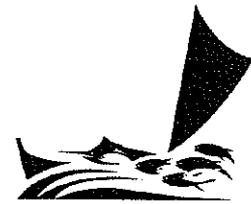




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**Western and Central Pacific  
Fisheries Convention**  
Preparatory Conference

31 January 2005

Dear Mr Hurry,

As you know, the Preparatory Conference for the Commission for the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was established by Resolution I of the Final Act of the Multilateral High Level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western Central Pacific Ocean (MHLIC), adopted on 5 September 2000. The Preparatory Conference met for the first time in Christchurch, New Zealand, on 23 April 2001. Six further sessions of the Conference took place between 2002 and 2005. The final session of the Conference took place at Pohnpei, Federated States of Micronesia on 6 and 7 December 2004.

Pursuant to paragraph 9 of resolution I, I now have the honour to transmit to you the Final Report of the Preparatory Conference on all matters within its mandate, issued as WCPFC/PrepCon/50, Vols. I – IV.

Yours sincerely,

**Michael Powles**  
Chairman

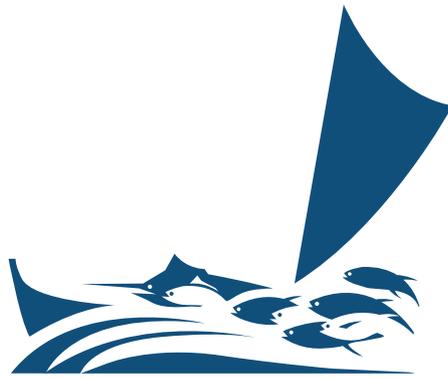
Mr Glenn Hurry  
Chairman  
Commission for the Conservation and  
Management of Highly Migratory Fish  
Stocks in the Western and Central Pacific  
Ocean  
Department of Agriculture, Fisheries and Forestry  
Canberra  
Australia

Michael Powles (New Zealand)  
Chairman  
[powles@paradise.net](mailto:powles@paradise.net)



Michael W. Lodge  
Head of Interim Secretariat  
[tematoatoa@yahoo.com](mailto:tematoatoa@yahoo.com)





**Western and  
Central Pacific  
Fisheries  
Convention**  
Preparatory Conference

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# Final Report of the Preparatory Conference

WCPFC/PrepCon/50, Volume IV

*Working Papers*  
*W.P. 14 - 24*

JANUARY 2005



## Working Papers

Following is a complete listing of official documents of the Preparatory Conference issued to date:

WCPFC/PrepCon/WP.1	Draft Rules of Procedure of the Commission	25 April 2001
WCPFC/PrepCon/WP.1/Rev.1	Draft Rules of Procedure of the Commission	23 January 2002
WCPFC/PrepCon/WP.1/Rev.2	Draft Rules of Procedure of the Commission	1 October 2002
WCPFC/PrepCon/WP.1/Rev.3*	Draft Rules of Procedure of the Commission	4 April 2003
WCPFC/PrepCon/WP.1/Rev.4	Draft Rules of Procedure of the Commission	6 August 2003
WCPFC/PrepCon/WP.1/Rev.5	Draft Rules of Procedure of the Commission	1 August 2004
WCPFC/PrepCon/WP.2	Draft Financial Regulations for the Commission	25 April 2001
WCPFC/PrepCon/WP.2/Rev.1	Revised draft Financial Regulations for the Commission	25 August 2003
WCPFC/PrepCon/WP.2/Rev.2	Revised draft Financial Regulations for the Commission	1 August 2004
WCPFC/PrepCon/WP.2/Rev.2*	Financial Regulations for the Commission	6 December 2004
WCPFC/PrepCon/WP.3	Service needs of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean and options and secretariat structures for the delivery of such services	13 February 2002
WCPFC/PrepCon/WP.4	Options for funding the service needs of the Commission	13 February 2002
WCPFC/PrepCon/WP.5	Preparatory Conference Organizational Fund and Preparatory Conference Secretariat	19 February 2002
WCPFC/PrepCon/WP.6	WG.III, Needs of the Commission with respect to MCS	3 October 2002
WCPFC/PrepCon/WP.7	WG.I, Indicative costs for a Commission secretariat and related issues	23 October 2002
WCPFC/PrepCon/WP.8	WG.I, Application of cost recovery principles to the provision of Commission services	31 October 2002
WCPFC/PrepCon/WP.9	WG.II, Review of ecosystem-by catch issues for the Western Central Pacific	13 November 2002
WCPFC/PrepCon/WP.10	WG.II, Review of data standards, technical capabilities and data sharing policies for the WCP region.	13 November 2002
WCPFC/PrepCon/WP.10/Corr.1	WG.II, Review of data standards, technical capabilities and data sharing policies for the WCP region, <i>Corrigendum</i> .	15 November 2002
WCPFC/PrepCon/WP.11	Report on status of Preparatory Conference Organizational Fund and Preparatory Conference Secretariat	11 November 2002
WCPFC/PrepCon/WP.11/Rev.1	Report on status of Preparatory Conference Organizational Fund and Preparatory Conference Secretariat	28 April 2003
WCPFC/PrepCon/WP.11/Rev.1/Add.1	Report on status of Preparatory Conference Organizational Fund and Preparatory Conference Secretariat	29 September 2003
WCPFC/PrepCon/WP.11/Rev.1/Add.2	Report on status of Preparatory Conference Organizational Fund and Preparatory Conference Secretariat	19 April 2004
WCPFC/PrepCon/WP.11/Rev.1/Add.3	Report on status of Preparatory Conference Organizational Fund and Preparatory Conference	28 November 2004

	Secretariat	
WCPFC/PrepCon/WP.12	Cooperation with IATTC	3 November 2002
WCPFC/PrepCon/WP.13	Formula for assessment of contributions to the budget of the Commission	15 April 2003
WCPFC/PrepCon/WP.13/Rev.1	Formula for assessment of contributions to the budget of the Commission	17 September 2003
WCPFC/PrepCon/WP.14	Draft procedures for boarding and inspection	24 April 2003
WCPFC/PrepCon/WP.14/Rev.1	Revised draft procedures for boarding and inspection	10 September 2003
WCPFC/PrepCon/WP.15	Review of data standards for the Western and Central Pacific region	30 June 2003
WCPFC/PrepCon/WP.15/Add.1	Review of data standards for the Western and Central Pacific region	9 September 2003
WCPFC/PrepCon/WP.15/Rev.1	Review of data standards for the Western and Central Pacific region	9 September 2003
WCPFC/PrepCon/WP.16	An investigation of technical capabilities and data security and confidentiality policies for the Western and Central Pacific region	30 June 2003
WCPFC/PrepCon/WP.16/Rev.1	An investigation of technical capabilities and data security and confidentiality policies for the Western and Central Pacific region	September 2003
WCPFC/PrepCon/WP.17	WG.III, Proposed guidelines for the rights, duties and responsibilities for observers, captains and crew	10 September 2003
WCPFC/PrepCon/WP.18	WG.III, Proposed components for regional vessel and gear marking systems	10 September 2003
WCPFC/PrepCon/WP.19	Draft provisional agenda for the first meeting of the Commission	1 March 2004
WCPFC/PrepCon/WP.20	WG.I, Provisional budget and scheme of contributions for the Commission	1 March 2004
WCPFC/PrepCon/WP.21	Process for appointment of an Executive Director for the Commission	1 March 2004
WCPFC/PrepCon/WP.22	WG.II, Provisional agenda and discussion items for PrepCon VI	5 March 2004
WCPFC/PrepCon/WP.23	VMS Discussion Paper	5 April 2004
WCPFC/PrepCon/WP.24	Management options paper	8 April 2004

**DRAFT PROCEDURES FOR BOARDING AND INSPECTION PURSUANT TO THE  
CONVENTION ON THE CONSERVATION AND MANAGEMENT OF HIGHLY  
MIGRATORY FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC OCEAN**

Prepared by the Chairman of Working Group III

1. The second meeting of WG.III will take place during the fourth session of the Preparatory Conference (PrepCon IV) from 5 – 9 May 2003 in Nadi, Fiji. Following the working procedure established prior to the first meeting of the Working Group, the annex to the present document contains a draft paper on boarding and inspection procedures for the consideration of participants.
2. In reviewing the paper, please keep in mind that the text provided here is not intended as a definitive set of procedures for boarding and inspection under the WCPFC. It is intended as a starting point for discussions on some of the more sensitive issues. In many cases, it will be necessary or desirable to further elaborate such procedures at the policy and/or technical level. Some cases where this might be appropriate are identified in italics in the text. However, there may be other such cases not identified, but this does not preclude further elaboration of any issue considered relevant by the participants in the discussion.
3. A draft of the paper was circulated informally to those delegations that expressed an interest in contributing to the elaboration of the text. A number of delegations provided substantive and thoughtful comments or suggestions for incorporation. The comments received on all sides of this issue highlight the complex and critical nature of boarding and inspection procedures to the work of the future Commission and all comments received warrant serious consideration. In particular, some comments cited the importance of ensuring greater consistency between boarding and inspection procedures of the Commission with those under article 22 of the UN Fish Stocks Agreement. Other comments suggested a greater role should be afforded to the flag state in carrying out boarding and inspection.
4. After reviewing all of the comments, I believe a thorough discussion in the Working Group of the issues raised is important before continuing efforts to further elaborate these procedures. As a result, only minor changes have been made to the previous text, most of which are technical or editorial in nature. I expect that those delegations that provided comments on the previous draft, or other input to the process, will come to the Working Group prepared to present those comments and suggestions. Of course, delegations that have not previously commented on the text will be free to do so at that time.
5. The tentative work programme adopted by the Working Group includes other items recommended for discussion at PrepCon II and it will be important to spend some time on these

issues as well. In this regard, I hope we will be able to begin a discussion on observers, in particular the parameters and guidelines for the observer programme with respect to MCS functions.

6. Other items on the tentative work programme include such issues as the Commission's vessel record; authorization to fish; vessel and gear markings and VMS. Some of the issues (such as the vessel record, vessel and gear markings, and perhaps others) may be considered more technical issues that may not require a great deal of discussion at the policy level in the Working Group. As a result, I would ask that participants consider whether it would be appropriate to delegate work on certain of these issues to a smaller technical subgroup or groups. These technical subgroups could work intersessionally and present the results of their work for the consideration of the Working Group at its next session (during PrepCon V).

7. Let me thank all participants in advance for the constructive and cooperative spirit I know you will bring to the second session of the Working Group. I look forward to our discussions.

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Annex

**DRAFT PROCEDURES FOR BOARDING AND INSPECTION PURSUANT TO THE  
WCPF CONVENTION**

PURPOSE

1. Boarding and inspection and related activities conducted pursuant to these procedures shall be for the purpose of verifying compliance with the conservation and management measures adopted by the Commission and in force.

AREA OF APPLICATION

2. The scheme established in these guidelines shall apply on the high seas within the Convention Area where conservation and management measures adopted by the Commission are in force.

PARTICIPATION

3. High seas boarding and inspection in accordance with the Convention shall be conducted only by vessels previously identified by the Commission as duly authorized for this purpose by the competent authority of the [Contracting Party][member of the Commission] under whose jurisdiction the vessel operates.

4. The Commission shall maintain a register of such vessels authorized to conduct high seas boarding and inspection activities in the Convention Area.

5. The Commission shall establish criteria for listing such vessels on the Commission's register. Such criteria shall include, inter alia, a requirement that all authorized enforcement vessels be dedicated solely to government service, clearly marked and identifiable as being on official government service and manned by personnel trained in accordance with standards approved by the Commission. *{Further elaboration will be required.}*

6. Any [Contracting Party][member of the Commission] may propose one or more of its vessels for inclusion on the Commission register. Such vessel or vessels shall be included on the register once the Commission, based on a recommendation of the Executive Director, has verified that the vessel and crew satisfy the approved criteria.

7. The list of authorized vessels shall be circulated annually to all members who, in turn, shall circulate the list to all vessels operating under their jurisdiction in the Convention Area. Any changes to the list shall be circulated to all members as soon as practicable. *{Information included on the list circulated will require further elaboration: e.g., name and description of vessel, radio call sign, frequency monitored, etc.}*

PROCEDURES

8. Any authorized enforcement vessel that encounters a fishing vessel operating on the high seas and engaged or reported to have engaged in a fishery regulated by the Commission shall,

prior to conducting any boarding and inspection, contact the fishing vessel by radio and identify itself as a vessel authorized to conduct enforcement activities under the Convention. *{Procedures for making such contact can be further elaborated.}*

9. The enforcement vessel shall then request permission to board from the master of the fishing vessel.

10. It is expected that the master of the vessel shall accommodate the request, in which case the boarding and inspection shall proceed on a consensual basis in accordance with the rules set forth in these procedures.

11. If the master of the vessel denies permission for such consensual boarding, he or she shall offer an explanation as to the reason for denying the request. The master's refusal and explanation for it shall be communicated without delay to the competent authorities under whose jurisdiction the fishing vessel is operating.

12. If the master of the vessel denies permission to the enforcement authorities for such consensual boarding, the enforcement authorities shall nonetheless be authorized to board the vessel in cases where:

(a) There is reason to believe that the vessel is or has been operating in violation of a conservation and management measure adopted by the Commission, and

(b) Such boarding and inspection is necessary to obtain or verify evidence documenting such a possible violation different from evidence that can be obtained without such boarding.

13. The inspecting State shall require its inspectors to observe generally accepted international regulations, procedures and practices relating to the safety of the vessel and crew, minimize interference with fishing operations and, to the extent practicable, avoid action that would adversely affect the quality of the catch on board. The inspecting State shall ensure that boarding and inspection is not conducted in a manner that would constitute harassment of any fishing vessel.

14. Boarding and inspection shall be carried out in accordance with the guidelines on use of force set forth in paragraphs 19 and 20 of these procedures and any further procedures adopted by the Commission. *{Procedures for the conduct of such inspections can be further elaborated.}*

15. Once on board the vessel, enforcement authorities shall be authorized to collect such information as may be necessary to substantiate a claim that the vessel operated in violation of a conservation and management measure adopted by the Commission.

16. Once the enforcement authorities have obtained all relevant evidence, they shall leave the fishing vessel at the earliest opportunity.

17. Any evidence obtained with respect to a fishing vessel operating in violation of a conservation and management measure adopted by the Commission, including any evidence of illegal fishing and any evidence obtained from inspections, shall be referred for legal action to the member under whose jurisdiction the vessel is operating, and shall be handled by that member in accordance with Article 25 of the Convention.

18. All incidents of boarding and inspection shall be reported promptly to the Executive Director, which shall circulate the information to all Commission members.

#### USE OF FORCE

19. Except as provided in paragraph 20, use of force shall not be authorized during high sea enforcement activities including for the purpose of stopping, slowing or boarding a vessel or, once aboard the vessel, carrying out routine inspection activities or for gaining access to any portion of the vessel, its gear, equipment, facilities, fish or fish products, or its records.

20. Use of force shall be authorized only when the conduct of the fishing vessel or its crew presents a real and imminent threat to the safety of the enforcement vessel, its crew or the boarding party. In such cases, application of force shall be limited to the minimum level determined necessary to counter the threat in question.

21. Any incident involving the use of force shall be communicated without delay to the Executive Director and to the competent authorities of the [Contracting Party][member of the Commission] under whose jurisdiction the fishing vessel involved is operating.

#### OTHER PROVISIONS

22. States shall be liable for damage or loss attributable to them arising from action taken pursuant to these procedures when such action is unlawful or exceeds that reasonable required in the light of available information to implement the provisions of these procedures.



**REVISED DRAFT PROCEDURES FOR BOARDING AND INSPECTION PURSUANT  
TO THE CONVENTION ON THE CONSERVATION AND MANAGEMENT OF  
HIGHLY MIGRATORY FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC  
OCEAN**

Prepared by the Chairman of Working Group III

1. The third meeting of WG.III will take place during the fifth session of the Preparatory Conference. The annex to the present document contains a revised draft of a scheme for boarding and inspection, which has been prepared by the Chairman of WG.III in the light of the discussions that took place during PrepCon IV, held in Nadi, Fiji from 5 – 9 May 2003,

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Annex

**REVISED DRAFT PROCEDURES FOR BOARDING AND INSPECTION PURSUANT  
TO THE WCPFC CONVENTION**

1. There is hereby established, pursuant to Article 26 of the Convention, the Western and Central Pacific Fisheries Convention (WCPFC) boarding and inspection scheme.

**PURPOSE**

2. Boarding and inspection and related activities, conducted pursuant to this scheme, shall be for the purpose of verifying compliance with the provisions of the Convention and conservation and management measures adopted by the Commission and in force.

**AREA OF APPLICATION**

3. The WCPFC boarding and inspection scheme shall operate on the high seas within the Convention area where conservation and management measures adopted by the Commission are in force.

**GENERAL RIGHTS AND OBLIGATIONS**

4. Each [Contracting Party] [Member of the Commission] is entitled to participate in the WCPFC boarding and inspection scheme and, subject to these provisions of the scheme, to carry out boarding and inspection on the high seas in the Convention Area of fishing vessels engaged in or reported to have engaged in a fishery regulated pursuant to the Convention.

5. Each Member of the Commission shall ensure that its vessels fishing on the high seas within the Convention area cooperate in the implementation of the WCPFC boarding and inspection scheme.

**GENERAL PRINCIPLES**

6. These procedures are intended to implement and give effect to Article 26 of the Convention and should be read to be consistent with those provisions.

7. The WCPFC boarding and inspection scheme shall be implemented with a view to achieving equitable distribution of inspections among fishing vessels and fleets operating in the scheme's area of application.

8. The scheme shall be implemented so as to take into account the full range of available measures to monitor compliance with the provisions of the Convention and agreed conservation and management measures, including inspection activities carried out by the authorities of Members of the Commission in respect of their own flag vessels.

9. The Commission shall keep the implementation of these principles under review.

## **PARTICIPATION**

10. The Commission shall maintain a register of all vessels and inspectors authorized to conduct boarding and inspection pursuant to the WCPFC boarding and inspection scheme.

11. Each [Contracting Party] [Member of the Commission] that intends to carry out boarding and inspection activities pursuant to this scheme shall so notify the Commission, through the Executive Director, and shall provide the following:

- (a) with respect to each vessel it proposes to assign to the scheme:
  - (i) details of the vessel (name, description, photograph, registration number, home port, international radio call sign, communication capability and crew complement);
  - (ii) certification that the vessel is dedicated solely to Government service and is clearly marked and identifiable as being on official Government service; and
  - (iii) certification that the crew has received and completed training in carrying out boarding and inspection activities at sea in accordance with standards and procedures adopted by the Commission.
- (b) with respect to each inspector it proposes to assign to the scheme:
  - (i) the name and affiliation of the inspector;
  - (ii) certification that the inspector is fully familiar with the fishing activities to be inspected and the provisions of the Convention and conservation and management measures in force; and
  - (iii) certification that the inspector has received and completed training in carrying out boarding and inspection activities at sea in accordance with standards and procedures adopted by the Commission.

12. Inspection vessels and inspectors notified by [Contracting Parties] [Members of the Commission] pursuant to paragraph 11 shall be included on the Commission inspection register once the Commission verifies that they meet the requirements of established in that paragraph.

13. In order to make optimum use of resources assigned to the scheme, [Contracting Parties] [Members of the Commission] shall seek to identify opportunities to place inspectors assigned by one [Contracting Party] [Member of the Commission] on the vessel assigned by another. Where appropriate, Members of the Commission should seek to conclude bilateral arrangements to this end or to otherwise facilitate communication and coordination between them for the purpose of implementing these procedures.

14. The Commission shall ensure that the register of authorized vessels and inspectors is at all times available to all Members of the Commission and shall immediately circulate any changes therein. Each Member of the Commission shall ensure that the list of vessels and

inspectors appearing on the register is circulated to each of its fishing vessels operating in the Convention area.

## **PROCEDURES**

15. Any vessel authorized to engage in boarding and inspection pursuant to this scheme (authorized inspection vessel) shall fly, in clearly visible fashion, a flag or pennant in the format and design designated by the Commission.

16. Any inspector authorized to engage in boarding and inspection pursuant to this scheme (authorized inspector) shall carry approved credentials issued by the designating [Contracting Party] [Member of the Commission] in the format agreed by the Commission.

17. An authorized inspection vessel that encounters a fishing vessel on the high seas that is engaged in or reported to have engaged in a fishery regulated pursuant to the Convention, shall be authorized to board and inspect such fishing vessel when:

(a) There is reason to believe that the vessel is or has been operating in violation of a conservation and management measure adopted by the Commission; and

(b) Such boarding and inspection is necessary to obtain or verify evidence documenting such a possible violation.

18. Prior to conducting a boarding and inspection of a fishing vessel on the high seas that is engaged in or reported to have engaged in a fishery regulated pursuant to the Convention, the inspecting vessel shall:

(a) establish contact with the vessel by radio and/or by the appropriate International Code of Signals;

(b) provide the information to identify itself as an inspection vessel authorized by the Commission - name, registration number, international radio call sign and contact frequency;

(c) provide notice of intent to board and the purpose of that boarding to the master of the fishing vessel; and

(d) initiate notice of the boarding and inspection to the competent authorities of the Member of the Commission of the vessel.

In carrying out these procedures, the inspectors shall make best efforts to communicate in a manner which the master of the fishing vessel in question can understand.

19. Authorized inspectors shall have the authority to inspect the vessel, its license, gear, equipment, records, facilities, fish and fish products and any relevant documents necessary to verify compliance with the conservation and management measures in force pursuant to the Convention.

20. Boarding and inspection pursuant to this scheme shall:

- (a) be carried out in accordance with internationally accepted principles of good seamanship so as to avoid risks to the safety of vessels and crews;
- (b) reduce interference with fishing operations to the greatest extent practicable and feasible;
- (c) avoid action that would adversely affect the quality of the catch on board; and
- (d) not be conducted in such manner as to constitute harassment of a fishing vessel.

21. In the conduct of a boarding and inspection, the authorized inspectors shall:

- (a) present a copy of their credentials to the master of the vessel and a copy of the text of the relevant measures in force pursuant to the Convention in the relevant area of the high seas;
- (b) not interfere with the master's ability to communicate with the authorities of the Member of the Commission under whose jurisdiction the vessel is operating during the boarding and inspection;
- (c) complete the inspection of the vessel within 6 (six) hours unless evidence of a serious violation is found;
- (d) acquire and clearly document any evidence they believe indicates a violation of measures in force pursuant to the Convention;
- (e) provide a copy of a report on the boarding and inspection to the master and to the competent authorities of the Member of the Commission under whose jurisdiction the vessel is operating, noting therein any objection or statement which the master wishes to have included in the report; and
- (f) promptly leave the vessel following completion of the inspection.

22. During the conduct of a boarding and inspection, the master of the fishing vessel shall:

- (a) accept and facilitate prompt and safe boarding by the authorized inspectors;
- (b) cooperate with and assist in the inspection of the vessel pursuant to these procedures;
- (c) not obstruct, intimidate or interfere with the inspectors in the performance of their duties;
- (d) allow the inspectors to communicate with the competent authorities of the Member of the Commission under whose jurisdiction the vessel is operating and the inspecting State during the boarding and inspection;
- (e) accord the inspectors the status of officers on board and provide them with reasonable facilities, including, where appropriate, food and accommodation; and

(f) facilitate safe disembarkation by the inspectors.

23. If the master of a fishing vessel denies permission for authorized inspectors to carry out a boarding in accordance with this scheme, such master shall offer an explanation of the reason for the denial. The [Contracting Party] [Member of the Commission] of the authorized inspection vessel shall immediately notify the Member of the Commission under whose jurisdiction the fishing vessel is operating, as well as the Commission, of the master's refusal and any explanation.

24. The Member of the Commission under whose jurisdiction the fishing vessel is operating shall, except in circumstances where generally accepted international regulations, procedures and practices relating to safety at sea make it necessary to delay the boarding and inspection, direct the master to accept the boarding and inspection. If the master does not comply with such direction, such Member shall suspend the vessel's authorization to fish and order the vessel to return immediately to port. That Member shall also notify the [Contracting Party] [Member of the Commission] of the authorized inspection vessel and the Commission as soon as practicable of the action it takes in these circumstances.

#### **USE OF FORCE**

25. The use of force for the purpose of stopping, slowing or boarding a vessel or, once on board a vessel, for carrying out inspection activities or for gaining access to any portion of the vessel, its gear, equipment, facilities, fish or fish products or its records shall be prohibited.

26. The master of the authorized inspection vessel may authorize the use of force only in circumstances when the conduct of the fishing vessel or its crew present a real and imminent threat to the safety of the inspection vessel, its crew or to the boarding party. In such cases, the degree of force used shall be the minimum necessary to counter the immediate threat in question.

27. Any incident involving the use of force shall be immediately reported to the competent authorities of the Member of the Commission under whose jurisdiction the fishing vessel involved is operating, as well as to the Commission.

#### **INSPECTION REPORTS**

28. Authorized inspectors shall prepare a complete report on each inspection they carry out pursuant to this scheme in accordance with such format as may be specified by the Commission. The [Contracting Party] [Member of the Commission] of the authorized inspection vessel from which the boarding and inspection was carried out shall transmit a copy of the inspection report to the Member of the Commission under whose jurisdiction the fishing vessel inspected is operating, as well as the Commission, within 3 (three) days of the inspection.

29. Such report shall clearly identify any observed activity or condition that the authorized inspectors believe to be a violation of the Convention or conservation and management measures adopted pursuant thereto and indicate the nature of specific factual evidence of such violation.

30. Each inspection report shall include any statement or objection that the master of the inspected vessel wishes to make.

## **SERIOUS VIOLATIONS**

31. In the case of any inspection of a fishing vessel during which the authorized inspectors observe an activity or condition that would constitute a serious violation, as defined in paragraph 36, [the Contracting Party] [Member of the Commission] of the authorized inspection vessel shall immediately notify the Member of the Commission under whose jurisdiction the fishing vessel is operating, directly as well as through the Commission.

32. Upon receipt of a notification under Paragraph 31, the Member of the Commission under whose jurisdiction the fishing vessel is operating shall:

(a) assume its obligation to investigate and, if the evidence warrants, take enforcement action against the fishing vessel in question and so notify the [Contracting Party] [Member of the Commission] of the authorized inspection vessel, as well as the Commission; or

(b) authorize the [Contracting Party] [Member of the Commission] of the authorized inspection vessel to complete investigation of the alleged violation and so notify the Commission.

33. In the case of 32(a), above, the [Contracting Party] [Member of the Commission] of the authorized inspection vessel shall provide, as soon as practicable, the specific evidence collected by the authorized inspectors to the Member of the Commission under whose jurisdiction the fishing vessel is operating.

34. In the case of 32(b), above, the [Contracting Party] [Member of the Commission] of the authorized inspection vessel shall provide the specific evidence collected by the authorized inspectors along with the results of its investigation to the Member of the Commission under whose jurisdiction the fishing vessel is operating immediately upon completion of the investigation.

35. If, after three full working days of receipt of a notification pursuant to Paragraph 31 (as confirmed by the Commission), the Member of the Commission under whose jurisdiction the fishing vessel is operating has failed to respond to the notification, the fishing vessel in question shall as of that date be deleted from the Commission's record of vessels authorized to fish in the Convention area (Article 24(4)).

36. For the purposes of this scheme, a serious violation means:

(a) fishing without a license, permit or authorization issued by the flag State in accordance with Article 24 of the Convention;

(b) failure to maintain accurate records of catch and catch-related data in accordance the Commission's reporting requirements or serious misreporting of such catch and/or catch-related data;

(c) fishing in a closed area;

(d) fishing during a closed season;

(e) taking of prohibited species;

- (f) significant violation of catch limits or quotas in force pursuant to the Convention;
- (g) using prohibited fishing gear;
- (h) falsifying or concealing the markings, identity or registration of a fishing vessel;
- (i) concealing, tampering with or disposing of evidence relating to investigation of a serious violation;
- (j) multiple violations which taken together constitute a serious disregard of measures in force pursuant to the Convention; and
- (k) refusal to accept a boarding and inspection in accordance with this scheme.

## **ENFORCEMENT**

37. Any evidence obtained with respect to violation by a fishing vessel of a measure in force pursuant to the Convention as a result of the operation of this scheme shall be referred to the competent authorities of the Member of the Commission under whose jurisdiction the vessel is operating for action in accordance with Article 25 of the Convention.

38. Interference with any authorized inspector shall be treated by the Member of the Commission under whose jurisdiction the fishing vessel being inspected is operating shall be treated by that Member as if the inspector were an inspector of that Member.

## **ANNUAL REPORTS**

39. [Members of the Commission][Contracting Parties] that assign vessels to this scheme shall report annually to the Commission on the boarding and inspections carried out by its authorized inspection vessels, as well as upon alleged violations observed.

40. Members of the Commission shall include in their annual compliance reports to the Commission under Article 25(8) of the Convention action that they have taken in response to boarding and inspections of their fishing vessels that resulted in observation of alleged violations, including information relating to any proceedings instituted and sanctions applied.

## **OTHER PROVISIONS**

41. Authorized inspection vessels, while assigned to this scheme, shall engage in surveillance aimed at identifying fishing vessels of non-Parties undertaking fishing activities on the high seas in the Convention area. Any such vessels identified shall be immediately reported to the Commission.

42. Members of the Commission shall be liable for damage or loss attributable to them from action in violation of these procedures.

## **COMMISSION COORDINATION AND OVERSIGHT**

43. Authorized inspection vessels shall establish regular contact for the purpose of sharing information on areas in which they are patrolling, sightings and boarding and inspections they have carried out, as well as other operational information relevant to carrying out their responsibilities under this scheme.

44. For this purpose, the Commission shall establish, within the Secretariat, a means to facilitate secure communication among authorized inspection vessels.

45. The Commission shall keep under continuous review the implementation and operation of the WCPFC boarding and inspection scheme, including review of annual reports relating to the scheme provided by Members. In particular, it shall seek to promote optimum use of the authorized inspection vessels and authorized inspectors assigned to the scheme by:

(a) identifying priorities by area and/or by fishery for boarding and inspections pursuant to this scheme;

(b) ensuring that boarding and inspection on the high seas is fully integrated with the other monitoring, compliance and surveillance tools available pursuant to the Convention;

(c) ensuring generally equitable distribution of boarding and inspections on the high seas among fishing vessels of Members of the Commission; and

(d) taking into account high seas inspection resources assigned by Members of the Commission to monitor and ensure compliance by their own fishing vessels, particularly for small boat fisheries whose operations extend onto the high seas in areas adjacent to waters under their jurisdiction.

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# **Capacity of Pacific Island Countries and Territories to Meet the Likely Data Requirements of the Western and Central Pacific Fisheries Commission**

A paper prepared by the

**Oceanic Fisheries Programme  
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# Acronyms

ALC	Automatic Location Communicator
BOFM	Bureau of Oceanic Fisheries management (Palau)
CES	Catch and Effort query System
DCC	Data Collection Committee
DMWR	Department of marine and Wildlife Resources (American Samoa)
DWFN	Distant-Water Fishing Nation
EC	European Community
EEZ	Exclusive Economic Zone
FAD	Fish Aggregation Device
FFA	Forum Fisheries Agency
FLEU	Fisheries Licensing and Enforcement Unit (Kiribati)
FSM	Federates States of Micronesia
MAFFM	Ministry of Agriculture, Forestry, Fisheries and Meteorology (Samoa)
MIMRA	Marshall Islands Marine Resources Authority
MMR	Ministry of Marine Resources (Cook Islands)
MNRD	Ministry of Natural Resources Development (Kiribati and Tuvalu)
NFA	National Fisheries Authority (Papua New Guinea)
NFMRA	Nauru Fisheries and Marine Resources Authority
NGO	Non Governmental Organisation
NMFS	National Marine Fisheries Service (United States)
NORMA	National Oceanic Resources Management Authority (Federated States of Micronesia)
OFFP	Oceanic Fisheries Programme (of the Secretariat of the Pacific Community)
PICT	Pacific Island Country or Territory
PNG	Papua New Guinea
PrepCon	Preparatory Conference (of the Western and Central Pacific Fisheries Commission)
PROCFish	Pacific Regional Oceanic and Coastal Fisheries (Project)
SCG	Scientific Coordinating Group (of the Preparatory Conference)
SCTB	Standing Committee on Tuna and Billfish
SPC	Secretariat of the Pacific Community
TMP	Tuna Management Plan
UNFSA	United nations Fish Stocks Agreement
VMS	Vessel Monitoring System
WCPF	Western and Central Pacific Fisheries (Convention or Commission)
WCPO	Western and Central Pacific Ocean
WG II	Working Group II (of the Preparatory Conference)

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## Introduction

In considering the issue of long-term data requirements of the Western and Central Pacific Fisheries (WCPF) Commission, the PrepCon through Working Group II (WG II), requested the Secretariat of the Pacific Community (SPC) Oceanic Fisheries Programme (OFP) to compile information on the current capacity and capacity needs of Pacific Island Countries and Territories (PICTs) to fulfil their likely scientific data collection and reporting obligations. Note that this report deals only with scientific data requirements and obligations. PICTs may also have broader fisheries management obligations with respect to their Exclusive Economic Zones (EEZs) and national fleets under the Convention, including obligations related to monitoring, control and surveillance, and development and implementation of fisheries management measures for their EEZs. These obligations may also have considerable capacity implications for PICTs, but these are not dealt with in this report.

Part I of the report provides overview material on topics related to this issue. First, we review the current status of fishery development in PICTs, as the level of development will bear considerably on the extent of data collection and reporting obligations. Second, we outline the likely long-term data requirements of the Commission, based on guidelines provided by the United Nations Fish Stocks Agreement (UNFSA), the WCPF Convention, and discussions that have taken place within the PrepCon framework, particularly in WG II and in the first two meetings of the Scientific Coordinating Group (SCG). Third, we describe the main sources, or methods of collection, of the data that are likely to be required. Fourth, we examine how the responsibilities for various data collection programmes might be allocated in the context of the tuna fisheries in the Convention Area, and the current capacity of PICTs to meet these responsibilities. Finally we make some remarks on the likely capacity needs of PICTs in the area of data analysis. A general summary and conclusions section completes Part I.

Part II of the report provides more detailed, country-specific information on current scientific data collection and reporting capacity by PICTs, and identifies specific areas where additional capacity is needed. Note that this survey of PICT capacity and needs is not exhaustive. A more comprehensive needs assessment of Forum Fisheries Agency (FFA) member countries will be undertaken in 2004 as part of a new project being funded by the Global Environment Facility and being implemented by SPC and FFA.

## Part I: Overview

### 1. Status of Tuna Fishery Development in PICTs

The extent of national obligations for data collection and reporting, however specified, will inevitably be related to the level of development of tuna fisheries in PICTs. There are two ways in which PICTs have “developed” their tuna fisheries, and both need to be recognised in the context of data collection and reporting obligations. First, the extent to which vessels flagged<sup>1</sup> by PICTs fish for tuna in the Convention Area will determine a principal data obligation. Second, the extent to which PICTs license foreign vessels to fish in their EEZs may also have implications for data obligations of PICTs, as will be discussed below.

Table 1 provides an overview of both types of fishing activity in PICTs, as reflected by data available to the OFP for the year 2002. In terms of fishing activity by national fleets, many PICTs have

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<sup>1</sup> In SPC databases, nationality is not determined strictly by flag, but by the nationality of the controlling interest in a vessel. This definition of nationality may be different in some cases to the flag. The terms are used interchangeably in this report, but any data presented by nationality are in relation to the SPC definition.

developed small-scale longline fisheries in recent years. The largest of these (in terms of catch) are currently Fiji, American Samoa, French Polynesia and Samoa, with four other national fleets recording catches of more than 1,000 t in 2002. Fewer PICTs have developed national purse seine fleets. Papua New Guinea now has a purse seine fleet catching at approximately the level of the United States fleet, while Marshall Islands and Federated States of Micronesia also have catch levels that are significant in the regional context. Solomon Islands and Kiribati have smaller national purse seine fleets. Only Solomon Islands currently has a substantial pole-and-line fishery, with smaller operations in Fiji and French Polynesia.

Most PICTs license foreign fishing in their EEZs, either through multilateral (US Treaty and FSM Arrangement) or bilateral access agreements. The two multilateral arrangements in place are administered by FFA on behalf of its members.

In 2002, the catch by foreign licensed purse seiners in the Kiribati EEZ was in excess of 300,000 t. The distribution of purse seine catches among EEZs varies considerably over time, with *El Niño* conditions (which prevailed in 2002) favouring EEZs in the east of the region (Nauru, Kiribati, Tuvalu and Marshall Islands) and *La Niña* conditions favouring EEZs towards the west (Palau, Federated States of Micronesia, Papua New Guinea, Solomon Islands). Overall, the 2002 purse seine catch in the EEZs of PICTs was in excess of 600,000 t. Much of this catch is unloaded or transhipped in regional ports, which provides opportunities for catch monitoring and sampling.

Federated States of Micronesia, Kiribati, Marshall Islands and Vanuatu licensed the majority of foreign longline fishing in their EEZs in 2002. Foreign longliners consist of smaller locally-based vessels that fish primarily in EEZs (Japanese, Taiwanese and Chinese fleets based in Guam, Palau, Federated States of Micronesia and Marshall Islands) and larger distant-water vessels (from Japan, Korea and Taiwan) that fish both in EEZs and on the high seas. The locally-based fleets unload their catches in base ports (from where they are air-freighted to Japan) while distant-water vessels typically undertake long campaigns and return to their home ports to unload.

The activities of the Japanese pole-and-line fleet in the tropical region of the Convention Area has reduced over the years. In 2002, the fleet fished in Marshall Islands and in previous years has regularly fished in Palau, Federated States of Micronesia, Kiribati Solomon Islands and elsewhere. The fleet also fishes extensively in international waters. All catch is landed directly in Japan.

Part I: Overview

Table 1. Longline, purse seine and pole-and-line catches and vessel numbers by flag for PICT fleets, and foreign catches and vessels numbers by PICT EEZ. Source: logsheet data held by OFP.

Flag or EEZ	2002 Fishing Activity by Domestically Flagged Vessel						2002 Fishing Activity within EEZs by Foreign Licensed Vessels					
	Longline		Purse seine		Pole & Line		Longline		Purse seine		Pole-and-line	
	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels
<b>1.1. FFA countries</b>												
Cook Islands	1,134	17					83	9	2,674	22		
Federated States of Micronesia	825	22	18,128	7			3,003	175	58,892	136		
Fiji	10,974	119			431	2	79	15				
Kiribati			5,112	1			2,144	89	302,292	170		
Marshall Islands			38,242	5			1,996	71	28,812	121	7,316	35
Nauru									94,755	129		
Niue												
Palau							827	82				
Papua New Guinea	2,198	41	119,873	28					94,597	103		
Samoa	4,901	80							86	6		
Solomon Islands	856	25	8,079	2	9,642	12	839	46	1,786	48		
Tokelau									6,397	30		
Tonga	1,642	26										
Tuvalu							35	14	24,438	51		
Vanuatu	354	13					2,303	72	63	1		
<b>1.2. US Territories</b>												
American Samoa	7,754	70										
Guam												
Northern Marianas												
<b>1.3. French Territories</b>												
French Polynesia	5,755	45			620	15						
New Caledonia	1,936	25										
Wallis & Futuna												

## 2. Data Requirements of the Commission

The long-term data requirements of the Commission have not yet been precisely defined. However, some guidance is provided by the UNFSA Annex 1 and by recent recommendations of the SCG.

### 2.1. UNFSA Annex 1

The following data types are specified in Annex 1 of UNFSA:

#### Basic Fishery Data

- (i) time series of catch and effort statistics by fleet;
- (ii) total catch in number, nominal weight, or both, by species (both target and non-target) as is appropriate to each fishery;
- (iii) discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery;
- (iv) effort statistics appropriate to each fishing method;
- (v) fishing location, date and time fished and other statistics on fishing operations as appropriate;
- (vi) composition of the catch according to length, weight and sex;
- (vii) other biological information supporting stock assessments such as information on age, growth, recruitment, distribution and stock identity; and
- (viii) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.

#### Vessel Data and Information

- (i) vessel identification, flag and port of registry;
- (ii) vessel type;
- (iii) vessel specifications (e.g. material of construction, date built, registered length, gross registered tonnage, power of main engines, hold capacity and catch storage methods);
- (iv) fishing gear description (e.g. types, gear specifications and quantity);
- (v) navigation and position fixing aids;
- (vi) communication equipment and international radio call sign; and
- (vii) crew size.

The annex further states that “States should ensure that data are collected from vessels flying their flag on fishing activities according to operational characteristics of each fishing method (e.g. each individual tow for trawl, each set for long-line and purse seine, each school fished for pole-and-line and each day fished for troll) and in sufficient detail to facilitate effective stock assessment”. This suggests that a fundamental obligation of flag states is to ensure that catch and effort (i.e. logsheet) data, and possibly other information, such as size composition data, are recorded at an operational level.

### 2.2. Scientific Co-ordinating Group

At its second meeting (July 2003), the SCG made some progress towards identifying the long-term data requirements of the Commission. To this end, the SCG recommended that:

## Part I: Overview

Operational level data be collected by all fleets and be made available to the Commission for stock assessment and other scientific analyses, with appropriate arrangements for data security and confidentiality;

Annual catches by species, gear and fleet in the Convention area be reported by flag states and coastal states;

Size composition data should be collected, at the operational level where practical, according to a statistically sound sampling design to ensure that the data are representative of the fishery.

In most other fishery commissions, the obligations for collection and provision of such data would be on flag states. However, there is recognition that, because of the unique characteristics of this region, coastal states have a critical role to play in regional data collection and provision to the WCPF Commission. This arises because a substantial proportion of the catch occurs within the EEZs of coastal states, both through the operation of domestic fleets and through licensed foreign fishing. In respect of the latter, most coastal states require the submission (to them) of complete logsheet data as a condition of licence, and will continue to do so when the WCPF Commission is in place. As a result of these conditions, coastal states in some cases collectively hold more complete historical data on the fishing operations of some fleets than the flag states themselves. Also, many foreign vessels unload or transship their catches in regional ports, providing opportunities for catch verification and sampling. In recognising this situation, the SCG recommended that

Flexibility be maintained in establishing data reporting requirements for the Commission and that coastal states and flag states cooperate in ensuring that the Commission receive data in a timely fashion.

### 2.3. Data Verification

Verification of data is required under the UNFSA and examples of verification methods are provided in Annex 1 of the Agreement:

- position verification through vessel monitoring systems;
- scientific observer programmes to monitor catch, effort, catch composition (target and non-target) and other details of fishing operations;
- vessel trip, landing and transshipment reports; and
- port sampling.

WGII and the SCG have not yet discussed the details of data verification requirements, but for the purpose of this report, reasonable assumptions can be made based on the above.

### 2.4. Likely Data Requirements of the Commission

Given the above background, a list of likely initial data requirements by the Commission can be proposed for the purpose of determining the obligations of PICTs and assessing their capacity to meet those obligations. These are as follows:

- (i) Operational-level catch and effort data primarily for target and retained by-catch species;
- (ii) Estimates of appropriately verified total annual catches (including discards) of target and non-target species and levels of effort by gear and national fleet;
- (iii) Estimates of catch composition according to species, length, weight and (for some species) sex; and
- (iv) Vessel and gear characteristics.

In the next sections, we look in greater detail at the possible sources of such data, and the types of infrastructure and expertise that PICTs will require to apply them.

### **3. Fishery Data Sources**

The data required by the Commission will be collected from a number of sources or methods, most of which are commonly utilised by other tuna commissions for these purposes. Table 2 presents a summary of the possible sources for each data type, which are discussed below.

#### **3.1. Operational Level Catch and Effort Data**

Operational level catch and effort data are most commonly collected by the use of logsheets. Additional information, for example details of fish aggregation device (FAD) use by purse seiners, may be collected by observers. Logsheets need to cover a high proportion of the total catch in order for it to be considered representative. Coverage rates in excess of 80% would likely be considered acceptable.

#### **3.2. Total Annual Catch and Effort and Catch–Effort Verification**

Estimates of total annual catch and effort are a product of several data sources. Verification is an important aspect of this process. If 100% coverage logsheet data are available in a timely fashion and the catch and effort estimates therein are considered accurate, the estimation of total annual effort and retained catch is a relatively trivial task. However, 100% logsheet coverage is rarely obtained and estimates of coverage rates are required to estimate total effort and catches of retained species. Also, verification of declared logsheet catches and fishing effort against other data sources is required.

Logsheets coverage rates may be estimated from landings (including transshipment) data if such data cover all fishing activity by the fleet concerned. Landings data are normally collected at the vessel-trip level at unloading locations by port sampling programmes with the cooperation of vessel operators and unloading or processing companies. Where landed catches are exported, export documentation (such as packing lists for sashimi longline fish) may provide a convenient estimate of landings. Currently, there is no other formal and widely applied system of documenting landings in most PICTs. In addition to determining coverage rates of logsheet data, landings data may also be used to correct logsheet catch declarations at the individual trip level.

The South Pacific Regional Fishing Trip and Port Visit Log, which was proposed by the 5<sup>th</sup> meeting of the SPC/FFA Tuna Fishery Data Collection Committee (DCC – Anon. 2003) may also provide an authoritative source of information on vessel activity. This form would be a vessel-specific annual return documenting fishing trip details and periods of inactivity throughout the year, and would be an effective means of verifying fishing activity and estimating the coverage of landings and logsheet data.

VMS also has the potential to provide complete records of vessel activity, and therefore will be invaluable for estimation of logsheet and landings data coverage when in universal use. VMS will also be important for verifying the fishing locations reported on logsheets.

Estimates of discarded target and non-target catch need to be incorporated into total catch estimates. Such data are only available through observer programmes, and the accuracy of the resulting estimates are dependent on the observer coverage rate for each fleet. For rare but important non-target species (such as turtles) very high observer coverage rates may be required to obtain reliable estimates. More common non-target species catches can be estimated with reasonable precision with lower coverage rates, e.g. 20-30% (Lawson 2003). Generally, the level of observer coverage will depend on the level of precision desired and the frequency with which the various species of interest occur in the catch.

#### **3.3. Catch Composition Data**

Catch composition by species, length, weight and other characteristics (such as sex) are typically obtained by sampling catches at sea through observer programmes and at the point of unloading by port sampling programmes. Sampling programmes need to be designed to ensure that the samples are

representative of the catch. At-sea sampling by observers has the advantage of enabling sampling of both the retained catch and the catches of target and non-target species that are subsequently discarded. An additional advantage is that operational-level sampling data can be obtained and, in the case of purse seiners, protocols adopted to promote representative sampling that are more difficult to implement by port sampling. Thus, observer programmes are the preferred method of sampling catches. However, there are often cost and logistical difficulties in achieving sufficiently high observer coverage rates for this method to be relied upon alone to generate catch composition data. Therefore, port-based sampling of catches at unloading sites is usually required to augment observer-based sampling. For some fleets (e.g. distant-water longline fleets that remain at sea for long periods), port sampling may be currently the only feasible method of sampling the catch.

For small-scale sashimi longline fleets that unload their catch in PICTs for export to overseas sashimi markets, export documentation, or so-called packing list data, provides an alternative to port-based size sampling. Packing list data comprise the individual weights of all fish exported. Often, similar data for export rejects are also available. Such data are usually attributable to a particular vessel and trip, and therefore information on time and location of catches can be derived in the same way as for port sampling data. The advantages of utilising packing list data are that they are readily available in written form and usually represent a very high proportion of the total catch, therefore ensuring representative sampling. However, the sheer volume of data can present data processing challenges.

### **3.4. Vessel and Gear Characteristics**

Information on vessel and gear characteristics has not been systematically collected from regional tuna fisheries to date. Some information is potentially available from existing sources, such as national licensing databases and regional or international vessel registries. However, the experience has so far been that the quality of such data has been insufficient to support stock assessment and related analyses. Therefore, it is likely that the Commission will need to develop new procedures for collecting information on vessels and fishing gear.

We suggest that collection of accurate data on vessel and gear characteristics will need to utilise several new and existing data collection methods.

- Basic vessel data such as various parameters of vessel size, engine horsepower, fish-holding capacity, and other parameters listed in Annex IV of the Convention, would not be expected to change very often and might be collected through an annual vessel return provided by the flag state.
- Gear characteristics of potential importance to stock assessment might change more frequently and could be collected on a trip-specific basis as part of a logbook. The SPC/FFA Tuna Fishery Data Collection Committee is currently testing a multi-page logbook (in contrast to the single-page logsheet that is currently used by most fleets in the WCPO), which contains detailed information regarding vessel and gear attributes.
- Both types of information could be verified periodically through in-port inspections and observers. These methods may also allow the collection of more detailed information of vessel and gear characteristics.

Table 2. Required data types and possible methods of collection.

Data type	Data Source/Method	Comments
Operational level data	logsheet observers	Logsheets record mainly effort and catches of target and retained by-catch species. More detailed information (e.g. FAD deployment by purse seiners, hook-by-hook data for longliners) need to be collected by observers.
Total annual catch and effort and catch-effort verification	logsheet landings vessel activity log VMS observers	Estimation typically requires high-coverage logsheet data and estimates of coverage rates provided by landings/transshipment data, VMS data and vessel activity log data. Observer data are required for estimates of discards of target and non-target catch. Observers can verify the accuracy of operational-level data reported on logsheets; landings (including transshipment) data are used to verify trip-level data from logsheets; vessel activity logs provide documentation of fishing activity; VMS provides verification of fishing location and fishing activity.
Catch composition	observers port sampling export documentation	Length, weight and other catch composition sampling can normally be obtained at the operational level for purse seiners by observers and port sampling; operational-level data for longline and pole-and-line can be obtained by observers only, and trip-level data by port sampling. Trip-level weight frequency data of high coverage are often available through export documentation (packing lists).
Vessel and gear characteristics	annual vessel return logbook in-port inspections observers vessel registries licensing databases	Information on basic vessel characteristics would be most usefully collected via an annual vessel return. Trip-specific data on gear characteristics may be collected via logbooks. Vessel registries and licensing databases may provide useful adjunct data. In-port inspection and observer programmes provide a means of verification of supplied data and may allow the collection of more detailed information on vessel and gear characteristics.

## 4. Data Collection Responsibilities and Current Status of Data Collection in PICTs

Table 3 indicates the likely responsibilities for data collection and provision utilising the various data sources. Table 4 summarises the current status of data collection by PICTs in respect of their national fleets. Below we discuss likely data collection responsibilities and current status of data collection in PICTs for each of the major data sources identified.

### 4.1. Logsheets Programmes

#### Responsibility

While flag states are required to ensure that logsheet data are collected (as stipulated by UNFSA Annex 1, article 2(a)), both UNFSA and the WCPF Convention are silent on the issue of who should have responsibility for provision of logsheet data to the Commission. In this region, coastal states licensing foreign fishing vessels have compiled logsheet data that have been collected by those vessels for many years. In some cases, the coastal states may collectively possess more complete logsheet data in respect of certain flag states than the flag states themselves. This is because some flag states have lacked a mechanism for compiling such data from their vessels, and in some cases because of data confidentiality clauses in agreements between coastal states and foreign fishing companies. It is therefore likely that, unless the Commission decides otherwise, provision of logsheet data to the Commission or its contracted data manager will be a joint responsibility of both flag states and those

coastal states which license foreign fishing in their EEZs. If this is the case, PICT responsibilities will include the collection and provision of logsheet data to the Commission or its contracted data manager in respect of their national fleets, and the compilation and provision of logsheet data collected in respect of licensed foreign fishing in their EEZs.

#### Current Status in PICTs

Almost all PICTs that are listed in Table 1 as having national tuna fishing fleets have logsheet data collection programmes in place. Likewise, countries that license foreign fishing in their EEZs compile logsheet data from licensed vessels. For both categories of fishing activity, regional logsheets developed by the SPC/FFA Tuna Fishery Data Collection Committee are widely used. Most countries rely heavily on the OFP to provide data processing and data management services for both national and licensed foreign fleets<sup>2</sup>. Exceptions to this include Fiji, French Polynesia, Papua New Guinea and Solomon Islands who undertake some or all of their own logsheet data processing. Cook Islands is in the process of developing in-house data processing capacity. Most countries have in-house national database systems developed and maintained by the OFP, and have staff that have been trained in the use of those systems.

The adequacy of logsheet coverage of the total catch of PICT fleets is indicated in Table 4. Many of the fleets are relatively new, and there has been some lag in implementing logsheet data collection systems. However, there has been rapid improvement, with 16 out of 19 national fleets recording high (>80%) coverage levels in 2002. This situation is expected to improve even further in 2003.

Logsheet coverage of the total catch by foreign licensed fleets in PICT EEZs is difficult to measure in the absence of independent catch estimates for the EEZs. Coverage is likely to vary by licensed vessel nationality and gear type. Logsheet coverage of foreign licensed purse seiners is likely to be high if not 100% for all fleets and EEZs. For purse seine fleets other than Japan, high-coverage logsheet data for fishing activities on the high seas are also provided to coastal states that license their activities in EEZs. Logsheet coverage of foreign longline fleets is more variable. High EEZ coverage of Japanese, Korean, Chinese and offshore Taiwanese (based in Micronesia) fleets is maintained, but there has been low coverage of the EEZ activities of the Taiwanese distant-water fleet (targeting albacore). Few if any logsheet data on high seas fishing activities by distant-water longline fleets are provided to PICTs. The activities of the Japanese pole-and-line fleet operating in the EEZs of PICTs is well covered by logsheet data, but data are not provided for the high seas.

Overall, the logsheet data held by PICTs in respect of foreign licensed fishing, and consolidated in the Regional Tuna Fishery Database managed by the OFP, represent a valuable source of historical logsheet data for all major fleets. Recent logsheet data coverage of foreign licensed fleets for their combined EEZ and high seas fishing activities (in the Convention Area south of 20°N but excluding Indonesia and the Philippines) has averaged 81% across all fleets, with 88% for purse seine (1999–2002), 32% for longline (1999–2001) and 42% for pole-and-line (1999–2001).

## **4.2. Landings/Transshipment Monitoring**

### Responsibility

The issue of responsibility for monitoring catch landings, including transshipments, has not been specifically dealt with in existing legal instruments nor has it yet been discussed in the PrepCon or its subsidiary bodies. Nevertheless, purely as a matter of logistics, it might be reasonable to assume that this monitoring function will become a port state responsibility, irrespective of the nationality of the vessel that is landing catch. This is because it would be difficult if not impossible for flag states to effectively monitor landings in the large number of foreign ports in which vessels unload their catch

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<sup>2</sup> The US National Marine Fisheries Service provides tuna fishery monitoring and data processing and management services to the US Territories (American Samoa, Guam and Northern Marianas).

in the Convention Area<sup>3</sup>. Port state responsibility in this area would be consistent with Article 27, paragraph 2 of the WCPF Convention, which states that “whenever a fishing vessel of a member of the Commission voluntarily enters a port or offshore terminal of another member, the port State may, *inter alia*, inspect documents, fishing gear and catch on board such fishing vessel”.

#### Current Status in PICTs

The survey of national fleets in Table 4 indicates that the monitoring of landings in PICTs is currently inconsistent and is largely inadequate to support verification of logsheet declarations and estimation of total annual catches. This is an area where PICTs will need to develop additional monitoring capability, both in respect of their national fleets, and, if catch landing monitoring is designated a port state responsibility, for foreign fleets landing their catches in PICT ports.

### **4.3. Vessel Activity Log**

#### Responsibility

The proposed South Pacific Regional Fishing Trip and Port Visit Log form (an annual vessel return) would, if completed accurately, fully document periods of activity and inactivity during the reporting year. We would suggest that completion of this form be a flag state responsibility and that its timely provision be linked to maintenance of good standing on the Commission’s vessel register and on their national equivalents. This would ensure a complete and timely record of vessel activity throughout the Convention Area.

#### Current Status in PICTs

Data collection using the DCC’s South Pacific Regional Fishing Trip and Port Visit Log form is not yet being implemented, but countries are actively encouraged to do so as soon as possible. Data systems to process and manage this information would need to be developed.

### **4.4. VMS**

#### Responsibility

Article 24, paragraphs 8–10 of the WCPF Convention indicate a shared responsibility among flag states, coastal states licensing foreign fishing and the Commission itself to have a coherent VMS that will ideally cover all vessels fishing for highly migratory species in the Convention Area. Flag states would have the responsibility of requiring that vessels flying their flags use “near real-time position-fixing transmitters” while fishing on the high seas and in the EEZs of other Commission members. The Commission shall determine the standards, specifications and procedures for high seas VMS, while coastal states shall make such determinations for waters under their jurisdiction. Any coastal state would have the right to include its waters in the Commission VMS. Flag states are not obligated to require their vessels to use VMS while fishing in their own EEZs, but it would be clearly desirable for flag states to do this so as to ensure universal VMS coverage of all vessels wherever they are fishing in the Convention Area. Flag states and coastal states will need to cooperate through the Commission to ensure that VMS data are compiled in such a way as to allow verification of fishing activity and catch locations while protecting the confidentiality of such data.

#### Current Status in PICTs

VMS is in operation at some level in 10 out of the 19 PICT national fleets (Table 4). However, in some of these cases, coverage of vessels is less than complete. Therefore, considerable effort will be required for systems to be implemented across all national fleets.

In addition to national VMS, FFA operates a regional VMS for foreign vessels licensed by their member countries. Almost all purse seiners licensed by FFA members are in good standing on the

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<sup>3</sup> Only the Japanese fleets and distant-water longline fleets of Korea and Taiwan routinely unload their catches in non-PICT ports.

FFA VMS Register, but slower progress has been achieved for foreign longline fleets, with the exception of Japan.

#### **4.5. Observer Programmes**

##### Responsibility

The WCPF Convention (Article 28) states that the Commission shall operate a regional observer programme and that flag states are required to ensure that their vessels, except those that operate exclusively in waters under national jurisdiction, are prepared to accept an observer from the Commission's regional observer programme. Flag state permission is required for Commission observers to continue their duties if the observed vessel enters the EEZ of the flag state. Vessels that fish exclusively in the national waters of the flag state are not required to carry Commission observers. Such vessels may be covered by national observer programmes, but this is the prerogative of the coastal state concerned.

The Commission will likely need to play a key role in ensuring that the regional observer programme is well coordinated with national programmes. Attention will need to be paid to specifying the overall scientific sampling objectives of the programmes and having an adequate level and distribution of observer coverage to meet those objectives. Some objectives (such as size sampling of retained target species) will be shared with port sampling programmes; therefore programme design will need to also consider the information that is available via this method.

##### Current Status in PICTs

The current status of observer coverage for the national fleets of PICTs is summarised in Table 4. Assessment of the adequacy of observer coverage for scientific purposes is somewhat complicated and has not been attempted here in a detailed way. The FFA-administered observer programmes conducted on US purse seine vessels operating under the US Tuna Treaty and on vessels operating under the FSM Arrangement target a coverage level of 20% of trips over the course of annual licensing periods. Also, Lawson (2003) found that coverage levels on longliners of 20–30% were required to achieve reasonable precision in estimating catch rates of common by-catch species. We have therefore used >20% as an indicator of high coverage in assessing the current status of PICT observer programmes, with 10–20% defined as moderate coverage, and <10% defined as low coverage.

Of the 19 existing national fleets of PICTs, 8 did not have any observer coverage in 2002 (Table 4). For those fleets covered by national observer programmes, most had low coverage; only 2 fleets had high rates of coverage (>20% of trips) in 2002. While the development of national observer programmes is not a specific requirement of the WCPF Convention, it is clear that PICTs will need to develop such programmes in order to collect data that are likely to be required. Most PICTs have in fact signalled their intention to develop national observer programmes, and the OFP is actively engaged in assisting countries in this respect. However, much remains to be done in the areas of observer training and developing national capacity in observer programme administration and data quality control. These are clearly an areas where PICTs will require assistance for some time to come.

#### **4.6. Port Sampling Programmes**

##### Responsibility

As with several other data collection methods, responsibility for the implementation of port sampling programmes has not yet been discussed in any detail. However, as for monitoring vessel landings, logistics would seem to dictate that port sampling be designated a port state responsibility, with some overall coordination provided by the Commission. That is, sampling would be carried out by port state authorities for vessels landing or transshipping catch in their ports regardless of the flag of the vessel that is unloading. The OFP has assisted many PICTs to establish port sampling operations over the past 10 years, and generally speaking these operations sample vessels regardless of their nationality.

So there is some precedence for port states taking this responsibility. Article 27 of the WCPF Convention would appear to provide some support for this.

#### Current Status in PICTs

Table 4 outlines the current coverage of PICT national fleets with respect to port sampling using a rating scheme similar to that used for observer programmes. Twelve of the 19 national fleets are currently covered by port sampling operations, and of those, 9 are at a level that is considered to be high coverage. Of the fleets not currently covered, the most important are the Solomon Islands fleets, although in this case lack of port sampling is ameliorated to some extent by moderate to high observer coverage.

The information in Table 4 covers sampling of PICT national fleets only. In addition to this, existing port sampling operations in American Samoa, Federated States of Micronesia, Fiji, Marshall Islands, Palau and Papua New Guinea also sample foreign vessels that land or transship their catches in those ports. For several foreign fleets, these sampling operations provide the only known size composition data for those fleets. As noted above, it would appear to be in the interests of the Commission to utilise these existing programmes, and expand upon them where necessary, to obtain adequate sampling coverage of all fleets landing or transshipping catches in the region.

Port sampling of purse seine fleets poses particular problems for PICTs. The spatial distribution of purse seine catches varies greatly from year to year, being influenced by oceanographic conditions associated with the *El Niño–La Niña* cycle. As a result, the location of purse seine landings and transshipments can vary greatly and is difficult to predict. It is therefore difficult for PICTs to establish port sampling infrastructure in individual ports when no unloading might occur there for periods of one year or more. On the other hand, it is difficult to rapidly establish a port sampling presence in a particular port at short notice when a large number of vessels begins to unload there. This problem may indicate that a greater reliance on sampling by observers is appropriate for purse seiners, augmented by sampling in ports that consistently receive unloading activity (e.g. those that have processing facilities, such as American Samoa, Marshall Islands and Papua New Guinea).

Overall, port sampling programmes are well established in the region, but new sampling operations are required in several countries. The initiation and maintenance of port sampling programmes requires an ongoing commitment to training and the development and retention of skills in programme management and data quality control.

### **4.7. Export Documentation**

#### Responsibility

Export documentation (packing lists) is a valuable source of weight-frequency data for sashimi longline fleets unloading their catches in the region. Such documentation is normally supplied to customs authorities of the exporting country, i.e. the country in which the catch is landed. Copies of the packing lists and associated vessel trip information can normally be collected from the local company handling the transaction. It is often convenient for port sampling staff to compile such information in preparation for data processing. The nature of the system therefore points to the compilation of this type of information as being a port state responsibility. Again, Article 27 of the WCPF Convention would provide support for port state responsibility in this matter.

#### Current Status in PICTs

The PICTs in which packing list data are potentially available include Cook Islands, Federated States of Micronesia, French Polynesia, Fiji, Guam, Marshall Islands, New Caledonia, Palau, Papua New Guinea, Solomon Islands and Tonga. Currently, such data are routinely compiled by fisheries authorities in Guam and Papua New Guinea and provided to the OFP for use in regional stock assessments. The OFP will be working with the other countries mentioned above to obtain similar data from fleets unloading catches in their ports. These data should be relatively easy to obtain, and could be incorporated into the functions of port sampling programmes with little additional effort. The main capacity implication of compiling packing list data is the additional data processing required.

## **4.8. Vessel Registries, Licensing Systems and Port Inspections**

### Responsibility

Article 24, paragraphs 4–6 of the WCPF Convention requires flag states to provide information (as set out in Annex IV of the Convention) to the Commission on fishing vessels authorised to fish in the Convention Area beyond the EEZ of the flag state. The Commission will compile and maintain the accuracy of such information. Such a vessel register would provide basic information on vessel characteristics that could be used in scientific analyses.

There is no requirement in the Convention for flag states to maintain similar records for vessels that fish only in waters under their jurisdiction; however such information would be necessary in order to have complete records of all vessels fishing for highly migratory species in the Convention Area.

### Current Status in PICTs

PICTs that license foreign fleets generally have developed and maintained (with OFP assistance in most cases) licensing databases that contain similar information in respect of those foreign fleets to that given in Annex IV of the WCPF Convention. Most of these systems also cater for national flag vessels as well. Known systems are indicated in Table 4; however, the completeness of data in most cases is uncertain.

It is unlikely that existing vessel registries and licensing systems will be able to provide all of the technical information required on vessel and gear characteristics required for stock assessment and related analyses. As noted earlier, it is suggested that an annual return documenting basic vessel characteristics (as a flag state responsibility) and an enhanced logbook system could provide the basis of a data system for vessel and gear characteristics. It would not be too difficult to incorporate this into existing data collection systems operated by PICTs.

Port inspections (along with observer programmes) are considered a useful source of information on vessel and gear characteristics and could be used to verify the information provided on annual returns and in logbooks. While only Papua New Guinea currently collects such information through port inspections, it is anticipated that other PICTs will do so in the future.

## **5. Analytical Capacity**

This report has so far focused on the capacity of PICTs to collect, compile and manage data of various types that will essentially be the “raw materials” for the Commission’s scientific information requirements. There is an additional capacity issue, which is the ability of PICTs to use, manipulate and analyse these data to produce data products for either their own domestic use in discharging their Commission-related responsibilities, or as a direct provision of information to the Commission. Two of the likely Commission data requirements identified earlier in this report will involve a degree of statistical treatment in order to produce the required information. These are estimates of annual catch and effort and estimates of catch composition by size, species and possibly by sex.

### **5.1. Estimating Annual Catch and Effort**

It is likely that PICTs will need to be able to generate two types of annual catch and effort estimates either as a direct information requirement of the Commission, or as a basis for decision-making with respect to their own EEZs. These are (i) estimates of annual effort and catches of target and non-target species for their national fleets; and (ii) estimates of annual effort and catches of target and non-target species for their EEZs. As has been described above, the derivation of such estimates will involve a combination of logsheet, landings, vessel activity, VMS and observer data. Depending on the circumstances, not all of the necessary data may be readily available to PICTs, e.g. landings data from foreign ports, vessel activity data from foreign vessels and data from regional observer and VMS programmes. There will likely be a need for the Commission, through its data managers, to play a coordinating role in ensuring that PICTs are able to access the necessary data to perform these functions.

However, given that these data will be available and accessible, few PICTs at this stage would have the in-house capacity to conduct the necessary statistical analyses. There are some exceptions to this, notably the US and French Territories. For most other PICTs, the OFP has provided direct support in the estimation of annual catch and effort. Some of the larger FFA members, such as Papua New Guinea and Fiji, are well on the way to building the necessary capacity to undertake this task themselves. Nevertheless, considerable capacity building in this area will be required for the majority of PICTs, and both OFP and Commission support is likely to be required in this area.

## 5.2. Estimating Catch Composition

In the case of estimating catch composition by size, species and possibly by sex, it is expected that a combination of observer and port sampling according to a regionally-coordinated sampling design will be established to provide the basic data to be used in regional stock assessment analyses. There are two main options for the provision of catch composition data. The first is for data to be provided to the Commission essentially in the form in which they are collected, with integration of the data into a form suitable for stock assessment analyses occurring at the Commission level. In this case, little if any statistical treatment of the data would be required prior to submission, although data would need to be evaluated to ensure that sampling protocols are being followed, species are being correctly identified, etc. The second option would be for countries to undertake the statistical analyses required to produce reliable and representative catch composition estimates for their national fleets and to provide such estimates to the Commission rather than the raw sample data. This would involve considerable statistical treatment of the data to match samples with catch data at an appropriate stratification. At this point, it is unclear which approach the Commission will take. Clearly, the second option has significant analytical capacity implications for PICTs and few would be in a position at this stage to be able to meet such a requirement. Therefore, it is likely that most PICTs will supply sampling data to the Commission or its data managers in raw form, with the analyses required to produce input data for stock assessment being undertaken at that level. However, there are likely to be some needs for PICTs to generate catch composition estimates at the national level (either in respect of national fleets or EEZs or both) in order for them to discharge their national responsibilities. To date, the OFP has assisted PICTs in this regard and will continue to do so; however, this is an area in which it is envisaged that national capacity building will need to occur.

## 6. Summary and Conclusions

This report has provided information on likely data requirements of the WCFP Commission, identified possible sources or methods of collecting those data, suggested key responsibilities for the various data collection programmes and assessed the current status of PICTs regarding their capacity to meet suggested responsibilities. The main conclusions of the report are:

- (i) The main routine fishery data requirements of the WCPF Commission will be operational-level catch and effort data, annual catch and effort estimates with verification, catch composition data and data on vessel and fishing gear characteristics. A range of data collection programmes will be required to generate these data, the most important of which are logsheet (or logbook) programmes, catch landings/transshipment monitoring, vessel characteristics and activity documentation, VMS, observer programmes, port sampling programmes, vessel registries and/or licensing databases, and port inspections.
- (ii) In respect of the collection and compilation logsheet data, most PICTs have well established programmes in place for foreign licensed vessels fishing in their EEZs and for their national fleets. Logsheet data from foreign licensed fishing compiled by PICTs and consolidated in the Regional Tuna Fishery Database managed by the OFP will be a valuable source of historical and future logsheet data for the Commission. For PICT national fleets, higher logsheet coverage is required for Federated States of Micronesia longline; coverage of the smaller Samoa longliners (*alias*) would be desirable; and logsheet data collection from the small Fiji pole-and-

line fleet should be re-established. The collection of fishing gear information by logsheet (or logbook) programmes should be established.

- (iii) Monitoring of catch landings and transshipments at the vessel-trip level is appropriately a port state responsibility. The status of landings monitoring in PICTs is inconsistent and will need to be improved in many cases in order to provide useful information on total catches.
- (iv) Vessel activity monitoring via an annual return is proposed as a flag state responsibility to provide supporting information for the estimation and verification of total catch and effort levels. A form has been designed for the latter purpose by the SPC/FFA Tuna Fishery Data Collection Committee (Anon. 2003) but is not yet in wide usage.
- (v) An integrated VMS covering all fishing activity in the Convention Area would provide the ultimate documentation of vessel activity and verification of catch location. VMS will be a shared responsibility among the Commission, flag states and coastal states that license foreign vessels. Some PICTs have implemented VMS for their national fleets, but considerable additional effort will be required for systems to be implemented across all national fleets.
- (vi) Observer programmes are completely lacking or operating at low levels of coverage for most PICT national fleets. PICTs will require ongoing assistance to develop observer programmes, and in particular to train sufficient numbers of observers to achieve adequate levels of coverage and to train national programme coordinators to manage observer placements, provide on-going training and evaluate data quality.
- (vii) Port sampling programmes are appropriately a port state responsibility. A majority of PICT national fleets are covered by existing port sampling programmes, although not all at a sufficient level of coverage. As for observer programmes, most PICTs will require ongoing assistance to train port samplers and ensure consistent high-quality data collection. Some rationalisation of purse seine port sampling will be required because of the large variability in unloading locations.
- (viii) The use of export documentation (packing list data) for sashimi longline fleets is currently an under-utilised but potentially valuable source of size composition data. Compilation of such data could be readily incorporated into port sampling programmes. Assistance with computer processing of these data may be required.
- (ix) Information on vessel characteristics should be provided by flag states by way of an annual return. These data would be stored on the Commission's vessel registry. Fishing gear characteristics could be collected via logbook programmes. In-port inspections and observers would provide independent verification of these data.
- (x) The system of data collection and compilation that has evolved in the region over many years is essentially a partnership between PICTs and the OFP. PICTs have the legal responsibilities of compiling data from national and foreign licensed fleets and for making informed management decisions regarding the activities of those fleets. The OFP has played a supporting role in providing a range of data-related services to PICTs over many years. The centralisation of some functions, such as data-form design, data processing and database management, has assisted in the maintenance of data consistency and quality and seems to have been a cost-effective means for PICTs to jointly develop and manage an extensive and diverse data system. The OFP will continue to supply these services and to assist PICTs as required and as funding allows. The OFP will also continue to work with PICTs and the WCPF Commission to develop the necessary in-country capacity for PICTs to fulfil their obligations for collection, compilation, analysis and provision of scientific data to the Commission.

## 7. References

- Anon. 2003. Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee. 2–6 December 2002, Brisbane, Australia. Oceanic Fisheries Programme, Secretary of the Pacific Community, Noumea, New Caledonia and Forum Fisheries Agency, Honiara, Solomon Islands.
- Lawson, T. 2003. Observer coverage rates and the accuracy and reliability of CPUE for offshore longline fleets targeting South Pacific albacore. Standing Committee on Tuna and Billfish 16, Working Paper SWG-4.

Table 3. Indicative responsibilities for various data sources.

Key Data Source	Responsibility
Logsheet	Flag state, coastal (licensing) state
Landings/transshipment	Port state
Vessel activity log	Flag state
VMS	Flag state, Commission (high seas), coastal (licensing) state (EEZs)
Observers	Flag state (home waters), Commission (multiple EEZs, high seas), coastal (licensing) state (locally-based foreign fleets)
Port sampling	Port state
Export documentation	Port state
Annual return of vessel characteristics, vessel registry	Flag state for data provision, Commission for maintenance of vessel registry
In-port inspections	Port state

Part I: Overview

Table 4. Current (2002) levels of fishery monitoring by logsheet, landings, observer, port sampling and VMS for national fleets of PICTs. For logsheet and landings data, coverage is rated according to the percentage of the total catch by weight measured or monitored. For port sampling and observers, coverage is rated according to the percentage of the catch measured for length for longline and the percentage of sets length sampled for purse seiners. For VMS, coverage is rated according to the proportion of vessels currently in good standing on the FFA VMS Register. The known existence of vessel information on registries or licensing databases is indicated by Y. A dash indicates that data are not currently collected and ? indicates status unknown.

PICT		Logsheet	Landings	Observer	Port Sampling	VMS	Vessel Data
		H:>80% M: 50-80% L: <50%	H:>80% M: 50-80% L: <50%	H:>20% M: 10-20% L: <10%	H:>20% M: 10-20% L: <10%	H:>80% M: 50-80% L: <50%	
<b>FFA Countries</b>							
Cook Is.	Longline	H	H	L	H	L	Y
FSM	Longline	M	M	L	H	-	Y
	Purse seine	H	L	M	L	H	Y
Fiji	Longline	H	H	-	H <sup>4</sup>	M	Y
	Pole-and-line	-	-	-	-	-	?
Kiribati	Purse seine	H	-	-	-	H	Y
Marshall Is.	Purse seine	H	L	-	H	H	Y
PNG	Longline	H	H	L	H <sup>4</sup>	L	Y
	Purse seine	H	L	H	L	H	Y
Samoa	Longline	M	L	-	H	-	Y
Solomon Is.	Longline	H	-	M	-	-	Y
	Purse seine	H	L	M	-	H	Y
	Pole-and-line	H	-	H	-	-	Y
Tonga	Longline	H	H	-	H	-	Y
Vanuatu	Longline	H	L	-	-	H	Y
<b>US Territories</b>							
American Samoa	Longline	H	H	L	H	L	Y
<b>French Territories</b>							
French Polynesia	Longline	H	- <sup>5</sup>	L	L	-	Y
	Pole-and-line	H	-	-	-	-	Y
New Caledonia	Longline	H	H	L	H	-	Y

<sup>4</sup> For these fleets, considerable additional weight measurement data are available from either export documentation or from port sampling operations.

<sup>5</sup> But new procedures introduced in 2003 should result in complete landings data.

## **Part II: Country Summaries**

In this section, summary information is presented for each PICT having either a national tuna fishing fleet, significant licensed foreign fishing in its EEZ or significant landings or transshipment activity in its ports. Therefore, the only PICTs not included in this section are Northern Marianas, Wallis and Futuna and Pitcairn. If tuna fishery developments occur in those territories, information can be compiled as appropriate.

The information presented includes fishery background, institutional structures, fishery monitoring, data management and reporting, and recommended priority measures to strengthen capacity in fishery monitoring. The information has been compiled mainly on the basis of data of various types held by the OFP on behalf of PICTs. Attempts have been made to verify the accuracy of this information with officials from each PICT; however, some of the summaries may not include the most recent developments that have occurred. The OFP would welcome any additional feedback from PICTs concerning the information presented in this report.

## American Samoa

### **Background**

The commercial tuna longline fishery in American Samoa began in about 1994, using small catamaran style *alias* that are typically less than 10 m in length, and which conduct mainly one-day trips. In the late 1990s, larger longliners (>20 m length) typical of the vessels that fish in several South Pacific island countries began entering the fishery. As a result, total effort and catch expanded dramatically beginning in 2001. The catch is dominated by albacore, which is sold to the local canneries in Pago Pago. In 2002, 70 vessels, comprising approximately equal numbers of *alias* and mono-hull longliners, were engaged in the fishery; however, total effort in hooks set is now dominated by the larger vessels. Fishing occurs in the EEZ and in adjacent EEZs under access arrangements. Fishing by US flag longliners in international waters within the US Treaty area has recently been allowed by amendment to the Treaty. No foreign fishing is allowed in the EEZ around American Samoa.

### **Institutional structures**

The fishery is managed under the Pelagic Fisheries Management Plan administered by the Western Pacific Regional Fisheries Management Council and the U.S. National Marine Fisheries Service. A limited entry programme is soon to be introduced, supplementing an existing 50 mi closure around the islands for vessels larger than 50 feet in length. The American Samoan Department of Marine and Wildlife Resources (DMWR) plays a significant role in fishery monitoring and data management.

### **Fishery monitoring**

Logsheets: All domestic longliners based in American Samoa are required to report operational level catch and effort data through a federal logbook system, which was initiated in 1996. Logbook coverage is very high and was close to 100% in 2002.

Landings: Landings data for the larger longliners unloading to the canneries are collected by DMWR and cross-checked against logbook returns. DMWR also conducts regular offshore creel surveys to estimate landings of small subsistence, recreational and commercial vessels undertaking one-day trips.

Vessel activity log: Since 1999, DMWR have conducted a daily effort census, which has been effective in monitoring the effort of the *alia* component of the fleet.

VMS: Several larger vessels that fish in the American Samoan fishery and that also have Hawaii limited entry permits carry VMS.

Observers: There has been no observer coverage to date of the American Samoan longline fleet. However, NMFS are in the process of implementing an observer programme, which is expected to have a coverage rate of 20% when fully operational.

Port sampling: Port sampling of both American Samoan and foreign longliners, and the US purse seine fleet unloading their catches to the Pago Pago canneries is carried out by the NMFS port sampling programme. This is the largest and longest running port sampling operation in the region and coverage rates are high.

Export documentation: The majority of catches landed in American Samoa are processed in the local canneries, so packing list data is generally not available.

Vessel characteristics: DMWR and NMFS maintain a comprehensive database of vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

DMWR have undertaken longline logbook data processing since 2000, with the data files being provided regularly to NMFS in Honolulu. All data collected by the port sampling programme are processed and managed by NMFS. DMWR and NMFS report aggregated catch and effort estimates to the Council on a quarterly basis. Catch and effort data aggregated at 5 degree square month resolution and port sampling data are provided to the OFP for incorporation into regional databases.

### **Priority measures/recommendations to strengthen capacity in fishery monitoring**

1. Increased resources are likely to be required to increase observer coverage of the longline fleet.

## Cook Islands

### **Background**

The Cook Islands EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. The tuna fishery is expanding rapidly and is conducted by domestic and foreign longline vessels. Many of the new entrants in the fishery are from neighbouring PICTs, principally Samoa. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet operates from Rarotonga and in the northern area of the EEZ by vessels based in Pago Pago or Apia. Cook Islands registered vessels have also operated beyond the EEZ in recent years, principally in the Fiji EEZ. There is limited fishing activity by US purse seine vessels in the Cook Islands EEZ.

### **Institutional structures**

Management of the tuna resource is the responsibility of the Ministry of Marine Resources (MMR). A draft of the "Cook Islands Tuna and Large Pelagic Fishery Plan: 2003" is currently under consideration by the Cook Islands Government.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage for the longline fishery is likely to be high for Rarotonga-based vessels although the level of logsheet coverage for the Pago Pago-based vessels is unknown. Full logsheet coverage is available from the limited fishing undertaken by the US purse seine fleet.

Landings: Landings are monitored in Rarotonga by the port sampling programme, and coverage is high for this component of the fleet. It is not known to what extent vessels unloading in Pago Pago are monitored for landings.

Vessel activity log: Not yet implemented.

VMS: MMR is instigating FFA approved VMS for foreign and charter longline vessels.

Observers: In 2002, an Observer Coordinator was appointed and an observer training programme was instigated. For the longline fishery, a target of 20% coverage has been established. Recent coverage has been about 5%. Given the recent loss of some observers and the large increase in fishing activity, coverage is likely to remain low. All observers are based in Rarotonga and, consequently, coverage is likely to be biased to the southern area of the EEZ.

Port sampling: Port sampling activities principally cover the component of the catch landed in Rarotonga. NMFS staff based in Pago Pago provide port sampling coverage of the vessels operating in the northern area of the fishery. The level of coverage of this component of the catch is believed to be high.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not yet routinely collected.

Vessel characteristics: MMR operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

MMR has developed a database with OFP assistance for storage of licensing, logsheet, port sampling and observer data. Logsheets data are processed by MMR and copies forwarded to the OFP for data entry verification. The OFP also processes all observer and port sampling data. All data are incorporated into regional and Cook Island national databases. MMR are equipped with the CES software for generating reports of catch and effort data. MMR routinely collates catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity in fishery monitoring**

1. Ensure that sufficient resources are allocated to fishery monitoring as further increases in the level of fishing activity occur.
2. Increase observer coverage to 20%, with coverage of the northern part of the EEZ if possible.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in Rarotonga.
5. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Federated States of Micronesia

### Background

The FSM EEZ currently accounts for approximately 6% of the total tuna catch from the WCPO. The tuna fishery is composed of purse seine, longline, and pole-and-line methods and is dominated by foreign licensed vessels. The foreign purse seine fleet is comprised of Japanese, US, Korean, Taiwanese, Philippines, New Zealand and Chinese vessels, while a small fleet (8) of domestic vessels also operates. FSM is a party to the FSM Arrangement and the domestic fleet also operates within the EEZs of other signatories. The longline fleet is comprised of Taiwanese and Japanese vessels based in Guam, Japanese distant-water vessels, and Chinese and FSM-registered vessels based in Pohnpei (about 20 vessels). The pole-and-line fishery is operated by distant-water Japanese vessels. FSM is regionally important for the transshipment of purse seine catch.

### Institutional structures

The National Oceanic Resource Management Authority (NORMA) is divided into three sections: Administration, Licensing and Research. The Statistics, Licensing, and Computer Section (4 staff) is responsible for processing permit applications, issuing licenses, monitor vessel activities, the collection of fees, and the processing of vessel logsheets. The Research Section is responsible for managing the port sampling and observer programmes, the analysis of the resultant data, monitoring of catch and effort of all foreign and domestic fishing operators and provision of advice to the Executive Director on management issues at national, regional, and international levels.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. However, recent longline logsheet coverage has been low for the domestic fleet (about 50%), while logsheet coverage of the other sectors of the fishery is high.

Landings: Landings data are collected from purse seiners and longliners unloading in FSM ports, although coverage is incomplete. Landings data from the Guam-based longline vessels are provided by the Guam Department of Statistics and Planning.

Vessel activity log: Not yet implemented.

VMS: All foreign and domestic purse seine vessels are required to carry ALCs.

Observers: NORMA administers an observer programme with approximately 9 trained observers. The current target level of annual observer coverage is 20% of fishing trips (all methods combined). In recent years, coverage of the longline fishery was <1%, while 4-5% coverage was achieved for purse seine and pole-and-line trips. Coverage of FSM purse seiners occurs under the FSM Arrangement and approaches 20%. The Taiwanese and Japanese longline vessels based in Guam pose difficulties for observer placement. Coverage of this section of the fleet is poor.

Port sampling: Unloadings in FSM are covered by port sampling programmes administered by NORMA. Port sampling coverage of longline catch has been high in recent years (about 50%, with a target of 80% coverage), although the programme does not include that component of the longline catch landed in Guam. Port sampling of the domestic purse seine catch is undertaken, although coverage is low.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not routinely collected.

Vessel characteristics: NORMA operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

NORMA processes summary information from logsheets, unloadings and observer data. OFP processes all detailed logsheet and port sampling data. All catch and effort data, landings data, and port sampling and observer data are incorporated into regional databases by the OFP. OFP also provides routine updates of national data to NORMA for incorporation into their national database. NORMA are equipped with the CES software for generating reports of catch and effort data. NORMA employs a Fisheries Resource Analyst who analyses fisheries data and provides management advice. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Increased observer coverage, in particularly on the Japanese and Taiwanese longline fleets.
2. Increased port sampling coverage of purse seine catches landed in FSM.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in FSM ports.

## Fiji

### Background

The Fiji EEZ currently accounts for approximately 0.4% of the total tuna catch from the WCPO. The tuna fishery is dominated by the domestic longline fleet, which has expanded considerably over the last five years. A small domestic pole-and-line fishery also operates in the Fiji EEZ. There is limited purse seine activity in the northern area of the EEZ. The longline fishery is principally comprised of Fiji registered vessels. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. Many of the Fiji longline vessels also fish in the Vanuatu and Solomon Islands EEZs and adjacent international waters. Fiji is an important transport hub in the Pacific, and catches from the Fiji EEZ and adjacent waters are unloaded in Fiji, principally through Suva.

### Institutional structures

The Department of Fisheries of the Ministry of Fisheries and Forests is currently responsible for the management of the Fiji tuna fishery. However, it is intended that this responsibility will be conveyed to a new agency, the Fiji National Fisheries Authority. Currently, the Offshore Section of the Department of Fisheries manages vessel licensing, compliance, port sampling, unloadings monitoring and processing of all vessel logsheet and landings data. In 2002, the Fiji Government implemented a Tuna Development and Management Plan (TMP) for the domestic tuna fishery. The TMP established a Total Allowable Catch for the tuna longline fishery and an associated number of vessel licences. These measures were initially introduced for a two-year period (2002–2003).

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Recent longline logsheet coverage within the Fiji EEZ has been high (>80%), while logsheet coverage of the pole-and-line vessels was negligible. Fiji vessels operating outside of the Fiji EEZ are also required to provide logsheets to the Department of Fisheries.

Landings: Vessel unloadings and transshipments are monitored by compliance staff of the Offshore Section; there is a requirement for all vessels to document the landed catch from each trip. The Department has also endeavoured to collect unloadings data from non-licensed vessels discharging their catches in Fiji.

Vessel activity log: Not yet implemented.

VMS: Fiji licensed vessels are required to carry ALCs.

Observers: In 2002, an observer coordinator position was established within the Offshore Section and the observer programme has been strengthened with the recruitment of 11 observers. However, to date these resources have been used mainly for port sampling and monitoring of landings. Consequently, observer coverage of the longline fishery has been very low (<1%), although there has been increased emphasis on at-sea monitoring in 2003.

Port sampling: Most vessel landings are monitored, ensuring a high level of port sampling coverage.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are available but not routinely collected.

Vessel characteristics: The Offshore section of the Department of Fisheries operates a licensing database that contains information on vessel characteristics.

In-port inspections: Occurs to some extent during monitoring of landings.

### Data management and reporting

All logsheet and landings data are processed by the Offshore statistics group. Observer data are processed by OFP. Copies of logsheet, landings and port sampling data are forwarded to the OFP for data entry verification and incorporation into regional databases. Fiji Fisheries are equipped with the CES software for generating reports of catch and effort data. Summary data are provided annually to SCTB. Reporting procedures are being developed to provide routine summaries of catch and effort data from the Offshore database. This will enable improved monitoring of trends in the tuna fishery.

### Priority measures/recommendations to strengthen capacity

1. Further strengthen data entry and data management procedures.
2. Increase the level of observer coverage of the longline fishery.
3. Collect logsheet data from the domestic pole-and-line fishery.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
5. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
6. Systematically collect unloadings data for all landings and transshipments in Fiji ports.

## French Polynesia

### Background

The French Polynesia EEZ currently accounts for approximately 0.3% of the total tuna catch from the WCPO. The tuna fishery is dominated by the longline method and has expanded considerably over the last five years and further development is planned. In recent years, the longline fleet has been comprised principally of domestic vessels. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is a fleet of smaller vessels (“bonitiers”) that undertakes fishing using a number of methods, including longlining and pole-and-line. The importance of this sector of the fleet has declined with the recent entry of larger longline vessels. The domestic longline fleet operates almost exclusively within the French Polynesia EEZ and most of the catch is unloaded in Papeete. Papeete is also an important port for the service, supply, and transshipment of the Japanese, Korean, and Taiwanese distant-water longline vessels.

### Institutional structures

Service de la Pêche is responsible for the management of the French Polynesian tuna fishery. The agency employs 60 staff and is divided into four departments. Departement Reglementation et control is responsible for vessel licensing, Departement Statistiques et communication is responsible for data collection, while Departement Developpement undertakes routine data analysis. Service de la Pêche is implementing a development plan for the tuna fishery, which is targeting annual catches of 30,000 t within the next 10 years.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage of the longline vessels (excluding bonitiers) has been about 70% in recent years. The logsheet coverage is supplemented by a biannual survey of each category of longliner and these data are collectively used to determine estimates of total catch.

Landings: No landings data are currently available. However, since 2003, there has been a formal requirement for vessels to report the landed catch from each trip. This should provide complete landings data for the domestic fleet.

Vessel activity log: Not yet implemented.

VMS: There is currently no intention to introduce a VMS for the domestic longline fleet.

Observers: A Monitoring Supervisor/Liaison Officer and two observers were recruited in September 2002 (under EC-PROCFish funding). The observer staff are principally involved in at-sea sampling and have no compliance function. An additional observer is employed by Service de la Pêche. This has resulted in an increase in observer placements, particularly on medium-sized (<20 m) fresh tuna vessels. There are also plans for placements on the larger freezer vessels. Recent coverage represents about 3-5% of longline trips.

Port sampling: Port sampling has been very limited in recent years, partly due to difficulties in accessing landed catches. However, these difficulties have been partly overcome by the completion of a centralised unloading facility in Papeete. A number of the new longliners operating in the fishery are now processing the catch of albacore at sea and, consequently, this component of the catch is not available to the port sampling programme.

Export documentation: Fish export data are collected by the customs agency. Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not routinely collected.

Vessel characteristics: Service de la Pêche operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

All processing of logsheet data and port sampling data is undertaken by Service de la Pêche. Observer data are processed by OFP. All logsheet, observer and port sampling data are provided to OFP for incorporation into regional databases. Service de la Pêche are equipped with the CES software for generating reports of catch and effort data. Service de la Pêche has the capacity to analyse information collected from the fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Increase port sampling and observer coverage of the domestic longline fleet.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings and transshipments in French Polynesia.

## Guam

**Background**

Industrial-scale commercial tuna fishing does not occur in the EEZ around Guam. A relatively small amount of tuna is caught locally by recreational trollers. However, Guam is regionally important as a transshipment port. A large fleet of mainly smaller Taiwanese and Japanese longline vessels fishing in Micronesia unload their catches in Guam, from where they are air-freighted to sashimi markets in Japan. In the past, purse seine vessels have also transhipped on Guam, but this is now a relatively rare occurrence.

**Institutional structures**

Tuna fishing in Guam is managed under the Pelagic Fisheries Management Plan administered by the Western Pacific Regional Fisheries Management Council and the U.S. National Marine Fisheries Service. The Division of Aquatic and Wildlife Resources monitors the local recreational fishery. The Department of Statistics and Planning compiles and processes transshipment and individual weight data from packing lists.

**Fishery monitoring**

Logsheets: N.A.

Landings: Landings data for foreign longliners transshipping on Guam are collected by the Department of Statistics and Planning. Landings are compiled from export packing lists and export rejects. Coverage of transshipment activity is high.

Vessel activity log: N.A.

VMS: N.A.

Observers: N.A.

Port sampling: N.A.

Export documentation: High coverage packing list (individual weight) data are available from longliners transshipping on Guam.

Vessel characteristics: N.A.

In-port inspections: Inspections are undertaken by NMFS enforcement personnel, but it is not known if information on vessel and gear characteristics is systematically collected.

**Data management and reporting**

The Department of Statistics and Planning maintains a database, originally developed by the OFP and now maintained by NMFS, on landings and catch size (weight) composition. Landings and packing list data are routinely provided to NMFS and to the OFP for incorporation into regional databases.

**Priority measures/recommendations to strengthen capacity in fishery monitoring**

No recommendations.

## Kiribati

### Background

The Kiribati EEZ currently accounts for approximately 11% of the total tuna catch from the WCPO, although the level of catch is highly variable between years. The tuna fishery is composed of purse seine, pole-and-line, and longline methods. The fishery is dominated by foreign licensed vessels, with the longline fishery comprised of mainly Japanese and Korean vessels. The purse seine fleet consists of US, Japanese, Taiwanese, and Korean vessels, and agreements have been reached recently to allow licensing of New Zealand and European Union vessels. Kiribati also operates a purse seine vessel that fishes under the FSM Arrangement. The Japanese distant-water pole-and-line fleet operates intermittently in the Kiribati EEZ. Kiribati is currently investigating the potential to develop a domestic tuna longline fishery. There are no onshore facilities for vessel discharge although considerable transshipment activity occurs in Kiribati, primarily in Tarawa and Kiritimati Island.

### Institutional structures

The Fisheries Division of the Ministry of Natural Resources Development (MNRD) is currently responsible for the management of tuna fisheries in Kiribati. The Fisheries Licensing and Enforcement Unit (FLEU) of the Fisheries Division is responsible for vessel licensing, monitoring, and processing of vessel logsheets. The structure of the Fisheries Division was reviewed during the formulation of the draft Tuna Management Plan for Kiribati. The draft plan includes a proposal for the establishment of a Fisheries Licensing and Law Enforcement Authority.

### Fishery monitoring

Logsheets: Foreign licensed vessels are required to provide daily catch and effort information on regional logsheets and communicate weekly catch reports. Logsheets coverage is approximately 100% for purse seine and pole-and-line vessels. Logsheets coverage of the longline fleet is unknown due to uncertainty regarding the level of logsheet coverage for the main Korean fleet.

Landings: There is a requirement to document catch transshipments, although the unloading documents are not provided to OFP and coverage is assumed to be low.

Vessel activity log: Not yet implemented.

VMS: All foreign vessels are required to carry ALCs and vessel locations are monitored by FLEU.

Observers: In 2002, an observer coordinator position was established within the MNRD and the observer programme has been strengthened with about 20 observers employed on a contractual basis. Observers are based in Tarawa and Kiritimati Island. The observer programme was developed in accordance with the regional protocols developed by OFP. Most vessel access agreements specify a level of observer coverage. However, the current level of observer coverage, particularly for the longline fishery, is very low (<1%).

Port sampling: Few port sampling data have been collected to date.

Export documentation: There is no export of tuna from Kiribati except by carrier vessels.

Vessel characteristics: FLEU operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Weekly vessel catch reports are entered in a database administered by the FLEU. Logsheets and observer data are provided to OFP for data processing and incorporation into regional databases and the Kiribati national tuna database. FLEU are equipped with the CES software for generating reports of catch and effort data. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Ascertain the level of logsheet coverage for the Korean longline fleet and improve coverage, if necessary.
2. Strengthen data management procedures, including the timely provision of data to OFP.
3. Increase the level of observer coverage, in particular for the foreign longline fishery.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
5. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
6. Systematically collect unloading data for all landings and transshipments in Kiribati.

## Marshall Islands

### Background

The Marshall Islands EEZ currently accounts for approximately 2.9% of the total tuna catch from the WCPO. The fishery is conducted by longline, purse seine, and pole-and-line vessels. The pole-and-line fishery is conducted exclusively by the Japanese distant-water fleet. The purse seine fleet is comprised of domestic vessels (5) and foreign vessels operating under multilateral (US Treaty, FSM Arrangement) and bilateral access agreements (Japan, Taiwan, Korea). There is considerable transshipment activity and servicing of the purse seine fleet in Majuro. The domestic purse seine vessels also operate in the adjacent waters under the reciprocal access rights granted by the FSM Arrangement. The longline fishery is dominated by the Japanese distant-water fleet although there has been an increase recently in fishing activity by locally-based foreign vessels (principally Chinese flagged vessels, but also including and vessels from FSM Taiwan and Japan).

### Institutional structures

Management of the tuna fishery is the responsibility of the Marshall Islands Marine Resources Authority (MIMRA). MIMRA is in the process of developing a National Tuna Management Plan to establish a framework for the development and management of the tuna fishery.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage of domestic and foreign purse seine vessels is considered to approach 100%. Logsheets coverage of the Japanese longline and pole-and-line fleets is also considered to be high. The current level of logsheet coverage of the locally-based foreign longline vessels is uncertain.

Landings: No unloadings (landings and transshipments) data are currently collected from either the purse seine or longline fleets. MIMRA plans to introduce routine landings data collection by 2004 to cover all vessels landing or transshipping in Majuro.

Vessel activity log: Not yet implemented.

VMS: Foreign and domestic purse seine vessels and some foreign longline vessels are monitored by the VMS administered by FFA.

Observers: MIMRA, with assistance from the OFP, has recently recruited a national observer and port sampling coordinator, and has a commitment to achieve coverage levels of 5–10% by 2005.

Port sampling: In recent years, port sampling has covered a large number of transshipments by purse seine vessels, although no routine port sampling has been undertaken of the longline catch. By 2004, MIMRA hopes to sample all landings and transshipments that occur in Majuro.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not routinely collected.

Vessel characteristics: MIMRA operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Logsheets and port sampling data are processed by OFP and incorporated into regional databases and the Marshall Islands national database. MIMRA are equipped with the CES software for generating reports of catch and effort data. Summary data from the fishery are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Port sampling of the longline catch landed by the locally based foreign longline vessels.
2. Observer coverage of the longline and purse seine fisheries.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in Majuro.
5. To develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Nauru

### Background

The Nauru EEZ currently accounts for approximately 4% of the total tuna catch from the WCPO. The fishery is comprised of foreign longline and purse seine vessels. Most distant-water and FSM Arrangement purse seine fleets fish to some extent in the Nauru EEZ. There is intermittent pole-and-line activity in the zone by the Japanese distant-water fleet. There is currently no domestic tuna fishery and no significant transshipment activity in Nauru. However, there is the potential for the development of a locally-based longline fishery exporting product by air-freight to the sashimi market.

### Institutional structures

Management of the tuna resource is the responsibility of the Nauru Fisheries and Marine Resources Authority (NFMRA). The authority has a staff of four and is responsible for vessel licensing, vessel monitoring, and data collection.

### Fishery monitoring

Logsheets: All foreign licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Vessels are also required to provide entry and exit reports and weekly catch reports when operating in the Nauru EEZ, although the level of reporting is unknown. It is also unknown whether these data are used to trace logsheets from individual vessels. Logsheets coverage of the purse seine and pole-and-line fishery is considered to approach 100%.

Landings: There is limited transshipment activity in Nauru.

Vessel activity log: N.A.

VMS: Foreign licensed vessels are monitored by the VMS administered by FFA.

Observers: Observer coverage of the purse seine fleet when operating in the Nauru EEZ is likely to be comparable to fisheries operating in adjacent EEZs. Observer coverage of the foreign longline fleet is negligible.

Port sampling: Not necessary; as there is limited transshipment activity in Nauru.

Export documentation: There is no significant export of tuna from Nauru.

Vessel characteristics: NFMRA operates a licensing database that contains information on foreign licensed vessel characteristics.

In-port inspections: Not relevant as there are no port calls by the foreign fleet.

### Data management and reporting

Logsheets are forwarded to OFP for processing; these data are incorporated into regional and Nauru national databases. NFMRA are equipped with the CES software for generating reports of catch and effort data.

### Priority measures/recommendations to strengthen capacity

1. Introduce procedures to improve the provision of logsheets to OFP.

## New Caledonia

### **Background**

The New Caledonia EEZ currently accounts for approximately 0.1% of the total tuna catch from the WCPO. The tuna fishery currently consists of 25 domestic longliners based in Noumea and Koumac and further development is envisaged. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet operates exclusively within the New Caledonia EEZ. There is currently no licensed foreign fishing in the EEZ.

### **Institutional structures**

The Service de la Marine Marchande et des Pêches Maritimes is responsible for management of the tuna fishery. The agency provides technical advice and is responsible for the implementation the management policies of the Territorial Government. The agency is responsible for vessel licensing and the collection of fisheries statistics (logsheets and landing data).

### **Fishery monitoring**

Logsheets: All licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The longline fleet has increasingly adopted the regional longline logsheet. Current logsheet coverage is considered to be approximately 80%.

Landings: Unloadings data are available for most of the fishing trips, although some companies may not yet be providing these data.

Vessel activity log: Not yet implemented.

VMS: A VMS is currently being assessed and is planned for implementation by late 2004.

Observers: A Monitoring Supervisor/Liaison Officer and one observer were recruited in September 2002 (under EU-PROCFish funding) and are based in the OFP. Observer placement, data quality and data processing is undertaken by the OFP. Observer coverage is currently of the order of 5% of trips.

Port sampling: Port sampling is managed by the OFP under the PROCFish project. Coverage is about 75% in Noumea and 100% in Koumac.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not yet collected.

Vessel characteristics: The Service de la Marine Marchande et des Pêches Maritimes operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

Port sampling and observer data are collected and processed by the OFP. Logsheets data are processed by OFP and incorporated into regional and the New Caledonian national databases. Service de la Marine Marchande et des Pêches Maritimes are equipped with the CES software for generating reports of catch and effort data. Service de la Marine Marchande et des Pêches Maritimes has the capacity to analyse information collected from the fishery. Summary data are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity**

1. Increased observer coverage, particular of vessels based in Koumac.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings in New Caledonia.

## Niue

### Background

The tuna catch from the Niue EEZ is very small (< 0.001%) relative to the entire catch from the WCPO. A small domestic fishery operates to supply the local market. Currently, the only foreign fleet licensed to fish in the Niue EEZ are Taiwanese distant-water longline vessels. This fleet was absent from the fishery from 1998 to 2002, but were re-licensed in 2002–2003 and now have an ongoing licensing arrangement. The Taiwanese fleet is comprised of about 20 vessels and fishing activity in the Niue EEZ is intermittent. There is considerable interest in the development of the domestic fishery through the establishment of joint venture operations with offshore partners, particularly from neighbouring countries (e.g. Samoa and American Samoa). This would include the development of onshore processing facilities. Niue is a signatory to the US Treaty, although no fishing activity has been reported by the US purse seine fleet.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Agriculture, Forestry and Fisheries. The Fisheries Division has 4-5 staff and is responsible for all fisheries management, policy and development. The Division is also responsible for vessel licensing, monitoring and data collection. There is no requirement for port sampling, although Niue does have a number of trained observers who are occasionally deployed on US Treaty purse seine vessels.

### Fishery monitoring

Logsheets: All foreign licensed vessels are required to provide catch and effort information at the operational level on approved logsheets, although the level of logsheet coverage of the Taiwanese fleet is unknown (no data have been provided for 2002). Vessels are also required to provide entry and exit reports and weekly reports of catch and fishing activity when operating in the Niue EEZ; the level of such reporting is unknown. The Fisheries Division is currently developing systems to link these various reports to ensure the provision of logsheets from individual vessels.

Landings: There is currently no significant landing of tuna in Niue.

Vessel activity log: N.A.

VMS: All foreign licensed vessels are required to participate in VMS programme administered by FFA.

Observers: Observer coverage of the Taiwanese distant-water longline fleet is negligible. Niue are planning to develop an observer programme to cover new joint venture longline fishing.

Port sampling: N.A.

Export documentation: There is currently no significant export of tuna from Niue.

Vessel characteristics: Fisheries Division operates a licensing database that contains information on characteristics of licensed vessels.

In-port inspections: N.A.

### Data management and reporting

The Fisheries Division forwards logsheets to the OFP for data processing and incorporation in the regional database. A national fisheries database and CES interface has not yet been established for Niue. Summary data from the tuna fishery are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. There is potential for the development of a locally-based longline fishery in the Niue EEZ. This may require additional resources for fishery monitoring, including observers, port sampling and landings monitoring. The scale of any future development of the fishery will dictate the level of resources required.
2. Establish a comprehensive national database with CES interface and develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Palau

### **Background**

The Palau EEZ currently accounts for approximately 0.4% of the total tuna catch from the WCPO. The fishery is principally conducted by locally-based foreign longline vessels (Chinese and Taiwanese) and the Japanese offshore fleet. In recent years, minimal purse seine activity has occurred in the Palau EEZ, although access arrangements exist for several (Japan, US Treaty, FSM Arrangement). There is currently no active pole-and-line fishery in the EEZ.

### **Institutional structures**

Management of the tuna fishery is the responsibility of the Bureau of Oceanic Fisheries Management (BOFM) of the Ministry of Resources and Development. BOFM manages fisheries access agreements, vessel licensing, the collection of associated fees, and the collection and compilation of fisheries statistics.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the locally based longline fleet is considered to be high (approaching 100%). Logsheets coverage is also considered high for the Japanese longline fleet.

Landings: Unloadings data are collected from the locally based longline fleet. These are routinely compared with tuna export data.

Vessel activity log: Not yet implemented.

VMS: Foreign purse seiners fishing in the Palau EEZ are covered by the FFA VMS programme.

Observers: No observer programme is currently in place, although BOFM is currently investigating means to re-establish an observer programme.

Port sampling: A well-established port sampling programme operates in Palau. Port sampling coverage of the locally-based longline catch has approached 100% in recent years.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are routinely collected.

Vessel characteristics: BOFM operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

Logsheets data are processed by OFP, while trip summary data, unloadings data, and port sampling data are processed by BOFM. All data are incorporated into regional databases and the Palau national database. BOFM are equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity**

1. Implement an observer programme to cover the locally-based foreign longline fleet.
2. Introduce annual returns for vessel activity and vessel characteristics for all locally-based foreign vessels.
3. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Papua New Guinea

### Background

The Papua New Guinea (PNG) EEZ currently accounts for approximately 9% of the total tuna catch from the WCPO. The fishery is comprised of a large domestic, locally-based foreign (Philippines), and foreign (US, Taiwanese, Philippines, Chinese, and Korean) purse seine fleet and a developing domestic longline fleet. Papua New Guinea is a signatory to the FSM Arrangement and PNG licensed purse seine vessels also operate in the EEZs of other parties to the Arrangement. An increasing amount of processing of the purse seine catch is occurring in PNG. A component of the domestic longline fishery targets shark.

### Institutional structures

Management of PNG tuna fisheries is the responsibility of the National Fisheries Authority (NFA). A National Tuna Fishery Management Plan was first gazetted in 1999. Management of the tuna fishery is undertaken through consultation with the Tuna Consultative Committee, which includes industry representatives, NGOs, and government officers. The NFA is responsible for all licensing, fisheries management, monitoring, and compliance. The Licensing and Information Group is responsible for processing catch, effort and export data. The observer programme is managed by the Monitoring Control and Surveillance Group.

### Fishery monitoring

**Logsheets:** All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage is approximately 100% for the purse seine fleet and 70% for the domestic longline fleet.

**Landings:** Fishing companies are required to provide landings and transshipment data to NFA. Landings data are currently available for approximately 15% of the purse seine catch. Systematic recording of transshipments is not currently undertaken.

**Vessel activity log:** Not yet implemented.

**VMS:** Some domestic longline vessels are fitted with ALCs. Foreign licensed purse seiners and PNG vessels fishing under the FSM Arrangement are required to participate in the VMS programme administered by FFA. PNG also operates a national VMS for vessels fishing exclusively in the PNG EEZ.

**Observers:** The PNG observer programme is the largest and best supported of the PICT observer programmes with approximately 50 active observers based at 10 ports around the country. NFA has specified target levels of observer coverage for purse seiners fishing in mothership operations (100%), other purse seine operations (20%), and longliners (5%). Observer coverage of the purse seine fleet has now been shifted from the motherships to the smaller catcher vessels. Overall, coverage of the purse seine fleet is 20% or greater.

**Port sampling:** Port sampling of the longline fishery is currently undertaken at Port Moresby, Lae, and Rabaul. The recent high level of observer coverage on purse seine catcher vessels means that port sampling of this component of the fleet is unnecessary. However, increased port sampling coverage of the foreign vessels landing in Wewak and Rabaul is required.

**Export documentation:** Individual weight data for air-freighted yellowfin and bigeye are routinely collected.

**Vessel characteristics:** NFA operates a licensing database that contains information on vessel characteristics.

**In-port inspections:** Routinely undertaken by NFA staff; vessel data are collected but are not currently entered to a database.

### Data management and reporting

NFA processes all logsheet and landings data. Observer, port sampling and packing list data are forwarded to OFP for processing. OFP also provides data entry verification of logsheet data. However, in future these data may be provided electronically from NFA. All PNG data are incorporated into regional databases and the PNG national database. NFA are equipped with the CES software for generating reports of catch and effort data. The NFA routinely collates catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Further improve logsheet coverage of the domestic longline fishery.
2. Initiate port sampling of the foreign purse seine vessels landing in Wewak.
3. Increase observer placements to achieve the target levels of coverage for longline and purse seine fleets.
4. Introduce annual returns for vessel activity and vessel characteristics for all domestic and locally-based foreign vessels.
5. Systematically collect unloadings data for all purse seine landings in PNG, including critical species composition data.

## Samoa

### Background

The Samoa EEZ currently accounts for approximately 0.3% of the total tuna catch from the WCPO. The tuna fishery developed rapidly during the mid-1990s and is conducted by domestic longline vessels. Initially, most vessels were small *alias* but larger mono-hull vessels have entered the fishery in recent years. Catches consist primarily of albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is also limited fishing activity by US purse seine vessels in the Samoa EEZ. The longline fleet is based in Apia, although some larger vessels are now operating in neighbouring EEZs, principally the Cook Islands.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Agriculture, Forestry, Fisheries and Meteorology (MAFFM). A management and development plan for the fishery was implemented in 2000. Management is undertaken through consultation with the Commercial Fisheries Management Advisory Committee which is comprised of elected industry representatives and government officers. The Fisheries Division is responsible for research, vessel licensing, and fishery monitoring.

### Fishery monitoring

Logsheets: Logsheets data are required from longliners over 15 m. There has been a high level of logsheet coverage from these vessels in recent years. Monitoring programmes are well established to estimate the level of catch from the large number of smaller vessels (daily effort census surveys and port sampling). However, these data do not provide details of location of the catch or the associated level of fishing effort (although some of this information is available from the port sampling).

Landings: Vessel unloadings data are not collected from the entire fleet due to the many small vessels operating in the fishery.

Vessel activity log: A daily effort census is carried out to verify the activity of *alias*.

VMS: There is no requirement for longline vessels to carry ALCs.

Observers: Currently, no at-sea observer programme operates in the domestic longline fishery.

Port sampling: All vessels are required to land their catch in Samoa and, consequently, landings are available for port sampling. There is a well-established port sampling programme and up to 50% of all longline landings have been sampled in recent years. Sampling is overseen by the Port Sampling Coordinator and currently two port sampling staff are funded under the EU-PROCFish project.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available. Export data are routinely used to determine annual catch estimates.

Vessel characteristics: MAFFM operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

All data collected from the tuna fishery are processed by the Fisheries Division and are provided to the OFP for incorporation into regional databases. MAFFM are equipped with the CES software for generating reports of catch and effort data. The Fisheries Division routinely collates quarterly catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. The implementation of an observer programme in the Samoa longline fishery.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic longline vessels.
3. Systematically collect unloadings data for all landings in Apia.
4. Further develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Solomon Islands

### Background

The Solomon Islands EEZ currently accounts for approximately 3.1% of the total tuna catch from the WCPO. The fishery consists of domestic and foreign longline, purse seine, and pole-and-line vessels. The longline fleet is comprised of domestic and foreign registered vessels (Korea, Taiwan, Vanuatu, and Fiji). The domestic longline fishery expanded considerably in the late 1990s, but has declined in the last few years. The pole-and-line and purse seine fisheries consist mainly of domestic vessels. Solomon Islands is a signatory to the FSM Arrangement allowing reciprocal access rights to other Parties. In particular, PNG registered purse seine vessels operate in the Solomon Islands EEZ, while domestic vessels undertake considerable fishing in neighbouring EEZs and international waters. Solomon Islands is a signatory to the US Treaty although there has been minimal fishing by the US purse seine fleet in the EEZ in recent years. Japanese, Korean and Taiwanese purse seine vessels have also been licensed to fish in the Solomon Islands EEZ in recent years.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Fisheries and Marine Resources. In 1999, Solomon Islands implemented a National Tuna Management Plan. The plan included the establishment of a Tuna Management Committee to advise the Minister of Fisheries on development and management issues. The committee includes representatives from the fishing industry and government agencies. Under the terms of the plan, a limit on the number of vessel licenses was established for each of the main fishing methods.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the domestic longline, purse seine and pole-and-line fleets is believed to be high. Logsheets coverage of all components of the foreign longline fleet is highly uncertain. Logsheets coverage of foreign purse seine vessels approaches 100%.

Landings: Landings data are available for the domestic pole-and-line and purse seine catch although coverage for the latter has been low (about 20%). Limited transshipment activity has occurred in the Solomon Islands EEZ in recent years. Honiara is the main transshipment port. There is no routine collection of data from vessel transshipments when they occur.

Vessel activity log: Not yet implemented.

VMS: Foreign licensed vessels are required to participate in the regional VMS programme administered by FFA. Domestic purse seiners also participate in the regional VMS programme.

Observers: The observer programme ceased during the disruption to domestic fishing operations that occurred during the recent period of unrest. The programme was recently re-established with a staff of 12 observers, an Observer Coordinator and an assistant Observer Coordinator and has achieved coverage rates of 20% or more for domestic fleets. The programme has not covered the foreign longline fleets. It has been proposed to increase coverage to 30% for longline, 40% for pole-and-line, and 100% for purse seine.

Port sampling: Prior to the civil unrest in Solomon Islands, port sampling was conducted in each of the main ports (Honiara and Noro). Sampling ceased during the period of unrest and has not yet been reinstated.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not routinely collected.

Vessel characteristics: Fisheries Division operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Logsheets data are processed by the Fisheries Division. However, some inadequacies with the current database system have been identified and the OFP is working with the Fisheries Division to rectify these problems. All data are provided to the OFP for incorporation into regional and Solomon Islands national databases. Fisheries Division are equipped with the CES software for generating reports of catch and effort data. Annual fishery summaries are routinely provided to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Audit the Fisheries Division database and suggest areas requiring improvement.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings in Solomon Islands.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Tokelau

### **Background**

The Tokelau EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. Historically, the tuna fishery is characterised by fishing by distant-water longline vessels and intermittent fishing by foreign purse seine fleets (principally US vessels). In recent years, there has been increased interest in fishing in the Tokelau EEZ by longline vessels operating from neighbouring countries, principally Samoa. There are four New Zealand flagged longline vessels licensed to fish in the Tokelau EEZ, although these vessels have not yet commenced fishing. Tokelau is investigating the potential for development of a domestic tuna industry, although infrastructure is limited.

### **Institutional structures**

Tokelau has recently been granted jurisdiction for management of the EEZ (previously managed by New Zealand). The management of the tuna fishery is the responsibility of the Department of Natural Resources and the Environment of the Office of the Council of Faipule. A management and development plan for the Tokelau tuna resource is currently being developed with assistance from FFA and SPC. This will assist in the formulation of policy for the licensing of vessels to fish in the Tokelau EEZ.

### **Fishery statistics**

Logsheets: Logsheets have not been systematically provided to Tokelau in respect of foreign fishing. Data are available for the US purse seine fleet via FFA as Treaty Administrator. It is expected that logsheet provision will be required for future foreign access agreements.

Landings: Significant quantities of tuna are not currently landed on Tokelau.

Vessel activity log: N.A.

VMS: Purse seine vessels fishing in the Tokelau EEZ participate in the regional VMS programme administered by FFA.

Observers: US purse seine vessels fishing in Tokelau waters may be covered by observers as part of the US Treaty.

Port sampling: Sampling of purse seine vessels that have fished in Tokelau waters may occur in Pago Pago.

Export documentation: N.A.

Vessel characteristics: N.A.

In-port inspections: N.A.

### **Data management and reporting**

There is currently no local data system nor a national infrastructure to monitor catch and effort in the EEZ. Tokelau is currently reliant on information received directly by OFP from fishing nations and regional licensing arrangements.

### **Measures/recommendations to strengthen capacity**

1. There is considerable interest in the development of the tuna fishery in the Tokelau EEZ and the potential for the development of a domestic fleet is being assessed. There is also considerable interest from DWFNs and PICT domestic fleets to gain licences to fish in the Tokelau EEZ. These initiatives also need to address the requirements for reliable monitoring of catch and effort from the fishery in the future. This may require the establishment of new national agency to undertake this role or rely on existing organisations (e.g. OFP) to undertake elements of this function.

## Tonga

### **Background**

The Tonga EEZ currently accounts for approximately 0.1% of the total tuna catch from the WCPO. The fishery has developed considerably over the last five years and is principally comprised of domestic longline vessels, including some locally-based foreign vessels. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet principally operates in the Tonga EEZ and in international waters south of the EEZ. Most of the longline catch is landed in Nuku'alofa, although some domestic vessels also discharge catch in Pago Pago. Tonga is a signatory to the US Treaty, although there is minimal fishing by the purse seine fleet in the Tonga EEZ.

### **Institutional structures**

Management of the tuna fishery is the responsibility of the Ministry of Fisheries. The Resource Management Division is responsible for vessel licensing, vessel monitoring and data collection. Tonga has formulated a National Tuna Management Plan. The plan has yet to be enacted in regulation but represents the current policy for management of the fishery. The plan includes the establishment of a National Tuna Management Committee to advise the Minister of Fisheries on development and management issues. The committee includes representatives from the fishing industry and government agencies.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the longline fleet has been improving in recent years and current logsheet coverage is considered high (about 80%). Provision of logsheets is required for vessels to have access to duty-free fuel.

Landings: Landings data are collected via the port sampling programme, although coverage is less than 100%.

Vessel activity log: Not yet implemented.

VMS: Legislation is in place to require all vessels to have VMS, although the regulations are yet to be enforced. There is currently a trial of VMS equipment on four locally-based foreign longline vessels.

Observers: No observer data are currently collected from the longline fishery. Tonga is committed to establishing a national observer programme and has recently requested assistance from the OFP in this regard.

Port sampling: There is a high level of coverage (80-100%) of the longline fleet by the port sampling programme, which is supported by the EC-PROCFish project. A number of domestic vessels may discharge their catch (often accumulated from several trips) in Pago Pago. These landings are covered by NMFS port sampling staff.

Export documentation: Tuna export data (including packing list data) are collected by the Customs agency.

Vessel characteristics: The Ministry of Fisheries operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

Vessel logsheets, landings and post sampling data are forwarded to the OFP for processing and incorporation into regional and the Tongan national database. The Ministry is equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### **Measures/recommendations to strengthen capacity**

1. Develop further port sampling capacity in line with expansion in fishing activity.
2. Implement an observer programme for the longline fishery.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic and locally-based foreign vessels.
4. Systematically collect unloadings data for all landings in Tonga.
5. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Tuvalu

### Background

The Tuvalu EEZ currently accounts for approximately 2% of the total tuna catch from the WCPO. The tuna fishery is comprised of foreign licensed longline (principally Japanese, Korean, Taiwanese distant-water), purse seine (US, Japanese, FSM Arrangement and New Zealand), and Japanese distant-water pole-and-line vessels. There is a small domestic fishery currently supporting the local market. There is no significant transshipment activity in Tuvalu ports.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Department of the Ministry of Natural Resources Development (MNRD). The Department is responsible for vessel licensing, vessel monitoring and data collection. A tuna management and development plan for Tuvalu has been developed with assistance from FFA and SPC.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Vessels are also required to provide entry and exit reports when operating in the Tuvalu EEZ, although the level of reporting is unknown. Logsheets coverage approaches 100% for purse seine vessels. Logsheets coverage of the longline fleet is unknown due mainly to uncertainty regarding the level of logsheet coverage for the Korean fleet.

Landings: There is no unloading (landing or transshipment) of tuna in Tuvalu.

Vessel activity log: N.A.

VMS: Foreign licensed vessels are required to participate in the regional VMS administered by FFA.

Observers: Observer coverage of US and FSM Arrangement purse seiners is likely to be comparable to that for adjacent EEZs. Observer coverage of the foreign longline fleet is negligible.

Port sampling: N.A.

Export documentation: N.A.

Vessel characteristics: MNRD operates a licensing database that contains information on vessel characteristics.

In-port inspections: N.A.

### Data management and reporting

OFP has provided a national tuna fisheries database which incorporates logsheet catch and effort and licensing data. Licensing data are entered by MNRD staff, while logsheets are forwarded to the OFP for processing and incorporation into the regional and Tuvalu national databases. MNRD are equipped with the CES software for generating reports of catch and effort data.

### Priority measures/recommendations to strengthen capacity

1. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
2. Observer coverage of distant-water longliners fishing in the Tuvalu EEZ is required.

## Vanuatu

### **Background**

The Vanuatu EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. The fishery is comprised of domestic and foreign longline vessels, principally Taiwan and Fiji flagged vessels. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is limited fishing by the US purse seine fleet in Vanuatu. In recent years, there has been no domestic tuna fishery and the longline fleet operates from foreign ports, principally in Fiji and Pago Pago.

### **Institutional structures**

Management of the tuna fishery is the responsibility of the Fisheries Department under a Ministry of Agriculture, Quarantine, Forestry, and Fisheries. The Compliance Section of the department is responsible for vessel licensing, vessel monitoring, and data collection from the fishery. A Tuna Management Plan has been formulated for Vanuatu and has been in place since 2000.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. However, limited logsheet and landings data are provided to the Vanuatu Fisheries Department. Vessels are also required to provide entry and exit reports when operating in the Vanuatu EEZ, although the level of reporting is unknown. Many of the Fiji-based vessels provide logsheets in respect of fishing activity in the Vanuatu EEZ to the Fiji Department of Fisheries.

Landings: There is no significant landing of tuna in Vanuatu.

Vessel activity log: Not yet implemented.

VMS: Vanuatu longliners participate in the regional VMS programme administered by FFA and are introducing a national VMS for all Vanuatu-flagged fishing vessels. These systems will provide a potential means of estimating vessel activity and logsheet coverage.

Observers: There is currently no observer coverage of Vanuatu longliners.

Port sampling: Port sampling of landed catch is occurring via the sampling programme implemented by the Fiji Department of Fisheries.

Export documentation: There is no significant export of tuna from Vanuatu.

Vessel characteristics: The Fisheries Department operates a licensing database that contains information on vessel characteristics.

In-port inspections: N.A.

### **Data management and reporting**

All logsheet data received by the Fisheries Department are sent to OFP for processing and incorporation into the regional and Vanuatu national databases. The Fisheries Department are equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity**

1. Increased linkages between Fiji and Vanuatu fisheries agencies to improve collection of data from the Vanuatu EEZ, including logsheet, unloading, observer, and port sampling data.
2. Implement an observer programme to provide coverage of the longline fishery.
3. Introduce annual returns for vessel activity and vessel characteristics for Vanuatu-flag vessels.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

# **Capacity of Pacific Island Countries and Territories to Meet the Likely Data Requirements of the Western and Central Pacific Fisheries Commission**

A paper prepared by the

**Oceanic Fisheries Programme  
Secretariat of the Pacific Community**

**For Working Group II of the Preparatory Conference**

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# Acronyms

ALC	Automatic Location Communicator
BOFM	Bureau of Oceanic Fisheries management (Palau)
CES	Catch and Effort query System
DCC	Data Collection Committee
DMWR	Department of marine and Wildlife Resources (American Samoa)
DWFN	Distant-Water Fishing Nation
EC	European Community
EEZ	Exclusive Economic Zone
FAD	Fish Aggregation Device
FFA	Forum Fisheries Agency
FLEU	Fisheries Licensing and Enforcement Unit (Kiribati)
FSM	Federates States of Micronesia
MAFFM	Ministry of Agriculture, Forestry, Fisheries and Meteorology (Samoa)
MIMRA	Marshall Islands Marine Resources Authority
MMR	Ministry of Marine Resources (Cook Islands)
MNRD	Ministry of Natural Resources Development (Kiribati and Tuvalu)
NFA	National Fisheries Authority (Papua New Guinea)
NFMRA	Nauru Fisheries and Marine Resources Authority
NGO	Non Governmental Organisation
NMFS	National Marine Fisheries Service (United States)
NORMA	National Oceanic Resources Management Authority (Federated States of Micronesia)
OFFP	Oceanic Fisheries Programme (of the Secretariat of the Pacific Community)
PICT	Pacific Island Country or Territory
PNG	Papua New Guinea
PrepCon	Preparatory Conference (of the Western and Central Pacific Fisheries Commission)
PROCFish	Pacific Regional Oceanic and Coastal Fisheries (Project)
SCG	Scientific Coordinating Group (of the Preparatory Conference)
SCTB	Standing Committee on Tuna and Billfish
SPC	Secretariat of the Pacific Community
TMP	Tuna Management Plan
UNFSA	United nations Fish Stocks Agreement
VMS	Vessel Monitoring System
WCPF	Western and Central Pacific Fisheries (Convention or Commission)
WCPO	Western and Central Pacific Ocean
WG II	Working Group II (of the Preparatory Conference)

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## Introduction

In considering the issue of long-term data requirements of the Western and Central Pacific Fisheries (WCPF) Commission, the PrepCon through Working Group II (WG II), requested the Secretariat of the Pacific Community (SPC) Oceanic Fisheries Programme (OFP) to compile information on the current capacity and capacity needs of Pacific Island Countries and Territories (PICTs) to fulfil their likely scientific data collection and reporting obligations. Note that this report deals only with scientific data requirements and obligations. PICTs may also have broader fisheries management obligations with respect to their Exclusive Economic Zones (EEZs) and national fleets under the Convention, including obligations related to monitoring, control and surveillance, and development and implementation of fisheries management measures for their EEZs. These obligations may also have considerable capacity implications for PICTs, but these are not dealt with in this report.

Part I of the report provides overview material on topics related to this issue. First, we review the current status of fishery development in PICTs, as the level of development will bear considerably on the extent of data collection and reporting obligations. Second, we outline the likely long-term data requirements of the Commission, based on guidelines provided by the United Nations Fish Stocks Agreement (UNFSA), the WCPF Convention, and discussions that have taken place within the PrepCon framework, particularly in WG II and in the first two meetings of the Scientific Coordinating Group (SCG). Third, we describe the main sources, or methods of collection, of the data that are likely to be required. Fourth, we examine how the responsibilities for various data collection programmes might be allocated in the context of the tuna fisheries in the Convention Area, and the current capacity of PICTs to meet these responsibilities. Finally we make some remarks on the likely capacity needs of PICTs in the area of data analysis. A general summary and conclusions section completes Part I.

Part II of the report provides more detailed, country-specific information on current scientific data collection and reporting capacity by PICTs, and identifies specific areas where additional capacity is needed. Note that this survey of PICT capacity and needs is not exhaustive. A more comprehensive needs assessment of Forum Fisheries Agency (FFA) member countries will be undertaken in 2004 as part of a new project being funded by the Global Environment Facility and being implemented by SPC and FFA.

## Part I: Overview

### 1. Status of Tuna Fishery Development in PICTs

The extent of national obligations for data collection and reporting, however specified, will inevitably be related to the level of development of tuna fisheries in PICTs. There are two ways in which PICTs have “developed” their tuna fisheries, and both need to be recognised in the context of data collection and reporting obligations. First, the extent to which vessels flagged<sup>1</sup> by PICTs fish for tuna in the Convention Area will determine a principal data obligation. Second, the extent to which PICTs license foreign vessels to fish in their EEZs may also have implications for data obligations of PICTs, as will be discussed below.

Table 1 provides an overview of both types of fishing activity in PICTs, as reflected by data available to the OFP for the year 2002. In terms of fishing activity by national fleets, many PICTs have

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<sup>1</sup> In SPC databases, nationality is not determined strictly by flag, but by the nationality of the controlling interest in a vessel. This definition of nationality may be different in some cases to the flag. The terms are used interchangeably in this report, but any data presented by nationality are in relation to the SPC definition.

developed small-scale longline fisheries in recent years. The largest of these (in terms of catch) are currently Fiji, American Samoa, French Polynesia and Samoa, with four other national fleets recording catches of more than 1,000 t in 2002. Fewer PICTs have developed national purse seine fleets. Papua New Guinea now has a purse seine fleet catching at approximately the level of the United States fleet, while Marshall Islands and Federated States of Micronesia also have catch levels that are significant in the regional context. Solomon Islands and Kiribati have smaller national purse seine fleets. Only Solomon Islands currently has a substantial pole-and-line fishery, with smaller operations in Fiji and French Polynesia.

Most PICTs license foreign fishing in their EEZs, either through multilateral (US Treaty and FSM Arrangement) or bilateral access agreements. The two multilateral arrangements in place are administered by FFA on behalf of its members.

In 2002, the catch by foreign licensed purse seiners in the Kiribati EEZ was in excess of 300,000 t. The distribution of purse seine catches among EEZs varies considerably over time, with *El Niño* conditions (which prevailed in 2002) favouring EEZs in the east of the region (Nauru, Kiribati, Tuvalu and Marshall Islands) and *La Niña* conditions favouring EEZs towards the west (Palau, Federated States of Micronesia, Papua New Guinea, Solomon Islands). Overall, the 2002 purse seine catch in the EEZs of PICTs was in excess of 600,000 t. Much of this catch is unloaded or transhipped in regional ports, which provides opportunities for catch monitoring and sampling.

Federated States of Micronesia, Kiribati, Marshall Islands and Vanuatu licensed the majority of foreign longline fishing in their EEZs in 2002. Foreign longliners consist of smaller locally-based vessels that fish primarily in EEZs (Japanese, Taiwanese and Chinese fleets based in Guam, Palau, Federated States of Micronesia and Marshall Islands) and larger distant-water vessels (from Japan, Korea and Taiwan) that fish both in EEZs and on the high seas. The locally-based fleets unload their catches in base ports (from where they are air-freighted to Japan) while distant-water vessels typically undertake long campaigns and return to their home ports to unload.

The activities of the Japanese pole-and-line fleet in the tropical region of the Convention Area has reduced over the years. In 2002, the fleet fished in Marshall Islands and in previous years has regularly fished in Palau, Federated States of Micronesia, Kiribati Solomon Islands and elsewhere. The fleet also fishes extensively in international waters. All catch is landed directly in Japan.

Part I: Overview

Table 1. Longline, purse seine and pole-and-line catches and vessel numbers by flag for PICT fleets, and foreign catches and vessels numbers by PICT EEZ. Source: logsheet data held by OFP.

Flag or EEZ	2002 Fishing Activity by Domestically Flagged Vessel						2002 Fishing Activity within EEZs by Foreign Licensed Vessels					
	Longline		Purse seine		Pole & Line		Longline		Purse seine		Pole-and-line	
	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels	Catch (t)	Vessels
<b>1.1. FFA countries</b>												
Cook Islands	1,134	17					83	9	2,674	22		
Federated States of Micronesia	825	22	18,128	7			3,003	175	58,892	136		
Fiji	10,974	119			431	2	79	15				
Kiribati			5,112	1			2,144	89	302,292	170		
Marshall Islands			38,242	5			1,996	71	28,812	121	7,316	35
Nauru									94,755	129		
Niue												
Palau							827	82				
Papua New Guinea	2,198	41	119,873	28					94,597	103		
Samoa	4,901	80							86	6		
Solomon Islands	856	25	8,079	2	9,642	12	839	46	1,786	48		
Tokelau									6,397	30		
Tonga	1,642	26										
Tuvalu							35	14	24,438	51		
Vanuatu	354	13					2,303	72	63	1		
<b>1.2. US Territories</b>												
American Samoa	7,754	70										
Guam												
Northern Marianas												
<b>1.3. French Territories</b>												
French Polynesia	5,755	45			620	15						
New Caledonia	1,936	25										
Wallis & Futuna												

## 2. Data Requirements of the Commission

The long-term data requirements of the Commission have not yet been precisely defined. However, some guidance is provided by the UNFSA Annex 1 and by recent recommendations of the SCG.

### 2.1. UNFSA Annex 1

The following data types are specified in Annex 1 of UNFSA:

#### Basic Fishery Data

- (i) time series of catch and effort statistics by fleet;
- (ii) total catch in number, nominal weight, or both, by species (both target and non-target) as is appropriate to each fishery;
- (iii) discard statistics, including estimates where necessary, reported as number or nominal weight by species, as is appropriate to each fishery;
- (iv) effort statistics appropriate to each fishing method;
- (v) fishing location, date and time fished and other statistics on fishing operations as appropriate;
- (vi) composition of the catch according to length, weight and sex;
- (vii) other biological information supporting stock assessments such as information on age, growth, recruitment, distribution and stock identity; and
- (viii) other relevant research, including surveys of abundance, biomass surveys, hydro-acoustic surveys, research on environmental factors affecting stock abundance, and oceanographic and ecological studies.

#### Vessel Data and Information

- (i) vessel identification, flag and port of registry;
- (ii) vessel type;
- (iii) vessel specifications (e.g. material of construction, date built, registered length, gross registered tonnage, power of main engines, hold capacity and catch storage methods);
- (iv) fishing gear description (e.g. types, gear specifications and quantity);
- (v) navigation and position fixing aids;
- (vi) communication equipment and international radio call sign; and
- (vii) crew size.

The annex further states that “States should ensure that data are collected from vessels flying their flag on fishing activities according to operational characteristics of each fishing method (e.g. each individual tow for trawl, each set for long-line and purse seine, each school fished for pole-and-line and each day fished for troll) and in sufficient detail to facilitate effective stock assessment”. This suggests that a fundamental obligation of flag states is to ensure that catch and effort (i.e. logsheet) data, and possibly other information, such as size composition data, are recorded at an operational level.

### 2.2. Scientific Co-ordinating Group

At its second meeting (July 2003), the SCG made some progress towards identifying the long-term data requirements of the Commission. To this end, the SCG recommended that:

## Part I: Overview

Operational level data be collected by all fleets and be made available to the Commission for stock assessment and other scientific analyses, with appropriate arrangements for data security and confidentiality;

Annual catches by species, gear and fleet in the Convention area be reported by flag states and coastal states;

Size composition data should be collected, at the operational level where practical, according to a statistically sound sampling design to ensure that the data are representative of the fishery.

In most other fishery commissions, the obligations for collection and provision of such data would be on flag states. However, there is recognition that, because of the unique characteristics of this region, coastal states have a critical role to play in regional data collection and provision to the WCPF Commission. This arises because a substantial proportion of the catch occurs within the EEZs of coastal states, both through the operation of domestic fleets and through licensed foreign fishing. In respect of the latter, most coastal states require the submission (to them) of complete logsheet data as a condition of licence, and will continue to do so when the WCPF Commission is in place. As a result of these conditions, coastal states in some cases collectively hold more complete historical data on the fishing operations of some fleets than the flag states themselves. Also, many foreign vessels unload or transship their catches in regional ports, providing opportunities for catch verification and sampling. In recognising this situation, the SCG recommended that

Flexibility be maintained in establishing data reporting requirements for the Commission and that coastal states and flag states cooperate in ensuring that the Commission receive data in a timely fashion.

### 2.3. Data Verification

Verification of data is required under the UNFSA and examples of verification methods are provided in Annex 1 of the Agreement:

- position verification through vessel monitoring systems;
- scientific observer programmes to monitor catch, effort, catch composition (target and non-target) and other details of fishing operations;
- vessel trip, landing and transshipment reports; and
- port sampling.

WGII and the SCG have not yet discussed the details of data verification requirements, but for the purpose of this report, reasonable assumptions can be made based on the above.

### 2.4. Likely Data Requirements of the Commission

Given the above background, a list of likely initial data requirements by the Commission can be proposed for the purpose of determining the obligations of PICTs and assessing their capacity to meet those obligations. These are as follows:

- (i) Operational-level catch and effort data primarily for target and retained by-catch species;
- (ii) Estimates of appropriately verified total annual catches (including discards) of target and non-target species and levels of effort by gear and national fleet;
- (iii) Estimates of catch composition according to species, length, weight and (for some species) sex; and
- (iv) Vessel and gear characteristics.

In the next sections, we look in greater detail at the possible sources of such data, and the types of infrastructure and expertise that PICTs will require to apply them.

### **3. Fishery Data Sources**

The data required by the Commission will be collected from a number of sources or methods, most of which are commonly utilised by other tuna commissions for these purposes. Table 2 presents a summary of the possible sources for each data type, which are discussed below.

#### **3.1. Operational Level Catch and Effort Data**

Operational level catch and effort data are most commonly collected by the use of logsheets. Additional information, for example details of fish aggregation device (FAD) use by purse seiners, may be collected by observers. Logsheets need to cover a high proportion of the total catch in order for it to be considered representative. Coverage rates in excess of 80% would likely be considered acceptable.

#### **3.2. Total Annual Catch and Effort and Catch–Effort Verification**

Estimates of total annual catch and effort are a product of several data sources. Verification is an important aspect of this process. If 100% coverage logsheet data are available in a timely fashion and the catch and effort estimates therein are considered accurate, the estimation of total annual effort and retained catch is a relatively trivial task. However, 100% logsheet coverage is rarely obtained and estimates of coverage rates are required to estimate total effort and catches of retained species. Also, verification of declared logsheet catches and fishing effort against other data sources is required.

Logsheets coverage rates may be estimated from landings (including transshipment) data if such data cover all fishing activity by the fleet concerned. Landings data are normally collected at the vessel-trip level at unloading locations by port sampling programmes with the cooperation of vessel operators and unloading or processing companies. Where landed catches are exported, export documentation (such as packing lists for sashimi longline fish) may provide a convenient estimate of landings. Currently, there is no other formal and widely applied system of documenting landings in most PICTs. In addition to determining coverage rates of logsheet data, landings data may also be used to correct logsheet catch declarations at the individual trip level.

The South Pacific Regional Fishing Trip and Port Visit Log, which was proposed by the 5<sup>th</sup> meeting of the SPC/FFA Tuna Fishery Data Collection Committee (DCC – Anon. 2003) may also provide an authoritative source of information on vessel activity. This form would be a vessel-specific annual return documenting fishing trip details and periods of inactivity throughout the year, and would be an effective means of verifying fishing activity and estimating the coverage of landings and logsheet data.

VMS also has the potential to provide complete records of vessel activity, and therefore will be invaluable for estimation of logsheet and landings data coverage when in universal use. VMS will also be important for verifying the fishing locations reported on logsheets.

Estimates of discarded target and non-target catch need to be incorporated into total catch estimates. Such data are only available through observer programmes, and the accuracy of the resulting estimates are dependent on the observer coverage rate for each fleet. For rare but important non-target species (such as turtles) very high observer coverage rates may be required to obtain reliable estimates. More common non-target species catches can be estimated with reasonable precision with lower coverage rates, e.g. 20-30% (Lawson 2003). Generally, the level of observer coverage will depend on the level of precision desired and the frequency with which the various species of interest occur in the catch.

#### **3.3. Catch Composition Data**

Catch composition by species, length, weight and other characteristics (such as sex) are typically obtained by sampling catches at sea through observer programmes and at the point of unloading by port sampling programmes. Sampling programmes need to be designed to ensure that the samples are

representative of the catch. At-sea sampling by observers has the advantage of enabling sampling of both the retained catch and the catches of target and non-target species that are subsequently discarded. An additional advantage is that operational-level sampling data can be obtained and, in the case of purse seiners, protocols adopted to promote representative sampling that are more difficult to implement by port sampling. Thus, observer programmes are the preferred method of sampling catches. However, there are often cost and logistical difficulties in achieving sufficiently high observer coverage rates for this method to be relied upon alone to generate catch composition data. Therefore, port-based sampling of catches at unloading sites is usually required to augment observer-based sampling. For some fleets (e.g. distant-water longline fleets that remain at sea for long periods), port sampling may be currently the only feasible method of sampling the catch.

For small-scale sashimi longline fleets that unload their catch in PICTs for export to overseas sashimi markets, export documentation, or so-called packing list data, provides an alternative to port-based size sampling. Packing list data comprise the individual weights of all fish exported. Often, similar data for export rejects are also available. Such data are usually attributable to a particular vessel and trip, and therefore information on time and location of catches can be derived in the same way as for port sampling data. The advantages of utilising packing list data are that they are readily available in written form and usually represent a very high proportion of the total catch, therefore ensuring representative sampling. However, the sheer volume of data can present data processing challenges.

### **3.4. Vessel and Gear Characteristics**

Information on vessel and gear characteristics has not been systematically collected from regional tuna fisheries to date. Some information is potentially available from existing sources, such as national licensing databases and regional or international vessel registries. However, the experience has so far been that the quality of such data has been insufficient to support stock assessment and related analyses. Therefore, it is likely that the Commission will need to develop new procedures for collecting information on vessels and fishing gear.

We suggest that collection of accurate data on vessel and gear characteristics will need to utilise several new and existing data collection methods.

- Basic vessel data such as various parameters of vessel size, engine horsepower, fish-holding capacity, and other parameters listed in Annex IV of the Convention, would not be expected to change very often and might be collected through an annual vessel return provided by the flag state.
- Gear characteristics of potential importance to stock assessment might change more frequently and could be collected on a trip-specific basis as part of a logbook. The SPC/FFA Tuna Fishery Data Collection Committee is currently testing a multi-page logbook (in contrast to the single-page logsheet that is currently used by most fleets in the WCPO), which contains detailed information regarding vessel and gear attributes.
- Both types of information could be verified periodically through in-port inspections and observers. These methods may also allow the collection of more detailed information of vessel and gear characteristics.

Table 2. Required data types and possible methods of collection.

Data type	Data Source/Method	Comments
Operational level data	logsheet observers	Logsheets record mainly effort and catches of target and retained by-catch species. More detailed information (e.g. FAD deployment by purse seiners, hook-by-hook data for longliners) need to be collected by observers.
Total annual catch and effort and catch-effort verification	logsheet landings vessel activity log VMS observers	Estimation typically requires high-coverage logsheet data and estimates of coverage rates provided by landings/transshipment data, VMS data and vessel activity log data. Observer data are required for estimates of discards of target and non-target catch. Observers can verify the accuracy of operational-level data reported on logsheets; landings (including transshipment) data are used to verify trip-level data from logsheets; vessel activity logs provide documentation of fishing activity; VMS provides verification of fishing location and fishing activity.
Catch composition	observers port sampling export documentation	Length, weight and other catch composition sampling can normally be obtained at the operational level for purse seiners by observers and port sampling; operational-level data for longline and pole-and-line can be obtained by observers only, and trip-level data by port sampling. Trip-level weight frequency data of high coverage are often available through export documentation (packing lists).
Vessel and gear characteristics	annual vessel return logbook in-port inspections observers vessel registries licensing databases	Information on basic vessel characteristics would be most usefully collected via an annual vessel return. Trip-specific data on gear characteristics may be collected via logbooks. Vessel registries and licensing databases may provide useful adjunct data. In-port inspection and observer programmes provide a means of verification of supplied data and may allow the collection of more detailed information on vessel and gear characteristics.

## 4. Data Collection Responsibilities and Current Status of Data Collection in PICTs

Table 3 indicates the likely responsibilities for data collection and provision utilising the various data sources. Table 4 summarises the current status of data collection by PICTs in respect of their national fleets. Below we discuss likely data collection responsibilities and current status of data collection in PICTs for each of the major data sources identified.

### 4.1. Logsheets Programmes

#### Responsibility

While flag states are required to ensure that logsheet data are collected (as stipulated by UNFSA Annex 1, article 2(a)), both UNFSA and the WCPF Convention are silent on the issue of who should have responsibility for provision of logsheet data to the Commission. In this region, coastal states licensing foreign fishing vessels have compiled logsheet data that have been collected by those vessels for many years. In some cases, the coastal states may collectively possess more complete logsheet data in respect of certain flag states than the flag states themselves. This is because some flag states have lacked a mechanism for compiling such data from their vessels, and in some cases because of data confidentiality clauses in agreements between coastal states and foreign fishing companies. It is therefore likely that, unless the Commission decides otherwise, provision of logsheet data to the Commission or its contracted data manager will be a joint responsibility of both flag states and those

coastal states which license foreign fishing in their EEZs. If this is the case, PICT responsibilities will include the collection and provision of logsheet data to the Commission or its contracted data manager in respect of their national fleets, and the compilation and provision of logsheet data collected in respect of licensed foreign fishing in their EEZs.

#### Current Status in PICTs

Almost all PICTs that are listed in Table 1 as having national tuna fishing fleets have logsheet data collection programmes in place. Likewise, countries that license foreign fishing in their EEZs compile logsheet data from licensed vessels. For both categories of fishing activity, regional logsheets developed by the SPC/FFA Tuna Fishery Data Collection Committee are widely used. Most countries rely heavily on the OFP to provide data processing and data management services for both national and licensed foreign fleets<sup>2</sup>. Exceptions to this include Fiji, French Polynesia, Papua New Guinea and Solomon Islands who undertake some or all of their own logsheet data processing. Cook Islands is in the process of developing in-house data processing capacity. Most countries have in-house national database systems developed and maintained by the OFP, and have staff that have been trained in the use of those systems.

The adequacy of logsheet coverage of the total catch of PICT fleets is indicated in Table 4. Many of the fleets are relatively new, and there has been some lag in implementing logsheet data collection systems. However, there has been rapid improvement, with 16 out of 19 national fleets recording high (>80%) coverage levels in 2002. This situation is expected to improve even further in 2003.

Logsheet coverage of the total catch by foreign licensed fleets in PICT EEZs is difficult to measure in the absence of independent catch estimates for the EEZs. Coverage is likely to vary by licensed vessel nationality and gear type. Logsheet coverage of foreign licensed purse seiners is likely to be high if not 100% for all fleets and EEZs. For purse seine fleets other than Japan, high-coverage logsheet data for fishing activities on the high seas are also provided to coastal states that license their activities in EEZs. Logsheet coverage of foreign longline fleets is more variable. High EEZ coverage of Japanese, Korean, Chinese and offshore Taiwanese (based in Micronesia) fleets is maintained, but there has been low coverage of the EEZ activities of the Taiwanese distant-water fleet (targeting albacore). Few if any logsheet data on high seas fishing activities by distant-water longline fleets are provided to PICTs. The activities of the Japanese pole-and-line fleet operating in the EEZs of PICTs is well covered by logsheet data, but data are not provided for the high seas.

Overall, the logsheet data held by PICTs in respect of foreign licensed fishing, and consolidated in the Regional Tuna Fishery Database managed by the OFP, represent a valuable source of historical logsheet data for all major fleets. Recent logsheet data coverage of foreign licensed fleets for their combined EEZ and high seas fishing activities (in the Convention Area south of 20°N but excluding Indonesia and the Philippines) has averaged 81% across all fleets, with 88% for purse seine (1999–2002), 32% for longline (1999–2001) and 42% for pole-and-line (1999–2001).

## **4.2. Landings/Transshipment Monitoring**

### Responsibility

The issue of responsibility for monitoring catch landings, including transshipments, has not been specifically dealt with in existing legal instruments nor has it yet been discussed in the PrepCon or its subsidiary bodies. Nevertheless, purely as a matter of logistics, it might be reasonable to assume that this monitoring function will become a port state responsibility, irrespective of the nationality of the vessel that is landing catch. This is because it would be difficult if not impossible for flag states to effectively monitor landings in the large number of foreign ports in which vessels unload their catch

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<sup>2</sup> The US National Marine Fisheries Service provides tuna fishery monitoring and data processing and management services to the US Territories (American Samoa, Guam and Northern Marianas).

in the Convention Area<sup>3</sup>. Port state responsibility in this area would be consistent with Article 27, paragraph 2 of the WCPF Convention, which states that “whenever a fishing vessel of a member of the Commission voluntarily enters a port or offshore terminal of another member, the port State may, *inter alia*, inspect documents, fishing gear and catch on board such fishing vessel”.

#### Current Status in PICTs

The survey of national fleets in Table 4 indicates that the monitoring of landings in PICTs is currently inconsistent and is largely inadequate to support verification of logsheet declarations and estimation of total annual catches. This is an area where PICTs will need to develop additional monitoring capability, both in respect of their national fleets, and, if catch landing monitoring is designated a port state responsibility, for foreign fleets landing their catches in PICT ports.

### **4.3. Vessel Activity Log**

#### Responsibility

The proposed South Pacific Regional Fishing Trip and Port Visit Log form (an annual vessel return) would, if completed accurately, fully document periods of activity and inactivity during the reporting year. We would suggest that completion of this form be a flag state responsibility and that its timely provision be linked to maintenance of good standing on the Commission’s vessel register and on their national equivalents. This would ensure a complete and timely record of vessel activity throughout the Convention Area.

#### Current Status in PICTs

Data collection using the DCC’s South Pacific Regional Fishing Trip and Port Visit Log form is not yet being implemented, but countries are actively encouraged to do so as soon as possible. Data systems to process and manage this information would need to be developed.

### **4.4. VMS**

#### Responsibility

Article 24, paragraphs 8–10 of the WCPF Convention indicate a shared responsibility among flag states, coastal states licensing foreign fishing and the Commission itself to have a coherent VMS that will ideally cover all vessels fishing for highly migratory species in the Convention Area. Flag states would have the responsibility of requiring that vessels flying their flags use “near real-time position-fixing transmitters” while fishing on the high seas and in the EEZs of other Commission members. The Commission shall determine the standards, specifications and procedures for high seas VMS, while coastal states shall make such determinations for waters under their jurisdiction. Any coastal state would have the right to include its waters in the Commission VMS. Flag states are not obligated to require their vessels to use VMS while fishing in their own EEZs, but it would be clearly desirable for flag states to do this so as to ensure universal VMS coverage of all vessels wherever they are fishing in the Convention Area. Flag states and coastal states will need to cooperate through the Commission to ensure that VMS data are compiled in such a way as to allow verification of fishing activity and catch locations while protecting the confidentiality of such data.

#### Current Status in PICTs

VMS is in operation at some level in 10 out of the 19 PICT national fleets (Table 4). However, in some of these cases, coverage of vessels is less than complete. Therefore, considerable effort will be required for systems to be implemented across all national fleets.

In addition to national VMS, FFA operates a regional VMS for foreign vessels licensed by their member countries. Almost all purse seiners licensed by FFA members are in good standing on the

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<sup>3</sup> Only the Japanese fleets and distant-water longline fleets of Korea and Taiwan routinely unload their catches in non-PICT ports.

FFA VMS Register, but slower progress has been achieved for foreign longline fleets, with the exception of Japan.

#### **4.5. Observer Programmes**

##### Responsibility

The WCPF Convention (Article 28) states that the Commission shall operate a regional observer programme and that flag states are required to ensure that their vessels, except those that operate exclusively in waters under national jurisdiction, are prepared to accept an observer from the Commission's regional observer programme. Flag state permission is required for Commission observers to continue their duties if the observed vessel enters the EEZ of the flag state. Vessels that fish exclusively in the national waters of the flag state are not required to carry Commission observers. Such vessels may be covered by national observer programmes, but this is the prerogative of the coastal state concerned.

The Commission will likely need to play a key role in ensuring that the regional observer programme is well coordinated with national programmes. Attention will need to be paid to specifying the overall scientific sampling objectives of the programmes and having an adequate level and distribution of observer coverage to meet those objectives. Some objectives (such as size sampling of retained target species) will be shared with port sampling programmes; therefore programme design will need to also consider the information that is available via this method.

##### Current Status in PICTs

The current status of observer coverage for the national fleets of PICTs is summarised in Table 4. Assessment of the adequacy of observer coverage for scientific purposes is somewhat complicated and has not been attempted here in a detailed way. The FFA-administered observer programmes conducted on US purse seine vessels operating under the US Tuna Treaty and on vessels operating under the FSM Arrangement target a coverage level of 20% of trips over the course of annual licensing periods. Also, Lawson (2003) found that coverage levels on longliners of 20–30% were required to achieve reasonable precision in estimating catch rates of common by-catch species. We have therefore used >20% as an indicator of high coverage in assessing the current status of PICT observer programmes, with 10–20% defined as moderate coverage, and <10% defined as low coverage.

Of the 19 existing national fleets of PICTs, 8 did not have any observer coverage in 2002 (Table 4). For those fleets covered by national observer programmes, most had low coverage; only 2 fleets had high rates of coverage (>20% of trips) in 2002. While the development of national observer programmes is not a specific requirement of the WCPF Convention, it is clear that PICTs will need to develop such programmes in order to collect data that are likely to be required. Most PICTs have in fact signalled their intention to develop national observer programmes, and the OFP is actively engaged in assisting countries in this respect. However, much remains to be done in the areas of observer training and developing national capacity in observer programme administration and data quality control. These are clearly an areas where PICTs will require assistance for some time to come.

#### **4.6. Port Sampling Programmes**

##### Responsibility

As with several other data collection methods, responsibility for the implementation of port sampling programmes has not yet been discussed in any detail. However, as for monitoring vessel landings, logistics would seem to dictate that port sampling be designated a port state responsibility, with some overall coordination provided by the Commission. That is, sampling would be carried out by port state authorities for vessels landing or transshipping catch in their ports regardless of the flag of the vessel that is unloading. The OFP has assisted many PICTs to establish port sampling operations over the past 10 years, and generally speaking these operations sample vessels regardless of their nationality.

So there is some precedence for port states taking this responsibility. Article 27 of the WCPF Convention would appear to provide some support for this.

#### Current Status in PICTs

Table 4 outlines the current coverage of PICT national fleets with respect to port sampling using a rating scheme similar to that used for observer programmes. Twelve of the 19 national fleets are currently covered by port sampling operations, and of those, 9 are at a level that is considered to be high coverage. Of the fleets not currently covered, the most important are the Solomon Islands fleets, although in this case lack of port sampling is ameliorated to some extent by moderate to high observer coverage.

The information in Table 4 covers sampling of PICT national fleets only. In addition to this, existing port sampling operations in American Samoa, Federated States of Micronesia, Fiji, Marshall Islands, Palau and Papua New Guinea also sample foreign vessels that land or transship their catches in those ports. For several foreign fleets, these sampling operations provide the only known size composition data for those fleets. As noted above, it would appear to be in the interests of the Commission to utilise these existing programmes, and expand upon them where necessary, to obtain adequate sampling coverage of all fleets landing or transshipping catches in the region.

Port sampling of purse seine fleets poses particular problems for PICTs. The spatial distribution of purse seine catches varies greatly from year to year, being influenced by oceanographic conditions associated with the *El Niño–La Niña* cycle. As a result, the location of purse seine landings and transshipments can vary greatly and is difficult to predict. It is therefore difficult for PICTs to establish port sampling infrastructure in individual ports when no unloading might occur there for periods of one year or more. On the other hand, it is difficult to rapidly establish a port sampling presence in a particular port at short notice when a large number of vessels begins to unload there. This problem may indicate that a greater reliance on sampling by observers is appropriate for purse seiners, augmented by sampling in ports that consistently receive unloading activity (e.g. those that have processing facilities, such as American Samoa, Marshall Islands and Papua New Guinea).

Overall, port sampling programmes are well established in the region, but new sampling operations are required in several countries. The initiation and maintenance of port sampling programmes requires an ongoing commitment to training and the development and retention of skills in programme management and data quality control.

### **4.7. Export Documentation**

#### Responsibility

Export documentation (packing lists) is a valuable source of weight-frequency data for sashimi longline fleets unloading their catches in the region. Such documentation is normally supplied to customs authorities of the exporting country, i.e. the country in which the catch is landed. Copies of the packing lists and associated vessel trip information can normally be collected from the local company handling the transaction. It is often convenient for port sampling staff to compile such information in preparation for data processing. The nature of the system therefore points to the compilation of this type of information as being a port state responsibility. Again, Article 27 of the WCPF Convention would provide support for port state responsibility in this matter.

#### Current Status in PICTs

The PICTs in which packing list data are potentially available include Cook Islands, Federated States of Micronesia, French Polynesia, Fiji, Guam, Marshall Islands, New Caledonia, Palau, Papua New Guinea, Solomon Islands and Tonga. Currently, such data are routinely compiled by fisheries authorities in Guam and Papua New Guinea and provided to the OFP for use in regional stock assessments. The OFP will be working with the other countries mentioned above to obtain similar data from fleets unloading catches in their ports. These data should be relatively easy to obtain, and could be incorporated into the functions of port sampling programmes with little additional effort. The main capacity implication of compiling packing list data is the additional data processing required.

## **4.8. Vessel Registries, Licensing Systems and Port Inspections**

### Responsibility

Article 24, paragraphs 4–6 of the WCPF Convention requires flag states to provide information (as set out in Annex IV of the Convention) to the Commission on fishing vessels authorised to fish in the Convention Area beyond the EEZ of the flag state. The Commission will compile and maintain the accuracy of such information. Such a vessel register would provide basic information on vessel characteristics that could be used in scientific analyses.

There is no requirement in the Convention for flag states to maintain similar records for vessels that fish only in waters under their jurisdiction; however such information would be necessary in order to have complete records of all vessels fishing for highly migratory species in the Convention Area.

### Current Status in PICTs

PICTs that license foreign fleets generally have developed and maintained (with OFP assistance in most cases) licensing databases that contain similar information in respect of those foreign fleets to that given in Annex IV of the WCPF Convention. Most of these systems also cater for national flag vessels as well. Known systems are indicated in Table 4; however, the completeness of data in most cases is uncertain.

It is unlikely that existing vessel registries and licensing systems will be able to provide all of the technical information required on vessel and gear characteristics required for stock assessment and related analyses. As noted earlier, it is suggested that an annual return documenting basic vessel characteristics (as a flag state responsibility) and an enhanced logbook system could provide the basis of a data system for vessel and gear characteristics. It would not be too difficult to incorporate this into existing data collection systems operated by PICTs.

Port inspections (along with observer programmes) are considered a useful source of information on vessel and gear characteristics and could be used to verify the information provided on annual returns and in logbooks. While only Papua New Guinea currently collects such information through port inspections, it is anticipated that other PICTs will do so in the future.

## **5. Analytical Capacity**

This report has so far focused on the capacity of PICTs to collect, compile and manage data of various types that will essentially be the “raw materials” for the Commission’s scientific information requirements. There is an additional capacity issue, which is the ability of PICTs to use, manipulate and analyse these data to produce data products for either their own domestic use in discharging their Commission-related responsibilities, or as a direct provision of information to the Commission. Two of the likely Commission data requirements identified earlier in this report will involve a degree of statistical treatment in order to produce the required information. These are estimates of annual catch and effort and estimates of catch composition by size, species and possibly by sex.

### **5.1. Estimating Annual Catch and Effort**

It is likely that PICTs will need to be able to generate two types of annual catch and effort estimates either as a direct information requirement of the Commission, or as a basis for decision-making with respect to their own EEZs. These are (i) estimates of annual effort and catches of target and non-target species for their national fleets; and (ii) estimates of annual effort and catches of target and non-target species for their EEZs. As has been described above, the derivation of such estimates will involve a combination of logsheet, landings, vessel activity, VMS and observer data. Depending on the circumstances, not all of the necessary data may be readily available to PICTs, e.g. landings data from foreign ports, vessel activity data from foreign vessels and data from regional observer and VMS programmes. There will likely be a need for the Commission, through its data managers, to play a coordinating role in ensuring that PICTs are able to access the necessary data to perform these functions.

However, given that these data will be available and accessible, few PICTs at this stage would have the in-house capacity to conduct the necessary statistical analyses. There are some exceptions to this, notably the US and French Territories. For most other PICTs, the OFP has provided direct support in the estimation of annual catch and effort. Some of the larger FFA members, such as Papua New Guinea and Fiji, are well on the way to building the necessary capacity to undertake this task themselves. Nevertheless, considerable capacity building in this area will be required for the majority of PICTs, and both OFP and Commission support is likely to be required in this area.

## 5.2. Estimating Catch Composition

In the case of estimating catch composition by size, species and possibly by sex, it is expected that a combination of observer and port sampling according to a regionally-coordinated sampling design will be established to provide the basic data to be used in regional stock assessment analyses. There are two main options for the provision of catch composition data. The first is for data to be provided to the Commission essentially in the form in which they are collected, with integration of the data into a form suitable for stock assessment analyses occurring at the Commission level. In this case, little if any statistical treatment of the data would be required prior to submission, although data would need to be evaluated to ensure that sampling protocols are being followed, species are being correctly identified, etc. The second option would be for countries to undertake the statistical analyses required to produce reliable and representative catch composition estimates for their national fleets and to provide such estimates to the Commission rather than the raw sample data. This would involve considerable statistical treatment of the data to match samples with catch data at an appropriate stratification. At this point, it is unclear which approach the Commission will take. Clearly, the second option has significant analytical capacity implications for PICTs and few would be in a position at this stage to be able to meet such a requirement. Therefore, it is likely that most PICTs will supply sampling data to the Commission or its data managers in raw form, with the analyses required to produce input data for stock assessment being undertaken at that level. However, there are likely to be some needs for PICTs to generate catch composition estimates at the national level (either in respect of national fleets or EEZs or both) in order for them to discharge their national responsibilities. To date, the OFP has assisted PICTs in this regard and will continue to do so; however, this is an area in which it is envisaged that national capacity building will need to occur.

## 6. Summary and Conclusions

This report has provided information on likely data requirements of the WCFP Commission, identified possible sources or methods of collecting those data, suggested key responsibilities for the various data collection programmes and assessed the current status of PICTs regarding their capacity to meet suggested responsibilities. The main conclusions of the report are:

- (i) The main routine fishery data requirements of the WCPF Commission will be operational-level catch and effort data, annual catch and effort estimates with verification, catch composition data and data on vessel and fishing gear characteristics. A range of data collection programmes will be required to generate these data, the most important of which are logsheet (or logbook) programmes, catch landings/transshipment monitoring, vessel characteristics and activity documentation, VMS, observer programmes, port sampling programmes, vessel registries and/or licensing databases, and port inspections.
- (ii) In respect of the collection and compilation logsheet data, most PICTs have well established programmes in place for foreign licensed vessels fishing in their EEZs and for their national fleets. Logsheet data from foreign licensed fishing compiled by PICTs and consolidated in the Regional Tuna Fishery Database managed by the OFP will be a valuable source of historical and future logsheet data for the Commission. For PICT national fleets, higher logsheet coverage is required for Federated States of Micronesia longline; coverage of the smaller Samoa longliners (*alias*) would be desirable; and logsheet data collection from the small Fiji pole-and-

line fleet should be re-established. The collection of fishing gear information by logsheet (or logbook) programmes should be established.

- (iii) Monitoring of catch landings and transshipments at the vessel-trip level is appropriately a port state responsibility. The status of landings monitoring in PICTs is inconsistent and will need to be improved in many cases in order to provide useful information on total catches.
- (iv) Vessel activity monitoring via an annual return is proposed as a flag state responsibility to provide supporting information for the estimation and verification of total catch and effort levels. A form has been designed for the latter purpose by the SPC/FFA Tuna Fishery Data Collection Committee (Anon. 2003) but is not yet in wide usage.
- (v) An integrated VMS covering all fishing activity in the Convention Area would provide the ultimate documentation of vessel activity and verification of catch location. VMS will be a shared responsibility among the Commission, flag states and coastal states that license foreign vessels. Some PICTs have implemented VMS for their national fleets, but considerable additional effort will be required for systems to be implemented across all national fleets.
- (vi) Observer programmes are completely lacking or operating at low levels of coverage for most PICT national fleets. PICTs will require ongoing assistance to develop observer programmes, and in particular to train sufficient numbers of observers to achieve adequate levels of coverage and to train national programme coordinators to manage observer placements, provide on-going training and evaluate data quality.
- (vii) Port sampling programmes are appropriately a port state responsibility. A majority of PICT national fleets are covered by existing port sampling programmes, although not all at a sufficient level of coverage. As for observer programmes, most PICTs will require ongoing assistance to train port samplers and ensure consistent high-quality data collection. Some rationalisation of purse seine port sampling will be required because of the large variability in unloading locations.
- (viii) The use of export documentation (packing list data) for sashimi longline fleets is currently an under-utilised but potentially valuable source of size composition data. Compilation of such data could be readily incorporated into port sampling programmes. Assistance with computer processing of these data may be required.
- (ix) Information on vessel characteristics should be provided by flag states by way of an annual return. These data would be stored on the Commission's vessel registry. Fishing gear characteristics could be collected via logbook programmes. In-port inspections and observers would provide independent verification of these data.
- (x) The system of data collection and compilation that has evolved in the region over many years is essentially a partnership between PICTs and the OFP. PICTs have the legal responsibilities of compiling data from national and foreign licensed fleets and for making informed management decisions regarding the activities of those fleets. The OFP has played a supporting role in providing a range of data-related services to PICTs over many years. The centralisation of some functions, such as data-form design, data processing and database management, has assisted in the maintenance of data consistency and quality and seems to have been a cost-effective means for PICTs to jointly develop and manage an extensive and diverse data system. The OFP will continue to supply these services and to assist PICTs as required and as funding allows. The OFP will also continue to work with PICTs and the WCPF Commission to develop the necessary in-country capacity for PICTs to fulfil their obligations for collection, compilation, analysis and provision of scientific data to the Commission.

## 7. References

- Anon. 2003. Report of the Fifth Meeting of the Tuna Fishery Data Collection Committee. 2–6 December 2002, Brisbane, Australia. Oceanic Fisheries Programme, Secretary of the Pacific Community, Noumea, New Caledonia and Forum Fisheries Agency, Honiara, Solomon Islands.
- Lawson, T. 2003. Observer coverage rates and the accuracy and reliability of CPUE for offshore longline fleets targeting South Pacific albacore. Standing Committee on Tuna and Billfish 16, Working Paper SWG-4.

Table 3. Indicative responsibilities for various data sources.

Key Data Source	Responsibility
Logsheet	Flag state, coastal (licensing) state
Landings/transshipment	Port state
Vessel activity log	Flag state
VMS	Flag state, Commission (high seas), coastal (licensing) state (EEZs)
Observers	Flag state (home waters), Commission (multiple EEZs, high seas), coastal (licensing) state (locally-based foreign fleets)
Port sampling	Port state
Export documentation	Port state
Annual return of vessel characteristics, vessel registry	Flag state for data provision, Commission for maintenance of vessel registry
In-port inspections	Port state

Part I: Overview

Table 4. Current (2002) levels of fishery monitoring by logsheet, landings, observer, port sampling and VMS for national fleets of PICTs. For logsheet and landings data, coverage is rated according to the percentage of the total catch by weight measured or monitored. For port sampling and observers, coverage is rated according to the percentage of the catch measured for length for longline and the percentage of sets length sampled for purse seiners. For VMS, coverage is rated according to the proportion of vessels currently in good standing on the FFA VMS Register. The known existence of vessel information on registries or licensing databases is indicated by Y. A dash indicates that data are not currently collected and ? indicates status unknown.

PICT		Logsheet	Landings	Observer	Port Sampling	VMS	Vessel Data
		H:>80% M: 50-80% L: <50%	H:>80% M: 50-80% L: <50%	H:>20% M: 10-20% L: <10%	H:>20% M: 10-20% L: <10%	H:>80% M: 50-80% L: <50%	
<b>FFA Countries</b>							
Cook Is.	Longline	H	H	L	H	L	Y
FSM	Longline	M	M	L	H	-	Y
	Purse seine	H	L	M	L	H	Y
Fiji	Longline	H	H	-	H <sup>4</sup>	M	Y
	Pole-and-line	-	-	-	-	-	?
Kiribati	Purse seine	H	-	-	-	H	Y
Marshall Is.	Purse seine	H	L	-	H	H	Y
PNG	Longline	H	H	L	H <sup>4</sup>	L	Y
	Purse seine	H	L	H	L	H	Y
Samoa	Longline	M	L	-	H	-	Y
Solomon Is.	Longline	H	-	M	-	-	Y
	Purse seine	H	L	M	-	H	Y
	Pole-and-line	H	-	H	-	-	Y
Tonga	Longline	H	H	-	H	-	Y
Vanuatu	Longline	H	L	-	-	H	Y
<b>US Territories</b>							
American Samoa	Longline	H	H	L	H	L	Y
<b>French Territories</b>							
French Polynesia	Longline	H	- <sup>5</sup>	L	L	-	Y
	Pole-and-line	H	-	-	-	-	Y
New Caledonia	Longline	H	H	L	H	-	Y

<sup>4</sup> For these fleets, considerable additional weight measurement data are available from either export documentation or from port sampling operations.

<sup>5</sup> But new procedures introduced in 2003 should result in complete landings data.

## **Part II: Country Summaries**

In this section, summary information is presented for each PICT having either a national tuna fishing fleet, significant licensed foreign fishing in its EEZ or significant landings or transshipment activity in its ports. Therefore, the only PICTs not included in this section are Northern Marianas, Wallis and Futuna and Pitcairn. If tuna fishery developments occur in those territories, information can be compiled as appropriate.

The information presented includes fishery background, institutional structures, fishery monitoring, data management and reporting, and recommended priority measures to strengthen capacity in fishery monitoring. The information has been compiled mainly on the basis of data of various types held by the OFP on behalf of PICTs. Attempts have been made to verify the accuracy of this information with officials from each PICT; however, some of the summaries may not include the most recent developments that have occurred. The OFP would welcome any additional feedback from PICTs concerning the information presented in this report.

## American Samoa

### **Background**

The commercial tuna longline fishery in American Samoa began in about 1994, using small catamaran style *alias* that are typically less than 10 m in length, and which conduct mainly one-day trips. In the late 1990s, larger longliners (>20 m length) typical of the vessels that fish in several South Pacific island countries began entering the fishery. As a result, total effort and catch expanded dramatically beginning in 2001. The catch is dominated by albacore, which is sold to the local canneries in Pago Pago. In 2002, 70 vessels, comprising approximately equal numbers of *alias* and mono-hull longliners, were engaged in the fishery; however, total effort in hooks set is now dominated by the larger vessels. Fishing occurs in the EEZ and in adjacent EEZs under access arrangements. Fishing by US flag longliners in international waters within the US Treaty area has recently been allowed by amendment to the Treaty. No foreign fishing is allowed in the EEZ around American Samoa.

### **Institutional structures**

The fishery is managed under the Pelagic Fisheries Management Plan administered by the Western Pacific Regional Fisheries Management Council and the U.S. National Marine Fisheries Service. A limited entry programme is soon to be introduced, supplementing an existing 50 mi closure around the islands for vessels larger than 50 feet in length. The American Samoan Department of Marine and Wildlife Resources (DMWR) plays a significant role in fishery monitoring and data management.

### **Fishery monitoring**

Logsheets: All domestic longliners based in American Samoa are required to report operational level catch and effort data through a federal logbook system, which was initiated in 1996. Logbook coverage is very high and was close to 100% in 2002.

Landings: Landings data for the larger longliners unloading to the canneries are collected by DMWR and cross-checked against logbook returns. DMWR also conducts regular offshore creel surveys to estimate landings of small subsistence, recreational and commercial vessels undertaking one-day trips.

Vessel activity log: Since 1999, DMWR have conducted a daily effort census, which has been effective in monitoring the effort of the *alia* component of the fleet.

VMS: Several larger vessels that fish in the American Samoan fishery and that also have Hawaii limited entry permits carry VMS.

Observers: There has been no observer coverage to date of the American Samoan longline fleet. However, NMFS are in the process of implementing an observer programme, which is expected to have a coverage rate of 20% when fully operational.

Port sampling: Port sampling of both American Samoan and foreign longliners, and the US purse seine fleet unloading their catches to the Pago Pago canneries is carried out by the NMFS port sampling programme. This is the largest and longest running port sampling operation in the region and coverage rates are high.

Export documentation: The majority of catches landed in American Samoa are processed in the local canneries, so packing list data is generally not available.

Vessel characteristics: DMWR and NMFS maintain a comprehensive database of vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

DMWR have undertaken longline logbook data processing since 2000, with the data files being provided regularly to NMFS in Honolulu. All data collected by the port sampling programme are processed and managed by NMFS. DMWR and NMFS report aggregated catch and effort estimates to the Council on a quarterly basis. Catch and effort data aggregated at 5 degree square month resolution and port sampling data are provided to the OFP for incorporation into regional databases.

### **Priority measures/recommendations to strengthen capacity in fishery monitoring**

1. Increased resources are likely to be required to increase observer coverage of the longline fleet.

## Cook Islands

### **Background**

The Cook Islands EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. The tuna fishery is expanding rapidly and is conducted by domestic and foreign longline vessels. Many of the new entrants in the fishery are from neighbouring PICTs, principally Samoa. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet operates from Rarotonga and in the northern area of the EEZ by vessels based in Pago Pago or Apia. Cook Islands registered vessels have also operated beyond the EEZ in recent years, principally in the Fiji EEZ. There is limited fishing activity by US purse seine vessels in the Cook Islands EEZ.

### **Institutional structures**

Management of the tuna resource is the responsibility of the Ministry of Marine Resources (MMR). A draft of the “Cook Islands Tuna and Large Pelagic Fishery Plan: 2003” is currently under consideration by the Cook Islands Government.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage for the longline fishery is likely to be high for Rarotonga-based vessels although the level of logsheet coverage for the Pago Pago-based vessels is unknown. Full logsheet coverage is available from the limited fishing undertaken by the US purse seine fleet.

Landings: Landings are monitored in Rarotonga by the port sampling programme, and coverage is high for this component of the fleet. It is not known to what extent vessels unloading in Pago Pago are monitored for landings.

Vessel activity log: Not yet implemented.

VMS: MMR is instigating FFA approved VMS for foreign and charter longline vessels.

Observers: In 2002, an Observer Coordinator was appointed and an observer training programme was instigated. For the longline fishery, a target of 20% coverage has been established. Recent coverage has been about 5%. Given the recent loss of some observers and the large increase in fishing activity, coverage is likely to remain low. All observers are based in Rarotonga and, consequently, coverage is likely to be biased to the southern area of the EEZ.

Port sampling: Port sampling activities principally cover the component of the catch landed in Rarotonga. NMFS staff based in Pago Pago provide port sampling coverage of the vessels operating in the northern area of the fishery. The level of coverage of this component of the catch is believed to be high.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not yet routinely collected.

Vessel characteristics: MMR operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

MMR has developed a database with OFP assistance for storage of licensing, logsheet, port sampling and observer data. Logsheets data are processed by MMR and copies forwarded to the OFP for data entry verification. The OFP also processes all observer and port sampling data. All data are incorporated into regional and Cook Island national databases. MMR are equipped with the CES software for generating reports of catch and effort data. MMR routinely collates catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity in fishery monitoring**

1. Ensure that sufficient resources are allocated to fishery monitoring as further increases in the level of fishing activity occur.
2. Increase observer coverage to 20%, with coverage of the northern part of the EEZ if possible.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in Rarotonga.
5. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Federated States of Micronesia

### Background

The FSM EEZ currently accounts for approximately 6% of the total tuna catch from the WCPO. The tuna fishery is composed of purse seine, longline, and pole-and-line methods and is dominated by foreign licensed vessels. The foreign purse seine fleet is comprised of Japanese, US, Korean, Taiwanese, Philippines, New Zealand and Chinese vessels, while a small fleet (8) of domestic vessels also operates. FSM is a party to the FSM Arrangement and the domestic fleet also operates within the EEZs of other signatories. The longline fleet is comprised of Taiwanese and Japanese vessels based in Guam, Japanese distant-water vessels, and Chinese and FSM-registered vessels based in Pohnpei (about 20 vessels). The pole-and-line fishery is operated by distant-water Japanese vessels. FSM is regionally important for the transshipment of purse seine catch.

### Institutional structures

The National Oceanic Resource Management Authority (NORMA) is divided into three sections: Administration, Licensing and Research. The Statistics, Licensing, and Computer Section (4 staff) is responsible for processing permit applications, issuing licenses, monitor vessel activities, the collection of fees, and the processing of vessel logsheets. The Research Section is responsible for managing the port sampling and observer programmes, the analysis of the resultant data, monitoring of catch and effort of all foreign and domestic fishing operators and provision of advice to the Executive Director on management issues at national, regional, and international levels.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. However, recent longline logsheet coverage has been low for the domestic fleet (about 50%), while logsheet coverage of the other sectors of the fishery is high.

Landings: Landings data are collected from purse seiners and longliners unloading in FSM ports, although coverage is incomplete. Landings data from the Guam-based longline vessels are provided by the Guam Department of Statistics and Planning.

Vessel activity log: Not yet implemented.

VMS: All foreign and domestic purse seine vessels are required to carry ALCs.

Observers: NORMA administers an observer programme with approximately 9 trained observers. The current target level of annual observer coverage is 20% of fishing trips (all methods combined). In recent years, coverage of the longline fishery was <1%, while 4-5% coverage was achieved for purse seine and pole-and-line trips. Coverage of FSM purse seiners occurs under the FSM Arrangement and approaches 20%. The Taiwanese and Japanese longline vessels based in Guam pose difficulties for observer placement. Coverage of this section of the fleet is poor.

Port sampling: Unloadings in FSM are covered by port sampling programmes administered by NORMA. Port sampling coverage of longline catch has been high in recent years (about 50%, with a target of 80% coverage), although the programme does not include that component of the longline catch landed in Guam. Port sampling of the domestic purse seine catch is undertaken, although coverage is low.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not routinely collected.

Vessel characteristics: NORMA operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

NORMA processes summary information from logsheets, unloadings and observer data. OFP processes all detailed logsheet and port sampling data. All catch and effort data, landings data, and port sampling and observer data are incorporated into regional databases by the OFP. OFP also provides routine updates of national data to NORMA for incorporation into their national database. NORMA are equipped with the CES software for generating reports of catch and effort data. NORMA employs a Fisheries Resource Analyst who analyses fisheries data and provides management advice. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Increased observer coverage, in particularly on the Japanese and Taiwanese longline fleets.
2. Increased port sampling coverage of purse seine catches landed in FSM.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in FSM ports.

## Fiji

### Background

The Fiji EEZ currently accounts for approximately 0.4% of the total tuna catch from the WCPO. The tuna fishery is dominated by the domestic longline fleet, which has expanded considerably over the last five years. A small domestic pole-and-line fishery also operates in the Fiji EEZ. There is limited purse seine activity in the northern area of the EEZ. The longline fishery is principally comprised of Fiji registered vessels. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. Many of the Fiji longline vessels also fish in the Vanuatu and Solomon Islands EEZs and adjacent international waters. Fiji is an important transport hub in the Pacific, and catches from the Fiji EEZ and adjacent waters are unloaded in Fiji, principally through Suva.

### Institutional structures

The Department of Fisheries of the Ministry of Fisheries and Forests is currently responsible for the management of the Fiji tuna fishery. However, it is intended that this responsibility will be conveyed to a new agency, the Fiji National Fisheries Authority. Currently, the Offshore Section of the Department of Fisheries manages vessel licensing, compliance, port sampling, unloadings monitoring and processing of all vessel logsheet and landings data. In 2002, the Fiji Government implemented a Tuna Development and Management Plan (TMP) for the domestic tuna fishery. The TMP established a Total Allowable Catch for the tuna longline fishery and an associated number of vessel licences. These measures were initially introduced for a two-year period (2002–2003).

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Recent longline logsheet coverage within the Fiji EEZ has been high (>80%), while logsheet coverage of the pole-and-line vessels was negligible. Fiji vessels operating outside of the Fiji EEZ are also required to provide logsheets to the Department of Fisheries.

Landings: Vessel unloadings and transshipments are monitored by compliance staff of the Offshore Section; there is a requirement for all vessels to document the landed catch from each trip. The Department has also endeavoured to collect unloadings data from non-licensed vessels discharging their catches in Fiji.

Vessel activity log: Not yet implemented.

VMS: Fiji licensed vessels are required to carry ALCs.

Observers: In 2002, an observer coordinator position was established within the Offshore Section and the observer programme has been strengthened with the recruitment of 11 observers. However, to date these resources have been used mainly for port sampling and monitoring of landings. Consequently, observer coverage of the longline fishery has been very low (<1%), although there has been increased emphasis on at-sea monitoring in 2003.

Port sampling: Most vessel landings are monitored, ensuring a high level of port sampling coverage.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are available but not routinely collected.

Vessel characteristics: The Offshore section of the Department of Fisheries operates a licensing database that contains information on vessel characteristics.

In-port inspections: Occurs to some extent during monitoring of landings.

### Data management and reporting

All logsheet and landings data are processed by the Offshore statistics group. Observer data are processed by OFP. Copies of logsheet, landings and port sampling data are forwarded to the OFP for data entry verification and incorporation into regional databases. Fiji Fisheries are equipped with the CES software for generating reports of catch and effort data. Summary data are provided annually to SCTB. Reporting procedures are being developed to provide routine summaries of catch and effort data from the Offshore database. This will enable improved monitoring of trends in the tuna fishery.

### Priority measures/recommendations to strengthen capacity

1. Further strengthen data entry and data management procedures.
2. Increase the level of observer coverage of the longline fishery.
3. Collect logsheet data from the domestic pole-and-line fishery.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
5. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
6. Systematically collect unloadings data for all landings and transshipments in Fiji ports.

## French Polynesia

### Background

The French Polynesia EEZ currently accounts for approximately 0.3% of the total tuna catch from the WCPO. The tuna fishery is dominated by the longline method and has expanded considerably over the last five years and further development is planned. In recent years, the longline fleet has been comprised principally of domestic vessels. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is a fleet of smaller vessels (“bonitiers”) that undertakes fishing using a number of methods, including longlining and pole-and-line. The importance of this sector of the fleet has declined with the recent entry of larger longline vessels. The domestic longline fleet operates almost exclusively within the French Polynesia EEZ and most of the catch is unloaded in Papeete. Papeete is also an important port for the service, supply, and transshipment of the Japanese, Korean, and Taiwanese distant-water longline vessels.

### Institutional structures

Service de la Pêche is responsible for the management of the French Polynesian tuna fishery. The agency employs 60 staff and is divided into four departments. Departement Reglementation et control is responsible for vessel licensing, Departement Statistiques et communication is responsible for data collection, while Departement Developpement undertakes routine data analysis. Service de la Pêche is implementing a development plan for the tuna fishery, which is targeting annual catches of 30,000 t within the next 10 years.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage of the longline vessels (excluding bonitiers) has been about 70% in recent years. The logsheet coverage is supplemented by a biannual survey of each category of longliner and these data are collectively used to determine estimates of total catch.

Landings: No landings data are currently available. However, since 2003, there has been a formal requirement for vessels to report the landed catch from each trip. This should provide complete landings data for the domestic fleet.

Vessel activity log: Not yet implemented.

VMS: There is currently no intention to introduce a VMS for the domestic longline fleet.

Observers: A Monitoring Supervisor/Liaison Officer and two observers were recruited in September 2002 (under EC-PROCFish funding). The observer staff are principally involved in at-sea sampling and have no compliance function. An additional observer is employed by Service de la Pêche. This has resulted in an increase in observer placements, particularly on medium-sized (<20 m) fresh tuna vessels. There are also plans for placements on the larger freezer vessels. Recent coverage represents about 3-5% of longline trips.

Port sampling: Port sampling has been very limited in recent years, partly due to difficulties in accessing landed catches. However, these difficulties have been partly overcome by the completion of a centralised unloading facility in Papeete. A number of the new longliners operating in the fishery are now processing the catch of albacore at sea and, consequently, this component of the catch is not available to the port sampling programme.

Export documentation: Fish export data are collected by the customs agency. Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not routinely collected.

Vessel characteristics: Service de la Pêche operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

All processing of logsheet data and port sampling data is undertaken by Service de la Pêche. Observer data are processed by OFP. All logsheet, observer and port sampling data are provided to OFP for incorporation into regional databases. Service de la Pêche are equipped with the CES software for generating reports of catch and effort data. Service de la Pêche has the capacity to analyse information collected from the fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Increase port sampling and observer coverage of the domestic longline fleet.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings and transshipments in French Polynesia.

## Guam

**Background**

Industrial-scale commercial tuna fishing does not occur in the EEZ around Guam. A relatively small amount of tuna is caught locally by recreational trollers. However, Guam is regionally important as a transshipment port. A large fleet of mainly smaller Taiwanese and Japanese longline vessels fishing in Micronesia unload their catches in Guam, from where they are air-freighted to sashimi markets in Japan. In the past, purse seine vessels have also transhipped on Guam, but this is now a relatively rare occurrence.

**Institutional structures**

Tuna fishing in Guam is managed under the Pelagic Fisheries Management Plan administered by the Western Pacific Regional Fisheries Management Council and the U.S. National Marine Fisheries Service. The Division of Aquatic and Wildlife Resources monitors the local recreational fishery. The Department of Statistics and Planning compiles and processes transshipment and individual weight data from packing lists.

**Fishery monitoring**

Logsheets: N.A.

Landings: Landings data for foreign longliners transshipping on Guam are collected by the Department of Statistics and Planning. Landings are compiled from export packing lists and export rejects. Coverage of transshipment activity is high.

Vessel activity log: N.A.

VMS: N.A.

Observers: N.A.

Port sampling: N.A.

Export documentation: High coverage packing list (individual weight) data are available from longliners transshipping on Guam.

Vessel characteristics: N.A.

In-port inspections: Inspections are undertaken by NMFS enforcement personnel, but it is not known if information on vessel and gear characteristics is systematically collected.

**Data management and reporting**

The Department of Statistics and Planning maintains a database, originally developed by the OFP and now maintained by NMFS, on landings and catch size (weight) composition. Landings and packing list data are routinely provided to NMFS and to the OFP for incorporation into regional databases.

**Priority measures/recommendations to strengthen capacity in fishery monitoring**

No recommendations.

## Kiribati

### Background

The Kiribati EEZ currently accounts for approximately 11% of the total tuna catch from the WCPO, although the level of catch is highly variable between years. The tuna fishery is composed of purse seine, pole-and-line, and longline methods. The fishery is dominated by foreign licensed vessels, with the longline fishery comprised of mainly Japanese and Korean vessels. The purse seine fleet consists of US, Japanese, Taiwanese, and Korean vessels, and agreements have been reached recently to allow licensing of New Zealand and European Union vessels. Kiribati also operates a purse seine vessel that fishes under the FSM Arrangement. The Japanese distant-water pole-and-line fleet operates intermittently in the Kiribati EEZ. Kiribati is currently investigating the potential to develop a domestic tuna longline fishery. There are no onshore facilities for vessel discharge although considerable transshipment activity occurs in Kiribati, primarily in Tarawa and Kiritimati Island.

### Institutional structures

The Fisheries Division of the Ministry of Natural Resources Development (MNRD) is currently responsible for the management of tuna fisheries in Kiribati. The Fisheries Licensing and Enforcement Unit (FLEU) of the Fisheries Division is responsible for vessel licensing, monitoring, and processing of vessel logsheets. The structure of the Fisheries Division was reviewed during the formulation of the draft Tuna Management Plan for Kiribati. The draft plan includes a proposal for the establishment of a Fisheries Licensing and Law Enforcement Authority.

### Fishery monitoring

Logsheets: Foreign licensed vessels are required to provide daily catch and effort information on regional logsheets and communicate weekly catch reports. Logsheets coverage is approximately 100% for purse seine and pole-and-line vessels. Logsheets coverage of the longline fleet is unknown due to uncertainty regarding the level of logsheet coverage for the main Korean fleet.

Landings: There is a requirement to document catch transshipments, although the unloading documents are not provided to OFP and coverage is assumed to be low.

Vessel activity log: Not yet implemented.

VMS: All foreign vessels are required to carry ALCs and vessel locations are monitored by FLEU.

Observers: In 2002, an observer coordinator position was established within the MNRD and the observer programme has been strengthened with about 20 observers employed on a contractual basis. Observers are based in Tarawa and Kiritimati Island. The observer programme was developed in accordance with the regional protocols developed by OFP. Most vessel access agreements specify a level of observer coverage. However, the current level of observer coverage, particularly for the longline fishery, is very low (<1%).

Port sampling: Few port sampling data have been collected to date.

Export documentation: There is no export of tuna from Kiribati except by carrier vessels.

Vessel characteristics: FLEU operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Weekly vessel catch reports are entered in a database administered by the FLEU. Logsheets and observer data are provided to OFP for data processing and incorporation into regional databases and the Kiribati national tuna database. FLEU are equipped with the CES software for generating reports of catch and effort data. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Ascertain the level of logsheet coverage for the Korean longline fleet and improve coverage, if necessary.
2. Strengthen data management procedures, including the timely provision of data to OFP.
3. Increase the level of observer coverage, in particular for the foreign longline fishery.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
5. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
6. Systematically collect unloading data for all landings and transshipments in Kiribati.

## Marshall Islands

### Background

The Marshall Islands EEZ currently accounts for approximately 2.9% of the total tuna catch from the WCPO. The fishery is conducted by longline, purse seine, and pole-and-line vessels. The pole-and-line fishery is conducted exclusively by the Japanese distant-water fleet. The purse seine fleet is comprised of domestic vessels (5) and foreign vessels operating under multilateral (US Treaty, FSM Arrangement) and bilateral access agreements (Japan, Taiwan, Korea). There is considerable transshipment activity and servicing of the purse seine fleet in Majuro. The domestic purse seine vessels also operate in the adjacent waters under the reciprocal access rights granted by the FSM Arrangement. The longline fishery is dominated by the Japanese distant-water fleet although there has been an increase recently in fishing activity by locally-based foreign vessels (principally Chinese flagged vessels, but also including and vessels from FSM Taiwan and Japan).

### Institutional structures

Management of the tuna fishery is the responsibility of the Marshall Islands Marine Resources Authority (MIMRA). MIMRA is in the process of developing a National Tuna Management Plan to establish a framework for the development and management of the tuna fishery.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage of domestic and foreign purse seine vessels is considered to approach 100%. Logsheets coverage of the Japanese longline and pole-and-line fleets is also considered to be high. The current level of logsheet coverage of the locally-based foreign longline vessels is uncertain.

Landings: No unloadings (landings and transshipments) data are currently collected from either the purse seine or longline fleets. MIMRA plans to introduce routine landings data collection by 2004 to cover all vessels landing or transshipping in Majuro.

Vessel activity log: Not yet implemented.

VMS: Foreign and domestic purse seine vessels and some foreign longline vessels are monitored by the VMS administered by FFA.

Observers: MIMRA, with assistance from the OFP, has recently recruited a national observer and port sampling coordinator, and has a commitment to achieve coverage levels of 5–10% by 2005.

Port sampling: In recent years, port sampling has covered a large number of transshipments by purse seine vessels, although no routine port sampling has been undertaken of the longline catch. By 2004, MIMRA hopes to sample all landings and transshipments that occur in Majuro.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not routinely collected.

Vessel characteristics: MIMRA operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Logsheets and port sampling data are processed by OFP and incorporated into regional databases and the Marshall Islands national database. MIMRA are equipped with the CES software for generating reports of catch and effort data. Summary data from the fishery are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Port sampling of the longline catch landed by the locally based foreign longline vessels.
2. Observer coverage of the longline and purse seine fisheries.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
4. Systematically collect unloadings data for all landings and transshipments in Majuro.
5. To develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Nauru

### Background

The Nauru EEZ currently accounts for approximately 4% of the total tuna catch from the WCPO. The fishery is comprised of foreign longline and purse seine vessels. Most distant-water and FSM Arrangement purse seine fleets fish to some extent in the Nauru EEZ. There is intermittent pole-and-line activity in the zone by the Japanese distant-water fleet. There is currently no domestic tuna fishery and no significant transshipment activity in Nauru. However, there is the potential for the development of a locally-based longline fishery exporting product by air-freight to the sashimi market.

### Institutional structures

Management of the tuna resource is the responsibility of the Nauru Fisheries and Marine Resources Authority (NFMRA). The authority has a staff of four and is responsible for vessel licensing, vessel monitoring, and data collection.

### Fishery monitoring

Logsheets: All foreign licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Vessels are also required to provide entry and exit reports and weekly catch reports when operating in the Nauru EEZ, although the level of reporting is unknown. It is also unknown whether these data are used to trace logsheets from individual vessels. Logsheets coverage of the purse seine and pole-and-line fishery is considered to approach 100%.

Landings: There is limited transshipment activity in Nauru.

Vessel activity log: N.A.

VMS: Foreign licensed vessels are monitored by the VMS administered by FFA.

Observers: Observer coverage of the purse seine fleet when operating in the Nauru EEZ is likely to be comparable to fisheries operating in adjacent EEZs. Observer coverage of the foreign longline fleet is negligible.

Port sampling: Not necessary; as there is limited transshipment activity in Nauru.

Export documentation: There is no significant export of tuna from Nauru.

Vessel characteristics: NFMRA operates a licensing database that contains information on foreign licensed vessel characteristics.

In-port inspections: Not relevant as there are no port calls by the foreign fleet.

### Data management and reporting

Logsheets are forwarded to OFP for processing; these data are incorporated into regional and Nauru national databases. NFMRA are equipped with the CES software for generating reports of catch and effort data.

### Priority measures/recommendations to strengthen capacity

1. Introduce procedures to improve the provision of logsheets to OFP.

## New Caledonia

### **Background**

The New Caledonia EEZ currently accounts for approximately 0.1% of the total tuna catch from the WCPO. The tuna fishery currently consists of 25 domestic longliners based in Noumea and Koumac and further development is envisaged. Their catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet operates exclusively within the New Caledonia EEZ. There is currently no licensed foreign fishing in the EEZ.

### **Institutional structures**

The Service de la Marine Marchande et des Pêches Maritimes is responsible for management of the tuna fishery. The agency provides technical advice and is responsible for the implementation the management policies of the Territorial Government. The agency is responsible for vessel licensing and the collection of fisheries statistics (logsheets and landing data).

### **Fishery monitoring**

Logsheets: All licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The longline fleet has increasingly adopted the regional longline logsheet. Current logsheet coverage is considered to be approximately 80%.

Landings: Unloadings data are available for most of the fishing trips, although some companies may not yet be providing these data.

Vessel activity log: Not yet implemented.

VMS: A VMS is currently being assessed and is planned for implementation by late 2004.

Observers: A Monitoring Supervisor/Liaison Officer and one observer were recruited in September 2002 (under EU-PROCFish funding) and are based in the OFP. Observer placement, data quality and data processing is undertaken by the OFP. Observer coverage is currently of the order of 5% of trips.

Port sampling: Port sampling is managed by the OFP under the PROCFish project. Coverage is about 75% in Noumea and 100% in Koumac.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but not yet collected.

Vessel characteristics: The Service de la Marine Marchande et des Pêches Maritimes operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

Port sampling and observer data are collected and processed by the OFP. Logsheets data are processed by OFP and incorporated into regional and the New Caledonian national databases. Service de la Marine Marchande et des Pêches Maritimes are equipped with the CES software for generating reports of catch and effort data. Service de la Marine Marchande et des Pêches Maritimes has the capacity to analyse information collected from the fishery. Summary data are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity**

1. Increased observer coverage, particular of vessels based in Koumac.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings in New Caledonia.

## Niue

### Background

The tuna catch from the Niue EEZ is very small (< 0.001%) relative to the entire catch from the WCPO. A small domestic fishery operates to supply the local market. Currently, the only foreign fleet licensed to fish in the Niue EEZ are Taiwanese distant-water longline vessels. This fleet was absent from the fishery from 1998 to 2002, but were re-licensed in 2002–2003 and now have an ongoing licensing arrangement. The Taiwanese fleet is comprised of about 20 vessels and fishing activity in the Niue EEZ is intermittent. There is considerable interest in the development of the domestic fishery through the establishment of joint venture operations with offshore partners, particularly from neighbouring countries (e.g. Samoa and American Samoa). This would include the development of onshore processing facilities. Niue is a signatory to the US Treaty, although no fishing activity has been reported by the US purse seine fleet.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Agriculture, Forestry and Fisheries. The Fisheries Division has 4-5 staff and is responsible for all fisheries management, policy and development. The Division is also responsible for vessel licensing, monitoring and data collection. There is no requirement for port sampling, although Niue does have a number of trained observers who are occasionally deployed on US Treaty purse seine vessels.

### Fishery monitoring

Logsheets: All foreign licensed vessels are required to provide catch and effort information at the operational level on approved logsheets, although the level of logsheet coverage of the Taiwanese fleet is unknown (no data have been provided for 2002). Vessels are also required to provide entry and exit reports and weekly reports of catch and fishing activity when operating in the Niue EEZ; the level of such reporting is unknown. The Fisheries Division is currently developing systems to link these various reports to ensure the provision of logsheets from individual vessels.

Landings: There is currently no significant landing of tuna in Niue.

Vessel activity log: N.A.

VMS: All foreign licensed vessels are required to participate in VMS programme administered by FFA.

Observers: Observer coverage of the Taiwanese distant-water longline fleet is negligible. Niue are planning to develop an observer programme to cover new joint venture longline fishing.

Port sampling: N.A.

Export documentation: There is currently no significant export of tuna from Niue.

Vessel characteristics: Fisheries Division operates a licensing database that contains information on characteristics of licensed vessels.

In-port inspections: N.A.

### Data management and reporting

The Fisheries Division forwards logsheets to the OFP for data processing and incorporation in the regional database. A national fisheries database and CES interface has not yet been established for Niue. Summary data from the tuna fishery are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. There is potential for the development of a locally-based longline fishery in the Niue EEZ. This may require additional resources for fishery monitoring, including observers, port sampling and landings monitoring. The scale of any future development of the fishery will dictate the level of resources required.
2. Establish a comprehensive national database with CES interface and develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Palau

### Background

The Palau EEZ currently accounts for approximately 0.4% of the total tuna catch from the WCPO. The fishery is principally conducted by locally-based foreign longline vessels (Chinese and Taiwanese) and the Japanese offshore fleet. In recent years, minimal purse seine activity has occurred in the Palau EEZ, although access arrangements exist for several (Japan, US Treaty, FSM Arrangement). There is currently no active pole-and-line fishery in the EEZ.

### Institutional structures

Management of the tuna fishery is the responsibility of the Bureau of Oceanic Fisheries Management (BOFM) of the Ministry of Resources and Development. BOFM manages fisheries access agreements, vessel licensing, the collection of associated fees, and the collection and compilation of fisheries statistics.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the locally based longline fleet is considered to be high (approaching 100%). Logsheet coverage is also considered high for the Japanese longline fleet.

Landings: Unloadings data are collected from the locally based longline fleet. These are routinely compared with tuna export data.

Vessel activity log: Not yet implemented.

VMS: Foreign purse seiners fishing in the Palau EEZ are covered by the FFA VMS programme.

Observers: No observer programme is currently in place, although BOFM is currently investigating means to re-establish an observer programme.

Port sampling: A well-established port sampling programme operates in Palau. Port sampling coverage of the locally-based longline catch has approached 100% in recent years.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are routinely collected.

Vessel characteristics: BOFM operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Logsheets are processed by OFP, while trip summary data, unloadings data, and port sampling data are processed by BOFM. All data are incorporated into regional databases and the Palau national database. BOFM are equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Implement an observer programme to cover the locally-based foreign longline fleet.
2. Introduce annual returns for vessel activity and vessel characteristics for all locally-based foreign vessels.
3. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Papua New Guinea

### Background

The Papua New Guinea (PNG) EEZ currently accounts for approximately 9% of the total tuna catch from the WCPO. The fishery is comprised of a large domestic, locally-based foreign (Philippines), and foreign (US, Taiwanese, Philippines, Chinese, and Korean) purse seine fleet and a developing domestic longline fleet. Papua New Guinea is a signatory to the FSM Arrangement and PNG licensed purse seine vessels also operate in the EEZs of other parties to the Arrangement. An increasing amount of processing of the purse seine catch is occurring in PNG. A component of the domestic longline fishery targets shark.

### Institutional structures

Management of PNG tuna fisheries is the responsibility of the National Fisheries Authority (NFA). A National Tuna Fishery Management Plan was first gazetted in 1999. Management of the tuna fishery is undertaken through consultation with the Tuna Consultative Committee, which includes industry representatives, NGOs, and government officers. The NFA is responsible for all licensing, fisheries management, monitoring, and compliance. The Licensing and Information Group is responsible for processing catch, effort and export data. The observer programme is managed by the Monitoring Control and Surveillance Group.

### Fishery monitoring

**Logsheets:** All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Logsheets coverage is approximately 100% for the purse seine fleet and 70% for the domestic longline fleet.

**Landings:** Fishing companies are required to provide landings and transshipment data to NFA. Landings data are currently available for approximately 15% of the purse seine catch. Systematic recording of transshipments is not currently undertaken.

**Vessel activity log:** Not yet implemented.

**VMS:** Some domestic longline vessels are fitted with ALCs. Foreign licensed purse seiners and PNG vessels fishing under the FSM Arrangement are required to participate in the VMS programme administered by FFA. PNG also operates a national VMS for vessels fishing exclusively in the PNG EEZ.

**Observers:** The PNG observer programme is the largest and best supported of the PICT observer programmes with approximately 50 active observers based at 10 ports around the country. NFA has specified target levels of observer coverage for purse seiners fishing in mothership operations (100%), other purse seine operations (20%), and longliners (5%). Observer coverage of the purse seine fleet has now been shifted from the motherships to the smaller catcher vessels. Overall, coverage of the purse seine fleet is 20% or greater.

**Port sampling:** Port sampling of the longline fishery is currently undertaken at Port Moresby, Lae, and Rabaul. The recent high level of observer coverage on purse seine catcher vessels means that port sampling of this component of the fleet is unnecessary. However, increased port sampling coverage of the foreign vessels landing in Wewak and Rabaul is required.

**Export documentation:** Individual weight data for air-freighted yellowfin and bigeye are routinely collected.

**Vessel characteristics:** NFA operates a licensing database that contains information on vessel characteristics.

**In-port inspections:** Routinely undertaken by NFA staff; vessel data are collected but are not currently entered to a database.

### Data management and reporting

NFA processes all logsheet and landings data. Observer, port sampling and packing list data are forwarded to OFP for processing. OFP also provides data entry verification of logsheet data. However, in future these data may be provided electronically from NFA. All PNG data are incorporated into regional databases and the PNG national database. NFA are equipped with the CES software for generating reports of catch and effort data. The NFA routinely collates catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Further improve logsheet coverage of the domestic longline fishery.
2. Initiate port sampling of the foreign purse seine vessels landing in Wewak.
3. Increase observer placements to achieve the target levels of coverage for longline and purse seine fleets.
4. Introduce annual returns for vessel activity and vessel characteristics for all domestic and locally-based foreign vessels.
5. Systematically collect unloadings data for all purse seine landings in PNG, including critical species composition data.

## Samoa

### Background

The Samoa EEZ currently accounts for approximately 0.3% of the total tuna catch from the WCPO. The tuna fishery developed rapidly during the mid-1990s and is conducted by domestic longline vessels. Initially, most vessels were small *alias* but larger mono-hull vessels have entered the fishery in recent years. Catches consist primarily of albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is also limited fishing activity by US purse seine vessels in the Samoa EEZ. The longline fleet is based in Apia, although some larger vessels are now operating in neighbouring EEZs, principally the Cook Islands.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Agriculture, Forestry, Fisheries and Meteorology (MAFFM). A management and development plan for the fishery was implemented in 2000. Management is undertaken through consultation with the Commercial Fisheries Management Advisory Committee which is comprised of elected industry representatives and government officers. The Fisheries Division is responsible for research, vessel licensing, and fishery monitoring.

### Fishery monitoring

**Logsheets:** Logsheets data are required from longliners over 15 m. There has been a high level of logsheet coverage from these vessels in recent years. Monitoring programmes are well established to estimate the level of catch from the large number of smaller vessels (daily effort census surveys and port sampling). However, these data do not provide details of location of the catch or the associated level of fishing effort (although some of this information is available from the port sampling).

**Landings:** Vessel unloadings data are not collected from the entire fleet due to the many small vessels operating in the fishery.

**Vessel activity log:** A daily effort census is carried out to verify the activity of *alias*.

**VMS:** There is no requirement for longline vessels to carry ALCs.

**Observers:** Currently, no at-sea observer programme operates in the domestic longline fishery.

**Port sampling:** All vessels are required to land their catch in Samoa and, consequently, landings are available for port sampling. There is a well-established port sampling programme and up to 50% of all longline landings have been sampled in recent years. Sampling is overseen by the Port Sampling Coordinator and currently two port sampling staff are funded under the EU-PROCFish project.

**Export documentation:** Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available. Export data are routinely used to determine annual catch estimates.

**Vessel characteristics:** MAFFM operates a licensing database that contains information on vessel characteristics.

**In-port inspections:** Not undertaken.

### Data management and reporting

All data collected from the tuna fishery are processed by the Fisheries Division and are provided to the OFP for incorporation into regional databases. MAFFM are equipped with the CES software for generating reports of catch and effort data. The Fisheries Division routinely collates quarterly catch and effort data from the tuna fishery. Summary data are provided annually to SCTB.

### Priority measures/recommendations to strengthen capacity

1. The implementation of an observer programme in the Samoa longline fishery.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic longline vessels.
3. Systematically collect unloadings data for all landings in Apia.
4. Further develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Solomon Islands

### Background

The Solomon Islands EEZ currently accounts for approximately 3.1% of the total tuna catch from the WCPO. The fishery consists of domestic and foreign longline, purse seine, and pole-and-line vessels. The longline fleet is comprised of domestic and foreign registered vessels (Korea, Taiwan, Vanuatu, and Fiji). The domestic longline fishery expanded considerably in the late 1990s, but has declined in the last few years. The pole-and-line and purse seine fisheries consist mainly of domestic vessels. Solomon Islands is a signatory to the FSM Arrangement allowing reciprocal access rights to other Parties. In particular, PNG registered purse seine vessels operate in the Solomon Islands EEZ, while domestic vessels undertake considerable fishing in neighbouring EEZs and international waters. Solomon Islands is a signatory to the US Treaty although there has been minimal fishing by the US purse seine fleet in the EEZ in recent years. Japanese, Korean and Taiwanese purse seine vessels have also been licensed to fish in the Solomon Islands EEZ in recent years.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Division of the Ministry of Fisheries and Marine Resources. In 1999, Solomon Islands implemented a National Tuna Management Plan. The plan included the establishment of a Tuna Management Committee to advise the Minister of Fisheries on development and management issues. The committee includes representatives from the fishing industry and government agencies. Under the terms of the plan, a limit on the number of vessel licenses was established for each of the main fishing methods.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the domestic longline, purse seine and pole-and-line fleets is believed to be high. Logsheets coverage of all components of the foreign longline fleet is highly uncertain. Logsheets coverage of foreign purse seine vessels approaches 100%.

Landings: Landings data are available for the domestic pole-and-line and purse seine catch although coverage for the latter has been low (about 20%). Limited transshipment activity has occurred in the Solomon Islands EEZ in recent years. Honiara is the main transshipment port. There is no routine collection of data from vessel transshipments when they occur.

Vessel activity log: Not yet implemented.

VMS: Foreign licensed vessels are required to participate in the regional VMS programme administered by FFA. Domestic purse seiners also participate in the regional VMS programme.

Observers: The observer programme ceased during the disruption to domestic fishing operations that occurred during the recent period of unrest. The programme was recently re-established with a staff of 12 observers, an Observer Coordinator and an assistant Observer Coordinator and has achieved coverage rates of 20% or more for domestic fleets. The programme has not covered the foreign longline fleets. It has been proposed to increase coverage to 30% for longline, 40% for pole-and-line, and 100% for purse seine.

Port sampling: Prior to the civil unrest in Solomon Islands, port sampling was conducted in each of the main ports (Honiara and Noro). Sampling ceased during the period of unrest and has not yet been reinstated.

Export documentation: Individual weight data for air-freighted yellowfin and bigeye tuna are potentially available but are not routinely collected.

Vessel characteristics: Fisheries Division operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### Data management and reporting

Logsheets data are processed by the Fisheries Division. However, some inadequacies with the current database system have been identified and the OFP is working with the Fisheries Division to rectify these problems. All data are provided to the OFP for incorporation into regional and Solomon Islands national databases. Fisheries Division are equipped with the CES software for generating reports of catch and effort data. Annual fishery summaries are routinely provided to SCTB.

### Priority measures/recommendations to strengthen capacity

1. Audit the Fisheries Division database and suggest areas requiring improvement.
2. Introduce annual returns for vessel activity and vessel characteristics for all domestic vessels.
3. Systematically collect unloadings data for all landings in Solomon Islands.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Tokelau

### **Background**

The Tokelau EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. Historically, the tuna fishery is characterised by fishing by distant-water longline vessels and intermittent fishing by foreign purse seine fleets (principally US vessels). In recent years, there has been increased interest in fishing in the Tokelau EEZ by longline vessels operating from neighbouring countries, principally Samoa. There are four New Zealand flagged longline vessels licensed to fish in the Tokelau EEZ, although these vessels have not yet commenced fishing. Tokelau is investigating the potential for development of a domestic tuna industry, although infrastructure is limited.

### **Institutional structures**

Tokelau has recently been granted jurisdiction for management of the EEZ (previously managed by New Zealand). The management of the tuna fishery is the responsibility of the Department of Natural Resources and the Environment of the Office of the Council of Faipule. A management and development plan for the Tokelau tuna resource is currently being developed with assistance from FFA and SPC. This will assist in the formulation of policy for the licensing of vessels to fish in the Tokelau EEZ.

### **Fishery statistics**

Logsheets: Logsheets have not been systematically provided to Tokelau in respect of foreign fishing. Data are available for the US purse seine fleet via FFA as Treaty Administrator. It is expected that logsheet provision will be required for future foreign access agreements.

Landings: Significant quantities of tuna are not currently landed on Tokelau.

Vessel activity log: N.A.

VMS: Purse seine vessels fishing in the Tokelau EEZ participate in the regional VMS programme administered by FFA.

Observers: US purse seine vessels fishing in Tokelau waters may be covered by observers as part of the US Treaty.

Port sampling: Sampling of purse seine vessels that have fished in Tokelau waters may occur in Pago Pago.

Export documentation: N.A.

Vessel characteristics: N.A.

In-port inspections: N.A.

### **Data management and reporting**

There is currently no local data system nor a national infrastructure to monitor catch and effort in the EEZ. Tokelau is currently reliant on information received directly by OFP from fishing nations and regional licensing arrangements.

### **Measures/recommendations to strengthen capacity**

1. There is considerable interest in the development of the tuna fishery in the Tokelau EEZ and the potential for the development of a domestic fleet is being assessed. There is also considerable interest from DWFNs and PICT domestic fleets to gain licences to fish in the Tokelau EEZ. These initiatives also need to address the requirements for reliable monitoring of catch and effort from the fishery in the future. This may require the establishment of new national agency to undertake this role or rely on existing organisations (e.g. OFP) to undertake elements of this function.

## Tonga

### **Background**

The Tonga EEZ currently accounts for approximately 0.1% of the total tuna catch from the WCPO. The fishery has developed considerably over the last five years and is principally comprised of domestic longline vessels, including some locally-based foreign vessels. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. The longline fleet principally operates in the Tonga EEZ and in international waters south of the EEZ. Most of the longline catch is landed in Nuku'alofa, although some domestic vessels also discharge catch in Pago Pago. Tonga is a signatory to the US Treaty, although there is minimal fishing by the purse seine fleet in the Tonga EEZ.

### **Institutional structures**

Management of the tuna fishery is the responsibility of the Ministry of Fisheries. The Resource Management Division is responsible for vessel licensing, vessel monitoring and data collection. Tonga has formulated a National Tuna Management Plan. The plan has yet to be enacted in regulation but represents the current policy for management of the fishery. The plan includes the establishment of a National Tuna Management Committee to advise the Minister of Fisheries on development and management issues. The committee includes representatives from the fishing industry and government agencies.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. The level of logsheet coverage of the longline fleet has been improving in recent years and current logsheet coverage is considered high (about 80%). Provision of logsheets is required for vessels to have access to duty-free fuel.

Landings: Landings data are collected via the port sampling programme, although coverage is less than 100%.

Vessel activity log: Not yet implemented.

VMS: Legislation is in place to require all vessels to have VMS, although the regulations are yet to be enforced. There is currently a trial of VMS equipment on four locally-based foreign longline vessels.

Observers: No observer data are currently collected from the longline fishery. Tonga is committed to establishing a national observer programme and has recently requested assistance from the OFP in this regard.

Port sampling: There is a high level of coverage (80-100%) of the longline fleet by the port sampling programme, which is supported by the EC-PROCFish project. A number of domestic vessels may discharge their catch (often accumulated from several trips) in Pago Pago. These landings are covered by NMFS port sampling staff.

Export documentation: Tuna export data (including packing list data) are collected by the Customs agency.

Vessel characteristics: The Ministry of Fisheries operates a licensing database that contains information on vessel characteristics.

In-port inspections: Not undertaken.

### **Data management and reporting**

Vessel logsheets, landings and post sampling data are forwarded to the OFP for processing and incorporation into regional and the Tongan national database. The Ministry is equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### **Measures/recommendations to strengthen capacity**

1. Develop further port sampling capacity in line with expansion in fishing activity.
2. Implement an observer programme for the longline fishery.
3. Introduce annual returns for vessel activity and vessel characteristics for all domestic and locally-based foreign vessels.
4. Systematically collect unloadings data for all landings in Tonga.
5. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

## Tuvalu

### Background

The Tuvalu EEZ currently accounts for approximately 2% of the total tuna catch from the WCPO. The tuna fishery is comprised of foreign licensed longline (principally Japanese, Korean, Taiwanese distant-water), purse seine (US, Japanese, FSM Arrangement and New Zealand), and Japanese distant-water pole-and-line vessels. There is a small domestic fishery currently supporting the local market. There is no significant transshipment activity in Tuvalu ports.

### Institutional structures

Management of the tuna fishery is the responsibility of the Fisheries Department of the Ministry of Natural Resources Development (MNRD). The Department is responsible for vessel licensing, vessel monitoring and data collection. A tuna management and development plan for Tuvalu has been developed with assistance from FFA and SPC.

### Fishery monitoring

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. Vessels are also required to provide entry and exit reports when operating in the Tuvalu EEZ, although the level of reporting is unknown. Logsheets coverage approaches 100% for purse seine vessels. Logsheets coverage of the longline fleet is unknown due mainly to uncertainty regarding the level of logsheet coverage for the Korean fleet.

Landings: There is no unloading (landing or transshipment) of tuna in Tuvalu.

Vessel activity log: N.A.

VMS: Foreign licensed vessels are required to participate in the regional VMS administered by FFA.

Observers: Observer coverage of US and FSM Arrangement purse seiners is likely to be comparable to that for adjacent EEZs. Observer coverage of the foreign longline fleet is negligible.

Port sampling: N.A.

Export documentation: N.A.

Vessel characteristics: MNRD operates a licensing database that contains information on vessel characteristics.

In-port inspections: N.A.

### Data management and reporting

OFP has provided a national tuna fisheries database which incorporates logsheet catch and effort and licensing data. Licensing data are entered by MNRD staff, while logsheets are forwarded to the OFP for processing and incorporation into the regional and Tuvalu national databases. MNRD are equipped with the CES software for generating reports of catch and effort data.

### Priority measures/recommendations to strengthen capacity

1. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.
2. Observer coverage of distant-water longliners fishing in the Tuvalu EEZ is required.

## Vanuatu

### **Background**

The Vanuatu EEZ currently accounts for approximately 0.2% of the total tuna catch from the WCPO. The fishery is comprised of domestic and foreign longline vessels, principally Taiwan and Fiji flagged vessels. The longline catch is dominated by albacore, while yellowfin and bigeye contribute significantly to the value of the catch. There is limited fishing by the US purse seine fleet in Vanuatu. In recent years, there has been no domestic tuna fishery and the longline fleet operates from foreign ports, principally in Fiji and Pago Pago.

### **Institutional structures**

Management of the tuna fishery is the responsibility of the Fisheries Department under a Ministry of Agriculture, Quarantine, Forestry, and Fisheries. The Compliance Section of the department is responsible for vessel licensing, vessel monitoring, and data collection from the fishery. A Tuna Management Plan has been formulated for Vanuatu and has been in place since 2000.

### **Fishery monitoring**

Logsheets: All foreign and domestic licensed vessels are required to provide catch and effort information at the operational level on approved logsheets. However, limited logsheet and landings data are provided to the Vanuatu Fisheries Department. Vessels are also required to provide entry and exit reports when operating in the Vanuatu EEZ, although the level of reporting is unknown. Many of the Fiji-based vessels provide logsheets in respect of fishing activity in the Vanuatu EEZ to the Fiji Department of Fisheries.

Landings: There is no significant landing of tuna in Vanuatu.

Vessel activity log: Not yet implemented.

VMS: Vanuatu longliners participate in the regional VMS programme administered by FFA and are introducing a national VMS for all Vanuatu-flagged fishing vessels. These systems will provide a potential means of estimating vessel activity and logsheet coverage.

Observers: There is currently no observer coverage of Vanuatu longliners.

Port sampling: Port sampling of landed catch is occurring via the sampling programme implemented by the Fiji Department of Fisheries.

Export documentation: There is no significant export of tuna from Vanuatu.

Vessel characteristics: The Fisheries Department operates a licensing database that contains information on vessel characteristics.

In-port inspections: N.A.

### **Data management and reporting**

All logsheet data received by the Fisheries Department are sent to OFP for processing and incorporation into the regional and Vanuatu national databases. The Fisheries Department are equipped with the CES software for generating reports of catch and effort data. Summary data from the longline fishery are provided annually to SCTB.

### **Priority measures/recommendations to strengthen capacity**

1. Increased linkages between Fiji and Vanuatu fisheries agencies to improve collection of data from the Vanuatu EEZ, including logsheet, unloading, observer, and port sampling data.
2. Implement an observer programme to provide coverage of the longline fishery.
3. Introduce annual returns for vessel activity and vessel characteristics for Vanuatu-flag vessels.
4. Develop the capacity for staff to analyse catch and effort data to enable routine monitoring of the fishery.

**Interim Advice to the Preparatory Conference for the  
Western and Central Pacific Fisheries Commission  
(WCPFC)**

**Review of Data Standards for the Western  
and Central Pacific Region**

Prepared for

**The Preparatory Conference  
For the Western and Central Pacific  
Fisheries Commission (WCPFC)**

By

**MRAG Americas, Inc.  
110 South Hoover Boulevard  
Suite 212  
Tampa, Florida 33609  
[www.mragamericas.com](http://www.mragamericas.com)**

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## List of Acronyms

BAS	Bureau of Agricultural Statistics (Philippines)
BFAR	Bureau of Fisheries and Aquatic Resources (Philippines)
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CECAF	Commission for the Eastern Central Atlantic Fisheries
CES	Catch and Effort Statistics
CPUE	Catch Per Unit Effort
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
CWP	Co-ordinating Working Party on Fishery Statistics
DCC	Data Collection Committee
DGCF-Stat	Directorate General Capture Fisheries sub-Directorate of Data and Statistics (Indonesia)
EEZ	Exclusive Economic Zone
EU	European Union
Eurostat	Statistical Office of the European Community (European Commission)
FAO	United Nations Food and Agriculture Organisation
FFA	Forum Fisheries Agency
FIDI	Fishery Information Data and Statistics Unit
FIGIS	Fisheries Global Information System
FTP	File Transfer Protocol
GAM	Generalised Additive Model
GFCM	General Fisheries Commission for the Mediterranean
GLM	Generalised Linear Model
HMS	Highly Migratory Species
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
IOTC	Indian Ocean Tuna Commission
IPTP	Indo-Pacific Tuna Programme
ISC	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
ISCAAP	International Standard Statistical Classification of Aquatic Animals and Plants
IWC	International Whaling Commission
LIPI	Indonesian Institute of Sciences
M & E	Monitoring and Evaluation
MCS	Monitoring Control and Surveillance
MHLC	Multilateral High Level Conference
NADS	Non-target, Associated and Dependent Species
NAFO	Northwest Atlantic Fisheries Organisation
NASCO	North Atlantic Salmon Conservation Organisation
OECD	Organisation for Economic Cooperation and Development
OFCF	Overseas Fisheries Cooperation Fund (Japan)
OFF	Oceanic Fisheries Programme
PICT	Pacific Island Countries and Territories
PrepCon	Preparatory Conference
RFMO	Regional Fisheries Management Organisation
RIMF	Research Institute of Marine (Indonesia)

SCG	Scientific Coordinating Group
SCTB	Standing Committee on Tuna and Billfish
SPC	Secretariat of the Pacific Community
STATWG	Statistics Working Group of the ISC
TAC	Total Allowable Catch
UNFSA	United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
VMS	Vessel Monitoring System
VPA	Virtual Population Analysis
WCPO	Western Central Pacific Ocean
WCPFC	Western Central Pacific Fishery Commission
WG	Working Group

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# 1 Introduction

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The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPO) was concluded in July 2000. The Convention was opened for signature at Honolulu on 5 September 2000. The Conference that negotiated the Convention passed a resolution establishing a Preparatory Conference (PrepCon), which met for the first time in April 2001 in Christchurch, NZ. The Conference recognized that PrepCon would function during an interim phase prior to ratification of the Convention. After ratification, a transition phase of up to two years would lead to the establishment of a fully functioning Commission.

During the meeting, the PrepCon established two open-ended working groups:

- Working Group I (WGI) on issues relating to the organisational structure of the Commission, its budget and financial contributions.
- Working Group II (WGII) on the scientific structure of the Commission and the provision of interim scientific advice.

During the second session of the Preparatory Conference (PrepCon2), WGII reviewed and gave preliminary consideration to the Commission's needs with respect to:

1. Data requirements, including current gaps in data coverage and standards for data collection and management;
2. Science, and in particular stock assessment and advice on stock status in the short term and ongoing;
3. Research priorities and research planning and co-ordination;
4. Review of assessments, analyses and other scientific work.

WGII established an ad-hoc task group to consider the future information needs to support discussions and progress on matters related to the scientific activities of the Commission. Drawing upon the material from the ad-hoc task group the working group agreed that the following matters, amongst others, should be addressed, as far as possible, prior to the next meeting of the working group:

1. An investigation of the technical capabilities, and security and data-sharing policies of existing organisations, including those of participants in the Preparatory Conference, with the view of possibly contracting out interim data services.
2. A compilation and review of standards for collection, verification and for the timely exchange and reporting of data on fisheries currently practised by existing arrangements (e.g. the Standing Committee on Tuna and Billfish (SCTB), the Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), the Inter American Tropical Tuna Commission (IATTC), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the International Commission for the Conservation of Atlantic Tuna (ICCAT)) and an assessment of their suitability for use by the Commission.

During the third session of the Preparatory Conference (PrepCon3), held in Manila, a paper (WCPFC/PrepCon/WP.10) addressing these matters was presented at a meeting of WGII. It was agreed that a number of revisions and updates, to the paper, would be undertaken prior to the next meeting of the Scientific Coordinating Group (SCG). Furthermore, it was decided that issues treated in WCPFC/PrepCon/WP.10 would best be addressed in two distinct papers; the first devoted to data standards and the second addressing issues of technical capacity.

The matter of data standards is addressed in this paper. In addition to matters discussed in the original draft, the revised document considers explicitly the obligations associated with data related standards and implications for developing states and territories, including consideration of the kinds of technical assistance (under Article 30 (4) of the Convention text) that would facilitate implementation of data standards.

## **1.1 The requirement for fishery data**

The quality of fishery data required for fishery management cannot be determined in isolation. The purpose for which data are needed dictates the required resolution. For example, to close a fishery that reaches an overall total allowable catch TAC requires data of lower resolution than that for a fishery where quota is allocated to individual vessels. Similarly, the time scale on which data are needed also varies depending on their intended use. For example, catch and effort data collected for use in an annual stock assessment analysis may be reported with several months delay between the catch event and the time of recording in the database. However, catch data that are used to monitor progress during the season towards a catch limit must be reported with minimal delay to ensure that the fishery is closed when the limit is reached.

Fishery collection programs often develop during the initial phases of a fishery, and continue even as the fishery and exploitation patterns change. Periodic review of the fishery, its management objectives, and the data collection program assures that the data collection program remains compatible with current data needs.

The data requirements for the types of scientific analyses needed to manage WCPO tuna fisheries in accordance with the Convention text are essentially those specified by other tuna commissions. The most basic data are catch (by weight and numbers), effort, and length frequency data. If the fish can be aged, which in the case of tuna is very rare, then age sub-samples, along with other biological data are needed to develop estimates of the various biological relationships (growth, mortality, length-weight, etc.). All these data should be collected on an ongoing routine basis. Ideally, they would be supplemented by other targeted data collection (surveys, tagging, etc.). Regarding fishing effort, it is important to collect vessel specific information, for example through a vessel register and observer programme.

One of the keys to reliable tuna assessments is the collection of representative data across the full range of the species being caught. First and foremost this provides good estimates of total removals. But, given the distribution of highly migratory species (HMS) is affected strongly by the environment, it is vital to cover the full geographical area, especially when developing abundance indices. Unlike most other ocean areas with tuna fisheries, the WCPO contains many small islands, which affect oceanic processes and make interpretation and extrapolation of data much more difficult. Finally, many longline vessels work preferentially on the high seas, rather than within an exclusive economic zone (EEZ), and data from them is vital. Longline effort data are usually considered easier to interpret than purse seine effort data.

Regarding the scale of data required for stock assessment, the characteristics of HMS and their fisheries make it very important to collect data at the finest scale possible. This points essentially to haul-by-haul data.

For most tuna species, especially tropical tunas, ageing is extremely difficult, and currently not possible for some species. In those species, good quality, comprehensive length frequency data (at as fine a geographical scale as possible) and growth curves are needed, with large enough sampling fractions and full area coverage. This is true whether one is using simple production models, age-structured production models, virtual population analysis (VPA) like assessments or integrated assessment methods.

The other vital element is catch per unit effort (CPUE) data. In many cases, these are the only data that might produce an index of abundance. It is routine now to analyse these data with complex statistical analytical tools such as generalised linear models (GLMs) and generalised additive models (GAMs). These models try to account for targeting changes over time, vessel changes, and spatial distribution. Commonly in these analyses every factor is significant, as usually is every interaction term. For these reasons, these analyses are most effective when undertaken on detailed haul-by-haul data (e.g. from logbooks) with exact positions, supplemented by observer data. However, this ideal is rarely met. Most tuna commissions do not have mandatory submission of data at such a fine scale. More commonly, catch and effort data are provided on a scale of 1-degree squares by month, while length data may be required on a scale of 5-degree squares by month or quarter. It is sometimes possible to get access to more detailed haul-by-haul data, but the problem is that collection of data at this scale impinges on issues of commercial confidentiality, and unless fishers and flag states are convinced that confidentiality will be preserved, there may be a reluctance to submit the necessary information.

## 1.2 Data standards in the context of the Commission

The Convention calls for the Commission to:

- adopt standards for collection, verification and for the timely exchange and reporting of data on fisheries for highly migratory fish stocks in the Convention Area in accordance with Annex I of the Agreement, which shall form an integral part of this Convention (Article 10(1d)); and
- compile and disseminate accurate and complete statistical data to ensure that the best scientific information is available, while maintaining confidentiality, where appropriate (Article 10(1e)).

With regard to data collection, Annex I of the United Nations Fish Stocks Agreement (UNFSA) explicitly requires fishery data collection at an operational level. Conversely, obligations relating to specifications for data reporting are not clearly defined. Nevertheless, given reference to the need for data collection and compilation enabling – *statistically meaningful analysis for the purposes of fishery resource conservation and management* – this too points to the need for catch and effort reporting at the finest stratum possible, at the operational level.

*States should ensure from vessels flying their flag that data are collected on fishing activities according to the operational characteristics of each fishing method (e.g., each individual tow for trawl, each set for long-line and purse-seine, each school fished for pole-and-line and each day fished for troll) and in sufficient detail to facilitate effective stock assessment (Article (2a))*

*States should agree, within the framework of subregional or regional fisheries management organisations or arrangements, or otherwise, on the specification of data and the format in which they are to be provided, in accordance with this Annex and taking into account the nature of the stocks and the fisheries for those stocks in the region (Article (2d))*

The management of HMS requires regional co-ordination through the development of common standards<sup>1</sup> influencing collection, verification and reporting of data. Criteria need to be established which, when applied, permit data collected at a national level to be used as the source of regional data. The primary objective of standardisation, in this context, is therefore to facilitate the integration of data collected under different data collection systems through the application of common standards and classification codes. The application of common standards and codes has a particular influence on the extent to which data can be integrated

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<sup>1</sup> 'A Standard is a documented agreement containing technical specifications or other precise criteria to be used consistently as rules, guidelines or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose.' - Source: International Organization for Standards (ISO)

within a central data repository. Significant benefits can be obtained in both the quality and value of data where standards are applied.

The use of data exchange standards, in addition to offering a framework of guidelines defining the format of submissions, provides ready means of integrating data from disparate sources, and in so doing enables Regional Fisheries Management Organisations (RFMO) to offer information and services in improved ways.

Timely exchange (reporting) of data will rely to a large extent on the structure of national data collection systems. Significant benefits in timeliness of data reporting can result through ensuring that standard (compatible) exchange formats are generated; recent information technology (IT) advances have been made in the development of methods of data exchange that are independent of proprietary software or hardware.

In the development of standards applicable within the region, the Commission will need to consider the particular situations of developing countries as these countries may not be able readily to implement standards designed in the context of more developed fisheries. Specific regional examples include the Philippines and Indonesia where the capacity to monitor domestic fleets is limited.<sup>2</sup> On the other hand the national capabilities of the Island Nations in the Convention Area are substantially augmented through their membership of the Forum Fisheries Agency (FFA) and the Secretariat of the Pacific Community (SPC)<sup>3</sup>.

Finally, it is essential that any framework of standards and classifications is not only capable of meeting immediate requirements but that it is flexible enough to meet those needs and priorities which might evolve over time.

### **1.3 Recommendations of the 1996 MHLC Technical Consultation**

The Multilateral High Level Conference (MHLC) Technical Consultation of 1996 agreed several outline standards for collection, verification, and exchange and reporting of data. During the Technical Consultation, a drafting group, consisting of Representatives of Japan, Korea, New Zealand, Papua New Guinea and the United States, assisted by SPC and FFA staff drafted recommendations for co-operation in data collection and exchange and research co-operation under some future regional fisheries management organisation or arrangement. The resulting recommendations were as follows:

*In recognition of the need to progress the development of scientific support for future conservation and management of highly migratory species in the WCPO, the Consultation affirmed its support for:*

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<sup>2</sup> As noted in Williams (2002), Indonesia and the Philippines represent two of the largest domestic tuna fisheries in the world. The estimated tuna catch from the Indonesian and Philippine fisheries contribute 17% and 13% of the WCPO total catch, respectively, and 13% and 9% of the Pacific Ocean total catch, respectively. Appropriate data from these fisheries are therefore fundamental to regional tuna stock assessments.

<sup>3</sup> Commencing in 1988, tuna fishery databases have been developed and installed on computers in fisheries departments of fourteen SPC member countries. The systems are customised according to the needs of the member country, but typically allow the production of data summaries and maps of fishing activity within their EEZ. Some systems also include a logsheet data entry component and components for landings data, observer data and length-frequency data. In cases where data entry is carried out at SPC, regular data updates are sent via email or on CD-ROM with the CES data retrieval system. Countries that have received support for their fisheries databases include Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, New Caledonia, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga and Tuvalu. In the past, the OFP has also provided support to Guam and the Northern Marianas; however, support for these systems has since been provided by the National Marine Fisheries Service (<http://www.spc.org.nc/OceanFish/Html/Statistics/StatSysSCTB.htm>).

- *collection by flag states of catch (target and non-target species), effort and other data at a vessel operation level, i.e. logbook data;*
- *provision of such data for both waters under national jurisdiction and the high seas at a degree of detail and at a level of resolution to be agreed upon to enable effective stock assessment; and*
- *cooperation in scientific programmes to generate other data required for effective stock assessment.*

*Regarding the future data needs of WCPO fisheries, the Consultation recommended that any future co-operative scientific data collection in the WCPO be consistent with the guidelines and requirements of the UN Implementing Agreement, especially as set out in Annex I of that agreement, and be established pursuant to a regional fisheries management organisation or arrangement, taking into account the nature of the stocks and the fisheries involved. Regarding the specification of agreed minimum requirements of any future scientific data collection programme, the Consultation also recommended that the following elements be included in any such future programme:*

- 1. Flag states should compile annual catch statistics by species, covering all fishing activities for each fleet.*
- 2. Flag states fishing for tuna in the WCPO should collect catch, effort and other data at the fishing operation level (i.e. logbook data in a format to be agreed upon) for all commercial tuna fishing activity, regardless of whether such activity takes place in waters under flag state jurisdiction, other national jurisdiction or on the high seas. The logbook data should be validated with landings or other information.*
- 3. Annual catch statistics should be made available as soon as possible to all parties involved in the arrangement. Agreement should be reached on how to consolidate logbook and other data for all fleets in a confidential database. Access to such data should be under conditions determined by international agreement.*
- 4. A data repository system for length-frequency and associated data should be established so that such data can be used under agreed conditions for stock assessment and other tuna research projects. A co-ordinated sampling plan for all major species should be developed and implemented through the co-operation of the parties involved in the arrangement.*
- 5. A scientific observer programme, based on a regionally co-ordinated sampling design, should be developed and implemented through an agreement among the parties involved in the arrangement. Observers should collect data on fishing operations, including bycatch and discards; they should also conduct biological sampling of both the target and non-target catch, and collect other operational data as appropriate.*
- 6. All parties involved in the arrangement should co-operate in developing and implementing scientific research programmes of relevance to stock assessment of target and non-target species caught by tuna fisheries in the WCPO.*

## **1.4 Organization of the report**

The paper opens in Section 2 with a discussion of international standardisation initiatives deemed appropriate for PrepCon consideration. Section 3 presents a brief review of data types required by international regional fisheries organisations, such as the WCPFC, to meet their obligations of fishery management advice based on the best scientific evidence available. Points (1) and (2) of the Technical Consultation list (Section 1.3) refer specifically to data types that are required for stock assessment analyses and should be collected by flag states. Point (4) also refers to another important data type - length frequency data - although in the context of data storage rather than data collection. Nevertheless this is another data type that is important for stock assessment. Options available for collecting these data (e.g. observer programs

mentioned in Point (5), the sampling plan mentioned in point (4) and the scientific research programs mentioned in Point (6) of the Technical Consultation list are discussed in Section 4. This section also discusses regional capabilities for collecting and handling various types of data. The importance of data quality and issues relating to the promotion of data quality and of validation of data resulting from several types of data collection (e.g. logbooks, observer programs) is stressed in Section 5. Expectations regarding timely data reporting to the organisation and standards for data exchange (point (3) of the Technical Consultation list) are discussed in Section 6.

Section 7 presents a discussion of the potential implications of defined Commission data standards for member States, specifically developing States and Territories. Consideration is placed on the types of assistance that might be appropriate under Article 30(4) of the Convention text to ensure that Commission standards are implemented.

The paper concludes with recommendations for the development and implementation of standards for collection, verification, reporting and timely exchange of fishery data. Recommendations are presented in the context of the Commission development process. Given the extent of uncertainty surrounding this process, rather than define explicit actions against a fixed timeframe, we felt that a more useful approach would be to present a sequence of recommendations against the backdrop of the Commission development process. We have treated Commission development as a phased process comprising: (1) an interim period leading up to entry into force of the Convention; (2) a transitional period immediately following entry into force of the Convention and establishment of a Secretariat; and (3) a fully developed phase.

The data repository system, mentioned in Point (4) of the Technical Consultation list, relates specifically to technical capabilities required by organisations to process and store data. These issues are discussed in detail in a separate paper (WCPFC/PrepCon/WP.16), where some of the specific hardware and software needs of organisations undertaking this type of data storage and processing are presented.

## **2 Initiatives towards standardisation**

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### **2.1 Co-ordinating Working Party on Fishery Statistics**

The United Nations Food and Agriculture Organisation (FAO) promotes various instruments, which present overarching guidelines for collection and exchange of fisheries data, including: the UNFSA (discussed earlier), the FAO Compliance Agreement, and the FAO Code of Conduct for Responsible Fisheries. Given clear reference to the UNFSA in the recommendations of the MHLC consultation of 1996 and subsequent Convention text, it is important for the Commission to be aware of FAO standards developed in support of statistical systems guided by these instruments. This includes internationally recognised definitions, classifications and codes, which the FAO recommends be used where possible and appropriate.

The FAO co-operates with regional fisheries bodies, particularly through the Co-ordinating Working Party on Fishery Statistics (CWP), to standardise reporting forms, procedures, definitions, classifications, and other related documentation.

The CWP has as its purpose to:

- keep under continuous review the requirements for fishery statistics for research, policy-making and management,
- agree standard concepts, definitions, classifications and methodologies for the collection and collation of fishery statistics, and
- make proposals for the co-ordination and streamlining of statistical activities amongst relevant intergovernmental organisations.

Current Membership of the CWP includes CCAMLR, CCSBT, FAO, IATTC, ICCAT, the International Council for the Exploration of the Sea (ICES), the Indian Ocean Tuna Commission (IOTC), the North Atlantic Salmon Conservation Organisation (NASCO), the Northwest Atlantic Fisheries Organisation (NAFO), the Organisation for Economic Cooperation and Development (OECD), the European Unions (EU) Eurostat, SPC, and the International Whaling Commission (IWC). The SPC Oceanic Fisheries Programme (OFP) Fisheries Statistician is currently chairman of the CWP.

The CWP is an advisory body and as such application of CWP defined standards is not a legal obligation. Nevertheless, it is reasonable to assume that if recommendations are made by the CWP, then working party participants will, where appropriate, endeavour to implement them.

#### **2.1.1 Review of statistical requirements**

To ensure that appropriate standards are maintained, whilst reflecting the changing needs and priorities of scientists, statisticians and fisheries managers, requires ongoing review and adaptation. Recent initiatives of the CWP, relevant to the Commission, include the recognition that a more integrated approach to fisheries management is needed. A consequence of this process is recognition that data outside the realm of traditional fishery statistics, including data relating to biological, environmental, ecosystem, social and economic aspects of fisheries is required. Concepts and definitions for the parameters necessary to address these additional aspects are under constant review, particularly with respect to mechanisms for their assimilation into existing data collection programmes. For example, although CWP was not mandated to define social and economic indicators, the CWP recognises that it has a role to play in addressing the data requirements necessary to quantify them (Inter-Sessional Meeting of the CWP, 2002).

#### **2.1.2 Standard classification codes and definitions**

The use of internationally agreed codes is an important element facilitating the collation of fishery statistics from disparate sources, at national, regional and at international levels. International classification codes agreed by the CWP include:

- International Standard Statistical Classification on Aquatic Animals and Plants (ISSCAAP)
- International Standard Statistical Classification of Fishing Vessels (ISSCFV)
- International Standard Statistical Classification of Fishing Gears (ISSCFG)

Standard classification codes drawn-up by the CWP have been widely accepted. Periodic reviews are undertaken in an effort to reflect changes in fisheries and the needs of scientists, statisticians and managers. Issues recently addressed by the CWP have included proposed revisions to ISSCAAP and ISSCFV (FAO, 2001).

Also with regard to standard classifications, a recommendation has recently been put forward by the SPC and IATTC proposing that once the Commission becomes operational, statistical areas be modified to reflect areas used for statistical purposes by the Commission, IATTC, and other RFMOs in the region.

In addition, the CWP has recommended improvements to standard definitions. A recommendation was made by the CWP for an amendment to the definition relating to attribution of catch nationality; specifically with regard to flag state reporting obligations (FAO, 1999c). The recommendation was made in recognition of the complex situation surrounding distant water fishing nation (DWFN) vessel reporting, particularly when fishing in territorial waters under access or joint venture arrangements. The updated definition has been implemented by the SPC-OFP when determining catch and effort reporting obligations (Lawson et al., 2002); this matter is discussed in more detail in Section 6.1.

### **2.1.3 Reporting methods**

Recognising the importance of harmonised data reporting, the CWP has also addressed the issue of standard formats for data reporting. Traditionally, focus has orientated towards the standardisation of paper reporting formats such as the STATLANT questionnaires, to which the CWP made a major contribution with regard to the specification of measures of fishing effort by gear type. The name itself betrays the origins of the CWP as a co-ordinating body for Atlantic statistics. STATLANT forms are dispatched (together with instructions for completion) by the FAO on behalf of RFMOs to the relevant national authorities.

- STATLANT A questionnaires are used for reporting annual nominal catch by species and by statistical sub-area, division or sub-division.
- STATLANT B questionnaires are used for reporting fishing effort by month, vessel size class, gear and statistical sub-area, division or subdivision and together with associated catch by species.

STATLANT A and B questionnaires have been used by CCAMLR to collate statistics for major fishing areas 48, 58 and 88 (Southern Oceans), by NAFO for area 21 (Northwest Atlantic), by ICES for area 27 (Northeast Atlantic), by CECAF for area 34 (Eastern Central Atlantic), and by GFCM for area 37 (Mediterranean and Black Sea).

With the specification of finer and finer detail in catch reports (many organisations now require that haul by haul data are reported from defined fisheries), STATLANT data are probably of less use to individual RFMOs than they were previously. If they are the only form of reporting on some fisheries, they are obviously essential, but in the case where there are better data available to the organisation, STATLANT data still have a use in being public domain summaries of data on catch and effort.

FAO only collates the STATLANT A questionnaires into its publication of global fisheries statistics, and the organisations listed above have generally found the STATLANT B information to be more useful for their purposes. Thus, if the Commission wishes data similar in scope to the STATLANT B data to be available publicly it will have to publish them itself. This should, however, be relatively inexpensive especially if web-based publication is envisaged.

More recent attention of the CWP has focused on the need for standards to be defined for reporting using electronic media. An example is the recognition of the CWP of the widespread implementation of vessel monitoring system (VMS) technology and the need for international reporting standards. The CWP agreed that there is an urgent need for an international standard format which accommodates the reporting of position, fishing activity, catch and other data through VMS. The CWP recommended that an international standard be developed and promoted, and that FAO consider facilitating this process as a matter of urgency (FAO, 1999c).

## **2.2 Fisheries Global Information System**

The Fishery Global Information System (FIGIS) is a global information system on fisheries developed by FAO aimed at providing policy makers with timely, reliable strategic information on fishery status and trends on a global scale. Designed as a policy-based information system, it provides a single entry point to strategic data, information, analyses and reviews of fisheries issues and trends. A key principle of FIGIS is that of ensuring that information is quality-controlled and maintained up-to-date. FIGIS' maintenance will rely upon a network of partners (initially RFMOs and National Centres of Excellence) contributing to the system according to their own mandate. As a corollary, the system's control is decentralised: contribution and maintenance rights are assigned to FIGIS partners who are the data owners, these partners having to share certain standards and adhere to certain rules aimed at ensuring the best possible quality of data and information. Being a distributed information system, FIGIS will allow states to fulfil their reporting obligations according to international requirements. In that respect, FAO has already agreed with SPC, ICCAT, ICES, and NAFO on the development of case studies.

For effective fisheries information management, FIGIS needs to promote and agree on standards: thesauri with agreed vocabularies and classifications for indexing, glossaries to ensure definitions of terms, and shared concepts. Norms for data sets content management are under development, including documentation of information quality assurance processes. FIGIS refers to the Dublin core XML Metadata standard ([dublincore.org](http://dublincore.org)) to set up its own proposal for Fisheries XML information standards.

## **2.3 International Standards Organisation**

The International Organisation for Standards (ISO – [www.iso.org](http://www.iso.org)) produces internationally agreed standards for quality management systems (ISO9000) and for environmental management systems (ISO14000). Under the ISO format, standards developed must:

- Consider and organise the purpose of the standards,
- Define the problem areas that the standards must solve,
- Determine the “best practices” available, and
- Select the actual measures to assure that the standards are met.

The main attributes of best practice are based on the standards established by ISO 14000. In environmental management these standards require consensus planning and comprehensive stakeholder involvement, based on full information and equal empowerment. The ISO 14000 standards for environmental management are scale-independent: they apply to environmental management of regions, sectors, specific projects and individual operational activities.

The rigorous and time-consuming process to achieve full ISO certification for data collection management standards will not likely serve the purpose of the Commission. However, a less

rigorous procedure that follows the ISO format will provide an opportunity for the PrepCon to fully evaluate the details of sampling requirements in the context of data quality needs, e.g. see Figure 2.1.

### 3 Data types

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As discussed in the previous section, a number of recommendations were presented in the 1996 MHLC Technical Consultation, specifically relating to data collection, reporting and associated standards; including a discussion of the overarching data types needed. These and the bodies charged with their collection are summarised below:

<b>Data type</b>	<b>Responsibility for collection</b>
Annual catch statistics	Flag state
Catch and effort data	Flag state
Logbook validation data	Flag state
Length data and associated biological information	All parties to the Commission through a co-ordinated sampling plan
Operational data, data on bycatch and discards, biological sampling of target and non-target species	All parties to the Commission through a regionally co-ordinated observer or port sampling programme
Research programmes of relevance to stock assessment which could broadly be interpreted as collection of biological, environmental and ecological data	All parties to the Commission through co-operative research

In discussing the data usually required to undertake stock assessment and other related scientific analyses that underpin management advice, we consider four principal categories of data:

- Commercial fishery data including catch and effort statistics, landings and transshipment records (both aggregated and fine-scale) collected on the basis of flag state submissions;
- Biological and ecological data, including by-catch information, length frequency data, sex, maturity, age data, environmental data etc.;
- Environmental data, including meteorological and oceanographic information;
- Economic data, including market information, trade data, commodity, consumption, fisher information etc.

In addition to the above data categories, we also recognise the category of technical data. This comprises the type of data collected on vessel characteristics and operational history that would be collected as part of a vessel registration process for use in standardising fishing effort data (see Section 3.1) and for other Commission purposes.

#### 3.1 Commercial fishery data

Commercial fishery data represent the most fundamental data type required to monitor a fishery. It can also contribute, once a sufficient time series has been collected, to the assessment of stock status and potential. Annual catch estimates and annual catch rates offer a baseline for monitoring long-term trends in a fishery, whilst for stock assessment and other population modelling, finer scale data are usually needed. Catch and discard data are required for both target and non-target species, although direct commercial sources are usually limited with respect to the latter.

Regarding standardised terminology for catch statistics, the following terms are suggested from the US National Marine Fisheries Service (NMFS) National Bycatch Strategy (1998)<sup>4</sup>.

- Target Catch      Catch of a species, a particular size or sex, or an assemblage of species that is primarily sought in a fishery, such as shrimp in a

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<sup>4</sup> US NMFS National Bycatch Strategy <http://www.nmfs.noaa.gov/bycatch.htm>

shrimp fishery or mature female fish in a roe fishery. The definition of targeted catch within a fishery is not static, for example in a multispecies fishery, the mix of species targeted and caught may be quite variable and may change over time.

- Incidental Catch Catch that is not part of the targeted catch. This includes retained nontargeted catch and discarded catch. Examples are finfish catch in shrimp fishery that may be sold or kept for personal use, juvenile pollock catch that now must be retained in the Alaska pollock fishery, and seabird catch in the Pacific longline tuna/swordfish fishery that must be discarded.
- Discarded Catch Living marine resources discarded whole at sea or elsewhere, including those released alive.
- Bycatch Discarded catch of any living marine resource plus retained incidental catch and unobserved mortality due to a direct encounter with fishing gear.

Landings and transshipment records comprise an important source of information with which reported catch data can be verified and validated; both in terms of absolute volume of catch and reported species composition. Additional sources of data used to verify reported catches, include observer programmes and port sampling programmes. Observer programmes are a particularly important source of data with which catches can be adjusted to reflect actual catch (all species landed on deck) rather than the proportion of catch that is retained.

Basic effort data, such as number of vessels and days fished must be supported with detailed information regarding vessel and gear attributes to allow standardisation of effort indices; this may be critical for estimating indices of abundance and for use in stock assessment models (e.g. surplus production models and MULTIFAN-CL models). Commercial sources of effort data, including details of vessel and gear attributes include operational logsheet reporting, vessel registers and vessel activity reports.

The following list identifies some of the key commercial fishery data types in the context of scientific research and the monitoring of catch and effort:

<b>Commercial fishery data collection</b>	
<b>Data type</b>	<b>Description/Source</b>
Annual catch estimates	Estimates of annual catch by gear and species Catch is defined as all species landed on deck; discard as all species caught and subsequently discarded Based on verifiable logsheet, unloading, or other commercial catch data sources (trade statistics etc.)
Catch data	Landings /unloading data Data on volumes by species, origin of catch (e.g. statistical area) Mechanism for confirmation of reported landed-catch volume and composition. Catch data are whole (green) weight only. If fish are processed on board, independent collection of data on conversion factors is highly recommended

Commercial fishery data collection	
Data type	Description/Source
	Port sampling Landed catch composition – volume by species
	Transshipment data Data on volumes by species, origin of catch (e.g. statistical area)
	Scientific observer data Detailed records maintained of catch composition (catch and by-catch species) Recorded on a haul-by-haul basis / by statistical area / as trip summary information
	Trade statistics Including catch documentation and trade documentation schemes Mechanism to verify legality and identify unreported catches (respectively).
Effort data	Vessel registers and activity reports Catalogue of operator, vessel and gear attributes (standardising effort) Trends in vessel activity
	Observer data Operational data recorded on a haul-by-haul basis Gear and vessel attributes, including any modifications to gear and setting practices Recording of other vessels sighted
	Surveillance reports Patrol reports used to verify licensed vessel activity and a means of identifying and recording Illegal, Unregulated and Unreported (IUU) fishing activity
	VMS data Mechanism for verifying licensed vessel activity and can act as a monitoring and evaluation (M & E) mechanism ensuring complete catch and effort enumeration (means of identifying missing data sets and intelligence prompting requests for data)
Catch and effort data	Flag state reporting based on vessel records – catch and effort logsheets <ul style="list-style-type: none"> <li>• Haul by haul</li> <li>• Fine-scale (by vessel per fishing operation)</li> <li>• Aggregated catch and effort data by time, area and gear strata (e.g. monthly 5° x 5° for longline and 1° x 1° for surface gears)</li> </ul> In some cases individual vessel catch and effort records transcribed at port in a prescribed format (IATTC).
	Observer data Usually detailed records of catch and bycatch recorded at an operational level (haul-by-haul).

### 3.2 Biological and ecological data

Biological and ecological data types supplement commercial fishery data and are collected either through targeted research initiatives or through monitoring programmes such as port sampling and observer programmes. Regular monitoring programmes, particularly observer programmes, provide a valuable source of supplementary data, which are not usually available from commercial catch and effort data. These include: catch composition, discards of target species, incidental catch and discard of non-target species, details of fishery interactions with species of special interest (e.g. marine mammals, seabirds and turtles) and changes in operational factors or gear. Of particular importance for observer programs in tuna fisheries is the recording of bycatch, especially in view of the increased emphasis on ecosystem approaches in modern fisheries management policy.

Data collected in support of age and growth studies include length data, otolith samples and tag recapture data. Tag recapture data together with genetic data also constitute an important source of information on stock structure. Tuna ecology studies are reliant on detailed ecosystem information with which food web structures may be modelled; data sources include samples of stomach contents and muscle / tissue biopsy samples.

Biological and ecological data collection	
Data type	Description/Source
Bycatch, discard and other data	Observer data Number and/or weight of discarded catch (target and non-target catch) Incidental mortality data of species of scientific interest (e.g. marine mammals, seabirds, turtles)
Length data	Observer sampling Information relating to unsorted catch according to defined sampling protocols (protocols differ based on scientific objectives (e.g. development of age length keys etc.).
	Port sampling Collect length frequency information based on samples of landed catch.
	In some cases crew record length frequency information of target species
Movement and growth data	Tagging programmes Supported by observer and crew records of recapture and sampling for ageing material
	Fishery independent research – aerial surveys (ICCAT/IOTC)
Morphometric data	Observer sampling Morphometric information, conversion factor information etc.
	Port sampling Additional information to length data collected on occasions
	Fishery independent research
Ecological data	Observer sampling Stomach contents, genetic data, etc Anecdotal information may provide qualitative data to inform future research.
	Fishery independent research Details of species interactions including predator prey relationships etc. Direct effects on non-target species and habitat. Details of species interactions including predator prey relationships etc. Direct effects on non-target species and habitat.

### 3.3 Environmental data

Tuna distribution and abundance have been shown to be sensitive to environmental variability. In particular, the El Niño Southern Oscillation (ENSO) appears to have important consequences both for spatial distributions and migrations of the tuna populations and for their level of recruitment and biomass. Environmental data are therefore important for the determination of effective effort, in longline and surface fisheries, and in monitoring the extent and the influence of, oceanographic and meteorological processes on tuna fishery stock dynamics, migrations and production.

### 3.4 Economic and sociological data

Fisheries managers and policy makers increasingly recognise the importance of social and economic information in fisheries management. The collection and evaluation of social and economic data, when integrated with fishery and biological data, can provide an important source of advice relating to optimal levels of fishing, from a bio-economic point of view. This is particularly important for Small Island Developing States (SIDS), where the fishing industry is often regarded as the cornerstone of the economy contributing socially through employment and protein and directly to the economy through contribution to Gross Domestic Product (GDP) and generation of foreign exchange.

The Convention is very clear regarding the consideration of sociological and economic criteria in the application of management measures. This stems primarily from the need to take into account the special requirements of developing States in the Convention Area, particularly small

island developing States (Article 5(b)), both in terms of the allocation of allowable levels of catch and effort (Article 10(3)), and inclusion in the scientific process (Article 30(3)).

In terms of scientific activities in support of these objectives, however, the Convention mentions only the collection and evaluation of economic and other fisheries-related data and information relevant to the work of the Commission (Article 10(1j)). To give effect to these objectives, the Commission will need to consider what specific information will be needed to support the application of the type of criteria listed in Article 10(3).

An increasing trend in the demand for economic data has resulted in a number of organisations, most notably the CWP, stressing the need for collaboration between fishery statisticians, economists and managers towards determining the types of data necessary to quantify the social and economic contribution of fisheries.

### 3.5 Technical data

The concept of a vessel register is now widely accepted as a valuable means of collecting vital information on vessels technical details and capacities (important for analysis of catch per unit effort data) and also for tracking vessel ownership and standing in terms of compliance with national and international management regulations. Fishing operators seeking to access resources managed under a regional fisheries arrangement should be required to register with the regional organisation and provide the required information on their vessel, company, master and catches. In Part V, Article 24 of the Convention text, vessel register information and procedures are discussed. Information requirements set out in Annex IV of the Convention are as follows:

1. *Name of fishing vessel, registration number, previous names (if known), and port of registry;*
2. *Name and address of owner or owners;*
3. *Name and nationality of master;*
4. *Previous flag (if any);*
5. *International Radio Call Sign;*
6. *Vessel communication types and numbers (INMARSAT A, B and C numbers and satellite telephone number);*
7. *Colour photograph of vessel;*
8. *Where and when built;*
9. *Type of vessel;*
10. *Normal crew complement;*
11. *Type of fishing method or methods;*
12. *Length;*
13. *Moulded depth; Beam;*
14. *Gross register tonnage;*
15. *Power of main engine or engines;*
16. *The nature of the authorisation to fish granted by the flag State;*
17. *Carrying capacity, including freezer type, capacity and number and fish hold capacity.*

These data surpass FAO standards, but represent an agreed framework upon which more specific information requirements can be established. It is crucial that standard units of measurement are agreed to facilitate harmonisation of data from different sources. This is particularly important, for example, with metrics that may be important for assessing fishing effort, such as Gross Registered Tonnage, which should be standardised to the international convention, not based on national conventions, which vary. Standard codes for potentially ambiguous data types are also an important component of vessel registers. These are particularly applicable with regard to vessel type and where operational details are required describing gear, processing facilities etc.

In addition to the information included in the list above detailed information is commonly submitted regarding: fishing gear attributes, including details of power blocks, winches, net type and configuration, hook size etc.; vessel technology in addition to communications equipment such as navigational equipment, fish finding equipment, Electronic Position Relay Beacons (EPRB), transceivers (VMS) etc.; and fishing vessel support, which may take the form of support vessels, helicopters etc.

### **3.6 Summary**

Steps have already been taken, through the PrepCon process, to prioritise data types for scientific purposes. A meeting of the SCG in Hawaii in July 2002 made recommendations concerning priority data types, which were subsequently endorsed by WGII at PrepCon3 in Manila. These data include: annual estimates of catch; catch and effort data (the scale and resolution are yet to be established, although data at the finest scale possible are recommended); and size composition data (length frequency).

The specifics of longer-term Commission data requirements for scientific purposes have yet to be agreed. Nevertheless, priority fishery data in the context of the PrepCon have been established (see above) and these same priority data types are likely to be reflected in Commission data needs and associated standards, at least in the short term.

## 4 Data Collection

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In this section we review some of the mechanisms commonly used to collect fishery data. The accepted mechanism to ensure both harmonised and consistent data collection is through the use of standardised data collection forms and/or formats (e.g. logsheets). These are usually supported by detailed instructions or manuals, which define data collection procedures / sampling protocols and standard classification codes to ensure compatibility, consistency and quality of reported data.

### 4.1 General fishery data collection techniques

#### 4.1.1 Logbooks and data forms

The logbook or logsheet is the accepted data collection form used to record catch and effort data. Vessel logsheets and logbooks can also offer a means of collecting additional information in a standardised manner, including information concerning vessel and gear attributes, discards etc. Other commonly used data collection forms include: unloading forms, transshipment forms, port sampling forms, observer forms and data transcription forms.

Standard approaches to the design of data collection forms are discussed in the Guidelines for the Routine Collection of Capture Fishery Data (FAO 1999a). Effective data collection form layout relies upon the relative simplicity with which forms can be completed and the extent to which data processing methods are reflected in design and layout. Some additional considerations for the design and implementation of data collection forms include:

- the identification of essential and desirable data types through prioritisation of essential data against those data types which can be collected and *de facto*, the extent to which it is practical for additional information to be collected;
- evaluation of the scale and precision of required data;
- the use of standard terms / classification codes / standard measurements / units etc. which facilitate harmonised data collection and data recording (where appropriate these standards must be defined with international reporting requirements in mind);
- the parallel development of detailed instructions, including statistically valid sampling protocols where appropriate;
- linguistic requirements of both collection forms and instructions should reflect the needs of those tasked with data collection; and,
- the effective implementation of an appropriate and regular mechanism for review.

With regard to the medium used, data collection forms are designed both in hardcopy format and in electronic form, either as printable copies or as data entry forms which can be uploaded directly into a data management system (database or spreadsheet files). It is becoming increasingly common to record data electronically rather than on paper. For instance, almost all research surveys and observer data are now collected on computers at sea, although there may be an intermediate paper stage if the data are being collected in a wet environment such as on the deck or in the factory. It is still probably the case that most fishing masters will prefer to use paper to collect their data, but the time is fast approaching when we can envisage the use of VMS data to collect some fisheries data.

#### 4.1.2 Observer programmes

At the micro-level it is usually extremely useful to have observers on at least some vessels. Observers provide feedback on fishing practices, processing practices and the level and species composition of discards. Care must be taken to try to identify changes in fisher behaviour when an observer is on board. This is very difficult to do (for obvious reasons) but some experimental designs are available, especially from fisheries with good levels of observer coverage.

International observer programmes (e.g. the CCAMLR Observer Scheme) offer some advantages over national observer programmes. The quality of the observations from such programmes may be higher, standards are consistently applied across the entire fleet, and the added transparency increases the confidence that all parties have in the data.

Observer responsibilities have components of collecting scientific information and assuring compliance with regulations. The distribution of tasks among these components affects the observers' relationship with the fishing industry. Some national and international programmes, such as CCAMLR, use observers only to collect data. The Australian programme uses observers to collect scientific data and compliance data related to permits and marine pollution.

In point (e) of Article 28 the Convention text states that:

*the activities of observers shall include collecting catch data and other scientific data, monitoring the implementation of conservation and management measures adopted by the Commission and reporting of their findings in accordance with procedures to be developed by the Commission;*

Careful consideration will be required when decisions are taken regarding observer responsibilities to ensure that the quality of scientific data is not compromised when the inevitable balance is struck between scientific data collection responsibilities and compliance (MCS) data collection.

### **4.1.3 Port sampling programmes**

Port sampling programmes offer a means of identifying volume and species composition of landed catch. These data are critical given that the majority of logbook data is based on estimates made under difficult working conditions at sea. In addition size (length/weight) frequency data can also be collected. As with observer programmes the use of standard nomenclature, methodology, sampling protocols and recording forms maximises the value of data.

## **4.2 Data collection programmes**

We have identified a number of international programmes responsible for the collection, compilation and dissemination of fishery data both within and outside the WCPO region, listed in Table 4.1. A discussion follows outlining the data types handled and the mechanisms employed in collation and collection of fishery data. The summary information was compiled on the basis of available literature, supplemented by information collected through telephone interviews and a structured pro-forma. In addition to the information presented here, Lawson (2002) provides the most recent and complete inventory of tuna fishery data collection, compilation and dissemination for nations in the WCPO currently available.<sup>5</sup>

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<sup>5</sup> The Statistics Working Group (SWG) of the SCTB has the objective of coordinating the collection, compilation and dissemination of tuna fishery data for the WCPO. At its inaugural meeting in June 1998, the SWG agreed to (a) coordinate data collection by reviewing data collection forms currently in use in the region; (b) coordinate data compilation by reviewing the compilation of annual catch statistics, catch and effort data, and length data, on an annual basis; and (c) coordinate data dissemination by reviewing the instances of the dissemination of data on an annual basis. A paper was prepared by the Coordinator of the SWG (Lawson 2002) in order to report on progress with the coordination of the collection, compilation and dissemination of data. We have made no attempt to specifically summarize the content of that paper, although matters relating to WCPO region developing state data collection, verification and reporting capabilities are addressed in Section 7 of this report.

**Table 4.1 Details of WCPO and International organisations responsible for fishery data collection and compilation considered**

Organisation	Description
SCTB	The Standing Committee on Tuna and Billfish. The SCTB provides a forum for scientists and others with an interest in the tuna stocks of the western and central Pacific region to meet to discuss scientific issues related to data, research and stock assessment. It was established in 1988, as an advisory body to the Tuna and Billfish Assessment Programme (TBAP), the predecessor to the OFP. Its role was to be purely advisory and consultative, to assist in the conduct of pelagic fisheries research through the provision of expertise, information and technical advice. In 1997 the terms of reference and participation guidelines of the SCTB changed to promote a wider sense of ownership and enhanced scientific collaboration. The SCTB no longer advises SPC's Regional Technical Meeting on Fisheries.
ISC	Interim Scientific Committee. A scientific forum to exchange views on a full range of biological and other scientific issues relating to tunas and tuna-like species in the North Pacific Ocean, including status of stocks, data collection, research, and the consideration of future work programmes.
OFP (SPC)	Oceanic Fisheries Programme. A unit of the Secretariat of the Pacific Community, with a mission to provide member countries with the scientific information and advice necessary to rationally manage fisheries exploiting the region's resources of tuna, billfish and related species.
FFA	South Pacific Forum Fisheries Agency. Collects, analyses, evaluates and disseminates information to member countries. The Agency also provides legal, economic and technical advice, information and assistance in the formulation and implementation of the fisheries policies and access agreements.
IATTC	Inter-American Tropical Tuna Commission. An intergovernmental organisation with full scientific secretariat that studies the biology of the tunas and related species of the eastern Pacific Ocean to estimate the effects that fishing and natural factors have on their abundance, recommends appropriate conservation measures to maintain the stocks of fish at levels which will afford maximum sustainable catches, and collects information on compliance with Commission resolutions.
CCSBT	Convention for the Conservation of Southern Bluefin Tuna. An intergovernmental organisation established to ensure, through appropriate management, the conservation and optimum utilisation of southern bluefin tuna.
ICCAT	International Commission for the Conservation of Atlantic Tuna. An intergovernmental organisation established to recommend on the basis of scientific evidence, management measures and resolutions aimed carrying out its objective of maintaining the populations of tuna and tuna-like fishes at levels that will permit maximum sustainable catch.
IOTC	Indian Ocean Tuna Commission. An intergovernmental organisation established under Article XIV of the FAO constitution. It is mandated to manage tuna and tuna-like species in the Indian Ocean and adjacent seas.
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources. An intergovernmental organisation with a mission for the conservation of Antarctic marine living resources with conservation defined to include rational use.

#### 4.2.1 Reported catch and effort data

Relevant to the WCPO region, the SPC-OFP, CCSBT, ISC and IATTC are regional fisheries bodies that maintain commercial fisheries data for tuna fisheries. In all cases, member states provide catch effort and landings data to the regional organisation. While the SPC-OFP and IATTC have long-established fisheries database capabilities, the CCSBT has recently developed a Commission database of catch, effort, landings and length composition data, and ISC is in the process of developing comprehensive database and data management systems. Of these groups, only

IATTC has staff members in the field to collect supplemental catch data. All four organisations collect or receive logbook data but the data do not include all fisheries from some nations or gear types. For example, the SPC-OFP collects logbook data on standard forms from both domestic and foreign fisheries. The logsheet data held by OFP for 1999 cover 47% of the catch of tuna in the WCPO. Excluding the domestic fisheries of Indonesia and the Philippines, which account for 33% of the catch of tuna in the WCPO, logsheet coverage is 68% (Lawson et al. 2002). A notable characteristic of the data held by SPC-OFP is that the majority originates from coastal state submissions inclusive of data relating to PICT national fisheries and DWFNs fishing under access arrangements in PICT territorial waters.

In the case of the international organisations reviewed, ICCAT, IOTC and CCAMLR receive catch and effort data from flag states according to standardised reporting formats. In the case of IOTC and CCAMLR, contracting parties are obliged to submit data in a standard format using standard codes in either paper or electronic form. In the case of CCAMLR, a comprehensive *Fishery Data Submission Manual*, produced in English, French, Russian and Spanish, provides guidelines for data submission including: deadlines for submission, data forms, explanatory guidelines, and standard definitions and codes.

Several WCPO organisations provide co-ordination and review of data-oriented activities. The SCTB co-ordinates data collection, compilation and dissemination according to agreed principles and procedures. While membership in SCTB is open to all interested parties, not all nations fishing in the WCPO are able to participate (for example, in past years, financial difficulties have curtailed full participation by Indonesia, Philippines and some Pacific Island States). The ISC has a primary task to regularly assess and analyse fishery and other relevant information concerning tuna and tuna-like species. Its membership consists largely of distant water fishing nations.

#### **4.2.2 VMS in the region**

The potential crosscutting benefits of Vessel Monitoring System (VMS) data for the purposes of fishery data verification should not be overlooked. The issue of VMS data compatibility is also of increasing concern to RFMOs (see Section 2.1.3). VMS data can be used both as a means of verifying reported effort data and as a means of monitoring the completeness of data submissions. It is in this context that existing VMS capacity within the WCPO region is discussed.

The FFA has taken a leading role in the development and application of VMS in the WCPO region. The FFA has convened a series of technical consultations for member states and DWFNs to review and discuss VMS (e.g. FFA 1996). Several nations (including: New Zealand, the People's Republic of China, Papua New Guinea, the USA, Korea, French Polynesia, New Caledonia, Australia, and Japan) have implemented or are evaluating VMS technology.

Under the existing programme any DWFN vessel that wishes to apply for a licence to fish in the waters of an FFA Member Country must first be registered on the VMS Register of Foreign Fishing Vessels maintained by FFA. The VMS Register is distinct from the regional register, also maintained by the FFA. Information required includes basic vessel details (name, call sign, type, operator / charter) and specific information relevant to the transceiver (Automatic Location Communicator, ALC) installed on the vessel (including communication information, certification and installation details).

The FFA system is based on the Inmarsat-C service, which offers comprehensive coverage of the entire WCPO region. In addition, Inmarsat-C offers two-way communications and messaging capabilities, which ensures flexibility with regards potential extensions to VMS (e.g. electronic logbook reporting). A type approval process has been implemented to ensure compatibility of hardware.

FFA maintains VMS information centrally and distributes data to member countries when fishing activity occurs within their respective EEZ. Actual data collected includes: vessel identity,

position (latitude and longitude) and a time stamp; course and speed are determined on the basis of this information. The frequency at which data are transmitted is standardised at 6 transmissions per day, although the frequency can be increased and decreased if and when it is deemed necessary. No VMS transmission is currently required in high seas waters.

### 4.2.3 Biological and ecological data

Observer programmes offer an opportunity to obtain scientific data directly from fishing operations. Observer programmes provide important scientific information on target catch, non-target catch (including incidental catch of seabirds, marine mammals and turtles), and the mortality of discards. In the WCPO, both FFA and IATTC operate regional observer programmes. The OFP supports and co-ordinates national observer programmes, and has employed full-time observers in the past for deployment in priority fisheries (3 full time staff provide technical support both for observer programmes and port sampling programmes to SPC member States). In addition OFP provides limited financial assistance in support of member state observer programmes. The FFA programme operates under a US purse seine fleet treaty and achieves some 20% coverage in terms of vessel days; there is no coverage of longline or pole and line fleets. The IATTC operates a regional observer programme and co-ordinates with member nations to obtain 100% coverage of purse seine vessels larger than 363-mt capacity. The CCSBT has begun planning for observer coverage.

It is important to note that the design of observer sampling programs is far from simple. The statistical qualities of the required parameters are often very poorly defined, and rarely lend themselves to that body of statistical theory that deals with normal distributions. Sampling is typically a three-stage process, with three levels that need to be considered – the vessel (i.e. how many vessels to sample), the haul (how many hauls to sample on a vessel) and within-haul (how many samples to take from any sampled haul). Solutions that have been adopted in other international forums may help to provide guidance, but observer programmes will have to be tailored specifically to the species in question and the particular operating characteristics of the various fleets. Furthermore, the ideal statistical sampling method will only rarely be practical to implement within budgetary and logistical constraints. Therefore we would caution at this stage against any decision being made about the correct level of coverage in terms of vessels to be covered, % of fishing days to be covered, etc.

Effects of fishing on non-target, associated and dependent species (NADs), typically known as bycatch, has assumed increasing importance in international forums. Analysis of fishing impacts on bycatch of finfish, porpoise (dolphins), sea turtles, and sea birds requires objective and scientifically collected data such as obtained by observers. Increasing fishing for tuna near Fish Attracting Devices (FADs) has increased the incidence of bycatch of many species, including some that are threatened or endangered. The “Agreement for the Conservation of Albatrosses and Petrels of the Southern Hemisphere” provides an example of the international attention given to means of reducing impacts of bycatch.

The following summary information is available on observer programmes on vessels fishing for HMS in the Pacific

Organisation	Function
FFA	Develops and co-ordinates regional observer programmes and assists in the development of national observer programmes. Data collected combines operational information including vessel and gear attributes, biological data collected according to defined sampling protocols and environmental data. Compliance information is also collected, although there are no defined formats for compliance data collection.
OFP	Obtains species composition, catch data for non-target species, and length data from national programmes; OFP observer programme co-ordinates with member nations to expand coverage; provides training and processes observer data.
IATTC	IATTC regional programme co-ordinates with national programmes for 100% coverage of vessels with > 363-mt capacity. Detailed observer manual and log sheets ensure

Organisation	Function
	standard protocols and collection procedures are followed.

Quality control of observer data is essential. Data provided to the OFP are checked both manually prior to data entry and by the data entry and data importing software (Lawson et al. 2002). In observer programmes for which technical support is provided by the OFP, a purse seine and longline debriefing form allows the national observer co-ordinator (or a senior observer) to check each data field systematically and to query the observer as to whether they have followed the correct sampling protocol. The observer database software also screens the data in order to set a number of data quality flags that indicate whether the data can be used for various analyses, such as the estimation of catches of non-target species.

An examination of observer samples of the proportion of bigeye in the catch taken by purse seine vessels has however revealed serious problems with data quality (Lawson, 2002b). Supervisors evaluated the reliability of observers and the results indicate that only 83 of 151 observers (55 percent) were considered to be reliable. Observer training programmes have since been conducted by the OFP and it is considered that the reliability of samplers has as a result improved considerably (Tim Lawson, OFP, pers. comm.).

Port sampling programmes offer a means of identifying both species size composition and length / weight of landed catches. The IATTC operates an extensive port sampling programme through its field offices; employing standard sampling formats supported by detailed instruction manuals.

The OFP supports member country and territory port sampling initiatives through encouraging the use of standard sampling protocols and reporting formats. In its supporting capacity port sampling data provided to the OFP are checked for data quality both manually before data entry and by the data entry software (Lawson et al. 2002). For example, missing information is flagged; length histograms are generated for each sample to identify falsified data; and floating object sets by purse seiners are checked for the presence of bigeye tuna.

The quality of port sampling data obtained varies among existing national programmes. An examination of port samples of the proportion of bigeye in the catch taken by purse seiners revealed serious problems with data quality (Lawson, 2002b). Supervisors evaluated the reliability of port samplers, other than those of the National Marine Fisheries Service and Japan, and the results indicate that only 19 of 129 port samplers (15 percent) were considered to reliably identify bigeye tuna.

Significant steps have since been taken by OFP to address this problem; several training programmes have been conducted and as a result the capacity of samplers to identify juvenile bigeye tuna in purse seine catches is judged to have improved considerably (Tim Lawson, OFP, personal comment).

The ISC Statistics Working Group has recently addressed the issue of size data collection by member countries, encouraging the use of standard protocols; species-specific measurement standards are currently being defined by the ISC's Species Working Groups.

Outside the region, size data collection is mandatory for IOTC and ICCAT contracting parties. In the case of CCAMLR biological data are not collected through port sampling programmes, although length data are reported to CCAMLR on the basis of crew samples, undertaken in the absence of International Scientific Observers.

No regional fishery bodies in the WCPO area conduct operations to obtain fishery-independent data. Some member nations conduct surveys to collect fishery-independent data, which are generally for local use.

Environmental data collection is in the most part restricted to data collected at sea through observer programmes. A range of public domain environmental data are however used, for

example the SPC-OFP has access to public domain data which it uses for assessment purposes and shares with member countries / territories.

#### 4.2.4 Social and economic data

The Convention makes reference to the need for sociological and economic criteria to be taken into account in the design of management measures. Underlying these provisions is recognition of the special requirements of developing States in the Convention Area, particularly small island developing States (Article 5(b)), both in terms of the allocation of allowable levels of catch and effort (Article 10(3)), and inclusion in the scientific process (Article 30(3)).

In terms of data collection activities in support of these sociological and economic objectives, however, the Convention mentions only the collection and evaluation of economic and other fisheries-related data and information relevant to the work of the Commission (Article 10(1j)). To give effect to these objectives, the Commission will need to consider what specific information will be needed to support the application of the type of criteria listed in Article 10(3).

The decisions made on the basis of fishery and biological data, stock assessment results, and management policies have direct economic and social ramifications for fishers. Yet the difficulties in obtaining data to assess these effects generally cause economic and social analyses to lag far behind other aspects of fishery science. In the WCPO region, FFA and OFP have made significant progress in obtaining and using social and economic data. The issue of the optimal level of fishing is receiving increasing attention. The OFP has begun a project to integrate the available economic information for the fisheries and markets with the population biology of major tuna species in the western Pacific to provide advice to FFA member countries on optimal (from a bio-economic point of view) levels of fishing effort.

The following summary information is available on the status of the incorporation of economic information into management scenario modelling of fisheries for HMS in the Pacific:

<b>Organisation</b>	<b>Summary of activities</b>
OFP	Integrates the available information on the population biology of major tuna species in the western Pacific with economic information on the fisheries and markets; develops bio-economic model to assess economic rent and economic benefits to FFA countries
FFA	Collects and disseminates economic and marketing information to the government and private sector in member countries

The CWP noted the trend for social and economic data to be increasingly requested for use in fisheries management and has recognised the need for the improved availability of such data. The CWP recognises the need for collaboration between fishery statisticians, economists and managers in determining the data required and the concepts and definitions to be applied to these data (CWP-18, Appendix 6).

## 5 Data quality

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Data quality control is applied at two points in the data capture and handling process. Firstly there is verification of data submissions prior to insertion into the database. Secondly there are internal mechanisms to ensure the integrity of data in the database is maintained.

### 5.1 Data verification

The verification of data is essential to ensure that data are accurate, complete and give a true indication of the state or value of the factors under consideration. The problems associated with the collection of fisheries data mean that the risks of collecting erroneous or inappropriate data are very high without careful and statistically valid design and monitoring.

Standard data import routines can facilitate traditional manual crosschecks of reported data with independent sources and ensure data integrity during data entry. Different types of data will need to be verified in different ways. Some examples of methods to verify data include:

- Checking logbooks against landings data (e.g. sales notes);
- Sampling catches for species or grade composition;
- Comparing landings statistics with certificates of origin, trade and commodity production statistics (e.g. processed fish) and similar sources of information;
- Inspecting data collection methods by statistical staff;
- Interviews with fishers;
- Observer schemes or inspections;
- Reporting from sea on retained catch on entering and leaving the fishing zones;
- Using vessel monitoring systems, such as transponders, to monitor the position, catch and activities of vessels;
- Instituting airborne and shipboard surveillance, together with the boarding of vessels.

In cases where fishery-independent data, such as stock abundance indices from research surveys, are available, it is possible to use these as an independent check on CPUE indices based on commercial fishery catch and effort data. In cases of suspected serious misreporting of catches, it is even possible to use such fishery-independent data to obtain estimates of the commercial catches.

At the macro-level (typically national), food balance sheets can be used as an overall check of the consistency between production, utilisation, trade and consumption statistics. For such an exercise, it is necessary to convert all figures into live-weight equivalent units using appropriate conversion factors. Total fish production from capture fisheries and aquaculture, less quantities used for non-food purposes (e.g. fishmeal production) plus imports minus exports should correspond to the domestic food fish supply. It is usually expressed in per capita terms by dividing by the population size. The average per capita fish supply can then be compared with fish consumption estimates derived from food surveys. Large deviations from food survey results or large fluctuations from year to year suggest that there are problems with some of the statistics used in the calculations (FAO, 1998).

## 5.2 Data Quality Control

### 5.2.1 Overview

Data quality control is a key element of ensuring adherence to data quality standards. In this context, we consider data quality control in terms of its utility to managers, scientists and other interested parties. The data collected must be rational in order to form the basis of standard report summaries (weight of catch, location of catch, CPUE, etc.) against which progress of the fisheries is monitored or managed (output control, stock assessment, etc.).

The main issue to be addressed in data quality control is the identification of 'outliers' in the input data. For example, one can ask the question, are catches / effort reported by each vessel consistent with other reports coming in from other vessels operating within the same fishery, at the same time, general location, and with the same gear? How consistent are these data with historical pictures of how data have accumulated within the fishery? (See also discussion of error types in Section 5.2.2). This requires some detailed level of understanding about 'average' expected conditions within any one particular fishery, under a given set of circumstances. For example, distributions of previous years' catch and effort data may be used to establish 'thresholds' above or below which input data are flagged (say, 95th and 5th percentiles - effectively, 'zero tolerance') as possibly suspect. Alternatively, depending on how data are assembled, individual input data sheets can be compared against current data accumulating from the fishery. 'Outliers' may also appear on position reports associated with catch records compared with detailed management measures, including conditions of licence, gear restrictions, area restrictions etc. which may be in force. These can be identified at the time of data entry in the same way as the genuine outliers described above.

It is also important to consider the 'completeness' of the data. On the assumption that any one vessel must submit a fishing report or a non-fishing report, the time series of accumulated data should be checked at the level of the individual vessel in order to identify any unaccounted gaps in the date sequence. This requires, for example, information on fishing plans and license periods for individual vessels.

The primary tool of monitoring data quality within a database is through database integrity constraints. Three mechanisms exist for implementing database integrity constraints dependent on the volume of data being processed. These are real-time, transaction and batch.

Real-time error trapping has become much easier in the last few years with the increase in speed of PC-based applications and their increased complexity. Single fields can now be checked within the data entry application against a set of possible values or that an entered value is within a defined range. Fields can also be checked relatively simply against each other as they are entered. For example take the latitude and longitude entered for the start and end of a haul. It is now quite a simple process to take the two positions, calculate the distance between the two (using the Great Circle functions) and check that this is within an appropriate range. For a wide variety of fields, pull-down menus of appropriate values can be added, e.g. only "N" or "S" can be entered for the latitude hemisphere field of a position.

Transaction processing occurs at the end of a single unit of data entry, i.e. a logsheet. Here error trapping can be implemented for a wide variety of fields. For instance, it is common to run a quick check to see that the values entered for a particular entry add up correctly to match an entered total. If they don't, the row is not submitted to the database and the user is prompted to check the data before proceeding to the next row. Another mechanism used for transaction processing is that of double entry or double keying of data. Normal practice for the double entry of data is to enter the data twice, i.e. a set of logbooks will be entered once by the first data entry person and then the entire set will be re-entered by a second independent data entry person. The two datasets will then be compared at the end of the entry of the second data record and any inconsistencies resolved by reference to the original paper record. This has been

found to reduce substantially simple errors caused by e.g., operator's inability to read data on a data sheet, transposition of numbers, missing decimal points etc.

The double entry method is expensive, however, and requires a number of personnel to be available to enter one single dataset, it also doubles the size of the database. The compromise solution is double typing where each field in a data set is typed twice during entry before the user is passed onto the next record. The previous typing is obscured and any differences are highlighted at the end of the second row and resolved against the paper record. Only one correct set of data is retained in the database and one data entry clerk is needed. Probably the simplest mechanism at this level of data checking is to make the data entry clerk do a simple visual check of the data entered at the end of each record. Batch processing is similar to transaction processing, but occurs after a number of rows have been entered into the database. During batch error processing a series of complex analytical routines are run automatically, usually overnight or at weekends when data are not being entered. Data are then flagged as having passed or failed the checks. Data having passed the test are available for analysis immediately. Data having failed one or more of the error checks are flagged and will need to be checked by the user. It is possible to implement a system of data flags that allow a number of flags to be applied to a particular data record, to track where in the record errors have occurred. For example, data can be checked for a large array of potential problems including CPUE within a particular range, species average weights within ranges, and species composition not skewed towards by-catch species that may in fact be targeted against regulations. Each of these is allocated a unique flag, which is applied to the data error flag field for the record. In this way multiple errors can be traced for each record. It is quite common for errors to cascade through a record; once one field is wrong, the user continues to enter data incorrectly until the row is completed. This mechanism easily highlights these occurrences.

### **5.2.2 Types of errors**

There are four types of data errors that commonly occur in database systems. These are completeness, consistency, currency, and accuracy. Completeness is a simple Boolean description of whether a datum has been filled or not. A datum is consistent if its value satisfies a set of constraints such as formal rules, logical requirements, or relational requirements, vis-à-vis other variables. A datum is non-current or out-of-date if its recorded value was true in the past but no longer agrees with the present true value. Finally a datum is accurate if its recorded value agrees with its true value.

In the case of the majority of fisheries data being collected, currency is not an issue as these are single entries recorded and stored that are not modified after storing (unless other types of errors are found). Completeness and consistency can both be trapped very easily by the mechanisms described above. Accuracy in many cases will be trapped but is the most likely of all errors to go undetected.

### **5.2.3 Numbers of errors allowable per unit**

The number of allowable errors, depends heavily on the context - for example what is considered to be a unit, the type of error, and how sensitive the subsequent analyses are to errors in the data. In a perfect world, there would be time to resolve all issues relating to anomalous or spurious data. In practice, this is not the case in most fisheries departments.

The number (and types) of errors that may be tolerated varies between users in terms of the effect they have in any subsequent use. Under a policy of zero tolerance of errors, no data that have failed a quantitative range test can be loaded into the live system. This extreme level of quality control might be implemented, for example due to the potential impact of erroneous data on a statistical model used to monitor and manage the fisheries in real time (e.g. for within season TAC monitoring). Range testing eliminates most quantitative errors in the data. Obvious outliers (e.g., orders of magnitude) should not be allowed, but see note above concerning

concept of 'flagging.' Redman (1992) estimated that in the US a typical payroll record has a 1% chance of having one or more errors and a typical US billing record as high as 2% - 7% of having errors. These are in many cases regarded as being within acceptable bounds. Primary errors in fisheries data have been set previously at levels in the region of 85% of all records are 95% or more correct. With modern data systems it should be possible to attain a much better level than this.

For the most part error trapping is only capable of detecting and fixing errors made during data entry. There will be a number of errors that are made during the recording phase that it may not be possible to fix, although a proportion of these errors can be flagged and excluded from the data analysis, if appropriate (see methods above).

There are a number of statistical procedures (using the hypergeometric distribution) that, given the sample size (i.e. total number of records) and the probability of errors (taken from a subset of data visually checked against the entered data), can estimate the confidence limits for a particular dataset.

#### **5.2.4 Methods used to rectify errors**

After potential errors have been flagged in the database, the most common and best recourse for sorting out data problems is to check the entered data against the original hardcopy paper record. If this is not available or an error in the paper record is the source of the problem, a number of options are still open to rectify the error. Values can be compared against past and future values collected for the same data field. It may show that the same value has been entered each day for the field and on one occasion a different value was entered but it was more likely to be the same as previous values. Erroneous or data that have been modified after looking at possible sources of error can also be easily excluded or partially excluded from analysis datasets by using the same set of data flags described earlier.

Flagged data can be held in a temporary 'pending' database while source documents are checked usually using an index system such as pre-numbered log-book sheets, which could be an index generated by a document management system. This means that at any one time, the live database holds only those data that pass range checking and input control. The source of error must be investigated before the data can be transferred into the live database, if necessary, by recourse to the originators of the document. An alternative solution that is commonly used throughout large database systems is that records may be flagged with a code whose value indicates at which particular level any one record failed range checking. Data will be recorded in the 'live' database but it is then the responsibility of the administrators and users of that database to make some rational decision concerning its usage and applicability for each analysis conducted, e.g. records where the catch data is flagged as erroneous would not be used for estimating total catch.

#### **5.2.5 Policies for reviewing data**

The data management section of an RFMO must be tasked with continually checking the validity of data, and must correspond with data originators to answer any discrepancies that appear in the data. This can be a costly and time-consuming task, but its importance cannot be understated. One important consideration is that the origin of official data is often known to only a few national officers. Requests for clarification several years later, when those individuals have moved on, is much less likely to lead to a resolution of the problem than questions raised immediately following submission of the data. If investment in a data management section of an RFMO is not high, a large number of historical records are likely to have low quality reliability, because of the legacy effect of delayed checking.

An essential element to an effective reviewing mechanism is the identification of data correspondents. The STATWG of the ISC recently recommended that data correspondents be

identified for each Member. Data correspondents will be responsible for ensuring the quality of data collection and submissions by Members. Data correspondents will constitute the primary contact with which the ISC will communicate in the event of data related queries.

## 6 Data exchange and reporting

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Timely reporting of fishery data directly influences the capacity of an RFMO to provide appropriate and timely management advice and disseminate information on the status of the fishery in question. Three contributing factors influence the timely exchange and reporting of fishery information, these include:

- agreement on the criteria used to allocate responsibility for data reporting;
- agreement on a framework for data reporting, including reporting schedules and defined lines of communication; and,
- agreement on a common format for data reporting and information exchange.

### 6.1 Fishery data reporting responsibilities

Although international instruments such as the UNFSA allocate responsibility for fishery data reporting to the flag State, areas of uncertainty remain particularly with regards the scale and resolution of data to be reported. Additional uncertainty exists in the case of DWFN activity (under access agreements and joint venture and charter arrangements). At its Eighteenth Session, the CWP revised its existing criteria in an effort to address these uncertainties, as detailed below:

*The flag State of the vessel performing the essential part of the fishing operation shall be responsible for the provision of catch and landing data.*

*Where a foreign flag vessel is fishing in the waters under the national jurisdiction of another State, the flag State of the vessel shall have at all times the responsibility to provide relevant catch and landing data. The only exceptions to this shall be:*

*(a) Where the vessel undertakes fishing under a charter agreement or arrangement to augment the local fishing fleet, and the vessel has become for all practical purposes a local fishing vessel of the host country;*

*(b) Where the vessel undertakes fishing pursuant to a joint venture or similar arrangement in waters under the national jurisdiction of another State and the vessel is operating for all practical purposes as a local vessel, or its operation has become, or is intended to become, an integral part of the economy of the host country.*

*In any situation where there is uncertainty as to the application of these criteria, any agreement, charter, joint venture or other similar arrangement shall contain a provision setting out clearly the responsibility for reporting catch and landing data, which shall be reported to the flag State, and, where relevant, to any coastal State in whose waters fishing operations are to take place or competent sub-regional, regional or global fisheries organisation or arrangement.*

Agreement will need to be reached regarding the allocation of Flag state status and associated data reporting obligations, particularly under circumstances where DWFN operations are undertaken on the basis of JV operations or under access arrangements. To this end, it is strongly suggested that the PrepCon consider the above definition.

The question of data reporting obligations is of particular relevance given the current status of data reporting by certain fleets in the WCPO. Coastal states, rather than flag states, are in some cases the best or only source of catch and effort logsheet data. For example, flag state holdings of logsheet data for the Korean purse seine fleet constituted less than 40% in 1999 (Koh et al., 2002), Whereas, SPC-OFN logsheet data holdings, provided by SPC member countries, suggest a significantly higher level of coverage, some 98% (Lawson, 2002). This situation is attributed to the unique nature of the WCPO region, where the majority of catches are taken in territorial waters and where logsheet submissions are an explicit requirement of access arrangements.

Although the situation of Korean purse seine vessels and other DWFNs can be compensated for in the short term with coastal state data, given the reporting obligations outlined in Annex I of the UNFSA, coastal state reporting should be viewed as a short-term solution. For the mid to long-term, commitment to improved flag state data reporting should be sought.

## 6.2 Schedules for data submission

An important measure to ensure timely data submissions is agreement on a framework for data reporting, which might include data specific schedules and reporting protocols. The nature of data collected and its importance with respect to the formulation of management advice and associated measures will generally dictate the regularity with which reporting should take place. The development of a clearly defined reporting schedule with associated mechanisms to monitor and enforce data submissions should be considered.

Closely associated with the development of a data-reporting schedule should be the allocation of a point of contact responsible for data submissions (See Section 5.2.5). The identification of an individual responsible for data reporting is crucial not only for monitoring purposes but also for feedback and review, particularly where discrepancies in reported data are identified.

As discussed in Section 5.2.5, the ISC has recently endorsed the use of data correspondents, whilst the OFP have established a system whereby designated contacts are assigned for all countries / territories reporting data. Data handling is monitored using a *Data Registry* database; data submissions are logged and receipt of information is automatically generated and sent to the designated contact by email. The system is reciprocal in that designated contacts are able to access secure pages of the OFP website and obtain information on the status of data processing, specific to their submissions. A similar system has also been established by the CCSBT.

Given the number of States likely to report to the Commission, it will be critical that a reporting framework be established including provision for an appropriate response if discrepancies in data are identified or in the case of delays in data reporting.

## 6.3 Data reporting formats

The range of mechanisms available for data reporting has developed significantly from traditional hard copy formats (e.g. STATLANT forms) to electronic solutions. Considerable emphasis has been recently placed on the use of electronic media for data submission. Electronic reporting formats that are independent of proprietary software have been developed and their use is encouraged by the FAO. The use of file transfer protocols (FTP) offers a fast and secure mechanism for exchange of large data sets. These solutions are fast becoming the norm and it will be important for the Commission to consider defining reporting formats which maximise developments in the IT environment whilst acknowledging member State capabilities.

An approach similar to that taken by CCAMLR may offer an effective solution; standard reporting formats are clearly defined both for hardcopy and electronic data submissions. Whilst electronic data reporting is encouraged, mechanisms are in place for hardcopy data reporting and subsequent data entry and processing. In this way, standard formats are ensured whilst sufficient flexibility is maintained in line with different levels of member states' data handling capacity<sup>6</sup>.

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<sup>6</sup> The CCAMLR *Fishery Data Manual* is published in English, French, Russian and Spanish. This manual describes CCAMLR procedures for collecting, submitting and disseminating catch, effort and biological data for fisheries in the CCAMLR Convention Area. Information is provided on deadlines for data submissions, data requirements for each fishery, data forms and guidelines for their completion, and definitions of data fields and codes. Procedures for collecting and submitting fishery observer data and reports are described in the CCAMLR *Scientific Observers Manual* (<http://www.ccamlr.org/pu/e/sc/fish/intro.htm>).

This approach is reflected informally by the CCSBT, where it is felt that too prescribed a format for data reporting may exert a negative influence on the timeliness and completeness of data submissions. As long as standards are consistent through time and sufficient information ("metadata") accompanies data describing them, in the short term, the benefits of rigidly enforcing standard data reporting formats may be outweighed by the need for timely delivery of data (Bob Kennedy, pers. com., CCSBT). Nevertheless, a more prescribed format than that applied by CCSBT may be appropriate in the case of the Commission, not least given that the likely volume of Member data submissions will be significantly higher than is the case for the CCSBT.

Alongside the growth in the use of electronic media, significant emphasis has been placed on the development of international standards for describing data. Metadata are "*information about data*" and can include characteristics about the data such as the content, accuracy, reliability and the source. Metadata provide the mechanism to describe data in a consistent form that allows users to gain a uniform understanding of the content and fitness for purpose of datasets. Metadata can accompany a dataset when it is transferred to another computer so that the dataset can be fully understood, and be used effectively. The FAO, through FIDI, are currently developing a global standard for fishery metadata, which will offer a baseline of common terms and definitions that describe fishery data. Within the WCPO region, the OFP routinely includes metadata when disseminating information; equivalent use of metadata by the Commission would increase the sustainability of electronic data and should therefore be considered by the Commission.

## 6.4 Standardisation of data collection and reporting in the WCPO region

### 6.4.1 Catch and effort logsheets

Significant steps have been taken towards the development of common standards for catch and effort logsheets within the WCPO region. This includes the following initiatives:

- SPC/FFA cooperation in the Tuna Fishery Data Collection Committee (DCC); and,
- the work of the Statistics Working Group of the SCTB.

The first meeting of the DCC was held in December 1995. At the time, an array of logsheets was used throughout the region. The OFP and FFA recognised the extent to which the situation complicated the task of data processing. In response, standard logsheets were designed and introduced to both domestic fleets of SPC and FFA member countries and the DWFN fleets with which they have access agreements. Subsequent DCC meetings have followed (December 1996, December 1998 and December 2000) where an ongoing process of review has continued and standard observer forms, port sampling forms and unloading forms have resulted; translated versions of logsheets have been made available on the SPC-OFP website in French, Japanese, Korean, Mandarin and Spanish.

A special session of the SCTB Statistics Working Group was held prior to the twelfth meeting of the SCTB in 1998 (Anon. 1999a) where minimum logsheet standards were established. The minimum standards reflect the need to differentiate between data that are essential and data that are desirable. Reviews of logsheets used in the region continue to ensure conformity with the agreed minimum standards.

The DCC logsheets include:

Logsheets	Languages	Instructions
Longline	English, French, Japanese, Korean,	English, French, Japanese,

	Mandarin	Mandarin
Pole and line	English, French, Japanese	English, French
Purse seine	English, French, Spanish	English, French, Spanish
Shark longline	English	English

A summary of the status of South Pacific Regional logsheet implementation is included in Anon. (2001). Although implementation amongst FFA and SPC flagged vessels has in the majority of cases been successful, adoption by DWFNs has been limited.

### 6.4.2 Observer data

Observer data collected for research purposes include primarily species composition of target species, catch data for non-target species, and length data.

A series of forms have been developed for observers aboard longline, pole and line and purse seine vessels. In addition there are a number of general forms completed by observers aboard all vessel types. Each form is accompanied by detailed instructions defining data format and codes as required. All forms include instructions that guide observers through the collection and sampling process with the exception of the longline forms, which provide detailed instructions for form filling only. The DCC observer data collection forms are listed below:

General Forms	Field data collection instructions
	GEN-1 - Vessel and aircraft sightings and fish transfer log
	GEN-3 - Vessel trip compliance record
	GEN-6 - Pacific regional pollution report
Longline forms	LL-1 - Longline general information
	LL-2 - Longline set information
	LL-3 - Longline haul information
	LL-4 - Longline catch monitoring
	LL-5 - Longline conversion factors
Pole and line forms	PL-1 - Pole and line general information
	PL-2 - Pole and line daily log
	PL-3 - Pole and line catch details
Purse seine forms	PS-1 - Purse seine general information
	PS-2 - Purse seine daily log
	PS-3 - Purse seine set details
	PS-4 - Purse seine length frequency
	PS-5 - Purse seine well loading

No regional manual has been developed combining instructions for collection and form filling with roles and duties of observers, statistical sampling techniques, standard classification codes, conduct of observers, safety at sea etc.

### 6.4.3 Unloading and port sampling data

Logsheets and associated guidelines have been developed to harmonise data collection and data recording protocols throughout the region. Similarly, SPC member agencies are encouraged to use the regional logsheets and guidelines when collecting port-sampling data. This ensures standard sampling practices, data collection procedures, and a standardised format for reporting. All forms are accompanied by instructions, with the exception of the *Monthly summary forms for longliners*, as detailed below.

Fishery	Types of forms	Language
Longline	Unloading Form	English, French (no instructions)
	Port sampling form	English, French (no instructions)

	Monthly summary form	English (no instructions), French (no instructions)
Pole and line	Unloading Form	English
	Port sampling form	English
Purse seine	Unloading Form	English
	Port sampling form	English
	Well unloading form	English
Troll	Port sampling form	English

A detailed port-sampling manual has been developed by SPC-OFP, which provides background information for port samplers explaining why data are collected, how samplers should comport themselves, standard measurements, sampling protocols and data collection procedures and how data should be recorded. The manual places particular focus on purse seine, pole and line and longline vessel port inspection.

The concerted actions of the DCC and the SCTB represent significant steps towards the standardisation of data collection and reporting within the WCPO region. It is important that these achievements are both acknowledged and taken advantage of by the PrepCon. DCC logsheets and forms, although not comprehensively implemented, have been endorsed through their application by both Pacific Island Countries and Territories (PICT) and to a lesser extent DWFNs.



## 7 Capacity to implement standards

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When considering the question of data standards, in addition to considering the science and management needs, it is also important to consider member State data handling capabilities. An appreciation of member State capabilities will ensure that standards are agreed that can realistically be achieved. Equally, a clear understanding of weaknesses in member State data collection and data handling programmes will help the Commission to identify where assistance, whether financial or technical, could be applied towards achieving data standardisation goals. The provision of technical and financial assistance towards this end is emphasised in the Convention text, which states:

*The Commission shall establish a fund to facilitate the effective participation of developing States Parties, particularly small island developing States, and, where appropriate, territories and possessions, in the work of the Commission, including its meetings and those of its subsidiary bodies. The financial regulations of the Commission shall include guidelines for the administration of the fund and criteria for eligibility for assistance.*

*Cooperation with developing States, and territories and possessions, for the purpose set out in this article may include the provision of financial assistance, assistance relating to human resources development, technical assistance, transfer of technology, including through joint venture arrangement, and advisory and consultative service. Such assistance shall, inter alia, be directed towards:*

- (a) improved conservation and management of highly migratory fish stocks through, collection, reporting, verification, exchange and analysis of fisheries data and related information;*
- (b) stock assessment and scientific research;*
- (c) monitoring, control, surveillance, compliance and enforcement, including training and capacity-building at the local level, development and funding of national and regional observer programmes and access to technology and equipment. Article 30 (3 & 4)*

Given significant concern expressed during the PrepCon process with regard to the quality and completeness of fishery information from Indonesia and the Philippines, this section presents a brief review of existing data handling arrangements in Indonesia and the Philippines and relates these to likely Commission data related obligations.

A paper prepared by the SPC-OFP (WCPFC/PrepCon/WP.15/Add.1), entitled "Current capacity of Pacific Island Countries and Territories to collect tuna fishery data," addresses these issues for PICTs in the WCPO region.

### 7.1 Indonesia

Comparatively little substantive information was available to describe Indonesia's capacity to collect and handle fishery data. Fisheries targeting HMS in the Pacific are prosecuted by both industrial and artisanal (small scale) domestic fleets. No joint venture or access arrangements exist although Indonesia does maintain a small distant water fleet presence in the WCPFC region.

As a flag state, Indonesia will be required to report data for both its domestic and distant water fleets. Logbook use is not currently enforced for domestic fleets. Catch and effort statistics are compiled on the basis of three data sources: surveys at village level (for artisanal data); survey data from selected landing sites; and, reports provided by large fishing companies (landing data). No indication of the extent of sample coverage was available. Given that these statistics have historically been reported in an aggregated form (by species, gear, and area), the current system of fishery data collection is unlikely to meet with the needs of the Commission.

Mechanisms for data verification are limited to survey data collected at selected sampling sites, for which no details of coverage were available and a limited supply of industry sourced landings statistics.

Biological data collection (length and species composition) is currently limited to a programme of data collection at selected sampling sites, although no length data has been supplied to SCTB since 1999. There is no active observer programme and as a result information regarding gear specifications, catch composition or discards is not available. Table 7.1 presents a review of available information concerning Indonesian capabilities to collect and handle fishery data for HMS in the WCPO region.

**Table 7.1 Indonesia**

<p><b>Background</b></p> <p>Indonesian catches contribute some 17% of total tuna catches for the WCPO region. Tuna fisheries prosecuted by Indonesia in Pacific Ocean include domestic artisanal and industrial fleets (purse seine, pole and line, longline, handline, troll). No access arrangements exist, no DWFNs licensed to operate in the Indonesian EEZ. Indonesia has historically maintained a distant water industrial fleet.</p>
<p><b>Institutional structures</b></p> <p>The Directorate General for Capture Fisheries sub-directorate of data and statistics (DGCF-stat) is responsible for compiling fishery statistics. DGCF-stat is supported by a network of offices at provincial and district levels. Eight provinces and some 70-80 districts include landing sites served by vessels active in the WCPO region. Fishery data are collected and compiled for all fisheries prosecuted, not just tuna fisheries. Details of specific structures responsible, timelines and sampling protocols and procedures applied were not available. Management decisions also supported with additional information contributed by: the Indonesian Institute of Sciences (LIPI); the Indonesian Research Institute for Marine Fisheries (RIMF); and various universities. RIMF conducts research on biology, stock assessment, ecology, fishing gear, vessels, socio-economics and post-harvest technology. Fisheries control and surveillance activities are currently under the control of the navy.</p>
<p><b>Fishery statistics</b></p> <p><u>Data collection:</u> Three primary data sources – (1) sample surveys at village level (artisanal data); (2) sample surveys from selected landing centres; (3) reports provided by large fishing companies (landing data). Enumerators collect data at district level. Details of actual sampling protocols are unclear although information indicates that there is inadequate species identification. Species of interest to the Commission are aggregated under 3 categories: <i>tuna</i>, <i>skipjack tuna</i>, and <i>Eastern little tuna</i>. The category '<i>tuna</i>' aggregates bigeye, yellowfin tuna and billfish. Size and species composition data were formerly collected under the Indo-Pacific Tuna Programme (IPTP). Funding constraints have limited capabilities to continue sampling since IPTP dissolved in 1992, although protocols are still maintained where funding permits. No observer programme.</p> <p><u>Data verification:</u> No information on processes in place to verify catch reporting aside from limited sampling exercises detailed above and export information.</p> <p><u>Data reporting:</u> Undertaken by DGCF statistics department. Statistics reported at SCTB 15 (SCTB15/NFR-9) include annual catch estimates, licensing and export data. Significant limitations observed in reported data. Highly aggregated statistics - large proportion of estimated catch unclassified by gear, catch information for two or more species aggregated under the category '<i>tuna</i>', limited information accompanying data to explain sampling protocols applied, no useful effort data. Historical use of logsheets (industrial fleets) unclear. Fishing company reports based on unloading data, therefore no spatial component. No size / species composition data reported since 1999.</p>
<p><b>Measures to strengthen capacity</b></p> <ol style="list-style-type: none"> <li>1. RIMF-IPTP programme (early 1980's - 1992). Sampling protocols devised, collection of tuna catch and effort data, and size composition data at selected ports.</li> <li>2. IOTC catch monitoring programme (report due in June discussing Indonesian data collection and compilation capabilities). A collaborative programme between IOTC / RIMF / Japan's Overseas Fisheries Cooperation Fund (OCFC) / Australia's CSIRO – the sampling scheme, as a whole, includes Indonesia, Thailand, Malaysia and Sri Lanka. In Indonesia data are collected from longline landings in three key ports (Jakarta, Benoa, Cilacap). The programme also aims to strengthen capacity for the collection and compilation of information for artisanal catches.</li> </ol>

3. Recommendation made in SCG report Annex III - to produce a status report for Indonesian fisheries in the Pacific Ocean, to develop an interim port sampling programme for Banda Sea and Pacific Ocean ports and to build capacity towards developing an integrated catch monitoring system for the Indonesian Pacific Ocean tuna fishery. Recommendation that this should be undertaken in collaboration with Indian Ocean monitoring programme.

Given the limited information available, recommendations presented in Annex III to the SCG report appear to offer a practical way forward towards strengthening Indonesian data collection and handling capabilities. The recommendations suggest a phased approach commencing with a comprehensive review of existing capabilities and data holdings. The second phase would involve the establishment of an interim solution towards the collection of priority data, likely focusing on strengthening the existing port sampling programme. The final phase would constitute a long-term initiative to develop capacity towards the establishment of an integrated system of monitoring for the Indonesian Pacific Ocean fisheries. The ongoing Indian Ocean joint Catch Monitoring Programme offers an opportunity for lessons to be learned that could be transferred to the programme design.

There are significant threats to the success of such a large-scale programme in Indonesia, not least the extent of political will invested in achieving Commission standards. Current initiatives in Indonesia appear to indicate a greater emphasis on fleet enlargement and post harvest improvements over the need to develop capacity to monitor fishing activity. If the programme is to be successful, participation will need to be sought not only from the monitoring authority, but also from the national fishing industry.

## 7.2 Philippines

As is the case in Indonesia, the Philippines maintains both a domestic artisanal and industrial fishing fleet. Significant efforts are currently underway to strengthen the national industrial fishing sector both directly through fleet improvements (gear and technology), improved processing facilities, and indirectly through the encouragement of joint venture arrangements. As a flag state, the Philippines will likely be obliged to supply the Commission with both annual estimates of catch and more detailed catch and effort data. Table 7.2 presents a summary of available information concerning the capacity to collect and handle fishery data in the Philippines.

**Table 7.2 Philippines**

<p><b>Background</b></p> <p>Philippine catches contribute some 13% of total tuna catches for the WCPO region. Diverse fisheries prosecuted by domestic artisanal and industrial fleets. Gears used: (ring net, purse seine, longline, handline, troll). The Philippines maintains a distant water fleet although there are no access arrangements permitting DWFNs to operate in the Philippine EEZ; joint venture (JV) agreements are, however, encouraged (no existing JVs).</p>
<p><b>Institutional structures</b></p> <p>Philippine Bureau of Agricultural Statistics (BAS) has been responsible for compiling fishery statistics since 1987; the Bureau of Fisheries and Aquatic Resources (BFAR) was responsible before 1987. Collection and compilation of fishery statistics acknowledged as a secondary task of BAS in favour of the agricultural sector. Philippine port authorities support BAS through supply of commercial catch statistics. Recent executive order for closer cooperation between BAS/BFAR. Research arm of BFAR a separate entity – National Fisheries Research and Development Institute.</p>
<p><b>Fishery statistics</b></p> <p><u>Data collection</u>: Three primary data sources – (1) sample surveys of municipal (artisanal) fisheries; (2) sample surveys of selected major landing centres; (3) reports provided by fishing companies (landing data). Details of actual sampling protocols used are unclear. Catch and effort data – DWF vessels complete logsheets when fishing in PICT EEZs, no details of domestic fleet logsheet requirements. Catch and effort data compiled on the basis of annual fishing company reports without spatial component. Port sampling data is also collected which</p>

includes catch effort information although only disaggregated by broad fishing area. Size and species composition data formerly collected under the Landed Catch and Effort Monitoring (LCEM) programme (1993-1994). No sampling in 1995. Funding received by BFAR for the National Stock Assessment Project (NSAP) – large component being a substantial port sampling programme (1998 onwards). There is, however, a backlog in data processing. No observer programme.

Data verification: no information on processes in place to verify catch reporting aside from limited sampling exercises detailed above and export statistics. Reliability of some data in question (municipality versus commercial catch reporting, level of coverage, sampling protocols used etc.)

Data reporting: undertaken by BAS. Data have been collected although there is a backlog in processing. Catch effort data are reported, but coverage is low and only disaggregated by broad fishing area and unclassified gears remain. Species composition / length data also suffer from backlog in processing.

**Measures to strengthen capacity**

1. NSAP & LCEM (see above)
2. OFP has provided technical support to strengthen database capabilities under NSAP - critical to overcome backlog in data processing.
3. Uncertainty remains regarding port sampling coverage although financial support has been sighted as essential if the existing programme is to continue.

It appears that a particular weakness of the Philippine system lies at the data processing stage. There are also indications that the system of data collection may not be sufficient in the short to mid-term to meet likely data standards, particularly with to the scale and resolution of required data. Deficiencies are particularly apparent when catch and effort data are considered; reporting currently relies on unloading information, from which spatial information is not discernable.

In the short term, it appears that financial support is required to support existing port sampling activities and additional technical support may be required to process the existing data backlog. Once this has been achieved, specific data handling needs will become more apparent.

Williams (2002) indicates that, as with Indonesia, a long-term programme of capacity building will be necessary if monitoring capabilities are to be strengthened to a level required for scientific purposes. In the long-term a challenge particular in the Philippines is the devolved nature of fisheries management and data collection responsibilities. Limited information was available describing specific data flows, although forthcoming projects, such as the USAID-funded Fisheries Improved for Sustainable Harvest (FISH) Project, include components aimed at strengthening both local and national fisheries monitoring capabilities and associated legislation. However, as is the case in Indonesia, significant uncertainty exists with regards the level of long-term commitment towards strengthening fisheries monitoring.

### 7.3 A way forward

Given the interim data needs identified by the SCG, likely data standards in the short to mid term will require flag states to collect and report commercial fishery data including annual catch estimates and catch and effort data to an agreed scale and resolution. These data standards should be formulated to reflect member State capacity, whilst not compromising the quality or completeness of required data. The CCSBT recommended that care be taken not to establish hurdles which might limit the level / quality of data submitted. In the short term, timely submission of accurate data should have a higher priority than having the data delayed to conform to a designated reporting format.

The information submitted alongside reported data (methodologies and processes used to collect and to collate data) will be essential particularly in instances where standards are not fully adopted or deviation from standards has been unavoidable as is likely in the case of both the Philippines and Indonesia.

Standards currently beyond the capacity of some members could nevertheless be established. These could represent target towards which member States should aim. Commission assistance, as envisaged in Article 30, could then be formulated in support of members achieving these targets and as such could be identified as a criterion to evaluate any subsequent application for assistance.



## 8 Recommendations

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The objective of this paper was primarily to present a review of standards applied by bodies charged with the collection, verification and reporting of fisheries data both within and outside the WCPO region with the aim of informing the PrepCon decision making process. Discussions at PrepCon3 indicated that significant value could be obtained from a document that not only presented these findings, but also placed them in the context of the Commission development process.

Given the extent of uncertainty surrounding this process, rather than define explicit actions against a fixed timeframe, we felt that a more useful approach would be to present a sequence of recommendations against the backdrop of the Commission development process characterised in three phases: (1) an interim period leading up to entry into force of the Convention; (2) a transitional period immediately following entry into force of the Convention and establishment of a Secretariat; and (3) a fully developed Commission.

Underpinning this approach is the recognition that specific data requirements, and the need for associated data standards, will grow as Commission capacity increases, and that a pivotal point in the implementation process of data associated standards will occur with ratification of the Convention.

In addition to presenting an indicative time-line we have also identified a number of overarching issues for PrepCon consideration. We regard these as essential for the successful establishment of Commission data related standards. These overarching issues represent a target for establishing standards for the WCPFC.

The Commission Secretariat will work with these standards for a considerable time, and should have a significant role in finalizing them. In some cases, the final standards will build on work in progress during PrepCon. In other cases, work during the transition period will lead to finalized standards when the Commission is fully staffed and operating. The following sections present recommendations for a process of developing the target standards and the interim standards.

### 8.1 Overarching issues to consider

The Convention text and the MHLC consultation report present overarching guidelines for data collection, verification and timely exchange and reporting. In addition, clear reference is made to associated standards and obligations presented in Annex I of the UNFSA. In support of this guiding instrument and others, the FAO co-operates with RFMOs, particularly through the CWP, to standardise reporting forms, procedures, definitions, classifications, and other related documentation.

The following measures are recommended as targets for development of standards during the transition phase and during the fully functioning phase:

1. Agreement on Commission participation in international initiatives promoting the implementation of data standards, particularly those of the FAO's CWP and FIGIS programmes
2. Consideration of the CWP definition regarding vessel flag, nationality of catch and associated reporting obligations
3. Agreement on scale and resolution for data collection and data reporting
4. Agreement on schedules for data reporting
5. Identification of appropriate member State data correspondents

6. Establishment of a mechanism for regular review of adopted standards
7. Consideration of the particular situations of developing countries and their capacity to implement standards designed in the context of more developed fisheries

The points listed above are regarded as essential elements to ensure a responsive and effective framework of Commission data standards, drawing from collective experience and lessons learned both internationally and within the WCPO region.

It is strongly recommended that the Commission adopt standard codes and co-ordinate with FAO and the CWP in their development. Where it is necessary to adopt unstandardised codes in the short term, databases can easily be configured to accept temporary codes for later replacement with standard codes.

Commission participation in the FIGIS programme is recommended as this will offer member States a conduit for meeting international reporting obligations, according to commonly shared data standards.

In the development of standards applicable within the region, the Commission will need to consider the particular situations of developing countries as these countries may not be readily able to implement standards designed in the context of more developed fisheries.

## 8.2 Interim period

The interim period constitutes PrepCon activity leading up to entry into force of the Convention. This is an important phase since decisions taken during this period will define the framework for the future data-related structures and systems of the Commission. The objective will be to create a responsive system of standards rather than a rigid and definitive structure. Initial decisions taken regarding data collection, data verification, and data dissemination standards will need to reflect perceived priority data needs.

Significantly, agreement has already been reached, through the PrepCon process, regarding priority data types for scientific purposes. These priority data types include: annual estimates of catch; catch effort data (the scale and resolution are yet to be established, although data at the level of individual fishing operations are recommended); and size composition data (length frequency).

Agreement concerning priority data types infers that efforts during the interim period should focus on the adoption of standards to meet perceived priority data requirements. In practical terms, this implies that the onus be placed on reaching agreement over appropriate standards applicable to the collection, verification and dissemination of annual catch estimates, catch and effort data and observer port sampling data.

In addition, the SCG also recommended that existing regional arrangements for the compilation and dissemination of data, coordinated by SCTB, are suitable in the interim. These arrangements include:

1. the provision of fisheries data by flag states and coastal states to the OFP;
2. processing and management of these and other data by the OFP; and
3. the dissemination of data according to established procedures by the OFP

Endorsement of existing arrangements underlines the important point that Commission data standards will not be developed in a vacuum and that significant steps have already been taken in the region.

### 8.2.1 Data collection

In acknowledgement of the significant progress already achieved, it is strongly recommended that the PrepCon consider DCC logsheets and forms as a baseline (template) from which Commission data collection forms can be developed. The forms, and associated manuals and instructions, have undergone regular review and have been widely implemented by SPC and FFA members and, to a lesser extent, DWFNs active in their respective waters.

An interim solution for the establishment of a vessel register will be addressed by WGIII. Existing capacity within the region should again be considered and cooperation is encouraged between WGII and WGIII, so that a balance is struck between scientific data needs and data needs associated with compliance and enforcement. Similarly, consultation between working groups to discuss observer data collection will be essential. Decisions taken in these areas will strongly influence the nature of appropriate standards.

### 8.2.2 Verification

The verification of data is essential to ensure that data are accurate, complete, and give a true indication of the state or value of factors under consideration. Landings and transshipment records comprise an important source of information with which reported catch data can be verified and validated. Additional sources of data used to verify reported catches include observer programmes, port sampling programmes, and VMS. In the absence of such data in the short term, adoption of existing standardised data collection forms will facilitate the collection of such data and the capacity for verification and quality control significantly.

### 8.2.3 Reporting

Although international instruments such as the UNFSA allocate responsibility for fishery data reporting to the flag State, areas of uncertainty remain. In the context of Commission needs, consensus will need to be reached regarding data reporting responsibilities, particularly those relating to DWFN operations. It is strongly suggested that the Preparatory Conference consider the definition agreed by the CWP.

It is also important to recall the *status quo*, in which OFP currently plays an essential role in supporting PICTs in data collection and processing. The data resulting from the work of OFP have proved to be of higher quality than those held by flag states. It would likely be counterproductive to disassemble the effective OFP-PICT *data pipeline* in favour of a flag-state reporting requirement that is known to be deficient, certainly in the short term.

When in place, the Commission should consider establishing a framework for data submissions including the identification of data correspondents and the definition of schedules for data reporting. The identification of an individual responsible for data reporting is crucial not only for monitoring purposes but also for feedback and review, particularly where discrepancies in reported data are identified. Adoption of such a framework at an early stage will enhance the Commission's capability to verify and validate data submissions and disseminate accurate and complete data in a timely fashion.

Considerable emphasis has recently been placed on the use of electronic media for data submission. Electronic solutions to data exchange are fast becoming the norm and it will be important for the Commission to consider, at the earliest stage possible, the definition of reporting formats which maximise developments in the IT environment whilst acknowledging member State capabilities.

An approach similar to that taken by CCAMLR may offer an effective solution. Whilst electronic data reporting is encouraged, mechanisms are in place for hardcopy data reporting and

subsequent data entry and processing. In this way, standard formats are ensured whilst sufficient flexibility is maintained in line with different levels of member States' data handling capacity.

The Commission should also consider the inclusion of metadata relating to the exchange of electronic fishery data, which will not only facilitate compatibility with international standards but may also influence the sustainability of data compiled by the Commission.

### **8.3 Transitional period**

The transitional period represents the point at which Commission capacity will develop and interim measures will be modified and/or replaced. In reality, groundwork achieved during the interim phase will likely overlap with the transitional period. The PrepCon is recommended to consider the establishment of a system of review and evaluation of data quality and needs. The rigorous and time-consuming process to achieve full ISO certification for data collection management standards will not likely serve the purpose of the Commission. However, a less rigorous procedure that follows the ISO format will provide an opportunity for the PrepCon to fully evaluate the details of existing and future sampling requirements in the context of data quality needs.

The specifics of longer-term Commission data requirements for scientific purposes have yet to be agreed. Nevertheless, priority fishery data in the context of the PrepCon have been established (see above) and these same priority data types are likely to be reflected in Commission data needs and associated standards, at least in the mid-term. Nevertheless, the Convention text does make clear reference to data types, in addition to those identified as being of a high priority.

Where the Commission requires information in addition to fishery data (e.g. economic and sociological data), it should seek to identify appropriate data to quantify indicators in cooperation with the CWP, which has already taken steps to address these issues. The development of associated standards will then be possible, ensuring that benefits are maximised in terms of utility.

With regards Commission data processing, standard data quality control approaches are now commonplace in data handling; it is recommended that quality control standards be adopted which incorporate these mechanisms, including: the double entry method of data capture (where hardcopy data are processed); real time error trapping; and transaction processing.

### **8.4 The fully-functioning Commission**

The term "fully-functioning" refers explicitly to the institutional structures and technical capacity of the Commission. This is not to say that a fixed framework of standards is envisaged. To ensure that Commission objectives are met both efficiently and effectively, it is strongly recommended that the system of review be ongoing. In this way it will aim to ensure that standards adopted during earlier stages of Commission development continue to meet Commission needs whilst taking into account the particular circumstances of member States.

### **8.5 Data handling capacity considerations**

Interim data standards agreed by PrepCon for WCPFC should be formulated to reflect member State data handling capabilities. Nevertheless, neither the quality nor completeness of data should be compromised. Care should be taken to ensure that 'hurdles' are not established which might limit the level / quality of data submitted.

In the short term, timely submission of accurate data should be given a higher priority than having the data delayed to conform to a designated reporting standard. Information submitted

alongside reported data documenting methodologies and processes used to collect and to collate data will be essential, particularly in instances where standards are not fully adopted or deviation from standards has been necessary.

Standards for the longer-term, currently beyond the capacity of some member States, could be established which members should strive to achieve. A schedule for all members to reach the final data standards would depend on the financial and technical assistance available for those states that are unable to meet them without such assistance.



Objective	Action	Interim	Transition	Developed	Remarks
<b>Overarching issues</b>					
<b>Adopt scale and resolution of data needs (collection and reporting)</b>	Priority data types: annual catch data, catch and effort data and length/weight data				Priority data types agreed although consensus not reached regarding scale and resolution or schedules for reporting.
	Additional data needs: biological and ecological, environmental, sociological and economic and technical				Data needs will be dictated by stock assessment requirements and Commission capacity
<b>Establish process for review of standards</b>	Agree on TOR, representation and meeting schedules				Essential process to evaluate existing standards and to ensure that change (data needs, fleet activity, technical innovation etc.) is accounted for. On ratification schedules for the review process will need to be established as the transitional period will likely need regular monitoring
<b>Commission participation in international standardisation initiatives e.g. CWP and FIGIS</b>	Agreement sought and appropriate representatives identified				May have implications for all aspects of data standards. SPC currently active in both CWP and with the FIGIS programme
<b>Data Collection</b>					
<b>Adoption of standard data collection formats and protocols</b>	Standards for priority data types: catch and effort logbooks/logsheets & length/weight data)				Consider formats developed by the DCC
	Standards for observer data collection				Consider formats and protocols developed by the DCC. Consultation with WGIII will be necessary to formalise scientific and other objectives
	Standards for port sampling/unloading data collection				Consider formats and protocols developed by the DCC
	Technical data – vessel registers				Consultation with WGIII will be necessary
	VMS				Start with FFA standards in interim phase, then consider modification in transition/developed phases.

Objective	Action	Interim			Transition			Developed			Remarks
	Standards for collection of additional data types: biological and ecological, environmental, sociological and economic and technical										Reflect ongoing data needs prioritisation process. Changing requirements captured on the basis of the evaluation process discussed above
<b>Data verification</b>											
<b>Improve data verification</b>	Adopt member State data verification standards (flag state)										Heavily dependent on member State data collection and processing capacity
<b>Assure quality of Commission data</b>	Develop in-house quality control system										Specifics will need to be considered when the Secretariat is established
<b>Data Reporting</b>											
<b>Adopt data reporting obligations (Flag state and Coastal state)</b>	Consider existing arrangements & CWP definition and adopt Commission standards										In the short term important to recognise the importance of coastal state reporting and associated capacity to meet reporting obligations
<b>Adoption of framework for data reporting</b>	Seek agreement on reporting schedule										Essential aspect of M & E ensuring timely submission and completeness (an aspect of data verification/quality control).  Interim arrangements could be formulated; to be reviewed once the Secretariat is established.
	Identify member State data correspondents										
	Sanctions for non-compliance should be considered.										
<b>Adoption of common reporting standards</b>	Initially consider using formats developed by the DCC for annual catch data and catch and effort data										
	Adopt outline (preferred and acceptable) formats both in electronic and hardcopy form										Will need to encompass the lowest common denominator in terms of technical capacity and also reflect current and future innovations

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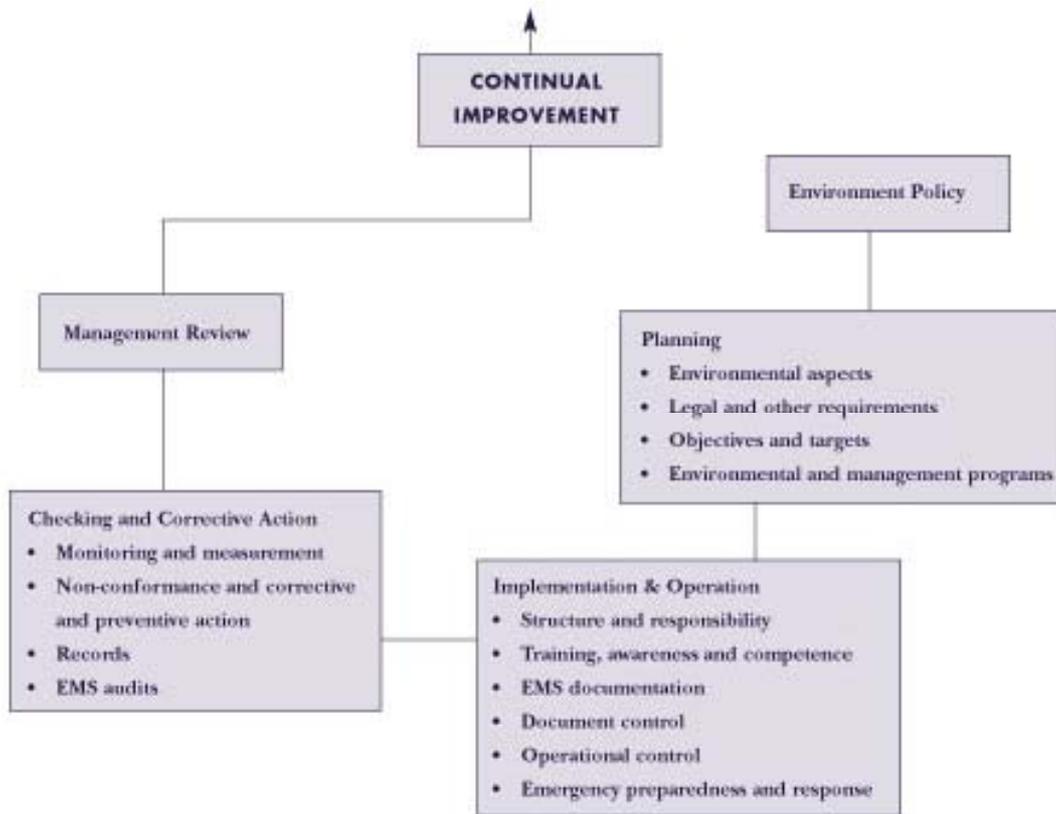
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## 11 Contacts

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Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	David Ramm	Data Manager
Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	Robert Kennedy	Data Manager
Departamen Kelautan dan Perikanan (DKP – Indonesia)	S. Wira Santosa Nilanto Perbowo	Direktor Pensawasan Ecosistem Laut
FAO – Fisheries Department Fishery Information Data and Statistics Unit	Marc Taconet	FIGIS Officer
FAO – Fisheries Department (Marine Resources Service)	Jacek Majkowski	Fishery Resources Officer
Forum Fisheries Agency (FFA)	Les Clark Joel Opnai Norman Kapun Andrew Richards	Fisheries Management Advisor Fisheries Management Advisor Database Manager Manager MCS
Commonwealth Scientific and Industrial Research Organisation (CSIRO)	John Gunn	Pelagic Ecosystems Sub-Program
Directorate General Capture Fisheries (DGCF) – Statistics (Indonesia)	Sri Dyah Retnowati	
Indian Ocean Tuna Commission (IOTC)	Alejandro Anganuzzi	Deputy Secretary
Inter-American Tropical Tuna Commission (IATTC)	Robin Allen Michael Hinton	Director Senior Scientist
International Commission for the Conservation of Atlantic Tuna (ICCAT)	Adolfo R. Lima	Executive Secretary
Ministry of Fisheries (New Zealand)	Neville Smith	Senior Scientist
Ministry of Fisheries	Noel Barut	Chief – Marine Fisheries Research Division
National Marine Fisheries Service - Southwest Fisheries Science Center	Gary Sakagawa	Senior Scientist for Highly Migratory Species
National Research Institute of Far Seas Fisheries (Japan)	Yuji Uozumi	Chairman ISC Statistics Working Group
Secretariat of the Pacific Community - Offshore Fisheries Programme (SPC-OPF)	John Hampton Peter Williams Timothy Lawson	Principal Fisheries Scientist Fisheries Database Manager Principal Fisheries Scientist (Statistics)



**Interim Advice to the Preparatory Conference for the  
Western and Central Pacific Fisheries Commission  
(WCPFC)**

**An Investigation of Technical Capabilities  
and Data Security and Confidentiality  
Policies for the Western and Central  
Pacific Region**

Prepared for

**The Preparatory Conference  
For the Western and Central Pacific  
Fisheries Commission (WCPFC)**

By

**MRAG Americas, Inc.  
110 South Hoover Boulevard  
Suite 212  
Tampa, Florida 33609  
[www.mragamericas.com](http://www.mragamericas.com)**

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## List of Acronyms

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CES	Catch and Effort Statistics
CPUE	Catch Per Unit Effort
CWP	Co-ordinating Working Party on Fishery Statistics
DBMS	Database Management System
DCC	Data Collection Committee
EEZ	Exclusive Economic Zone
FAO	United Nations Food and Agriculture Organisation
FFA	Forum Fisheries Agency
FIDI	Fishery Information, Data, and Statistics Unit
FIGIS	Fishery Global Information System
FTP	File Transfer Protocol
HMS	Highly Migratory Species
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
ISC	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
IT	Information Technology
MCS	Monitoring Control and Surveillance
MHLC	Multilateral High Level Conference
NADS	Non-target, Associated and Dependent Species
NIWA	National Institute of Water and Atmospheric Research Ltd
OPF	Oceanic Fisheries Programme
PMU	Project Management Unit
PrepCon	Preparatory Conference
RFMO	Regional Fisheries Management Organisation
SCG	Scientific Coordinating Group
SCTB	Standing Committee on Tuna and Billfish
SPC	Secretariat of the Pacific Community
SQL	Structured Query Language
UNFSA	United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement)
VMS	Vessel Monitoring System
WCPO	Western Central Pacific Ocean
WCPFC	Western Central Pacific Fishery Commission
WG	Working Group



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# 1 Introduction

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## 1.1 Background

The Convention on the Conservation and Management of Highly Migratory Fish Stocks (HMS) in the Western and Central Pacific Ocean (WCPO) was concluded in July 2000. The Convention was opened for signature at Honolulu on 5 September 2000. The Conference that negotiated the Convention passed a resolution establishing a Preparatory Conference (PrepCon), which met for the first time in April 2001 in Christchurch, NZ. The Conference recognized that PrepCon would function during an interim phase prior to ratification of the Convention. After entry into force, there is likely to be a further, transitional phase, during which not all PrepCon participants will have become members of the Commission. During this time, the Commission will progressively develop, using an evolutionary approach, to its full level of functions.

The first session of PrepCon was held in Christchurch, NZ. During the meeting, the PrepCon established two open-ended working groups:

- Working Group I (WGI) on issues relating to the organisational structure of the Commission, its budget and financial contributions.
- Working Group II (WGII) on the scientific structure of the Commission and the provision of interim scientific advice.

During the second session of the Preparatory Conference (PrepCon2), WGII reviewed and gave preliminary consideration to the Commission's needs with respect to:

1. Data requirements, including current gaps in data coverage and standards for data collection and management;
2. Science, and in particular stock assessment and advice on stock status in the short term and ongoing;
3. Research priorities and research planning and co-ordination;
4. Review of assessments, analyses and other scientific work.

WGII established an ad-hoc task group to consider the future information needs to support discussions and progress on matters related to the scientific activities of the Commission. Drawing upon the material from the ad-hoc task group the working group agreed that the following matters, amongst others, should be addressed, as far as possible, prior to the next meeting of the working group:

- An investigation of the technical capabilities, and security and data-sharing policies of existing organisations, including those of participants in the Preparatory Conference, with the view of possibly contracting out interim data services.
- A compilation and review of standards for collection, verification and for the timely exchange and reporting of data on fisheries currently practised by existing arrangements (e.g. the Standing Committee on Tuna and Billfish (SCTB), the Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), the Inter American Tropical Tuna Commission (IATTC), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the International Commission for the Conservation of Atlantic Tuna (ICCAT)) and an assessment of their suitability for use by the Commission.

During the third session of the Preparatory Conference (PrepCon3), held in Manila, a paper (WCPFC/PrepCon/WP.10) addressing these matters was presented at a meeting of WGII. It was agreed that a number of revisions and updates, to the paper, would be undertaken prior to the next meeting of the Scientific Coordinating Group (SCG). Having considered the revisions and updates recommended by WGII, it was decided that, in place of WCPFC/PrepCon/WP.10, two distinct papers would best suite the needs of the PrepCon; the first addressing data standards and the second

addressing technical capabilities. Matters relating to technical capabilities and security and data sharing policies are addressed in this paper.

Specific revisions and updates relating to technical capabilities and data security and data confidentiality issues requested are outlined below:

- the compilation of additional information relating to Regional Fishery Management Organisations (RFMOs) (specifically those of ICCAT) in order that as broad and as balanced a review of technical capabilities and confidentiality and security policies be presented;
- that the strengths and weaknesses of commercial service provision, in the context of Commission data handling needs, be addressed explicitly; and
- that recommendations should be presented in the context of the Commission development process.

## 1.2 Organization of the report

The report opens (Section 2) with a discussion of data management needs. Section 3 presents a review of the data handling capabilities of selected organisations responsible for handling fisheries data. Issues relating to hardware and software capabilities, human resources and data security and confidentiality policies are presented. In Section 4 we present a discussion of commercial data service providers, including a review of service provider use by organisations charged with handling fisheries statistics and an assessment of the value commercial service providers in support of the Commissions data handling requirements as it matures.

The information originally presented to WGII at PrepCon3 in Manila in November 2002 in WCPFC/PrepCon/WP.10 was structured in such a way as to inform the PrepCon decision-making process with regards to suitable options for meeting interim data handling needs. Significant progress was made at the SCG meeting in Hawaii, where an interim solution was identified; the SCG recommendation was subsequently endorsed at PrepCon3 in Manila by WGII:

*WG.II recognized that existing regional arrangements for the compilation and dissemination of data, coordinated by several relevant international and national sources and the SCTB, are suitable in the interim. (WCPFC/PrepCon/20 paragraph 5(f)) [Italics added]*

In light of the above and the requirement for farther reaching recommendations, the report closes with recommendations presented in the context of the Commission development process. Given the extent of uncertainty surrounding this process, rather than define explicit actions against a fixed time-frame, recommendations are presented against the backdrop of the Commission development process characterised as three 3 phases: (1) an interim period leading up to entry into force of the Convention; (2) a transitional period immediately following entry into force of the Convention and establishment of a Secretariat; and (3) a fully developed Commission.

It should, nevertheless, be recognised that uncertainty remains regarding the exact nature and institutional structure of the Commission Secretariat; recommendations are therefore by no means prescriptive but are intended as a guide for future discussions.

## 2 Data management needs

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Decision making for fisheries policy-making, planning and management relies largely on processed information, not raw data. The Multilateral High Level Conference (MHLCC) consultation report makes clear reference to the need for agreement on “*how to consolidate logbook and other data for all fleets in a confidential database.*” Further reference is also made to the need for a “*data repository system for length-frequency and associated data.*”

Similarly, the Convention requires that the Commission collect and share, in a timely manner, complete and accurate data concerning fishing activities on, *inter alia*, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes (Article 5(i)).

These requirements, coupled with responsibilities outlined in Annex I of the United Nations Fish Stocks Agreement (UNFSA), point to the requirement for Commission data management capabilities and specifically the need for regional Data Base Management System (DBMS) capacity.

If the Commission is to meet its scientific obligations, data handling capabilities will need to reflect priority data needs and be capable of scaling up to match increased volume and breadth of data and changing analytical needs.

Data types, identified as a priority for the interim period, include:

- Annual catch estimates (resolution to be agreed)
- Catch and effort data (resolution to be agreed)
- Length data
- Operational data, data on bycatch and discards, biological sampling of target and non-target species from observer data

These data are likely to remain a priority to the Commission through its transitional period. Specifics of longer-term Commission data needs have yet to be agreed, nevertheless, the Convention does refer to data types, in addition to those identified as being of high priority (biological and ecological data, environmental data, sociological and economic data). The matter of Commission data needs is discussed in greater detail in the Data Standards paper (WCPFC/PrepCon/WP.15).

### 2.1 Data management systems

Before evaluating technical capabilities necessary for data management, it is important to recognise the functions and attributes of a DBMS. Database management systems offer a means of storing data securely, whilst permitting ready access to data for analysis purposes. A fundamental principle is that data should be held in the form in which they were submitted. This allows flexibility in the way data can be processed (e.g. filtered, aggregated, transformed), and ensures all calculations are reproduced from source data incorporating all revisions.

The primary functions of database management systems are:

- To ensure data conform to standard classifications
- To ensure validity of the data;
- To ensure data integrity and internal consistency;
- To secure and maintain primary data;
- To allow easy access to primary data;
- To process the data efficiently as required;
- To allow different data sets to be integrated, thereby increasing their overall utility.

These key functions facilitate data consolidation, integration, verification, analysis, and where necessary provide a mechanism for generating reports and information for dissemination.

In considering the issue of system design and capability, the role played by database developers should be addressed carefully. There are considerable advantages in the development of database management systems in parallel with any planned data collection system, not least with regard to enhanced opportunity for data standardisation and increased potential for data integration.

## 2.2 System architecture

Available information technology (IT) is diverse and evolving rapidly; as a consequence it is important to seek the most up-to-date advice before selecting a system. When considering the approach to take for developing a new DBMS, the following options are available:

- Taking commercially available software and adapting it to new requirements;
- Piecing together a system with different software components;
- Creating a custom system from scratch.

The advantages and disadvantages vary for each approach and should be weighed carefully before committing resources (Table 1).

**Table 1. Strengths and weaknesses of three approaches to developing DBMS**

DBMS design	Strength	Weakness
Adaptation of commercial software	Useful for prototyping purposes: <ul style="list-style-type: none"> <li>• assists identification of data flows and system components; and,</li> <li>• assists integration process between data collection process and data storage design.</li> </ul>	Can have long-term limitations particularly with regard to data collected under large-scale sampling programmes – eventual migration necessary to larger more robust system
Adaptation of existing components	Quick to implement Comparatively low start-up costs	Significant modification of an existing system may lead to potential conflicts.  As a result there may be high maintenance costs associated.
Custom designed systems	Flexible - can be configured to match data collection / sampling methodology closely.  Database development itself can contribute to (act as a tool) data collection programme development, where standardisation can be of mutual benefit through standardisation of data collection and data storage	Essential presence and continuing support required of system developers, which can be costly.

In addition to data specific requirements a number of issues influence the sustainability and effectiveness of a DBMS including:

- the chosen hardware and software configuration;
- the capacity of personnel to support, maintain and develop the system; and
- the security arrangements and confidentiality policies that underpin flow of data into and from the system.

## 3 Technical capabilities to meet data handling needs

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In this section we evaluate the technical capabilities and policies of participants and organisations within the region, where the types of data of interest to the PrepCon are routinely handled. We also evaluate how RFMOs handle these matters elsewhere, for contrast with Western and Central Pacific regional organisations, and to provide an objective assessment of regional standards. The WCPO regional organisations evaluated include: SPC-OFP; the Forum Fisheries Agency (FFA); ISC; and SCTB. RFMOs considered include: CCAMLR; CCSBT; IATTC; ICCAT; and the Indian Ocean Tuna Commission (IOTC).

The information concerning data handling responsibilities, technical capabilities and security and confidentiality policies was obtained through structured questionnaires, supplemented with an extensive literature search and, where necessary, with discussions with key personnel.

### 3.1 Data handling needs

Before evaluating the technical capabilities of the selected organisations, the types of fishery data handled by each are compared with those of interest to the Commission. A summary of data types handled by each organisation is presented in Table 2.

#### 3.1.1 WCPO region organisations

SPC-OFP routinely handles the types of data of interest to the Commission, in particular those data types identified as a priority for the interim period, as discussed in Section 2. Data types that are likely to be of increasing priority to the Commission in the future are also handled by SPC-OFP to varying degrees. The majority of data considered by the SCTB are compiled by SPC-OFP, and for this reason the technical capabilities of SCTB will not be evaluated in the following section.

FFA predominantly handles technical data and to a lesser extent economic data that, although likely to be important aspects of the long-term data needs of the Commission, are less likely to be regarded as priority scientific data needs in the short to mid-term. Nevertheless, FFA capacity and expertise in relation to a future regional vessel register and regional vessel monitoring systems (VMS) should not be overlooked, particularly in the context of the Commission's monitoring control and surveillance (MCS) needs. Crosscutting benefits associated with the implementation of a comprehensive regional vessel register and regional VMS will undoubtedly influence the Commission's capacity to monitor stock status and verify fishing effort more effectively in the long-term.

ISC technical capabilities, to handle fishery data, are currently being developed; nevertheless the types of data compiled by ISC are equivalent to those identified by the PrepCon as priorities for the interim period. Despite limited information regarding technical approaches to handling fishery data there is information detailing ISC confidentiality policies from which lessons could be learned.

Of the organisations identified from the WCPO region, the SPC-OFP is most likely to maintain technical capabilities at an equivalent level to those required by the Commission; nevertheless an evaluation of FFA data handling capabilities will certainly help in identifying appropriate standards.

#### 3.1.2 RFMOs

The selected RFMOs offer examples of a broad range of data handling capabilities, which span all data types of interest to the Commission in the short term and additional data types that will be of interest in the future (Table 2). The RFMOs also represent examples of data handling capabilities at different stages of development including examples of:

- long established and comprehensive data handling systems (e.g. CCAMLR, IATTC);
- systems recently or currently under review and in the throes of being restructured (e.g. ICCAT); and
- comparatively new, developing systems (e.g. CCSBT).

Whilst currently not charged with handling significant amounts of biological and ecological data (restricted to tag-recapture data) the CCSBT is developing a database of trade statistics and plans to implement a catch documentation scheme. In addition to handling data of interest to the Commission in the short term, CCAMLR, IATTC and IOTC all handle ecological and environmental data to varying degrees. Although these data types do not fall within the initial category of priority data identified for the interim, they are likely to grow in relative importance to the Commission as it matures.

**Table 2. Summary of data types handled by the selected regional organisations with data management responsibilities**

	Commercial fishery data	Biological and ecological data	Environmental data	Sociological & economic data	Comments
FFA	✓			✓	Position information; regional VMS programme. Regional observer programme Compile economic data particularly in relation to licensing and access arrangements for negotiation purposes.
ISC	✓	✓			Catch and effort data received annually, including total catch and effort (nationally) and summarised logbook data (nationally) for all fleet segments according to agreed spatial and temporal resolutions. Length data compiled on the basis of data originating from national sampling programmes.
SPC-OFP	✓	✓	✓	✓	Collate flag state reports including aggregated and fine scale catch and effort data. Catch and effort log sheets provided to SPC by member countries and territories, mostly within the EEZ. Some high seas data provided voluntarily. Collate aggregated (summary logbook) data submitted by distant water fishing nations (DWFNs) according to agreed spatial and temporal resolution by gear type. Supplemental data obtained through industry and observer reports if no logbooks provided. Compile biological and ecological data from observer reports supplemented by national port sampling initiatives. Collate sociological and economic data for bio-economic models from sociological and economic data collected by FFA.
SCTB	✓	✓	✓		Collate data, based on reports generated by SPC-OFP. Supports initiative for regional data collection standards through SCTB Statistics Working Group.
CCAMLR	✓	✓	✓		Collate flag state reported catch and effort data at various levels of spatial and temporal aggregation: 'real-time' catch and effort reports, for each 5-day, 10-day or monthly interval during fishing seasons; fine-scale catch, effort and biological data (operational data encouraged); and annual and monthly summaries of catch and effort (STATLANT) data. Collate biological data through member State scientific observer data submissions and reports. Implement catch documentation scheme. Ecosystem information collected under the CCAMLR Ecosystem Monitoring Programme (CEMP).
CCSBT	✓	✓		✓	Developing a database of fishery statistics and trade statistics. Ongoing discussions in relation to obtaining consensus from members concerning minimum data standards and the subsequent confidentiality of those data.
IATTC	✓	✓	✓		Transcribe logbook data and collate flag state reports. Collect and collate port sampling, transshipment, unloadings and observer data. Extensive monitoring and analysis of ecological data - dolphin and other species, recent emphasis on sharks; observer data handling.

	Commercial fishery data	Biological and ecological data	Environmental data	Sociological & economic data	Comments
ICCAT	✓	✓	✓		Collate catch effort data submitted according to agreed spatial and temporal resolution by nation, vessel and gear type. ICCAT has been carrying out environmental-related activities including work on associated and independent species and by-catch.
IOTC	✓	✓		✓	Collate catch effort data submissions from contracting parties and in some cases non-contracting parties. Data reported according to standard spatial and temporal resolutions by vessel and gear type. Technical vessel and gear characteristics compiled annually. Data on bycatch (NADs) limited as no logbook requirement for bycatch reporting. Collate limited biological data - length / weight data, monthly by 5x5 (port-based sampling); tag recapture DBMS under construction. Trade statistics collected for selected species.

### 3.2 Hardware and software configurations

Hardware and software solutions employed by the selected organisations are summarised in Table 3, and more detailed information is presented in Tables 1 and 2 of the Appendix. The underlying characteristics of each of the DBMS systems are comparatively uniform in terms of the hardware and software used. Differences lie predominantly in the actual DBMS design, which in turn reflects the complexity of data handled by each organisation and the extent of data analysis performed.

The hardware infrastructure adopted by each of the systems evaluated (with the exception of the ISC system where the DBMS is still being prototyped) is the client server style configuration. There are considerable advantages to using a client-server type configuration, these include:

- enhanced potential for expansion as data needs evolve;
- relatively straightforward backup requirements; and
- central control of data, enhancing system security.

A further hardware consideration is the issue of redundancy. The capacity to replace individual components, should they fail, is essential. RAID-style hard disks offer this facility. In the event of complete hardware failure it is important that a contingency plan exists. Furthermore, comprehensive support contracts are commonly offered when hardware is purchased and may offer an appropriate solution. For example, the CCSBT server is supported by just such a service contract, which offers complete server replacement, within two working days, in the event of complete system failure.

Allied with the need for redundancy is the requirement for regular data backup. The SPC-OFP, FFA, IATTC, CCAMLR and ICCAT maintain regular schedules for database backup, which incorporate combinations of differential and full server area backups undertaken on a daily, weekly and monthly basis. The CCSBT undertakes full server area backups, daily and monthly, and stores password protected copies both on and offsite.

Although offsite backup is the norm for all organisations evaluated, none of them display provisions for out of country backups. Data confidentiality issues were cited as potential stumbling blocks preventing out of country backups both by the SPC-OFP and CCSBT. No specific information was available regarding the ISC's backup policies.

Backup features are dependent on the database engine used and its associated features. It is important to ensure that the database supports 'backup and restore' not only archiving of raw data. The ability to integrate into incremental backup regimens is now a standard feature of most high-end systems as demonstrated by the majority of the DBMSs used by the organisations evaluated.

In terms of software at the server end, the database engines used in all cases are internationally recognised relational databases. Relational database systems are capable of relatively sophisticated data storage in inter-related tables. The key attributes of relational database systems are that they discourage storage of redundant data and permit fast and complex querying. They are particularly beneficial where a large number of records are combined to synthesise results. Relational databases are designed to model highly structured data; as a consequence maintenance can be prohibitively high unless careful system design is undertaken. The majority of relational databases use Structured Query Language (SQL) for description and querying of records.

With regards DBMS choice, the most commonly used systems (Oracle / MS SQL Server) demonstrate particular strengths in that substantial user support is offered and that common systems may provide a conduit for the exchange of commonly used functions and in so doing facilitate data dissemination (between RFMOs), where appropriate.

On the subject of data dissemination, Extensible Markup Language (XML) is a simple, flexible text format originally designed to meet the challenges of large-scale electronic publishing. XML is playing an increasingly important role in the exchange of a wide variety of data on the Web. For example, the FAO's Fishery Information, Data, and Statistics Unit (FIDI) has made extensive use of XML in its Fishery Global Information System (FIGIS) programme. Some benefits associated with XML are listed below:

- Enables internationalised media-independent electronic publishing.
- Cost effective by enabling the use of inexpensive off-the-shelf tools to process data.
- Saves training and development costs by providing a single format for a wide range of uses.
- Provides for enhanced interoperability and information interchange.
- Encourages the use of platform-independent protocols for the exchange of data.
- Permits enhanced control of information display.
- Enables long-term reuse of data, with no lock-in to proprietary tools or undocumented formats.

Some additional issues to consider when designing and procuring a DBMS system include:

- the chosen platform;
- internet (intranet) connectivity / security;
- usability of the DBMS (management and manipulation tools, SQL interface, querying tools);
- the extent to which multi-user access is supported; and
- integral data security features.

**Table 3. Characteristics of DBMS solutions employed by WCPO organisations and other RFMOs**

	Client server configuration	Database engine	Client interface	Back-up schedules	Analysis tools	Web use	Upgrade policy
SPC-OFP	✓	Visual Fox Pro	Proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
FFA	✓	Oracle	Proprietary software	Regular & offsite	Custom written – externally	✓	✓
ISC	Desktop PC database still under development					Planned	
CCAMLR	✓	MS SQL Server	MS Access	Regular	In-house custom written routines / queries	✓	✓
CCSBT	✓	MS SQL Server	Limited proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
IATTC	✓	MS SQL Server	Proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓

	Client server configuration	Database engine	Client interface	Back-up schedules	Analysis tools	Web use	Upgrade policy
ICCAT	✓	MS SQL Server	MS Access & Proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
IOTC	✓	MS SQL Server	Limited proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓

Upgrade policies are required to enable future planning. This is both in terms of personnel resources required to upgrade, maintain and train for future versions but also for financial planning purposes. Large database management systems are expensive and the capital outlays required should be known in advance; commonly, upgrade policies operate on a rolling 3-5 year period.

The level of sophistication required at the client interface is dependent on the extent to which users (apart from system developers / administrators) need access to and manipulate data. For example, the client interface supporting the CCSBT system is comparatively limited, reflecting that the majority of post processing analysis (error checking, normalisation) is undertaken by the database manager and that no scientific data analysis is undertaken directly by CCSBT.

Conversely, SPC-OFP has developed a custom written graphical interface, supported by a suite of post processing and error checking routines, facilitating data entry, quality control, and analysis by fisheries scientists. An estimated 80-90% of routine queries are pre-written accounting for all standard data requests and reporting needs. An additional feature common to the majority of systems evaluated is that the query and data retrieval system is maintained in isolation (read-only) from the live database, ensuring database integrity. Given the likely requirements for data entry and post processing quality control and analysis significant efforts will likely be required in the development of appropriate graphical displays supporting both data entry and analysis.

Overarching factors to consider when discussing DBMS choice will include:

- capital costs of the solution (both start-up and recurrent);
- relative ease of maintenance;
- ease of data access through front end and its development;
- integral security features;
- the potential for internet (intranet) connectivity;
- mechanisms for data dissemination.

### 3.3 Human resources

Staffing requirements to handle fishery data are influenced by a number of factors, including: the types of data processed; the volume of data received; and the format in which data are made available.

Staffing needs may vary at different stages of DBMS development; demands may be high during the early stages of DBMS development, levelling out once the system is fully operational. Nevertheless, continued commitment to database management is essential, as are technical capabilities to develop the DBMS to match changing needs, both in terms of data storage and reporting.

Technical capabilities in terms of human resources, for each of the organisations evaluated, indicate essentially similar skill types, in that each of the organisations maintains at least a permanent database administrator and support staff responsible for data entry (Table 4, Table 3 of the Appendix). However, the number of staff of each skill type varies among the organisations.

For example, the IATTC maintains a large contingent of staff charged with DBMS analysis, development and administration (14 staff). This reflects the range of data collected and compiled by IATTC and in turn the complexity of the DBMS. Staffing levels also provide a level of redundancy. Although staffing levels associated with data handling at IATTC appear high, it is felt that workloads should be monitored closely to assess whether research needs can be met sustainably (IATTC 2002).

In comparison, staffing levels at CCSBT consist of one database manager and a single general administrative assistant who performs data entry as required. This disparity in staffing levels can be attributed to the following characteristics:

- The organisation has limited membership and as a consequence the volume of data processed is comparatively small.
- Those members that do report data to CCSBT largely submit in electronic form.
- The CCSBT undertakes no data collection itself and maintains comparatively limited data reporting obligations.
- The secretariat has no stock assessment responsibility. Data handling is therefore limited to normalisation and quality control, which is undertaken solely by the database manager.

**Table 4. Summary of human resource capabilities of the organisations evaluated**

	Staff No.	Database management	Development / programming	Statistical analysis	Data entry technicians
SPC-OFP	4 + IT support	Fisheries statistician	1 x database supervisor 1 x programmer researcher 1 x research officer analyst		4
FFA	4 + admin	Data manager, database developers (include general IT support roles for FFA). Initial structural and analysis software design outsourced			Entry clerks & admin staff
ISC	No information - system management by Fisheries Agency of Japan				
CCAMLR	-	Data manager – supported by data entry/administrative staff			
CCSBT	1 + 1	Database manager – supported by administrative officer. Majority of data submitted in electronic form			General administrative officer
IATTC	7 + 7	System manager	1 x assist. system manager 2 x data administrators 2 x programmers 1 x graphics / web designer		7 data entry & editing
ICCAT	2 + 2	Systems analyst	1 x biostatistician		2 general support staff
IOTC	4 + 2	Data manager	1 x assistant data manager 1 x data analyst / programmer 1 x webmaster		2 general support staff

A range of factors is likely to influence human resource needs, both in terms of skills and levels of staffing, including the:

- volume and complexity of reported data to be processed (short, mid, longer term);
- format of data reporting (short, mid, longer term);
- planned data intensive collection programmes (e.g. observer programmes, port sampling, tag recapture);
- relative maturity of the DBMS;
- extent of data analysis to be undertaken; and
- extent to which certain tasks may be outsourced.

The strengths and weaknesses of options to use commercial service providers are discussed in Section 4. Issues tackled include options to meet short-term capacity needs through consulting support (e.g. needs assessment, database design and prototyping) and longer-term solutions through outsourcing (e.g. data processing).

### 3.4 Data security arrangements

The importance of data security and confidentiality policies can not be overstated in the context of a RFMO and stems from the recognition that data is a resource and as such has a value, whether economic or otherwise. Confidence in RFMO security and confidentiality policies underpins the willingness of member States to submit data.

Security policies address overarching needs relating to the confidentiality and integrity of data submitted to RFMOs and must reflect security considerations relevant to both hardcopy and electronic data. Security policies must mitigate against theft of data and hardware; data loss (hardware and software failure, data corruption); and contravention of confidentiality policies. Commonly applied security measures relate to both physical security (hardware and software and paper records) and logical security of electronically stored data (Table 5).

**Table 5. Key attributes for security measures**

Physical security	Logical security
<ul style="list-style-type: none"> <li>▪ Restricted access to premises where data are held, whether in electronic or hard copy format.</li> <li>▪ Hardware access limited to valid data users, server access limited to database administrators/engineers.</li> <li>▪ Secure offsite backup storage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Integral database system security including username and password protected access to processed and pre-processed data.</li> <li>▪ Internet security provisions - firewalls</li> <li>▪ Restricted levels of access to data reflecting user requirements.</li> <li>▪ Encrypted and password protected means of data transmission, including FTP sites, CD-ROMs, diskettes etc.</li> </ul>

In addition, provision must be made for data recovery in the cases of data corruption or loss. Routine backup procedures are essential, including provision for offsite backup. Recently, consideration has also been placed on the importance of developing provisions for so called *doomsday scenarios*, where copies of data are maintained out of country to ensure recovery in the event of serious environmental disaster or political instability (backup solutions are discussed in Section 3.2).

Table 4 of the Appendix summarises some of the security policies of fisheries organisations both in and outside the WCPO region.

#### 3.4.1 Physical security

Physical security of data applied by organisations within the region appears comprehensive when compared to policies applied outside the region and the attributes presented above.

Within the region, the OFP maintains a strict data security policy; servers are maintained in a secure room to which only appointed personnel have access; and user access is restricted to authorised OFP personnel whilst hardcopy data are stored in locked filing cabinets. Equivalent restrictions are maintained by all the organisations evaluated, where information was available.

#### 3.4.2 Logical security

Access to electronic data should be controlled to ensure database integrity and confidentiality, but interfere as little as possible with legitimate access.

Global concern is steadily growing over the threat of internet breaches and cyber attacks. Each of the systems evaluated uses software-based firewall protection against access by unauthorised external users. Additional, layers of security at the user level are also used including password protected automated system locks, in the case of temporary absence of valid users.

Similarly, at the local level, OFP, IATTC, CCAMLR, FFA, and CCSBT all demonstrate similar systems, which ensure that data are logically secure. These centre upon access restrictions for

nominated personnel based on a username and password system that tailors user access based on operational requirements. In this way access to development system (the database command line) is restricted to database administrators, ensuring database integrity. Access to the live databases is generally also restricted through separate (read-only) query systems.

It is now the norm for organisations to draft a security policy document, outlining all processes and procedures applied to ensure data security and integrity. Given the rapidly evolving IT environment it is essential that security arrangements be reviewed on a regular basis to match threats as they develop. For example, security arrangements concerning wireless internet connectivity have been slow to meet security requirements of wireless networks, in so doing exposing them to potential disruption or loss / theft of data (McQuillan 2003).

### **3.5 Data confidentiality and data dissemination policies**

Given the clear requirement for data compilation and dissemination, criteria and protocols for data confidentiality will need to be established, which define the framework within which data may be disseminated. These criteria and protocols generally constitute rules-based data confidentiality policies. Where agreement has been reached, confidentiality policies describe data ownership, the type and resolution of public domain data and actions necessary to gain access to non-public domain data. Table 5 of the Appendix presents summary information regarding the data confidentiality policies of RFMOs both within the WCPO region and outside. A review of the confidentiality policies of selected RFMOs indicates that a number of common conditions surrounding issues of data confidentiality exist.

It is usual, when faced with a data request, for an organisation to be obliged to either seek the data owner/originator's permission or to at least inform them that the data have been supplied, to whom and for what reason.

Most organisations protect the identity of individual vessels, even in requests from Member scientists. The point is usually made that the name of the vessel is not important, that a code is sufficient. Although data may be supplied for scientific work, there are usually strict rules on the application of the data outside of the particular analysis for which it was intended.

Many organisations apply rules that preclude the supply of aggregated data if that aggregation contains fewer than 3 vessels. This is because if one knows which vessels have participated in a fishery, and there are only one or two of them, it is fairly easy to determine where a competitor has been fishing.

Rules-based confidentiality policies are usually defined in an effort to establish procedures for the release of data and generally specify data type and resolution. In certain cases (e.g. CCSBT) the issue of confidentiality is treated on a case-by-case basis. Protocols are defined outlining procedures to be followed if access to data is requested. Similar procedures are outlined in rules-based confidentiality policies where ad hoc data access is requested, both from Members and non-Members.

Although confidentiality of data is crucial to ensure that reliable fishery statistics are reported, it is essential that the methodologies and processes used to collect and to collate data are transparent and well documented, particularly where standards are not fully adopted or deviation from standards has been necessary.

When discussing appropriate levels of confidentiality, it is equally important to recognise that confidentiality policies can exert a significant influence on both the reliability and quality of data reporting. It is therefore essential to ensure that a balance is struck between levels of access permitted and levels of confidentiality. On the one hand, policies must not be set too high, thereby prohibiting effective use of data for analysis purposes. But neither should policies be too relaxed since confidence in the security of proprietary information underpins the quality and reliability of reported data. This balance is not easily reached, particularly since the legal position regarding business information varies from country to country. This matter is discussed in greater detail in FAO 2002 and NRC 2000.

## 4 Commercial service providers

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### 4.1 Introduction

Today's economy is characterized by tightening IT budgets and shortening technological cycles. As a consequence, there has been a marked tendency for businesses to employ commercial data service providers. Migration towards commercial service provision (particularly outsourcing) has to a great extent been championed by larger business, although small and mid-sized businesses and non-profit organizations are beginning to follow suit. Organizations classically exploiting commercial data service providers include: the service industries, particularly in the spheres of banking and ecommerce.

Before continuing this discussion it is first important to distinguish between consulting and outsourcing; both of which fall in the domain of commercial service providers. The difference between the two is best described as follows:

- consulting services meet strategic needs, usually with the objective of identifying, developing or fixing but never maintaining processes, whilst
- outsourcing services offer an alternative to in-house capabilities by maintaining processes or functions.

Commonly, commercial service providers offer a continuum of services; these range from short term technical support (needs assessments, database development) to longer term outsourcing support; as demonstrated by application service providers where data processing and web based data warehousing and analysis services are offered.

In the context of data management needs and associated Commission capabilities to deliver data of high quality in a timely fashion, the value of commercial service provision (either through consulting inputs or by outsourcing) may have benefits at a number of stages of data handling capability development and once the DBMS is established, including:

- support through the needs assessment stage;
- through system selection;
- custom database development;
- support at the implementation stage;
- database customization, report development, and other enhancements including additional database capabilities to meet the needs of newly established data collection programmes;
- staff support (training, and documentation);
- system support (database management, server management).

Consulting support can offer a means of reducing lead-time as in-house capabilities are developed. Database development projects tend to require sustained periods of intense work followed by long periods of relative stability; the requirement for specific technical skills over a defined period of time lends itself well to consulting support.

With regards to outsourcing, there is, however, a viewpoint that suggests that under certain circumstances handling data in-house is preferable; this position rests upon a number of underlying questions, the most pertinent of which is: *Is data management a core competency of the organization?*

In-house collaboration between system developers and users can offer greater flexibility and timely responses to changing needs through an enhanced understanding of the datasets in question and direct access to tools and features to manipulate data 'locally'. A particular risk identified with regards to the use of data service providers lies in an organization becoming dependent on a particular service provider or developer. Methods can be implemented which mitigate against this situation, not the least of which is accurate documentation and comprehensive monitoring of progress by in-house staff.

Additional considerations include: (1) whether sufficient hardware and software infrastructure is maintained in-house and (2) the extent to which interaction between system developers and users is required to create, maintain and enhance system capabilities.

On the other hand, particular strengths exist in employing service providers including, those relating to: economic considerations; the technical competence of staff; and the scalability of resulting systems.

- Scalability – in-house solutions rely on finite resources, outsourced data warehousing service providers offer solutions designed to overcome problems associated with increasing data volume.
- Reduced total cost ownership – commercial service providers leverage volume purchasing power for hardware, software and human resources, resulting in cost efficiencies that can be passed on to clients.
- Best of breed technology – by virtue of technology industry contacts, service providers maintain access to ‘state of the art’ hardware and software and retain sufficient expertise to maximize the benefits of innovations in the field.

Key questions, to bear in mind, when considering the use of commercial service providers should include:

- Is data management a core competency of the organisation?
- Is data analysis a core competency of the organisation?
- Will sufficient dedicated technical resources be available in-house to build and then effectively support a solution that meets both short term and longer term needs?
- What are the total cost ownership implications (i.e. cost benefits of in-house versus outsourced)?

## **4.2 Fishery data handling organisations – experience with commercial data service providers**

Classically the use of service providers by organisations in sectors outside fisheries (e.g. banking and securities firms etc) stems from a conscious move towards focusing in-house capacity towards core competencies and cost efficiency considerations. This move has been strengthened dramatically as confidence in the quality of services offered, both locally and remotely, has improved.

The extent to which RFMOs use service providers in support of data management tasks appears limited; this likely reflects the perception that the ‘*core competencies*’ of RFMOs lie in data handling, as demonstrated by CCSBT, which has no stock assessment role but maintains a DBMS of fishery statistics.

A number of RFMOs were consulted regarding the extent to which service providers have been, are, or will be used in support of data handling activities (Table 6). Additionally where support has been accessed, comments were sought regarding the quality of services delivered and any ensuing benefits or problems encountered.

Of the RFMOs consulted, positive responses regarding the use of commercial service providers were received from CCAMLR and, to a certain extent, ICCAT. In addition to RFMO use of service providers, we also considered the case of New Zealand, where outsourcing of administrative aspects of fisheries management has been widely implemented (Table 7). The case of New Zealand is unique in that the driving force behind outsourcing has been a broader initiative towards devolved management of domestic fisheries (increased industry participation in and ownership of the monitoring process) rather than an explicit response to the need for meeting technical capability needs or cost efficiencies.

**Table 6.** The experience of RFMO and WCPO regional organisations with commercial service providers

**CCAMLR**

All data processing undertaken in-house.  
Stand-alone database development work (in progress) has been outsourced.  
Additional service provider support used for document translation.

Reasoning

The Secretariat conducts data processing and database development as part of its regular functions. Therefore, outsourcing of these functions is only usually considered if in-house resources are insufficient to meet short-term needs. In the case of irregular data submissions, where short-term need is low (for processed data) best option is simply to delay until in-house capacity is freed to handle any backlog. Outsourced data processing was considered but was rejected because data are not submitted regularly and no appropriate local service providers were identified. Perceived costs associated with looking beyond local providers (time / tenders / review etc) have resulted in the employment of full time data entry clerks.

Additional comments

1. Current services towards stand-alone database development are considered good and CCAMLR would, if needed, use a commercial service provider in the future for similar short-term inputs.
2. Time must be allocated for liaison with and monitoring of service providers, associated costs and (staff) effort regarded as a major constraint.
3. With regards wider application of service provider support towards DBMS development - unless this type of work is done/maintained regularly, by the service provider, it is not cost-effective in the long term, as in-house staff must remain fully cognoscente of service provider development efforts to maintain and undertake further DBMS development.

Confidentiality issues

Confidentiality issues met through use of a strict confidentiality agreement between CCAMLR and the service provider.

**CCSBT**

Currently no service provider support  
Previously a small portion of data entry was outsourced to a local data processing company

Reasoning

There is sufficient capacity in-house to undertake all data entry processing and DBMS development. Actual in-house data analysis requirements are limited to quality control of data submissions and reporting.

Additional comments

Outsourced data entry not of adequate quality. Significant staff time was required to error check data supplied by the service provider.

**IATTC**

No commercial service provider support.  
Programmers have been hired for specific project development.

Reasoning

Confidentiality of data and access to data present a significant stumbling block preventing data handling by persons or commercial operations which do not have protection from search and seizure (immunity) under USA laws. While this could possibly be overcome, it has not been the path chosen. This also limits the amount of data permitted in overseas offices.

Additional comment

Maintaining data compilation and management closely with analysts leads to a much better understanding of the information and its usefulness/limitations by those tasked with its analysis.

There are significant benefits to regular interaction between analysts and the data management team. Frequent interaction (on a daily basis) offers a means of mitigating problems in data and permits timely and appropriate responses to changes in the nature of the data observed from the field (collection) to the entry process. This understanding may be lost when analysts are presented with digested data or data developed lacking such interaction during collection and compilation.

**ICCAT**

Currently no service provider support  
During the early stages of ICCAT development a service provider was used in initial DBMS development

Reasoning

ICCAT maintains an in-house team of data entry clerks, developers and programmers capable of meeting all data handling needs.

**IOTC**

Currently no service provider support is used, although limited independent consulting support has been secured

Reasoning

IOTC maintains an in-house team of data entry clerks, developers and programmers capable of meeting all data handling needs. In-house capability has developed as Commission data handling needs have evolved

Additional comments

A forthcoming tag recapture programme will place significant stress on existing human resources. There are indications that consulting support will be sought - technical staffing capabilities have already been supplemented in anticipation of this through employment of an additional programmer / database developer (on a short term contract basis). In addition programme management is likely to be overseen by a project management unit (PMU) housed in IOTC facilities. Data handling will however be undertaken using existing IOTC IT infrastructure.

**FFA**

Limited information available, although consulting support was used in the development of FFA DBMS capabilities. Ongoing support is maintained as and when necessary. Comprehensive DBMS documentation is maintained in support of in-house development activities mitigating against dependence on the service provider.

**FAO – FIDI (FIGIS programme)**

Specific technical needs met through short term consulting contracts with programmers. All indications point to the comparative success of this approach.

**Table 7. The experience of the New Zealand Ministry of Fisheries with commercial service providers**

**New Zealand Ministry of Fisheries (MFish)**

**Catch effort data management (service provider: FishServe)**

Contracted to FishServe for a 6-year period, since 2001. Services include all administrative aspects of catch and effort data handling. 'Clean' electronic copies are forwarded to MFish on a regular basis. The drivers behind this were largely towards providing greater control to the fishing industry for services they pay for - FishServe is wholly owned and supported by the New Zealand seafood industry. In addition to handling catch and effort data FishServe is also responsible for other administrative services:

**Devolved Services:**

The services that the New Zealand Seafood Industry are responsible for through FishServe include:

- ACE Transfers and Registers
- Quota Share Transfers and Registers
- Client Management
- Vessel Registration
- Monthly Harvest Returns
- Licensed Fish Receiver Returns
- Caveats

**Contracted Services:**

The services that are provided under a contract from the Ministry of Fisheries include:

1. Fishing Permit Issue and Administration
2. Crown revenue collection
3. Quota Allocation
4. Catch Effort Processes
5. Special Approvals
6. Managing the Crown's ACE and Quota portfolio

There are indications that the contract has been successful – success has been attributed to extensive efforts taken to outline standards and specifications for all aspects of data handling. In addition, an MFish staff member is charged with auditing the quality of the service provided on a monthly basis.

**Storage and management of research data (service provider: National Institute of Water and Atmospheric Research Ltd, NIWA)**

NIWA is one of 9 New Zealand Crown Research Institutes; NIWA operates as a stand-alone company with its own board of directors and its shares held by the Crown. NIWA is responsible for data entry, quality control and data warehousing of fisheries research data (incl. market sampling, trawl survey data, dive survey data etc.) on behalf of MFish. Extracts of data are provided to researchers on an as required basis. A small in house policy group is maintained at MFish, which sets standards and monitors/audits the service provider and adjudicates as required on release of data.

NIWA has been responsible for managing research data on behalf of MFish since 1995, on the basis of a 2-year rolling (non-contestable) contract. The non-contestable aspect of the contract is also reviewed every 2 years.

**Collection of research data**

These services are contracted to a wide variety of organisations. Approximately 30 projects are tendered annually (competitive tender) to collect research data. Contracts are typically for 1 or 2 years. An example is the contract tendered to Bluewater Marine Research (independent fisheries research consultancy). A 3-year contract to manage a gamefish tag recapture programme. The contractor collates and reports on recapture information annually; the groomed data set is then incorporated into the research database managed by NIWA. As with other research data managed by NIWA it is then available to MFish or any approved researcher as required.

The example set by New Zealand clearly demonstrates that commercial service provider support, when monitored closely, can be applied successfully and can achieve both reduced costs and high quality of data and processing efficiency. It is important to note that the service providers used demonstrate considerable experience with handling equivalent data types (NIWA, Bluewater Marine) or close fishing sector association (FishServe – represents producer organisations although no track record in providing similar services).

Nevertheless, the review of selected RFMOs indicates that despite increased confidence in services offered, the trend towards the use of service providers for data handling processes, observed in other sectors, has not been reflected in RFMO approaches to data handling.

Key issues, identified on the basis of the experience summarised above, are presented below in the context of different aspects of data handling capabilities:

**DBMS development** – RFMOs regard data handling, including development and data processing as part of their regular functions and therefore show a preference towards maintaining sufficient in-house technical capabilities. Given the labour intensive nature, technical skills required and defined time periods associated with DBMS development, there are indications that consulting support in this area, particularly during the early stages of system development (needs assessment, system design etc.) may be beneficial.

**DBMS support and maintenance** – Regarded as a core task of an RFMO, and as such necessary technical and staffing capabilities and infrastructure are maintained in-house. Additionally, service provider support is regarded as unsustainable in the long-term, since in-house staff need to be fully cognoscente of development efforts, to ensure that future modifications or developments can be undertaken seamlessly (this issue can however be overcome if accurate documentation is maintained and service provider work is comprehensively monitored).

**Routine data processing** – Although there are examples of situations where data entry tasks have been outsourced the quality of service was deemed questionable. Rather than outsource, the tendency is to prioritise data needs (deal with backlogs when staff are available) and cope with additional processing requirements through multi-tasking of generalised administrative staff.

**Stand-alone / project needs** – Here service provider expertise has been employed and is viewed as an efficient and cost effective means of meeting short-term needs (when in-house capacity is insufficient). Potential constraints include the '*hidden*' costs associated with identification of appropriate consulting support, monitoring / auditing demands on staff and the need to develop detailed standards and specifications, beyond the needs for in-house staff. Issues of data confidentiality may also act as a barrier, although this can usually be overcome with comprehensive privacy agreements.

A fundamental weakness in using a commercial service provider to handle fishery data was underlined by a number of the organisations approached on this matter. The issue here relates to

maximising the utility of data to analysts responsible for stock assessment and scenario modelling. The point was made that it is essential for data analysts to work in consultation with data handlers, both at the collection and processing stage, to ensure that maximum benefits are obtained from available data and to ensure that analysts are aware of changes in data and are able to react to these changes appropriately and in a timely fashion.

A number of potential risks were also identified, which might influence the decision to seek support from commercial service providers, these include:

- A significant amount of professional staff time must be dedicated to liaison with service providers, particularly with respect to monitoring / auditing progress and evaluating quality of service.
- There are significant costs associated with identifying, evaluating and contracting service providers.
- There may be dangers of dependence upon service providers, which should be avoided.
- Breaches in confidentiality policies and laws protecting proprietary information.
- Goals of the service provider may not be in line with the clients' objectives (organisation philosophy).
- Response times for new tools slower than if in-house expertise is maintained.

### 4.3 Options for the Commission

Drawing from the information above, this section presents a discussion of possible options open to the Commission to support fishery data handling activities. To structure the analysis we have identified key data handling functions and placed these into the context of the Commission development process (Table 8).

**Table 8. Provisional timeline for developing Commission data handling functions**

Function	Time Period		
	Interim (I)	Transition (T)	Fully-developed (F)
<b>Overarching</b>	Security policy (I)	Policy review (T, F)	Policy review (T, F)
	Confidentiality policy (I)		
	Interim data handling arrangements (I)		
<b>DBMS development</b>	Needs assessment (I)	System selection (T)	
		Development & implementation - process mapping; detailed specifications (tables, screens, reports, interface etc.) (T)	
		System testing – prototyping (T)	
<b>DBMS management</b>		Support and maintenance – ongoing modifications, upgrades, training (T, F)	Support and maintenance – ongoing modifications, upgrades, training (T, F)
<b>Routine data processing</b>	Data entry (I, T, F)	Data entry (I, T, F)	Data entry (I, T, F)
	Quality control (I, T, F)	Quality control (I, T, F)	Quality control (I, T, F)
		Electronic data integration / normalisation (T, F)	Electronic data integration / normalisation (T, F)
		Dissemination / reporting formats established & reviewed (T, F)	Dissemination / reporting formats established & reviewed (T, F)
<b>Stand-alone projects / programmes</b>			Observer programme, research surveys, stock assessment, biological and ecological research (F)

Contingent with interim data handling arrangements, consideration and agreement on provisional data standards and security and confidentiality policies will provide the infrastructure based on which specific data handling capability needs will be assessed.

Actions during the transition period will likely focus on the development of Commission IT infrastructure and the selection, development and implementation of DBMS capabilities. Practical application of mutually agreed security and confidentiality policies will allay concerns regarding data integrity and access to proprietary information.

Once the Commission is fully established resources will be required to maintain the DBMS, process data and respond both to analysis requirements and change. Likely requirements will include establishment of capabilities to handle additional data types, including: observer data; research survey data etc.; and to integrate MCS data from other sources. Processes will need to be established to ensure that Commission data reporting responsibilities will be met in a timely fashion and that analysts are adequately serviced for stock assessment and other scientific purposes. The establishment of a formal process of review will facilitate response to change in terms of data priorities, technical innovations and threats to data security.

### 4.3.1 SWOT analysis: outsourcing and consulting services

The following section presents an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) associated with commercial service provision (Table 9). The data handling functions analysed apply to those detailed in the time-line above and include: database development, database support and maintenance, data entry and processing, and response to new projects.

**Table 9. SWOT analysis for commercial service provision**

Source	Strength	Weakness	Opportunity	Threat
In-house: all functions performed by Commission staff	<ul style="list-style-type: none"> <li>• Coordination with analysts to develop database (DB)</li> <li>• DB manager has major role with DB</li> <li>• On-site expertise available for maintenance;</li> <li>• "Ownership" of DB and its uses</li> </ul>	<ul style="list-style-type: none"> <li>• DB development is labour intensive over finite time and requires specific skills</li> <li>• Short-term needs may not match long-term needs</li> <li>• Funding may limit staff and diminish system function</li> </ul>	<ul style="list-style-type: none"> <li>• Core task of Commission</li> <li>• Responsive to needs of member states and analysts</li> </ul>	<ul style="list-style-type: none"> <li>• DB may not be available to receive data on time</li> <li>• Insufficient human resources to process data</li> </ul>
Consultant: Contractor provides guidance and coordinates with staff as needed (e.g. development, stand-alone projects)	<ul style="list-style-type: none"> <li>• Similar to in-house, but use services as needed</li> <li>• Combine with staff</li> <li>• No long-term commitment required</li> <li>• Objective, unbiased approach</li> <li>• Instils urgency - delivery against defined timelines</li> </ul>	<ul style="list-style-type: none"> <li>• In-house capabilities may not be sufficient to handle subsequent problems</li> <li>• Cost may outweigh benefits for small projects</li> </ul>	<ul style="list-style-type: none"> <li>• Can free database staff for long-term needs</li> <li>• Flexibility - hire specific expertise as and when needed</li> </ul>	<ul style="list-style-type: none"> <li>• May be significant lead time associated with identifying and evaluating contractors</li> <li>• Contractor may not meet standards</li> <li>• Bias towards an inappropriate solution</li> </ul>

Source	Strength	Weakness	Opportunity	Threat
Outsource: Contractor performs functions off-site	<ul style="list-style-type: none"> <li>• Cost efficiencies – capital costs &amp; operational costs</li> <li>• Access to best of breed solutions</li> <li>• Offers a readily scalable solution</li> </ul>	<ul style="list-style-type: none"> <li>• Lower on-site expertise</li> <li>• No coordination with analysts</li> <li>• Extensive oversight needed from staff</li> <li>• Requires staff cognoscente of all functions</li> <li>• Requires full documentation</li> <li>• Slower response to problems</li> <li>• Few service providers with equivalent experience</li> </ul>	<ul style="list-style-type: none"> <li>• Opportunity to devolve data functions - frees resources</li> <li>• Can search for best quality</li> <li>• Change contractor if necessary</li> <li>• Capital outlay risks mitigated</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor may not meet standards</li> <li>• Security-confidentiality breach</li> <li>• Contractor may not have long-term view</li> <li>• Dependency on contractor</li> <li>• Consistency lost – change of contractor</li> <li>• Contractor may not understand needs fully</li> <li>• Bias towards a particular solution</li> <li>• Risk of shadow system in-house</li> <li>• Lack of “ownership”</li> </ul>

Considerable uncertainty remains regarding the institutional structure of the Commission Scientific Secretariat, it is clear however that both the Secretariat and the subsequent Data Manager will play a significant role in developing the database system and defining associated processes and procedures. Firm recommendations, at this stage, are not realistic; nevertheless, it appears that certain aspects of Commission data handling may benefit consulting support. The results of the analysis supported by information in the previous sections are presented below.

#### 4.3.2 DBMS development

DBMS development actions are characterised by a finite, labour intensive period, where specific skills are required. Human resource needs associated with DBMS development therefore may not match longer-term needs; consulting support may offer a means of bridging the gap between potential short- and long-term needs. Options to secure consulting expertise should be considered at the needs assessment stage and in support of DBMS design and development. If the option of consulting support is followed, careful selection of contractors and close participation between contractors and Secretariat staff will be necessary to assure that objectives are met. An added benefit of securing technical support under contract is that work is delivered against defined timelines, in this way emphasising the urgency of required tasks, which may otherwise fall behind in favour of other priorities.

#### 4.3.3 DBMS maintenance and support

Devolved control of DBMS management and associated processes appears unsatisfactory in the context of the Commission. Fundamental characteristics of Commission data handling capabilities will be flexibility and ready capacity to adapt to change in terms of the types of data handled, analysis needs and innovations in the IT environment. These characteristics suggest a close association between developers and analysts, implying that this function would best be undertaken in-house.

#### 4.3.4 Data entry and processing

As with DBMS maintenance and support it will be important for the Commission to retain control over data processing. In addition to concerns regarding data security and confidentiality, maintaining in-house data processing capabilities will ensure the quality and consistency of data.

#### 4.3.5 Solutions to new and stand-alone projects

As with DBMS development there may be some disparity between short- and long-term needs. New data handling requirements may demand significant technical and human resource needs that might best be served through short-term consulting support. It is too early at this stage (institutional structures remain uncertain, DBMS capabilities are yet to be established) to determine which

programmes will require or would benefit most from consulting support. However, WGII has identified specific programmes that will likely come into force in the future, e.g. a regional observer programme, research surveys, biological and ecological research, stock assessment and MCS programmes. Discernable advantages lie in short-term consulting support, particularly where stand-alone projects are concerned, although data confidentiality and security issues will need to be considered.

## 5 Recommendations

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The UNFSA, the MHLC consultation report, and Convention text all point to the requirements for Commission data handling capabilities and specifically the need for regional DBMS capabilities. Priority data requirements of the Commission in the short- to mid-term are likely to consist of fishery and biological data, including annual catch estimates; catch and effort data; and biological information, specifically length frequency data. Data sources are likely to include flag and coastal state reported catch and effort estimates, and observer data and port sampling data.

WCPFC/PrepCon/WP.3 presented a series of alternative organisations to meet the science provision requirements of the Commission. WCPFC/PrepCon/WP.7

1. reviewed recommendations on these alternatives from WGI, WGII, and PrepCon 2 for developing an initial science structure for the Secretariat, and
2. proposed staffing levels and budgets for the first several years of the Secretariat.

Agreement on preliminary staffing levels for the scientific component of the Secretariat in advance of ratification of the Convention will allow the Secretariat to quickly fill the positions needed for efficient provision of the Commission's science needs in the medium term, provided that the use of external providers of certain technical functions is maximized.

### 5.1 Interim period

In practical terms, WGII has recommended that interim data handling be undertaken by SPC-OFP, coordinated by SCTB. SPC-OFP capabilities compare favourably with those of organisations charged with handling equivalent data types and volumes. Although outsourcing this task to an alternative service provider may have been an option, on balance this is not seen as an efficient option for the interim period.

- SPC\_OFP technical capabilities (hardware and software associated with the OFP DBMS) demonstrate a relatively sophisticated system, on a par with systems used elsewhere for the management of regional fishery data.
- The SPC-OFP already compiles fishery data for the entire WCPO region. Data submissions are made on a voluntary basis and comprise predominantly data of coastal State origin, and as a result are not comprehensive. Notwithstanding this, the types of data handled do reflect the priority data types identified by the SCG.
- There is still some room for increasing the data management workload at OFP without increasing the number of current staff. However, if in the medium term, there is a major increase in data compiled on behalf of the Commission, then the situation may need to be reviewed.

The interim marks an important period during which significant ground-work could be made by WGII and the PrepCon towards establishing the Commission's data handling capabilities that will underpin the Commissions' capacity to meet scientific objectives. Development of data handling capabilities is likely to be regarded as a priority objective for the short to mid-term. However, the Scientific Secretariat and the Database Manager would reasonably expect to participate in developing any subsequent database system. WGII and PrepCon could, however, develop a needs assessment for the DBMS during the interim period as a recommendation to the Secretariat and the Data Manager.

Confidentiality and security policies underpin the confidence of member States to report data. It is essential that the Commission agree and adopt sufficient security arrangements and equitable confidentiality policies that reflect both concerns regarding proprietary data and the needs of analysts and researchers to enable the Commission to meet its scientific obligations. WGII and PrepCon could, therefore, develop interim confidentiality and security policies for subsequent adoption by the Commission.

## 5.2 Transitional period

On balance, establishment of an *'in-house'* Commission DBMS, and maintenance and support capabilities appears preferable to outsourcing to a data provider. With this in mind securing a Database Manager early in the transition phase will provide the Secretariat with the opportunity to focus efforts on the complex and involved task of DBMS development. Whether the Commission chooses a custom-built database, a commercial database, or modifications of existing databases, substantial time will be required to have all the hardware and software components functioning properly. Consulting for technical assistance in participation with Commission staff could provide the required skills and reduce the time needed in undertaking:

- detailed needs assessment;
- procurement and installation of hardware and software;
- physical DBMS design;
- DBMS prototyping;
- DBMS documentation; and
- handover from interim arrangements to in-house DBMS.

WCPFC/PrepCon/WP.7 proposed a first-year scientific staffing structure of an Executive Director, Science Manager, IT Manager, and a Network Administrator. Over a period of two years, the Secretariat would progressively recruit one Science Analyst, one Data Analyst, one Observer Program Manager, and one Compliance Manager. This would appear to be a satisfactory way to proceed at this stage and should provide the Commission with the human resources necessary to manage the delivery of science in the initial phase. Details of longer-term data handling and analytical needs will become apparent through the transition period. Human resource needs will need to be evaluated to ensure that the required skills and staff- time are available to meet data processing needs and the following range of functions:

- ongoing DBMS development and fine-tuning, particularly with regards to analysis needs and automated solutions (reporting and dissemination);
- re-assessment of IT needs;
- capacity to monitor and implement security arrangements; and
- capacity to ensure that confidentiality policies are implemented and monitored as data types handled and reporting requirements evolve.

## 5.3 The fully functioning Commission

Much uncertainty remains regarding the final form of the Secretariat and of the database system and management unit of the Commission. As such, the Commission must retain some flexibility for the final capabilities of the data unit to evolve. Additional data collection programmes will be identified and priority data types modified. Member States will establish routine data reporting to the Commission and capacity of the States to efficiently report will improve, likely through a move from paper copy reporting to electronic reporting.

WGII has identified specific programmes that will likely come into force in the future, e.g. observer programme, research surveys, VMS, biological and ecological research, and stock assessment. WGII recommended that the Commission contract out some of these programmes rather than conduct them in-house. Some of these programmes (observer, VMS) retain similar confidentiality concerns as discussed earlier, which suggests that the Commission data management staff be responsible for developing (perhaps with consultant assistance) and maintaining the databases and entering data. If reassessment of staff commitments and evolving needs determines that the Commission should consider outsourcing DBMS for stand-alone programmes to commercial service providers, the tag recapture programme, research surveys, and biological and ecological research might prove most appropriate given that these programmes combine collection and compilation of non-confidential data.



## 6 Resources

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## 7 Appendix

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**Table 1. Hardware & software configurations**

Organisat	Server & Client machines	Upgrade policy	Database
OFF	<p>Separate Database, Web and Mail servers. Database server specifications include: HP3000 900 MHz; 1 Gb RAM; Data storage - 6 drives 2 x RAID0, 3 x RAID5, 1 Hot swap</p> <p>Client machine minimum specifications include: Pentium 4; 1.7 Ghz processor; 512 Mb RAM; 80 Gb Hard drive.</p> <p>Backup facilities include a 60 Gb supporting tape drive, soon to be upgraded to 840 Gb. The current drive is capable of backing up all existing data.</p>	No routine replacement cycle. Upgrades chiefly motivated by software compatibility.	<b>Visual Fox Pro (VFP)</b> Relational database including administrative databases and metadata: Data registry database; Global reference tables
FFA	VMS and FFA have separate networks and servers HP 9000 servers 10 x 5Gb HD.	Hardware upgraded when perceived necessary to support programmes.	<b>Oracle v 7.3</b> UNIX operating system Data integrated where possible: Regional vessel register, observer database, people and organisations, vessel activity and catch (US Treaty), violations and prosecutions, Fisheries agreements and licensing.
ISC	Desktop PC database Still under development		
CCAMLR	Client server configuration	Annual review and upgrade cycle	<b>MS SQL Server</b> In house custom design and development. All major data sets integrated where possible
CCSBT	<p>Combined file and database server</p> <p>Compaq 1.25 Gb RAM RAID type HD Broadband internet connection</p>	<p>Informal upgrade policy, predominantly driven by operating system compatibility.</p> <p>The system is 2 years old – server lifespan expected to exceed 5 years and 4 years for client machines.</p>	<p><b>MS SQL Server</b></p> <p>For simplicity and flexibility, some links (particularly to the “CODES” table) are maintained through triggers and stored procedures rather than via referential integrity constraints.</p> <p>Date and time stamps used to manage data.</p> <p>Do not use public metadata standards although description fields are included for internal database administration purposes.</p>
IATTC	<p>Servers include: database; mail; file; and web. Minimum specification - Pentium processor, 512 Mb RAM, Storage 9 Gb</p> <p>Network 10/100 Mb TX Ethernet</p> <p>Numerous client machines with minimum specification – Pentium 400MHz, 256 Mb RAM, Storage 20Gb</p>	<p>Flexible hardware standard set to accommodate change.</p> <p>Bi-annual capacity and obsolescence evaluations.</p>	<b>MS SQL Server</b>
ICCAT	<p>Dedicated data base server: Compaq Proliant dual processor (Pentium-3 Xeon 1000 Mhz) with 2GB RAM -4 drives (Raid-5)</p> <p>A total of 20 clients PC (pentium 3 and 4), 6 of which are for the exclusive use of staff involved in fishery statistics.</p>	Machines replaced at least every 4 years	<p>Server End (Windows 2000 Server)</p> <p>Data base software: SQL-Server 2000</p>

**Table 2. Hardware & software configurations**

	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
OFP	<p>Standard routines including: referential checks, reports and, standard loading routines based on custom queries written in visual basic –using custom query building software (<i>Quick Query</i>).</p> <p>No other analysis software bar standard MS products.</p> <p>Any transformation and adjustment to data undertaken in a development version of the database in the first instance.</p>	<p>Visual Fox Pro (VFP) front-end (MS ACCESS front-ends developed for SPC clients)</p> <p>Comprehensive custom designed data entry system; the system is under continual development, paperless solutions are under investigation including FTP logsheet transfer.</p> <p>Comprehensive post processing query and data retrieval system also written in VFP – 80-90% of queries are pre-written.</p> <p>A professional licence is held by OFP that permits 3<sup>rd</sup> party software and subset dissemination.</p>	<p>No scheduled review</p> <p>Upgrades when necessary, driving force is compatibility.</p> <p>Extensive software testing prior to upgrades incl. patches upgrades</p>
FFA	<p>Custom written VFP routines for: Verification Analysis Data retrieval</p>	<p>Database front-end – custom written ORACLE VMS front-end – custom programme (<i>MapTrac</i>) based on MapInfo</p>	<p>Upgrade as and when available</p>
ISC	No information	No information	No information
CCAMLR	Off the shelf (MS Office, S-Plus, FORTRAN) and purpose built routines	MS Access front end.	Annual review and upgrade cycle
CCSBT	Custom written query software, designed and maintained by contracted developers.	<p>Client machines use 3 x MS Windows 2000 Professional, 1 x XP, operating systems.</p> <p>Visual basic interface - Limited for the time being to module associated with data entry</p> <p>Comprehensive data entry interfaces for three modules:</p> <ul style="list-style-type: none"> <li>• the Tag Recapture module;</li> <li>• the Trade Information Scheme module; and,</li> <li>• the Reference File module.</li> </ul> <p>All other data loaded electronically and extracted via SQL queries for other modules.</p>	<p>Informal upgrade policy</p> <p>Driving force behind upgrades is software compatibility with member States</p>
IATTC			Regular audit and review process
ICCAT	Proprietary Software written in Visual Fortran, Delphi, Visual studio	<p>Client end (Microsoft platforms): Microsoft Access 2000 Proprietary Software written in Visual Fortran, Delphi, Visual studio</p>	

**Table 3. Human resources**

OFP	<p>8 permanent staff</p> <ul style="list-style-type: none"> <li>• 1 x Fisheries Statistician responsible for overall management of the section, liaison with users external to SPC, editing and publication of statistical bulletins, and conducting statistical analyses</li> <li>• 1 x Programmer / Research Officer responsible for maintaining data processing and query interface software, providing technical support for tuna fishery database systems in SPC member countries and territories, and compiling data summaries.</li> <li>• 1 x Research Officer / Analyst responsible for maintaining data processing and query interface software, providing technical support for tuna fishery database systems in SPC member countries and territories, and maintaining the SPC/OFP website.</li> <li>• 1 x Fisheries Database Supervisor is responsible for supervising the processing of data, maintaining data processing software, and compiling data summaries</li> <li>• 4 x Data Entry Technicians responsible for data entry and other secretarial duties, as required.</li> </ul> <p>In addition, technical support is provided to national and regional port sampling and observer programmes through the work of 3 further staff members not strictly linked to data handling, but who nevertheless influence the quality of data submissions. These include a port sampling supervisor, an observer supervisor, and a port sampling and observer trainer.</p> <p>IT system management is handled independently of the OFP by the SPC IT unit that handles operating systems and server backup.</p>
FFA	4 permanent staff including a database developer – the bulk of design work and development has been outsourced. A combination of data entry clerks and FFA admin staff manage data processing needs.
ISC	No information – the system is to be managed by the Fishery Agency of Japan
IATTC	<p>IATTC employs 7 permanent IT staff including:</p> <ul style="list-style-type: none"> <li>• 1 x System manager</li> <li>• 1 x Assistant system manager</li> <li>• 2 x Data administrator</li> <li>• 2 x Programmers</li> <li>• 1 x Graphics/web designer</li> </ul> <p>Additional support is available from some 7 data editing and data entry personnel. IATTC are unsure if current staffing levels will be sufficient to support all projects.</p>
CCSBT	<p>Data submissions predominantly take electronic form, although on occasions there is a requirement for data entry (e.g. tagging returns, trade information). Data entry was formerly outsourced but the quality was deemed poor; all data entry is now undertaken by the database manager with assistance from the administrative office.</p> <ul style="list-style-type: none"> <li>• 1 x database manager responsible for editing and publication of statistical bulletins, supervising the processing of data, maintaining data processing software, compiling data summaries and maintaining the CCSBT website.</li> <li>• 1 x administrative officer who occasionally assists with data entry.</li> </ul>
ICCAT	<p>4 permanent staff compile, verify, update and disseminate data, as follows.</p> <ul style="list-style-type: none"> <li>• 2 professional category staff (1 Systems Analyst responsible for the overall management of this department and 1 Biostatistician responsible for developing and maintaining databases and query interfaces)</li> </ul> <p>2 general service staff for data entry, verification and validation, and secretarial duties.</p>

**Table 4. Data Security**

Organisation	Data security provisions
OFP	<p>The OFP makes specific provision to ensure security and confidentiality of all data submissions  <i>Access to unauthorised users is restricted through:</i></p> <ul style="list-style-type: none"> <li>• Firewall protection</li> <li>• Integral operating system based password and username requirement for access to data.</li> <li>• Automatic system lock with password protection is instigated after 5 minutes</li> <li>• Restricted access to data for authorised users – e.g. scientists only have access to data through the query system (read-only access)</li> <li>• Development system (db command line) access restricted to database developers.</li> </ul> <p><i>External users:</i></p> <ul style="list-style-type: none"> <li>• SPC Fire wall –logically secure from external attack.</li> <li>• Web access password protected; access restricted to Member nations and OFP personnel. Member nations only have access to their own data sets (one user per nation).</li> <li>• Virus checking software is regularly updated</li> </ul> <p><i>Physical security:</i></p> <ul style="list-style-type: none"> <li>• All hardcopy data are stored in locked file cabinets in a secure area of SPC.</li> <li>• Offices locked out of hours</li> <li>• Access to hardware (servers restricted to IT personnel (locked room)</li> </ul>
ISC	No details available
CCSBT	<p>The CCSBT has recently agreed policies relating to data security.  <i>Electronic data security</i></p> <ul style="list-style-type: none"> <li>• The Database Manager will control the level of access that is allocated to individuals.</li> <li>• Access to the Secretariat’s computers will require logging on with a valid user-name and password. Passwords of users will be changed every 60 days.</li> <li>• The Secretariat’s computers will have screen savers with password protection. Screen savers will have a “wait” time of less than 10 minutes.</li> <li>• Access to the Secretariat’s database will require a valid username and password. Direct access to the database will not be available via the internet.</li> <li>• Any confidential data that is not held on the database (e.g. data files received by the Secretariat prior to being loaded onto the database) will either be stored in a password-protected file, or on an encrypted section of the hard disk that requires a password to be accessed.</li> <li>• Transmission of confidential data via electronic means (e.g. e-mail, disk, CD, FTP) will always use password protected files (e.g. password protected Excel and Zip files), or an e-mail encryption system.</li> <li>• Backups of CCSBT data (e.g. tapes, disks) will be password protected and/or be stored in an external secure environment.</li> </ul> <p><i>Physical data security</i></p> <ul style="list-style-type: none"> <li>• The Secretariat’s office is locked when unattended and is monitored by an electronic security system when the building is closed (e.g. in the evenings).</li> <li>• Physical data (e.g. paper records) of a confidential nature will be kept within the Secretariat’s office, or in the company of a Secretariat staff member.</li> <li>• Physical data that are deemed to be highly confidential will be stored in filing cabinets and cupboards that are locked when the office is unattended.</li> <li>• Physical copies of electronic data provided to the Secretariat (e.g. CD’s) will be destroyed or returned to the supplier of the data.</li> </ul>
Organisation	Data security provisions

Organisation	Data security provisions
ICCAT	<ul style="list-style-type: none"> <li>• Access to the data base centre is limited to Staff working in this section.</li> <li>• Daily and monthly backup facilities using 50 GB on tape drive</li> <li>• A bank safe deposit box is rented for the storage of backup files</li> <li>• An anti-virus shield is installed on each computer</li> </ul>
IOTC	<p>Procedures for safeguarding records and databases include:</p> <ul style="list-style-type: none"> <li>• Access to logbook-level information will be restricted to IOTC staff requiring these records for their official duties. Each staff member having access to these records will be required to sign an attestation recognising the restrictions on the use and disclosure of the information.</li> <li>• Logbook records will be kept locked, under the specific responsibility of the Data Manager. These sheets will only be released to authorised IOTC personnel for the purpose of data input, editing or verification. Copies of these records will be authorised only for legitimate purposes and will be subjected to the same restrictions on access and storage as the originals.</li> <li>• Databases will be encrypted to preclude access by unauthorised persons. Full access to the database will be restricted to the Data Manager and to senior IOTC staff requiring access to these data for official purposes, under the authority of the Secretary. Staff entrusted with data input, editing and verification will be provided with access to those functions and data sets required for their work.</li> </ul>

**Table 5. Data Confidentiality**

Organisation	Data confidentiality
OFP	<p>The OFP policy on the dissemination of data is identical to the policy that was established by the Standing Committee on Tuna and Billfish at its eleventh meeting in July 1998 (Anon., 1998).</p> <p>Annual catch estimates, by gear type, flag state and year, are considered to be in the public domain.</p> <p>Policies relating to catch and effort agreed at the eleventh meeting of the Standing Committee on Tuna and Billfish (SCTB11).</p> <ul style="list-style-type: none"> <li>• Catch and effort data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries, for all fishing nations combined, are considered to be in the public domain.</li> <li>• Catch and effort data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries, stratified by fishing nation, are available for release at the discretion of the Co-ordinator of the SCTB Statistics Working Group (SWG), for those sources of data which have so authorised the SWG Chairman. For those sources of data that have not authorised the SWG Chairman to release data at his discretion, authorisation for the release of data must be obtained from the sources of the data.</li> <li>• Catch and effort data grouped at a finer level of time-area stratification may be released with authorisation from the sources of the data.</li> <li>• Catch and effort data are released for research purposes only, and to individuals who can be trusted to use the data responsibly. The person requesting the data is required to provide a description of the research project. The data are released only for use in the specified research project and the data must be destroyed upon completion of the research project. However, catch and effort data may be released for general usage, such that the data need not be destroyed, with authorisation from the sources of the data.</li> <li>• The person requesting the data will be asked to provide a report of the results of the research project to the SWG Chairman for subsequent forwarding to the sources of the data.</li> </ul> <p>All SPC member countries and territories, except New Zealand, have authorised the OFP Fisheries Statistician to release data at its discretion. Of the non-SPC sources of data held by the OFP, the Forum Fisheries Agency, Japan and Korea require authorisation before their data can be released.</p> <p>Policies relating to length data are the same as those detailed for catch and effort data</p> <p>Observer data - observer reports released to the agency that arranged the placement of the observer (when the agency does not already have a copy of the report) or to the captain and owner of the vessel (if a request is received by the OFP). Otherwise, only summary information for research purposes is released by the OFP.</p>
ISC	<p>Public domain: Total catch and effort aggregated over entire North Pacific with caveat that some discards in N Pacific not reported.</p> <p>Confidential: Raw data, both commercial and biological contains proprietary information and is therefore considered confidential. Access restricted to contributors and authorised scientists of ISC WGs. Any requests from non-contributing parties, all ISC members and observers will be informed of details of the request and permission solicited from contributors. If species specific data are requested the appropriate WG head will take lead in seeking approval. Access to non-public domain data by contributors for purposes other than stock assessment treated as above. Access rules cannot be changed without agreement of all contributors</p>

Table 5. Data Confidentiality Continued

Organisation	Data confidentiality
CCAMLR	<p>CCAMLR has a series of rules for access to data.</p> <ol style="list-style-type: none"> <li>1. For the preparation of scientific papers for CCAMLR, all scientific data are available but only on request from nominated scientific committee representatives, for specified reasons. All data originators/owners are informed that the data have been supplied.</li> <li>2. If scientists wish to publish analyses that include CCAMLR data, they must obtain permission of the data owner/originators.</li> <li>3. For data pertaining to compliance and enforcement, data access is limited to nominated Member officers. These are highly sensitive data, often including commercial information. Therefore, the data are filtered on a need-to-know basis, so that for instance the owners can see all the data whereas importing states can only see quantities (not destination companies, and not origins) of fish.</li> <li>4. Although haul-by-haul data may be released to CCAMLR Members requesting them, the identity of observers and vessels is protected by the adoption of codes.</li> </ol> <p>CCAMLR has recently become concerned about the commercial confidentiality of data available to participants at working groups. This concern has come about because some delegations to scientific working groups bring with them representatives of commercial organisations. The solution has been to apply the same rules as above at working groups. Thus data are only supplied to specific requestors (not made generally available to all participants) for specific work (for instance, in the WCPO context someone conducting an assessment of bigeye would only be given bigeye data, not yellowfin data).</p> <p>The following Rules for Access and Use of CCAMLR Data were adopted by the Eleventh Meeting of the Commission (CCAMLR-XI, para. 4.35): These rules replace those adopted at the Eighth Meeting of the Commission (CCAMLR-VIII, paragraph 64)</p> <ol style="list-style-type: none"> <li>(a) All data submitted to the CCAMLR Data Centre should be freely available to Members for analysis and preparation of papers for use within the Commission, the Scientific Committee and their subsidiary bodies.</li> <li>(b) The originators/owners of the data should retain control over any use of their unpublished data outside of CCAMLR.</li> <li>(c) Requests to the Secretariat by individual scientists of a Member for access to data in the CCAMLR Data Centre will only be considered if the request has been approved in writing by the Representative to the Scientific Committee (or his nominated deputy) of that Member. The Representative is responsible for informing the individual scientist requesting the data, of the rules governing access to CCAMLR data and for obtaining the requester's agreement to comply with these rules.</li> <li>(d) When Members request access to data for the purpose of undertaking analyses or preparing papers to be considered by future meetings of CCAMLR bodies, they should indicate the reason for the request and the nature of envisaged data analysis. The Secretariat should supply the data and inform the originators/owners of the data of this action, together with the details of the original request. When data are requested for purposes other than consideration by future meetings of CCAMLR bodies, the Secretariat will, in response to a detailed request, supply the data only after permission has been given by the originators/owners of the data.</li> <li>(e) Data contained in papers prepared for meetings of the Commission, the Scientific Committee, and their subsidiary bodies should not be cited or used in the preparation of papers to be published outside of CCAMLR without the permission of the originators/owners of the data. Furthermore, because inclusion of papers in the <i>Selected Scientific Papers</i> series or any other of the Commission's or Scientific Committee's publications, constitutes formal publication, written permission to publish papers prepared for meetings of the Commission, Scientific Committee and Working Groups should be obtained from the originators/owners of the data and authors of papers.</li> <li>(f) The following statements should be placed on the cover page of all unpublished working papers and background documents tabled: This paper is presented for consideration by CCAMLR and may contain unpublished data, analyses, and/or conclusions subject to change. Data contained in this paper should not be cited or used for purposes other than the work of the CCAMLR Commission, Scientific Committee, or their subsidiary bodies without the permission of the originators/owners of the data.</li> </ol>

Table 5. Data Confidentiality Continued

Organisation	Data confidentiality
CCSBT	<p>Data provided for the CCSBT database will be treated confidentially and will not be released by the Secretariat except where members of the Extended Commission approve the specific data release on a case-by-case basis.</p> <p>Consensus at SAG/ESC meetings and subsequent approval by the Extended Commission is sufficient approval for release of specific data to members of the Extended Commission for the purpose of routine data exchange for the stock assessment and management procedure. This approval will apply until the Extended Commission revises the data confidentiality policy. Release of other data requires case-by-case approval from an exchange of correspondence (including e-mails) between Extended Commission member's nominated contacts.</p> <p>When providing approval to release specific data, members of the Extended Commission can specify that the particular data does not require their re-approval for future releases by the Secretariat. In these situations, members of the Extended Commission must also specify the groups of people (e.g. public, Extended Commission members) to whom the Secretariat may release the data without requiring case-by-case re-approval. The Secretariat will maintain a list of data sets (and associated groups of people) that are approved for release without requiring case-by-case re-approval. The list will be provided to members of the Extended Commission and members of the Extended Commission have the right to revise the approvals that they have given.</p>
IATTC	<p>Confidentiality is provided by laws against search and seizure of IATTC records. Detailed data (e.g. logbook or company records) are only released with written permission of the individuals providing the data to the IATTC. Access is provided to summary data, which does not reveal the identify of operations of individual companies or vessels. Catch &amp; effort data summaries on 5x5- quarter resolution are available on request. Coastal state agencies may be provided 1x1- month catch &amp; effort summaries for their EEZs on request. Other formats may be provided on an ad hoc basis by request to and approval of the Director of Investigations: requests for scientific purposes and research collaboration are seldom disapproved. Release of selected data from the observer program is provided for by signature agreement of vessel skippers and owners. This data is available to flagging nations, and to the International Review Panel (IRP) without vessel identification, for purposes of investigating compliance with marine mammal protection.</p> <p>IATTC catch and effort data aggregated by 5° by 5° are made available, if catches by individual vessels cannot be identified in the aggregated data. Data aggregated by 1° by 1° may be released if justified by reasonable use. Raw logbook data may only be released with authorisation from the skipper and the owner. Observer data are confidential, although under certain conditions observer data are provided to the government of the fishing nation in which the vessel is registered. Other research data collected by individual scientists are exchanged with scientists outside IATTC on an ad hoc basis.</p>
ICCAT	<p>Nominal catch data are available on the ICCAT web page and distributed to ICCAT scientists on CD. Catch and effort data, size data and tagging data are available on request (through statistical correspondents), with the exception of detailed data from observer programs, for which confidentiality may be requested at the time of submission. Such data may be used in assessments on the condition that the scientists involved undertake to respect the confidentiality requirements.</p>

Table 5. Data Confidentiality Continued

Organisation	Data confidentiality
IOTC <sup>1</sup>	<p>The IOTC has a defined policy for releasing catch-and-effort and length-frequency data:</p> <ul style="list-style-type: none"> <li>• Catch-and-effort and length-frequency data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries stratified by fishing nation are considered to be in the public domain, provided that the catch of no individual vessel can be identified within a time/area stratum. In cases when an individual vessel can be identified, the data will be aggregated by time, area or flag to preclude such identification, and will then be in the public domain.</li> <li>• Catch-and-effort and length-frequency data grouped at a finer level of time-area stratification will only be released with written authorisation from the sources of the data. Each data release will require the specific permission of the Secretary based on the following criteria: <ul style="list-style-type: none"> <li>○ A Working Party will specify the reasons for which the data are required.</li> <li>○ Individuals requesting the data are required to provide a description of the research project, including the objectives, methodology and intentions for publication. Prior to publication, the manuscript should be cleared by the Secretary. The data are released only for use in the specified research project and the data must be destroyed upon completion of the project. However, with authorisation from the sources of the data, catch-and-effort and length-frequency data may be released for long-term usage for research purposes, and in such cases the data need not be destroyed.</li> <li>○ The identity of individual vessels will be hidden in fine-level data unless the individual requesting this information can justify its necessity.</li> <li>○ Both Working Parties and individuals requesting data shall provide a report of the results of the research project to IOTC for subsequent forwarding to the sources of the data.</li> </ul> </li> </ul> <p>Data submitted to working parties</p> <ul style="list-style-type: none"> <li>• Data submitted to Working Parties will be retained by the Secretariat or made available for other analyses only with the permission of the source. The above rules of confidentiality will apply to all members of Working Parties.</li> </ul>

<sup>1</sup> The IOTC policy on data dissemination was modelled on the OFP policy (David Ardill, IOTC, pers. comment)



## 8 List of Organisations Contacted

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FAO – Fisheries Department (Marine Resources Service)	Jacek Majkowski	Fishery Resources Officer
FAO – Fisheries Department Fishery Information Data and Statistics Unit	Marc Taconet	FIGIS Officer
Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	Robert Kennedy	Data Manager
Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	David Ramm	Data Manager
Inter-American Tropical Tuna Commission (IATTC)	Robin Allen Michael Hinton	Director Senior Scientist
International Commission for the Conservation of Atlantic Tuna (ICCAT)	Adolfo R. Lima	Executive Secretary
Indian Ocean Tuna Commission (IOTC)	Alejandro Anganuzzi	Deputy Secretary
National Marine Fisheries Service - Southwest Fisheries Science Center	Gary Sakagawa	Senior Scientist for Highly Migratory Species
Forum Fisheries Agency (FFA)	Les Clark Joel Opnai Norman Kapun Andrew Richards	Fisheries Management Advisor Fisheries Management Advisor Database Manager Manager MCS
National Research Institute of Far Seas Fisheries (Japan)	Yuji Uozumi	Chairman ISC Statistics Working Group
Ministry of Fisheries (New Zealand)	Neville Smith Kim Duckworth	Senior Scientist Research Data Manager
Secretariat of the Pacific Community - Offshore Fisheries Programme (SPC-OFP)	John Hampton Peter Williams Timothy Lawson	Principal Fisheries Scientist Fisheries Database Manager Principal Fisheries Scientist (Statistics)



**Interim Advice to the Preparatory Conference for the  
Western and Central Pacific Fisheries Commission (WCPFC)**

**An Investigation of Technical Capabilities  
and Data Security and Confidentiality  
Policies for the Western and Central Pacific  
Region**

Prepared for

**The Preparatory Conference  
For the Western and Central Pacific  
Fisheries Commission (WCPFC)**

By

**MRAG Americas, Inc.  
110 South Hoover Boulevard  
Suite 212  
Tampa, Florida 33609  
[www.mragamericas.com](http://www.mragamericas.com)**

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## List of Acronyms

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CES	Catch and Effort Statistics
CPUE	Catch Per Unit Effort
CWP	Co-ordinating Working Party on Fishery Statistics
DBMS	Database Management System
DCC	Data Collection Committee
EEZ	Exclusive Economic Zone
FAO	United Nations Food and Agriculture Organisation
FFA	Forum Fisheries Agency
FIDI	Fishery Information, Data, and Statistics Unit
FIGIS	Fishery Global Information System
FTP	File Transfer Protocol
HMS	Highly Migratory Species
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IOTC	Indian Ocean Tuna Commission
ISC	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean
IT	Information Technology
MCS	Monitoring Control and Surveillance
MHLC	Multilateral High Level Conference
NADS	Non-target, Associated and Dependent Species
NIWA	National Institute of Water and Atmospheric Research Ltd
OFF	Oceanic Fisheries Programme
PMU	Project Management Unit
PrepCon	Preparatory Conference
RFMO	Regional Fisheries Management Organisation
SCG	Scientific Coordinating Group
SCTB	Standing Committee on Tuna and Billfish
SPC	Secretariat of the Pacific Community
SQL	Structured Query Language
UNFSA	United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement)
VMS	Vessel Monitoring System
WCPO	Western Central Pacific Ocean
WCPFC	Western Central Pacific Fishery Commission
WG	Working Group



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# 1 Introduction

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## 1.1 Background

The Convention on the Conservation and Management of Highly Migratory Fish Stocks (HMS) in the Western and Central Pacific Ocean (WCPO) was concluded in July 2000. The Convention was opened for signature at Honolulu on 5 September 2000. The Conference that negotiated the Convention passed a resolution establishing a Preparatory Conference (PrepCon), which met for the first time in April 2001 in Christchurch, NZ. The Conference recognized that PrepCon would function during an interim phase prior to ratification of the Convention. After entry into force, there is likely to be a further, transitional phase, during which not all PrepCon participants will have become members of the Commission. During this time, the Commission will progressively develop, using an evolutionary approach, to its full level of functions.

The first session of PrepCon was held in Christchurch, NZ. During the meeting, the PrepCon established two open-ended working groups:

- Working Group I (WGI) on issues relating to the organisational structure of the Commission, its budget and financial contributions.
- Working Group II (WGII) on the scientific structure of the Commission and the provision of interim scientific advice.

During the second session of the Preparatory Conference (PrepCon2), WGII reviewed and gave preliminary consideration to the Commission's needs with respect to:

1. Data requirements, including current gaps in data coverage and standards for data collection and management;
2. Science, and in particular stock assessment and advice on stock status in the short term and ongoing;
3. Research priorities and research planning and co-ordination;
4. Review of assessments, analyses and other scientific work.

WGII established an ad-hoc task group to consider the future information needs to support discussions and progress on matters related to the scientific activities of the Commission. Drawing upon the material from the ad-hoc task group the working group agreed that the following matters, amongst others, should be addressed, as far as possible, prior to the next meeting of the working group:

- An investigation of the technical capabilities, and security and data-sharing policies of existing organisations, including those of participants in the Preparatory Conference, with the view of possibly contracting out interim data services.
- A compilation and review of standards for collection, verification and for the timely exchange and reporting of data on fisheries currently practised by existing arrangements (e.g. the Standing Committee on Tuna and Billfish (SCTB), the Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), the Inter American Tropical Tuna Commission (IATTC), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the International Commission for the Conservation of Atlantic Tuna (ICCAT)) and an assessment of their suitability for use by the Commission.

During the third session of the Preparatory Conference (PrepCon3), held in Manila, a paper (WCPFC/PrepCon/WP.10) addressing these matters was presented at a meeting of WGII. It was agreed that a number of revisions and updates, to the paper, would be undertaken prior to the next meeting of the Scientific Coordinating Group (SCG). Having considered the revisions and updates recommended by WGII, it was decided that, in place of WCPFC/PrepCon/WP.10, two distinct papers would best suite the needs of the PrepCon; the first addressing data standards and the second addressing technical capabilities. Matters relating to technical capabilities and security and data sharing policies are addressed in this paper.

Specific revisions and updates relating to technical capabilities and data security and data confidentiality issues requested are outlined below:

- the compilation of additional information relating to Regional Fishery Management Organisations (RFMOs) (specifically those of ICCAT) in order that as broad and as balanced a review of technical capabilities and confidentiality and security policies be presented;
- that the strengths and weaknesses of commercial service provision, in the context of Commission data handling needs, be addressed explicitly; and
- that recommendations should be presented in the context of the Commission development process.

## 1.2 Organization of the report

The report opens (Section 2) with a discussion of data management needs. Section 3 presents a review of the data handling capabilities of selected organisations responsible for handling fisheries data. Issues relating to hardware and software capabilities, human resources and data security and confidentiality policies are presented. In Section 4 we present a discussion of commercial data service providers, including a review of service provider use by organisations charged with handling fisheries statistics and an assessment of the value commercial service providers in support of the Commissions data handling requirements as it matures.

The information originally presented to WGII at PrepCon3 in Manila in November 2002 in WCPFC/PrepCon/WP.10 was structured in such a way as to inform the PrepCon decision-making process with regards to suitable options for meeting interim data handling needs. Significant progress was made at the SCG meeting in Hawaii, where an interim solution was identified; the SCG recommendation was subsequently endorsed at PrepCon3 in Manila by WGII:

*WG.II recognized that existing regional arrangements for the compilation and dissemination of data, coordinated by several relevant international and national sources and the SCTB, are suitable in the interim.* (WCPFC/PrepCon/20 paragraph 5(f)) [Italics added]

In light of the above and the requirement for farther reaching recommendations, the report closes with recommendations presented in the context of the Commission development process. Given the extent of uncertainty surrounding this process, rather than define explicit actions against a fixed time-frame, recommendations are presented against the backdrop of the Commission development process characterised as three 3 phases: (1) an interim period leading up to entry into force of the Convention; (2) a transitional period immediately following entry into force of the Convention and establishment of a Secretariat; and (3) a fully developed Commission.

It should, nevertheless, be recognised that uncertainty remains regarding the exact nature and institutional structure of the Commission Secretariat; recommendations are therefore by no means prescriptive but are intended as a guide for future discussions.

## 2 Data management needs

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Decision making for fisheries policy-making, planning and management relies largely on processed information, not raw data. The Multilateral High Level Conference (MHLC) consultation report makes clear reference to the need for agreement on *“how to consolidate logbook and other data for all fleets in a confidential database.”* Further reference is also made to the need for a *“data repository system for length-frequency and associated data.”*

Similarly, the Convention requires that the Commission collect and share, in a timely manner, complete and accurate data concerning fishing activities on, *inter alia*, vessel position, catch of target and non-target species and fishing effort, as well as information from national and international research programmes (Article 5(i)).

These requirements, coupled with responsibilities outlined in Annex I of the United Nations Fish Stocks Agreement (UNFSA), point to the requirement for Commission data management capabilities and specifically the need for regional Data Base Management System (DBMS) capacity.

If the Commission is to meet its scientific obligations, data handling capabilities will need to reflect priority data needs and be capable of scaling up to match increased volume and breadth of data and changing analytical needs.

Data types, identified as a priority for the interim period, include:

- Annual catch estimates (resolution to be agreed)
- Catch and effort data (resolution to be agreed)
- Length data
- Operational data, data on bycatch and discards, biological sampling of target and non-target species from observer data

These data are likely to remain a priority to the Commission through its transitional period. Specifics of longer-term Commission data needs have yet to be agreed, nevertheless, the Convention does refer to data types, in addition to those identified as being of high priority (biological and ecological data, environmental data, sociological and economic data). The matter of Commission data needs is discussed in greater detail in the Data Standards paper (WCPFC/PrepCon/WP.15).

### 2.1 Data management systems

Before evaluating technical capabilities necessary for data management, it is important to recognise the functions and attributes of a DBMS. Database management systems offer a means of storing data securely, whilst permitting ready access to data for analysis purposes. A fundamental principle is that data should be held in the form in which they were submitted. This allows flexibility in the way data can be processed (e.g. filtered, aggregated, transformed), and ensures all calculations are reproduced from source data incorporating all revisions.

The primary functions of database management systems are:

- To ensure data conform to standard classifications
- To ensure validity of the data;
- To ensure data integrity and internal consistency;
- To secure and maintain primary data;
- To allow easy access to primary data;

- To process the data efficiently as required;
- To allow different data sets to be integrated, thereby increasing their overall utility.

These key functions facilitate data consolidation, integration, verification, analysis, and where necessary provide a mechanism for generating reports and information for dissemination.

In considering the issue of system design and capability, the role played by database developers should be addressed carefully. There are considerable advantages in the development of database management systems in parallel with any planned data collection system, not least with regard to enhanced opportunity for data standardisation and increased potential for data integration.

## 2.2 System architecture

Available information technology (IT) is diverse and evolving rapidly; as a consequence it is important to seek the most up-to-date advice before selecting a system. When considering the approach to take for developing a new DBMS, the following options are available:

- Taking commercially available software and adapting it to new requirements;
- Piecing together a system with different software components;
- Creating a custom system from scratch.

The advantages and disadvantages vary for each approach and should be weighed carefully before committing resources (Table 2.1).

**Table 2.1 Strengths and weaknesses of three approaches to developing DBMS**

DBMS design	Strength	Weakness
Adaptation of commercial software	Useful for prototyping purposes: <ul style="list-style-type: none"> <li>• assists identification of data flows and system components; and,</li> <li>• assists integration process between data collection process and data storage design.</li> </ul>	Can have long-term limitations particularly with regard to data collected under large-scale sampling programmes – eventual migration necessary to larger more robust system
Adaptation of existing components	Quick to implement Comparatively low start-up costs	Significant modification of an existing system may lead to potential conflicts.  As a result there may be high maintenance costs associated.
Custom designed systems	Flexible - can be configured to match data collection / sampling methodology closely.  Database development itself can contribute to (act as a tool) data collection programme development, where standardisation can be of mutual benefit through standardisation of data collection and data storage	Essential presence and continuing support required of system developers, which can be costly.

In addition to data specific requirements a number of issues influence the sustainability and effectiveness of a DBMS including:

- the chosen hardware and software configuration;
- the capacity of personnel to support, maintain and develop the system; and
- the security arrangements and confidentiality policies that underpin flow of data into and from the system.

## **3 Technical capabilities to meet data handling needs**

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In this section we evaluate the technical capabilities and policies of participants and organisations within the region, where the types of data of interest to the PrepCon are routinely handled. We also evaluate how RFMOs handle these matters elsewhere, for contrast with Western and Central Pacific regional organisations, and to provide an objective assessment of regional standards. The WCPO regional organisations evaluated include: SPC-OFP; the Forum Fisheries Agency (FFA); ISC; and SCTB. RFMOs considered include: CCAMLR; CCSBT; IATTC; ICCAT; and the Indian Ocean Tuna Commission (IOTC).

The information concerning data handling responsibilities, technical capabilities and security and confidentiality policies was obtained through structured questionnaires, supplemented with an extensive literature search and, where necessary, with discussions with key personnel.

### **3.1 Data handling needs**

Before evaluating the technical capabilities of the selected organisations, the types of fishery data handled by each are compared with those of interest to the Commission. A summary of data types handled by each organisation is presented in Table 3.1.

#### **3.1.1 WCPO region organisations**

SPC-OFP routinely handles the types of data of interest to the Commission, in particular those data types identified as a priority for the interim period, as discussed in Section 2. Data types that are likely to be of increasing priority to the Commission in the future are also handled by SPC-OFP to varying degrees. The majority of data considered by the SCTB are compiled by SPC-OFP, and for this reason the technical capabilities of SCTB will not be evaluated in the following section.

FFA predominantly handles technical data and to a lesser extent economic data that, although likely to be important aspects of the long-term data needs of the Commission, are less likely to be regarded as priority scientific data needs in the short to mid-term. Nevertheless, FFA capacity and expertise in relation to a future regional vessel register and regional vessel monitoring systems (VMS) should not be overlooked, particularly in the context of the Commission's monitoring control and surveillance (MCS) needs. Crosscutting benefits associated with the implementation of a comprehensive regional vessel register and regional VMS will undoubtedly influence the Commission's capacity to monitor stock status and verify fishing effort more effectively in the long-term.

ISC technical capabilities, to handle fishery data, are currently being developed; nevertheless the types of data compiled by ISC are equivalent to those identified by the PrepCon as priorities for the interim period. Despite limited information regarding technical approaches to handling fishery data there is information detailing ISC confidentiality policies from which lessons could be learned.

Of the organisations identified from the WCPO region, the SPC-OFP is most likely to maintain technical capabilities at an equivalent level to those required by the Commission; nevertheless an evaluation of FFA data handling capabilities will certainly help in identifying appropriate standards.

#### **3.1.2 RFMOs**

The selected RFMOs offer examples of a broad range of data handling capabilities, which span all data types of interest to the Commission in the short term and additional data types that will be of interest in the future (Table 3.1). The RFMOs also represent examples of data handling capabilities at different stages of development including examples of:

- long established and comprehensive data handling systems (e.g. CCAMLR, IATTC);
- systems recently or currently under review and in the throes of being restructured (e.g. ICCAT); and
- comparatively new, developing systems (e.g. CCSBT).

Whilst currently not charged with handling significant amounts of biological and ecological data (restricted to tag-recapture data) the CCSBT is developing a database of trade statistics and plans to implement a catch documentation scheme. In addition to handling data of interest to the Commission in the short term, CCAMLR, IATTC and IOTC all handle ecological and environmental data to varying degrees. Although these data types do not fall within the initial category of priority data identified for the interim, they are likely to grow in relative importance to the Commission as it matures.

**Table 3.1 Summary of data types handled by the selected regional organisations with data management responsibilities**

	Commercial fishery data	Biological and ecological data	Environmental data	Sociological & economic data	Comments
FFA	✓			✓	Position information; regional VMS programme. Regional observer programme Compile economic data particularly in relation to licensing and access arrangements for negotiation purposes.
ISC	✓	✓			Catch and effort data received annually, including total catch and effort (nationally) and summarised logbook data (nationally) for all fleet segments according to agreed spatial and temporal resolutions. Length data compiled on the basis of data originating from national sampling programmes.
SPC-OFP	✓	✓	✓	✓	Collate flag state reports including aggregated and fine scale catch and effort data. Catch and effort log sheets provided to SPC by member countries and territories, mostly within the EEZ. Some high seas data provided voluntarily. Collate aggregated (summary logbook) data submitted by distant water fishing nations (DWFNs) according to agreed spatial and temporal resolution by gear type. Supplemental data obtained through industry and observer reports if no logbooks provided. Compile biological and ecological data from observer reports supplemented by national port sampling initiatives. Collate sociological and economic data for bio-economic models from sociological and economic data collected by FFA.
SCTB	✓	✓	✓		Collate data, based on reports generated by SPC-OFP. Supports initiative for regional data collection standards through SCTB Statistics Working Group.

	Commercial fishery data	Biological and ecological data	Environmental data	Sociological & economic data	Comments
CCAMLR	✓	✓	✓		Collate flag state reported catch and effort data at various levels of spatial and temporal aggregation: 'real-time' catch and effort reports, for each 5-day, 10-day or monthly interval during fishing seasons; fine-scale catch, effort and biological data (operational data encouraged); and annual and monthly summaries of catch and effort (STATLANT) data. Collate biological data through member State scientific observer data submissions and reports. Implement catch documentation scheme. Ecosystem information collected under the CCAMLR Ecosystem Monitoring Programme (CEMP).
CCSBT	✓	✓		✓	Developing a database of fishery statistics and trade statistics. Ongoing discussions in relation to obtaining consensus from members concerning minimum data standards and the subsequent confidentiality of those data.
IATTC	✓	✓	✓		Transcribe logbook data and collate flag state reports. Collect and collate port sampling, transshipment, unloadings and observer data. Extensive monitoring and analysis of ecological data - dolphin and other species, recent emphasis on sharks; observer data handling.
ICCAT	✓	✓	✓		Collate catch effort data submitted according to agreed spatial and temporal resolution by nation, vessel and gear type. ICCAT has been carrying out environmental-related activities including work on associated and independent species and by-catch.
IOTC	✓	✓		✓	Collate catch effort data submissions from contracting parties and in some cases non-contracting parties. Data reported according to standard spatial and temporal resolutions by vessel and gear type. Technical vessel and gear characteristics compiled annually. Data on bycatch (NADs) limited as no logbook requirement for bycatch reporting. Collate limited biological data - length / weight data, monthly by 5x5 (port-based sampling); tag recapture DBMS under construction. Trade statistics collected for selected species.

### 3.2 Hardware and software configurations

Hardware and software solutions employed by the selected organisations are summarised in Table 3.2, and more detailed information is presented in Table 7.1 and Table 7.2 of the Appendix. The underlying characteristics of each of the DBMS systems are comparatively uniform in terms of the hardware and software used. Differences lie predominantly in the actual DBMS design, which in turn reflects the complexity of data handled by each organisation and the extent of data analysis performed.

The hardware infrastructure adopted by each of the systems evaluated (with the exception of the ISC system where the DBMS is still being prototyped) is the client server style configuration. There are considerable advantages to using a client-server type configuration, these include:

- enhanced potential for expansion as data needs evolve;
- relatively straightforward backup requirements; and
- central control of data, enhancing system security.

A further hardware consideration is the issue of redundancy. The capacity to replace individual components, should they fail, is essential. RAID-style hard disks offer this facility. In the event of complete hardware failure it is important that a contingency plan exists. Furthermore, comprehensive support contracts are commonly offered when hardware is purchased and may offer an appropriate solution. For example, the CCSBT server is supported by just such a service contract, which offers complete server replacement, within two working days, in the event of complete system failure.

Allied with the need for redundancy is the requirement for regular data backup. The SPC-OFP, FFA, IATTC, CCAMLR and ICCAT maintain regular schedules for database backup, which incorporate combinations of differential and full server area backups undertaken on a daily, weekly and monthly basis. The CCSBT undertakes full server area backups, daily and monthly, and stores password protected copies both on and offsite.

Although offsite backup is the norm for all organisations evaluated, none of them display provisions for out of country backups. Data confidentiality issues were cited as potential stumbling blocks preventing out of country backups both by the SPC-OFP and CCSBT. No specific information was available regarding the ISC's backup policies.

Backup features are dependent on the database engine used and its associated features. It is important to ensure that the database supports 'backup and restore' not only archiving of raw data. The ability to integrate into incremental backup regimens is now a standard feature of most high-end systems as demonstrated by the majority of the DBMSs used by the organisations evaluated.

In terms of software at the server end, the database engines used in all cases are internationally recognised relational databases. Relational database systems are capable of relatively sophisticated data storage in inter-related tables. The key attributes of relational database systems are that they discourage storage of redundant data and permit fast and complex querying. They are particularly beneficial where a large number of records are combined to synthesise results. Relational databases are designed to model highly structured data; as a consequence maintenance can be prohibitively high unless careful system design is undertaken. The majority of relational databases use Structured Query Language (SQL) for description and querying of records.

With regards DBMS choice, the most commonly used systems (Oracle / MS SQL Server) demonstrate particular strengths in that substantial user support is offered and that common systems may provide a conduit for the exchange of commonly used functions and in so doing facilitate data dissemination (between RFMOs), where appropriate.

On the subject of data dissemination, Extensible Markup Language (XML) is a simple, flexible text format originally designed to meet the challenges of large-scale electronic publishing. XML is playing an increasingly important role in the exchange of a wide variety of data on the Web. For example, the FAO's Fishery Information, Data, and Statistics Unit (FIDI) has made extensive use of XML in its Fishery Global Information System (FIGIS) programme. Some benefits associated with XML are listed below:

- Enables internationalised media-independent electronic publishing.
- Cost effective by enabling the use of inexpensive off-the-shelf tools to process data.
- Saves training and development costs by providing a single format for a wide range of uses.
- Provides for enhanced interoperability and information interchange.
- Encourages the use of platform-independent protocols for the exchange of data.

- Permits enhanced control of information display.
- Enables long-term reuse of data, with no lock-in to proprietary tools or undocumented formats.

Some additional issues to consider when designing and procuring a DBMS system include:

- the chosen platform;
- internet (intranet) connectivity / security;
- usability of the DBMS (management and manipulation tools, SQL interface, querying tools);
- the extent to which multi-user access is supported; and
- integral data security features.

Upgrade policies are required to enable future planning. This is both in terms of personnel resources required to upgrade, maintain and train for future versions but also for financial planning purposes. Large database management systems are expensive and the capital outlays required should be known in advance; commonly, upgrade policies operate on a rolling 3-5 year period.

The level of sophistication required at the client interface is dependent on the extent to which users (apart from system developers / administrators) need access to and manipulate data. For example, the client interface supporting the CCSBT system is comparatively limited, reflecting that the majority of post processing analysis (error checking, normalisation) is undertaken by the database manager and that no scientific data analysis is undertaken directly by CCSBT.

Conversely, SPC-OFP has developed a custom written graphical interface, supported by a suite of post processing and error checking routines, facilitating data entry, quality control, and analysis by fisheries scientists. An estimated 80-90% of routine queries are pre-written accounting for all standard data requests and reporting needs. An additional feature common to the majority of systems evaluated is that the query and data retrieval system is maintained in isolation (read-only) from the live database, ensuring database integrity. Given the likely requirements for data entry and post processing quality control and analysis significant efforts will likely be required in the development of appropriate graphical displays supporting both data entry and analysis.

**Table 3.2 Characteristics of DBMS solutions employed by selected regional organisations with data management responsibilities including WCPO organisations and other RFMOs**

	Client server configuration	Database engine	Client interface	Back-up schedules	Analysis tools	Web use	Upgrade policy
SPC-OFP	✓	Visual Fox Pro	Proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
FFA	✓	Oracle	Proprietary software	Regular & offsite	Custom written – externally	✓	✓
ISC	Desktop PC database still under development					Planned	
CCAMLR	✓	MS SQL Server	MS Access	Regular	In-house custom written routines / queries	✓	✓
CCSBT	✓	MS SQL Server	Limited proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
IATTC	✓	MS SQL Server	Proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓
ICCAT	✓	MS SQL	MS Access	Regular &	In-house custom	✓	✓

	Client server configuration	Database engine	Client interface	Back-up schedules	Analysis tools	Web use	Upgrade policy
		Server	& Proprietary software	offsite	written routines / queries		
IOTC	✓	MS SQL Server	Limited proprietary software	Regular & offsite	In-house custom written routines / queries	✓	✓

Overarching factors to consider when discussing DBMS choice will include:

- capital costs of the solution (both start-up and recurrent);
- relative ease of maintenance;
- ease of data access through front end and its development;
- integral security features;
- the potential for internet (intranet) connectivity;
- mechanisms for data dissemination.

### 3.3 Human resources

Staffing requirements to handle fishery data are influenced by a number of factors, including: the types of data processed; the volume of data received; and the format in which data are made available.

Staffing needs may vary at different stages of DBMS development; demands may be high during the early stages of DBMS development, levelling out once the system is fully operational. Nevertheless, continued commitment to database management is essential, as are technical capabilities to develop the DBMS to match changing needs, both in terms of data storage and reporting.

Technical capabilities in terms of human resources, for each of the organisations evaluated, indicate essentially similar skill types, in that each of the organisations maintains at least a permanent database administrator and support staff responsible for data entry (Table 3.3 & Table 7.3). However, the number of staff of each skill type varies among the organisations.

For example, the IATTC maintains a large contingent of staff charged with DBMS analysis, development and administration (14 staff). This reflects the range of data collected and compiled by IATTC and in turn the complexity of the DBMS. Staffing levels also provide a level of redundancy. Although staffing levels associated with data handling at IATTC appear high, it is felt that workloads should be monitored closely to assess whether research needs can be met sustainably (IATTC 2002).

In comparison, staffing levels at CCSBT consist of one database manager and a single general administrative assistant who performs data entry as required. This disparity in staffing levels can be attributed to the following characteristics:

- The organisation has limited membership and as a consequence the volume of data processed is comparatively small.
- Those members that do report data to CCSBT largely submit in electronic form.
- The CCSBT undertakes no data collection itself and maintains comparatively limited data reporting obligations.
- The secretariat has no stock assessment responsibility. Data handling is therefore limited to normalisation and quality control, which is undertaken solely by the database manager.

**Table 3.3 Summary of human resource capabilities of the organisations evaluated**

	Staff No.	Database management	Development / programming	Statistical analysis	Data entry technicians
SPC-OFP	4 + IT support	Fisheries statistician	1 x database supervisor 1 x programmer researcher 1 x research officer analyst		4
FFA	4 + admin	Data manager, database developers (include general IT support roles for FFA). Initial structural and analysis software design outsourced			Entry clerks & admin staff
ISC	No information - system management by Fisheries Agency of Japan				
CCAMLR	-	Data manager – supported by data entry/administrative staff			
CCSBT	1 + 1	Database manager – supported by administrative officer. Majority of data submitted in electronic form			General administrative officer
IATTC	7 + 7	System manager	1 x assist. system manager 2 x data administrators 2 x programmers 1 x graphics / web designer		7 data entry & editing
ICCAT	2 + 2	Systems analyst	1 x biostatistician		2 general support staff
IOTC	4 + 2	Data manager	1 x assistant data manager 1 x data analyst / programmer 1 x webmaster		2 general support staff

Based on the observations above, a range of factors is likely to influence human resource needs, both in terms of skills and levels of staffing, including the:

- volume and complexity of reported data to be processed (short, mid, longer term);
- format of data reporting (short, mid, longer term);
- planned data intensive collection programmes (e.g. observer programmes, port sampling, tag recapture);
- relative maturity of the DBMS;
- extent of data analysis to be undertaken; and
- extent to which certain tasks may be outsourced.

The strengths and weaknesses of options to use commercial service providers are discussed in Section 4. Issues tackled include options to meet short-term capacity needs through consulting support (e.g. needs assessment, database design and prototyping) and longer-term solutions through outsourcing (e.g. data processing).

### 3.4 Data security arrangements

The importance of data security and confidentiality policies can not be overstated in the context of a RFMO and stems from the recognition that data is a resource and as such has a value, whether economic or otherwise. Confidence in RFMO security and confidentiality policies underpins the willingness of member States to submit data.

Security policies address overarching needs relating to the confidentiality and integrity of data submitted to RFMOs and must reflect security considerations relevant to both hardcopy and electronic data. Security policies must mitigate against theft of data and hardware; data loss (hardware and software failure, data corruption); and contravention of confidentiality policies.

Commonly applied security measures (Table 3.4) relate to both physical security (hardware and software and paper records) and logical security of electronically stored data.

**Table 3.4 Key attributes for security measures**

Physical security	Logical security
<ul style="list-style-type: none"> <li>▪ Restricted access to premises where data are held, whether in electronic or hard copy format.</li> <li>▪ Hardware access limited to valid data users, server access limited to database administrators/engineers.</li> <li>▪ Secure offsite backup storage</li> </ul>	<ul style="list-style-type: none"> <li>▪ Integral database system security including username and password protected access to processed and pre-processed data.</li> <li>▪ Internet security provisions - firewalls</li> <li>▪ Restricted levels of access to data reflecting user requirements.</li> <li>▪ Encrypted and password protected means of data transmission, including FTP sites, CD-ROMs, diskettes etc.</li> </ul>

In addition, provision must be made for data recovery in the cases of data corruption or loss. Routine backup procedures are essential, including provision for offsite backup. Recently, consideration has also been placed on the importance of developing provisions for so called *doomsday scenarios*, where copies of data are maintained out of country to ensure recovery in the event of serious environmental disaster or political instability (backup solutions are discussed in Section 3.2).

Table 7.4 summarises some of the security policies of fisheries organisations both in and outside the WCPO region.

### 3.4.1 Physical security

Physical security of data applied by organisations within the region appears comprehensive when compared to policies applied outside the region and the attributes presented above.

Within the region, the OFP maintains a strict data security policy; servers are maintained in a secure room to which only appointed personnel have access; and user access is restricted to authorised OFP personnel whilst hardcopy data are stored in locked filing cabinets. Equivalent restrictions are maintained by all the organisations evaluated, where information was available.

### 3.4.2 Logical security

Access to electronic data should be controlled to ensure database integrity and confidentiality, but interfere as little as possible with legitimate access.

Global concern is steadily growing over the threat of internet breaches and cyber attacks. Each of the systems evaluated uses software-based firewall protection against access by unauthorised external users. Additional, layers of security at the user level are also used including password protected automated system locks, in the case of temporary absence of valid users.

SPC-OFP, IATTC, CCAMLR, FFA, and CCSBT all demonstrate similar systems, which ensure that data are logically secure. These centre upon access restrictions for nominated personnel based on a username and password system that tailors user access based on operational requirements. In this way access to development system (the database command line) is restricted to database administrators, ensuring database integrity. Access to the live databases is generally also restricted through separate (read-only) query systems.

It is now the norm for organisations to draft a security policy document, outlining all processes and procedures applied to ensure data security and integrity. Given the rapidly evolving IT environment it is essential that security arrangements be reviewed on a regular basis to match threats as they develop. For example, security arrangements concerning wireless internet connectivity have been slow to meet security requirements of wireless networks, in so doing exposing them to potential disruption or loss / theft of data (McQuillan 2003).

### **3.5 Data confidentiality and data dissemination policies**

Given the clear requirement for data compilation and dissemination, criteria and protocols for data confidentiality will need to be established, which define the framework within which data may be disseminated. These criteria and protocols generally constitute rules-based data confidentiality policies. Where agreement has been reached, confidentiality policies describe data ownership, the type and resolution of public domain data and actions necessary to gain access to non-public domain data. Table 5 of the Appendix presents summary information regarding the data confidentiality policies of RFMOs both within the WCPO region and outside. A review of the confidentiality policies of selected RFMOs indicates that a number of common conditions surrounding issues of data confidentiality exist.

It is usual, when faced with a data request, for an organisation to be obliged to either seek the data owner/originator's permission or to at least inform them that the data have been supplied, to whom and for what reason.

Most organisations protect the identity of individual vessels, even in requests from Member scientists. The point is usually made that the name of the vessel is not important, that a code is sufficient. Although data may be supplied for scientific work, there are usually strict rules on the application of the data outside of the particular analysis for which it was intended.

Many organisations apply rules that preclude the supply of aggregated data if that aggregation contains fewer than 3 vessels. This is because if one knows which vessels have participated in a fishery, and there are only one or two of them, it is fairly easy to determine where a competitor has been fishing.

Rules-based confidentiality policies are usually defined in an effort to establish procedures for the release of data and generally specify data type and resolution. In certain cases (e.g. CCSBT) the issue of confidentiality is treated on a case-by-case basis. Protocols are defined outlining procedures to be followed if access to data is requested. Similar procedures are outlined in rules-based confidentiality policies in the case of ad hoc requests for access to data.

Although confidentiality of data is crucial to ensure that reliable fishery statistics are reported, it is essential that the methodologies and processes used to collect and to collate data are transparent and well documented, particularly where standards are not fully adopted or deviation from standards has been necessary.

When discussing appropriate levels of confidentiality, it is equally important to recognise that confidentiality policies can exert a significant influence on both the reliability and quality of data reporting. It is therefore essential to ensure that a balance is struck between levels of access permitted and levels of confidentiality. On the one hand, policies must not be set too high, thereby prohibiting effective use of data for analysis purposes. But neither should policies be too relaxed since confidence in the security of proprietary information underpins the quality and reliability of reported data. This balance is not easily reached, particularly since the legal position regarding business information varies from country to country. This matter is discussed in greater detail in FAO 2002 and NRC 2000.



## 4 Commercial service providers

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### 4.1 Introduction

Today's economy is characterized by tightening IT budgets and shortening technological cycles. As a consequence, there has been a marked tendency for businesses to employ commercial data service providers. Migration towards commercial service provision (particularly outsourcing) has to a great extent been championed by larger business, although small and mid-sized businesses and non-profit organizations are beginning to follow suit. Organizations classically exploiting commercial data service providers include: the service industries, particularly in the spheres of banking and ecommerce.

Before continuing this discussion it is first important to distinguish between consulting and outsourcing; both of which fall in the domain of commercial service providers. The difference between the two is best described as follows:

- consulting services meet strategic needs, usually with the objective of identifying, developing or fixing but never maintaining processes, whilst
- outsourcing services offer an alternative to in-house capabilities by maintaining processes or functions.

Commonly, commercial service providers offer a continuum of services. This ranges from short term technical support (needs assessments, database development) to longer term outsourcing support; as demonstrated by application service providers where data processing and web based data warehousing and analysis services are offered.

In the context of data management needs and associated Commission capabilities to deliver data of high quality in a timely fashion, the value of commercial service provision (either through consulting inputs or by outsourcing) may have benefits at a number of stages of data handling capability development and once the DBMS is established, including:

- support through the needs assessment stage;
- through system selection;
- custom database development;
- support at the implementation stage;
- database customisation, report development, and other enhancements including additional database capabilities to meet the needs of newly established data collection programmes;
- staff support (training, and documentation);
- system support (database management, server management).

Consulting support can offer a means of reducing lead-time as in-house capabilities are developed. Database development projects tend to require sustained periods of intense work followed by long periods of relative stability; the requirement for specific technical skills over a defined period of time lends itself well to consulting support.

With regards to outsourcing, there is, however, a viewpoint that suggests that under certain circumstances handling data in-house is preferable; this position rests upon a number of underlying questions, the most pertinent being – *Is data management a core competency of the organization?*

In-house collaboration between system developers and users can offer greater flexibility and timely responses to changing needs through an enhanced understanding of the datasets in question and direct access to tools and features to manipulate data 'locally'. A particular risk

identified with regards to the use of data service providers lies in an organization becoming dependent on a particular service provider or developer. Methods can be implemented which mitigate against this situation, not the least of which is accurate documentation and comprehensive monitoring of progress by in-house staff.

Additional considerations include: (1) whether sufficient hardware and software infrastructure is maintained in-house and (2) the extent to which interaction between system developers and users is required to create, maintain and enhance system capabilities.

On the other hand, particular strengths exist in employing service providers including, those relating to: economic considerations; the technical competence of staff; and the scalability of resulting systems.

- Scalability – in-house solutions rely on finite resources, outsourced data warehousing service providers offer solutions designed to overcome problems associated with increasing data volume.
- Reduced total cost ownership – commercial service providers leverage volume purchasing power for hardware, software and human resources, resulting in cost efficiencies that can be passed on to clients.
- Best of breed technology – by virtue of technology industry contacts, service providers maintain access to ‘state of the art’ hardware and software and retain sufficient expertise to maximize the benefits of innovations in the field.

Key questions, to bear in mind, when considering the use of commercial service providers should include:

- Is data management a core competency of the organisation?
- Is data analysis a core competency of the organisation?
- Will sufficient dedicated technical resources be available in-house to build and then effectively support a solution that meets both short term and longer term needs?
- What are the total cost ownership implications (i.e. cost benefits of in-house versus outsourced)?

## **4.2 Fishery data handling organisations – experience with commercial data service providers**

Classically the use of service providers by organisations in sectors outside fisheries (e.g. banking and securities firms) stems from a conscious move towards focusing in-house capacity towards core competencies and cost efficiency considerations. This move has been strengthened dramatically as confidence in the quality of services offered, both locally and remotely, has improved.

The extent to which RFMOs use service providers in support of data management tasks appears limited; this likely reflects the perception that the ‘*core competencies*’ of RFMOs lie in data handling, as demonstrated by CCSBT, which has no stock assessment role but maintains a DBMS of fishery statistics.

A number of RFMOs were consulted regarding the extent to which service providers have been, are, or will be used in support of data handling activities (Table 4.1). Additionally where support has been accessed, comments were sought regarding the quality of services delivered and any ensuing benefits or problems encountered.

Of the RFMOs consulted, positive responses regarding the use of commercial service providers were received from CCAMLR and, to a certain extent, ICCAT. In addition to RFMO use of service providers, we also considered the case of New Zealand, where outsourcing of

administrative aspects of fisheries management has been widely implemented (Table 4.2). The case of New Zealand is unique in that the driving force behind outsourcing has been a broader initiative towards devolved management of domestic fisheries (increased industry participation in and ownership of the monitoring process) rather than an explicit response to the need for meeting technical capability needs or cost efficiencies.

**Table 4.1 The experience of RFMO and WCPO regional organisations with commercial service providers**

#### **CCAMLR**

All data processing undertaken in-house.  
Stand-alone database development work (in progress) has been outsourced.  
Additional service provider support used for document translation.

##### Reasoning

The Secretariat conducts data processing and database development as part of its regular functions. Therefore, outsourcing of these functions is only usually considered if in-house resources are insufficient to meet short-term needs. In the case of irregular data submissions, where short-term need is low (for processed data) best option is simply to delay until in-house capacity is freed to handle any backlog. Outsourced data processing was considered but was rejected because data are not submitted regularly and no appropriate local service providers were identified. Perceived costs associated with looking beyond local providers (time / tenders / review etc) have resulted in the employment of full time data entry clerks.

##### Additional comments

1. Current services towards stand-alone database development are considered good and CCAMLR would, if needed, use a commercial service provider in the future for similar short-term inputs.
2. Time must be allocated for liaison with and monitoring of service providers, associated costs and (staff) effort regarded as a major constraint.
3. With regards wider application of service provider support towards DBMS development - unless this type of work is done/maintained regularly, by the service provider, it is not cost-effective in the long term, as in-house staff must remain fully cognoscente of service provider development efforts to maintain and undertake further DBMS development.

##### Confidentiality issues

Confidentiality issues met through use of a strict confidentiality agreement between CCAMLR and the service provider.

#### **CCSBT**

Currently no service provider support  
Previously a small portion of data entry was outsourced to a local data processing company

##### Reasoning

There is sufficient capacity in-house to undertake all data entry processing and DBMS development. Actual in-house data analysis requirements are limited to quality control of data submissions and reporting.

##### Additional comments

Outsourced data entry not of adequate quality. Significant staff time was required to error check data supplied by the service provider.

#### **IATTC**

No commercial service provider support.  
Programmers have been hired for specific project development.

##### Reasoning

Confidentiality of data and access to data present a significant stumbling block preventing data handling by persons or commercial operations which do not have protection from search and seizure (immunity) under USA laws. While this could possibly be overcome, it has not been the path chosen. This also limits the amount of data permitted in overseas offices.

Additional comment

Maintaining data compilation and management closely with analysts leads to a much better understanding of the information and its usefulness/limitations by those tasked with its analysis.

There are significant benefits to regular interaction between analysts and the data management team. Frequent interaction (on a daily basis) offers a means of mitigating problems in data and permits timely and appropriate responses to changes in the nature of the data observed from the field (collection) to the entry process. This understanding may be lost when analysts are presented with digested data or data developed lacking such interaction during collection and compilation.

**ICCAT**

Currently no service provider support  
During the early stages of ICCAT development a service provider was used in initial DBMS development

Reasoning

ICCAT maintains an in-house team of data entry clerks, developers and programmers capable of meeting all data handling needs.

**IOTC**

Currently no service provider support is used, although limited independent consulting support has been secured

Reasoning

IOTC maintains an in-house team of data entry clerks, developers and programmers capable of meeting all data handling needs. In-house capability has developed as Commission data handling needs have evolved

Additional comments

A forthcoming tag recapture programme will place significant stress on existing human resources. There are indications that consulting support will be sought - technical staffing capabilities have already been supplemented in anticipation of this through employment of an additional programmer / database developer (on a short term contract basis). In addition programme management is likely to be overseen by a project management unit (PMU) housed in IOTC facilities. Data handling will however be undertaken using existing IOTC IT infrastructure.

**FFA**

Limited information available, although consulting support was used in the development of FFA DBMS capabilities. Ongoing support is maintained as and when necessary. Comprehensive DBMS documentation is maintained in support of in-house development activities mitigating against dependence on the service provider.

**FAO – FIDI (FIGIS programme)**

Specific technical needs met through short term consulting contracts with programmers. All indications point to the comparative success of this approach.

**Table 4.2 The experience of the New Zealand Ministry of Fisheries with commercial service providers**

<b>New Zealand Ministry of Fisheries (MFish)</b>	
<b>Catch effort data management (service provider: FishServe)</b>	
<p>Contracted to FishServe for a 6-year period, since 2001. Services include all administrative aspects of catch and effort data handling. 'Clean' electronic copies are forwarded to MFish on a regular basis. The drivers behind this were largely towards providing greater control to the fishing industry for services they pay for - FishServe is wholly owned and supported by the New Zealand seafood industry. In addition to handling catch and effort data FishServe is also responsible for other administrative services:</p>	
<p><b>Devolved Services:</b> The services that the New Zealand Seafood Industry are responsible for through FishServe include:</p> <ul style="list-style-type: none"> <li>• ACE Transfers and Registers</li> <li>• Quota Share Transfers and Registers</li> <li>• Client Management</li> <li>• Vessel Registration</li> <li>• Monthly Harvest Returns</li> <li>• Licensed Fish Receiver Returns</li> <li>• Caveats</li> </ul>	<p><b>Contracted Services:</b> The services that are provided under a contract from the Ministry of Fisheries include:</p> <ol style="list-style-type: none"> <li>1. Fishing Permit Issue and Administration</li> <li>2. Crown revenue collection</li> <li>3. Quota Allocation</li> <li>4. Catch Effort Processes</li> <li>5. Special Approvals</li> <li>6. Managing the Crown's ACE and Quota portfolio</li> </ol>
<p>There are indications that the contract has been successful – success has been attributed to extensive efforts taken to outline standards and specifications for all aspects of data handling. In addition, an MFish staff member is charged with auditing the quality of the service provided on a monthly basis.</p>	
<b>Storage and management of research data (service provider: National Institute of Water and Atmospheric Research Ltd, NIWA)</b>	
<p>NIWA is one of 9 New Zealand Crown Research Institutes; NIWA operates as a stand-alone company with its own board of directors and its shares held by the Crown. NIWA is responsible for data entry, quality control and data warehousing of fisheries research data (incl. market sampling, trawl survey data, dive survey data etc.) on behalf of MFish. Extracts of data are provided to researchers on an as required basis. A small in house policy group is maintained at MFish, which sets standards and monitors/audits the service provider and adjudicates as required on release of data. NIWA has been responsible for managing research data on behalf of MFish since 1995, on the basis of a 2-year rolling (non-contestable) contract. The non-contestable aspect of the contract is also reviewed every 2 years.</p>	
<b>Collection of research data</b>	
<p>These services are contracted to a wide variety of organisations. Approximately 30 projects are tendered annually (competitive tender) to collect research data. Contracts are typically for 1 or 2 years. An example is the contract tendered to Bluewater Marine Research (independent fisheries research consultancy). A 3-year contract to manage a gamefish tag recapture programme. The contractor collates and reports on recapture information annually; the groomed data set is then incorporated into the research database managed by NIWA. As with other research data managed by NIWA it is then available to MFish or any approved researcher as required.</p>	

The example set by New Zealand clearly demonstrates that commercial service provider support, when monitored closely, can be applied successfully and can achieve both reduced costs and a high level of data quality and processing efficiency. It is important to note that the service providers used demonstrate considerable experience with handling equivalent data types (NIWA, Bluewater Marine) or close fishing sector association (FishServe – represents producer organisations although no track record in providing similar services). Nevertheless, the review of selected RFMOs indicates that despite increased confidence in services offered, the trend towards the use of service providers for data handling processes, observed in other sectors, has not been reflected in RFMO approaches to data handling.

Key issues, identified on the basis of the experience summarised above, are presented below in the context of different aspects of data handling capabilities:

**DBMS development** – RFMOs regard data handling, including development and data processing as part of their regular functions and therefore show a preference towards maintaining sufficient in-house technical capabilities. Given the labour intensive nature, technical skills required and defined time periods associated with DBMS development, there are indications that consulting support in this area, particularly during the early stages of system development (needs assessment, system design etc.) may be beneficial.

**DBMS support and maintenance** – Regarded as a core task of an RFMO, and as such necessary technical and staffing capabilities and infrastructure are maintained in-house. Additionally, service provider support is regarded as unsustainable in the long-term, since in-house staff need to be fully cognoscente of development efforts, to ensure that future modifications or developments can be undertaken seamlessly (this issue can however be overcome if accurate documentation is maintained and service provider work is comprehensively monitored).

**Routine data processing** – Although there are examples of situations where data entry tasks have been outsourced the quality of service was deemed questionable. Rather than outsource, the tendency is to prioritise data needs (deal with backlogs when staff are available) and cope with additional processing requirements through multi-tasking of generalised administrative staff.

**Stand-alone / project needs** – Here service provider expertise has been employed and is viewed as an efficient and cost effective means of meeting short-term needs (when in-house capacity is insufficient). Potential constraints include the '*hidden*' costs associated with identification of appropriate consulting support, monitoring / auditing demands on staff and the need to develop detailed standards and specifications, beyond the needs for in-house staff. Issues of data confidentiality may also act as a barrier, although this can usually be overcome with comprehensive privacy agreements.

A fundamental weakness in using a commercial service provider to handle fishery data was underlined by a number of the organisations approached on this matter. The issue here relates to maximising the utility of data to analysts responsible for stock assessment and scenario modelling. The point was made that it is essential for data analysts to work in consultation with data handlers, both at the collection and processing stage, to ensure that maximum benefits are obtained from available data and to ensure that analysts are aware of changes in data and are able to react to these changes appropriately and in a timely fashion.

A number of potential risks were also identified, which might influence the decision to seek support from commercial service providers, these include:

- A significant amount of professional staff time must be dedicated to liaison with service providers, particularly with respect to monitoring / auditing progress and evaluating quality of service.
- There are significant costs associated with identifying, evaluating and contracting service providers.
- There may be dangers of dependence upon service providers, which should be avoided.
- Breaches in confidentiality policies and laws protecting proprietary information.
- Goals of the service provider may not be in line with the clients' objectives (organisation philosophy).
- Response times for new tools slower than if in-house expertise is maintained.

### 4.3 Options for the Commission

Drawing from the information above, this section presents an analysis of the possible options open to the Commission in support of fishery data handling tasks. To structure the analysis we

have identified key data handling functions and placed these into the context of the Commission development process (Table 4.3).

**Table 4.3 Provisional timeline for developing Commission data handling functions**

Function	Time Period		
	Interim (I)	Transition (T)	Fully-developed (F)
<b>Overarching</b>	Security policy (I)	Policy review (T, F)	Policy review (T, F)
	Confidentiality policy (I)		
	Interim data handling arrangements (I)		
<b>DBMS development</b>	Needs assessment (I)	System selection (T)	
		Development & implementation - process mapping; detailed specifications (tables, screens, reports, interface etc.) (T)	
		System testing – prototyping (T)	
<b>DBMS management</b>		Support and maintenance – ongoing modifications, upgrades, training (T, F)	Support and maintenance – ongoing modifications, upgrades, training (T, F)
<b>Routine data processing</b>	Data entry (I, T, F)	Data entry (I, T, F)	Data entry (I, T, F)
	Quality control (I, T, F)	Quality control (I, T, F)	Quality control (I, T, F)
		Electronic data integration / normalisation (T, F)	Electronic data integration / normalisation (T, F)
		Dissemination / reporting formats established & reviewed (T, F)	Dissemination / reporting formats established & reviewed (T, F)
<b>Stand-alone projects / programmes</b>			Observer programme, research surveys, stock assessment, biological and ecological research (F)

The establishment of interim data handling arrangements is contingent with agreement on and adoption of provisional data standards and security and confidentiality policies. These provide the basis upon which specific data handling capability needs will be assessed.

Assuming that consensus can be reached with regards appropriate data standards and security and confidentiality policies, actions during the transition period will likely focus on the development of appropriate Commission IT infrastructure and the selection, development and implementation of DBMS capabilities. In practical terms, application of mutually agreed security and confidentiality policies will allay concerns regarding data integrity and access to proprietary information.

Once the Commission is fully established resources will be required to maintain the DBMS, process data and respond both to analysis requirements and change. Likely additional requirements will include the establishment of appropriate capabilities to handle additional data types, including: observer data; research survey data etc. and the integration MCS data from other sources (e.g. VMS data). Processes will need to be established to ensure that Commission data reporting responsibilities are met in a timely fashion and that analysts are adequately serviced for stock assessment and other scientific purposes. The establishment of a regular internal review process will facilitate response to change in data needs, technical innovations and threats to data security.

## 4.4 SWOT analysis: outsourcing and consulting services

The following section presents an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) associated with commercial service provision (Table 4.4). The data handling functions analysed apply to those detailed in the time-line above and include: database development, database support and maintenance, data entry and processing, and response to new projects.

**Table 4.4 SWOT analysis for commercial service provision**

Source	Strength	Weakness	Opportunity	Threat
In-house: all functions performed by Commission staff	<ul style="list-style-type: none"> <li>• Coordination with analysts to develop database (DB)</li> <li>• DB manager has major role with DB</li> <li>• On-site expertise available for maintenance;</li> <li>• "Ownership" of DB and its uses</li> </ul>	<ul style="list-style-type: none"> <li>• DB development is labour intensive over finite time and requires specific skills</li> <li>• Short-term needs may not match long-term needs</li> <li>• Funding may limit staff and diminish system function</li> </ul>	<ul style="list-style-type: none"> <li>• Core task of Commission</li> <li>• Responsive to needs of member states and analysts</li> </ul>	<ul style="list-style-type: none"> <li>• DB may not be available to receive data on time</li> <li>• Insufficient human resources to process data</li> </ul>
Consultant: Contractor provides guidance and coordinates with staff as needed (e.g. development, stand-alone projects)	<ul style="list-style-type: none"> <li>• Similar to in-house, but use services as needed</li> <li>• Combine with staff</li> <li>• No long-term commitment required</li> <li>• Objective, unbiased approach</li> <li>• Instils urgency - delivery against defined timelines</li> </ul>	<ul style="list-style-type: none"> <li>• In-house capabilities may not be sufficient to handle subsequent problems</li> <li>• Cost may outweigh benefits for small projects</li> </ul>	<ul style="list-style-type: none"> <li>• Can free database staff for long-term needs</li> <li>• Flexibility - hire specific expertise as and when needed</li> </ul>	<ul style="list-style-type: none"> <li>• May be significant lead time associated with identifying and evaluating contractors</li> <li>• Contractor may not meet standards</li> <li>• Bias towards an inappropriate solution</li> </ul>
Outsource: Contractor performs functions off-site	<ul style="list-style-type: none"> <li>• Cost efficiencies – capital costs &amp; operational costs</li> <li>• Access to best of breed solutions</li> <li>• Offers a readily scalable solution</li> </ul>	<ul style="list-style-type: none"> <li>• Lower on-site expertise</li> <li>• No coordination with analysts</li> <li>• Extensive oversight needed from staff</li> <li>• Requires staff cognoscente of all functions</li> <li>• Requires full documentation</li> <li>• Slower response to problems</li> <li>• Few service providers with equivalent experience</li> </ul>	<ul style="list-style-type: none"> <li>• Opportunity to devolve data functions - frees resources</li> <li>• Can search for best quality</li> <li>• Change contractor if necessary</li> <li>• Capital outlay risks mitigated</li> </ul>	<ul style="list-style-type: none"> <li>• Contractor may not meet standards</li> <li>• Security-confidentiality breach</li> <li>• Contractor may not have long-term view</li> <li>• Dependency on contractor</li> <li>• Consistency lost – change of contractor</li> <li>• Contractor may not understand needs fully</li> <li>• Bias towards a particular solution</li> <li>• Risk of shadow system in-house</li> <li>• Lack of "ownership"</li> </ul>

Considerable uncertainty remains regarding the institutional structure of the Commission Scientific Secretariat, it is clear however that both the Secretariat and the subsequent Data

Manager will play a significant role in developing the database system and defining associated processes and procedures. Firm recommendations, at this stage, are not realistic; nevertheless, it appears that certain aspects of Commission data handling may benefit from consulting support. The results of the analysis supported by information in the previous sections are presented below.

#### **4.4.1 DBMS development**

DBMS development actions are characterised by a finite, labour intensive period, where specific skills are required. Human resource needs associated with DBMS development therefore may not match longer-term needs; consulting support may offer a means of bridging the gap between potential short- and long-term needs. Options to secure consulting expertise should be considered at the needs assessment stage and in support of DBMS design and development. If the option of consulting support is followed, careful selection of contractors and close participation between contractors and Secretariat staff will be necessary to assure that objectives are met. An added benefit of securing technical support under contract is that work is delivered against defined timelines, in this way emphasising the urgency of required tasks, which may otherwise fall behind in favour of other priorities.

#### **4.4.2 DBMS maintenance and support**

Devolved control of DBMS management and associated processes appears unsatisfactory in the context of the Commission. Fundamental characteristics of Commission data handling capabilities will be flexibility and ready capacity to adapt to change in terms of the types of data handled, analysis needs and innovations in the IT environment. These characteristics suggest a close association between developers and analysts, implying that this function would best be undertaken in-house. This observation is coherent with the provisional Science Secretariat structure agreed by WGII.

#### **4.4.3 Data entry and processing**

As with DBMS maintenance and support (above) it will be important for the Commission to retain control over data processing. In addition to concerns regarding data security and data confidentiality, maintaining in-house data processing capabilities will ensure the quality and consistency of data.

#### **4.4.4 Solutions to new and stand-alone projects**

As with DBMS development there may be some disparity between short- and long-term needs when new and stand-alone projects are considered. New data handling requirements may demand significant technical and human resources that might best be served through short-term consulting support. It is too early at this stage (institutional structures remain uncertain, DBMS capabilities are yet to be established) to determine which programmes will require or would benefit most from consulting support. However, WGII has identified a number of specific programmes that will likely come into force in the future, including: a regional observer programme, research surveys, biological and ecological research, stock assessment and MCS programmes. Discernable advantages lie in short-term consulting support, particularly where stand-alone projects are concerned, although data confidentiality and security issues will need to be considered.

## 5 Recommendations

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The UNFSA, the MHLC consultation report, and Convention text all point to the need for Commission data handling capabilities, specifically regional DBMS capabilities.

Priority data requirements of the Commission in the short- to mid-term have been identified by SCG, namely fishery data (including annual catch estimates, operational catch and effort data) and biological information, specifically length frequency data. Data sources are likely to include both flag state and coastal state sourced catch and effort statistics, and observer and port sampling programme data.

WCPFC/PrepCon/WP.3 presented a series of alternative organisational structures to meet the science provision requirements of the Commission. This matter was progressed in WCPFC/PrepCon/WP.7, which

1. reviewed recommendations on these alternatives from WGI, WGII, and PrepCon 2 for developing an initial science structure for the Secretariat, and
2. proposed staffing levels and budgets for the first several years of the Secretariat.

Agreement on preliminary staffing levels for the scientific component of the Secretariat in advance of ratification of the Convention will allow the Secretariat to quickly fill the positions needed for efficient provision of the Commission's science needs in the medium term, provided that the use of external providers is maximized for certain technical functions.

In the previous sections we have presented the technical characteristics of data handling solutions and security and data confidentiality policies employed by equivalent RFMOs. On the basis of SWOT analysis we have also identified the potential areas where the Commission might profit from the support of commercial data service providers.

The following sections draw together this information in an effort to identify a way forward for the development of data handling capabilities and data security and confidentiality policies and are presented in the context of the Commission development process.

### 5.1 Interim period

In practical terms, WGII has recommended that interim data handling be undertaken by SPC-OFP, coordinated by SCTB. SPC-OFP capabilities compare favourably with those of organisations charged with handling equivalent data types and volumes.

- SPC-OFP technical capabilities (hardware and software associated with the OFP DBMS) demonstrate a relatively sophisticated system, on a par with systems used elsewhere for the management of regional fishery data.
- The SPC-OFP already compiles fishery data for the entire WCPO region. Data submissions are made on a voluntary basis and comprise predominantly data of coastal State origin, and as a result are not comprehensive. Notwithstanding this, the types of data handled do reflect the priority data types identified by the SCG.
- There is still some room for increasing the data management workload at OFP without increasing the number of current staff. However, if in the medium term, there is a major increase in data compiled on behalf of the Commission, then the situation may need to be reviewed.

Although outsourcing this task to an alternative service provider may have been an option, on balance this is not seen as an efficient option for the interim period. Use of existing technological infrastructure and expertise coupled with the considerable exposure SPC-OFP has in the region is also consistent with Article 15(5) of the Convention text.

The interim marks an important period during which significant ground-work could be made by WGII and the PrepCon towards the establishment of Commission data handling capabilities. These fundamental steps will underpin the Commissions' capacity to meet scientific objectives. Development of data handling capabilities is likely to be regarded as a priority objective for the short to mid-term. Contingent with decisions made by the PrepCon regarding the organisational structure of the Commission, the Scientific Secretariat and the Database Manager would reasonably expect to participate in developing any subsequent database system. In the interim WGII and PrepCon could, however, develop a needs assessment for the DBMS as a recommendation to the Secretariat and the Data Manager.

Confidentiality and security policies underpin the confidence of member States to report data. It is essential that the Commission agree and adopt sufficient security arrangements and equitable confidentiality policies that strike a balance between the need to maintain the confidentiality of proprietary information and the data needs of analysts and researchers to enable the Commission to meet its scientific obligations. WGII and PrepCon could, therefore, develop interim confidentiality and security policies for subsequent adoption by the Commission. The rules-based approach currently applied by SPC-OFP may provide a useful template for PrepCon consideration.

## 5.2 Transitional period

The paper "Approaches to Meeting the Science and Data needs of the Commission," presented at PrepCon2, proposed a first-year scientific staffing structure of an Executive Director, Science Manager, IT Manager, and a Network Administrator. Over a period of two years, the Secretariat would progressively recruit one Science Analyst, one Data Analyst, one Observer Program Manager, and one Compliance Manager. WG.II developed, on a provisional basis, a revised alternative for the structure of scientific functions that included a Database Manager, two data analysts, and two data entry clerks (WCPFC/PrepCon/15).

Both alternatives assume the establishment of a DBMS with maintenance and support capabilities as an entity of the Commission. An in-house DBMS should provide the Commission with the resources necessary to manage the delivery of science in the initial phase. Details of longer-term data handling and analytical needs will become apparent through the transition period. Human resource needs will need to be evaluated to ensure that the required skills and staff-time are available to meet data handling needs and the following range of functions:

- ongoing DBMS development and fine-tuning, particularly with regards analysis needs and potential automated solutions (for verification, reporting and dissemination);
- re-assessment of IT needs;
- capacity to monitor and implement security arrangements; and
- capacity to ensure that confidentiality policies are implemented and monitored as data types handled and reporting requirements evolve.

With this in mind, securing a Database Manager early in the transition phase will provide the Secretariat with the opportunity to focus efforts on the complex and involved task of DBMS development. Whether the Commission chooses a custom-built database, a commercial database, or modifications of existing databases, substantial time will be required to have all the hardware and software components functioning properly. Consulting for technical assistance in participation with Commission staff could provide the required skills and reduce the time needed in undertaking:

- detailed needs assessment;
- procurement and installation of hardware and software;

- physical DBMS design;
- DBMS prototyping;
- DBMS documentation; and
- handover from interim/transitional arrangements to in-house DBMS.

Given both that the Convention is likely to enter into force in 2004 and the unique characteristics of the region; SCG2 has recommended to the PrepCon that OFP data management support be extended through the transition period. In addition, SCG2 recommended that a detailed cost benefit analysis be undertaken of OFP data management services for the transitional period.

However, PrepCon consideration of a long-term solution to address Commission data management needs will not only hinge on cost but also on the concerns of both flag and coastal states and consideration of Article 15(5) of the Convention text.

### **5.3 The fully functioning Commission**

Considerable uncertainty remains regarding the final form of the Secretariat and of the database system and management unit of the Commission. As such, the Commission must retain some flexibility for the final capabilities of the data unit to evolve. Additional data collection programmes will be identified and priority data types modified. Member States will establish routine data reporting to the Commission and capacity of the States to efficiently report will improve, likely through a move from paper copy reporting to electronic reporting.

WGII has identified specific programmes that will likely come into force in the future, e.g. a regionally co-ordinated observer programme, research surveys, VMS, biological and ecological research, and stock assessment. WGII recommended that the Commission contract out some of these programmes rather than conduct them in-house. Some of these programmes (observer, VMS) retain similar confidentiality concerns as discussed earlier, which suggests that the Commission data management staff be responsible for developing (perhaps with consultant assistance) and maintaining the databases and entering data. If reassessment of staff commitments and evolving needs determines that the Commission should consider outsourcing data handling tasks for stand-alone programmes to commercial service providers; the tag recapture programme, research surveys, and biological and ecological research might prove most appropriate given that these programmes combine collection and compilation of non-confidential data.

## 6 Resources

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## 7 Appendix

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**Table 7.1 Hardware & software configurations (Part 1)**

Organisation	Server & Client machines	Upgrade policy	Database
OFFP	<p>Separate Database, Web and Mail servers. Database server specifications include: HP3000 900 MHz; 1 Gb RAM; Data storage - 6 drives 2 x RAID0, 3 x RAID5, 1 Hot swap</p> <p>Client machine minimum specifications include: Pentium 4; 1.7 Ghz processor; 512 Mb RAM; 80 Gb Hard drive.</p> <p>Backup facilities include a 60 Gb supporting tape drive, soon to be upgraded to 840 Gb. The current drive is capable of backing up all existing data.</p>	No routine replacement cycle. Upgrades chiefly motivated by software compatibility.	<p><b>Visual Fox Pro (VFP)</b> Relational database including administrative databases and metadata: Data registry database; Global reference tables</p>
FFA	<p>Client-Server computing environment with client PC's running Microsoft Windows95/98 and the database server running UNIX operating system. VMS and FFA maintained on separate networks and servers.</p> <ul style="list-style-type: none"> <li>• Servers - HP 9000</li> <li>• Memory - 10 x 5Gb HD.</li> <li>• Standard networking protocols such as TCP/IP</li> </ul>	Hardware upgraded when perceived necessary to support programmes.	<p><b>Relational database – Oracle v 7.3.2</b></p> <ul style="list-style-type: none"> <li>• UNIX operating system</li> <li>• ODBC software for database connectivity</li> </ul> <p>Data integrated where possible: Regional vessel register, observer database, people and organisations, vessel activity and catch (US Treaty), violations and prosecutions, Fisheries agreements and licensing.</p>
ISC	The database management system is currently being developed at Japan's National Research Institute of Far Seas Fisheries. A desktop PC relational database is currently being used as a prototype – data fields to be used are described in ISC (2002). No decisions have been taken regarding final hardware and software needs.		
CCAMLR	Client server configuration	Annual review and upgrade cycle	<p><b>MS SQL Server</b> In house custom design and development. All major data sets integrated where possible</p>

Organisation	Server & Client machines	Upgrade policy	Database
CCSBT	<p>Combined file and database server            Compaq            1.25 Gb RAM            RAID type HD            Broadband internet connection</p>	<p>Informal upgrade policy, predominantly driven by operating system compatibility.</p> <p>The system is 2 years old – server lifespan expected to exceed 5 years and 4 years for client machines.</p>	<p><b>MS SQL Server</b>            For simplicity and flexibility, some links (particularly to the “CODES” table) are maintained through triggers and stored procedures rather than via referential integrity constraints.</p> <p>Date and time stamps used to manage data.</p> <p>Do not use public metadata standards although description fields are included for internal database administration purposes.</p>

**Table 7.1 Hardware & software configurations (Part 1 - continued)**

Organisation	Server & Client machines	Upgrade policy	Database
IATTC	<p>Servers include: database; mail; file; and web.            Minimum specification - Pentium processor, 512 Mb RAM, Storage 9 Gb            Network 10/100 Mb TX Ethernet            Numerous client machines with minimum specification – Pentium 400MHz, 256 Mb RAM, Storage 20Gb</p>	<p>Flexible hardware standard set to accommodate change.</p> <p>Bi-annual capacity and obsolescence evaluations.</p>	<p><b>MS SQL Server</b></p>
ICCAT	<p>Dedicated data base server: Compaq Proliant dual processor (Pentium-3 Xeon 1000 Mhz) with 2GB RAM - 4 drives (Raid-5)            A total of 20 clients PC (pentium 3 and 4), 6 of which are for the exclusive use of staff involved in fishery statistics.</p>	<p>Machines replaced at least every 4 years</p>	<p>Server End (Windows 2000 Server)            Data base software: SQL-Server 2000</p>
IOTC	<p>Client server configuration</p>	<p>No information available</p>	<p>Data base software: MS SQL Server</p>

**Table 7.2 Hardware & software configurations (Part 2)**

Organisation	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
OFFP	<p>Standard routines including: referential checks, reports and, standard loading routines based on custom queries written in visual basic –using custom query building software (<i>Quick Query</i>).</p> <p>No other analysis software bar standard MS products.</p> <p>Any transformation and adjustment to data undertaken in a development version of the database in the first instance.</p>	<p>Visual Fox Pro (VFP) front-end (MS ACCESS front-ends developed for SPC clients)</p> <p>Comprehensive custom designed data entry system; the system is under continual development, paperless solutions are under investigation including FTP logsheet transfer.</p> <p>Comprehensive post processing query and data retrieval system also written in VFP – 80-90% of queries are pre-written.</p> <p>A professional licence is held by OFFP that permits 3<sup>rd</sup> party software and subset dissemination.</p>	<p>No scheduled review</p> <p>Upgrades when necessary, driving force is compatibility.</p> <p>Extensive software testing prior to upgrades incl. patches upgrades</p>
FFA	<p>Custom written VFP routines for: Verification Analysis Data retrieval</p>	<p>MS ACCESS – based on the following principals:</p> <ol style="list-style-type: none"> <li>1. Assist developers in building applications timely and efficiently,</li> <li>2. Achieve high levels of software quality and minimise time and effort required for program maintenance,</li> <li>3. Create systems that closely satisfy user requirements,</li> <li>4. Establish common, consistent and easy-to-use user interface across the applications portfolio.</li> </ol>	<p>Upgrade as and when available</p>
Organisation	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
ISC	<p>The database management system is currently being developed at Japan’s National Research Institute of Far Seas Fisheries. A desktop PC relational database is currently being used as a prototype – data fields to be used are described in ISC (2002). No decisions have been taken regarding final hardware and software needs.</p>		
CCAMLR	Off the shelf (MS Office, S-Plus, FORTRAN) and purpose built routines	MS Access front end.	Annual review and upgrade cycle

**Table 7.2 Hardware & software configurations (Part 2 - continued)**

CCSBT	Custom written query software, designed and maintained by contracted developers.	Client machines use 3 x MS Windows 2000 Professional, 1 x XP, operating systems. Visual basic interface - Limited for the time being to module associated with data entry Comprehensive data entry interfaces for three modules: <ul style="list-style-type: none"> <li>• the Tag Recapture module;</li> <li>• the Trade Information Scheme module; and,</li> <li>• the Reference File module.</li> </ul> All other data loaded electronically and extracted via SQL queries for other modules.	Informal upgrade policy Driving force behind upgrades is software compatibility with member States
Organisation	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
IATTC	In-house custom written routines / queries	MS Access & Proprietary software	Regular audit and review process Upgrades reflect IATTC needs and industry trends
ICCAT	Proprietary Software written in Visual Fortran, Delphi, Visual studio	Client end (Microsoft platforms): Microsoft Access 2000 Proprietary Software written in Visual Fortran, Delphi, Visual studio	
IOTC	In-house custom written routines / queries	Limited proprietary software	No explicit policy clear

**Table 7.3 Human resources**

<p>OFFP</p>	<p>8 permanent staff</p> <ul style="list-style-type: none"> <li>• 1 x Fisheries Statistician responsible for overall management of the section, liaison with users external to SPC, editing and publication of statistical bulletins, and conducting statistical analyses</li> <li>• 1 x Programmer / Research Officer responsible for maintaining data processing and query interface software, providing technical support for tuna fishery database systems in SPC member countries and territories, and compiling data summaries.</li> <li>• 1 x Research Officer / Analyst responsible for maintaining data processing and query interface software, providing technical support for tuna fishery database systems in SPC member countries and territories, and maintaining the SPC/OFP website.</li> <li>• 1 x Fisheries Database Supervisor is responsible for supervising the processing of data, maintaining data processing software, and compiling data summaries</li> <li>• 4 x Data Entry Technicians responsible for data entry and other secretarial duties, as required.</li> </ul> <p>In addition, technical support is provided to national and regional port sampling and observer programmes through the work of 3 further staff members not strictly linked to data handling, but who nevertheless influence the quality of data submissions. These include a port sampling supervisor, an observer supervisor, and a port sampling and observer trainer.</p> <p>IT system management is handled independently of the OFFP by the SPC IT unit that handles operating systems and server backup.</p>
<p>FFA</p>	<p>4 permanent staff including a database developer – the bulk of design work and development has been outsourced. A combination of data entry clerks and FFA admin staff manage data processing needs.</p>
<p>ISC</p>	<p>Currently database development task assigned to Japan National Research Institute for Far Seas Fisheries – dedicated staffing details not available</p>
<p>CCAMLR</p>	<p>Data manager – supported by data entry/administrative staff</p>
<p>CCSBT</p>	<p>Data submissions predominantly take electronic form, although on occasions there is a requirement for data entry (e.g. tagging returns, trade information). Data entry was formerly outsourced but the quality was deemed poor; all data entry is now undertaken by the database manager with assistance from the administrative office.</p> <ul style="list-style-type: none"> <li>• 1 x database manager responsible for editing and publication of statistical bulletins, supervising the processing of data, maintaining data processing software, compiling data summaries and maintaining the CCSBT website.</li> <li>• 1 x administrative officer who occasionally assists with data entry.</li> </ul>
<p>IATTC</p>	<p>IATTC employs 7 permanent IT staff including:</p> <ul style="list-style-type: none"> <li>• 1 x System manager</li> <li>• 1 x Assistant system manager</li> <li>• 2 x Data administrator</li> <li>• 2 x Programmers</li> <li>• 1 x Graphics/web designer</li> </ul> <p>Additional support is available from some 7 data editing and data entry personnel. IATTC are unsure if current staffing levels will be sufficient to support all projects.</p>



**Table 7.3 Human resources (continued)**

ICCAT	4 permanent staff compile, verify, update and disseminate data, as follows. <ul style="list-style-type: none"><li>• 2 professional category staff (1 Systems Analyst responsible for the overall management of this department and 1 Biostatistician responsible for developing and maintaining databases and query interfaces)</li><li>• 2 general service staff for data entry, verification and validation, and secretarial duties.</li></ul>
IOTC	6 permanent staff :- <ul style="list-style-type: none"><li>• 1 x Data manager</li><li>• 1 x Assistant data manager</li><li>• 1 x Data analyst / programmer</li><li>• 1 x Webmaster</li><li>• 2 x general support staff</li></ul>

**Table 7.4 Data security**

Organisation	Data security provisions
OFP	<p>The OFP makes specific provision to ensure security and confidentiality of all data submissions Access to unauthorised users is restricted through:</p> <ul style="list-style-type: none"> <li>• Firewall protection</li> <li>• Integral operating system based password and username requirement for access to data.</li> <li>• Automatic system lock with password protection is instigated after 5 minutes</li> <li>• Restricted access to data for authorised users – e.g. scientists only have access to data through the query system (read-only access)</li> <li>• Development system (db command line) access restricted to database developers.</li> </ul> <p><i>External users:</i></p> <ul style="list-style-type: none"> <li>• SPC Fire wall – logically secure from external attack.</li> <li>• Web access password protected; access restricted to Member nations and OFP personnel. Member nations only have access to their own data sets (one user per nation).</li> <li>• Virus checking software is regularly updated</li> </ul> <p><i>Physical security:</i></p> <ul style="list-style-type: none"> <li>• All hardcopy data are stored in locked file cabinets in a secure area of SPC.</li> <li>• Offices locked out of hours</li> <li>• Access to hardware (servers restricted to IT personnel (locked room)</li> </ul>
FFA	<p>Both physical and logical security solutions applied.</p> <ul style="list-style-type: none"> <li>• Physical access to hardware and archived data is restricted to FFA personnel (VMS housed in separate building). Access to servers is restricted to defined FFA personnel (technicians, developers, data base manager).</li> <li>• Logical security is maintained through restricted access based on a system of defined access ‘rights’ or ‘privileges’. The highest level of access is open to the database administrator and access at lower tiers is permitted on strict user group definitions. FFA Security mechanisms are defined in the ‘Applications Development Standards and Guidelines document’. A firewall protects data integrity against malicious attack / theft. The system also includes a subnet firewall which separates the VMS data from other aspects of the FFA data management system. VMS information is further protected through 16-bit encryption.</li> </ul>
ISC	<p>Given that the current system is still under development, no specific security mechanisms have been defined. Nonetheless ISC has demonstrated a commitment to maintaining the security of proprietary information held in its data depository (through defining a proposed confidentiality policy) and has expressed the intent to develop secure data transfer mechanisms – most likely through the use of a dedicated FTP site for member use.</p>
CCAMLR	<p>See Data Confidentiality Table 7.5</p>



**Table 7.4 Data Security (continued)**

Organisation	Data security provisions
CCSBT	<p>The CCSBT has recently agreed policies relating to data security.</p> <p><i>Electronic data security</i></p> <ul style="list-style-type: none"> <li>• The Database Manager will control the level of access that is allocated to individuals.</li> <li>• Access to the Secretariat’s computers will require logging on with a valid user-name and password. Passwords of users will be changed every 60 days.</li> <li>• The Secretariat’s computers will have screen savers with password protection. Screen savers will have a “wait” time of less than 10 minutes.</li> <li>• Access to the Secretariat’s database will require a valid username and password. Direct access to the database will not be available via the internet.</li> <li>• Any confidential data that is not held on the database (e.g. data files received by the Secretariat prior to being loaded onto the database) will either be stored in a password-protected file, or on an encrypted section of the hard disk that requires a password to be accessed.</li> <li>• Transmission of confidential data via electronic means (e.g. e-mail, disk, CD, FTP) will always use password protected files (e.g. password protected Excel and Zip files), or an e-mail encryption system.</li> <li>• Backups of CCSBT data (e.g. tapes, disks) will be password protected and/or be stored in an external secure environment.</li> </ul> <p><i>Physical data security</i></p> <ul style="list-style-type: none"> <li>• The Secretariat’s office is locked when unattended and is monitored by an electronic security system when the building is closed (e.g. in the evenings).</li> <li>• Physical data (e.g. paper records) of a confidential nature will be kept within the Secretariat’s office, or in the company of a Secretariat staff member.</li> <li>• Physical data that are deemed to be highly confidential will be stored in filing cabinets and cupboards that are locked when the office is unattended.</li> <li>• Physical copies of electronic data provided to the Secretariat (e.g. CD’s) will be destroyed or returned to the supplier of the data.</li> </ul>
IATTC	Standard physical and logical security arrangements apply
ICCAT	<p>Standard physical and logical security solutions apply</p> <ul style="list-style-type: none"> <li>• Access to the data base centre is limited to Staff working in this section.</li> <li>• Daily and monthly backup facilities using 50 GB on tape drive</li> <li>• A bank safe deposit box is rented for the storage of backup files</li> <li>• An anti-virus shield is installed on each computer</li> </ul>
IOTC	<p>Procedures for safeguarding records and databases include:</p> <ul style="list-style-type: none"> <li>• Access to logbook-level information will be restricted to IOTC staff requiring these records for their official duties. Each staff member having access to these records will be required to sign an attestation recognising the restrictions on the use and disclosure of the information.</li> <li>• Logbook records will be kept locked, under the specific responsibility of the Data Manager. These sheets will only be released to authorised IOTC personnel for the purpose of data input, editing or verification. Copies of these records will be authorised only for legitimate purposes and will be subjected to the same restrictions on access and storage as the originals.</li> <li>• Databases will be encrypted to preclude access by unauthorised persons. Full access to the database will be restricted to the Data Manager and to senior IOTC staff requiring access to these data for official purposes, under the authority of the Secretary. Staff entrusted with data input, editing and verification will be provided with access to those functions and data sets required for their work.</li> </ul>

**Table 7.5 Data confidentiality**

Organisation	Data confidentiality
OFP	<p>The OFP policy on the dissemination of data is identical to the policy that was established by the Standing Committee on Tuna and Billfish at its eleventh meeting in July 1998 (Anon., 1998).</p> <ul style="list-style-type: none"> <li>• Annual catch estimates, by gear type, flag state and year, are considered to be in the public domain.</li> <li>• Catch and effort data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries, for all fishing nations combined, are considered to be in the public domain.</li> <li>• Catch and effort data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries, stratified by fishing nation, are available for release at the discretion of the Co-ordinator of the SCTB Statistics Working Group (SWG), for those sources of data which have so authorised the SWG Chairman. For those sources of data that have not authorised the SWG Chairman to release data at his discretion, authorisation for the release of data must be obtained from the sources of the data.</li> <li>• Catch and effort data grouped at a finer level of time-area stratification may be released with authorisation from the sources of the data.</li> <li>• Catch and effort data are released for research purposes only, and to individuals who can be trusted to use the data responsibly. The person requesting the data is required to provide a description of the research project. The data are released only for use in the specified research project and the data must be destroyed upon completion of the research project. However, catch and effort data may be released for general usage, such that the data need not be destroyed, with authorisation from the sources of the data.</li> <li>• The person requesting the data will be asked to provide a report of the results of the research project to the SWG Chairman for subsequent forwarding to the sources of the data.</li> </ul> <p>All SPC member countries and territories, except New Zealand, have authorised the OFP Fisheries Statistician to release data at its discretion. Of the non-SPC sources of data held by the OFP, the Forum Fisheries Agency, Japan and Korea require authorisation before their data can be released.</p> <p>Policies relating to length data are the same as those detailed for catch and effort data</p> <p>Observer data - observer reports released to the agency that arranged the placement of the observer (when the agency does not already have a copy of the report) or to the captain and owner of the vessel (if a request is received by the OFP). Otherwise, only summary information for research purposes is released by the OFP.</p>
FFA	Confidentiality policy in place to protect VMS data - ownership retained by individual FFA member countries
ISC	<p>Public domain: Total catch and effort aggregated over entire North Pacific with caveat that some discards in N Pacific not reported.</p> <p>Confidential: Raw data, both commercial and biological contains proprietary information and is therefore considered confidential. Access restricted to contributors and authorised scientists of ISC WGs. Any requests from non-contributing parties, all ISC members and observers will be informed of details of the request and permission solicited from contributors. If species specific data are requested the appropriate WG head will take lead in seeking approval. Access to non-public domain data by contributors for purposes other than stock assessment treated as above. Access rules cannot be changed without agreement of all contributors</p>



**Table 7.5 Data confidentiality (continued)**

Organisation	Data confidentiality
CCAMLR	<p>CCAMLR has a series of rules for access to data.</p> <ol style="list-style-type: none"> <li>1. For the preparation of scientific papers for CCAMLR, all scientific data are available but only on request from nominated scientific committee representatives, for specified reasons. All data originators/owners are informed that the data have been supplied.</li> <li>2. If scientists wish to publish analyses that include CCAMLR data, they must obtain permission of the data owner/originators.</li> <li>3. For data pertaining to compliance and enforcement, data access is limited to nominated Member officers. These are highly sensitive data, often including commercial information. Therefore, the data are filtered on a need-to-know basis, so that for instance the owners can see all the data whereas importing states can only see quantities (not destination companies, and not origins) of fish.</li> <li>4. Although haul-by-haul data may be released to CCAMLR Members requesting them, the identity of observers and vessels is protected by the adoption of codes.</li> </ol> <p>CCAMLR has recently become concerned about the commercial confidentiality of data available to participants at working groups. This concern has come about because some delegations to scientific working groups bring with them representatives of commercial organisations. The solution has been to apply the same rules as above at working groups. Thus data are only supplied to specific requestors (not made generally available to all participants) for specific work (for instance, in the WCPO context someone conducting an assessment of bigeye would only be given bigeye data, not yellowfin data).</p> <p>The following Rules for Access and Use of CCAMLR Data were adopted by the Eleventh Meeting of the Commission (CCAMLR-XI, para. 4.35): These rules replace those adopted at the Eighth Meeting of the Commission (CCAMLR-VIII, paragraph 64)</p> <ol style="list-style-type: none"> <li>(a) All data submitted to the CCAMLR Data Centre should be freely available to Members for analysis and preparation of papers for use within the Commission, the Scientific Committee and their subsidiary bodies.</li> <li>(b) The originators/owners of the data should retain control over any use of their unpublished data outside of CCAMLR.</li> <li>(c) Requests to the Secretariat by individual scientists of a Member for access to data in the CCAMLR Data Centre will only be considered if the request has been approved in writing by the Representative to the Scientific Committee (or his nominated deputy) of that Member. The Representative is responsible for informing the individual scientist requesting the data, of the rules governing access to CCAMLR data and for obtaining the requester's agreement to comply with these rules.</li> <li>(d) When Members request access to data for the purpose of undertaking analyses or preparing papers to be considered by future meetings of CCAMLR bodies, they should indicate the reason for the request and the nature of envisaged data analysis. The Secretariat should supply the data and inform the originators/owners of the data of this action, together with the details of the original request. When data are requested for purposes other than consideration by future meetings of CCAMLR bodies, the Secretariat will, in response to a detailed request, supply the data only after permission has been given by the originators/owners of the data.</li> <li>(e) Data contained in papers prepared for meetings of the Commission, the Scientific Committee, and their subsidiary bodies should not be cited or used in the preparation of papers to be published outside of CCAMLR without the permission of the originators/owners of the data. Furthermore, because inclusion of papers in the <i>Selected Scientific Papers</i> series or any other of the Commission's or Scientific Committee's publications, constitutes formal publication, written permission to publish papers prepared for meetings of the Commission, Scientific Committee and Working Groups should be obtained from the originators/owners of the data and authors of papers.</li> <li>(f) The following statements should be placed on the cover page of all unpublished working papers and background documents tabled: This paper is presented for consideration by CCAMLR and may contain unpublished data, analyses, and/or conclusions subject to change. Data</li> </ol>

Organisation	Data confidentiality
	contained in this paper should not be cited or used for purposes other than the work of the CCAMLR Commission, Scientific Committee, or their subsidiary bodies without the permission of the originators/owners of the data.

**Table 7.5 Data confidentiality (continued)**

Organisation	Data confidentiality
CCSBT	<p>Data provided for the CCSBT database will be treated confidentially and will not be released by the Secretariat except where members of the Extended Commission approve the specific data release on a case-by-case basis.</p> <p>Consensus at SAG/ESC meetings and subsequent approval by the Extended Commission is sufficient approval for release of specific data to members of the Extended Commission for the purpose of routine data exchange for the stock assessment and management procedure. This approval will apply until the Extended Commission revises the data confidentiality policy. Release of other data requires case-by-case approval from an exchange of correspondence (including e-mails) between Extended Commission member's nominated contacts.</p> <p>When providing approval to release specific data, members of the Extended Commission can specify that the particular data does not require their re-approval for future releases by the Secretariat. In these situations, members of the Extended Commission must also specify the groups of people (e.g. public, Extended Commission members) to whom the Secretariat may release the data without requiring case-by-case re-approval. The Secretariat will maintain a list of data sets (and associated groups of people) that are approved for release without requiring case-by-case re-approval. The list will be provided to members of the Extended Commission and members of the Extended Commission have the right to revise the approvals that they have given.</p>
IATTC	<p>Confidentiality is provided by laws against search and seizure of IATTC records. Detailed data (e.g. logbook or company records) are only released with written permission of the individuals providing the data to the IATTC. Access is provided to summary data, which does not reveal the identity of operations of individual companies or vessels. Catch &amp; effort data summaries on 5x5- quarter resolution are available on request. Coastal state agencies may be provided 1x1- month catch &amp; effort summaries for their EEZs on request. Other formats may be provided on an ad hoc basis by request to and approval of the Director of Investigations: requests for scientific purposes and research collaboration are seldom disapproved.</p> <p>Release of selected data from the observer program is provided for by signature agreement of vessel skippers and owners. This data is available to flagging nations, and to the International Review Panel (IRP) without vessel identification, for purposes of investigating compliance with marine mammal protection.</p> <p>IATTC catch and effort data aggregated by 5° by 5° are made available, if catches by individual vessels cannot be identified in the aggregated data. Data aggregated by 1° by 1° may be released if justified by reasonable use. Raw logbook data may only be released with authorisation from the skipper and the owner. Observer data are confidential, although under certain conditions observer data are provided to the government of the fishing nation in which the vessel is registered. Other research data collected by individual scientists are exchanged with scientists outside IATTC on an ad hoc basis.</p>
ICCAT	<p>Nominal catch data are available on the ICCAT web page and distributed to ICCAT scientists on CD. Catch and effort data, size data and tagging data are available on request (through statistical correspondents), with the exception of detailed data from observer programs, for which confidentiality may be requested at the time of submission. Such data may be used in assessments on the condition that the scientists involved undertake to respect the confidentiality requirements.</p>

**Table 7-5 Data Confidentiality (continued)**

Organisation	Data confidentiality
IOTC <sup>1</sup>	<p>The IOTC has a defined policy for releasing catch-and-effort and length-frequency data:</p> <ul style="list-style-type: none"> <li>• Catch-and-effort and length-frequency data grouped by 5° longitude by 5° latitude by month for longline and 1° longitude by 1° latitude by month for surface fisheries stratified by fishing nation are considered to be in the public domain, provided that the catch of no individual vessel can be identified within a time/area stratum. In cases when an individual vessel can be identified, the data will be aggregated by time, area or flag to preclude such identification, and will then be in the public domain.</li> <li>• Catch-and-effort and length-frequency data grouped at a finer level of time-area stratification will only be released with written authorisation from the sources of the data. Each data release will require the specific permission of the Secretary based on the following criteria: <ul style="list-style-type: none"> <li>○ A Working Party will specify the reasons for which the data are required.</li> <li>○ Individuals requesting the data are required to provide a description of the research project, including the objectives, methodology and intentions for publication. Prior to publication, the manuscript should be cleared by the Secretary. The data are released only for use in the specified research project and the data must be destroyed upon completion of the project. However, with authorisation from the sources of the data, catch-and-effort and length-frequency data may be released for long-term usage for research purposes, and in such cases the data need not be destroyed.</li> <li>○ The identity of individual vessels will be hidden in fine-level data unless the individual requesting this information can justify its necessity.</li> <li>○ Both Working Parties and individuals requesting data shall provide a report of the results of the research project to IOTC for subsequent forwarding to the sources of the data.</li> </ul> </li> </ul> <p>Data submitted to working parties</p> <ul style="list-style-type: none"> <li>• Data submitted to Working Parties will be retained by the Secretariat or made available for other analyses only with the permission of the source.</li> </ul> <p>The above rules of confidentiality will apply to all members of Working Parties.</p>

<sup>1</sup> The IOTC policy on data dissemination was modelled on the OFP policy (David Ardill, IOTC, pers. comment)

## 8 List of Organisations Contacted

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FAO – Fisheries Department (Marine Resources Service)	Jacek Majkowski	Fishery Resources Officer
FAO – Fisheries Department Fishery Information Data and Statistics Unit	Marc Taconet	FIGIS Officer
Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	Robert Kennedy	Data Manager
Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	David Ramm	Data Manager
Inter-American Tropical Tuna Commission (IATTC)	Robin Allen Michael Hinton	Director Senior Scientist
International Commission for the Conservation of Atlantic Tuna (ICCAT)	Adolfo R. Lima	Executive Secretary
Indian Ocean Tuna Commission (IOTC)	Alejandro Anganuzzi	Deputy Secretary
National Marine Fisheries Service - Southwest Fisheries Science Center	Gary Sakagawa	Senior Scientist for Highly Migratory Species
Forum Fisheries Agency (FFA)	Les Clark Joel Opnai Norman Kapun Andrew Richards	Fisheries Management Advisor Fisheries Management Advisor Database Manager Manager MCS
National Research Institute of Far Seas Fisheries (Japan)	Yuji Uozumi	Chairman ISC Statistics Working Group
Ministry of Fisheries (New Zealand)	Neville Smith Kim Duckworth	Senior Scientist Research Data Manager
Secretariat of the Pacific Community - Offshore Fisheries Programme (SPC-OFP)	John Hampton Peter Williams Timothy Lawson	Principal Fisheries Scientist Fisheries Database Manager Principal Fisheries Scientist (Statistics)



## **DRAFT GUIDELINES FOR THE RIGHTS, DUTIES AND RESPONSIBILITIES FOR OBSERVERS, CAPTAINS AND CREW**

Prepared by the Chairman of Working Group III

1. At the second session of WG.III during PrepCon IV in Nadi, Fiji, the Working Group considered an informal discussion paper prepared by the Chairman on the MCS Component of the Commission's observer Programmeme. In doing so the Working Group emphasized a number of considerations to be taken into account in the development of the Commission's observer Programmeme (WCPFC/PrepCon/26). Following this discussion, the Working Group agreed that the most appropriate next step would be to begin to build on the principal elements for the development of the observer programme agreed at PrepCon III (WCPFC/PrepCon/21), in close coordination with WG.II. Therefore, WG.III requested that the Chairman prepare a discussion document on proposed guidelines for the rights, duties, and responsibilities of observers, captains, and crew, drawing from similar guidelines adopted by other regional organizations and national governments.
2. WG.III recognized that the development of the Commission's observer programme would require close consultation and cooperation with Working Group II. In this regard, the specific duties of observers, captains and crew may be influenced by the deliberations of Working Group II with respect to the science needs of the Commission.
3. The following are proposed guidelines for the rights, duties, and responsibilities of observers, captains, and crew. The proposed guidelines were developed after a thorough review of material provided by participating governments and the FFA Secretariat as well as similar guidelines adopted by the Convention for the Conservation of Antarctic Living Marine Resources (CCAMLR), the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea, and the Agreement on the International Dolphin Conservation Programme (AIDCP). WG.III is invited to consider the following elements for possible inclusion in a comprehensive set of guidelines or procedures governing the operation of the Commission's observer programme.

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Annex

**DRAFT GUIDELINES FOR THE RIGHTS, DUTIES AND RESPONSIBILITIES FOR  
OBSERVERS, CAPTAINS AND CREW**

**SECTION A: RIGHTS, DUTIES, AND RESPONSIBILITIES OF ON BOARD  
OBSERVERS**

1. The rights of observers shall include:
  - (a) Access to all areas and facilities of the vessel necessary to conduct observer duties, including the bridge, pilothouse, deck, areas used to process, weigh, and store fish, gear, equipment, fish catch, and crew, as agreed by the Commission.
  - (b) Access to the vessel's records including its logs and documentation for the purpose of records inspection and copying, access to navigational equipment, charts and radios, and reasonable access to other information relating to fishing.
  - (c) Access to and use of communications equipment and personnel, upon request, for entry, transmission, and receipt of work related data or information.
  - (d) Access to additional equipment, if present, to facilitate the work of the observer while on board the vessel, such as high powered binoculars, electronic means of communication, etc.
  - (e) Access to the working deck during net or line retrieval and to specimens (alive or dead) in order to collect samples.
  - (f) Notice of at least fifteen (15) minutes before fish are brought on board, unless the observer specifically requests not to be notified.
  - (g) Access to food, accommodations, medical facilities, and sanitary facilities of a reasonable standard equivalent to those normally available to an officer on board the vessel.
  - (h) The provision of adequate space on the bridge or pilot house for clerical work and adequate space on the deck for observer duties.
  - (i) Freedom to carry out their duties without interference, intimidation, or obstruction.
  
2. The duties of observers shall include:
  - (a) Gathering pertinent information on the fishing operations of the vessel as needed to implement the Convention and as agreed by Members of the Commission.
  - (b) Making available to the vessel captain all measures adopted by the Commission.
  - (c) Making available to the vessel captain records of specific activities monitored by the Commission, if applicable.
  - (d) Preparing reports and providing the vessel captain with an opportunity to include any information or statements deemed relevant.
  - (e) Providing reports to the Commission or national programme in accordance with procedures adopted by the Commission.
  - (f) Performing other functions as agreed by the Commission.
  
3. The responsibilities of observers shall include:

- (a) Acceptance and compliance with agreed confidentiality rules and procedures<sup>1</sup> with respect to the fishing operations of the vessels and of the vessel owners.
- (b) Maintenance of independence and impartiality at all times while on board the fishing vessel.
- (c) Compliance with the laws and regulations of the Member of the Commission that exercises jurisdiction over the vessel.<sup>2</sup>
- (d) Respecting the hierarchy and general rules of behaviour that apply to all vessel personnel.<sup>3</sup>
- (e) Performance of duties in a manner that minimizes interference with fishing operations.
- (f) Familiarity with the emergency procedures aboard the vessel, including the locations of life rafts, fire extinguishers, and first aid kits.
- (g) Communicating regularly with the vessel captain.

## **SECTION B: RIGHTS, DUTIES, AND RESPONSIBILITIES OF VESSEL CAPTAINS**

1. The rights of vessel captains shall include:
  - (a) Expectation that a reasonable period of prior notice of the placement of an observer shall be given.
  - (b) Opportunity to review and comment on the observer's report, including the right to include additional information deemed relevant or a personal statement.
  - (c) Compliance by the observer with the general rules of behavior, hierarchy, and laws and regulations of the Member of the Commission that exercises jurisdiction over the vessel.
  - (d) Timely receipt from the observer of the relevant and current measures adopted by the Commission.
  - (e) Ability to conduct lawful fishing operations with minimum interference due to the observer's presence and performance of necessary duties.
  - (f) Ability to assign, at his or her discretion, a vessel crew member to accompany the observer when the observer is carrying out duties in hazardous areas.
  
2. The duties of vessel captains shall include:
  - (a) Accepting an approved observer that is part of the Commission's observer programme, if required by the Commission.
  - (b) Assisting the observer to safely embark and disembark the vessel at an agreed place and time.
  - (c) Assisting the observer to carry out all duties safely.
  - (d) Providing the observer with food, accommodations, medical facilities, and sanitary facilities of a reasonable standard equivalent to those normally available to an officer on board the vessel.
  - (e) Facilitating access by the observer to all areas and facilities of the vessel necessary to conduct observer duties, including the bridge, communications equipment and personnel, pilothouse, deck, and areas used to process, weigh, and store fish, gear, and equipment.

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<sup>1</sup> Procedures and guidelines relating to security and confidentiality of data and other information, as called for in Article 28, remain to be developed.

<sup>2</sup> As long as these requirements are not incompatible with the provisions of the Convention or measures adopted pursuant to the Convention.

<sup>3</sup> Provided that they do not interfere with the duties of the observer or the responsibilities of the captain and crew.

- (f) Permitting the observer to remove samples from the catch and providing appropriate storage space for specimens collected and retained by the observer.
3. The responsibilities of vessel captains shall include:
- (a) Ensuring actions are consistent with regulations and procedures established under the Convention.
  - (b) Complying with other guidelines, regulations, or conditions established by the Member of the Commission that exercises jurisdiction over the vessel.
  - (c) Ensuring that captain or crew does not obstruct, intimidate, influence, or interfere with the observer or impede or delay observer duties.

### **SECTION C: RIGHTS, DUTIES, AND RESPONSIBILITIES OF VESSEL CREW**

1. The rights of vessel crew shall include:
- (a) Expectation that the observer will comply with the general rules of behaviour, hierarchy, and laws and regulations of the Member of the Commission that exercises jurisdiction over the vessel.
  - (b) Expectation that a reasonable period of prior notice of the placement of an observer shall be given.
  - (c) Reasonable expectation of privacy in crew personal areas.
  - (d) Ability to carry out duties associated with normal fishing operations with minimal interference by the observer in performance of their duties.
2. The duties of the vessel crew shall include:
- (a) Accepting an approved observer that is part of the Commission's observer programme, if required by the Commission.
  - (b) Assisting the observer to embark and disembark the vessel at an agreed place and time.
  - (c) Allowing access by the observer to all areas and facilities of the vessel necessary to conduct observer duties, including the bridge, pilothouse, deck, and areas used to process, weigh, and store fish, gear, and equipment.
  - (d) Assisting the observer to carry out all duties safely
  - (e) Permitting the observer to remove samples from the catch.
3. The responsibilities of the vessel crew shall include:
- (a) Not obstructing, intimidating, influencing, or interfering with the observer or impeding or delaying observer duties.
  - (b) Compliance with regulations and procedures established under the Convention and other guidelines, regulations, or conditions established by the Member of the Commission that exercises jurisdiction over the vessel.
  - (c) Compliance with directions given by the vessel captain with respect to the observer or performance of observer duties.

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## **BACKGROUND PAPER ON POSSIBLE COMPONENTS FOR REGIONAL VESSEL AND GEAR MARKING SYSTEMS**

Prepared by the Secretariat

### **I. PREPARATION OF THIS DOCUMENT**

1. The Preparatory Conference for the establishment of the Commission for the Conservation and Management of the Highly Migratory Fish Stocks for the Western and Central Pacific (PrepCon) at its fourth session in Nadi (PrepCon IV), Fiji, requested the interim secretariat to prepare a background paper on a regional vessel and gear marking system for consideration at PrepCon V. Accordingly, the interim secretariat has prepared this background paper in consultation with the technical staff of the Fisheries Technology Service (FIIT) of the Fisheries Department of the Food and Agriculture Organization of the United Nations.

2. The background paper presents essential considerations for developing a regional fisheries management organization vessel and gear marking systems and provides proposals for such systems. It should be noted that while the background paper seeks to address as many needs of the PrepCon and eventually the Commission as possible, it has been prepared with the objective that it should also be relevant to the development of regional vessel and gear marking systems in general. The proposals on a regional vessel and a fishing gear marking system are presented herein with the objective of stimulating discussion and in no way precludes improvement of the proposals.

### **II. INTRODUCTION**

3. Vessel and gear marking for rapid identification greatly facilitates MCS activities. For this reason, vessel and gear marking requirements are essential components of an effective monitoring control and surveillance (MCS) system and consequently, sound fisheries management. It is also agreed that rapid identification of vessels will enhance safety at sea and greatly facilitates effective search and rescue operations.

4. Relevant international fisheries instruments such as the *United Nations Agreement for the Implementation of Certain Provisions of the Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks* (Fish Stocks Agreement), the *FAO Code of Conduct for Responsible Fisheries* (the Code) and the *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas* (Compliance Agreement) require that vessels be marked in a manner that will make them easily identifiable. Only the former two international fisheries instruments require that fishing gear be marked for the same

reason. The requirement in these instruments for vessel and gear marking for easy identification is based on flag state responsibility.

5. Article 18 of the Fish Stocks Agreement provides that the measures to be taken by a State in relation to vessels flying its flag shall include “*requirements for marking of fishing vessels and fishing gear for identification in accordance with uniform and internationally recognizable vessel and gear marking systems, such as the Food and Agriculture Organization of the United Nations Standard Specification for the marking and identification of fishing vessels*”. The significance of vessel identification in particular is underlined further by article 21(11)(f) which provides that concealing the markings, identity or registration of a fishing vessel is a serious violation.

6. The Compliance Agreement in Article III provides, in respect of the requirement for vessel markings, that “*each Party to the Agreement shall ensure that all fishing vessels entitled to fly its flag that it has entered in the record maintained under Article IV are marked in such a way that they can be readily identified in accordance with generally accepted standards, such as the FAO Standard Specifications for the Marking and Identification of Fishing Vessels.*”

7. The Code requires in Article 8.2.3, in respect of markings of fishing vessels that “*[f]ishing vessels authorized to fish on the high seas or in waters under the jurisdiction of a State other than the flag State, should be marked in accordance with uniform and internationally recognizable vessel marking systems such as the FAO Standard Specifications and Guidelines for Marking and Identification of Fishing Vessels*”. In respect of gear markings, Article 8.2.4 requires that “*[f]ishing gear should be marked in accordance with national legislation in order that the owner of the gear can be identified*” and that “*[g]ear marking requirements should take into account uniform and internationally recognizable gear marking systems*”.

8. The *FAO Technical Guidelines on Responsible Fisheries 1, Fishing Operations* (Guidelines on Fishing Operations), reinforces the Code by requiring a State to ensure that vessels entitled to fly its flag are marked in accordance with the Standard Specification and Guidelines approved by the FAO Committee on Fisheries (COFI) at its 18th Session, Rome, 10-14 April 1989 (see Annex II of the Guidelines on Fishing Operations) for adoption on a voluntary basis. The Guidelines on Fishing Operations further provide that national legislation should also contain a requirement for the marking of fishing gear and fishing implements in order to identify the owner of the gear. Such requirements should take into account uniform and internationally recognizable gear marking systems. Nets, lines and other gear anchored in the sea as well as fish aggregating devices and nets, lines or fish aggregating devices which drift in the sea should also carry marks to indicate their position and the extent of the gear. Further details are given in Annex III (“*Standard Specifications for the Marking of Fishing Gear*”) and Annex IV (“*Guidelines for the Application of a Standard System of Lights and shapes for the identification and Location of Fishing Gear*”) of the Guidelines on Fishing Operations.

9. The *International Plan of Action to Prevent, Deter and Eliminate Illegal Unreported and Unregulated Fishing* (IPOA-IUU) adopted under the auspices of FAO is the most recent fisheries international instrument that contains requirements relating to vessel and gear markings. Under the requirement that States should ensure that all fishing by their nationals are authorised, the IPOA-IUU provides that States should ensure that authorised vessels are marked in accordance with internationally recognized standards such as the *FAO Standard Specification and Guidelines for the Marking and Identification of Fishing Vessels*. Vessels’ fishing gear should similarly be marked in accordance with internationally recognized standards (see paragraph 47.8).

10. The *FAO Technical Guidelines for Responsible Fisheries 9, Implementation of the International Plan of Action to Prevent Deter and Eliminate Illegal Unreported and Unregulated Fishing* (IPOA-IUU Guidelines) re-emphasises this requirement. It also encourages States to cooperate with others including through regional fisheries management organizations (RFMOs) to prevent, deter and eliminate IUU fishing.

11. It can be safely deduced from the review of international fisheries instruments mentioned above that the requirements for action on markings of vessels and fishing gear are global in scope and applies also to subregional, regional and global organizations concerned with the conservation of fishery resources and management and development of fisheries. States, within their respective competences and in accordance with international law including within the framework of subregional or regional fisheries conservation and management organizations or arrangements, are required to ensure compliance with and enforcement of conservation and management measures and establish effective mechanisms, as appropriate, to monitor and control the activities of fishing vessels and fishing support vessels.

12. Evidently, the parties to the *Convention for the Conservation and Management of the Highly Migratory Fish Stocks of the Western and Central Pacific Ocean* (the Convention) were mindful of the importance of vessel and gear markings in the Commission's effort in conserving and managing the highly migratory fish stocks of the western and central Pacific Ocean. They were also very well aware of their commitments, binding or otherwise, under the international fisheries instruments reviewed above. In recognition of these needs and requirements, specific reference is made to the need to make recommendations on vessel and gear marking for consideration by the Commission (Article 14 (Functions of the Technical and Compliance Committee) and Annex III, (Terms and conditions for fishing) Article 6(3)). The PrepCon's agreement at its fourth session in Nadi, Fiji to examine the development of vessel and gear marking systems, simply underscores the significance of these systems for sound fisheries management and seeks to implement the obligations of the members of the Commission as stipulated under the Convention.

### III. PROPOSED COMPONENTS FOR A REGIONAL VESSEL AND GEAR MARKING SYSTEM AND CONSIDERATIONS IN DEVELOPING SUCH SYSTEMS

13. The proposals for a regional vessel and gear marking system for consideration by the Preparatory Conference are respectively presented in **Annex A** and **Annex B** to this Background Paper. The proposals were prepared against the following background.

14. An obvious starting point for developing a regional system for vessel and gear marking is the consideration of international commitments and guidelines as set out in legal and voluntary fisheries conservation and management international instruments outlined above. The clear direction stipulated in these international instruments is that vessels and gear should be marked **in accordance with internationally recognized standards or systems**.

15. With respect to vessel markings, the reference to the *FAO Standard Specifications for the Marking and Identification of Fishing Vessels* in international fisheries instruments is overwhelming. Therefore, the use of this international specification as the principal reference document is unavoidable (attached as **Annex C**) and is so used in the preparation of the proposed components for the regional vessel marking system.

16. One internationally recognised national vessel marking system is that which has been developed by Malaysia for vessel marking and identification. This system is part of Malaysia's licensing and registration system that has met ISO 9000 standards (included in **Annex D**). The Malaysian vessel marking system incorporates the use of colour coding, which is linked to a fisheries zoning system (4 zones designated A-B), with a numbering system so that the operational limits of a vessel is quickly ascertained by the zone colour and letter. It should be noted however that Malaysia is not the only country using colour codes for vessel marking as such systems are also in use in, for example, the US particularly in the Fisheries of the Caribbean Gulf and South Atlantic, the Spiny Lobster Fishery of the Gulf of Mexico and South Atlanta and Stone Crab Fishery of the Gulf of Mexico. It should be noted also that the Malaysian marking system applies to fishing gear. The Malaysian system may be worth considering in the development of a vessel and gear marking system, particularly and perhaps initially for developing a national marking system, where there are designated fisheries by species, method of fishing or geographical area. This latter point underscores the importance of ensuring that the Commission has the ability to review and improve the vessel marking system when the need arises and in light of technical advancements in vessel and gear marking or general changes. The proposed components for regional vessel and gear marking systems attempt to cover this concern.

17. With respect to developing a gear marking system, the specification in international circulation and consistently referred to, is the *FAO Recommendations for the Marking of Fishing Gear* (FAO 1991) which forms the basis of the proposal in **Annex III Standard Specifications for the Marking of Fishing Gear in the Guidelines on Fishing Operations**. (see **Annex E**). This specification is used as the principal reference document in developing the proposal for the regional gear marking system. While the primary objective of this Background Paper is to propose a vessel and gear marking system, consideration should also be given to the Rules for the Marking of Nets, Lines and other Gear to Indicate Position (see Appendix 3 of *FAO Recommendations for the Marking of Fishing Gear*) which has been developed into the *Standard System of Lights and shapes for the identification and Location of Fishing Gear* in the *FAO Guidelines on Fishing Operations* (**Annex F**) which, if permitted to be developed for a RFMO in parallel or in the future to complement the gear marking system, would comprehensively address concerns related to the need for fishing gears to be marked. This was also taken into account in developing the attached proposals.

18. Global trends should also be considered in developing regional vessel and gear marking systems. To this end, the trends based on state practice in the central and western Pacific region and globally, were considered in developing the proposals. The basic finding of the analyses of the requirements relating to vessel and gear marking in national legislation of the States in the central and western Pacific Ocean region (the Participants of PrepCon) and that of selected States is that a majority of the States' legislation prescribe specifications for vessel marking consistent with the *FAO Standard Specifications for the Marking and Identification of Fishing Vessels*. While there are many varieties of gear marking systems in use globally, the *FAO Recommendations for the Marking of Fishing Gear* is the main initiative which attempts to create a common system with basic commonalities. It is for this reason that the *FAO recommendations* are used as the principal reference document for the development of a regional fishing gear marking system.

19. The practice of RFMOs and multilateral agreements or arrangements was also looked at. In terms of fishing vessel marking systems, a majority of the agreements and arrangements (e.g. US Treaty) adopt and apply vessel marking systems consistent with the *FAO Standard*

*Specifications for the Marking and Identification of Fishing Vessels* with modifications to reflect the fishery.

20. A regional vessel and gear marking system has to take into account the peculiarities of the regional fisheries. The fisheries of the central and western Pacific Ocean of immediate concern to the Commission by virtue of the Convention is the tuna fisheries (mainly the industrial pole and line, long line and purse seine tuna fisheries).

21. As is evident from the relevant international instruments reviewed above, internationally recognised vessel marking systems and national legislation, a vessel marking system exists and is applied in the context of and in association with a fishing authorisation regime and a vessel registration or record system. In this respect, the Convention requires that a member of the Commission shall ensure that a vessel flying its flag does not fish in the Convention area beyond its national jurisdiction without an authorisation (Article 24). Members of the Commission are also required to maintain a record of fishing vessels authorised to fish in the Convention area beyond its national jurisdiction. The Convention establishes a regional record to which all members of the Commission send information regarding the vessels that are authorised to fish in the Convention area beyond areas under their national jurisdiction. The proposed vessel marking system is designed in this context, in particular that vessels marking requirements shall be met as a condition of an authorisation (licence) and non compliance is an offence which may also be used to deny future issuance of authorisation to the offending fishing operator.

22. Gear marking systems requirements are also operated in association with a fishing authorisation system and as a condition of authorisation. The proposed regional gear marking system is also developed in that context.

23. Above all considerations, Article 6(3) of Annex III of the Convention specifies in clear terms that **“vessels shall be marked and identified in accordance with the FAO Standard Specifications for the Marking and Identification of Fishing Vessels or such alternative standard as may be adopted by the Commission”**. It seems therefore that the choices for a vessel marking system for the Commission would be to either reconfirm that the applicable vessel marking system is the *FAO Standard Specifications for the Marking and Identification of Fishing Vessels* or to develop an alternative. The proposed specifications follows the former option, i.e. that the applicable system is the *FAO Standard Specifications for the Marking and Identification of Fishing Vessels* but also assumes that the members of the Commission would wish to modify it so that it directly applies to the operators of vessels of the members of the Commission.

24. Both proposals are presented in a manner that makes them directives rather than being also descriptive in character as is the case with the *FAO Standard Specifications for the Marking and Identification of Fishing Vessels* and the *FAO Recommendations for the Marking of Fishing Gear*. Although the proposals retain the basic requirements of the FAO systems/recommendations, an attempt is made to also make them relevant for the members of the Commission and the fisheries of the western and central Pacific Ocean.

25. In conclusion, it should be noted as associated issues that vessel and gear marking requirements of other RFMOs are part of their larger MCS and enforcement schemes. Thus, the Commission’s vessel and gear marking system might have to be integrated into the wider MCS and enforcement requirements. Thought should therefore be given at a later stage as to how to incorporate the proposed vessel and gear marking systems into the regional MCS scheme perhaps by reference in the general MCS scheme to the adopted marking systems or by assimilating it into

the MCS scheme itself such as is done in a general way in the Northwest Atlantic Fisheries Organization (NAFO) Conservation and Enforcement Measures. Thought should also be given to the procedures for reviewing, amending or enhancing the adopted systems for marking of vessel and fishing gear, including looking at innovative approaches such as the marking of fishing gear which appears to have been used in contravention of conservation measures in effect under the system of inspection of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). Above all, the Commission in adopting vessel and gear marking systems should be able to adapt its vessel and gear marking systems to changing circumstances including reflecting advances in technology in vessel and gear marking which do not undermine the objectives for which vessel and gear requirements are established in the first place.

#### IV. REFERENCES

FAO 1985, Report of the Expert Consultation on Fishing Vessel Markings, Halifax, Nova Scotia, Canada, 11-15 March 1985 (FAO Fisheries Report No.343)

FAO 1986, Report of the World Conference on Fisheries. Management and Development, Rome, 16-20 June 1986 (FAO Fisheries Report No.367)

FAO 1989, Report of the Eighteenth Session of the FAO Committee on Fisheries, Rome, 10-14 April 1989 (FAO Fisheries Report No.416). Annex II 2

FAO 1993 Report of the Expert Consultation on the Marking of Fishing Gear, Victoria, British Columbia, Canada 1991, Rome, 1993.

FAO 1993a, Fisheries Report No. 485 Supplement, FAO Recommendations for the Marking of Fishing Gear, Supplement to the Report of the Expert Consultation on the Marking of Fishing Gear, Victoria, British Columbia, Canada 1991, Rome, 1993.

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FAO 2001, The International Plan of Action to Prevent, Deter and Eliminate Illegal Unreported and Unregulated Fishing (IPOA-IUU)

FAO 2002, Technical Guidelines for Responsible Fisheries 9, Implementation of the International Plan of Action to Prevent Deter and Eliminate Illegal Unreported and Unregulated Fishing, Rome 2002

FAO 2003, Recent trends in monitoring control and surveillance systems for capture fisheries, FAO Fisheries Technical Paper 415, Rome 2003

#### **International Fisheries Agreements and instruments**

Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas

An Arrangement Implementing the Nauru Agreement Setting forth Minimum Terms and Conditions of Access to the Fisheries Zones of the Parties

Convention for the Conservation and Management of the Highly Migratory Fish Stocks of the Western and Central Pacific Ocean

Convention on Conduct of Fishing Operations in the North Atlantic

Convention on the Conservation and Management of Fishery Resources in the South East Atlantic Ocean

Convention on the conservation and management of fishery resources in the South-East Atlantic Ocean 20 April 2001

Niue Treaty on Cooperation in Fisheries Surveillance and Law Enforcement in the South Pacific Region

Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures NAFO/FC Doc. 03/1A.

Treaty on Fisheries between the Governments of Certain Pacific Island States and the Government of the United States of America.

The Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access (FFC)

The Federated States of Micronesia Arrangement for Regional Fisheries Access

The North East Atlantic Fisheries Commission Recommendation on a Scheme of Control And Enforcement In Respect of Fishing Vessels Fishing in Areas Beyond the Limits of National Fisheries Jurisdiction in the Convention Area, 1 July 1999.

Text of the CCAMLR System of Inspection

United Nations Agreement for the Implementation of Certain Provisions of the Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks.

**Samples of national legislation reviewed**

*Australia*

Fisheries Management Act 1991 as amended  
Fisheries Management Regulations 1992 as amended

*Canada*

Fisheries Act [R.S. 1985, c. F-14]  
Fishery General Regulations [SOR/93-53]

*European Union*

Commission Regulation (EEC) No 1381/87 of 20 May 1987 establishing detailed rules concerning the marking and documentation of fishing vessels.

*Marshall Islands*

Marine Resources Act 1997

*Mauritius*

The Fisheries and Marine Resources Act 1998

*Namibia*

Marine Resources Act 2000

Marine Resources Regulations 2001

*Solomon Islands*

The Fisheries Act 1998

*Tonga*

Fisheries Management Act 2002

*USA*

Title 50 – Wildlife and Fisheries

Chapter III – International Fishing and related Activities,

Part 285 – Atlantic Tuna Fisheries

Part 300 – International Fishing Regulations

Subpart B High Seas Fisheries

Subpart D South Pacific Tuna Fisheries

Subpart G Antarctic Marine Living Resources

Subpart H Vessels of the United States Fishing in Colombian Treaty Waters

Chapter VI – Fishery Conservation and Management National Oceanic and Atmospheric Administration, Department of Commerce, - Part 600

Part 635 Atlantic Highly Migratory Species

Part 660 Fisheries off West Coast States and in the Western Pacific

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## ANNEX A

### Proposed Specifications for the Marking and Identification of Fishing Vessels [in the Convention Area]

Referring to:

- the objective of the Convention and in particular Articles 10 and 14 and Annex III of the Convention;
- the need to adopt generally recommended international minimum standards for the responsible conduct of fishing operations and, to this end, the utility of adopting internationally recognized vessel marking standards,

the Commission adopts the following specifications:

#### 1. GENERAL PROVISIONS

##### 1.1 Purpose, basis and scope

1.1.1 These specifications, based on the FAO Standard Specifications for the Marking and Identification of Fishing Vessels, the International Telecommunication Union's system for the allocation of signs to countries for ship stations (the International Communication Union Radio Call Signs) and generally accepted design standards for lettering and numbering:

- a) recognizes the utility of the use of an established international system from which the identity and nationality of vessels can be readily determined, irrespective of size and tonnage, and for which a register is maintained;
- b) is without prejudice to international conventions, national or bilateral practices;
- c) is cognizant of the desirability of keeping the costs implementation and maintenance for fishing operations to a minimum;
- d) facilitates search and rescue operations; and,
- e) contribute to sound fisheries management, in particular, responsible fishing operations and safety at sea,

in the Convention Area.

1.1.2 These specifications apply to the operation of fishing vessels of the members of the Commission authorized to fish in the Convention Area beyond the areas of national jurisdiction in accordance with the Convention.

1.1.3 These specifications shall be interpreted and applied in the context of and in a manner consistent with the Convention.

##### 1.2 Definitions

For the purpose of these Specifications:

“Convention” means the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.

“deck” means any surface lying in the horizontal plane, including the top of the wheelhouse;

“FAO Standard Specifications for the Marking and Identification of Fishing Vessels” means the Standard Specification and Guidelines approved by the FAO Committee on Fisheries (COFI) at its 18th Session, Rome, 10-14 April 1989;

"vessel" means any vessel intending to fish or engaged in fishing or ancillary activities and authorized by a member of the Commission to fish in the Convention area beyond areas of the member's national jurisdiction, and includes a boat, skiff or craft (including aircraft) carried on board the vessel and required for fishing operations;

“operator” means any person who is in charge of or directs or controls a vessel, or for whose direct economic or financial benefit the vessel is being used, including the master, owner, and charterer;

## **2. REQUIREMENTS AND APPLICATION**

### **2.1 General requirements**

2.1.1 The members of the Commission shall ensure that operators of the vessels:

- (a) subject to these specifications, identify and mark their vessels in accordance with the FAO Standard Specifications for the Marking and Identification of Fishing Vessels;
- (b) are required to mark the vessels for their identification with their International Telecommunication Union Radio Call Signs (IRCS);
- (c) except as provided for in paragraph 2.2.5 below, mark vessels to which an IRCS has not been assigned, with the characters allocated by the International Telecommunication Union (ITU) to the member of the Commission and followed by, as appropriate, the fishing authorization or vessel registration number assigned to the vessel by the member of the Commission. In such cases, a hyphen shall be placed between the nationality identification characters and the licence or registration number identifying the vessel.

2.1.2 In order to avoid confusion with the letters **I** and **O**, members of the Commission shall not allocate the numbers **1** and **0**, as fishing authorization or registration numbers.

2.1.3 The members of the Commission shall ensure that:

- (a) apart from the vessels name or identification mark and the port of registry as may be required by international practice or national legislation, the marking system as specified shall be the only other vessel identification mark consisting of letters and numbers to be painted on the hull or superstructure;
- (b) the requirement for the marking of fishing gear in accordance with these specifications is a condition for authorization to fish in the Convention Area;
- (c) the:
  - (i) non compliance with these specifications;
  - (ii) non marking or wrongful marking of vessel;
  - (iii) deliberate removal of the vessel mark;
  - (iv) the use of a mark allocated to another operator or to another vessel;

is an offence against national legislation; and

- (d) ensure that vessel marking or related offence is as a ground for refusing authorization to fish.

### **2.2 Markings and other technical specifications**

2.2.1 The member of the Commission shall ensure that the Operator displays the markings in the English language prominently at all times:

- a) on the vessel's side or superstructure, port and starboard. Operators may place fixtures that are inclined at an angle to the vessel's side or superstructure provided that the angle of inclination would not prevent sighting of the sign from another vessel or from the air;
- b) on a deck, except as provided for in paragraph 2.2.4 below. Should an awning or other temporary cover be placed so as to obscure the mark on a deck, the awning or cover shall also be marked. These marks should be placed athwartships with the top of the numbers or letters towards the bow.

2.2.2 The member of the Commission shall ensure that that the Operator places the marks:

- a) as high as possible above the waterline on both sides of the vessel and that such parts of the hull as the flare of the bow and the stern are avoided;
- b) in a manner that does not allow the marks to be obscured by the fishing gear whether it is stowed or in use;
- c) so that they are clear of flow from scuppers or overboard discharges including areas which might be prone to damage or discolouration from the catch of certain types of species; and,
- d) so that they do not extend below the waterline.

2.2.3 Undecked vessels shall not be required to display the markings on a horizontal surface. However, operators should be encouraged by the member of the Commission, where practical, to fit a board on which the markings are placed so that they may be clearly seen from the air.

2.2.4 Boats, skiffs and craft carried by the vessel for fishing operations shall bear the same mark as the vessel concerned.

2.2.5 The members of the Commission shall ensure that Operators comply with the technical specifications of letters and numbers in 3.1 and painting in 3.2 of the FAO Standard Specifications for the Marking and Identification of Fishing Vessels with due consideration for the need to reflect proportionality between the size of vessel identification marks and the size of the vessel without compromising the need for ease of identification for responsible fishing operations, safety at sea and viability of search and rescue operations. In particular operators shall, in placing identification marks on the vessel, ensure:

- (a) that block lettering and numbering is used throughout;
- (b) that the width of the letters and numbers is in proportion to the height;
- (c) the height (h) of the letters and numbers is in proportion to the size of the vessel in accordance with the following:

- (i) for marks to be placed on the hull, superstructure and/or inclined surfaces:

<u>Length of vessel overall (LOA) in meters (m)</u>	<u>Height of letters and numbers in meters (m) is not less than:</u>
25 m and over	1.0 m
20 m but less than 25 m	0.8 m
15 m but less than 20 m	0.6 m
12 m but less than 15 m	0.4 m
5 m but less than 12 m	0.3 m
Under 5 m	0.1 m

- ii) for marks to be placed on deck: the height is not less than 0.3 m for all classes of vessels of 5 m and over;

- (d) that the length of the hyphen is half the height of the letters and numbers;
- (e) the width of the stroke for all letters, numbers and the hyphen is  $\frac{h}{6}$ ;
- (f) the space between letters and/or numbers does not exceed  $\frac{h}{4}$  nor be less than  $\frac{h}{6}$ ;
- (g) the space between adjacent letters having sloping sides does not exceed  $\frac{h}{8}$  nor be less than  $\frac{h}{10}$ ; for example A V.
- (h) that the marks shall be white on a black background, or black on a white background;
- (i) the background shall extend to provide a border around the mark of not less than  $\frac{h}{6}$ ;
- (j) that good quality marine paint is used throughout;

- (k) that the mark meets the requirements of these Specifications where retro-reflective or heat-generating substances are used; and,
- (l) the marks and the background are maintained in good condition at all times.

#### **4. RECORD OF VESSEL MARKS AND FISHING AUTHORISATION NUMBERS**

4.1 The members of the Commission shall:

- (a) in addition to the information required under Annex IV of the Convention, enter the identification marks of vessels or fishing authorization numbers of such vessels into the record of fishing vessels required to be maintained under article 24, paragraph 4 of the Convention.
- (b) provide annually to the Commission, the identification marks of vessels or fishing authorization numbers of such vessels to the Commission and shall promptly notify the Commission of any modification to such information.

#### **5. REVIEW AND AMENDMENT OF SPECIFICATION**

5.1 The Commission shall:

- (a) regularly review the specifications and amend them as appropriate; and
- (b) inform the members of the Commission of amendments to the specifications.

## ANNEX B

### Proposed Specifications for the Marking and Identification of Fishing Gears [in the Convention Area]

Referring to:

- the objective of the Convention and in particular Articles 10 and 14 of the Convention;
- the need to adopt generally recommended international minimum standards for the responsible conduct of fishing operations and, to this end, the utility of adopting internationally recognized fishing gear marking standards,

the Commission adopts the following specifications:

#### 1. GENERAL PROVISIONS

##### 1.1 Purpose, basis and scope

1.1.1 The specifications, based on the FAO Recommendations for the Marking of Fishing Gear, the FAO Standard Specifications for the Marking and Identification of Fishing Vessels, the International Telecommunication Union's system for the allocation of signs to countries for ship stations (the International Communication Union Radio Call Signs) and generally accepted design standards for lettering and numbering:

- (b) recognizes the utility of the use of an established system for fishing gear marking from which the identity of the owner of the fishing gear or operator and vessel can be readily determined;
- (c) is without prejudice to international conventions, national or bilateral practices;
- (d) is cognizant of the desirability of keeping the costs implementation and maintenance for fishing operations to a minimum;
- (e) promotes responsible conduct of fishing operations; and,
- (f) contribute to sound fisheries management and safety at sea,

in the Convention Area.

1.1.2 These specifications apply to the operation of fishing vessels of the members of the Commission authorized to fish in the Convention Area beyond the areas of national jurisdiction in accordance with the Convention.

1.1.3 These specifications shall be interpreted and applied in the context of and in a manner consistent with the Convention.

##### 1.2 Definitions

For the purpose of these Specifications:

“Convention” means the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.

“FAO Recommendations for the Marking of Fishing Gear” means the Recommendations for the Marking of Fishing Gear contained in FAO Fisheries Report No. 485 Supplement to the Report of the Expert Consultation on the Marking of Fishing Gear, Victoria, British Columbia, Canada, 14-July 1991.

“fishing gear” means any implement used for fishing or is essential to or used in connection with any fishing operation and includes a fish aggregating device (FAD);

“mark” means a unique identifier allocated to each vessel which shall be inscribed, embossed or otherwise displayed on a tag or directly onto the fishing gear or the attachments of fishing gear;

“operator” means any person who is in charge of or directs or controls a fishing vessel, or for whose direct economic or financial benefit a vessel is being used, including the master, owner, and charterer;

“tag” means a device which is attached to the fishing gear to carry the mark;

"vessel" means any vessel intending to fish or engaged in fishing or ancillary activities and authorized by a member of the Commission to fish in the Convention Area beyond areas of the member's national jurisdiction, and

includes a boat, skiff or craft (including aircraft) carried on board the vessel and required for fishing operations;

## **2. REQUIREMENTS AND APPLICATION**

### **2.1 General requirements**

2.1.1 The members of the Commission shall:

- (e) ensure that the requirement for the marking of fishing gear in accordance with these specifications is a condition for authorization to fish in the Convention Area;
- (f) ensure that the:
  - (i) non compliance with these specifications;
  - (ii) non marking or wrongful marking of fishing gear, deliberate removal of a mark and the use of a mark allocated to another operator or to another fishing gear;
  - (iii) deliberate discard or dumping of any fishing gear;
  - (iv) non reporting or providing false information on the use, loss, abandoned or disposed fishing gear; is an offence against national legislation;
- (g) ensure that fishing gear marking or related offence can be used as a ground for refusing authorization to fish;

2.1.2 The members of the Commission shall ensure that operators of the vessels:

- (a) subject to these specifications, identify and mark their fishing gear in accordance with the FAO Recommendations for the Marking of Fishing Gear;
- (b) are required to mark their fishing gear with the nationality identification and fishing authorization mark accorded to the vessel on which or in connection to which the fishing gear shall be used;
- (c) mark their fishing gear in a manner that ensures that the owner or operator or vessel can be identified;
- (d) comply with, in association with these specifications, the FAO Rules for the Marking of Nets, Lines and Other Fishing Gear to Indicate Position contained in Appendix 3 of FAO Recommendations for the Marking of Fishing Gear;
- (e) are required to keep a log of fishing gear location;
- (f) report lost, abandoned or otherwise discarded fishing gear giving details of such fishing gear as well as its last known position;
- (g) recover lost or abandoned fishing gear and report the recovery of such fishing gear, in particular if the fishing gear presents a hazard to the navigation of surface and subsurface vessels, fouls reefs, fouls spawning beds or becomes an impediment to fishing or would continue to ghost fish;
- (h) report fishing gear found in the Convention Area.

### **2.2 Markings and other technical specifications**

2.2.1 The member of the Commission shall ensure that the Operator marks the fishing gear with materials and in a manner and on places on the fishing gear which ensures that the identification mark is easily attachable to the fishing gear, is not easily lost or rendered unrecognizable and does not interfere with the operation of the fishing gear.

2.2.2 In order to avoid confusion with the letters **I** and **O**, members of the Commission shall not allocate the numbers **1** and **0**, as fishing authorization or registration numbers.

2.1.3 The member of the Commission shall ensure that that the Operator marks surround nets:

- (a) at each headline; and
  - (b) on the spar buoys and supplementary buoys if used.
- 2.2.4 The member of the Commission shall ensure that that the Operator places the marks, in respect of boat seines:
- (a) at each end of the headline;
  - (b) on the cod-end.
- 2.2.5 The member of the Commission shall ensure that that the Operator places the marks in respect of drifting long lines:
- (a) on the longline at each end and at 500m intervals;
  - (b) on floats and buoys in accordance with Appendix 1 one of the FAO Recommendations for the Marking of Fishing Gear;
- 2.2.6 The member of the Commission shall ensure that that the Operator places the marks in respect of set longlines:
- (a) on the longline at each end and at 500m intervals;
  - (b) on floats and buoys in accordance with Appendix 1 one of the FAO Recommendations for the Marking of Fishing Gear;
- 2.2.7 The member of the Commission shall, in respect of fishing gear for which specific marking requirements are not provided in these specifications, ensure that that the operator places the marks at the suggested points of marking for such fishing gear in accordance with the FAO Recommendations for the Marking of Fishing Gear.
- 2.2.8 The member of the Commission shall ensure that the operator:
- (a) uses marking implements and materials including tags for fishing gear so that the mark is easily read, deciphered and capable of accepting a variety of printed or embossed data; and,
  - (b) maintains the marks and the background in good condition at all times.

### **3. RECOVERY OF LOST AND ABANDONED FISHING GEAR**

- 3.1 The members of the Commission shall ensure that:
- (a) the owners and operators are properly equipped to recover lost and abandoned fishing gear; and
  - (b) in the event that the operator fails to recover lost or abandoned fishing gear, that the competent authority of the member of the Commission make appropriate arrangements for the recovery of such fishing gear including costs recovery, particular if the fishing gear presents a hazard to the navigation of surface and subsurface vessels, fouls reefs, fouls spawning beds, becomes an impediment to fishing, or would continue to ghost fish

### **4. SALVAGE OF LOST AND ABANDONED FISHING GEAR**

- 4.1 The member of the Commission shall ensure that:
- (a) national legislation concerning salvage provide for fishing gear found or picked up at sea, whether marked or unmarked, to be delivered in the shortest possible time to the competent authority of the member of the Commission responsible for dealing with wrecks;

- (b) operators, whether national or alien, be informed of fishing gear recovered (where appropriately marked), any liens on the fishing gear and the arrangements for them to collect the fishing gear; and,
- (c) its competent authority could recover costs of retrieval of abandoned, lost and found fishing gear including levying a fee for each piece of fishing gear returned to the owners so that the income from such levy may be used to offset the cost of retrieval.

## **5. FISH AGGREGATING DEVICES**

5.1 The member of the Commission shall ensure that the authorization to fish in the Convention Area also include conditions in relation to the deployment of FADs where FADs are used in the fishing operation of the holder of the fishing authorization and that the authorization indicate:

- (a) the type of FAD used;
- (b) the location of the allocated datum geographical position of the FAD; and,
- (c) the fishing activities permitted at the FAD.

## **6. RECORD OF FISHING GEAR MARKS**

6.1 The member of the Commission shall:

- (a) establish a record of fishing gear marking which may be a separate record, linked to or used in association with a national fishing vessel register or record required to be established by the Convention;
- (b) provide annually to the Commission, information of fishing gear markings and shall promptly notify the Commission of any modification to such information.

## **7. REVIEW AND AMENDMENT OF SPECIFICATIONS**

7.1 The Commission shall:

- (a) regularly review the specifications and amend them as appropriate; and
- (b) inform the members of the Commission of amendments to the specifications.

## **ANNEX C**

*(Extracted from the FAO Technical Guidelines on Responsible Fisheries I: Fishing Operations)*

### **Annex II**

#### **The Standard Specifications for the Marking and Identification of Fishing Vessels**

##### **Preparation of this Annex**

This document contains the specifications of a standardized system for the marking and identification of fishing vessels as endorsed by the FAO Committee on Fisheries, Rome, April 1989. Background documents relating to this subject are the Report of the Expert Consultation on Fishing Vessel Markings, Halifax, Nova Scotia, Canada, 11-15 March 1985 (FAO Fisheries Report No.343), the Report of the World Conference on Fisheries. Management and Development, Rome, 16-20 June 1986 (FAO Fisheries Report No.367) and the Report of the Eighteenth Session of the FAO Committee on Fisheries, Rome, 10-14 April 1989 (FAO Fisheries Report No.416).  
Annex II 2

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## FOREWORD

The need for an international standard system for the marking and identification of fishing vessels was included in the Strategy for Fisheries Management and Development approved by the 1984 FAO World Fisheries Conference. An Expert Consultation on the Marking of Fishing Vessels convened by the Government of Canada, in collaboration with FAO, in Halifax, Nova Scotia, Canada, March 1985, elaborated the basis for a standard system. A review of the report of this Expert Consultation by the Sixteenth Session of the FAO Committee on Fisheries resulted in a further Expert Consultation on the Technical Specifications for the Marking of Fishing Vessels convened in Rome, June 1986. The Specifications contained herein were endorsed by the Eighteenth Session of the FAO Committee on Fisheries, Rome, April 1989, for adoption by States on a voluntary basis as a standard system to identify fishing vessels operating, or likely to operate, in waters of States other than those of the flag State. The Director General of FAO has informed the Secretary Generals of the International Maritime Organization (IMO) and the International Telecommunication Union (ITU) of the adoption of these Standard Specifications as an aid to fisheries management and safety at sea.

## 1. GENERAL PROVISIONS

### 1.1 Purpose and scope

- 1.1.1 As an aid to fisheries management and safety at sea, fishing vessels should be appropriately marked for their identification on the basis of the International Telecommunication Union Radio Call Signs (IRCS) system.
- 1.1.2 For the purpose of these Standard Specifications, the use of the word "vessel" refers to any vessel intending to fish or engaged in fishing or ancillary activities, operating, or likely to operate, in waters of States other than those of the flag State.

### 1.2 Definitions

For the purpose of these Specifications:

- a) the word "vessel" also includes a boat, skiff or craft (excluding aircraft) carried on board another vessel and required for fishing operations;
- b) a deck is any surface lying in the horizontal plane, including the top of the wheelhouse;
- c) a radio station is one that is assigned an International Telecommunication Union Radio Call Sign.

### **1.3 Basis for the Standard Specifications**

The basis for the Standard Specifications, the IRCS system, meets the following requirements:

- a) the use of an established international system from which the identity and nationality of vessels can be readily determined, irrespective of size and tonnage, and for which a register is maintained;
- b) it is without prejudice to international conventions, national or bilateral practices;
- c) implementation and maintenance will be at minimum cost to governments and vessel owners; and,
- d) it facilitates search and rescue operations.

## **2. BASIC SYSTEM AND APPLICATION**

### **2.1 Basic system**

2.1.1 The Standard Specifications are based on:

- a) the International Telecommunication Union's system for the allocation of signs to countries for ship stations; and,
- b) generally accepted design standards for lettering and numbering.

2.1.2 Vessels shall be marked with their International Telecommunication Union Radio Call Signs (IRCS).

2.1.3 Except as provided for in paragraph 2.2.6 below, vessels to which an IRCS has not been assigned shall be marked with the characters allocated by the International Telecommunication Union (ITU) to the flag State and followed by, as appropriate, the licence or registration number assigned by the flag State. In such cases, a hyphen shall be placed between the nationality identification characters and the licence or registration number identifying the vessel.

2.1.4 In order to avoid confusion with the letters I and O it is recommended that numbers 1 and 0, which are specifically excluded from the ITU call signs, be avoided by national authorities when allocating licence or registration numbers.

2.1.5 Apart from the vessels name or identification mark and the port of registry required by international practice or national legislation, the marking system as specified shall, in order to avoid confusion, be the only other vessel identification mark consisting of letters and numbers to be painted on the hull or superstructure.

## 2.2 Application

- 2.2.1 The markings shall be prominently displayed at all times:
- a) on the vessel's side or superstructure, port and starboard; fixtures inclined at an angle to the vessel's side or superstructure would be considered as suitable provided that the angle of inclination would not prevent sighting of the sign from another vessel or from the air;
  - b) on a deck, except as provided for in paragraph 2.2.4 below. Should an awning or other temporary cover be placed so as to obscure the mark on a deck, the awning or cover shall also be marked. These marks should be placed athwartships with the top of the numbers or letters towards the bow.
- 2.2.2 Marks should be placed as high as possible above the waterline on both sides. Such parts of the hull as the flare of the bow and the stern shall be avoided.
- 2.2.3 The marks shall:
- a) be so placed that they are not obscured by the fishing gear whether it is stowed or in use;
  - b) be clear of flow from scuppers or overboard discharges including areas which might be prone to damage or discolouration from the catch of certain types of species; and,
  - c) not extend below the waterline.
- 2.2.4 Undecked vessels shall not be required to display the markings on a horizontal surface. However, owners should be encouraged, where practical, to fit a board on which the markings may be clearly seen from the air.
- 2.2.5 Vessels fitted with sails may display the markings on the sail in addition to the hull.
- 2.2.6 Boats, skiffs and craft carried by the vessel for fishing operations shall bear the same mark as the vessel concerned.
- 2.2.7 Examples of the placement of marks are set out in pages 47 to 69 of the FAO publication "The Standard Specifications for the Marking and Identification of Fishing Vessels".

### 3. TECHNICAL SPECIFICATIONS

#### 3.1 Specifications of letters and numbers

3.1.1 Block lettering and numbering shall be used throughout.

3.1.2 The width of the letters and numbers shall be in proportion to the height.

3.1.3 The height (h) of the letters and numbers shall be in proportion to the size of the vessel in accordance with the following:

a) for marks to be placed on the hull, superstructure and/or inclined surfaces:

<u>Length of vessel overall (LOA) in meters (m)</u>	<u>Height of letters and numbers in meters (m) to be not less than:</u>
25 m and over	1.0 m
20 m but less than 25 m	0.8 m
15 m but less than 20 m	0.6 m
12 m but less than 15 m	0.4 m
5 m but less than 12 m	0.3 m
Under 5 m	0.1 m

b) for marks to be placed on deck: the height shall not be less than 0.3 m for all classes of vessels of 5 m and over.

3.1.4 The length of the hyphen shall be half the height of the letters and numbers.

3.1.5 The width of the stroke for all letters, numbers and the hyphen shall be  $\frac{h}{6}$

3.1.6 Spacing:

a) the space between letters and/or numbers shall not exceed  $\frac{h}{4}$  nor be less than  $\frac{h}{6}$

b) the space between adjacent letters having sloping sides shall not exceed  $\frac{h}{8}$  nor be less than  $\frac{h}{10}$   
for example A V.

### 3.2 Painting

- 3.2.1 The marks shall be:
- a) white on a black background; or,
  - b) black on a white background.
- 3.2.2 The background shall extend to provide a border around the mark of not less than  $\frac{h}{6}$
- 3.2.3 Good quality marine paints to be used throughout.
- 3.2.4 The use of retro-reflective or heat-generating substances shall be accepted, provided that the mark meets the requirements of these Standard Specifications.
- 3.2.5 The marks and the background shall be maintained in good condition at all times.

## 4. REGISTRATION OF MARKS

- 4.1 The International Telecommunication Union maintains and updates a worldwide register of International Radio Call Signs that contains details of the nationality of the vessel and its name.
- 4.2 In addition to maintaining a separate register of its vessels., which IRCS have been assigned, the flag State shall also maintain a record of vessels to which it has given a nationality identifier (allocated by the ITU), followed by the hyphen and licence/registration number; such records should include details of the vessels and owners.

## 5. INTERNATIONAL ALLOCATION OF CALL SIGNS

- 5.1 The International Telecommunication Union (ITU) Geneva allocates call signs to countries. These take the form of letters of the alphabet or number and letters, for example:
- one of the sets of call signs allocated to Italy is **LAA-IZZ** inclusive, whereas,
  - one of the sets allocated to Malaysia is **9WA-9WZ** .
- 5.2 These signs allocated by the ITU clearly identify the flag State. The flag State adds further characters to the allocated call sign in order to identify the "radio station" (the vessel). A typical example being JNQK which is a Japanese vessel.
- 5.3 ITU should be contacted for an update of the List of Call Signs.

## ANNEX D

*(Extracted from Recent trends in Monitoring, Control and Surveillance Systems for Capture Fisheries)*

### J3. MALAYSIAN SYSTEM\*

The Malaysian vessel identification system comprises the following:

- a) A three to four letter code and number designating the state, use of vessel and number for the vessel. This is hammered on to the hull of the vessel, e.g. JHF 1 –JH meaning the state of Jahor, F for fisheries, and 1 for the number of the vessel.
- b) The “tin plate” with the Department of Fisheries logo and the signature of the Director General is placed on the inner side of the hull with non-removable nails, currently for vessels above 70 GRT.
- c) The wheelhouse colour for the state of registration, e.g. Johor is blue.
- d) The registration number for the vessel is white with a black background and sized depending on the size of the vessel:

VESSEL SIZE (GRT)	SIZE OF ALPHABET/NUMBERS (INCHES)		
	HEIGHT	WIDTH	THICKNESS
Canoe/skiff with outboard engine	6	4	1.25
<25 GRT with onboard engine	9	6	1.75
25-40 GRT with on board engine	12	8	2.5
>40 GRT	18	12	4

- e) Each vessel (except a canoe/skiff without a wheelhouse) is marked according to its appropriate fishing zone (Zone A, B, C, and C2). The letter is coloured in white with a black, round background and painted on both sides of the wheelhouse. The diameter of the background ranges from 10-22 inches according to vessel size.

Fishing Zones are as follows:

ZONE	GEAR USED	GRT	FISHING AREA
<b>A</b>	Artisanal	-	Free
<b>B</b>	Trawler/P. Seine	<40	>5 nm from shore
<b>C</b>	Trawler/P. Seine	40-69.9	>12 nm from shore
<b>D</b>	Trawler/P. Seine	>70	>30 nm from shore

As trawlers are considered to be “unfriendly” to the environment and resources, their activities are closely monitored by the Department of Fisheries. A special marking was imposed on the vessel for ease in identification. All trawlers are required to have a white diagonal stripe across each side of the wheelhouse.

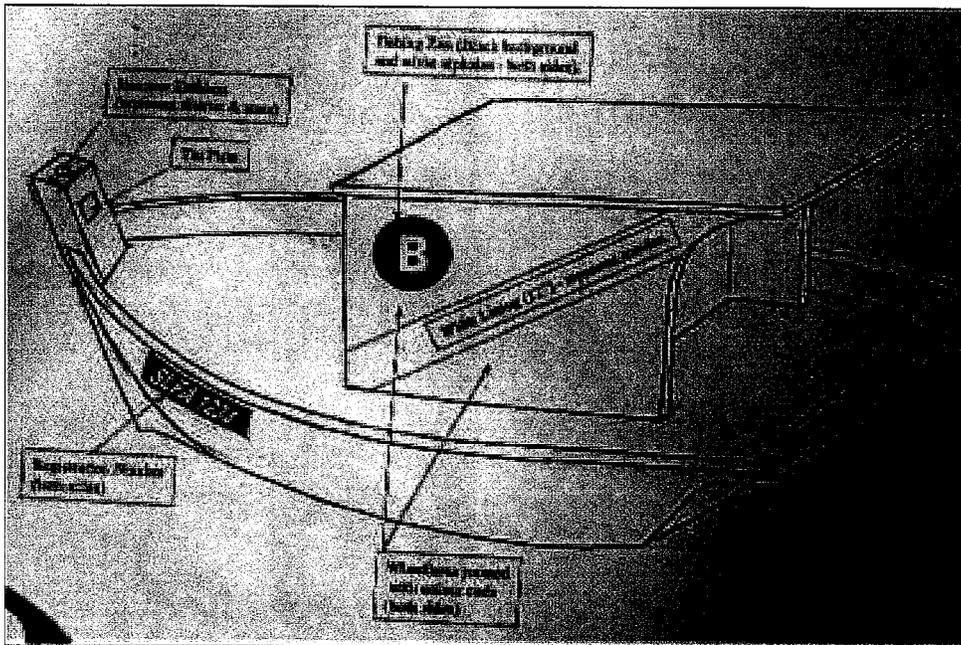
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\* Personal discussions with Mr Salehan, Chief of Fisheries Resource Protection in Malaysia, May 2000.

#### J4. MALAYSIAN EXAMPLES



#### Summary of the Malaysian Vessel Marking System





## **ANNEX E**

### Annex III

*(Extracted from the FAO Technical Guidelines on Responsible Fisheries 1: Fishing Operations)*

#### Proposed System for the Marking of Fishing Gear

#### Preparation of this Annex

This annex contains the specifications of a proposed standardized system for the marking of fishing gear in order to identify the owner.

Background documents relating to the subject are the Reports of the FAO Committee on Fisheries (FAO Fisheries Reports No. 387; 416; 459 and 488), the Report of the Expert Consultation on the Marking of Fishing Gear, Victoria, British Columbia, Canada, 14-19 July 1991 (FAO Fisheries Report No.485), the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, the Agreement for the Implementation of the Provisions of the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks and the Code of Conduct for Responsible Fisheries as adopted by the Conference of FAO on 31 October 1995.

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### **B. Proposed System for the Marking of Fishing Gear**

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2. A System for the Marking of Fishing Gear
3. Implementation of a Standard System
4. Recovery of Lost and Abandoned Fishing Gear
5. Salvage of Lost and Abandoned Fishing Gear
6. Fish Aggregating Devices

## A. INTRODUCTION

1. Although the marking of fishing gear in order to identify the owner of the gear has been practised for centuries, there are still no common standards on how to mark fishing gear, what information should be carried by the mark or how the information should be stored and retrieved.
2. At the IMO, the lack of a common system made it difficult to deal with fishing gear in the development of MARPOL 73/781. In order to address the issue, a recommendation on the development of the technology for the marking of fishing gear is included in the IMO Guidelines for the Application of Annex V of MARPOL.
3. The FAO Committee on Fisheries (COFI), at its 18th session in April 1989, "noted, that for the purpose of determining ownership, no international regulations, guidelines or common practices exist for the marking of fishing gear deployed outside national jurisdiction. Some delegations noted the problem as it related to the protection of living marine resources from entanglement in fishing nets and in the case of discarded fishing gear. It was noted that the elaboration of a standard for the marking of fishing gear would be of benefit to coastal States and recommended that further studies be undertaken".
4. Studies were carried out by the FAO with regard to systems used (past and present) as well as to identify available technology and, with the cooperation of the government of Canada, an Expert Consultation on the Marking of Fishing Gear was held in Victoria, British Columbia, Canada, 14-19 July 1991. It was found that whereas the systems varied in detail with the marks taking the form of tokens, multi-coloured twine, patent tags with a bar code to a vessels' radio call sign being used, it was common to have a simple record of the persons to whom the mark had been allocated, irrespective of whether these were individuals, companies or even communities.
5. The report of the Expert Consultation on the Marking of Fishing Gear was submitted to COFI in 1993 at which time, the Committee considered that there would be a need for further study before finalizing the text of a Standard System for the Marking of Fishing Gear.
6. At the United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks<sup>2</sup>, which concluded its work in August 1995, it was agreed that there should be "requirements for the marking of fishing vessels and fishing gear for identification in accordance with uniform and internationally recognizable marking

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<sup>1</sup> MARPOL 73/78 the International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 relating thereto

<sup>2</sup> The Conference concluded its work in August 1995 with the adoption of the "Agreement for the Implementation of the United Nations Convention on the Law of the Sea of December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks".

- systems, such as the Food and Agriculture Organization of the United Nations Standard Specifications for the Marking and Identification of Fishing Vessels”.
7. The Code of Conduct for Responsible Fisheries (the Code) makes provision for fishing gear to be marked in accordance with national legislation in order that the owner of the gear can be identified. It also provides for the authorization of fishing activities as well as the maintenance of records related to fishing vessels and that these records should include details of the vessels, their ownership and authorizations to fish. In this respect the Compliance Agreement<sup>3</sup>, which is an integral part of the Code, makes important provisions for the maintenance of records in relation to fishing vessels (including details of ownership), as well as the storage, retrieval, and dissemination of data.
  8. These developments, since the 20th. Session of COFI in 1993, made it possible to address the concerns expressed by some COFI members at that time with regard to the apparent additional administrative burdens that might accrue from the adoption of a common system for the marking of fishing gear.
  9. The proposed System for the Marking of Fishing Gear and guidelines for the implementation of the system, as set out in this Annex, take into account inter alia:
    - a) the contents of the report of the Expert Consultation on the Marking of Fishing Gear (FAO Fisheries Report No. 485);
    - b) comments received by FAO following the 20th. Session of COFI ;
    - c) the negotiations at the U.N. Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks;
    - d) discussion on the marking of gear that took place during the elaboration of the Code of Conduct for Responsible Fisheries; and,
    - e) progress made in the preparation of data bases for the implementation of the Compliance Agreement.

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<sup>3</sup> *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*

## **B. PROPOSED SYSTEM FOR THE MARKING OF FISHING GEAR**

### **1. General Provisions**

- 1.1 Except in cases of force majeure or circumstances involving the safety of a vessel or its crew, it should be an offence under national law for any person to deliberately discard or dump any fishing gear or piece thereof into the aquatic environment.
- 1.2 Fishing Gear should be marked in accordance with national legislation in order that the owner of the gear can be identified. Gear marking requirements should take into account uniform and internationally recognizable gear marking systems.
- 1.3 The gear marking system should apply to all types of fishing gear and fishing implements as well as to all fisheries.
- 1.4 The system should provide:
  - a) a simple, workable and enforceable means of identifying the ownership of fishing gear;
  - b) a system that can be universally adopted; and,
  - c) a mechanism as an aid to fisheries management.

### **2. A System for the Marking of Fishing Gear**

- 2.1. The system of marking fishing gear should be set out in national legislation .
- 2.2. The marking of fishing gear should be a condition of an authorization to fish. Whereas such a condition may vary in detail and extent with regard to the different fisheries, the authorization to fish it should, in general, include a requirement for the following information to be given on:
  - a) name and address of person(s) authorized to fish and name of vessel (where relevant);
  - b) gear type;
  - c) expected area of use; and,
  - d) principal target species.
- 2.3 The marking system should be designed, as and where appropriate, to reflect the special requirements of:
  - a) vessels fishing on the high seas;
  - b) vessels fishing in waters of States other than those of the flag State;
  - c) vessels of a coastal State fishing in waters under the jurisdiction of the same State; and,
  - d) owners of fishing gear and implements that are not associated with a fishing vessel.

- 2.4. The actual method or device used to display or carry information set out in paragraph 2.2, hereinafter referred to as the “mark” or “marks”, should be :
- a) simple;
  - b) inexpensive;
  - c) easily manufactured having regard to locally available materials;
  - d) easily read or deciphered;
  - e) able to stay attached;
  - f) durable; and,
  - g) designed so that they do not interfere with the operation and performance of the fishing gear and, in the case of tags, capable of accepting a variety of printed or embossed data.
- 2.5 The “mark” should, as a minimum, give or hold sufficient information through which the name and address of the owner may be traced. FAO Fisheries Report 485 (Supp.) describes types of tags and of the means for the identification of ownership; it being understood that there should be a link in the information chain between the mark and the record of authorization to fish maintained by the State.
- 2.6 The system should also provide for the:
- a) reporting of fishing gear lost, abandoned or otherwise discarded;
  - b) reporting of fishing gear found;
  - c) recovery of lost or abandoned<sup>4</sup> fishing gear; and,
  - d) the disposal of old and unwanted gear.

### **3. Implementation of a Standard System**

- 3.1 The marking of fishing gear should be a condition of the authorization to fish.
- 3.2 States individually or in cooperation with other States, either bilaterally or through subregional or regional fisheries bodies, should decide :
- a) on a system to be adopted;
  - b) the fisheries to be targeted;
  - c) reporting procedures;
  - d) data storage, retrieval and information exchange; and,
  - e) exemptions.
- 3.3 An owner should be allocated a mark or code, that would only apply to all of the fishing gear and fishing implements so owned.
- 3.4 The competent authority may authorize the use of a common mark to a company, organization of fishers or similar entity, if it can be demonstrated that the fishing gear to be marked can be used by more than one group of users or vessels on a

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<sup>4</sup> Abandoned gear as provided for under paragraph 1.1 above.

- rotational or common pool basis. In such cases, the owner(s), identified by the mark, should keep a log of the location of the gear.
- 3.5 In the case of a mothership operation, the fishing gear carried by the catcher vessels may carry the mark of the mothership.
- 3.6 All vessels fishing on the high seas, should use a commonly agreed system for the marking of fishing gear. Since the Compliance Agreement provides for a system for the marking of fishing vessel that would be on the basis of the International Telecommunications Union Radio Call Signs (IRCS) it would be appropriate to use this as the basis for the marking of the fishing gear. For those vessels to which an IRCS has not been assigned, the mark would display or hold information consisting of the characters allocated to a flag State by the ITU, and followed by a hyphen, and as appropriate, the number of registration of the vessel or the number on the authorization to fish. Benefits would also accrue from the adoption of such a system with regard to the maintenance of any records to be kept and the exchange of information that may be required<sup>5</sup>.
- 3.7 Likewise, for fishing vessels authorized to fish in the waters of States other than those of the flag State, the coastal States concerned should accept a marking system for fishing gear of such vessels as described for the high seas in paragraph 3.6 above.
- 3.8 States, regional and subregional fisheries bodies should ensure that control and enforcement of a system for the marking of fishing gear is an integral part of arrangements for the monitoring, control and surveillance of fisheries.
- 3.9 In the event of loss or abandonment of fishing gear, the owner should be required to report the fact to the competent authority.
- 3.10 Every effort should be made by the owner to retrieve lost gear or abandoned gear.
- 3.11 Where gear lost or abandoned, may be a danger to navigation, the owner of the gear concerned<sup>6</sup> should immediately warn other mariners in the vicinity as well as the competent authority, giving details of the gear as well as its last known position.

The competent authority should use the most effective local means to give a general warning to mariners.

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<sup>5</sup> *Gear marks carrying, as a minimum, the IRCS of a vessel would also enable other mariners to identify the flag State and the vessel concerned which would simplify the reporting of lost and abandoned gear.*

<sup>6</sup> *The skipper of a vessel, or person in charge of the vessel, if different from the owner, should be considered to be acting for the owner. The report made on return to harbour should, if practical, be countersigned by the owner.*

- 3.12 The competent authority may impose appropriate penalties on an owner for noncompliance with the system for the marking of gear and fishing implements, including FAD's, in particular, for:
- a) deploying fishing gear without displaying the mark so required as a condition of an authorization to fish;
  - b) deliberate removal of a mark;
  - c) use of a mark allocated to another owner or to other gear; and,
  - d) providing false information on the use, loss, abandonment or disposal of fishing gear.

#### **4. Recovery of Lost and Abandoned Fishing Gear**

- 4.1 The competent authority should ensure that owners of fishing gear have adequate equipment available for the recovery of gear.
- 4.2 In the event of failure of the owner to recover lost and abandoned gear, the competent authority should make appropriate arrangements for its recovery, particularly if the gear:
- a) presents a hazard to the navigation of surface and sub-surface vessels;
  - b) fouls reefs;
  - c) fouls spawning beds;
  - d) becomes an impediment to fishing; or,
  - e) would continue to ghost fish.
- 4.3 The competent authority should encourage the re-use of recovered gear.

#### **5. Salvage of Lost and Abandoned Fishing Gear**

- 5.1 National legislation concerning salvage, should provide for fishing gear found or picked up at sea, whether marked or unmarked, to be delivered in the shortest possible time to the competent authority responsible for dealing with wrecks.
- 5.2 Owners, national or foreign, should be informed of gear recovered (where appropriately marked), any liens on the gear and arrangements for them to collect the gear.
- 5.3 The competent authority may levy a fee for each piece of gear returned to the owners and such income may be used to offset the cost of retrieval.

## **6. Fish Aggregating Devices**

- 6.1 The authorization to fish should also include conditions in relation to the deployment of fish aggregating devices and, in addition to carrying a mark to identify ownership of a FAD, the authorization should relate to the:
- a) type of FAD;
  - b) location of the allocated datum geographical position; and,
  - c) the fishing activities permitted at the FAD.
- 6.2 The responsibility for recovery of drifting FAD's should lie with the owner.
- 6.3 The loss of a FAD (drifting or anchored) should be treated in the same way as lost or abandoned fishing gear.
- 6.4 The competent authority, should take appropriate action in accordance with paragraph 5.2 above in the event of a lost or abandoned FAD considered to be a hazard to navigation.



## **ANNEX F**

*(Extracted from the FAO Technical Guidelines on Responsible Fisheries 1: Fishing Operations)*

### **Annex IV**

**Proposals for the Application of a Standard System of Lights and Shapes for the Identification and Location of Fishing Gear**

#### **Preparation of this Annex**

This annex contains the specifications of a proposed standard system for the identification of types of gear set, where the gear is set and in which direction as well for the location of gear that may be unattended.

Background documents relating to the subject are, the Report of the eighteenth session of the FAO Committee on Fisheries Rome, April 1989 (FAO Fisheries, Report No.416), the Report of the Expert Consultation on the Marking of Fishing Gear, Victoria, British Columbia, Canada, 14-19 July 1991, relevant Reports of the Maritime Safety Committee of the International Maritime Organization and the International Regulations for the Prevention of Collisions at Sea.

## **CONTENTS**

**A. Introduction**

**B. A Standard System of Lights and Shapes for Fishing Gear and Fishing Implements**

1. General Provisions
2. Technical Provisions
3. Application of a Standard System
4. Technical Specifications

## A. INTRODUCTION

1. In its discussions on the marking of fishing gear at the Eighteenth session of the FAO Committee on Fisheries (COFI), most delegates agreed that there was a need for a review of lights and shapes displayed by vessels engaged in fishing and certain types of fishing gear. The Committee invited the Director-General of FAO to bring this matter to the attention of the International Maritime Organization (IMO), and noted that careful consideration must be given to the costs that any changes may imply.
2. The matter was brought to the attention of IMO where it was referred to its Sub-Committee on Navigation which requested its members to submit comments and proposals on the need to amend Rule 26 of the Collision Regulations. It also took note of the intention of FAO to convene an Expert Consultation on the Marking of Fishing Gear where the identification of ownership of lost, abandoned and unattended fishing gear was to be considered. Since this issue was seen to constitute a hazard to sea mammals and birds as well as to the safety of navigation, the Sub-Committee decided to give consideration to any recommendations resulting from the FAO consultation.
3. The IMO participated in the Expert Consultation for the Marking of Fishing Gear, Victoria, British Columbia, Canada, 14-19 July 1991. The Consultation agreed that in order to protect the fishers and their gear and to warn mariners of the presence of deployed fishing gear, a standard system of lights and shapes would be useful. It was also agreed that the technical specifications of such a system would need to be distributed to all mariners so that all would know and understand the marks, lights, use of radar reflectors and shapes that might be encountered at sea. Such information would need to be included in training programmes not only for fishers but other mariners as well.
4. The IMO reviewed the report of the Expert Consultation on the Marking of Fishing Gear as well as recommendations for amendments to the COLREGS. It agreed with FAO that the optional lights provided for in Section 2 of Annex II to the 1972 Collision Regulations should be mandatory for vessels of 20 metres or more in length when engaged in trawling, whether using demersal or pelagic gear, or when pair trawling. IMO could not agree with the proposal to allow the use of flashing yellow lights shown by purse seiners (described in Section 3 of Annex II of the Collision Regulations), by other vessels engaged in fishing operations when such fishing operations involve extensive alterations of course or speed, or both, and when the vessel concerned is hampered by its gear. It agreed, however, that the marking of fishing gear in order to identify its position in the sea, need not be included in the COLREGS.
5. This Annex has been prepared on the basis of the Report of the Expert Consultation for the Marking of Fishing Gear (FAO Fisheries Report No.485 and its Supplement), and the outcome of discussions at the International Maritime Organization. (IMO).

## **B. A STANDARD SYSTEM OF LIGHTS AND SHAPES FOR FISHING GEAR AND FISHING IMPLEMENTS**

### **1. General Provisions**

- 1.1 In order to protect fishers and their gear and to warn other mariners of the presence of deployed fishing gear, States should make provisions in national legislation for the adoption of a standard system of lights and shapes for the identification of fishing gear and for marking its position in the water.
- 1.2 States should make provisions for the inclusion of the details of the system in training programmes for fishers and other mariners.
- 1.3 The need to comply with a system of lights and shapes related to fishing gear, fishing implements and fishing vessels should be a condition of the authorization to fish.

### **2. Technical Provisions**

- 2.1 The system should take into account:
  - a) the provision of the International Regulations for the Prevention of Collisions at Sea (COLREGS);
  - b) any local rules, including rules of navigation governing river, lake or coastal fisheries;
  - c) regulations pertaining to offshore structures; and,
  - d) systems for the marking of fishing gear for the identification of ownership.
- 2.2 Where practicable, all position indicators attached to fishing gear should:
  - a) be as conspicuous as possible in a clear daytime atmosphere from a distance of at least 2 nautical miles at sea level;
  - b) carry radar reflectors;
  - c) carry lights with characteristics which do not conflict with those of navigational marks and which would be visible on a clear night at a distance of at least 2 nautical miles; and,
  - d) be fitted with a coloured flag or flags of fluorescent material, as an aid to daytime visibility.
- 2.3 Lights and shapes should also indicate the direction and extent of set and drifting gear.
- 2.4 Electronic devices, such as transponders and radio beacons which automatically and continuously indicate their position by means of signals may be used in addition to the lights and shapes. Such devices, however, must not operate at frequencies that would conflict with other devices used for navigation and search and rescue purposes.

### 3. Application of a Standard System

- 3.1 An individual pot, trap, fyke net, stake net and other similar gear, should be marked with a buoy or other device at the surface to indicate its position. Gear set in series, such as a number of pots connected are on line, should be marked at each end with a buoy.
- 3.2 Anchored or drifting fishing gear with the upper continuous edge of the gear at a depth of more than 2 metres below the surface should be marked in the following manner:
- a) fishing gear set below the level of the sea and extending from an anchor or parent vessel, should be marked at both extremities by a spar buoy and at intermediate positions. The distance between the intermediate marks, and between the intermediate marks closest to the extremities and the extremity markers should not exceed one kilometre. In the case of fishing gear attached to a vessel, the extremity of the gear nearest to the vessel need not carry a marker;
  - b) for recognition in daytime, the westernmost end spar buoy of such gear extending horizontally in the sea should be fitted with two flags one above the other or one flag and a radar reflector. The end spar buoy at the most easterly extremity should be fitted with one flag or a radar reflector; and,
  - c) for night time recognition, the most westerly end spar buoy should have two white lights one above the other; the most easterly end spar buoy to have one white light.
- 3.3 Fishing gear set within the upper two metres of the water column, and therefore a hazard to small transiting vessels, should be marked in the following manner:
- a) for day time recognition, the extremities of the gear should have spar buoys carrying top marks consisting of two spherical shapes, one above the other at no more than one metre apart; the diameter of the upper of the two spheres to be smaller but no less than one half the diameter of the lower one;
  - b) for night time recognition, the spar buoys placed at the extremity of the gear should have two yellow lights, one above the other at no less than one metre apart and of different characteristics to lights fitted to intermediate buoys;
  - c) gear extending more than one kilometre should have intermediate buoys placed at distances of not more than one kilometre; intermediate spar buoys should have one spherical shape for day time recognition and one yellow light for night time;
  - d) "gates" should be provided for the free passage of surface vessels. Each side of the gate should be marked by spar buoys; the closest intermediate float should not be more than 10 meters from these spar buoys; and,
  - e) attended gear need not be marked at the extremity attached to a fishing vessel.

- 3.4 The dhan-buoy used with active gear, such as anchor seining, fly dragging and purse seining, should comply with the provisions as set out in paragraph.2.2.
- 3.5 Fish aggregating devices should be marked in the same way as fishing gear and carry means to identify their position by day and by night. As a minimum requirement, they should comply with the provisions set out in paragraph 2.2. The requirements of paragraph 2.4 should apply to the use of electronic devices fitted to FAD's.

#### 4. Technical Specifications

- 4.1 A spar buoy should meet the following specifications:
- a) the pole of a spar buoy extending above the floatation buoy should have a height of at least 2 metres; the height of the spar buoy may be less than 2 metres if an administration is satisfied that the fishing gear so marked would not be a hazard to navigation;
  - b) where radar reflectors are required, they should be fitted at the top of the pole;
  - c) the size of flags should not be less than 25 centimetres in height and 35 centimetres in width<sup>1</sup>; when two flags are required, the distance between them should not be less than 10 centimetres; flags should be made of waterproof material in fluorescent colours;
  - d) lights should be attached to the pole in such a way that they will not be obscured by a flag;
  - e) for shapes that give the appearance of being spherical when viewed from a distance, provided for in paragraph 3.3 c) above, the lower of the spherical shapes and the shape, if only one is fitted, should have a diameter of not less than 30 centimetres, the upper shape should be smaller in diameter but not less than half that of the lower shape; and when two shapes are required, they should not be less than 10 centimetres apart; and,
  - f) intermediate floats should have a diameter of not less than 50 centimetres<sup>2</sup>.

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<sup>1</sup> *Flags should not be too large otherwise they could affect the ability of the spar buoy to remain as upright as possible in strong winds*

<sup>2</sup> *The competent authority should take into account locally available material for the construction of floats and whereas most fishers use a spherical shape, in some parts of the world it is common practice to use pieces of wood bound together; the underlying principle is that they should be visible from a distance*

- 4.2 Radar reflectors should be:
- a) as light as possible;
  - b) octahedral in shape; and,
  - c) of metal plate or wire mesh construction.
- 4.3 Lights should be visible at a distance of at least 2 nautical miles; and preferably of a type that are fitted with sensors that automatically switch the light on at dusk and off at daylight<sup>3</sup>.
- 4.4 Radio Beacons may be of a type that can be attached to the pole of the spar buoy or FAD, if they are of the free floating type, they should be linked to the spar buoy.

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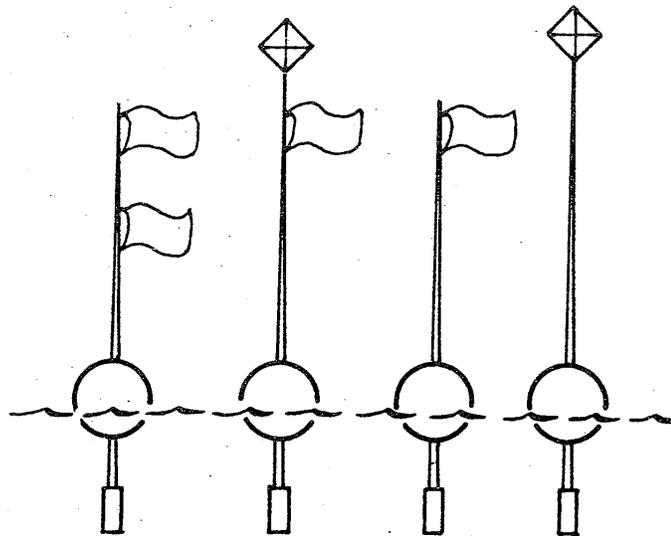
<sup>3</sup> The competent authority should take into consideration local practice since the type of lights available would dictate whether or not these could be attached to the pole of a spar buoy.

Appendix 1

Examples of  
Lights, Shapes and Acoustic Devices

Use flags for gear that drifts and is set below the upper 2m in the water column.

See Para 3.2 b )



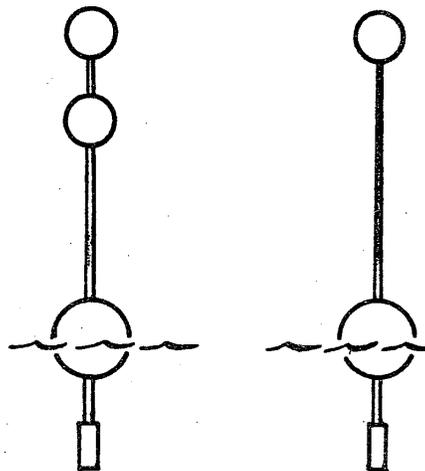
Spar Buoy

Use spherical shapes when drifting gear is set in the upper 2m of the water column.

See Para 3.3 a ) and c )

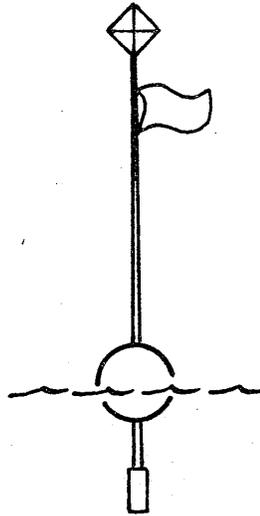
End Buoy

Intermediate Buoy

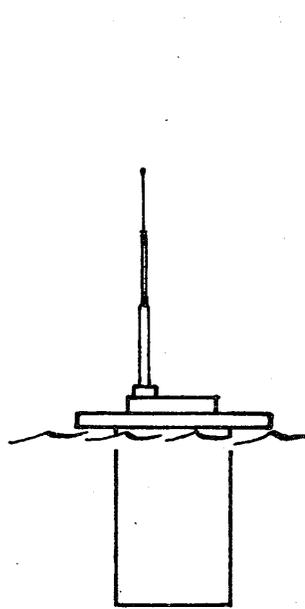


Spar Buoy

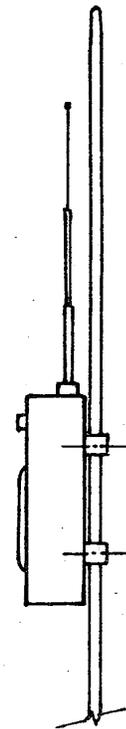
Dhan buoy as used with active gear such as anchor seining, fly dragging and purse seining.



**Dhan Buoy**



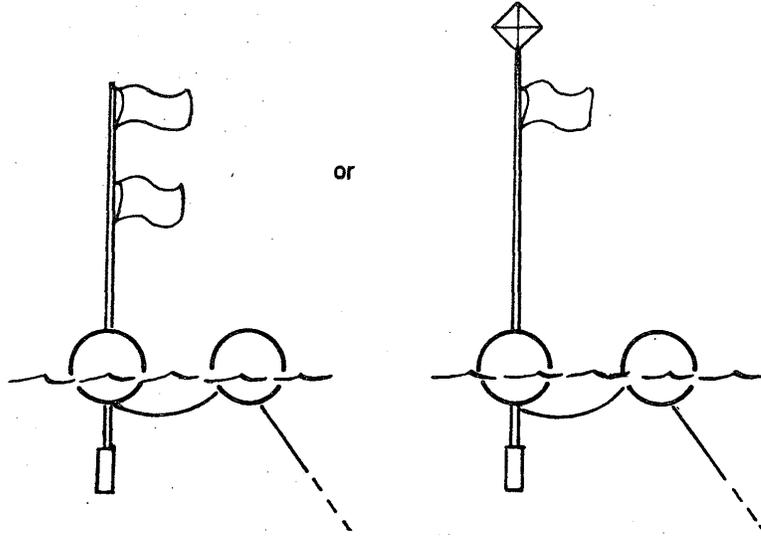
**Floating**



**Fixed to spar buoy**

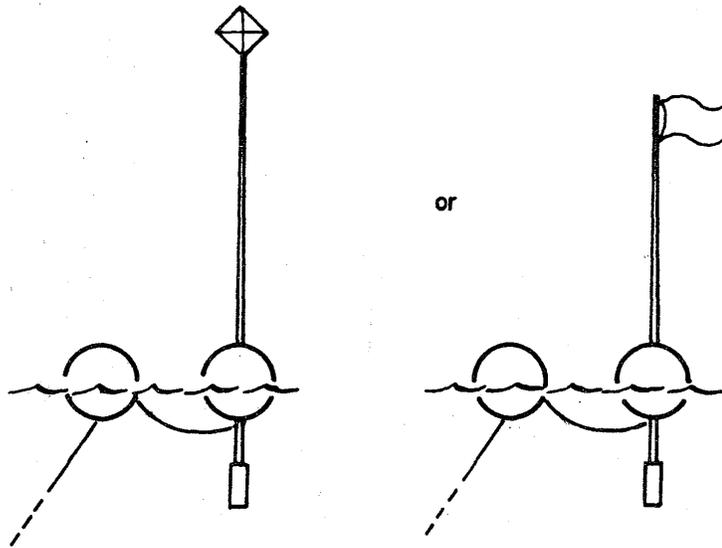
**Radio Beacon**

Spar buoy indicating fishing gear lying to the East of the buoy.

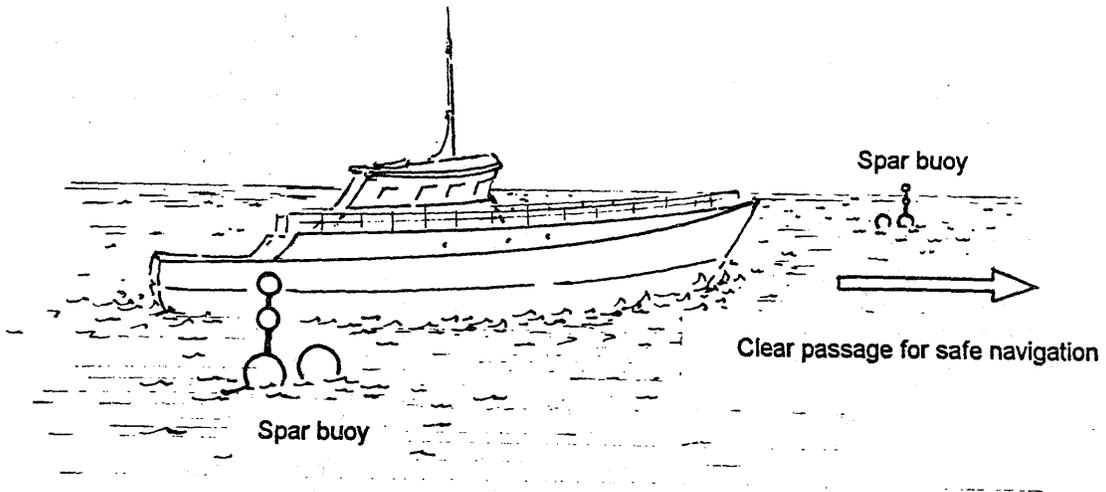


**Fishing Gear Set  
Below the Upper 2m of the Water Column**

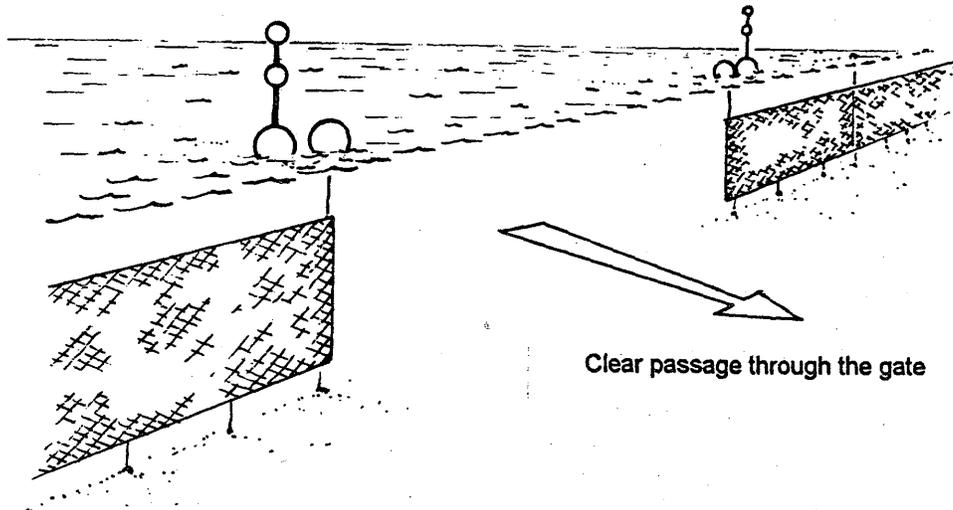
Spar buoy indicating fishing gear lying to the West of the buoy.



**Fishing Gear Set  
Below the Upper 2m in the Water Column**

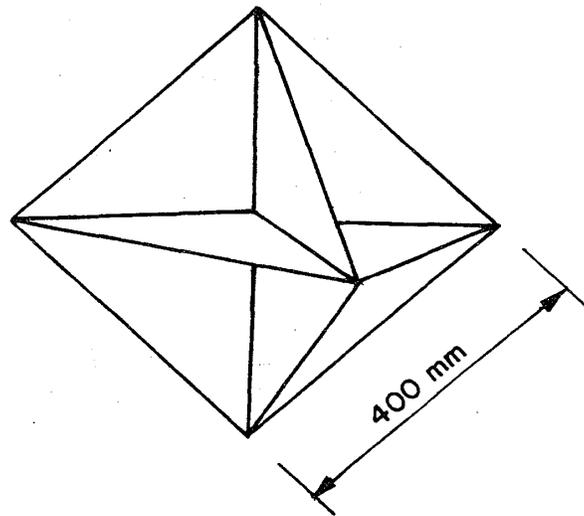


**Gate in Gear Set  
in Upper 2m of the Water Column**



**Gate in Gear Set  
in Upper 2m of the Water Column**

Aluminium plate or wire mesh is suitable. To provide a good target, the reflector should be a reasonable size; however if too large, the windage effect could cause the buoy to heel excessively.



**Radar Reflectors**

**DRAFT PROVISIONAL AGENDA FOR THE FIRST MEETING OF THE  
COMMISSION FOR THE CONSERVATION AND MANAGEMENT OF HIGHLY  
MIGRATORY FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC OCEAN**

Prepared by the Secretariat<sup>1</sup>

1. Paragraph 6(c) of the Resolution establishing the Preparatory Conference provides the Preparatory Conference will “prepare the provisional agenda for the first meeting of the Commission and, as appropriate, make recommendations relating to items thereon.”
2. The present paper explores how the first meeting of the Commission might be run and what needs to be on the agenda for the first meeting of the Commission to ensure the smooth functioning of the first meeting; and of the Commission and any subsidiary bodies thereafter.
3. Relevant parts of the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (“the Convention”) include Parts III and XII which establish some fundamental matters relating to the operation of the Commission, namely:
  - That, on entry into force of the Convention, the Commission is established.
  - The Commission comprises each Contracting Party to the Convention at the time the Commission meets (Article 34(4) and Article 9(1)); also, a fishing entity may participate in the work of the Commission (Article 9(2));
  - The Commission shall meet at least annually and other meetings will be scheduled with the principle of cost effectiveness in mind (Articles 9(3) and 9(5));
  - The Commission shall adopt rules of procedure for its meetings and meetings of its subsidiary bodies (Article 9(8)); and
  - The Commission shall elect a Chairman and Vice-Chairman of different nationalities from among the Contracting Parties, and those elected shall hold office for an initial period of two years (Article 9(4)).
4. It will be recalled that, at PrepCon V, the Conference endorsed a suggestion made by the Chairman that, on the basis that it appeared highly likely that the Convention would enter into force by the middle of 2004, there would be two sessions of the Conference in 2004. PrepCon VI, would, inter alia, seek to:

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<sup>1</sup> The present paper is a slightly revised and updated version of a paper prepared for the first session of the Preparatory Conference in 2001, issued under symbol WCPFC/PrepCon/BP.9.

- (a) Finalize recommendations relating to the organizational structure of the Commission Secretariat;
- (b) Finalize the budget for the early years of the Commission and the way in which it will be financed;
- (c) Draw up the agenda for the first session of the Commission; and
- (d) Make recommendations on the procedure for selection of an Executive Director.

PrepCon VI would also provide the opportunity to consider arrangements for the hosting of the Commission. PrepCon VII, which would be expected to be the final session of the Preparatory Conference would, if practicable, be held back to back with the inaugural session of the Commission at a time to be determined in due course. The main purpose of PrepCon VII would be to formally adopt the final report and recommendations of the Preparatory Conference, conclude the business of the Conference and deal with any unfinished business.

5. The inaugural session of the Commission would most likely be a largely ceremonial affair, at which important organizational decisions would be taken, based, where appropriate, on the recommendations of the Preparatory Conference. Since the Commission will not, at that stage, in all likelihood, have a budget, or a staff, it must be recognized that it might not be possible for the Commission to finalize many of the technical matters on the proposed provisional agenda at its first meeting.

6. There is no doubt that, within the rules for making decisions established by article 20 of the Convention, the Commission has legal capacity to elect a chair of its first meeting and to establish rules by which its meetings and those of its subsidiary bodies can be conducted. In this regard, it will be recalled that the Preparatory Conference has already done substantial work on the draft Rules of Procedure for the Commission. At PrepCon V, it was agreed that the Interim Secretariat would be tasked to prepare a revised version of the draft rules,<sup>2</sup> noting any remaining issues which would require consideration. It was further agreed that the revised draft of the rules would be taken up at the final session of the Conference with a view to finalizing a recommendation for adoption by the Commission at its first session.

7. There are a range of financial and administrative matters which need to be agreed to enable the Commission and its subsidiary bodies to function effectively. These include:

- (a) In relation to the Commission and Secretariat:
  - Approving rules concerning financial management and internal administration of the Commission including the scheme of contributions to the budget (Article 18(2)) and guidelines for administration of the fund referred to in Article 30(3);
  - Approving a budget for at least the first year of operation of the Commission (Article 18);
  - Appointment of an auditor (Article 19);
  - Decision on the location of the headquarters of the Commission;<sup>3</sup>
  - Agreeing upon a process for selecting an Executive Director (Article 16);

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<sup>2</sup> WCPFC/PrepCon/WP.1/Rev.4

<sup>3</sup> And, in due course, an agreement with the host country.

- Providing guidance to the Executive Director on conditions for appointment of staff and the number of and types of positions to be filled; and
- Date for the next meeting of the Commission and subsidiary bodies.

(b) Subsidiary bodies

Based on the relevant provisions of the Convention (Articles 11-14), the Commission will need to consider the arrangements for the subsidiary bodies to discharge the functions allocated to them in the Convention, including their relationship with existing regional bodies, such as SCTB (in the case of the Scientific Committee), as well as any overlap with the area of interest of these subsidiary bodies. For example the regional observer programme has a scientific element and a compliance element (Article 28(1)). Whilst data collected by observers needs to be tailored to the needs of the scientific community, the day to day operational aspects of the observer programme are probably best dealt with in the Technical and Compliance Committee. The Commission might also wish to consider the need to establish additional subsidiary bodies, where appropriate.<sup>4</sup> The final recommendations made by Working Groups II and III of the Preparatory Conference will be important in this respect.

(c) Other matters

There are a range of practical matters which should be addressed early in the life of the new Commission, such as consideration of the need for conservation and management measures in light of recent scientific advice and any emerging management issues, agreeing to the standards, specifications and procedures for use of VMS transmitters (Article 24(8)), setting dates for information to be provided to the Commission Secretariat under Articles 24(5), 23(2), 25(8), determining boarding and inspection procedures if necessary (Article 26(2)) and addressing a range of issues for the regional observer programme (Articles 28(7) and (8)). Many of these matters, however, would most likely not be considered in any detail at the first meeting of the Commission, but would be deferred to subsequent meetings, following consideration by the relevant subsidiary bodies.

8. The annex to the present document contains a proposal for a draft provisional agenda for the first meeting of the Commission.

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<sup>4</sup> For example, the advisory committee on financial and budget matters envisaged by article 3.7 of the draft Financial Regulations.

Annex

**FIRST MEETING OF THE COMMISSION FOR THE CONSERVATION AND  
MANAGEMENT OF HIGHLY MIGRATORY FISH STOCKS IN THE WESTERN AND  
CENTRAL PACIFIC OCEAN**

**DRAFT PROVISIONAL AGENDA**

AGENDA ITEM 1. OPENING OF MEETING

- 1.1 Welcoming address
- 1.2 Election of Chairman and Vice-Chairman
- 1.3 Meeting arrangements
- 1.4 Adoption of agenda
- 1.5 Opening Statements

AGENDA ITEM 2. MEMBERSHIP

- 2.1 Status of the Convention
- 2.2 New parties to the Convention.

AGENDA ITEM 3. FINAL REPORT OF THE PREPARATORY CONFERENCE

- 3.1 Presentation of the final report of the Preparatory Conference on all matters within its mandate pursuant to paragraph 9 of resolution I. \*

AGENDA ITEM 4. ESTABLISHING RULES FOR MEETINGS

- 4.1 Consideration, with a view to adoption, of the Rules of Procedure for the Commission \*
- 4.2 Adoption of rules and procedures for the Subsidiary Bodies of the Commission

AGENDA ITEM 5. LOCATION OF THE HEADQUARTERS OF THE COMMISSION  
AND ESTABLISHMENT OF THE SECRETARIAT

- 5.1 Location of the headquarters of the Commission \*
- 5.2 Procedure for the appointment of the Executive Director of the Commission \*
- 5.3 Adoption of terms of service for the staff of the Commission and the Staff Regulations
- 5.4 Emblem and symbol of the Commission

AGENDA ITEM 6. BUDGET AND FINANCE

- 6.1 Adoption of budget for first year of the Commission \*
- 6.2 Adoption of the scheme of assessed contributions to the budget of the Commission \*
- 6.3 Consideration, with a view to adoption, of the Draft Financial Regulations of the Commission \*
- 6.4 Appointment of an Auditor
- 6.5 Report on the status of the Preparatory Conference Organizational Fund

AGENDA ITEM 7. FISHERIES MANAGEMENT AND MONITORING MEASURES

- 7.1 Consideration of the need for management measures for stocks in light of current scientific advice and any emerging management issues
- 7.2 Adopt standards, specifications and procedures for use of VMS transmitters
- 7.3 Dates for information to be provided to Commission Secretariat under various Convention articles
- 7.4 Procedures for boarding and inspection in the Convention Area
- 7.5 Regional Observer Programme – matters under Article 28(7), coordination of operation of regional observer programme and desired levels of observer coverage.

AGENDA ITEM 8. SCIENCE ISSUES

- 8.1 Provision of scientific advice to the Commission
- 8.2 Programme of work for the Scientific Committee
- 8.3 Scientific research plan

AGENDA ITEM 9. COOPERATION WITH OTHER INTERNATIONAL ORGANIZATIONS

- 9.1 Appropriate means of cooperation with other international organizations into whose area of competence stocks may range
  - CCSBT
  - IOTC
  - IATTC \*
  - CCAMLR
- 9.2 Appropriate means of cooperation with other fisheries related bodies where management is not an issue
  - Pacific Community
  - Forum Fisheries Agency
  - UN Food and Agriculture Organisation

AGENDA ITEM 10. NEXT MEETING

- 10.1 Date and place of next meeting

\* Matters upon which a recommendation of the Preparatory Conference is likely to be adopted prior to the first session of the Commission.

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**WORKING GROUP I  
(ORGANIZATIONAL STRUCTURE, BUDGET AND FINANCIAL CONTRIBUTIONS)**

**PROVISIONAL BUDGET AND SCHEME OF CONTRIBUTIONS FOR THE  
COMMISSION IN ITS FIRST YEARS OF OPERATION**

Prepared by the Secretariat

**I. INTRODUCTION**

1. At previous sessions of the Preparatory Conference, Working Group I (WG. I) has considered sequentially the various matters set out in its terms of reference (WCPFC/PrepCon/3). Thus, at PrepCon III, WG.I gave consideration to the matter of the costs associated with the Commission Secretariat, the provision of external services to the Commission and the application of cost recovery principles to the work of the Commission.<sup>1</sup> At PrepCon IV, WG.I began substantive consideration of the issues associated with the development of a scheme for the assessment of contributions to the budget of the Commission. This work was continued at PrepCon V, when WG.I also considered in more detail the issue of a special requirements fund for the purposes identified in article 30 of the Convention.

2. At the outset, it will be recalled that WG.I agreed that the following principles would serve as a guide to its work:

- (a) The Commission should, as far as possible be self-reliant with respect to funding;
- (b) The Commission Secretariat must be independent and adequately resourced in order to ensure an efficient and cost-effective organization;
- (c) Services procured by the Commission should be sourced at market rates and subject to clear standards and specifications;
- (d) Every effort should be made to avoid duplication in the provision of services, ensure compatibility and maintain cost-effectiveness.

These principles have continued to guide and inform the preparation of the present document.

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<sup>1</sup> See WCPFC/PrepCon/WP.7, WCPFC/PrepCon/WP.8 and WCPFC/PrepCon/19.

3. In light of the progress made in its discussions on the scheme of contributions, it was agreed that, at PrepCon VI, WG.I should return to address in detail matters relating to the structure of the Commission Secretariat as well as the provisional budget of the Commission for its early years and how such a budget may be financed.

4. In order to better inform its discussions, the following working papers had been provided to WG.I at earlier sessions. These remain available on the PrepCon website, [www.ocean-affairs.com](http://www.ocean-affairs.com):

WCPFC/PrepCon/WP.3	Service needs of the Commission and options and secretariat structures for the delivery of such services
WCPFC/PrepCon/WP.7	Indicative costs for a Commission Secretariat and related issues
WCPFC/PrepCon/WP.8	Application of cost recovery principles to the provision of Commission services
WCPFC/PrepCon/WP.13 and Rev.1	Formula for assessment of contributions to the budget of the Commission

During the discussions at PrepCon V, however, it was noted that much of the information that had been provided in these papers had been superseded in the light of subsequent developments and would need to be revisited. This would be particularly important in light of the recommendations regarding the science structure of the Commission which had been formulated by Working Group II during PrepCon V and also taking into account the discussions taking place in Working Group III.

5. The purpose of the present working paper, therefore, is to provide the working group with a revised proposal for a Secretariat structure taking into account the discussions to date together with a provisional indicative budget for the first year of operation of the Commission. The provisional indicative budget also includes revised and updated costings for the external services to be sourced by the Commission. In addition, following the discussions that took place at PrepCon V, it is now possible to provide an accurate forecast of the costs associated with the participation of developing States and territories in the work of the Commission and to factor this element into the provisional indicative budget. Finally, taking into account the outcome of the discussions at PrepCon V on the scheme of contributions, it is possible to provide, on an indicative basis, a schedule of estimated contributions for the first financial period of the Commission. In light of the stipulation in the draft Financial Regulations<sup>2</sup> that the draft budget should be accompanied by a forecast budget for the subsequent financial year, the provisional indicative budget also includes tentative projections for Years 2 and 3 of the Commission's existence.

## II. SECRETARIAT STRUCTURE AND INDICATIVE COSTS

### A. Proposed secretariat structure

6. In its earlier deliberations, there was broad support within WG.I for using the proposed Secretariat structure presented in document WCPFC/PrepCon/WP.3 as a basis for further consideration of the costs associated with the Commission Secretariat. That structure was based

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<sup>2</sup> WCPFC/PrepCon/WP.2/Rev.1.

upon an Executive Director appointed in accordance with the Convention, five Professional staff members and seven General Service staff recruited at locality rates, giving a total staff of 13. While this basic structure has been maintained, the model has been further refined in the light of the discussions that took place in WG.I at PrepCon III and in the light of the conclusions reached by WG.II in relation to the structure for the scientific functions of the Commission during its transitional period (WCPFC/PrepCon/32, paras. 5 – 7 and annex III).

7. Under the alternative developed by WG.II a professional staff of one Science Manager would be required to manage the external provision of science services. This would be a senior position, requiring an incumbent with high-level qualifications including broad experience in fisheries science and project management. A Data Manager, with high-level qualifications in database management and information and communications technology (ICT) would be required to manage the Commission's databases and data management functions. An Observer Programme Coordinator would manage activities associated with both scientific and MCS-related observer activities.

8. The revised proposal for the Secretariat structure is set out in Annex I to the present document. The revised structure also takes into account preliminary comments made by members of WG.I during PrepCon III. In particular, it will be seen that the senior position of Science Manager has also been allocated the responsibilities of a Deputy to the Executive Director. Although one delegation had proposed the establishment of a specific position of Deputy Director, others felt that this was difficult to justify on financial grounds and it is hoped that the present proposal, which involves conferring additional responsibilities on the most senior professional staff position (and remunerating that position at a level commensurate with those responsibilities), goes some way towards meeting the concerns of all delegations. The proposed structure has also been streamlined as far as possible, whilst bearing in mind that for a Commission of this size and extent of responsibilities, it is simply not realistic to reduce the overall number of staff positions below the basic minimum needed to provide essential services. Compared to the model produced for preliminary consideration at PrepCon III, the overall staffing level proposed has been reduced to 14 (six Professional and eight General Service<sup>3</sup>) by the third year of operation of the Commission, when the Secretariat begins to carry out the full range of functions identified in the Convention

9. To assist in considering in more detail the need for each staff position, Annex II sets out the broad functions of each proposed staff position. The table also indicates the year in which it might be anticipated that each staff position would become operational.

#### B. Indicative costs of proposed Secretariat structure

10. The costs associated with the establishment of a Commission Secretariat include not only the direct costs associated with the recruitment and remuneration of staff, but also other costs attributable to the core budget of the organization, including the general operating costs of the Commission, the purchase and maintenance of capital assets, meeting costs and the costs of the provision of services to the Commission. The latter item is considered in more detail in Part III.

##### 1. Remuneration system for staff of the Secretariat

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<sup>3</sup> For convenience, locally-recruited staff positions are referred to throughout as "General Service", although that is an appellation used by the UN system.

11. At least in the early years, the largest component of the budget of the Commission is likely to be staff costs, including salaries, allowances and the costs of recruitment. In most intergovernmental organizations, the relationship between the staff and the employing organization, including the terms and conditions of service, is governed by a set of Staff Regulations, established by the members of the organization and elaborated through administrative directions and rules established by the chief executive officer of the organization.

12. In determining an appropriate remuneration system for the staff of the Commission secretariat, it is important to recall article 16, paragraph 2, of the Convention, which provides as follows:

“ The paramount consideration in the recruitment and employment of the staff shall be the necessity of securing the highest standards of efficiency, competence and integrity. Subject to this consideration, due regard shall be paid to the importance of recruiting the staff on an equitable basis between the members of the Commission with a view to ensuring a broad-based Secretariat.”

Similar provisions appear in the constituent instruments of many international organizations, most notably in article 101 of the Charter of the United Nations and in article 167, paragraph 2, of the United Nations Convention on the Law of the Sea. The provision makes it clear that the paramount consideration is the need to secure staff of the highest standards of efficiency, competence, and integrity. The establishment of the remuneration system should reflect this intention. If the Commission is to attract the highest quality candidates then remuneration will be an important consideration as there is likely to be considerable competition in the employment market for such personnel. Article 16 also requires due regard to be paid to the importance of recruiting the staff on an equitable basis between the members of the Commission with a view to ensuring a broad-based secretariat. On the basis that the Commission will have a membership drawn from States both within and beyond the Asia-Pacific region it may also be appropriate to consider the extent to which the Commission should seek to attract suitably qualified applicants from across the entire range of potential member States. In the United Nations, which applies a common system of salaries and allowances to over 52,000 international staff members, these competing objectives have been reflected in the so-called Noblemaire principle, which places importance upon the ability to recruit from all member States by establishing the base salaries of professional staff by reference to the highest paid national public service (in the case of the United Nations this is considered to be the U.S. Federal Civil Service).

13. In previous discussions in WG.I, a range of options for a system of remuneration were considered, ranging from participation in the United Nations common system of salaries and allowances<sup>4</sup> to participation in a regional system of salaries and allowances, such as the system applied by the agencies of the Council of Regional Organizations of the Pacific (CROP).<sup>5</sup> The advantages and disadvantages of each option were discussed in some detail. It was noted that the CROP system is not designed to accommodate the needs of countries which are not members of

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<sup>4</sup> Some of the regional fisheries management organizations that apply the UN Common system include: The Commission for the Conservation of Southern Bluefin Tuna (CCSBT); The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR); the International Commission for the Conservation of Atlantic Tunas (ICCAT); and the Indian Ocean Tuna Commission (IOTC).

<sup>5</sup> The organizations involved include the Forum Fisheries Agency (FFA); the Pacific Forum Secretariat (ForSEC), the Secretariat of the Pacific Community (SPC), the South Pacific Applied Geoscience Commission (SOPAC); and the South Pacific Regional Environment Programme (SPREP).

the CROP organizations and that those countries will not have had the opportunity to provide any input into the process of establishing the CROP standards. Further, the concept of a regional civil service is not well-developed and there is no centralized administration of terms and conditions nor is there any standardized methodology for the purposes of budgeting for staff positions. There is also no pension fund. At present, the CROP remuneration system is in a state of flux, with a major review ongoing including, inter alia, a review of the appropriate comparator index. On the other hand, it was noted that participation in the UN system is administratively complex and may be unnecessarily burdensome to apply within a relatively small organization. This indeed has been the experience of both CCAMLR and CCSBT, both of which apply the salary conditions developed by the International Civil Service Commission, but have developed acceptable alternatives to the UN pension and insurance schemes.

14. It is suggested that for WG.I to debate a direct comparison between, for example, UN and CROP salary scales would be counter-productive, primarily because such a comparison is very difficult to make, but also because it is apparent that neither system would fully meet the specific requirements of the Commission nor respect its unique characteristics as an organization which is located within the Pacific Islands region but has a broad-based, divergent, membership.

15. It is recommended, therefore, that WG.I should first seek to reach broad agreement on the structure of the proposed Secretariat and the functions of each position as set out in annexes I and II. The next stage, which could be carried out between PrepCon VI and PrepCon VII, would be to conduct a detailed job-sizing exercise which would include the establishment of market indicators and appropriate remuneration packages for the key professional staff positions. Market indicators for the General Service staff positions could be easily derived from a study of host country employment conditions.<sup>6</sup> This work could be conducted by any one of a number of internationally-recognized firms experienced in such matters. As a basic benchmark, WG.I had suggested at previous meetings that the level for the Executive Director should be broadly equivalent, at least in terms of key competencies and responsibilities, to level D-1 in the UN system.<sup>7</sup> Subject to further consideration by PrepCon VII, this should enable initial appointments to the Commission secretariat to be made, at least on a short-term basis, pending the approval by the Commission of more detailed Staff Regulations in its first few years of operation.

16. As far as the indicative budget is concerned, pending the exercise described in paragraph 15, a provisional figure of US\$ 600,000 is proposed during the first year and US\$ 900,000 for subsequent years.<sup>8</sup>

## 2. General operating expenses

17. In addition to staffing costs, the Commission will also have to meet the ongoing general operating expenses of the Secretariat. These would include official staff travel on mission, consultancy, maintenance of capital assets (vehicles, computers etc.), communications, electricity, office supplies, printing, general maintenance and security, library acquisitions and subscriptions, external printing, audit fees and bank charges. Many of these items, especially those relating to travel, utilities, security and communications, are heavily influenced by the

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<sup>6</sup> Usually, international organizations employ General Service staff on the basis of the best rates paid for such work in the locality of the organization, the so-called "Flemming" principle.

<sup>7</sup> That is, the same level as the Executive Secretary of IOTC.

<sup>8</sup> It may be noted for comparison that the IOTC budget for staff costs (12 positions) for 2003 was US\$ 907,968. It should also be noted that the budget line item includes all costs associated with staff employment, such as leave, pension, recruitment, education allowances etc., and not just salary.

location and characteristics of the headquarters. It is not really possible at this stage to give any more than a general indication of the extent of the costs involved, but it is considered that the amounts shown in Annex IV are a reasonable indication of the likely costs.

### 3. Purchase and maintenance of capital assets

18. It is assumed that the Commission will not own real estate assets. Office accommodation, free of charge, would be provided by the host government. The Commission would be required to pay for normal maintenance. However, particularly in the early years of operation of the Commission, there will be a need to acquire capital assets. These include, for example, vehicles, office furniture, photocopiers, library books and supplies and computers (network server, web server etc.). These should therefore be reflected in the indicative budget for the first year.

### 4. Meeting costs

19. The cost of convening meetings of the Commission and its subsidiary bodies depends to a great extent upon where those meetings take place. However, given that it is unlikely that the Commission will have its own purpose-built conference venue, there will be a need to make provision for the hire of meeting space, which may include sums for such items as rental of additional photocopiers, computers, sound systems and other essential equipment. In addition, given the small size of the proposed Secretariat, it is likely that there would be a need to make provision for the hire of temporary staff when the Commission is in session. These costs could be significantly increased if the Commission decided to hold its meetings in different countries, for example on a rotational basis, because of the need for additional staff travel and local hire of meeting facilities (which may be quite costly where hotel facilities are used).

20. By far the major expense under this head, however, will be the cost of financing the participation of developing States Parties, territories and possessions. It will be recalled that, during its discussions on the draft Financial Regulations for the Commission, a proposal had been made to insert the following provision:

“3.5 The draft budget shall include an item specifying the costs required to finance the travel and subsistence for one representative from each developing State Party to the Convention and, where appropriate, territories and possessions, to each meeting of the Commission and to meetings of relevant subsidiary bodies of the Commission.”

21. On the basis that a total of 20 participants (one from each developing State Party, territory and possession) would require funding, it is estimated that the total budgetary requirement under this sub-item would be US\$131,300. A breakdown of this figure is provided in Annex III.

## **IV. PROVISION OF EXTERNAL SERVICES**

22. The working paper prepared for PrepCon III (WCPFC/PrepCon/WP.7), contained a discussion of the way in which the Commission may source services relating to science and research, data management, administration of the vessel register and the provision of a Vessel

Monitoring System (VMS).<sup>9</sup> Although in the that paper, an indicative budget US\$ 1,200,000 was proposed for the provision of such external services, it was noted by WG.I that it was still too early in the process to make assumptions as to the precise nature and extent of the services that would be required and that further discussion in WG.II and WG.III would be required. It was also noted that there although there would clearly be a need at a later stage to incorporate the costs of a Commission observer programme and VMS, it was not possible to consider those items at such an early stage of the development of the Commission. No allowance has therefore been made for these items in the provisional indicative budget, although the discussion in WCPFC/PrepCon/WP.7 remains relevant for future consideration.

23. In the light of the discussions at PrepCon V in WG.II,<sup>10</sup> and on the assumption that scientific services will, at least during the transitional period identified by WG.II, be provided by OFP-SPC, it has been possible to substantially revise the estimated costs of the provision of scientific services. These are considered below, along with the costs of administering the vessel register.

#### A. Provision of scientific services by SPC-OFP

24. Currently the SPC-OFP undertakes, on behalf of its member countries, many of the data- and stock-assessment-related activities that the Commission will ultimately require, with appropriate modification, for its own scientific information needs. These activities were identified by WG.II at PrepCon V.<sup>11</sup> Such activities are currently funded from a range of sources, including SPC core funding (i.e. assessed contributions of member countries), long-term extra-budgetary funding from several SPC metropolitan members, and fixed-term project funding from sources including the European Community, the Global Environment Facility, some fishing nations and SPC island members. During the initial period of the Commission's operation, when the majority of its membership is likely to be a subset of the SPC membership, SPC has advised that it considers it appropriate that the OFP uses its existing resources as much as possible to satisfy the data and stock assessment needs of the Commission. However, the SPC membership has also made it clear that, even during the initial stages of the Commission, the provision of services to the Commission by the OFP must not be to the detriment of services that are currently provided by the OFP to SPC members, and that the Commission would need to cover the incremental costs of any OFP services that go beyond, or are more specific, than the services that are normally provided by the SPC-OFP to its membership. As the Commission membership broadens to include more countries that are not SPC members, particularly the larger fishing nations, the expectation is that the Commission would begin to assume greater financial responsibility for the full package of scientific services that it requires.

25. In the first full year of the Commission's operation, it is anticipated that the Commission will require the following priority data-related services:

(a) Database products tailored to specification, including summary databases of historical catch, effort and size composition for the major target species at various levels of spatial resolution;

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<sup>9</sup> The analysis in that paper was derived from cost estimates provided by existing regional organizations (OFP-SPC and the Forum Fisheries Agency) and, where possible, advice and cost information from commercial service providers.

<sup>10</sup> See WCPFC/PrepCon/32.

<sup>11</sup> Id. Annex III.

- (b) Estimates of catches of major non-target species
- (c) Data summaries and statistical analyses of various types to support consideration of issues before the Commission and its subsidiary bodies, including consideration of potential management measures;
- (d) Provision of analyses in support of planning of regional observer and other sampling programmes;
- (e) Provision of statistical information to the FAO on behalf of the Commission.

26. In the first full year of the Commission's operation, it is anticipated that the Commission will require the following priority stock-assessment-related services:

- (a) Stock assessments of yellowfin and bigeye tuna in the Convention Area, tailored to specifications that might be adopted by the Scientific Committee or its technical sub-committees:
- (b) Updating of current stock assessment methodology to reflect the information requirements of the Commission:
- (c) Undertaking specific analyses, such as catch-per-unit-effort standardization, in support of stock assessment:
- (d) Begin assembling data, developing stock assessment methodology and undertaking preliminary analyses for species of interest to the Commission that are not currently routinely assessed (e.g. marlins, some species of sharks).<sup>12</sup>

27. It is estimated that the incremental costs of providing these services in the first full year of the Commission's operation will be equivalent to the cost of two mid-level scientific positions, one focused on fisheries statistics and the other on stock assessment. The estimated cost of two such positions (equivalent to two positions at CROP level J.4) is US\$ 223,561. In addition, travel costs for staff members to the Commission and the Scientific Committee are estimated at US\$ 16,000. Overall, the incremental cost of data and stock assessment services provided by SPC-OFP in the first full year of operation of the Commission is estimated at US\$ 240,000. This figure would need to be revised on an annual basis in the light of funding available for the OFP from its traditional donors, changes in the Commission membership, the capacity of its Secretariat, and the evolution of its scientific requirements.

#### B. Vessel Register

28. Article 24 of the Convention requires members of the Commission to maintain a record of vessels authorized to fish in the Convention Area and goes on to require that the information as set in Annex IV of the Convention be provided to the Commission annually or when alterations occur. The Commission is required pursuant to article 24, paragraph 7, to maintain a record of the information provided by members and to circulate this information periodically to all members or on request individually to any member. The Commission could take a number of approaches to the management of these data, ranging from paper records and manual searches, through a simple

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<sup>12</sup> This list of requirements is subject to further refinement by WG.II and by SCG, but is assumed to broadly reflect the scope of the services that will be required by the Commission.

electronic database to a more complete vessel register system akin to those applied in many national jurisdictions with the ability to search the database.

29. To enable the Commission to satisfy the requirements of article 24, an electronic vessel register is proposed. It has been assumed that capacity for approximately 2,000 vessels would be required in the medium term. This is based upon the 1,200 vessels currently on the FFA system, plus provision for another 1,000 vessels that may either be operating in EEZ jurisdictions outside the FFA membership or authorized to operate on the high seas in the Convention Area.

30. FFA has advised that if it were to be engaged to provide vessel register services to the Commission, the cost to the Commission would be in the order of US\$ 120,000 in the first year with ongoing costs of US\$ 96,000 per annum. The initial costs include the costs of programming and hardware to create a parallel system to the current FFA register. It is estimated that going out to commercial service providers (which in relation to a vessel register could include providers that manage similar register-style databases in other sectors) is likely to involve costs in the order of US\$ 200,000 in the first year with ongoing costs of US\$ 100,000 per annum. A commercial register would include all the details, including photographs, stipulated in Annex IV of the Convention and, in addition to regular reports being prepared by the service provider, members of the Commission would also be able to access the register via the Internet.

31. Even with the secretariat staffing levels proposed in the present paper, it is anticipated that the Commission secretariat could operate an in-house vessel register. The additional cost to the Commission would be the set-up costs associated with the establishment of the database and ongoing maintenance. An indication of possible establishment costs may be drawn from recent international tenders involving a vessel register integrated with a vessel monitoring system. The establishment cost of the vessel register component of such a system is in the order of US\$ 400,000. Ongoing costs, in addition to staff costs and Secretariat overheads, would be in the order of US\$ 120,000 per annum.

32. It is estimated that in the medium-term, the annual costs to the Commission for provision of the vessel register, based upon the use of either the FFA or a commercial service provider, may be in the order of US\$ 100,000 – 200,000 per year.

## **V. COST RECOVERY**

33. It will be recalled that a separate working paper (issued as WCPFC/PrepCon/WP.8) had been prepared on the application of cost recovery principles to the provision of specified Commission services and remains relevant to future discussions.

## **VI. INDICATIVE BUDGET**

34. For the purposes of the discussions in WG.I, a provisional indicative budget for the first three years of the Commission has been prepared and is contained in Annex IV to the present paper. The provisional indicative budget is based upon the assumptions contained in this paper and will clearly be subject to change as discussions in the Preparatory Conference progress. In particular, greater precision will be possible once the key variable factors of staff costs and the actual costs associated with the location of the headquarters of the Commission have been determined. Actual budget estimates for the second and subsequent years of the Commission do not, of course, need to be determined by the Preparatory Conference, and are included for illustrative purposes only. They would be subject to debate in the relevant organs of the

Commission itself. Other key variables that might affect the budget for the first year include the following:

(a) inevitable delay in recruitment of staff would affect the budget line for staff costs (but any savings would be offset to some extent by recruitment costs (travel, installation etc.) being concentrated in the first year);

(b) the timing of the actual establishment of the Commission (the budget covers a full year from January to December);

(c) the possible provision of certain capital items by the host country, or from alternative extra-budgetary sources; and

(d) the “piggy-backing” of certain of the Commission’s meetings in the first year with other existing regional meetings (e.g. SCTB).

35. It is suggested, however, that the figures contained in Annex IV provide a reasonably accurate estimate of the anticipated size of the Commission budget in the early years of its operations. This information, combined with the information on the scheme of contributions contained in the next section of the paper, should provide participants with a reasonable indication of the likely costs of membership of the Commission.

## VII. SCHEME OF CONTRIBUTIONS

36. Preliminary discussions on the formula for funding the budget of the Commission took place both at MHLCC6 and, to a limited extent, at PrepCon II in Madang. The Convention, in article 18, paragraph 2, already gives guidance as to the nature of the scheme of contributions to the budget and discussions to date both within MHLCC and within PrepCon have indicated general agreement that the scheme should be based on the considerations set out in the Convention. The Convention provides as follows:

“... due consideration shall be given to each member being assessed an equal basic fee, a fee based on national wealth, reflecting the state of development of the member concerned and its ability to pay, and a variable fee. The variable fee shall be based, inter alia, on the total catch taken within exclusive economic zones and in areas beyond national jurisdiction in the Convention Area of such species as may be specified by the Commission, provided that a discount factor shall be applied to the catch taken in the exclusive economic zone of a member of the Commission which is a developing State or territory by vessels flying the flag of that member.”

37. Working Group I gave detailed consideration to a proposed scheme of assessed contributions to the budget of the Commission during its meetings at PrepCon IV and PrepCon V.<sup>13</sup> The outcomes of those discussions are reflected in the reports of the Chair of WG.I to

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<sup>13</sup> Using, as a basis for its discussions, a working paper prepared by the Interim Secretariat. (WCPFC/PrepCon/WP.13 and WP.13/Rev.1). other relevant documents considered by MHLCC and PrepCon included MHLCC/INF.2/Corr.1 and WCPFC/PrepCon/WP.4, as well as a document tabled by the delegation of Republic of Korea on proposed financial regulations for the Commission, including a scheme of contributions (WCPFC/PrepCon/DP.9).

PrepCon IV and PrepCon V (WCPFC/PrepCon/25 and WCPFC/PrepCon/31). By the end of PrepCon V, there was broad support within WG.I for the adoption of a revised methodology for the calculation of the national wealth component (NWC) on the basis of a proposal by the delegation of Korea to use an equal weighting of proportional gross national income (GNI)<sup>14</sup> per capita<sup>15</sup> and proportional GNI: various alternative methodologies put forward for consideration by the Interim Secretariat having been found to be unsatisfactory for one reason or another.<sup>16</sup>

38. In considering the overall scheme of contributions, it became apparent during the discussions within WG.I that the main area of difficulty was the relative weighting of the three components set out in article 18 of the Convention. Although a preference was expressed for a relative weighting of 10 per cent (base fee), 20 per cent (national wealth component) and 70 per cent (fish production component), some participants considered that the relative weighting should be 10 per cent (base fee), 45 per cent (national wealth component) and 45 per cent (fish production component). In both cases, a discount factor of 0.4 was applied to the catches taken within the exclusive economic zone of a developing State or territory by vessels flying the flag of that developing State or territory. Although a proposal was made to cap the total amount of contributions by any one member of the Commission at 25 per cent, it was noted by others that the level of contributions was largely determined by the level of catch and that a ceiling would not therefore be appropriate.

39. Following extensive discussions, including discussion of a possible compromise between the differing positions, it became clear that there was a preponderance of views in favour of a relative weighting of 10/20/70. The delegation of Korea noted that its proposal for a relative weighting of 10/45/45 remained on the table and reserved its position with respect to any possible compromise. Several participants emphasized the need to reach finality on the scheme of contributions, at least for an interim period, so that WG.I could begin to address the other matters on its agenda. The Chair of WG.I proposed that, for the time being, the Conference should proceed on the basis of the formula that had been discussed during the meeting, with the application of a relative weighting of 10/20/70, but that the matter of the relative weighting could be revisited should any compromise proposal emerge from further consideration by delegations before the next session of the PrepCon.

40. With respect to the territories and possessions listed in article 43 of the Convention, WG.I noted that, in light of the discussions that had taken place in the informal plenary in relation to the rules of procedure, the territories had not been included in the revised assessed contributions scenario. It was noted that the territories would make independent and voluntary contributions in accordance with the proposed Annex II to the rules of procedure of the Commission and that such contributions would be fixed in accordance with a methodology to be determined, but which would reflect the extent of the relevant territory's competence. The overall budget of the Commission would therefore comprise (a) assessed contributions, and (b) agreed contributions by participating territories.<sup>17</sup>

41. On the basis of the discussions to date, Annex V contains a revised summary table of contributions. For the purposes of illustration, and without prejudice to the discussion in

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<sup>14</sup> References to GNI are based on three-year average GNI.

<sup>15</sup> Based on available sources of population data.

<sup>16</sup> The various alternative indices of national wealth are discussed in WCPFC/PrepCon/WP.13/Rev.1.

<sup>17</sup> WG.I noted that further work would be needed to determine the appropriate methodology, but, in the meantime, any revised scheme of contributions should be structured in such a way as to fully reflect the willingness of the territories to make agreed contributions.

paragraph 40 above, it has been assumed that the participating territories of French Polynesia, New Caledonia, Wallis and Futuna and Tokelau would make independent and voluntary contributions calculated on the same basis as the contributions of members of the Commission. Clearly, the actual dollar amounts shown in Table V would alter significantly depending upon the actual membership of the Commission at the time of entry into force and at the time the budget is adopted.

### **VIII. FINANCING OF THE FIRST FINANCIAL PERIOD AND TRANSITIONAL ARRANGEMENTS**

42. It is inevitable that when the Convention first enters into force, the number of members of the Commission will be less than the number of participants in the Preparatory Conference. With this in mind, an evolutionary approach has been taken to the establishment of the Commission, as recommended in WCPFC/PrepCon/WP.7, and it will be seen that the budget for the first two financial periods of the Commission is set at a level that will be somewhat lower than the budget for the third and subsequent years. On the other, the need to pay for necessary set-up and infrastructure costs means that there is relatively little scope for additional cost-saving in the early years.

43. For this reason, depending on the number of members of the Commission in the months immediately following entry into force, there may also be a need to use additional measures to facilitate the transition from the Preparatory Conference to the Commission proper. Such measures, some of which have been adopted by other new international organizations, may include, for example, temporary adjustments to the scale of contributions to reflect the composition of the Commission as at the date of entry into force or a division of the budget into two or more parts, one to be financed by assessed contributions in accordance with the agreed formula and one to be financed through voluntary contributions by those who are not yet members, but have committed to accede to the Convention within the first budget period. Any such voluntary contributions would be set off against assessed contributions due for that year as a result of accession.

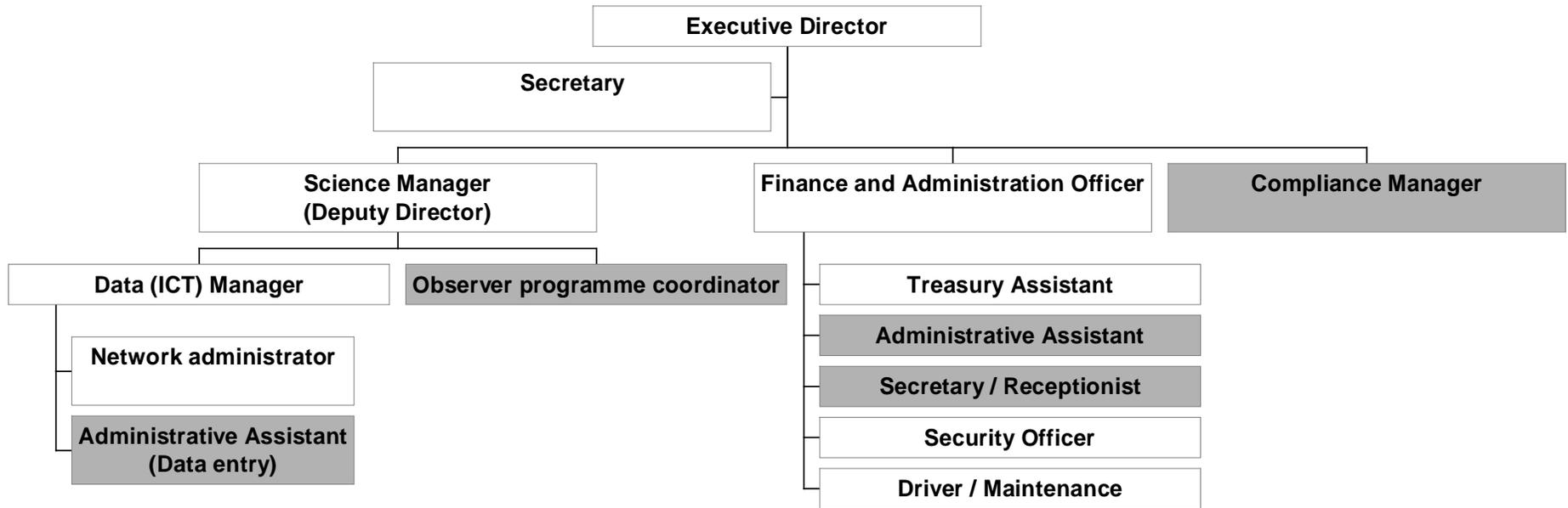
44. Another possibility may be to factor into the first budget a one-off capital levy, equivalent to 10 per cent of assessed contributions. This would help to ensure that the Commission has an adequate cash-flow to meet its financial obligations, particularly bearing in mind that some contributions may be paid late in the year, and some may not be paid at all. Unless such measures are taken, it may not be possible to recruit key staff until part way through the financial year, when the Commission has built up sufficient funds.

45. In order to ensure a smooth transition, it is also recommended that the Preparatory Conference Organizational Fund should be transferred to the Commission immediately upon entry into force. The Fund should, however, remain open for a period of time for further voluntary contributions following entry into force, including from participants in the Preparatory Conference that have not yet completed the necessary steps to become members of the Commission. These voluntary contributions could be used in due time for such purposes as the Commission sees fit, or set off against assessed contributions at a later time.

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Annex I

**PROPOSED SECRETARIAT STRUCTURE: ORGANIZATION CHART**



Annex II

**PROPOSED SECRETARIAT STRUCTURE: PROVISIONAL STAFFING LEVEL AND PROPOSED GRADE RANGE  
IN THE FIRST THREE YEARS OF OPERATION**

<i>Summary of functions</i>		<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
<b>Executive Director</b>	Functions as prescribed in the Convention.	•	•	•
<b>Science Manager (Deputy to the Executive Director)</b>	Review of scientific advice to the Commission; Secretary of Scientific Committee; manage contracts for science services, including development of specifications and standards for the provision of contracted science services.	•	•	•
<b>Finance and Administration Officer</b>	Monitor the budget and financial transactions of the Commission; internal oversight; manage contracts for technical services as necessary; supervisory office administration and personnel management.	•	•	•
<b>Data (ICT) Manager</b>	Manage the IT requirements of the Secretariat, establish and maintain necessary database, network and communications services; ongoing management of service agreements with external providers for the provision of data services to the Commission.	•	•	•
Compliance Manager	Secretary to Technical and Compliance Committee; provide information and advice associated with the development and ongoing implementation of any regional compliance schemes; manage the Commission's VMS and vessel register either directly or through existing regional organizations and programmes or through commercial service providers.		•	•
Observer Programme Coordinator	Manage the Commission's observer programme; provide support to Compliance Manager.			•
<b>Total professional staff</b>		<b>4</b>	<b>5</b>	<b>6</b>
<b>Network Administrator</b>	Maintain Commission WAN, LAN and website; user support; software management.	•	•	•
Administrative Assistant / Data Entry	Data entry; assist administration of the Commission's vessel register and observer programme.		•	•
<b>Treasury Assistant</b>	Record contributions, process payments and assist the finance and administration officer with respect to the monitoring of the budget; payroll.	•	•	•
<b>Secretary</b>	Secretary to Executive Director; maintain records and archives; press officer.	•	•	•
<b>Security Officer</b>	HQ premises and equipment security; inventory; personnel security.	•	•	•
Administrative Assistant	Personnel records; meeting organization; travel and procurement.		•	•
<b>Secretary / Receptionist</b>	Reception, communications, meeting assistance; general clerical and secretarial assistance to professional staff.		•	•
<b>Driver / maintenance</b>	Official transport; vehicle and general maintenance; deliveries; customs clearance.	•	•	•
<b>Total GS (locality) staff</b>		<b>5</b>	<b>8</b>	<b>8</b>
<b>Total Staff</b>		<b>9</b>	<b>13</b>	<b>14</b>

### Annex III

#### **COST OF PARTICIPATION BY DEVELOPING STATES AND TERRITORIES**

<i>Country</i>	<i>Airfare (USD)</i>	<i>Per diem (USD)</i>	<i>Total (USD)</i>
Cook Islands	5,500	3,200	8,700
FSM	0	0	0
Fiji	4,200	2,900	7,100
French Polynesia	4,500	3,300	7,800
Indonesia	4,200	3,200	7,400
Kiribati	4,100	3,200	7,300
Marshall Islands	900	3,100	4,000
Nauru	3,900	3,200	7,100
New Caledonia	4,800	3,200	8,000
Niue	5,000	3,400	8,400
Palau	1,400	2,700	4,100
Papua New Guinea	2,900	3,100	6,000
Philippines	1,800	3,100	4,900
Samoa	4,500	3,100	7,600
Solomon Islands	3,100	3,400	6,500
Tokelau	4,600	4,800	9,400
Tonga	2,800	3,500	6,300
Tuvalu	4,600	3,300	7,900
Vanuatu	4,200	2,900	7,100
Wallis and Futuna	6,000	3,500	9,500
<b>Total</b>	<b>69,200</b>	<b>62,100</b>	<b>131,300</b>

#### Notes:

- It is assumed that meetings will be held in Pohnpei for a period of 3 weeks, and will include the main Commission session plus the two main Committees.
- It is assumed that there will be one funded participant from each developing State Party and each participating territory.
- Airfares are based on the most direct and economical route, where most of the Southern hemisphere countries would travel Cairns-Guam-Pohnpei, except for French Polynesia, which due to frequent flight connections makes return via Honolulu possible. Countries neighbouring Pohnpei (Marshall Islands, Palau, Philippines) either travel direct or via Guam. Airfare quotes are mostly excursion fares. Possible savings may result where APEX purchases are possible.
- DSA is calculated based on current UNDP rates generally applicable in the region.

Annex IV

**Estimated budgetary requirements of the Commission  
(thousands of United States dollars)**

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>
<b>PART 1</b>			
<b>1 Staff Costs</b>			
Established posts	600.0	900.0	900.0
General temporary assistance	7.0	7.0	7.0
Overtime	10.0	10.0	10.0
Consultancy	60.0	40.0	40.0
<b>Sub-total</b>	<b>677.0</b>	<b>957.0</b>	<b>957.0</b>
<b>2 Staff travel</b>	90.0	90.0	90.0
<b>Sub-total</b>	<b>90.0</b>	<b>90.0</b>	<b>90.0</b>
<b>3 General operating expenses</b>			
Electricity	20.0	20.0	20.0
Communications	55.0	55.0	55.0
Office supplies	30.0	20.0	20.0
Publications and printing	20.0	20.0	20.0
Audit	5.0	5.0	5.0
Bank charges	2.0	2.0	2.0
Entertainment	10.0	10.0	10.0
Miscellaneous	10.0	10.0	10.0
<b>Sub-total</b>	<b>152.0</b>	<b>142.0</b>	<b>142.0</b>
<b>4 Capital expenditure</b>			
Vehicles	65.0	0.0	45.0
Computers (server and workstations)	55.0	30.0	25.0
Furniture and office equipment	50.0	30.0	15.0
<b>Sub-total</b>	<b>170.0</b>	<b>60.0</b>	<b>85.0</b>
<b>5 Maintenance of capital assets</b>			
Vehicle maintenance	3.0	5.0	5.0
IT maintenance and software licenses	15.0	6.0	6.0
Insurance	7.0	7.0	7.0
<b>Sub-total</b>	<b>25.0</b>	<b>18.0</b>	<b>18.0</b>
<b>6 Meeting services</b>			
Annual session (including Committees)	30.0	30.0	30.0
Travel and per diems (eligible members)	131.3	131.3	131.3
<b>Sub-total</b>	<b>161.3</b>	<b>161.3</b>	<b>161.3</b>
<b>Sub-total Part 1</b>	<b>1,275.3</b>	<b>1,428.3</b>	<b>1,453.3</b>
<b>PART 2</b>			
<b>1 Scientific services (OFP-SPC)</b>	240.0	240.0	240.0
<b>2 Vessel register</b>	50.0	100.0	100.0
<b>Sub-total Part 3</b>	<b>290.0</b>	<b>340.0</b>	<b>340.0</b>
<b>TOTAL BUDGETARY REQUIREMENTS</b>	<b>1,565.3</b>	<b>1,768.3</b>	<b>1,793.3</b>

Annex V

**BUDGET CONTRIBUTIONS SCENARIO WHERE BASE FEE = 10%, NWC = 20% AND  
CATCH COMPONENT = 70% (DISCOUNT FACTOR OF 0.4). PROVISIONAL  
INDICATIVE BUDGET OF US\$ 1,565,300**

<b>Commission Members</b>	<i>Base fee 10% of budget</i>	<i>National wealth component 20% of budget</i>	<i>Catch component 70% of budget</i>	<i>Total contribution 100% of budget</i>	<i>% of budget by member</i>
Australia	5,218	15,596	7,224	<b>28,037</b>	1.79%
Canada	5,218	17,884	206	<b>23,307</b>	1.49%
China	5,218	8,879	9,839	<b>23,937</b>	1.53%
Cook Islands	5,218	2,887	96	<b>8,200</b>	0.52%
FSM	5,218	1,214	13,803	<b>20,234</b>	1.29%
Fiji	5,218	1,368	3,703	<b>10,288</b>	0.66%
France	5,218	25,398	0	<b>30,615</b>	1.96%
Indonesia	5,218	1,403	25,516	<b>32,137</b>	2.05%
Japan	5,218	55,755	347,671	<b>408,643</b>	26.11%
Kiribati	5,218	569	4,863	<b>10,649</b>	0.68%
Korea	5,218	8,777	173,162	<b>187,156</b>	11.96%
Marshall Islands	5,218	1,349	16,167	<b>22,733</b>	1.45%
Nauru	5,218	492	0	<b>5,710</b>	0.36%
New Zealand	5,218	8,100	13,892	<b>27,210</b>	1.74%
Niue	5,218	492	0	<b>5,710</b>	0.36%
Palau	5,218	4,272	34	<b>9,525</b>	0.61%
Papua New Guinea	5,218	444	28,582	<b>34,244</b>	2.19%
Philippines	5,218	1,286	40,768	<b>47,272</b>	3.02%
Samoa	5,218	891	2,134	<b>8,243</b>	0.53%
Solomon Islands	5,218	407	6,530	<b>12,155</b>	0.78%
Chinese Taipei	5,218	10,635	245,997	<b>261,849</b>	16.73%
Tonga	5,218	988	615	<b>6,820</b>	0.44%
Tuvalu	5,218	817	0	<b>6,035</b>	0.39%
United Kingdom	5,218	27,004	0	<b>32,222</b>	2.06%
USA	5,218	96,898	130,017	<b>232,133</b>	14.83%
Vanuatu	5,218	668	17,986	<b>23,872</b>	1.53%
<b>Total assessed contributions</b>	<b>135,659</b>	<b>294,473</b>	<b>1,088,804</b>	<b>1,518,937</b>	<b>97.04%</b>
<b>Participating territories</b>					
French Polynesia	5,218	9,940	6,233	<b>21,391</b>	1.37%
New Caledonia	5,218	8,647	672	<b>14,537</b>	0.93%
Wallis and Fortuna	5,218	0	0	<b>5,218</b>	0.33%
Tokelau	5,218	0	0	<b>5,218</b>	0.33%
<b>Total independent and voluntary contributions by participating territories</b>	<b>20,871</b>	<b>18,587</b>	<b>6,906</b>	<b>46,363</b>	<b>2.96%</b>
<b>Total Budget</b>	<b>156,530</b>	<b>313,060</b>	<b>1,095,710</b>	<b>1,565,300</b>	<b>100.00%</b>



## **PROCESS FOR APPOINTMENT OF AN EXECUTIVE DIRECTOR FOR THE COMMISSION**

### Prepared by the Secretariat

1. The Convention, article 15, paragraph 1 states that the “Commission may establish a permanent Secretariat consisting of an Executive Director and such other staff as the Commission may require.” Paragraph 2 of the same article states that the “Executive Director shall be appointed for a term of four years and may be re-appointed for a further term of four years.” The Executive Director is not only the administrative head of the Secretariat, but also the “chief administrative officer of the Commission,” with specific functions and responsibilities set out in the Convention.
2. If the Commission decides to establish a permanent Secretariat, it will also need to appoint an Executive Director. The Convention is silent as to the procedures that should be adopted to make such an appointment. It will therefore be important for the Commission to agree at an early stage upon the procedures that it will follow.
3. Traditionally, the heads of intergovernmental organizations are appointed, or elected, following a political process. For this reason, the constituent instruments of many intergovernmental organizations, including even the Charter of the United Nations, do not spell out the qualifications expected of the chief administrative officer. Appointment is made in accordance with a political process either explicitly spelt out or developed by custom and usage. In recent times, however, particularly in intergovernmental organizations with an emphatically technical focus there has been a marked trend towards depoliticising the appointment process and making appointments based primarily on merit, determined through a transparent selection process. An example of such a process is that recently adopted by the Indian Ocean Tuna Commission (IOTC) for the selection of an Executive Secretary, where candidates were shortlisted in order of merit on the basis of objective criteria prior to interview and final selection. In such a case, the final selection may be by consensus (desirable where possible) or by some other means, such as secret ballot. In the case of the IOTC, all member countries were given the opportunity to participate in the shortlisting process, which was done by point scoring. An alternative scenario would be to entrust the shortlisting to a smaller group of member countries. Whichever mechanism is chosen, it is often the case that a large number of unmeritorious applications are received (i.e. applicants that obviously do not meet the basic essential criteria) and, prior to shortlisting, it may be necessary to give some consideration to entrusting the Chairman of the Commission, or the Chairman and a small panel of representatives, to draw up a longlist of qualified applicants.

4. The Preparatory Commission may wish to give preliminary consideration to the establishment of a job description for the Executive Director and to a selection and appointment process. An appropriate recommendation could then be made to the first session of the Commission in order to facilitate the early appointment of the first Executive Director of the Commission. As a basis for discussion of this item, a sample job description and outline selection process are attached as annexes I and II to this note.

5. In addition to deciding on the appropriate procedures to be adopted, participants will also need to decide on the timing of the appointment of the first Executive Director of the Commission. Ideally, the first Executive Director would be appointed at the first meeting of the Commission. However, until the new Commission has a budget, and in the absence of any other source of funding, it may not be possible for any such appointment to become effective for a number of months. It may be necessary, therefore, for consideration to be given to interim arrangements, to apply between the inaugural meeting of the Commission and its first substantive session in 2005, or to a deferred appointment, pending the effective operation of the Commission.

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## Annex I

Terms of reference: Executive Director

### Qualifications:

The incumbent should have university-level qualifications, preferably at post-graduate level, in relevant field, for example, fisheries science or biology, fisheries economics, international law and international relations. He/she should have at least ten years relevant experience in fisheries management, policy formulation and implementation, preferably including multilateral relations. He/she should have the ability to exercise a high degree of professional initiative and autonomy. The incumbent must also be experienced in the organization of international meetings and the preparation of budgets, working documents and reports.

Other essential requirements include competence in the selection of staff; demonstrated ability to supervise professionals in subject field; demonstrated organizational and management ability in the context of international organizations; and familiarity with the use of word processing, spread sheets and database management systems.

Highly desirable requirements include: a high degree of adaptability and ability to cooperate effectively with people of different nationalities and of various social and cultural backgrounds and education levels.

### Terms of reference

Pursuant to article 15 of the Convention, the Executive Director is the chief administrative officer of the Commission. The Executive Director shall be responsible for implementing the policies and activities of the Commission and shall report thereon to the Commission. He/she shall also act as Secretary to the subsidiary bodies established by the Commission, as required. The incumbent will have overall responsibility for planning, coordination, financial management and administration of the Commission in accordance with the Convention and the decisions of the Commission and shall be accountable to the Commission therefor.

He/she will in particular:

- (a) receive and transmit the Commission's official communications;
- (b) maintain high level contacts with appropriate government officials, fishery institutions and international organizations concerned with tuna fisheries to facilitate consultation and cooperation between them on information collection and analysis;
- (c) maintain an active and effective network of national focal points for routine communication of progress and results of the activities of the Commission;
- (d) prepare and implement work programmes, prepare budgets and ensure timely reporting to the Commission;
- (e) authorize disbursement of funds in accordance with the Commission's budget;
- (f) account for the funds of the Commission;

(g) stimulate interest among Members of the Commission and potential donors in the activities of the Commission and in possible financing or in implementing of pilot projects and complementary activities;

(h) promote, facilitate and monitor the development of databases for resources assessment of biological and socio-economic research to provide a sound basis for conservation management;

(i) organize sessions of the Commission and its subsidiary bodies and other related ad hoc meetings;

(j) prepare background papers and an annual report on the Commission's activities and the programme of work for submission to the Commission at the regular sessions, and arrange the subsequent publication of the report of the proceedings of the Commission as well as its subsidiary bodies and related ad hoc meetings;

(k) represent the Commission at international meetings and other fora; and

(l) perform other related duties as required.

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## Annex II

### Timeline for appointment process

'A' minus 6 months	Advertisement of post
'A' minus 4 months	Applications to be submitted to Chairman. <sup>1</sup> Longlisting by the Chairman and heads of 2 other delegations on the basis of objective criteria
'A' minus 3 months	Circulation of longlist to all heads of delegations
'A' minus 2 months	Shortlisting of 3 candidates. Shortlisted CVs to be re-circulated to all delegations.
Appointment session	Interview of each candidate by panel (Day before session)
Appointment	By Commission (consensus if possible)

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<sup>1</sup> It is assumed this would be the Chairman of the Commission. For the appointment of the first Executive Director, a possible accelerated procedure would require the Chairman of the Preparatory Conference to fulfil this role.



## **WORKING GROUP II: PROVISIONAL ANNOTATED AGENDA AND GUIDE TO DISCUSSIONS AT PREPCON VI**

Prepared by the Interim Secretariat

1. Based on the provisional agenda described in the revised 'Information Note' circulated on 6 February 2004, the following items are proposed for discussion by WG II at PrepCon VI:

### **I Operation of the Scientific Committee**

- *Preliminary consideration of possible terms of reference and operating procedures for the future Scientific Committee of the Commission (and any possible specialist working groups that may be established), as well as the possible transition from existing institutional arrangements in the region, particularly the Standing Committee on Tuna and Billfish. This may include development of a plan or outline for the provision of scientific advice throughout 2005.*

### **II Scientific Coordinating Group, 2004 agenda**

- *The need for and the terms of reference for any meeting of the Scientific Coordinating Group (SCG) in 2004, as well as the timing of and funding for such a meeting. One of the matters that may be taken up by the SCG in 2004 may be the issue of the effects of fishing on bycatch and ecosystems. WG.II and SCG may wish to consider this matter on the basis of the study of approaches to ecosystem and bycatch issues that had been prepared for an earlier session of the Conference (WCPFC/PrepCon/WP.10).*

### **III Further development of the proposed initiative to enhance data collection in Indonesia and Philippines.**

### **IV The provision of scientific advice in relation to northern stocks as related to the activities of the Northern Committee.**

### **V Further development of the strategies for meeting the special requirements of developing States and territories with respect to data requirements and technical capabilities (referred to in paragraph 10 of WCPFC/PrepCon/32)**

2. The present working paper provides background on these topics and identifies where decision-making is required by WG II.

## **AGENDA ITEM I: OPERATION OF THE SCIENTIFIC COMMITTEE IN THE INTERIM PERIOD**

### *Background to the item*

3. At PrepCon IV, WG.II gave, *inter alia*, recommendations to PrepCon on the matter of the scientific structure and provision of scientific advice during the transitional period.

WCPFC/PrepCon/32 outlines key features of the structures required for the scientific functions of the Commission during the transitional period (3 to 5 years). WG.II noted that during this period the structure and functions of the science secretariat must be flexible and adaptable in order to meet changing needs. An independent review of the transitional structure and function should be carried out two years after entry into force of the convention, or earlier if required, to determine the effectiveness of the science structure and recommend changes as appropriate.

4. When the Convention comes into force in June 2004, the Commission's entities (of which the Scientific Committee is one) will begin to start functioning at some level. The following material is provided to assist WG II to discuss the scientific processes and functions required for the Scientific Committee to hold its first meeting, which would probably take place in 2005.

5. The roles and relationships of the Scientific Committee with the Commission, specialist working groups, research providers and the Secretariat are described in WCPFC/PrepCon/32 and Articles 12 and 13 of the Convention. While many of the practices of SCTB are expected to be used in the operation of the Scientific Committee (SC) during the interim period, the following items require discussion:

- (a) the number and timing of SC meetings required annually;
- (b) location of SC meetings;
- (c) process for selection of chairs and vice chairs;
- (d) SC work plan for year 1 (2005);
- (e) role of the Commission's Science Manager and support unit in SC business;
- (f) role of SCTB from 2005 onwards.

6. (a) *the number and timing of SC meetings.* The SCTB processes include one meeting of about seven working days per year. This meeting is held around July- August. Members need to consider whether a meeting of similar duration and timing might be appropriate for the Scientific Committee. Note that the timing of the annual Commission meeting has not been set and this may influence the timing of the Scientific Committee meeting.

7. (b) *location of the meeting.* If the Scientific Committee meetings are to be held in places other than the Commission HQ (this will need to be determined by the Commission), then some method of selecting the locations of meetings will need to be employed. One option could be to hold the meetings in a location nominated by each member in turn; where a turn is determined by the alphabetical order of Member names (acknowledging that Members ought to have the ability to abstain from hosting a meeting when their turn arises).

8. (c) *process for selection of chairs and vice chairs.* In some organizations the Secretariats provide a permanent Chair or vice-chair for technical meetings. In other organizations the Chairs and vice-chairs are drawn from the members. In such cases, some method of selecting Chairs and vice-chairs would need to be employed. As above, selection of these positions might be resolved using an alphabetical system (acknowledging that Members ought to have the ability to abstain from the role when their turn arises).

9. (d) *SC work plan for year 1 (2005).* If the first meeting of the SC is expected to occur in 2005, then the following items will need elaboration, either at PrepCon VI or, at the latest, by PrepCon VII:

- The timing and location of SC I
- The identification of the SC I Chair and vice-chair
- Identification of the special requirements of members relating to SC I
- The need for any meetings of specialist working group in 2005 (also see the need for SWG rules and procedures below)
- A provisional SC agenda, which among other items could include:
  - stock assessments to be covered
  - other scientific matters (e.g. Ecosystem and bycatch issues)
  - research planning (including determining how to prioritize research)
  - Rules and procedures for the Specialist Working Groups.

10. (e) *Role of the Commission's Science Manager and support unit.* WG II has previously described the key features of the scientific functions of the Commission during the transitional period, including the roles and relationships of the Scientific Committee with the Commission, specialist working groups, research providers and the Secretariat (WCPFC/PrepCon/WP.32 - see also Articles 12 and 13 of the Convention). It is assumed that the Science Manager would provide a major support role to the Scientific Committee. WG.II may wish to consider any additional recommendations as to items to be included in the job description of the Science Manager and the work to be carried out by the science support unit.

11. (f) *role of SCTB from 2005 onwards.* Currently the SCTB contributes greatly to the scientific advice provided by the SCG and WG II to PrepCon. SCTB meets in July-August each year for about seven working days. Acknowledging that Scientific Committee meetings in the interim period are expected to follow closely the current practices used for SCTB, WG II needs to discuss the nature and extent of SCTB's contribution to the Commission's science processes in 2005 and onwards, and advise PrepCon on the outcomes of the discussions including any financial or resource implications.

#### *Action required from WG II*

12. WG II is expected to identify what actions are necessary to enable the Scientific Committee to hold its first meeting in 2005. To this end it should:

- develop a work plan for the Scientific Committee in 2005;
- make recommendations to PrepCon on the nature and extent of that work plan, including, if possible, on the timing and location of the meeting and the process for selection of Chair and vice-chair;
- highlight to PrepCon the implications with respect to the number, timing and location of science-related meetings in 2005; the possible work required from the Commission's Science Support Unit (if it is established); and any special requirements for Members.

- make recommendations on the nature and extent of SCTB's contribution to the Commission's science processes in 2005 and onwards, and highlight any financial or resource implications.

## **AGENDA ITEM II: SCIENTIFIC COORDINATING GROUP - 2004 AGENDA**

### *Background to the item*

13. In 2003, the Scientific Coordinating Group met in accordance with the terms of reference agreed by the Preparatory Conference in its second session (WCPFC/PrepCon/15, Annex V), in Mooloolaba, Australia from 17 to 19 July 2003, immediately following SCTB16. SGC 2 produced *inter alia* stock status statements for the major target species (bigeye, yellowfin, skipjack and South Pacific albacore) (WCPFC/PrepCon/28). WG II later endorsed these summaries at PrepCon V (WCPFC/PrepCon/32). As a result of sustainability concerns in respect of bigeye and yellowfin, PrepCon V requested the Interim Secretariat to prepare a paper on management options, to be delivered to the next session of the Preparatory Conference (WCPFC/PrepCon/34).

14. A process for the provision of advice on the status of the target stocks for 2004 has not been confirmed. SCTB 17 is scheduled to meeting in Majuro, Marshall Island from 9 to 18 August 2004. Given this, a similar operation to 2003 could be employed whereby SCG 3 could meet for 2-3 days immediately following SCTB. SCG 3 has been tentatively scheduled for 19 – 21 August 2004.

15. If there is support for a third meeting of the Scientific Coordinating Group, the agenda could include:

(a) review of the updated stock status statements for the major target species (bigeye, yellowfin, skipjack and South Pacific albacore), including implications for sustainability;

(b) discussion on addressing ecosystem and bycatch issues (using, as a basis for discussion, WCPFC/PrepCon/WP.10);

(c) discussion on the issue of data verification including consideration of Article 6 of Annex I of the UNFSA.

### *Action required from WG II*

16. WG II is expected to discuss the need for a third meeting of the Scientific Coordinating Group. If there is agreement that SCG 3 should take place in 2004, WGII should:

- propose a work plan for SCG 3 in 2004;
- make recommendations to PrepCon on the nature and extent of that work plan, including, if possible, on the timing and location of the meeting and the process for selection of Chair and vice-chair; and
- highlight to PrepCon any financial or resource implications, and any special requirements for Members.

## **AGENDA ITEM III: ENHANCING DATA COLLECTION IN INDONESIA AND THE PHILIPPINES**

### *Background to the item*

17. At PrepCon V, WG.II (WCPFC/PrepCon/32) confirmed the importance of obtaining catch data from Indonesia and Philippines as highlighted in SCG 2 report (WCPFC/PrepCon/28)

and recommended that, in cooperation with Indonesia and the Philippines, the proposal be further developed, and as a high priority that participants in the PrepCon further consider how they might assist this initiative, through services or financial support. As indicated during the PrepCon V discussions, Chinese Taipei has made an initial contribution of USD 20,000 towards financing this initiative (WCPFC/PrepCon/35).

*Action required from WG II*

18. A revised proposal will be tabled at PrepCon VI for WG II to review. WG II is expected to provide advice to PrepCon on the technical merits of the proposal.

**AGENDA ITEM IV: THE PROVISION OF SCIENTIFIC ADVICE IN RELATION TO NORTHERN STOCKS AS RELATED TO THE ACTIVITIES OF THE NORTHERN COMMITTEE**

*Background to the item*

19. WG II has previously described the key features of the structures required for the scientific functions of the Commission during the transitional period (3 to 5 years), including the handling of technical material and the provision of scientific advice based on that material (WCPFC/PrepCon/32). This work illustrated some differences in the approach taken by the Scientific Committee for information derived from research contracted by the Commission and Member initiated research. It did not specifically consider the case of handling technical information from the Northern Committee.

*Action required from WG II*

20. WG II is expected to review the current scientific structure (WCPFC/PrepCon/32) in relation to the Scientific Committee (a) considering scientific information from the Northern Committee and (b) providing scientific advice based on such information to the Commission. WG II should also verify whether the existing scientific structure is adequate for evaluating inputs on science relating to the Northern Committee and report the outcome of its deliberations on this issue to the PrepCon.

**AGENDA ITEM V: FURTHER DEVELOPMENT OF THE STRATEGIES FOR MEETING THE SPECIAL REQUIREMENTS OF DEVELOPING STATES AND TERRITORIES WITH RESPECT TO DATA REQUIREMENTS AND TECHNICAL CAPABILITIES**

*Background to the item*

21. WG II has previously discussed this issue and in WCPFC/PrepCon/32 recommended that in order to address this issue in the longer term, PrepCon should include the following recommendations in its in its report to the Commission:

(a) The development of a long term strategy for building fisheries data collection and analytical capacity in developing states and territories ;

(b) The development within the Commission science and data programmes of the capacity to provide advice and assistance to FFA members in respect of data and other technical areas; and

(c) The establishment of a broader process of consultation and a programme of cooperation to build FFA member capabilities in areas related to the Convention, including data and other technical aspects.

*Action required from WG II*

22. The technical nature of the above recommendations is such that the PrepCon/Commission is, in the future, likely to seek further elaboration and advice on addressing this issue. WG II could discuss how it might further contribute to this topic in the future.

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**DISCUSSION PAPER ON THE INSTITUTIONAL OPTIONS FOR VMS  
COOPERATION AMONG THE PARTIES TO THE CONVENTION ON THE  
CONSERVATION AND MANAGEMENT OF HIGHLY MIGRATORY FISH  
STOCKS IN THE WESTERN AND CENTRAL PACIFIC OCEAN**

Prepared by the Interim Secretariat<sup>1</sup>

**SUMMARY**

The discussion paper reviews the basis for VMS in international law and in terms of the Convention. The scope and operational arrangements for VMS made by regional fisheries organisations are described and the key differences and points of interest highlighted.

As a basis for further discussion, the institutional approaches to building a WCPFC VMS are suggested. Technical, legal and procedural issues are identified, which require further analysis and deliberation among the Contracting Parties.

Examples of measures and regulations governing VMS arrangements at a multilateral level are appended.

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<sup>1</sup> Prepared by Kieran Kelleher, Consultant, fishybiz@indigo.ie



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**ABBREVIATIONS**

VMS	Vessel Monitoring System
FFA	Forum Fisheries Agency
NEAFC	Northeast Atlantic Fisheries Commission
FAO	Food and Agriculture Organisation
EU	European Union
EC	European Commission
ALC	Automatic Location Communicator = VMS unit
FMC	Fisheries Monitoring Centre

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**Disclaimer**

The designations employed and the representations of the material in this discussion document do not imply the expression of any opinion whatsoever on the part of the Interim Secretariat concerning the legal status of any country, or territory, or concerning the delimitation of frontiers, or borders.

The opinions expressed are those of the author and should not be taken to represent the views of the Interim Secretariat.

## **1. INTRODUCTION**

The purpose of this document is:

- to briefly describe the use of vessel monitoring systems and the legal basis for VMS;
- to describe the different institutional structures and arrangements with regard to international cooperation on VMS;
- to identify options for VMS cooperation arrangements among the Parties to the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Convention);
- to identify issues which must be addressed in defining the VMS system to be adopted by the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Commission); and
- to outline a roadmap for development of VMS cooperation among the Parties.

This discussion paper does not prescribe the system to be adopted. It merely presents selected questions, issues and options that should be considered when establishing a regional VMS. It does not purport to be exhaustive in its coverage of questions and issues involved, but attempts to highlight links between technical, institutional and legal dimensions of such a regional system. The opinions, suggestions and assumptions set out in the paper are not necessarily representative of all stakeholder perspectives and need critical appraisal and examination.

### **1.1. SCOPE OF THE DISCUSSION PAPER**

Under Article 24 of the Convention, the vessels of member states are required to operate a satellite-based position-fixing vessel monitoring system. The Commission will operate such a VMS for all vessels fishing on the high seas.

VMS is essentially a system of communication. A variety of different types of information can be communicated from the fishing vessel to the fisheries authorities, including:

- reports of the vessel's position with a time stamp;
- catch reports, or reports of fish quantities on board;
- scientific information, such as water temperature;
- status of the fishing gear, i.e. setting, or hauling of lines, or nets as relayed from sensors on winches, motors, or other gear components; and
- video information, such as images of sorting fish on deck.

This paper focuses primarily on the use of satellite technology to communicate vessel position information as required under Article 24 of the Convention and the institutional arrangements for sharing such information. The paper does not address technical aspects of VMS.

In the future the Commission may require sharing of other types of information. It is assumed that such additional shared communications will constitute changes of information content and are unlikely to alter the fundamental institutional arrangements for VMS. This paper does not address the use of other satellite communication media, or the use of satellite-based radar imagery for remote detection of fishing vessels and their operations.

### **1.2. TERMINOLOGY**

Over 50 countries around the world are using VMS for monitoring fishing activities. Over 6,000 vessels are being monitored, either by fisheries administrations, or by fleet managers.

The following terms are used:

**Vessel Monitoring System (VMS).** The term ‘VMS’ is used to refer to the system of transmission by satellite of the coordinates of a fishing vessel’s position at a time and date to a fisheries administration. If other types of information are transmitted via satellite, e.g. catch on board, this is referred to in the text.

**Fisheries Monitoring Centre (FMC).** The term ‘FMC’ refers to the unit within the government administration that receives, analyses, and if necessary, retransmits the VMS information received from a fishing fleet. FMCs can be operated by the fisheries authorities, by parastatals, coast guards, or military.

**VMS unit.** This means the equipment that transmits the position information from on board the fishing vessel. It is also referred to as a Vessel Locator Device (VLD) in the FAO terminology and as an Automatic Location Communicator (ALC) in FFA terminology.

## **2. LEGAL AND INSTITUTIONAL BASIS FOR VMS**

### **2.1. LEGAL BASIS FOR VMS AT GLOBAL LEVEL**

At the international level, the legal basis for VMS rests on the United Nations Convention on the Law of the Sea (LOS Convention) and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA). Both of these instruments are referred to in the preamble of the WCPFC Convention.

Under the LOS Convention:

- coastal states have general duty to conserve, manage and utilize in a sustainable manner the living resources of the EEZ (Article 61.2)
- states shall cooperate in the conservation and management of the living resources of the high seas (article 118)
- states shall contribute and exchange available data relevant to the conservation of fish stocks through competent international organizations (Article 61.5 – EEZ and Article 119.2 -high seas)
- coastal and flag states shall seek to cooperate on the conservation of straddling stocks (Article 63 (2))
- coastal and flag states shall cooperate on the conservation and management of highly migratory species (Article 64)
- flag states have responsibilities for their fishing vessels operating on the high seas and shall effectively exercise jurisdiction and control over such vessels (Articles 94 and 117)

The UNFSA makes specific reference to establishing appropriate cooperative mechanisms for effective MCS and enforcement (Article 10(h)). The UNFSA also sets out requirements for the collection and sharing of fisheries and vessel data. States have obligations:

- to collect and share data concerning fishing activities, including on vessel position (Article 5(j));
- promote and conduct scientific research and develop appropriate technologies in support of fisheries management (Article 5(k));
- to implement and enforce conservation and management measures through effective MCS (Article 5(l));
- to ensure that their vessels collect and supply accurate information as required by RFMOs (Article 14); and
- with respect to recording and timely reporting of relevant fisheries data (vessel position, catch, effort) (Article 18.3 (e)); and

- development and implementation of VMS, including, as appropriate, satellite transmitter systems (Article 18.3 (g) (iii)), in accordance with schemes agreed at regional level.

Annex I of the UNFSA focuses on the ‘Standard requirements for the collection and sharing of data’:

- States or regional fisheries management organizations (RFMOs) should use VMS as a tool for position verification.
- Data collected by flag states must be shared with other states through appropriate RFMOs.
- RFMOs, when making data available, shall maintain confidentiality of non-aggregated data.

Other international instruments which make reference to VMS include: the Code of Conduct for Responsible Fisheries (CCRF); the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993) (the Compliance Agreement); and the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA / IUU). The CCRF provides that states should implement effective MCS and law enforcement measures, including, where appropriate, vessel monitoring systems (Article 7.7.3). The IPOA/ IUU states that countries, where appropriate, should require vessels to carry VMS on board, in accordance with national, regional, or international standards (Article 24.3).

Under the 1993 FAO Compliance Agreement:

- States shall ensure that their flag vessels provide information on their fishing activities, including on area of fishing operations (Article III.7)
- States are required to exchange information, including evidentiary material relating to activities of fishing vessels (Article V.1).

It is clear that foreign vessels carrying out fishing operations can be subjected to VMS requirements by the coastal state. It is also clear that on the high seas vessels are subject to the exclusive jurisdiction of the flag state (Article 92.1). The requirement for support vessels to carry VMS may be disputed. It may be difficult to distinguish between a cargo vessel and a reefer vessel under international law, in particular if the reefer is under a non-Party flag. In such cases provisions may be required to prohibit vessels from transshipping catches (or using support vessels) flagged in non-Party states that fail to cooperate with the Commission.

## **2.2. REGIONAL WCPFC CONTEXT**

Working Group III of the Preparatory Conference is charged with the development of standards, specifications and procedures, consistent with the Convention, including article 24, for the operation of a vessel monitoring system (WCPFC/PrepCon/13 and WCPFC/PrepCon/WP.6). Article 24 (24.8, 24.9 and 24.10) makes specific reference to VMS (see following Box).

**Box 1. Convention Articles referring to VMS (Articles 24.8, 24.9 and 24.10)**

24.8. Each member of the Commission shall require its fishing vessels that fish for highly migratory fish stocks on the high seas in the Convention Area to use near real-time satellite position-fixing transmitters while in such areas. The standards, specifications and procedures for the use of such transmitters shall be established by the Commission, which shall operate a vessel monitoring system for all vessels that fish for highly migratory fish stocks on the high seas in the Convention Area. In establishing such standards, specifications and procedures, the Commission shall take into account the characteristics of traditional fishing vessels from developing States. The Commission, directly, and simultaneously with the flag State where the flag State so requires, or through such other organization designated by the Commission, shall receive information from the vessel monitoring system in accordance with the procedures adopted by the Commission. The procedures adopted by the Commission shall include appropriate measures to protect the confidentiality of information received through the vessel monitoring system. Any member of the Commission may request that waters under its national jurisdiction be included within the area covered by such vessel monitoring system.

24.9. Each member of the Commission shall require its fishing vessels that fish in the Convention Area in areas under the national jurisdiction of another member to operate near real-time satellite position-fixing transmitters in accordance with the standards, specification and procedures to be determined by the coastal State.

24.10. The members of the Commission shall cooperate to ensure compatibility between national and high seas vessel monitoring systems.

Several other Articles are of relevance to the establishment of the VMS system:

- Article 8.1, Compatibility of management measures
- Article 10. Functions of the Commission
- Article 23. Obligations of members, and
- Article 30. Special requirements of developing States

**Box 2. Article 8. Compatibility of conservation and management measures**

1. Conservation and management measures established for the high seas and those adopted for areas under national jurisdiction shall be compatible in order to ensure conservation and management of highly migratory fish stocks in their entirety. To this end, the members of the Commission have a duty to cooperate for the purpose of achieving compatible measures in respect of such stocks.

The Commission shall take into account ...

2. (b) (ii) previously agreed measures established and applied in respect of the same stocks for the high seas which form part of the Convention Area by relevant coastal States and States fishing on the high seas in accordance with the 1982 Convention and the Agreement;

2. (c) take into account previously agreed measures established and applied in accordance with the 1982 Convention and the Agreement in respect of the same stocks by a subregional or regional fisheries management organization or arrangement;

**Article 8.1.** The VMS measures taken by the members of the Commission must be compatible with each other and with the VMS measures take by the Commission with respect to the high seas areas. The areas of compatibility may include:

- the standards for the VMS units, including provisions to prevent falsification of position data and the means of inspection and approval of the on-board equipment;
- data formats and protocols for data exchange;
- penalties and measures to be taken if flag vessels fail to comply with the VMS measures; and
- confidentiality of the VMS data.

**Article 10. Functions of the Commission.** Allocation and control of effort on the basis of VMS information is done in several fisheries including in the EU, in the Gulf of Maine. Such measures may also be of use to the Commission: ‘...(g) develop, where necessary, criteria for the allocation of the total allowable catch or the total level of fishing effort for highly migratory fish stocks in the Convention Area;

(i) establish appropriate cooperative mechanisms for effective monitoring, control, surveillance and enforcement, including a vessel monitoring system;’

**Obligations of members.** Under Article 23 ‘Each member of the Commission shall: (a) provide ... to the Commission ... such data and information as the Commission may require;’

**Developing states.** Article 30.4 (c) recognises the special requirements of developing States with respect to: ‘monitoring, control, surveillance, compliance and enforcement, including training and capacity building at the local level, development and funding of national and regional observer programmes and access to technology and equipment’.

Other recommendations of Working Group III of relevance to the VMS system include:

- ‘Develop guidelines for creation of national vessel registries (Article 24(4)) and the regional vessel registry (Article 24(7)).’ Clarity regarding vessel identity is fundamental to a VMS system.
- ‘Develop guidelines for regulating and monitoring transshipment (Article 29 and Article 4.1 of Annex 3).’

### **2.3. VMS SYSTEMS OF THE PARTICIPANTS IN THE CONFERENCE**

This section provides a short summary of the state of VMS in the countries of the Convention signatories and countries that participated in the Conference. The information presented is indicative only. Working Group III can compile more comprehensive and accurate information in due course.

**Australia and New Zealand.** Australia participates in the FFA VMS with respect to tuna vessels fishing in the FFA area. Australia, or Australian States operates several additional VMS systems for trawl and other fisheries. The VMS regulations are tailored to each specific fishery. For example, the Queensland trawl fishery is partly located within the Great Barrier Reef Marine Park. The VMS monitors the fishing activities of approximately 500 vessels in relation to 150 different closures (areas and time periods). The on-board equipment used complies with FFA type approval.

Eight New Zealand vessels comply with the FFA VMS requirements. An additional 50 vessels use Argos in several non-HMS fisheries.

**China.** VMS is not used for control of the domestic fleet. High penalties for fishery violations and closed season regulations are used to good effect. VMS used by the distant water fleet complies with the requirements of the coastal states. Chinese vessels are understood to be equipped exclusively with Inmarsat C.

**Chinese Taipei.** Distant water vessels transmit VMS data directly both to the coastal state and to the tuna fisheries association(s). Approximately 600 distant-water tuna vessels fishing in all oceans are involved. Approximately 60 vessels operate in the Southern Bluefin fishery. There are 41 tuna purse seiners under the Chinese Taipei flag. An additional 26 foreign-registered purse seiners may be owned, or operated by persons, or companies based in Chinese Taipei. Most, if not all of these vessels operate in the Pacific. An estimated 66% of the vessels use Argos, the remainder use Inmarsat C. Some vessels are equipped with both Argos and Inmarsat C. The Taiwan Deep Sea Tuna Boat-Owners and Exporters Association represents the vessel owners in access negotiations.

**France and the UK.** VMS used in Metropolitan France and in the UK complies with the EC requirements (see below). The French Fisheries Monitoring Centre (FMC) can thus interpret VMS signals from both Argos and Inmarsat C terminals. New Caledonia and French Polynesia are understood to require foreign fishing vessels to fit and operate the Argos vessel tracking system as a condition of licence for vessels fishing within their respective EEZs.

**Indonesia.** In the first phase the Indonesian fisheries authorities are installing an Argos VMS to track 1,500 vessels and are currently installing the VMS units in an initial group of 300 vessels. It is planned to expand the VMS coverage to another 2,000 vessels. A clearer profile of the Indonesian tuna fleet will emerge from an inventory being carried out by the Indonesian authorities and the IOTC and through the VMS project. In the interests of compliance with international norms, operators of large-scale tuna longline vessels (> 130 GRT, or > 24m and equipped with modern freezing equipment) are recommended to join the Association of Tuna Indonesia (ASTUIN).

**Japan.** Japanese distant water vessels use both Argos and Inmarsat C. The 239 Japanese flag vessels licensed to fish in the EEZs of FFA members comply with the VMS requirements of each FFA member. Approximately 750 Argos VMS units are installed on Japanese vessels. The Federation of Japan Tuna Fisheries Cooperative Associations plays an important role in coordinating the activities of the tuna fleet.

**Republic of Korea.** Information is not available. The 35 Korean flag vessels licensed to fish in the EEZs of FFA members comply with the VMS requirements of each FFA member. The Korean Ministry of Fisheries has an Argos FMC to monitor vessels in the Pacific and in the vicinity of the Russian Federation and Antarctica. About 250 vessels use Argos VMS units. The Korea Deep Sea Fisheries Association coordinates the activities of the distant water tuna fleet.

**Pacific Islands.** Jointly, Vanuatu and Fiji account for over 100 vessels on the FFA VMS register. Vanuatu requires all commercial tuna fishing vessels to be tracked by VMS at a minimum of 4 polls per day.

**Republic of the Philippines.** The Philippines has carried out trials with Argos. VMS is not used at the level of the fisheries administration. The 47 Philippine flag vessels licensed to fish in the EEZs of FFA members comply with the VMS requirements of each FFA member.

**United States of America.** VMS in the US is mandated on a fishery-by-fishery basis. It is generally used to enforce prohibited area regulations. VMS is used in the Hawaii longline fishery (approximately 145 vessels) to prevent fishing in close proximity to the Hawaiian Islands. Its use has been shown to be particularly cost effective in this fishery. The 21 U.S. purse seiners licensed under the U.S. Multilateral Treaty are in good standing on the FFA VMS Register. The U.S. has indicated that it intends requiring these U.S. purse seiners to provide automatic position reports to the U.S. domestic VMS sometime in 2004. Administrative matters are delaying the implementation of this proposed arrangement. Inmarsat, Argos and Boatracs VMS are used in Alaskan and US west coast fisheries. Approximately 650 Argos units are operating in US and Canadian west coast fisheries.

### **3. MULTILATERAL ARRANGEMENTS FOR VMS COOPERATION**

#### **3.1. TYPES OF INSTITUTIONAL ARCHITECTURE**

Three different types of institutional arrangements for VMS cooperation can be identified in regional fisheries organisations:

- Peer-to-peer VMS data exchange. The fisheries authorities of two, or more countries agree to share, or swap VMS information in accordance with agreed procedures. The arrangements made under the Common Fisheries Policy (CFP) provide an example. Similar VMS cooperation occurs under several EU bilateral fisheries agreements.
- A centralised VMS service for foreign fishing in coastal state EEZs. The FFA provides an example of this arrangement.
- A centralised VMS service applied to high seas. Examples are the NAFO and NEAFC arrangements.

A range of institutional arrangements in regional fisheries organisations is described below. Each responds to the particular requirements of the specific fisheries and also reflects the historical evolution of these fisheries. In each case the VMS should be seen as an integral part of a management regime, complementing other conservation and control measures. In each case the utility of the VMS is closely linked and dependent upon the other elements of the management regime. These include fishing vessel registers, catch reporting, catch documentation, port inspection, observer schemes and sea-going surveillance.

Maps of the regulatory areas and copies of selected VMS-related measures approved by the regional fisheries organisations are appended in the Annex.

### **3.2. VMS UNDER THE COMMON FISHERIES POLICY (EU)**

In accordance with Article 22 (1b) of EC regulation 2371/2002 all fishing vessels exceeding 18 meters in length overall must have installed onboard a fully functioning Vessel Monitoring System unit from 1 January 2004. This requirement will also apply to vessels exceeding 15 meters in length overall from 1 January 2005. Approximately 4,000 vessels are involved.

The EC regulations apply to member countries, not directly to individuals. National legislation obliges vessel owners to comply with the EC regulations. Under EC legislation each member country is obliged to have an operational Fisheries Monitoring Centre (FMC) which will receive VMS position and other information from its flag vessels and from other vessels fishing in its EEZ. EC legislation is enforceable through the European Court of Justice. Member states which do not ensure adequate compliance with the VMS regulations can face fines, or other penalties.

The type of VMS unit installed must be in compliance with the rules laid down in Commission Regulation (EC) No 1498/97. It must be tamper-proof and ensure the automatic transmission to the Fisheries Monitoring Centre of the flag state, at all times, of data relating to:

- the vessel identification;
- the most recent geographical position of the vessel, with a position error which shall be less than 500 meters;
- with a confidence interval of 99%; and
- the date and time of the fixing of the position of the vessel.

**Unique feature.** The unique feature of the EU VMS is the automatic re-transmission of VMS position information between member states. When a vessel moves from the EEZ of one member state to another, the software in the flag state FMC automatically copies this position information to the EU coastal state FMC. The VMS information is also available to the Commission. The data formats and services of numerous satellite service providers are harmonised within this integrated VMS data exchange system. The providers include: Argos, Inmarsat, Emsat and Euteltracs.

**Reciprocal fisheries access agreements.** The EC enters into two different forms of bilateral fisheries access agreements under which VMS information is transmitted to coastal states. Reciprocal agreements are concluded with Norway, Faeroes, Iceland and other North Atlantic countries. Under reciprocal agreements the VMS information is automatically transmitted between the parties in essentially the same manner as between EU member states. Thus, for example, when EU vessels enter Norwegian waters, the EU flag state automatically transmits the vessel position information to the Norwegian FMC and Norway reciprocates with respect to its vessels when they are fishing in the waters of EU states.

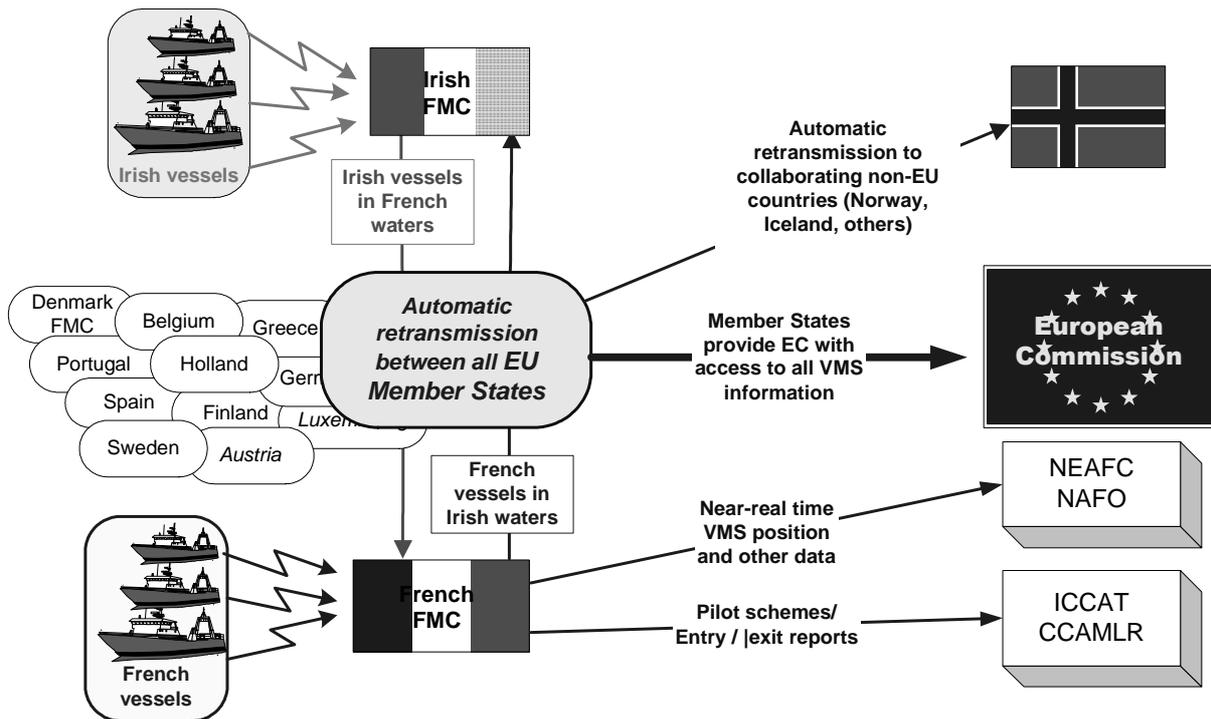


Figure 1. Diagrammatic representation of VMS in the EU

**Access agreements with compensation.** Comoros, Seychelles, Senegal and a number of other countries have access agreements whereby the EC makes a payment for fishing rights. Under some of these agreements there is an obligations upon the EU to provide VMS position information to the coastal state when the EU flag vessels are in the coastal state EEZ. However, partly because of lack of coastal state VMS facilities these provisions may not be implemented. In some cases VMS position information has been provided on paper rather than in electronic form. Exceptions are Seychelles and Kiribati. Under the EC agreement with Kiribati, EU vessels must be in good standing on the FFA VMS Register. Position information is sent directly via the Perth, Australia LES to the FFA VMS hub-site at Honiara, Solomon Islands, i.e. the VMS information does not pass through the intermediary of the flag state (Spanish) FMC.

**Entry, exit, catch information and other communications.** In certain fisheries or in areas where fishing effort controls are applied EU vessels may be obliged to report ‘entry to the area’, exit from the area’ and ‘catch on board’ by VMS. VMS may also be used to arrange for inspections of vessels prior to the time a vessel exit an area (see NEAFC below).

**VMS cooperation with regional fisheries organisations.** As members of various regional fisheries organisations, VMS information is transmitted to several RFOs from the EC, from EU member states, or directly from EU flag vessels. The RFOs include CCAMLR, FFA, NEAFC, and NAFO. Further details of this cooperation are provided in subsequent sections.

### 3.3. NORTHEAST ATLANTIC FISHERIES COMMISSION (NEAFC)

NEAFC has a sophisticated and advanced system of VMS cooperation between members. NEAFC’s area of competence is FAO Area 27, the Northeast Atlantic. The Regulatory Area of NEAFC comprises three high seas enclaves in FAO Area 27 (see map in Annex). The Commission recommends management measures including TACs for the high seas fisheries. An objection procedure applies. As the range of many of the managed fish stocks extends outside the Regulatory Area, there is close cooperation with NAFO (see below). Under a memorandum of understanding, ICES provides scientific advice to NEAFC.

**VMS position reporting.** VMS is obligatory for Contracting Party vessels over 24m in overall length fishing in Regulatory Area. The vessels automatically transmit position information (to within 500m, 99% confidence) to their flag state FMC, which re-transmits to the Commission. The FMC re-transmission is automatic which means that NEAFC receives the information in near real time. Position information is transmitted at least 2-hourly within the Regulatory Area. There are provisions for alternative reporting in the case of faulty, or non-functional VMS equipment.

**Communication with surveillance assets.** NEAFC automatically forwards position and catch information to the Parties' fishery patrol vessels that are active in the Regulatory Area. Patrol vessels of the Parties are authorised to board and inspect fishing vessels of other Parties.

**Catch reporting.** Quantities of fish on board must be communicated either to the flag state FMC, or NEAFC on entry to and exit from the Regulatory Area. Similar provisions apply to transshipment. Weekly catch reports are also required. Transmission of catch reports may be either by VMS, or other approved means. Pilot schemes to use VMS for catch reporting are operational in the case of vessels equipped with suitable equipment.

**Unique feature.** Under the pilot scheme, fishing vessels transmit 'catch on board' information one hour prior to entry to/ exit from the Regulatory Area. The NEAFC Secretariat automatically forwards this information to patrol vessels in the area. The patrol vessel, via the NEAFC Secretariat and the FMC, may instruct a vessel to remain in the area, or stop fishing for a period of 6 hours pending an inspection.

**Data security.** NEAFC's detailed provisions for VMS and other data security are appended in the Annex.

### **3.4. NORTHWEST ATLANTIC FISHERIES ORGANISATION (NAFO)**

The NAFO area embraces both high seas areas and EEZs (Canada, Greenland, France, USA). However the 'Regulatory Area' is restricted to the high seas area within FAO Statistical Area 21. The regulated species exclude tunas and salmon. The Commission proposes and adopts international measures for control and enforcement for the fisheries within the regulatory area and allocates the catches between the members. NAFO regulatory measures are subject to objection procedures.

**VMS.** VMS pilot projects have been undertaken by NAFO. The NAFO VMS regulation is given in the Annex. NAFO regulations require that vessels operating in the Regulatory Area be equipped with a VMS. The VMS unit must report position every 2 hours to an accuracy of 500m, with a confidence interval of 99%. The obligation is on the FMC of the contracting party (NAFO member state) to retransmit the VMS position data to NAFO. There are various provisions for faulty VMS units. The NAFO secretariat makes VMS position data available to fisheries authorities that have a patrol vessel, or patrol aircraft in the regulatory area. All VMS data is confidential. Rules and regulations govern data use and dissemination. The Contracting Parties are responsible for the costs associated with the VMS. NAFO must be informed electronically of the catch on board the vessel when entering and exiting the regulatory area and of transshipment operations.

### **3.5. FORUM FISHERIES AGENCY (FFA)**

The FFA Secretariat manages and administers the FFA VMS on behalf of the 17 FFA members. The FFA has been given clearly defined operational responsibility for VMS by the Member States. FFA has no requirements of its own in relation to the FFA VMS, since the requirements are enshrined in the national legislation of each of the FFA members. The FFA system deals only with tuna fishing vessels and support vessels. The licensing conditions of all FFA members with respect to foreign fishing vessels conform to harmonised minimum terms and conditions of access agreed by all FFA members. Under the Harmonised Minimum Terms and Conditions (MTC) for Foreign Fishing Vessel Access, VMS is a requirement for all foreign vessels fishing in the EEZs of the FFA members. There

is ongoing harmonisation of the countries' legal frameworks regarding the complex legal issues associated with VMS.

**The VMS Register.** The VMS is implemented through a process of application for good standing on the Regional VMS Register. The good standing status requires that the vessel be equipped with a VMS unit (referred to by the FFA as an Automatic Location Communicator, or ALC), which meets the specification set out by FFA. FFA only accepts transmission via Inmarsat C. The VMS units approved by FFA undergo a type approval process, which includes the installation of the VMS units by approved suppliers. Not all FFA members have licence conditions requiring that reefer, bunker and support vessels need to be in good standing, i.e. in some jurisdictions these vessels may not necessarily be required to report position by VMS.

Total number of vessels on the FFA VMS register of which	921
- vessels flagged in FFA member and fishing outside flag EEZ	146
- vessels flagged in non-FFA WCPFC signatories	702
- other flag, including flag of convenience and non-Pacific coastal states	73

See table in annex for details by country.

**Vessel numbers.** Over 900 vessels are tracked with the system, which has a maximum capacity for 2,000 vessels in its present configuration. There are currently 921 'active' vessels of all types in good standing on the Regional VMS Register until the end of the registration year on 31 August 2004. Of these, 16% are FFA-flag, 76% are flagged in non-FFA signatories to the WCPFC Convention. The remaining 8% includes vessels registered in several flag of convenience countries. The vessels on the Register are flagged in 29 different states. The FFA Regional (vessel) Register is effectively identical to the FFA Regional VMS Register. A table showing numbers of vessels by flag state is provided in the Annex.

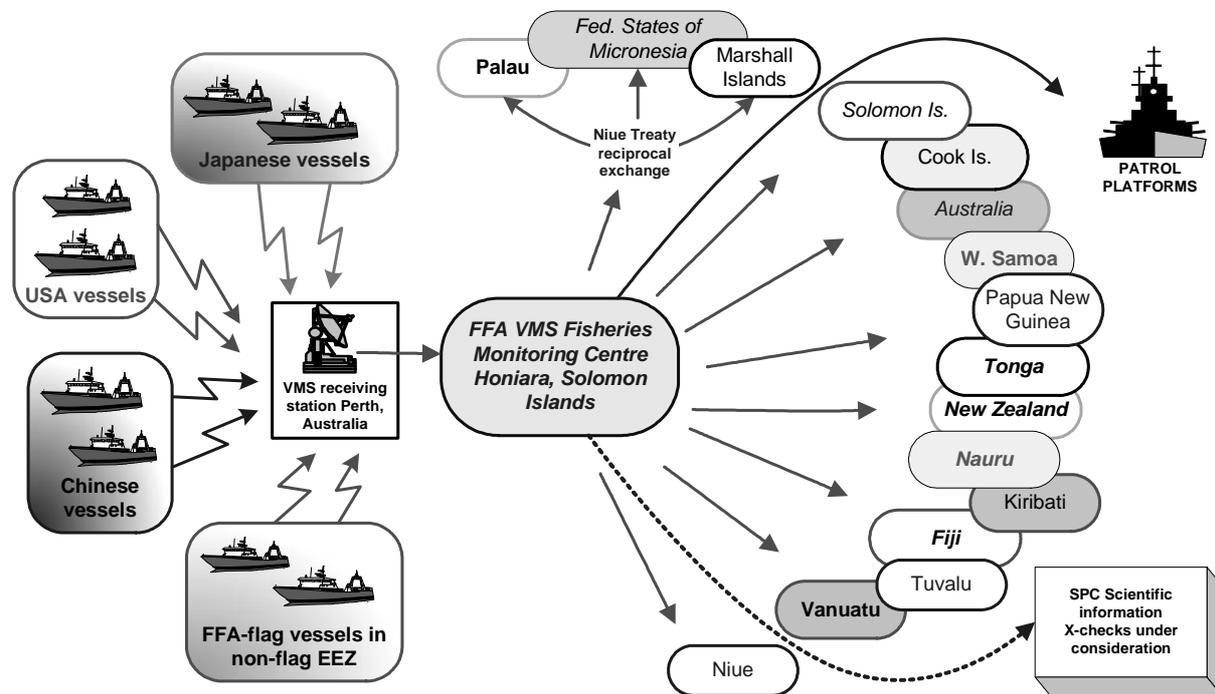


Figure 2. Diagrammatic representation of FFA VMS

**VMS reports.** The FFA VMS receives automatic position reports at a default rate of 6 reports per 24 hours. This frequency can be increased to 1 report every 15 minutes through polling. If a vessel's VMS unit (ALC) is switched on while it is on the high seas, the FFA will receive automatic position reports

from that vessel. The U.S. has agreed that U.S. purse seine vessels will provide automatic position reports to the FFA VMS at all times while these vessels are inside the Treaty Area, which includes high seas areas.

Details of the registration procedure are available in WCPFC/PrepCon/DP.23 and further instructions can be downloaded from the FFA website [www.ffa.int](http://www.ffa.int).

### **3.6. OTHER REGIONAL FISHERIES ORGANISATIONS**

#### **3.6.1 International Commission for the Conservation of Atlantic Tunas (ICCAT)**

In 2002, based partly on the results of pilot schemes, ICCAT adopted 'general principles of integrated monitoring measures', which include VMS measures. However, the Working Group on Compliance has made relatively slow progress in making this initiative operational. In its 2003 meeting, ICCAT recommended that all vessels over 24m in LOA report position at 6-hour intervals to their flag FMCs and encouraged the Parties to extend the use of VMS to smaller vessels as necessary. The flag state submits annual reports on the implementation of its pilot program for ICCAT's annual report. Tuna/ HMS fishing vessels of Japan, China, Chinese Taipei, USA and Canada all use VMS in the ICCAT area.

ICCAT recommends that, as a minimum, the VMS system:

- is tamper proof;
- is fully automatic and operational at all times regardless of environmental conditions;
- provides real time data; and
- provides latitude and longitude, with a position accuracy of 500 m. or better, with the format to be determined by the flag state.

There are currently no provisions for transmitting VMS information to ICCAT. A centralised VMS is not envisaged in the near future. Procedures on the submission of aggregate information, how the information is shared between Contracting Parties, and appropriate measures to ensure confidentiality are among the issues to be resolved.

#### **3.6.2 Indian Ocean Fisheries Commission (IOTC)**

In 2002 the IOTC adopted a resolution regarding the establishment of a vessel monitoring system (Appendix B). A flag-state based two-year pilot programme is to be implemented by July 2003. The technical specifications of the programme are similar to those of ICCAT, including the provisions for transmission of position information in the event that the transceiver malfunctions. Flag states report annually to the IOTC on progress with VMS. Results will be evaluated by the Commission at its meeting in 2005, with a view to establishing a comprehensive VMS program.

#### **3.6.3 Inter American Tropical Tuna Commission (IATTC)**

IATTC management measures do not require use of VMS. Discussions concerning VMS are ongoing. IATTC considers that VMS would be of value both for fisheries and oceanographic research and for compliance, including assisting communications from observers (see Document IATTC-70-09 on [www.iattc.org](http://www.iattc.org)). Some IATTC members do not have a functioning VMS. A pilot scheme similar to those recommended in ICCAT and IOTC has been proposed.

#### **3.6.4 Commission for the Conservation of Southern Bluefin Tuna (CCSBT)**

The Convention does not specify a geographical area of competence, but focuses on the conservation of the stock of southern bluefin tuna (SBT) in all oceans. Conservation measures are adopted by unanimous vote. CCSBT conservation measures do not require the use of VMS.

In 2002, 60 Chinese Taipei vessels harvested the SBT quota. Over 150 Chinese Taipei vessels were registered to catch SBT (targeted plus bycatch). Over 200 Japanese vessels fish for SBT. Between 50 and 60 of these vessels fish in the Pacific. Their respective fisheries administrations oblige Chinese Taipei (since April 2002) and Japanese vessels to carry VMS. The Korean fleet operates predominantly in the Indian and Atlantic Oceans. Australian and NZ vessels carry observers.

### **3.6.5 Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)**

The area under the competence of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) includes both high seas and a number of EEZs of island possessions of Australia, France, South Africa and the UK.

Under Conservation Measure 10-02 all parties have an obligation to ensure that vessels licensed for all fisheries, except krill, use tamperproof VMS. The VMS must provide 'real time' position information. The parties are obliged to transmit the VMS information to CCAMLR within 2 working days of receipt. Position information is required when vessels enter the Convention Area and when the vessels move between the various statistical areas. There are various provisions pertaining to the failure of VMS equipment. Implementation of the VMS measure is the sole responsibility of the member country.

The CCAMLR Secretariat does not pass VMS position information to member state patrol vessels in the CCAMLR area. VMS position information is not currently cross-checked with catch information. Non-VMS position reports may be used as an indicator of fishing effort in areas where special conservation measures apply. CCAMLR is initiating a study on a centralised VMS system using 'dual transmission' of VMS information from the vessel to both flag states and the Commission.

### **3.6.6 Sub-Regional Fisheries Commission (SRFC)**

Approximately 70% of the industrial fleet operating in the SRFC area (Mauritania to Sierra Leone) is non-SRFC flag. To improve control over these fleets, which target both demersal species and HMS, a technical workshop of the SRFC has recommended that the introduction of VMS be considered as part of the regional strategy. In Senegal private companies track approximately 60 trawlers using VMS. Mauritania is in the initial phases of VMS introduction. A summary of the workshop recommendations is provided in the Annex.

### **3.6.7 Southwest Indian Ocean (SWIO)**

A VMS cooperation workshop was held in 2003 and attended by technical representatives of the following coastal states: Comoros, France (Reunion), Kenya, Madagascar, Mauritius, Mozambique, South Africa, Seychelles, Tanzania, and UK (BIOT). There was unanimity on the necessity of enhanced cooperation between SWIO countries on MCS in general and on VMS in particular. The workshop recommended:

- a) establishment of a database of all vessels;
- b) establishment of automatic forwarding by VMS information between coastal states. The information should include position and catch upon leaving EEZs with particular reference to EEZ entry and exit information; and
- c) establishment of requirements for vessels to report position and catch from high seas areas, either to the coastal states or to IOTC, or other appropriate RFO.

#### **4. INSTITUTIONAL OPTIONS FOR THE WCPFC**

Under Article 24 of the Convention a number of key requirements for the VMS system are set out.

##### **4.1. DEFINING THE TARGET FLEET**

All fishing vessels as defined in Article 1(e) of the Convention are obliged to use VMS for position reporting. This definition includes all carrier and support vessels. Under the specifications for the VMS system to be established under Article 24.8 vessels which fish exclusively within their flag state EEZ are exempt from this requirement.

Article 24.8 states that the VMS requirement applies to ‘fishing vessels that fish for highly migratory species’. This is interpreted as meaning fishing vessels that target HMS, and excludes vessels that catch HMS as bycatch of fishing operations directed at other species. Some vessels may target HMS on a seasonal basis, such that the proportion of HMS in the vessel’s annual catch is less than 50%. While it is unlikely that significant numbers of such vessels exist, or that they have significant HMS catches, a provisional quantitative rule may be of use, e.g. VMS is required if 25% of the vessel’s annual catch consists of HMS.

The VMS system must take the characteristics of traditional vessels into account. Some traditional vessels may fish for HMS outside their flag state EEZ, e.g. in the Sulu Sea, or Torres Straits. The numbers of traditional vessels fishing for HMS on the high seas in the Convention area is probably negligible. A working hypothesis is that traditional vessels are of timber construction and are less than 24m in length overall. Vessels meeting these characteristics could be exempted from the VMS requirement. Under EC legislation vessels operating exclusively within 12 nautical miles of the baseline of the flag Member State, or which never spend more than 24 hours at sea taken from the time of departure to the return to port, are exempt from the VMS requirement.

Exemptions from the VMS requirements specified in Article 24 could be of a temporary nature, or derogation. Any exemption would automatically expire after a certain period, i.e. the exemption would have to be periodically reviewed and re-adopted by the Commission.

There are numerous advantages in obliging carrier/ support vessels to report position with VMS. These include the possibility of cross-checking catches and/ or landings; tracing oil spillages from refuelling operations, and tracking the flows of economic benefits from the fisheries. To ensure that carrier and support vessels flagged in non-WCPFC countries comply with the VMS requirements, WCPFC vessels could be prohibited from transshipping to/from such vessels unless they comply with the VMS requirements of the Convention. Similarly, carrier and support vessels flagged in WCPFC member states may be prohibited from transshipping to/ from vessels that do not comply with the provisions of the Convention.

It has been estimated by the SPC that there may be up to 2,000 vessels that fish for tuna in the Convention Area, in addition to those in good standing on the FFA Regional Register (921 vessels). Thus a WCPFC VMS will have to accommodate in the order of 3,000 vessels. A cleared definition of the vessels required to use VMS will assist members to establish a more accurate figure.

If a phased development of the VMS is required, the vessels referred to in the Conference literature as large-scale tuna fishing vessels (LSTFVs, or vessels in excess of 24m length overall) would form a suitable group for initial application of the VMS requirement. If the development of an indicator of fishing effort derived from VMS information is considered a priority, then the purse seine fleet are probably a priority set of vessels for early application of the VMS requirement.

**Conclusions.** An expanded working definition of ‘vessels that fish for HMS’ and ‘traditional vessels’ is required. Provisions may be required in relation to carrier and support vessels flagged in non-member countries. If a phased introduction of the VMS is required the priority groups of vessels include the purse seine fleet and those referred to as ‘large scale tuna fishing vessels’. The cooperation

of all interested parties is required to accurately estimate of the number of vessels to be included in the VMS.

#### **4.2. AREAS AND JURISDICTIONS**

**Areas.** There are three different areas of ‘VMS jurisdiction’ within the Convention area:

- EEZs of flag states, where the flag state’s VMS is required;
- EEZs of coastal states where the coastal state’s standards and requirements for VMS must be respected; and
- the high seas where the Commission’s VMS standards and requirements must be applied (Article 24.8).

Harmonised VMS requirements will benefit all parties: flag and coastal state fisheries administrations charged with operating the VMS; vessel operators who may fish in several different EEZs; and the Commission in its task of integrating and analysing the patterns of fishing.

**NEAFC model.** As the Commission’s VMS requirement under Articles 24.8 applies only to the high seas areas, many of the procedures of NEAFC are directly applicable. NEAFC receives position information through the flag state FMC when the vessel is in the NEAFC high seas area. However, NEAFC receives position and catch information from the vessel prior to the vessel’s entry into the NEAFC high seas area.

**FFA model.** Under Article 24.8 any Commission member may request that the waters under its national jurisdiction be included in the Commission’s VMS. This arrangement could be similar to the VMS service provided by the FFA to its members.

**National maritime boundaries.** Ideally, for the purpose of effective VMS, countries should clearly define their maritime boundaries and conclude boundary agreements where necessary. Lack of clarity may destroy any civil or criminal cases and may cause dissent between members. By ‘grey zones’ is meant marine areas claimed by two, or more countries. In the event that ‘grey zones’ exist in the Convention area, joint VMS coverage of the grey zones can be considered, i.e. vessels in the grey zone report to both countries and to the Commission as required. Several precedents exist including: the ‘dogleg’ between France, UK and Ireland and the Barents Sea ‘loophole’ between Norway and Russia.

**Charting.** Ideally, the VMS requires a common chart of the high seas areas so that the agreed coordinates of the high seas areas can be programmed into the VMS software, either in the on-board VMS units, or at the FMCs of the members and cooperating parties. This is a technical exercise requiring further advice and eventual agreement between the members. The common chart can be extended to include the coordinates of boundaries between contiguous EEZs and the coordinates of areas where fishing may be restricted. The digital charting of FFA member EEZs has been a practical necessity for operation of the FFA VMS.

Fishing vessels may also have difficulty in knowing the precise location of EEZ boundaries and other regulatory areas, as this information may exist only in national legislation and is not printed on marine charts. There is thus a clear need for national VMS monitoring centres to maintain charts of foreign regulatory areas, in addition their own, and, if possible, to alert vessels from their fleet when they enter these areas. An agreed and harmonised digital chart(s) of the Convention area showing agreed maritime boundaries and high seas areas would assist establishment of the VMS.

**Conclusions.** For both scientific and compliance purposes, the Commission should ideally have a complete VMS position record of a vessel’s trip. If this is not possible, then a complete trip record, excluding the time spent within the flag state EEZ is desirable. If members are unwilling to release ‘raw’ VMS position information to the Commission with respect to vessels within their EEZ, then some form of aggregate information could be provided. Alternatively the VMS position information

for foreign flag vessels could be provided to the Commission. Provision of VMS information additional to that required under Article 24.8 is closely linked to assurances of confidentiality and clear knowledge of the uses of this information.

### **4.3. TYPES OF VMS INFORMATION**

#### **4.3.1 Basic position information**

Article 24.8 refers only to vessel position information. This is the most basic requirement of a VMS and gives vessel latitude, longitude plus a date/ time stamp. Analysis of this vessel position information provides a quasi real time indication of the activity of the fishing vessel, e.g.:

- derived speed and course;
- estimate of fishing effort measured in days at sea;
- determination of likely port of landing;
- determination of transit or fishing activity in restricted areas;
- determination of probable fishing activity using speed;
- determination of fishing activity using a “fishing fingerprint”; and
- prediction of future activity of vessel.

**Fishing fingerprint.** The fishing fingerprint, or digital signature of the vessel can indicate if the vessel is transiting, fishing, or searching. The accuracy of the inference depends largely on the frequency of the VMS reporting. The FFA VMS will automatically generate an alert message if purse seiner’s speed drops below its rated speed. This may in turn prompt the national FFA VMS operator to increase the reporting rate for that vessel. Neither FFA nor NEAFC currently use the ‘fingerprint’ to determine fishing effort although the scientific bodies in these regions have expressed interest in the use of VMS information to determine, or crosscheck effort.

**Position transmission data protocol.** Harmonisation of the data formats for transmission of VMS information between FMCs, and between FMCs and the Commission is fundamental. There are no global standards, but there are at least two widely used international formats: the North Atlantic Format used in FAO areas 21 and 27, and the FFA format (the differences, if any, will require further study). The NAF includes a specification for the transmission of catch data (see Annex). Once a format is decided, any changes involve major problems and expense, as part of the software supporting the VMS and related communications may have to be rewritten. FAO has recognised this difficulty and a technical consultation on VMS data formats will be held in 2004 to make the initial steps towards a standardised global VMS data exchange formats.

**Data standards.** Advice on data standards has been provided in WCPFC/PrepCon/WP.15. Additional detailed advice on specific VMS data standards may be required.

#### **4.3.2 Possible future VMS information requirements**

Several other types of information can be captured and transmitted via VMS communications. Scientific uses include the tracking of tagged fish, marine mammals, or turtles and the reporting of sea temperatures. Catch information can provide the markets with guidance on supplies. Price information can persuade fishers switch target species. It is possible to monitor bycatch and discards using video links.

The Technical and Compliance Committee of the Commission is to ‘review the implementation of cooperative measures for monitoring, control, surveillance and enforcement adopted by the Commission and make such recommendations to the Commission as may be necessary’ (Article 11.1) .... developing and reviewing measures to provide for the verification and validation of fisheries data...’. Of particular interest are the possibilities for catch reports, electronic logbooks and management of effort using the VMS.

**Catch reports.** Reference has already been made to the use of catch reports in the NEAFC and CCAMLR areas. The catch reports are made prior to entry to or exit from the management area, or when a vessel moves from one statistical area to another. Such catch reports would have value in the Convention area for verification and cross-checking of logbook data, to provide a timely overview of the status and trends in the fisheries and fishing areas, and as a basis for onboard inspection from patrol vessels.

**Electronic logs.** The scale, geographical extent and complexity of the fisheries warrant serious consideration of the use of harmonised electronic logbooks (e-logs). Such logbooks schemes are in various stages of implementation in many countries. The initial problems regarding their design and adoption by fishers are gradually being resolved. The e-logs provide many advantages (see Annex for further details). In particular the e-log provides an internationally transparent historical record of fishing activity by the flag state's vessels, sometimes referred to as the 'track record'. Such a transparent record may be of value in future negotiations for quotas, or fishing rights (see Article 10.3. (c)). The e-logs will also greatly assist in the capture and timely analysis of catch and effort data and enable real time verification of landings and transshipments.

**Effort control.** Under the Palau Arrangement there is an upper limit of 205 purse seiners allowed to fish in the area under the jurisdiction of the parties to the Nauru Agreement. However, there is currently no limit on the total tonnage, or fishing capacity<sup>2</sup> of the purse seine fleet. The parties agreed that a long-term management system based on national limits on the number of purse seine days should be further developed. The VMS is likely to be a primary tool for implementing such a scheme.

**Fish aggregating devices (FADs).** FADs equipped with GPS and VMS are of growing importance in tuna fisheries. The FADs may concentrate juvenile fish and greatly enhance the level of real fishing effort. Enhanced regulation and control over FADs may require consensus among Commission members on the property rights over drifting and high seas FADs. It is also conceivable that future effort regulations may require that FADs be registered and fitted with some form of VMS.

#### **4.3.3 Polling and compliance communication**

The FFA considers polling an essential feature of the VMS. NEAFC's 'stop fishing' and 'remain in the regulatory area' messages are further examples of the utility of the polling and communication features.

#### **4.3.4 Conclusions**

A vision of the future role, structure and operation of the VMS system is required. The Convention makes little specific reference to the use of the VMS information. The VMS position reporting can be seen as but one dimension of a comprehensive fisheries communication and information system for the Commission. This electronic communication system can be the 'information highway' for the Commission, capturing catch and effort information in near real time as a data feed for management models. A phased and prioritised development of a comprehensive information system, of which the VMS is but one component, is likely to be a cost-effective medium to long-term approach.

If, in accordance with the precautionary approach (Article 5(c)), decision rules are predetermined by the Commission, such an information system can provide a rapid response capability for management. Communication of 'catch on board' information on entry to/ exit from EEZs is highly desirable. VMS provides the optimum means of communicating this catch information.

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<sup>2</sup> Reid, C. et al. 2003. An analysis of fishing capacity in the western and central Pacific Ocean tuna fishery and management implications. *Marine Policy* 27 (2003) 449–469.

An enhanced communication system may also improve economic returns to the fishery by providing markets with supply information, giving vessels access to electronic sales, and helping to stabilise price fluctuations.

Polling is seen as a highly desirable feature for the VMS system. In the absence of a polling feature, 'smart' pre-programmed VMS units that record and then download multiple positions may be an alternative. However there are practical difficulties in altering numerous pre-programmed VMS units if zoning, or other regulations change.

#### **4.4. SYSTEM ARCHITECTURE**

As the WCPFC VMS must cater for both high seas and waters under national jurisdiction it must draw upon the VMS architecture of several different fisheries organisations and arrangements.

NEAFC provides a model for the high seas VMS. FFA provides a model for VMS in waters under national jurisdiction. The EU and arrangements between Palau, Marshall Islands and Federated States of Micronesia pursuant to the Niue Treaty<sup>3</sup> provides a model for reciprocal exchange and sharing of VMS information.

##### **4.4.1 Possible VMS data transmission paths**

**Transmission from vessel to Commission.** Because of the variety of institutional arrangements of the parties to the Convention the VMS may have to accommodate several different transmission pathways at least during the initial phases of the VMS.

**Direct, near real-time and simultaneous transmission.** 'Near real-time' is essentially a function of VMS satellite used and the area of operation of the vessel and could be measured in minutes, or hours (see 'Technical issues'). 'Simultaneous transmission' is taken as meaning that the VMS position information is automatically re-transmitted by the flag state FMC to the Commission. The delays involved are solely a function of the equipment and the software, which must meet certain minimum requirements. Automatic re-transmission from a flag state FMC to the Commission is interpreted as complying with the term 'directly' in Article 24.8, subject to compliance with transmission standards and protocols agreed by the Commission.

##### From vessels on the high seas.

- A. High seas vessel *TO* flag state FMC with automatic, simultaneous re-transmission *TO* Commission.
- B. High seas vessel *via* direct transmission *TO* Commission.

##### From FFA member state-flag vessels on the high seas.

- C. From 'FFA-flag vessel' on the high seas *TO* FFA with automatic, simultaneous re-transmission *TO* Commission, subject to the FFA being an 'organisation designated by the Commission' under Article 24.8.

##### From vessels within EEZs subject to approval of a request by a member under Article 24.8.

- D. Vessel in flag state EEZ *TO* flag state FMC with automatic, simultaneous re-transmission *TO* Commission, or *via* direct transmission *TO* Commission.

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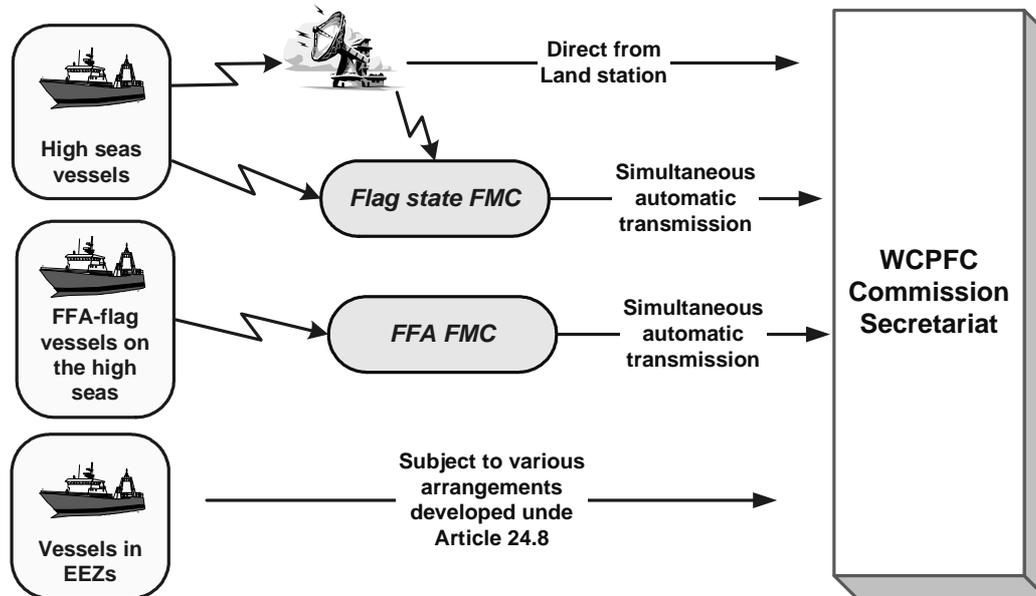
<sup>3</sup> ARTICLE V - EXCHANGE OF INFORMATION

1. Each Party shall, to the extent permitted by its national laws and regulations, provide to the South Pacific Forum Fisheries Agency, or to any other Party directly, information relevant to the purposes of this Treaty, including but not limited to information about: (a) the location and movement of foreign fishing vessels; ...

F. Foreign vessel in an EEZ *TO* EEZ state FMC with automatic, simultaneous re-transmission *TO* Commission, or *via* direct transmission *TO* Commission.

G. From 'FFA-flag vessel' in an EEZ *TO* FFA with automatic, simultaneous re-transmission *TO* Commission, subject to the FFA being an 'organisation designated by the Commission' under Article 24.8.

All transmissions are via land stations. The transmission pathways for FMCs linked to, fishing entities are considered to be similar to those for the FMCs of flag states.



*Figure 3. Diagrammatic representation of VMS transmission paths*

#### **4.4.2 Polling**

The general requirement for polling must first be agreed by the Commission. The introduction of polling could be phased to allow vessels and FMCs that do not have a polling capability to adapt equipment, software and procedures. Polling is likely to be required in several situations:

- when fishing is taking place on the high seas in close proximity to an EEZ boundary;
- when fishing is taking place in close proximity to restricted areas, such as those reserved for small-scale fishers;
- if the Commission designates certain areas for limited effort or other fishing restrictions;
- during surveillance exercises; and
- upon the detection of VMS anomalies, e.g. suspected unreported transshipment.

Three polling pathways can be envisaged:

- initiated directly by the EEZ FMC with a 'copy' to the Commission;
- initiated by the Commission based on agreed procedures; or
- initiated by a request to the flag state FMC via the Commission.

#### **4.4.3 Transmission from the Commission to other parties.**

'Raw' near real-time VMS information is unlikely to be regularly transmitted from the Commission either to members, or other parties. Subject to agreement, information on tuna vessels transiting to the Indian Ocean could possibly be transmitted to the IOTC, or CCSBT. However, neither commission currently has a VMS. Subject to special procedures information on vessels suspected of illegal activity

could be sent to a non-member flag state, or a port state requested to detain the vessel. Procedures are likely to evolve in response to member's specific requests and incidents and need not be the subject of immediate attention.

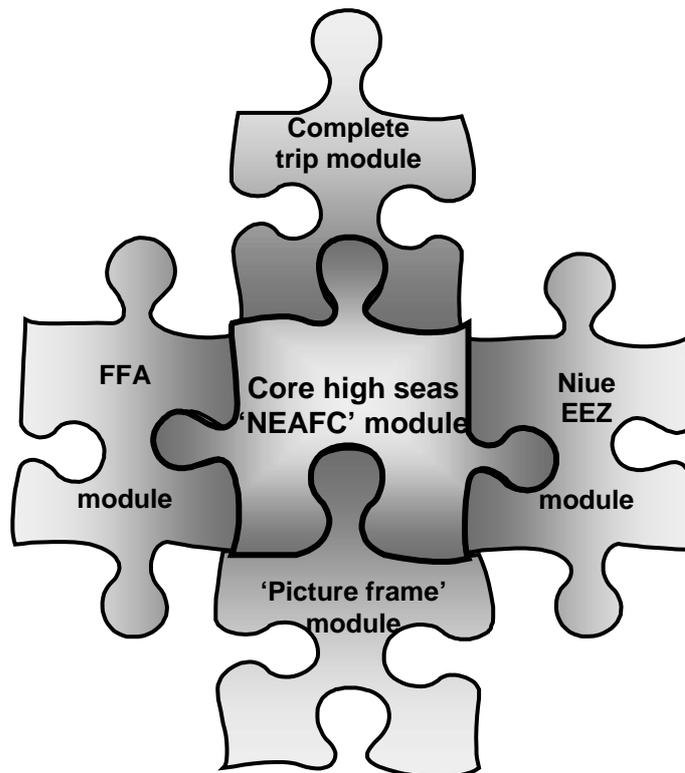
Aggregate VMS information analysed to show recent trends in the fisheries may be needed by all members. Initially summary information can be distributed in a timely manner. The level of detail can be gradually enhanced in accordance with rules approved by the Commission.

Transmission of aggregate information to national, or regional scientific bodies for scientific purposes will require further detailed study. Discussions between ICES and EU and between FFA and SPC may provide guidance.

#### **4.4.4 VMS conceptual modules**

The following text and graphics are provided purely as an exercise in visualising the evolving shape of one possible structure for the Commission's VMS. The VMS is presented as a set of modules. Each may refer to a different set of vessels, or a different maritime area, and each may have differing rules of procedure.

**The NEAFC, or high seas module.** This is the 'core' module for the Commission with respect to the high seas. The vessels directly transmit VMS position messages to the Commission, or the FMCs of members automatically and simultaneously re-transmit VMS position messages to the Commission with respect to their vessels fishing on the high seas. The Commission's FMC, through its software harmonises any differences in VMS data transmission until all members have adopted common formats and protocols.



*Figure 4. Conceptual diagram of possible VMS modules*

**The FFA module.** The FFA, on instruction from the FFA members, automatically re-transmits to the Commission VMS position information with respect to FFA-flag vessels operating on the high seas. A

VMS agreement is concluded between the FFA and the Commission. Transmission of VMS information from FFA to the Commission with respect to foreign-flag vessels operating in EEZs would be subject to further study and agreements.

**The EU/ Niue module.** A framework agreement is concluded under which members may exchange VMS data directly and automatically between FMCs with respect either their own flag vessels, or to foreign vessels.

**The ‘picture frame’ or MLT module.** A fishing entity, or country agrees to provide all VMS position data to the Commission, irrespective of whether the vessels is operating on the high seas, or in an EEZ. The area could be the entire Convention area, or an area defined in a treaty such as the US MLT.

**The complete trip module.** The complete trip VMS record is made available to the Commission. This information could be provided retrospectively rather than in real time. It may be of particular value for monitoring compliance by reefer and support vessels. Explanation of ‘missing’ segments of a trip will also be of compliance interest. The complete trip record could include segments outside the Convention Area.

#### **4.5. CONFIDENTIALITY**

##### **4.5.1 A divided responsibility**

‘Raw’ VMS information is legitimately confidential commercial information. Even aggregate VMS information may reveal valuable commercial insights and must be regarded as confidential unless it is released under approved guidelines and formats. Historical information can be equally valuable. This confidentiality is an extremely sensitive issue for the fishing industry. Vessel operators must have assurance that information will remain confidential, and that legitimate stakeholders have equal access to any summary information that may be divulged.

The responsibility for confidentiality is distributed among the various links in the information chain:

- the manufacturers of the VMS units to ensure that the units meet certain standards;
- the satellite service providers, land station operators and communications companies to ensure that there is no ‘leakage’ of VMS information in transit;
- the national fisheries administration when the VMS information is received by the FMC;
- the Commission when the VMS information is received; and
- any intermediaries, or service companies which may be contracted by any of the above.

##### **4.5.2 Safeguarding confidentiality**

Confidentiality must be safeguarded through legal, physical and procedural means. The physical and procedural means are broadly similar at national level and for the Commission. However, the legal provisions for data protection for the Commission will be based on the legislation in the country where the Commission’s VMS data handling is located.

**Legal safeguards.** Provisions relating to the keeping, access to, use and disclosure of confidential information can be found in different pieces of national legislation. ‘Trade secrets’ acts protect of commercially sensitive information, limiting disclosure of information that may lead to a commercial disadvantage. Rights to privacy acts often do not permit direct or indirect identification of natural or legal persons. In some countries rules on confidentiality and disclosure exist in fisheries legislation. There is a growing body of legislation prohibiting ‘hacking’ and computer fraud.

The contracts under which data and other services are provided, including those with the satellite service providers, communications companies and computer maintenance companies, should make adequate provisions for confidentiality.

**Physical safeguards.** Access to premises where VMS information is stored and to the information itself must be restricted. For this reason FMCs are often located on a naval, or coastguard premises. Persons given access should be held accountable for unauthorized disclosure. Such persons must be informed of these responsibilities and may be required to sign a statement of confidentiality.

**Procedural safeguards.** Data security must conform to a specific standard. NEAFC specifies conformity with Section 2.2 of the U.S. Department of Defence Trusted Computer System Evaluation Criteria (TCSEC), DOD 5200.28-STD. A copy of the NEAFC data security requirements is provided in the Annex. NAFO confidentiality and data security provisions are available on: [www.nafo.int](http://www.nafo.int) NAFO/FC Doc. 04/1, Annex XX, Serial No. N4936.

**Authorised access.** National authorities and the Commission will require to specify what constitutes authorised use of different forms of VMS information (e.g. 'raw' and aggregate). The conditions for access to VMS information for research purposes, retransmission to patrol vessels, or emergency search and rescue will need to be determined. A VMS record may be required in relation to catch documentation. In such cases the Commission may only require to assert that the VMS track does not show evidence of illegal fishing activity. Release of information for evidentiary purposes may be subject to the laws of the Commission's host country and agreements on 'long-arm jurisdiction' between countries. Possible disputes between members may be avoided, if the Commission agrees the basic principles, under which the Commission can release VMS information for evidence.

#### **4.6. RESPONSIBILITY FOR VMS**

Under Article 15 the Secretariat has the role of 'facilitating the compilation and dissemination of data necessary to accomplish the objective of this Convention; [and]...administering agreed arrangements for monitoring, control and surveillance' in a cost-effective manner. This gives the Secretariat has the mandate to administer the VMS system. The Technical and Compliance Committee has an important role in reviewing and recommending upon VMS matters (Article 14.1 (c)).

Under Article 24 the flag states and cooperating fishing entities have responsibility to ensure that its vessels are equipped with a functioning VMS, which meets the Commission's specifications.

Under Article 22 the Commission has responsibility to cooperate with regional fisheries organisations such as the FFA on matters related to VMS.

#### **4.7. COSTS AND BENEFITS**

Estimation of the costs and benefits of a VMS require further detailed study. Valuation of the benefits presents difficulties as the VMS is seen as but one tool in a suite of fishery management and protection measures. It is complementary and supportive to other control and enforcement initiatives, without which neither the VMS, nor the other MCS measures may be effective. As the Commission is already committed to acquiring a VMS the focus of attention may be directed towards:

- Specifying the technical requirements of the system with a view to its expanded use, possibly as the principal fisheries information conduit in the medium/ long-term;
- Maximising the effectiveness of the system and reducing its capital and recurrent costs, possibly through Commission-wide contracts for services.
- Sharing information and technical advice among the Contracting Parties to promote equivalence and data exchange as may be required among the VMS of the Parties.

Indicative costs of on-board VMS units are between US\$ 2,500 and US\$ 4,000 per unit. The cost of a monitoring centre ranges from US\$ 5,000 in the case of a company fleet (PC and software) to several million US\$ in the case of a major national, or regional VMS which may have secure, climate controlled buildings and several backup systems.

The annual cost of monitoring the EU fleet of 4,000 vessels is estimated to be in the order of Euro 8 Million. An estimated increase of 20% in the effectiveness of marine surveillance, which has an estimated annual cost of EURO 100 Million, is considered to justify the cost of the VMS. The UK has recently contracted for a new VMS at a value in the order of US\$ 1.5 million. The FFA charges an annual registration fee of US\$ 845, which provides an indication of the annual operating cost of the system (approximate annual revenue of US\$ 0.8 million).

#### **4.8. TECHNICAL ISSUES**

At a minimum, technical decisions must be made regarding the satellite system to be used, the VMS unit type and its physical and functional requirements, the nature of the FMC and the scope of the program (i.e. type of vessels included and data to be transmitted).

##### **4.8.1 Satellite suppliers**

There are currently two suppliers of suitable satellite services suitable for vessel monitoring throughout the Convention area: Argos and Inmarsat C. Discussion of the satellite services is restricted to these two for the following reasons:

- They provide coverage for the entire Convention area.
- Both provide tried and tested VMS and meet the VMS requirements of many countries.
- They have adequate support services and agencies throughout the Convention area.
- The companies owning and operating these services appear to be financially and institutionally sound so that there is a high probability that these services will continue for the foreseeable future.

<b>ARGOS</b>	<b>Inmarsat-C</b>
<b>Advantages</b>	
World-wide coverage Simple and reliable Relatively low power consumption Integrated (turnkey) delivery of VMS and associated software, support and training	Quasi real-time data Small and light equipment Multiple manufacturers and softwares GMDSS (safety at sea) Data messaging Two-way communication (polling)
<b>Disadvantages</b>	
Delays in delivery of data One-way communications only – no polling (this is reported to be about to change)	Equipment relatively expensive No coverage in polar regions Requires sturdy power supply

**Argos.** Argos satellites have a circumpolar orbit and provide full global coverage. However, the reception of vessel position data by the satellite may have to await the passage of the satellite over the ocean area where the vessel is located. A further delay may occur while the satellite moves within range of the nearest land receiving station to which it can download the vessel's position data. Delays of several hours may occur in equatorial regions. Estimated reception /transmission delays are more than 70% in less than 20 minutes. Argos is currently a one-way communication system does not currently support polling, e.g. the national fisheries authority is unable to instruct the VMS unit on board the vessel to transmit its position more frequently. The Adeos II satellite with a two-way Argos payload on-board is now out of order and the next satellite with such a payload is METOP, planned to be launched in 2005.

Argos offers an integrated VMS package (see [www.cls.fr](http://www.cls.fr) ). It will supply: the VMS units; the computer and other equipment needed for the FMC; and the software, including the electronic maps, required to operate the VMS; the training of FMC staff; and the maintenance and other services. The approximate numbers of Argos VMS units in vessels flagged in Convention signatory countries is as follows:

USA (Alaska) / Canada	650	Indonesia	1,500
China	30	Micronesia	5
Korea	380	New Zealand	50
Japan	750	Tonga	50
Chinese Taipei	230	<b>Total</b>	<b>3,645</b>

Note: Not all these vessels are tuna vessels, nor do they necessarily fish in the Convention area.

**Inmarsat C.** Inmarsat C satellites are geostationary and positioned over the equator. They do not give coverage of the polar regions. However, this is of little consequence to the Commission. Inmarsat guarantees 99.9% coverage of the area between 76°N and 76°S, as required by the GMDSS (maritime distress calls) system supported by Inmarsat. Inmarsat C is a two-way communication system. The vessel owner, or FMC can remotely alter the parameters of the Inmarsat C terminal on board the fishing vessel. For example, by ‘polling’ the vessel the frequency of transmission of position reports can be altered. There are over 60,000 Inmarsat C terminals installed worldwide on fishing, commercial and recreational vessels. The Inmarsat commercial organisation only supplies the satellite services. The VMS equipment and some services (on-board units, FMC computers, software, operation of land receiving stations, training) are supplied by private companies, which have commercial relationships with Inmarsat. Further details are available at: [www.inmarsat.org](http://www.inmarsat.org).

In addition to data transmission, both Inmarsat C and Argos support a range of other communication devices including emergency signalling, email, and telephone. ‘Smart’ VMS units exist for both Argos and Inmarsat C. These units can be programmed to send position information more frequently if the vessel is close to a prohibited, or closed area.

**Costs.** Possible cost differences require additional study in relation to a particular VMS configuration. The capital and recurrent costs such as transmission costs are variable. The costs are particular to the scale and specifications of the VMS and subject to negotiations with suppliers. In the case of Argos, services are priced on a flat rate basis defined in relation to a number of parameters such as: the number of vessels to be contracted, the duration of the contract, the number of position to be distributed. Argos service price is fixed, whatever the number of address where to deliver the data.

**Key differences.** For the purposes of fisheries control, the key differences between the two systems are:

- Polling. Argos currently does not support polling.
- Near-real time. Inmarsat C signals are likely to be received more rapidly by FMCs. There can be substantial delays with Argos in tropical latitudes.
- Installation and maintenance. Argos offers integrated solutions from a single supplier. Inmarsat C involves a minimum of two suppliers.

It is apparent that, within the Convention area, Inmarsat C currently has technical advantages over Argos in terms of polling capability and timeliness of position reporting.

**GPS satellites.** The VMS takes its position information from a US-operated set of GPS satellites. Another Galileo position fixing satellite system is planned to come into operation later in the decade.

#### **4.8.2 Harmonised technical standards**

Technical standards are beyond the scope of this discussion paper. Harmonised technical standards may be required as regards:

- the technical specifications of the VMS units;
- the exchange of position data (with the time and date stamp) between recipients, e.g. FMCs;
- polling protocols (if considered to be a necessary feature of the VMS); and
- catch reporting by satellite communication, initially as a 'total catch on board' on entry to/ exit from EEZs, and later as a full electronic logbook, eventually substituting the paper logbooks.

**FFA format.** The FFA already has established standards (type approval) for VMS units.

**North Atlantic Format.** This is a standardised VMS data transmission format used between NEAFC and NEAFC members, in the EU, in NAFO, and in several bilateral fisheries agreements, such as those between Norway and Russia.

Authorised data exchange protocols for electronic transmission of reports and messages between contracting parties and the regional fisheries organization are usually X.25 and X.400. Internet-based protocols (e.g. HTTP protocol) also offer secure alternatives to X.25 and X.400. Other protocols are also available, but have not yet been tested.

**Agreed international data exchange standards.** During 2004 the FAO plans to convene a technical meeting to recommend upon VMS data exchange standards.

#### **4.8.3 Tampering with the VMS**

**Reliability.** Strict adherence to adequate technical specifications of the VMS units is important. Up to 5% of VMS units in some EU fisheries may be non-functional at any given time. Malfunctioning VMS units undermine the integrity and transparency of the system, which must be seen to be a 'level playing field' for all vessels.

**Falsifying the VMS signal.** Recent studies commissioned by the EC indicate that many of the VMS units currently manufactured have a low level of security from tampering. Of particular concern has been the use of a false computer generated GPS signal. Solutions include: improved technical specifications; cooperation among manufacturers to agree on tamper proofing standards; and software checks to identify signal anomalies.

**Tamper proofing.** A number of measures can deter tampering:

- integration of the VMS and GPS electronics and antennas in a single case protected by a tamper evident deco or seals;
- light sensors to detect that VMS unit compartments have been opened causing an 'intrusion alert' message to be immediately transmitted to the VMS satellite;
- tamper-resistant screws closing the access to the VMS compartments;
- tamper-evident seals or decos on screws, cable outlets, wiring, ports and junction boxes;
- use of plastic mouldings, soldered, or integrated components; and
- random, or requested cross-checking of signal origin using Doppler.

In order to prevent tampering, there have been moves to reduce the communications capabilities of the VMS units. However, this may be counterproductive to the development of electronic logbooks, facilitating crew email and other evolving communications.

## **4.9. LEGAL ISSUES**

### **4.9.1 Legislating for VMS**

Effective national VMS legislation is necessary to implement the VMS requirements of the Convention. International legal instruments are normally made binding on persons, or vessels operators through national legislation. A range of other legal issues related to VMS, including confidentiality, evidence, and maritime boundaries also require appropriate national laws. Expert legal advice is likely to be required on the legal dimensions of VMS legislation. In this regard, the following points and issues are of note:

- The relevant parts of the fisheries and VMS legislation must apply outside jurisdictional waters to ensure that the flag state can enforce the Convention's VMS requirements on the high seas and in the waters of third countries. Powers of inspection and control on high seas may need to be specified.
- The nature of electronic data, its status as evidence and custody of the chain of electronic evidence must be considered if VMS is to be used in prosecutions.
- Authorisation for a national fisheries administration to share 'private' commercial VMS information with the Commission may require legislative change, although this may be circumvented by requiring the vessel operator to authorise this data sharing in a fishing licence application.
- As the VMS tracks not only the vessel, but also the crew, it may constitute an invasion of privacy.
- The VMS units must be irrefutably linked to a vessel; otherwise the system is tracking VMS units, not fishing vessels. This underscores the importance of the legal aspects of the VMS unit installation and the links between vessel and VMS registers.
- Civil and criminal offences. In 'common law' countries an offence against the fisheries laws may be a criminal offence. Criminal offences require a higher standard of proof than civil offences. Criminal prosecutions require proof beyond reasonable doubt, while in civil proceedings the preponderance of the evidence may be proof of an offence. In common law countries, VMS information may be inadmissible in criminal proceedings due to the rule against hearsay evidence. The hearsay rule may be overcome by exceptions such as 'rebuttable presumption' and 'judicial notice'.

There may be advantages in harmonising certain provisions of the VMS legislation among the members. There are strong arguments in favour of some degree of harmonisation of sanctions for VMS violations. This may prove difficult in terms of criminal versus civil laws, administrative versus court procedures.

During the development of the FFA VMS, the FFA Secretariat provided draft model VMS legislation to each FFA member. Upon request, FFA may make this model available to the Commission. Such a draft may provide guidance on possible harmonization, or establishment of equivalence of some legislative provisions for VMS among members.

### **4.9.2 Nature of the VMS offence**

Article 25.7 makes reference to sanctions for violations. The sanctions must be: effective in securing compliance; discourage violations; and deprive offenders of the benefits of their illegal activities. Equivalence among the members with regard to the nature of the sanctions is highly desirable. At least two types of VMS violations can be identified.

**Failure to install and/ or operate the VMS.** As a minimum, the flag state can withdraw the fishing authorisation of the vessel until the VMS is operational. In the event that the vessel is suspected of repeatedly tampering with the VMS, the 'three strikes rule' can be applied, i.e. on the third occurrence

the fishing authorisation of the vessel is automatically suspended for a period sufficient to deter further incidents.

**Fishing in a prohibited area.** VMS is particularly useful in detecting possible fishing in a prohibited area. The prohibited area could be an EEZ for which the vessel does not possess a fishing authorisation, a high seas sanctuary for protected species, or zones reserved for small-scale fishers. There are two basic options with respect to the prohibited area offence: (a) it is an offence to fish in the prohibited area; (b) it is an offence to be in the prohibited area. It may be difficult to prove that fishing was carried out on the basis of VMS evidence. If by its presence in the prohibited area the vessel is assumed to be fishing, then the onus is on the vessel to prove that it was not fishing. This latter approach may conflict with principles of freedom of navigation. Reversing the burden of proof<sup>4</sup> may not be possible in criminal law. Transit corridors, inspection checkpoints and obligations to hail of entry and exit have also been used with some success to address this problem.

#### **4.9.3 Vessels in transit**

Fishing vessels in transit pose a particular difficulty in the Convention Area. Under international law it may be difficult to impose an obligation to report position by VMS, yet compliance with the requirements for innocent passage (e.g. stowage of gear) are difficult to monitor. Malaysia physically inspects vessels in transit and South Africa encourages transiting vessels to hail entry and exit. This hailing of entry and exit is gradually becoming an accepted practice and features in many bilateral and multilateral fisheries arrangements.

In order to prevent disputes over inspections and unnecessary detentions of transiting vessels, and out of courtesy to other Commission members, hailing of entry and exit, preferably by automatic VMS message, could be considered as a general requirement. If necessary this could be complemented by a 'catch on board' message.

## **5. CONCLUSIONS**

**Vision.** The Commission requires a long-term vision of the future scope and role of the VMS. It is suggested that the VMS can constitute the backbone of the Commission's information communication system, and that in the VMS should not be restricted to vessel position information. The design of the system should allow for the introduction of catch reporting and electronic logbooks in the medium to long-term.

**Best practice.** The Commission can draw on the experiences and lessons of other multilateral VMS users to identify technical and administrative options and best practices. The arrangements in the FFA, in the EU and in NEAFC are of particular interest and are likely to contribute features and solutions to the Commission's VMS.

**Detailed analysis of issues.** A broad range of issues will require discussion and preparation of more detailed options papers based on thorough study of the national VMS plans, the fisheries, fleets, fishing areas, technical and legal questions.

**Fleets.** The precise definition of the target fleets will require further consideration, with particular reference to bycatch of tuna, traditional vessels and non-member support vessels. The VMS can focus initially on priority fleets and fisheries and gradually expand its scope to embrace other groups of vessels.

**Areas.** The initial geographical target of the VMS is the high seas. However, subject to agreement by the members, the VMS could plan for the capture of the VMS position information for the complete

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<sup>4</sup> The Queensland fisheries legislation requires the person to prove that the vessel was not where the VMS indicates in order to prove innocence.

trip of a vessel, or groups of vessels of special interest. Harmonised electronic charts of the Convention area are desirable. Administrative 'fixes' may be required if maritime boundaries are subject to dispute. Details of a number of precedents can be examined.

**Technical issues.** The technical issues include the specifications of the VMS units with particular regard to the minimum frequency for position reports and the requirement for polling and tamper proofing of the VMS units. Recognising the rapid advances in technology and possible decreases in costs in the longer term, it may be preferable to agree upon a relatively high standard and provide for a staged implementation to allow some vessels and FMCs to upgrade their VMS.

Data exchange formats and protocols will need to be agreed. Agreed data formats are required for catch reports and eventually for logbooks. Longer-term projects, such as electronic logs should be included on the VMS agenda giving members a degree of ownership of any national trials, or pilot projects for sub-regions.

**Legal and administrative issues.** The need for harmonisation, or equivalence in VMS legislation may require discussion. The Commission will need to agree upon the use and terms and conditions for use of VMS information by the Commission, including the provisions for confidentiality and data security. The interpretation of the terms 'simultaneous', 'directly', and 'near real time' may need to be specified.

### **5.1.1 Process**

The process of developing the VMS may start by securing broad agreement on the functions of the VMS and related satellite communications with the fleet in the longer term. Consensus on the future scope of the system is important, with particular reference to future coverage of non-high seas areas, polling, possible effort control requirements, possible reporting of catch and entry/ exit by satellite communication and the relationship between the FFA and the Commission.

The second step is to identify: (i) the areas of broad agreement with respect to the scope and operation of the VMS; and (ii) the key issues which need to be resolved to proceed with a more detailed design. A working proposal describing the VMS is required to facilitate this discussion. A synthesis of information from a set of country papers describing the existing and planned national VMS can provide a clearer overview of the legal and technical issues.

Further detailed studies can be prepared in an effort to further build on consensus already developed, and to weigh the options in areas of disagreement, or uncertainty.

Based on broad agreement in all key areas a feasibility study can be commissioned followed by the preparation of functional specifications and eventual tenders.

### **5.1.2 Possible phases in VMS development**

As approximately one third of the target fleet is already equipped with Inmarsat C and complies with the FFA standards, it is suggested that the FFA technical standards could be considered as a basis for discussion of the Commission's VMS technical requirements. The two-way communication ability and the polling facility are highly desirable features for the Commission's VMS and, if possible, should be an integral part of the VMS.

The technical development of the VMS is likely to be a phased process. The timelines of the phases could overlap for different groups of vessels, or for different sub-areas.

1. The initial phase would accommodate the current capabilities of both Argos and Inmarsat C in terms of a relatively low frequency of reporting and non-requirement for polling. Vessels using Argos may be subject to a higher level of non-VMS reporting.

2. The second phase would conform to the requirements of the FFA VMS in terms of frequency of reporting and requirement for polling. The polling facility of the new Argos satellites could be active by this time.
3. In a third phase, basic catch reporting (entry/ exit/ transshipment) would be introduced for certain groups of vessels, e.g. purse seiners, or with respect to certain areas, e.g. where there are concentrations of juveniles.
4. A fourth phase would have two objectives: the gradual introduction of standardised electronic catch reports to eventually substitute the paper forms; and pilot schemes for effort control if considered necessary for certain fleets, or species.

## ANNEXES

### 6. ANNEX 1. REPORTED NUMBERS OF FISHING VESSELS WITH VMS IN THE CONVENTION AREA

Flag State	FFA <sup>1</sup>	Argos <sup>2</sup>	Total
Australia	2		2
Cook Islands	5		5
Fed. States of Micronesia	10	5	15
Fiji	49		49
Marshall Islands	6		6
New Zealand	8	50	58
Papua New Guinea	1		1
Kiribati	1		1
Vanuatu	61		61
Solomon Islands	3		3
Tonga		50	50
<b>Sub-total FFA member states</b>	<b>146</b>	<b>55</b>	<b>201</b>
China	112	30	142
Indonesia	1	1,500	1,501
Japan <sup>3</sup>	239	750	989
Republic of Korea	35	380	415
Philippines	47		47
Chinese Taipei <sup>5</sup>	247	230	477
U.S.A. <sup>4</sup>	21	650	671
<b>Sub-total other Convention signatories</b>	<b>702</b>	<b>3,540</b>	<b>4,242</b>
Belize	17		17
Cyprus	2		2
Estonia	1		1
Georgia	1		1
Democratic Republic of Korea	1		1
Malta	1		1
Netherlands Antilles	1		1
Panama	31		31
Seychelles	1		1
Singapore	10		10
Spain	2		2
St Vincent & The Grenadines	5		5
<b>Sub-total third countries</b>	<b>73</b>	<b>0</b>	<b>73</b>
<b>Total</b>	<b>921</b>	<b>3,595</b>	<b>4,516</b>

1. Numbers of vessels on the FFA VMS Register.

2. Approximate numbers of Argos VMS units in the signatory countries to the Convention. Not all Argos units are installed on tuna vessels, or on vessels operating in the Convention Area (information from CLS).

3. Japan has over 200 Argos units installed on tuna vessels.

4. United States of America: 145 Hawaii longline vessels use Inmarsat C; 21 WCP purse seiners use Inmarsat C

5. Chinese Taipei Southern Bluefin 60 vessels (mandatory); Tuna association indicative total of 600 vessels, of which an estimated 66% use Argos and 33% Inmarsat C.

## **7. ANNEX 2. EXAMPLES OF VMS REGULATIONS**

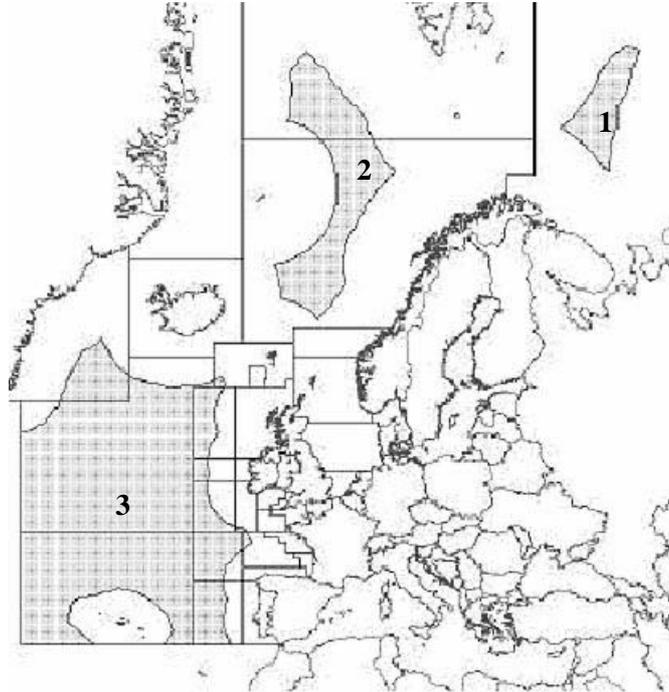
### **7.1. LEGISLATIVE BASIS FOR VMS IN THE EUROPEAN UNION.**

#### **Extracted from: Council Regulation (EEC) No 2847/93 (subsequently amended)**

1. Each Member State shall establish a satellite-based vessel monitoring system, hereinafter referred to as 'VMS', to monitor the position of Community fishing vessels.
2. The VMS shall apply no later than 1 January 2000 to all Community fishing vessels exceeding 20 meters (*now 18 meters*) between perpendiculars or 24 meters overall length wherever they operate.
3. Notwithstanding the provisions of paragraphs 1 and 2 above, the VMS shall not apply to vessels: (a) operating exclusively within 12 nautical miles of the baseline of the flag Member State; or (b) which never spend more than 24 hours at sea taken from the time of departure to the return to port.
4. When a Member State imposes VMS on vessels flying its flag and not falling within the scope of paragraphs 1 to 3, those vessels will be eligible for the same financial support as is applicable for vessels applying VMS under paragraphs 1 and 2.
5. Member States shall ensure that satellite-tracking devices be installed and be fully operational on Community fishing vessels flying their flag to which VMS shall apply. The satellite-tracking device shall enable a fishing vessel to communicate by satellite to the flag State and the coastal Member State concerned simultaneously, its geographical position and where applicable the effort reports referred to in Article 19b. In the case of *force majeure* relevant information shall be communicated by radio via a radio station approved under Community rules for the reception of such information or by the means specified in Article 19c.
6. The masters of the Community fishing vessels to which VMS applies shall ensure that the satellite-tracking devices are at any time fully operational and that the information referred to in paragraph 5 is transmitted. Transmission shall be carried out at the required daily frequency to ensure that the flag Member State and/or the coastal Member State can effectively monitor the vessels.
7. Member States shall establish and operate fisheries monitoring centres, hereinafter referred to as 'FMC', which shall monitor fishing activities and fishing effort. The FMC shall be operational no later than 30 June 1998.  
  
The FMC of a particular Member State shall monitor the fishing vessels flying its flag, regardless of the waters in which they are operating or the port they are in, as well as Community fishing vessels flying the flag of other Member States and fishing vessels of third countries to which a VMS applies operating in the waters under the sovereignty or the jurisdiction of that particular Member State.
8. Each flag Member State shall appoint the competent authorities responsible for the FMC and shall take the appropriate measures to ensure that its FMC has the proper staffing resources and is equipped with computer hardware and software enabling automatic data processing and electronic data transmission. Member States shall provide for back-up and recovery procedures in case of system failure. Member States may operate a joint FMC.
9. The flag Member State shall take the necessary measures to ensure that the data received from its fishing vessels to which a VMS applies are recorded in computer-readable form for a period of three years.  
  
The coastal Member State shall take the necessary measures to ensure that the data received from fishing vessels flying the flag of another Member State or of a third country to which a VMS applies are recorded in computer-readable form for a period of three years. The Commission shall have access to these computer files on the basis of a specific request. The provisions of Article 37 shall apply.
10. Detailed rules for the implementation of this Article shall be decided in accordance with the procedure laid down in Article 36. In particular, on the basis of an application by a Member State and in accordance with the provisions of Article 36, the Commission may decide that an alternative system to VMS may be applied, taking into account the type of monitoring system proposed, the type of fishing vessel or vessels, the area or areas fished, the targeted species and the duration of the fishing trips. The alternative system must be as effective as a VMS and apply on a non-discriminatory basis.

## **7.2. NEAFC COMPLIANCE SCHEME FOR CONTRACTING PARTIES**

### **7.2.1 Map of the NEAFC area**



*Figure 5. Map of the NEAFC area, showing the three high seas Regulatory Areas*

### **7.2.2 NEAFC provisions on VMS**

#### **Article 9**

#### **Vessel Monitoring System**

1. Each Contracting Party shall implement no later than 1 January 2000, a vessel monitoring system (hereinafter referred to as VMS) for its fishing vessels exceeding 20 metres between perpendiculars or 24 metres overall length which fish, or plan to fish, in the Regulatory Area and:

a) require its fishing vessels, fishing in the Regulatory Area, to be equipped with an autonomous system able to automatically transmit messages to a land-based fisheries monitoring centre (hereinafter referred to as FMC) allowing a continuous tracking of the position of a fishing vessel by the Contracting Party of that fishing vessel in conformity with the specifications and schedule set out in Annex VI;

b) ensure that the satellite device shall enable a fishing vessel to communicate by satellite to the Contracting Party messages relating to the following data:

- the vessel identification;
- the most recent geographical position of the vessel (longitude, latitude) with a position error which shall be less than 500 metres, with a confidence interval of 99%;
- the date and time of the fixing of the said position of the vessel;
- where applicable, data relating to the catch on board;
- where applicable, data relating to transshipment.

2. Each Contracting Party shall take the necessary measures to ensure that the FMC receives through the VMS the messages requested in paragraph 1(b).

3. Each Contracting Party shall ensure that the masters of fishing vessels flying its flag shall ensure that the satellite tracking devices are at all times fully operational and that the information in paragraph 1(b) is transmitted. In the event of a technical failure or non-operation of the satellite tracking device fitted on board a fishing vessel, the device shall be repaired or replaced within one month. After this period, the Master of a fishing vessel shall not be authorised to commence a fishing trip with a defective satellite tracking device.

Where a device stops functioning and a fishing trip lasts more than one month, the repair or the replacement has to take place as soon as the vessel enters a port, the fishing vessel shall not be authorised to continue or commence a fishing trip without the satellite tracking device having been repaired or replaced.

4. Each Contracting Party shall ensure that a fishing vessel with a defective VMS tracking device shall communicate, at least daily, reports containing the information in paragraph 1(b) to the FMC, by satellite or by other means of communication (radio, telefax or telex) in accordance with the format set out in Annex VII (5).

5. Contracting Parties shall, for the purpose of this scheme, co-operate with the Secretary in order to establish, before 1 January 1999, a data-base delimiting the Regulatory Area by latitude and longitude co-ordinates. This shall be without prejudice to each Contracting Party's position concerning the delimitation of sea areas under their sovereignty and jurisdiction.

## **ANNEX VI**

### **Vessel Monitoring System (VMS)**

1. Each Contracting Party of the vessel shall establish and operate fishing monitoring centers, hereinafter referred to as "FMC", which shall monitor the fishing activities of vessels flying their flags. The FMC shall be operational no later than 1 January 2000 and shall be equipped with computer hardware and software enabling automatic data processing and electronic data transmission. Each Contracting Party shall provide for back-up and recovery procedures in case of system failures.

2. The Contracting Party of the vessel shall take the necessary measures to ensure that the data received from its fishing vessels to which VMS applies are recorded in computer readable form for a period of three years.

3. The satellite tracking devices installed on board the fishing vessels shall ensure the automatic transmission to the fisheries monitoring center of the flag Contracting Party, at all applicable times, messages relating to the data prescribed in the NEAFC Control and Enforcement Measures Article 9(1)(b).

4. Each Contracting Party shall take the necessary measures to ensure that its FMC receives through the VMS, at least the mandatory information requested in Article 9(1)(b). The Contracting Parties concerned shall take the necessary measures to ensure that the NEAFC Secretary receives the position of the vessel in real time upon entering into or exiting from the Regulatory Area and at least once every two hours when operating in the NEAFC Regulatory Area. Reports shall be in accordance with the format set out in Annex VIII D.1.

### **7.2.3 NEAFC VMS pilot projects**

#### **Article 11**

Contracting Parties may undertake Pilot Projects, which combine the use of daily electronic catch reports, two way communication between inspection vessels in the Regulatory Area and fishing vessels, and a reduction in the period of advance notification of entry and exit by fishing vessels from the area.

##### **1. Scope**

Only vessels of Contracting Parties that have the necessary technical facilities in place to send electronic "catch reports" are eligible.

Contracting Parties shall notify the Secretary of their intention to participate in a Pilot Project by 31 January 2004. They shall also notify the Secretary of the identification and contact details of the vessels participating in a pilot project.

##### **2. Procedure**

a) By way of derogation from the provisions of Article 10 masters of vessels taking part in the pilot project shall:

i) transmit the report foreseen in Article 10 a) at least 1 hour in advance of each entry in the Regulatory Area;

ii) transmit on a daily basis before midnight the catch reports provided for under Article 10 b);

iii) transmit the report foreseen in Article 10 c) at least 1 hour in advance of each exit from the Regulatory Area.

b) The FMC of a Contracting Party participating in a pilot project shall forward immediately upon receipt the reports referred to in paragraph a) to the Secretary.

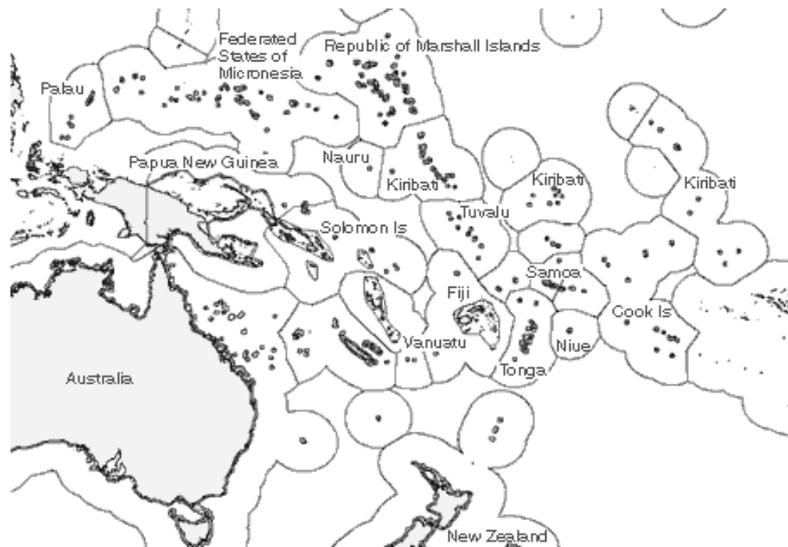
- c) The Secretary shall forward the reports received under paragraph b) to any inspection vessel or vessels which may be operating in the relevant geographical area of the Regulatory Area.
- d) Any inspection vessel present in the relevant geographical area of the Regulatory Area may require fishing vessels, for no more than 6 hours from the time of transmission of the report:
  - i) not to start fishing, for reports referred to in Article 10(a);
  - ii) not to leave the Regulatory Area, for reports referred to in Article 10(c).
- e) To this end the inspection vessel shall communicate to the Secretary the report “Prepare for inspection” set out in Annex X (C). The Secretary shall forward this report without delay to the FMC of the flag state of the vessel concerned which shall forward it to the vessel.
- f) The master of a fishing vessel having received the report referred to in (e) shall comply with the requirements notified by the inspection vessel.

### 3. Evaluation

Each Contracting Party participating in a pilot project should submit a detailed report at the intersessional meeting of PECCOE in 2004 on its execution. On the basis of the results of the pilot project PECCOE may make appropriate proposals or recommendations.

Further details are available on the NEAFC website: [www.neafc.org](http://www.neafc.org).

### 7.2.4 Forum Fisheries Agency



*Figure 6. Map of the FFA area*

**7.2.5 Numbers of vessels in good standing on the FFA VMS Register (by flag)**

Australia	2	Netherlands Antilles	1
Belize	17	New Zealand	8
China	112	Panama	31
Cook Islands	5	Papua New Guinea	1
Cyprus	2	Philippines	47
Estonia	1	Kiribati	1
Federated States of Micronesia	10	Vanuatu	61
Fiji	49	Seychelles	1
Georgia	1	Singapore	10
Indonesia	1	Solomon Islands	3
Japan	239	Spain	2
Democratic Republic of Korea	1	St Vincent & The Grenadines	5
Republic of Korea	35	Chinese Taipei	247
Malta	1	U.S.A.	21
Marshall Islands	6	<b>Total 29 flags</b>	<b>921</b>

**7.2.6 The Harmonised MTC**

**From the the FFA Harmonised Minimum Terms and Conditions (MTC) for Foreign Fishing Vessel Access as amended by FFC53 (28 April – 8 May 2003)**

**14. Vessel Monitoring System**

(a) The vessel monitoring system shall be implemented by the operation of a VMS Register of Foreign Fishing Vessels as set out in ANNEX 4 (b)The operator of a foreign fishing vessel shall apply for registration of the ALC on the prescribed form (ANNEXES 6 and 7) for each year and pay the prescribed fee; install and operate a registered ALC on board the vessel; and maintain the ALC in good working order. (c)The operator of a foreign fishing vessel shall not interfere with, tamper with, alter, damage or disable the ALC; move or remove the ALC from the agreed installed position without the prior permission of the licensing country; or impede the operation of the ALC.

(d) At least [*to be determined by the licensing country*] hours prior to entry into the exclusive economic zone of [*insert name of the licensing country*] the operator of a foreign fishing vessel shall ensure that the ALC is switched on and is operating properly at all times when the vessel is in the exclusive economic zone of [*insert name of licensing country*].

(e) The operator of a foreign fishing vessel or his or her authorized agent, upon notification by the [*insert name of licensing country, appropriate authority*] that the vessel's ALC has failed to transmit, shall ensure that position reports are communicated to [*insert name of authority delegated by the licensing country/appropriate authority*] in the manner set out in ANNEX 1.

(f) If it is not possible to make position reports, or if the [*insert name of authority delegated by licensing country/appropriate authority*] directs, the master of the vessel must immediately stow the fishing gear and take the vessel directly to a port as set out in ANNEX 1.

**From summary of license conditions:**

8. The operator of a foreign fishing vessel shall install, maintain and operate a registered ALC at all times and in accordance with the manufacturer's specifications and operating instructions and FFA standards.

9. The operator of a foreign fishing vessel shall ensure that no person tampers or interferes with the ALC and that the ALC is not altered, damaged or disabled.

10. The operator of a foreign fishing vessel shall ensure that the ALC is not moved from the agreed installed position or removed without the prior permission of the licensing authority.

The operator of a foreign fishing vessel shall ensure that the ALC is switched on and is operational at all times when the vessel is within the EEZ of the licensing country.

12. The operator of a foreign fishing vessel or his or her authorised agent, upon notification by the licensing country/ appropriate authority that the vessel's ALC has failed to report, shall ensure that reports containing the vessel's name, call sign, position (expressed in Latitude and Longitude to minutes of arc), and date and time of the report, are communicated to [*insert delegated authority*] at intervals of 8 hours or such shorter period as specified by the delegated authority, commencing from the time of notification of the failure of the ALC. Such reports must continue until such time the ALC is confirmed operational by the licensing country/ appropriate authority.

### 7.3. NORTHWEST ATLANTIC FISHERIES ORGANISATION

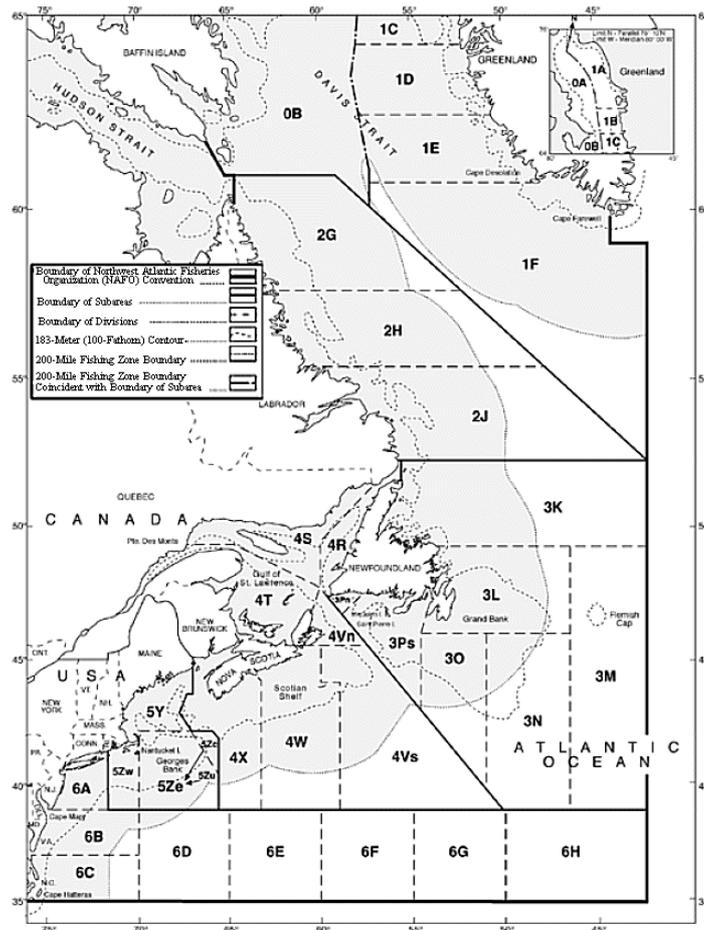


Figure 7. Map of the NAFO area

#### 7.3.1 NAFO VMS measure

##### NAFO Article 21 - Vessel Monitoring System (VMS)

1. In order to improve and maintain compliance with the Conservation and Enforcement Measures for their vessels fishing in the Regulatory Area, fishing vessels operating in the Regulatory Area shall be equipped with a satellite monitoring device allowing the continuous reporting of their position by the Contracting Party. The satellite monitoring device shall ensure the automatic communication at least once every two hours to a land-based fisheries monitoring centre of the flag state (hereafter referred to as FMC) of data relating to:

- a) the vessel identification;
- b) the most recent geographical position of the vessel (longitude, latitude) with a position error which shall be less than 500 metres, with a confidence interval of 99%; and
- c) the date and time of the fixing of the said position of the vessel.

The first transmitted position report in the Regulatory Area detected by the FMC of the Contracting Party shall be identified as “ENT”. All subsequent position reports shall be identified as “POS” except the first position report detected outside the Regulatory Area which shall be identified as “EXI”. If a Contracting Party so requests, the Secretariat shall confirm receipt of all electronic reports using a return message identified as “RET”.

2. Each Contracting Party shall take the necessary measures to ensure that its FMC receives these data. The FMC of each Contracting Party shall be equipped with computer hardware and software enabling automatic data processing and electronic data transmission. Each Contracting Party shall provide for back-up and recovery procedures in case of system failures and shall take the necessary measures to ensure that the data received from its fishing vessels are recorded in computer readable form for a period of three years.

3. The masters of fishing vessels shall ensure that the satellite monitoring devices are at all times fully operational and that the information in paragraph 1 is transmitted to the FMC. In the event of a technical failure or non-operation of the satellite monitoring device fitted on board a fishing vessel, the device shall be repaired or replaced within one month. After this period, the master of a fishing vessel shall not be authorised to commence a fishing trip with a defective satellite monitoring device. Where a device stops functioning and a fishing trip lasts more than one month, the repair or the replacement has to take place as soon as the vessel enters a port and the fishing vessel shall not be authorised to continue or commence a fishing trip without the satellite monitoring device having been repaired or replaced.
4. Contracting Parties shall take the necessary measures to ensure that the master or the owner of the vessel or their representative is informed when the satellite tracking device fitted on board a vessel flying their flag appears to be defective or non-functioning.
5. Fishing vessels with a defective satellite monitoring device shall communicate, at least every 6 hours, reports containing the information in paragraph 1 to the FMC, by other means of communication (email, radio, facsimile or telex).
6. Contracting Parties shall communicate reports and messages pursuant to paragraphs 1 and 5 to the Executive Secretary as soon as possible, but not later than 24 hours after receipt of those reports and messages. If the Contracting Party so desires, its fishing vessels shall communicate reports (by satellite, email, radio, facsimile or telex) to the Executive Secretary. When the Executive Secretary has not received two consecutive position reports in accordance with paragraphs 1 and 5 and the vessel concerned has not reported that it has left the Regulatory Area the Executive Secretary shall automatically notify the FMC of the flag Contracting Party.
7. Contracting Parties shall ensure that the reports and messages transmitted between the Contracting Party and the Executive Secretary or between its fishing vessels and the Executive Secretary, shall be in accordance with the data exchange format set out in Annex IX.
8. The Executive Secretary shall make available as soon as possible the information received under paragraph 6 to other Contracting Parties with an inspection presence in the Regulatory Area. All reports and messages shall be treated in a confidential manner.
9. When an inspector observes a fishing vessel in the Regulatory Area and has not received data in accordance with paragraphs 1 or 5 he/she shall inform the master of the vessel and the Executive Secretary, who shall immediately inform the flag Contracting Party of the vessel.
10. Contracting Parties shall notify any changes of the name, address, telephone, telex, email and facsimile numbers of their competent authorities to the Executive Secretary without delay.
11. Subject to any other arrangements between Contracting Parties, each Contracting Party shall pay all costs associated with this system.
12. The elements of the VMS program are subject to review and revision, as appropriate, for application in 2004 and subsequent years.

### **7.3.2 NAFO communication of catches**

#### **NAFO Article 22 - Communication of Catches**

1. Fishing vessels shall communicate electronically via the FMC to the Secretariat the following reports:
  - a) catch on entry into the Regulatory Area. This report shall be made at least six (6) hours in advance of the vessel's entry and shall include the date, time, geographical position of the vessel, total round weight by species (3 alpha codes) on board in kilograms (rounded to the nearest 100 kilograms) and directed species. This report shall be identified as COE;
  - b) catch on exit from the Regulatory Area. This report shall be at least six (6) hours in advance of the vessel's exit and shall include the date, time, geographical position of the vessel and catch in round weight taken and retained in the Regulatory Area by species (3 alpha codes) in kg (rounded to nearest 100 kilograms). This report shall be identified as COX;
  - c) each transshipment in the Regulatory Area. This report shall be made at least twenty-four (24) hours in advance and shall include the date, time, geographical position of the vessel and total round weight by species (3 alpha codes) to be transhipped in kilograms (rounded to the nearest 100 kilograms) and the call signs of vessels transhipped to and from. This report shall be identified as TRA;



#### **7.4.1 CCAMLR Conservation measure 10-04 (2002)**

##### **CCAMLR CONSERVATION MEASURE 10-04 (2002) Automated Satellite-Linked Vessel Monitoring Systems (VMS)**

The Commission hereby adopts the following conservation measure in accordance with Article IX of the Convention:

1. Each Contracting Party shall maintain an automated Vessel Monitoring System (VMS) to monitor the position of its fishing vessels, which are licensed<sup>1</sup> in accordance with Conservation Measure 10-02.
2. The implementation of VMS on vessels while participating only in a krill fishery is not currently required.
3. Each Contracting Party, within two working days of receiving the required VMS information, shall provide to the Secretariat dates and the statistical area, subarea or division for each of the following movements of its flag fishing vessels:
  - (i) entering and leaving the Convention Area;
  - (ii) crossing boundaries between CCAMLR statistical areas, subareas and divisions.
4. For the purpose of this measure, VMS means a system where, *inter alia*:
  - (i) through the installation of satellite-tracking devices on board its fishing vessels, the Flag State receives automatic transmission of certain information. This information includes the fishing vessel identification, location, date and time, and is collected by the Flag State at least every four hours to enable it to monitor effectively its flag vessels;
  - (ii) performance standards provide, as a minimum, that the VMS:
    - (a) for both the hardware and software components, shall be tamper proof, i.e. shall not permit the input or output of false positions and must not be capable of being manually over-ridden;
    - (b) is fully automatic and operational at all times regardless of environmental conditions;
    - (c) provides real time data;
    - (d) provides the geographical position of the vessel, with a position error of less than 500 m with a confidence interval of 99%, the format being determined by the Flag State;
    - (e) in addition to regular messages, provides special messages when the vessel enters or leaves the Convention Area and when it moves between one CCAMLR area, subarea or division within the Convention Area.
5. Contracting Parties shall not issue licences under Conservation Measure 10-02 unless the VMS complies with paragraph 4 in its entirety.
6. In the event of technical failure or other non-function of the VMS, the master or the owner of the fishing vessel, as a minimum:
  - (i) shall communicate at least once every 24 hours, starting from the time that this event was detected, the data referred in paragraph 4(i) by telex, by fax, by telephone message or by radio to the Flag State;
  - (ii) shall take immediate steps to have the device repaired or replaced as soon as possible, and, in any event, within two months. If during that period the vessel returns to port it shall not be allowed to commence a further fishing trip without having the defective device repaired or replaced.
7. In the event that the VMS ceases to operate, the Contracting Party as soon as possible shall advise the Executive Secretary of the name of the vessel, the date, time and the location of the vessel when the VMS failed. The Party shall also inform the Executive Secretary when the VMS becomes operational again. The Executive Secretary shall make such information available to Contracting Parties upon request.

8. Contracting Parties shall report to the Secretariat before the start of annual meetings of the Commission, on the VMS which has been introduced in accordance with paragraphs 1 and 2, including its technical details, on:

(i) any change in the VMS;

(ii) in accordance with paragraph XI of the CCAMLR System of Inspection, all cases where they have determined, with the assistance of the VMS that vessels of their flag had fished in the Convention Area in possible contravention of CCAMLR conservation measures.

#### **7.4.2 Additional CCAMLR measures referring to VMS**

**Catch documentation scheme for Toothfish.** ..... any Contracting Party, or any non-Contracting Party participating in the Catch Documentation Scheme, may require additional verification of catch documents by Flag States by using, *inter alia*, VMS, in respect of catches<sup>1</sup> taken on the high seas outside the Convention Area, when landed at, imported into or exported from its territory.

**Transshipment.** The Commission agreed that, on a voluntary basis, subject to their laws and regulations, Flag States participating in the Catch Documentation Scheme for *Dissostichus* spp. should ensure that their flag vessels authorised to fish for or tranship *Dissostichus* spp. on the high seas maintain an operational VMS, as defined in Conservation Measure 10-04, throughout the whole of the calendar year.<sup>1</sup> (RESOLUTION 16/XIX. Application of VMS in the Catch Documentation Scheme) [<sup>1</sup>This requirement does not extend to vessels of less than 19 m engaged in artisanal fisheries].

**Suspected IUU vessels.** Contracting Parties whose vessels are included in the draft list established by the Secretariat will transmit before 30 June to CCAMLR, their comments, as appropriate, including verifiable VMS data and other supporting information showing that the vessels listed have neither engaged in fishing activities in contravention of CCAMLR conservation and management measures nor had the possibility of being engaged in fishing activities in the Convention Area.

**Crosschecking of VMS and catch documentation data.** .... urges States participating in the CDS to ensure that *Dissostichus* Catch Documents (DCDs) relating to landings or imports of *Dissostichus* spp., when necessary, are checked by contact with Flag States to verify that the information in the DCD is consistent with the data reports derived from an automated satellite-linked Vessel Monitoring System (VMS)<sup>1</sup>.

### **7.5. ICCAT, SRFC AND SWIO**

#### **7.5.1 ICCAT pilot VMS recommendation**

THE INTERNATIONAL COMMISSION FOR THE CONSERVATION  
OF ATLANTIC TUNAS (ICCAT) RECOMMENDS THAT:

1. Each Contracting Party with vessels greater than 24 meters in overall length (or greater than 20 meters between perpendiculars) and fishing for ICCAT species on the high seas outside the fisheries jurisdiction of any coastal state shall adopt a pilot program for a satellite-based vessel monitoring system (VMS) for ten percent of such vessels, or ten vessels, whichever is greater. The pilot program will be a flag-state based program.
2. Each Contracting Party shall implement a three-year pilot program effective 1 January, 1999; except the three year pilot program for vessels fishing in the Mediterranean, which shall be effective 1 January, 2000. Contracting Parties are encouraged to implement the pilot program earlier, if possible.
3. The pilot program shall not apply to vessels that never spend more than 24 hours at sea, counted from the time of departure from port to the time of return to port.
4. Information collected shall include the vessel identifier, location, date and time, which shall be collected with a required frequency to ensure that the Contracting Party can effectively monitor the vessel.
5. Performance standards shall at a minimum include a system that:
  - is tamper proof;
  - is fully automatic and operational at all times regardless of environmental conditions;
  - provides real time data; and
  - provides latitude and longitude, with a position accuracy of 500 m. or better, with the format to be determined by the flag state.

6. At its meeting in the year 2000, the Commission shall establish procedures on the submission of aggregate information and how the information is shared between Contracting Parties. These procedures shall ensure that appropriate measures are in place to ensure confidentiality.
7. By 1 June 1998, each Contracting Party shall submit to the Secretariat a report on anticipated implementation of its pilot program. Beginning in 1999, each Contracting Party shall report annually on the progress and implementation of its pilot VMS program. These reports shall be included in the annual national report.
8. The Commission shall evaluate the pilot program at its meeting in 2002.

### **7.5.2 SRFC VMS workshop recommendations**

1. There was unanimous consensus that cooperation on VMS is necessary for several reasons including:
  - a) no one country can fully monitor the fleets operating in its own waters;
  - b) VMS provides improved monitoring of the movement of vessels in the sub-region;
  - c) VMS can help reduce IUU fishing in the Sub-Region;
  - d) VMS may provide more accurate evidence in the case of contested violations and conflicts between fishermen;
  - e) VMS may make the use of surveillance assets more effective, reduce surveillance costs and improve the cost-effectiveness of surveillance;
  - f) the presence of shared, straddling and highly migratory stocks makes cooperation essential in all domains of fisheries management;
  - g) individual vessels, in particular foreign flag vessels, operate in two, or more countries in the sub-region and VMS can assist in tracking such vessels;
  - h) the general weakness, or inexistence of surveillance assets in the countries;
  - i) VMS can assist in search and rescue operations.
2. Each country wished to have its own VMS system. In this manner, each country could proceed at its own pace with a gradual development of a secure data exchange network between member countries. A sub-regional protocol on information exchange could be considered, and the need for further work on the proposed sub-regional vessel register was noted.
3. Areas in which cooperation was considered necessary which included the following:
  - a) information exchange;
  - b) standardisation of equipment (in so far as practical);
  - c) harmonisation of legislation; and
  - d) training.
4. There was consensus that VMS should target industrial vessel, while monitoring development of suitable technical solutions for artisanal vessels.
5. The actions to be considered at national level include:
  - a) the VMS support systems (software, and/or equipment) installed in national FMCs must ensure interoperability and compatibility with other national VMS systems and an ability to accept and interpret VMS signals from different satellite service suppliers;
  - b) inform the SRFC, and SOCU in particular concerning the choices of systems and results of pilot VMS schemes;
  - c) seek financing for VMS;
  - d) prepare suitable VMS regulations;
  - e) finalise national vessel registers;
  - f) inform vessel operators of the merits of VMS and seek their active cooperation in the design and establishment of such systems;
  - g) train VMS operators; and
  - h) conduct pilot VMS projects, feasibility and cost benefit studies in all countries.
6. The actions to be considered at Sub-Regional level include:
  - a) VMS to be considered as an integral part of sub-regional strategy;

- b) harmonise VMS legislation. The Permanent Secretary to request the FAO Legal Office for such assistance bearing in mind that a request for 'regional project assistance' requires requests from at least three countries;
- c) seek financial assistance for UCOS and enable the SRFC to fulfil its role;
- d) prepare a draft protocol on the exchange of VMS information and a 'roadmap' for future development of VMS in the sub-region;
- e) put the sub-regional vessel register in place; and
- f) transfer of technologies and skills between countries.

### **7.5.3 SWIO VMS workshop recommendations**

1. There was unanimity on the necessity of enhanced cooperation between SWIO countries on MCS in general and on VMS in particular. The reasons include:

- a) To improve efficiency of MCS and fisheries management. VMS may make the use of surveillance assets more effective, reduce surveillance costs and improve the cost-effectiveness of surveillance.
- b) To fulfil of international obligations with respect to fisheries.
- c) To ensure consistency in reporting of exploitation of resource.
- d) To improve in knowledge of the state of stocks.
- e) To assist in unique vessel identification and establishment of a regional database(s) of fishing vessels.
- f) To harmonise terms and conditions for reporting on fisheries.
- g) To facilitate aggregation of data on fleets.
- h) To provide an opportunity to harmonize requirements for VMS equipment and service providers.
- i) To provide an opportunity to harmonize requirements for issuing of licenses.

2. Cooperation should focus not only on VMS, but also on a range of complementary MCS activities.

Information exchange:

- a) establish a database of all vessels ;
- b) establish automatic forwarding of VMS position (and catch on leaving EEZ) information between coastal states with particular reference to EEZ entry and exit information;
- c) establish requirements for vessels to report position and catch from high seas areas, either to the coastal states or to IOTC, or other appropriate RFO.

Legal issues:

- d) harmonise fisheries legislation as appropriate ;
- e) seek means to make cooperative MCS initiatives effective even in the absence of settlement of boundary disputes;
- f) seek legal advice on issues of international law such as the means of responding to requests from foreign governments to detain a vessel from a third party flag state for alleged fisheries violations; and
- g) require VMS for all reefers and supply vessels ; and

Technical issues:

- h) explore the possibilities of reducing tampering with VMS units on board the vessel.

## **8. ANNEX 3. THE BASICS OF VMS**

### **8.1. HOW VMS WORKS**

A typical VMS system involves four basic operations:

1. The fishing vessel receives its position from a Global Positioning System satellite (GPS)
2. The vessel sends its position coordinates to a VMS satellite. The VMS satellite retransmits this position information to an earth station.
3. The earth station sends the information through telephone lines, or other secure links, to the vessel owner and the Fisheries Monitoring Centre, or FMC.
4. The FMC sends the information to other users. In some systems the FMC, or the vessel owner, may also request the vessel to send its position information. This feature is known as 'polling'.

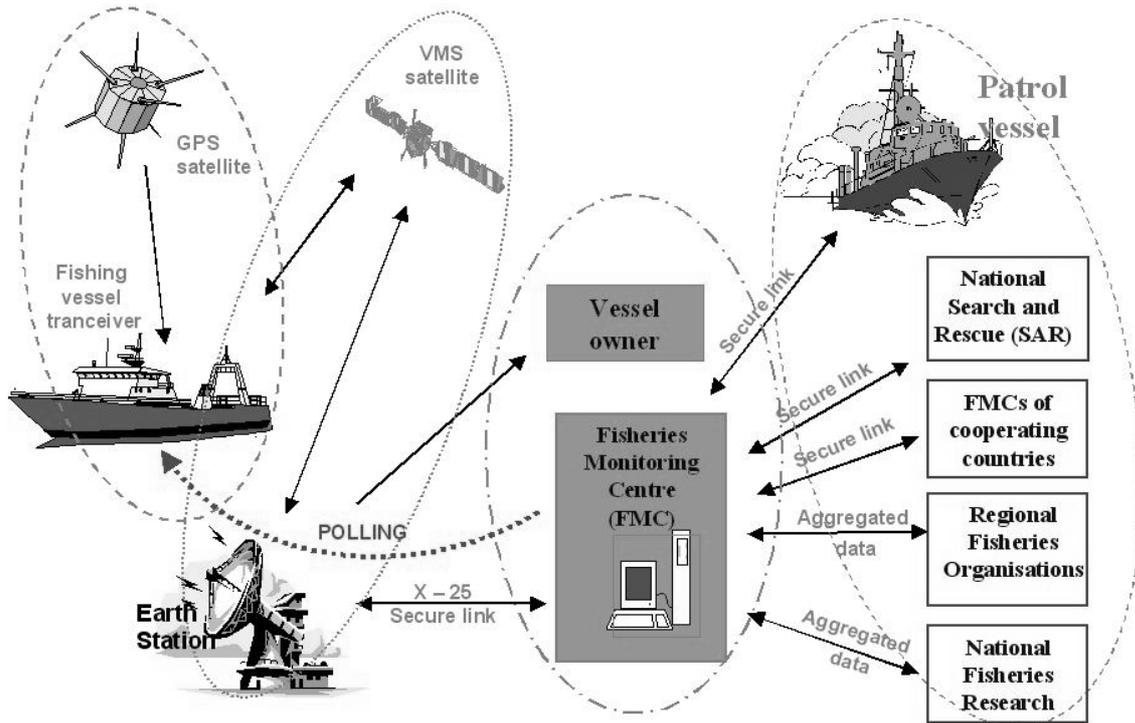


Figure 9. Model of a VMS

There are a number of variations on these transmission pathways. The vessel can send position information directly (via an earth station) to a regional fisheries organization. A range of other types of information can be sent via additional communications modules, such as email, which may be attached to the system.

Argos has global coverage. The footprint of the Inmarsat satellites to 76°N & S is illustrated below.

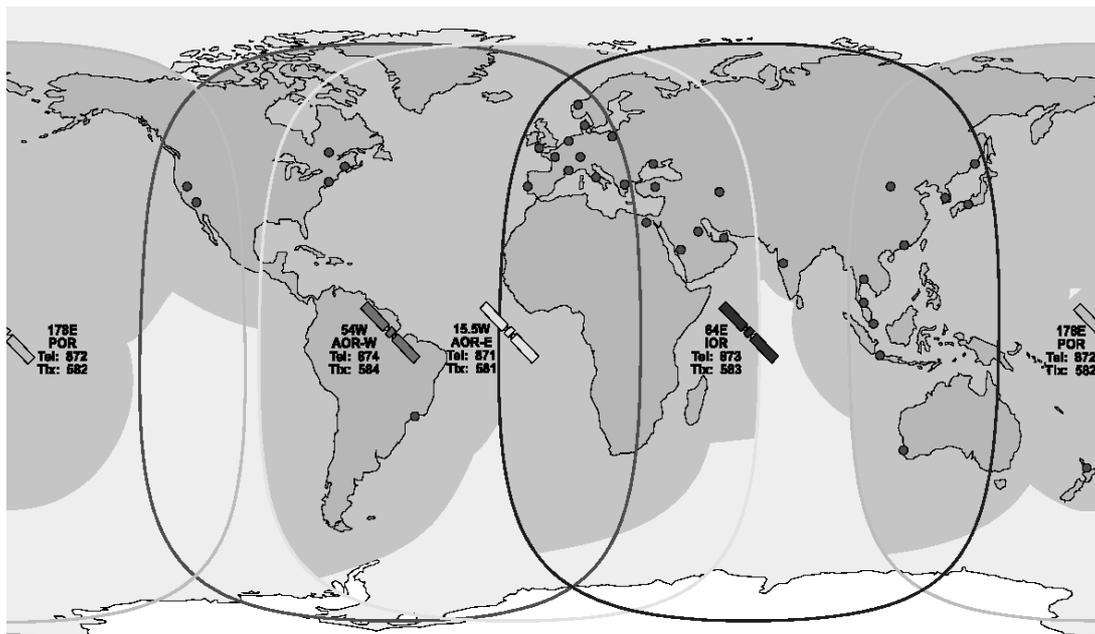


Figure 10. Footprint of the Inmarsat satellites

### **8.1.1 Summary of uses of VMS information**

VMS is used extensively for tracking trucks, cargo containers and even private vehicles. VMS is also widely used by fishing companies to monitor the activities of their own vessels. VMS information is of considerable value to fisheries scientists. Inmarsat, one of the main VMS satellite networks was created specifically in the interests of vessel safety

**Fisheries protection.** VMS does not substitute for conventional fisheries monitoring, surveillance and enforcement. Aircraft, patrol vessels, seagoing observers and port controls are still required. However, VMS may make their use much more cost effective. VMS has particular utility for:

- control of fishing effort;
- control of protected/forbidden zones;
- detection and control of illegal landings;
- detection and control of illegal transshipments;
- increasing the efficiency and targeting of patrol vessels and aircraft;
- providing supporting evidence in prosecutions; and
- providing a powerful tool against and credible deterrent to illegal fishing.

IOTC has pointed out that, if a vessel, which is not on IOTC's positive list (i.e. non-IUU vessels), visits the harbour of an Indian Ocean coastal state, the vessel operator may have to prove it has not fished in the Indian Ocean. A VMS record may be the only way to prove that a vessel has not fished in an area. The situation may also certainly arise where a flag state national VMS monitoring centre is called upon to testify, from VMS records, that one of their vessels has not infringed fisheries regulations established by national authorities or international fisheries management organizations.

**Resource management.** VMS creates new possibilities for fisheries resource management in particular:

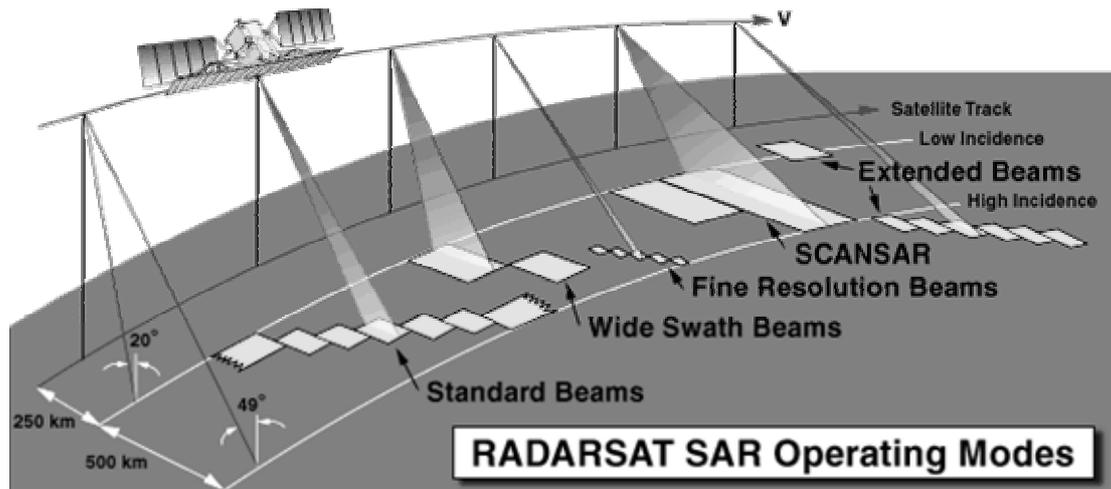
- calculation, allocation and control of fishing effort (and quotas);
- control of specific fishing areas and fleets;
- monitors the status of fisheries and fishing grounds, seasonally, yearly;
- enhanced verification through cross-checking cross-referenced with landing and research data;
- enables allocation of fishing effort and quotas;
- enhanced analysis of fisheries under pressure of over-exploitation; and
- potential information on use of fishing gears, bycatch and discards (gear sensors, video links).

**At the service of industry.**

- provides transparency and equality of treatment, or a 'level playing field' for all fleets;
- distribute data in real-time to assist operations;
- significantly improved safety at sea;
- the provision of an accurate navigation system ;
- enables conflict resolution through evidence regarding possible responsibility for destruction of gears; and
- the provision of secure communications allows transmission and receipt of catch and market information and even pre-sale of catch.

### **8.1.2 Synthetic aperture radar**

Space borne imagery gives a real view of the vessels in a region, while VMS shows only those vessels using VMS. Studies in the EU have shown that space borne synthetic aperture radar (SAR) imagery could complement VMS by detecting and identifying non-compliant vessels. Work started in 1998 and led to a collaborative project in 2002.



*Figure 11. Synthetic aperture radar*

Studies undertaken by the EU's Joint Research Centre (JRC) indicated a 92% success in identifying a vessels with standard detection procedure, if hourly VMS was available. The average distance between detected vessels and VMS was less than 0.3 nautical miles. The main reason for non-identification was low frequency of VMS reports. When VMS available with a report frequency of an hour or less the identification was unambiguous. The technology requires transmission of very large files (over 100 MB). There is a need to filter out non-fishing traffic, or vessels. Fiberglass vessels are not visible on ScanSAR. Sea conditions don't affect detection, with the exception of some very local turbulence.

Important JRC projects are under way in association with a large numbers of partners. IMPAST is exploring means of integrating the satellite imagery with the VMS systems and FMCs. DECLIMS is designed to improve the scientific basis for this technology.

### 8.1.3 Electronic catch and effort reporting

Electronic catch and effort reporting, also referred to as an electronic logbook is used in many countries including Norway, Iceland, Australia. Data transmission need not necessarily be made by satellite, but can be archived electronically on the vessel's computer. However near real time catch reporting can aid compliance.

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Availability of “near real time” data if sent by satellite</li> <li>• Fine scale spatial data</li> <li>• Increased data quality</li> <li>• Cost saving over traditional hard copy logbooks (printing, postage, data entry)</li> <li>• Enhanced tools for stock assessment</li> <li>• improved legibility and reduced data transcription errors</li> <li>• Reduction in paperwork for fishers</li> <li>• Value adding to industry (same/additional information to vessel operators/ markets)</li> <li>• Enhanced e-mail capabilities (if email used to send catch reports)</li> <li>• Operators have their own databases of the boats activity</li> <li>• Inclusion of “real-time” validation procedures at both the point of entry (the boat) and upon receipt.</li> <li>• Electronic cross-checking with VMS information</li> </ul>	<ul style="list-style-type: none"> <li>• Software development needed when logbook requirements change</li> <li>• Installation of software packages may incur problems</li> <li>• Hardware failure may cause loss of data, if not backed up</li> <li>• User resistance</li> <li>• Some boats are not equipped with personal computers</li> <li>• Life-span of PC is limited in a marine environment</li> <li>• Communication costs</li> <li>• Installations costs</li> <li>• Training</li> <li>• Some fishing vessels do not have computers.</li> <li>• Some computers not capable of supporting E-logs</li> <li>• Some computers may not have any spare RS323 ports.</li> <li>• Initial problems with software “crashing”.</li> <li>• Software conflicts with other navigational plotting software.</li> <li>• Every computer system onboard a vessel is configured differently, making stable installation difficult.</li> <li>• Due to the marine environment computers are replaced regularly, requiring the software to be re-installed.</li> <li>• Fishers unfamiliar with the use of computers.</li> <li>• High turn-over of skippers resulted in decreased use.</li> </ul>

Source: Adapted from: Martin Hicks, Electronic Catch & Effort Reporting. Queensland's Experience. Queensland Fisheries Service, Inmarsat VMS Conference, Cairns, 2003.

## 8.2. BASIC ELEMENTS OF VMS LEGISLATION

The agency responsible for the VMS should be designated and the its responsibilities described. VMS should be specified as a precondition for the issue of a fishing license, or authorization for particular classes of vessels, e.g. vessels over 24 meters, foreign vessels, tuna vessels. The fishing license holder and/ or master of the vessel should be made responsible for ensuring the VMS unit is fully operational and requested information transmitted regularly.

The VMS unit should have minimum performance standards, be tamper proof and not permit input of false positions or information. The VMS unit should be operational at all times. There should be approved modalities for installation and maintenance to ensure continuous reliable operation in conformity with minimum performance standards. The registration of the VMS unit may need to be specified to ensure a valid physical and legal link between vessel and VMS unit.

Position should be set to within a specific distance with a specified degree of accuracy. Frequency of position reporting should be specified, and if polling is required this should be specified. The to be transmitted and the formats or codes for transmission must be specified including the vessel identification, coordinates, date and time. Any other information to be transmitted must be specified, such as catch, and entry and exit hailing

Procedures in case of VMS unit failure should be prescribed to assure continuity of the reporting by vessels. The procedures should include: (i) notification procedures; (ii) require information through alternative communication system; (iii) specification of time period within which the VMS unit must be repaired/replaced. Offences and penalties should be specified. Offences must include all possible interference with the proper functioning of VMS. Penalties must be severe enough to deter violations.

It has been suggested that FAO prepare model VMS legislation.

### **8.3. NEAFC PROVISIONS REGARDING DATA SECURITY**

#### **PROVISIONS ON SECURE AND CONFIDENTIAL TREATMENT OF ELECTRONIC REPORTS AND MESSAGES TRANSMITTED PURSUANT TO ARTICLES 9, 10, 12 AND 16, AND TO ANNEXES VII, VIII AND XI OF THE SCHEME (ATTACHMENT V)**

##### 1. Field of application

The provisions set out below shall apply to all electronic reports and messages transmitted and received pursuant to Articles 9, 10, 12 and 16, and to Annexes VII, VIII and XI of the Scheme, hereinafter referred to as “reports and messages”.

##### 2. General Provisions

2.1 The Secretary and the appropriate authorities of Contracting Parties transmitting and receiving reports and messages shall take all necessary measures to comply with the security and confidentiality provisions set out in sections 3 and 4.

2.2 The Secretary shall inform all Contracting Parties of the measures taken in the secretariat to comply with these security and confidentiality provisions

2.3 The Secretary shall take all the necessary steps to ensure that the requirements pertaining to the deletion of reports and messages handled by the Secretariat are complied with.

2.4 Each Contracting Party shall guarantee the Secretary the right to obtain as appropriate, the rectification of reports and messages or the erasure of reports and messages the processing of which does not comply with the provisions of the Scheme.

2.5 Notwithstanding the provisions of Article 12.4 of the Scheme, the Commission may instruct the Secretary not to make available the reports and messages received under Article 12 of the Scheme to a Contracting Party, where it is established that the Contracting Party in question has not complied with these security and confidentiality provisions.

##### 3. Provisions on Confidentiality

3.1 Reports and messages shall be used only for the purposes stipulated in the Scheme. No report or message transmitted and received pursuant to Articles 9, 10 and 12 shall be kept in a computer database at the Secretariat unless explicitly provided for in the Scheme.

3.2 Each inspecting Contracting Party shall make available reports and messages only to their means of inspection and their inspectors assigned to the Scheme.

3.3 The Secretary shall delete all the original reports and messages transmitted and received pursuant to Articles 9, 10 and 12 from the database at the Secretariat by the end of the first calendar month following the year in which the reports and messages have originated. Thereafter the information related to the catch and movement of the fishing vessels shall only be retained by the Secretary, after measures have been taken to ensure that the identity of the individual vessels can no longer be established.

3.4 The Secretary shall not make available reports and messages to other parties than those specified explicitly in Article 12.4 of the Scheme.

3.5 Inspecting Contracting Parties may retain and store reports and messages transmitted by the Secretary pursuant to Article 12.4 until 24 hours after the vessels to which the reports and messages pertain have departed from the Regulatory Area without re-entry. Departure is deemed to have been effected six hours after the transmission of the intention to exit from the Regulatory Area.

##### 4. Provisions on security

###### 4.1 Overview

Inspecting Contracting Parties and the Secretariat shall ensure the secure treatment of reports and messages in their respective electronic data processing facilities, in particular where the processing involves transmission over a network. Contracting Parties and the Secretariat must implement appropriate technical and organisational measures to protect reports and messages against accidental or unlawful destruction or accidental loss, alteration, unauthorised disclosure or access, and against all inappropriate forms of processing. The following security issues must be addressed from the outset:

- System access control: The system has to withstand a break-in attempt from unauthorised persons.
- Authenticity and data access control: The system has to be able to limit the access of authorised parties to a predefined set of data only.

- Communication security: It shall be guaranteed that reports and messages are securely communicated.
- Data security: It has to be guaranteed that all reports and messages that enter the system are securely stored for the required time and that they will not be tampered with.
- Security procedures: Security procedures shall be designed addressing access to the system (both hardware and software), system administration and maintenance, backup and general usage of the system.

Having regard to the state of the art and the cost of their implementation, such measures shall ensure a level of security appropriate to the risks represented by the processing of the reports and the messages. Security measures are described in more detail in the following paragraphs.

#### 4.2 System Access Control

For their main computer systems the Contracting Parties and the Secretariat shall aim to meet the criteria of a C2-level trusted system, (as described in Section 2.2 of the U.S. Department of Defence Trusted Computer System Evaluation Criteria (TCSEC), DOD 5200.28-STD, December 1985).

The following features are some of the ones provided by a C2-level trusted system:

- A stringent password and authentication system. Each user of the system is assigned a unique user identification and associated password. Each time the user logs on to the system he/she has to provide the correct password. Even when successfully logged on the user only has access to those and only those functions and data that he/she is configured to have access to. Only a privileged user has access to all the data.
- Physical access to the computer system is controlled.
- Auditing; selective recording of events for analysis and detection of security breaches.
- Time-based access control; access to the system can be specified in terms of times-of-day and days-of-week that each user is allowed to login to the system.
- Terminal access control; specifying for each workstation which users are allowed to access.

#### 4.3 Authenticity and Data Access Security

Communication between the Contracting Parties and the Secretariat for the purpose of the Scheme shall use the X.25 Protocol. Where E-mail is used for general communication and reports outside the scope of provision 1.1. between the Secretariat and the Contracting Parties the X.400 Protocol shall be used.

#### 4.4 Communication Security

If Contracting Parties and the Secretariat agree, the X.400 Protocol can be used for communication of data under the Scheme, but then appropriate encryption protocols like "Pretty Good Privacy" (PGP) or "Digital Encryption Standard" (DES) shall be applied to ensure confidentiality and authenticity.

#### 4.5 Data Security

Access limitation to the data shall be secured via a flexible user identification and password mechanism. Each user shall be given access only to the data necessary for his task.

#### 4.6 Security Procedures

Each Contracting Party and the Secretary shall nominate a security system administrator. The security system administrator shall review the log files generated by the software, properly maintain the system security, restrict access to the system as deemed needed and act as a liaison with the Secretariat in order to solve security matters.



WCPFC Preparatory Conference  
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8 April 2004

**MANAGEMENT OPTIONS FOR BIGEYE AND YELLOWFIN TUNA IN THE  
WESTERN AND CENTRAL PACIFIC OCEAN**

Prepared by the Interim Secretariat

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## Background

In response to the recommendations of the second meeting of the Scientific Coordinating Group on Sustainable Fisheries Management (SCG2), the fifth meeting of the Preparatory Conference (PrepCon) resolved, among other things, that the Interim Secretariat be requested to "...prepare a paper on management options, to be delivered to the next session of the Preparatory Conference, on how the Commission could respond to sustainability concerns in respect of bigeye and yellowfin...". The full text of the Resolution is provided at Attachment 1. This paper has been prepared in response to that request.

## Purpose

The paper recognizes the need for PrepCon and the Western and Central Pacific Fisheries Commission (WCPFC) to take a broad and long-term view of fisheries management options while also responding to currently identified management needs. It is intended, therefore, that the paper provide a general platform for discussion of management options, both now and into the future, as well as providing a basis for discussion of the possible and feasible management response to the immediate sustainability concerns for bigeye and yellowfin tuna. As suggested by the SCG2 Report (para 19) the paper takes, as one of its starting points, the experience of other tuna Commissions. It is acknowledged, however, that there are particular characteristics of the fisheries in the western and central Pacific Ocean (WCPO) which may determine the relevance and appropriateness of management options.

With these factors in mind, the paper:

- outlines the context in which management options will be considered;
- identifies and canvasses the broad range of management options available, their application elsewhere and their potential in the WCPO; and
- comments on the appropriateness and feasibility of these options in the context of the specific sustainability concerns for bigeye and yellowfin tuna and the particular characteristics of the WCPO fisheries for these species.

## Context

Some of the important factors in consideration of options for highly migratory fish species in the WCPO are listed below.

- Article 2 of The Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (the Convention) specifies that the Convention's objective is "to ensure, through effective management, the long-term conservation and sustainable use of highly migratory fish stocks in the western and central Pacific Ocean in accordance with the 1982 Convention<sup>1</sup> and the Agreement<sup>2</sup>".
- The previous resolutions of the fourth Multilateral High Level Conference (MHLC) in 1999 and PrepCon III in 2002 " ...urged all States and other entities to exercise reasonable restraint in respect of any expansion of fishing effort and capacity in the Convention Area and to apply the precautionary approach forthwith...."<sup>3</sup>.

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<sup>1</sup> The UN Convention on the Law of the Sea of 10 December 1982 (UNCLOS)

<sup>2</sup> The Agreement for the Implementation of the Provisions of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks

<sup>3</sup> Resolution of the Preparatory Conference relating to illegal, unreported and unregulated fishing and limits on fishing capacity, 22 November 2002 (WCPFC/PrepCon/22)

- Despite these resolutions, there is considerable potential for effort and capacity in the WCPO to expand and this is likely to occur in the absence of management action by the WCPFC.
- There are a range of regional (the Palau Arrangement<sup>4</sup>, bilateral access agreements, the Nauru Agreement<sup>5</sup>, the US Multilateral Treaty<sup>6</sup>) and national fisheries arrangements already in place in the WCPO.
- SCG2 recommended that:
  - given the possible worsening status of the bigeye stock suggested by the 2003 assessment, the concept of the precautionary approach should be applied. The most practical immediate management recommendation in support of this approach would be to ensure there is no increase in fishing mortality on bigeye.
  - to reduce the risk of the yellowfin stock becoming over-fished further increases in fishing mortality (particularly on juvenile yellowfin) in the WCPO should be avoided.
  - if the assessment results for bigeye, and to a lesser extent yellowfin, are confirmed the PrepCon will need to consider how to implement management measures to address overfishing and alleviate over-fished stock conditions.

For the purposes of this paper these recommendations are used as the management objective against which options are assessed. In an operational sense the question for management is "Which management option/s provide the most feasible and effective means of ensuring that mortality of yellowfin and bigeye are not increased and, if necessary, of delivering a reduction in fishing mortality of bigeye and yellowfin?"

## Management Options

The discussion of management options below is drawn from a range of sources including fisheries management texts (eg King 1995) and the consideration and application of management options by other fisheries agencies, arrangements and tuna Commissions. The options are discussed following the classification adopted by the FAO (FAO 1997). In practice, no single management tool will address all management issues and a package of measures is likely to be necessary. For the purposes of this analysis, however, management measures are considered in isolation.

Each management option has its own set of characteristics in respect of factors such as: ease of implementation; the need for, and basis of, allocation; management costs; monitoring; observer coverage; compliance; data and research needs; impact on behaviour of fishers; and impact on the economics of fishing operations. The following analysis does not attempt to assess the options against each of these characteristics. Rather, it identifies the key, recognized positive and negative characteristics of each option so as to provide a basis for discussion at PrepCon VI and, ultimately, to assist in identification of preferred management options. Those will need to be subject to more detailed assessment and comparison against specific characteristics such as those identified above.

It is acknowledged, as recognised in the Resolution (Attachment 1) that there are some key data deficiencies, particularly in relation to catch, effort and size composition of the fisheries in Indonesia and the Philippines. The lack of reliable data from these fisheries increases the uncertainties in stock assessments and has ramification for all management options that rely

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<sup>4</sup> The Palau Arrangement for the Management of the Western Pacific Purse Seine Fishery

<sup>5</sup> The Nauru Agreement concerning Cooperation in the Management of Fisheries of Common Interest

<sup>6</sup> The Treaty on Fisheries between the Governments of certain Pacific Island States and the Government of the United States of America

on the results of those assessments. This is not the only source of uncertainty in the stock assessments and in the short term uncertainty is a constraint within which analysis of management options must be made. Even in the longer term it is unlikely that uncertainty will be eliminated.

## **Output controls**

Output controls aim to control the total catch directly by setting an upper limit on catch. The catch limit can relate to the total catch of a species (or group of species), catch in a specified area (eg high seas or in-zone), catch by a gear type (eg purse seine and longline) or catch of a certain size of fish. The two most recognized forms of output controls are competitive quotas and allocated quotas. Both rely on the establishment of a total allowable catch (TAC) and the basis for setting a TAC needs to be considered. If the fisheries management objective is to ensure catches are kept within sustainable limits then output controls based around the setting of a TAC provide the most direct management response to achieving that objective, assuming that the TAC can be adjusted in a timely manner in response to changes in stocks, and that monitoring and enforcement are adequate.

### **Competitive quotas**

A competitive quota involves the setting of a TAC, commonly on an annual basis but it can be for shorter or longer periods, for which participants compete until the TAC is reached and the fishery is closed.

Only where effective monitoring and enforcement measures are in place can a competitive quota provide effective control on total removals. Real-time monitoring of all catches supported by monitoring of reported catches through observer and port sampling programmes or a form of catch/trade documentation scheme would be required. After the TAC has been reached enforcement is relatively easy since fishing is prohibited, although enforcement may be more complex in a multi-species fishery.

A competitive quota avoids the difficulties associated with decisions on how the TAC should be allocated. Unfortunately, this also gives rise to the major recognized deficiency of a competitive quota approach, that is, rather than preventing a long-term increase in capacity, it actively encourages it. Competing fishers race to obtain a larger share of the TAC before it is filled and the fishery is closed. In order to gain advantage in this race, fishers invest in more vessels or in increasing the power of their vessels. The economics of fishing is, therefore, squeezed by increasing costs. This increases the risk of illegal fishing and/or transfer of effort to other species/areas as operators seek to maintain an adequate economic return on their investment.

In order to ameliorate the impact of the race to fish, competitive quotas can be accompanied by other controls such as limits on the amount of fish that may be landed per day or per trip. Such controls will be likely to further reduce the economic efficiency of vessel operations.

Where the TAC relates to a particular species, incidental catch of that species after the TAC has been reached may occur. The integrity of the TAC can be compromised by these mortalities unless they are taken into account in setting the TAC.

Safety of fishers may be compromised under a competitive quota since the incentive to take greater risks with respect to weather, to make catches before the TAC is filled, is high.

#### *Application elsewhere*

Competitive quotas are used by the Inter-American Tropical Tuna Commission (IATTC):

- An overall catch limit on purse seine catches of juvenile bigeye was in place between 1998 and 2001 that triggered a closure of the purse seine fishery on floating objects. The closure was triggered in 1998 and 1999.<sup>7</sup>
- A TAC was first applied to yellowfin in 1966 and remained in effect until 1979 when overcapacity and falling economic returns made it impossible for governments to reach agreement to close the fishery in time to stay within the recommended catch limits (Joseph 2003). A total catch limit applied to the purse seine catch of yellowfin tuna in the Commission's Yellowfin Regulatory Area in 1998, 1999, 2000 and 2001<sup>8</sup>. A maximum of 15% of yellowfin in the total catch of each vessel was provided for after the limit was reached.

These measures are monitored in the Eastern Pacific Ocean (EPO) by 100% observer coverage.

A competitive TAC for southern albacore has been in place in the International Commission for the Conservation of Atlantic Tunas (ICCAT) since 1998. Countries actively fishing for southern albacore compete for a TAC while others are subject to a catch limit of 100t<sup>9</sup>.

#### *Potential application in the WCPO*

In the WCPO the need to contain expansion of capacity and hence fishing effort, has been recognised for at least five years. A competitive quota would encourage rather than prevent further expansion of capacity and effective effort. The effective implementation of such a system would require the parties or the WCPFC to monitor catch on a near real-time basis and to effectively enforce a closure. The feasibility of a competitive quota in the WCPO is complicated by the balance of in-zone/high-seas catch and the use of bilateral and multilateral agreements between coastal states and distant water fishing nations. The movement and inter-annual variability in the geographical abundance of tuna stocks could result in inequalities in access to the stock under a competitive approach.

Competitive quotas are not likely to be an effective mechanism as the major instrument for regulating fishing mortality on target species in the WCPO tuna fisheries. However, they may have a role in particular circumstances. For example, a competitive TAC, along the lines of the IATTC's competitive TAC for juvenile bigeye, could be used to manage juvenile bigeye bycatch in the purse seine fishery. However, as in the EPO, the TAC might only take effect in periods of relatively high abundance of juvenile bigeye. When recruitment was poor, and the need to reduce fishing mortality more critical, it is unlikely the TAC would be reached and it would make no contribution to addressing sustainability concerns. In theory, a TAC for juvenile bigeye could be adjusted to reflect short-term recruitment changes, but in practice, it may not be possible to gather the data, undertake the stock assessment and adjust the TAC to reflect changes in abundance in young fish in the time frame required.

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<sup>7</sup> IATTC Resolution on Bigeye Tuna June 1998; IATTC Resolution on the Conservation and Management of Bigeye Tuna in the Eastern Pacific Ocean, July 1999; IATTC Resolution on Bigeye Tuna, 16 June 2000; IATTC Resolution on the Conservation of Bigeye Tuna in the Eastern Pacific Ocean, 21 June 2001.

<sup>8</sup> IATTC Resolutions on Yellowfin Tuna, June 1998, June 1999, June 2000 and June 2001.

<sup>9</sup> Recommendation by ICCAT on Limitation of Southern Albacore Catches (96-6); ICCAT Recommendations - Revision, Implementation and Sharing of S. Albacore Catch Limit (98-9, 00-7 and 01-6); Recommendations by ICCAT on the Southern Albacore Catch Limit and Sharing Arrangements for 2003 and 2004 (02-6 and 03-7).

## **Allocated quotas**

Under a system of allocated quotas the TAC is subdivided into shares (usually as a percentage converted to a tonnage of catch) for nations, fleets, fishing enterprises or vessels. The shares may be transferable (individual transferable quotas (ITQs)) or non-transferable.

As with competitive TACs the cap on total catch provided by allocated quotas can provide an effective direct control over the level of mortalities if it is adequately monitored and enforced. However, allocated quotas have the potential to address a number of the deficiencies of competitive quotas by generating incentives for economic rationalisation of fishing operations. The nation, fleet or individual fishing enterprise can make rational decisions on the appropriate level of capacity to take its allocated tonnage, when to fish, how much time to spend on vessel maintenance etc. Compared to competitive quotas, catch tends to be spread over a longer period with obvious benefits for processing, marketing and economic returns.

Allocated quotas encourage the adoption and implementation of effective conservation measures since each individual, fleet or country has a vested interest in maximising the long-term value of their allocation, in terms of the quantity of fish it entitles them to take.

Where quotas are allocated to individual operators or vessels an incentive for discards and high grading can be created. Discarding and high grading does not occur only in allocated quota fisheries. However, under allocated quotas, there is an additional incentive to discard to maximise the value of catches within the quota, and discarding may even be required by regulation when catch over and above allocated quota is taken. This can compromise the integrity of the TAC. Provisions that allow carryover/under of allocations from one year to the next can alleviate, although not eliminate, the problem. A monitoring programme to effectively estimate discarding is necessary with an allocated quota system.

Transferable quotas offer additional benefits. They are recognised as providing a mechanism for autonomous adjustment of overcapitalized fleets. The proceeds of the sale of an allocation by less efficient operators to more efficient operators may enable some operators to leave the fishery. Transferable quotas may also go some way to addressing inter-annual variations in the spatial availability of fish (eg within EEZs/high seas).

The accuracy of the TAC is an important element of the success of an allocated quota system. If the TAC is significantly overestimated relative to market demand or sustainable production, for example, there becomes little difference between a competitive and allocated quota system. If the TAC is underestimated, fishers may lose confidence in the system and bycatch and discarding of the species may distort catch records and subsequent stock assessments. The difficulties associated with TAC setting are increased in fisheries with high inter-annual variability in abundance.

Allocated quotas, by definition, require decisions on the basis by which shares are to be determined. This can be contentious and can cause significant delays in the implementation of management measures.

Allocated quotas provide an incentive to under-report catch and therefore require an effective quota monitoring system. The effectiveness and cost of such a system is affected by the size of the fleet, the geographical dispersion of the fleet and landing sites, the number of marketing channels and the proximity to other fisheries that take the same species but are not subject to quota. The failure of the quota monitoring system may lead to the TAC being exceeded and the data set used for stock assessment being corrupted. The costs of reliable monitoring and enforcement systems are likely to be high especially in the establishment phase. Once established, however, running costs may not be significantly higher than those incurred by monitoring and enforcement of input controlled systems.

In an international context, output controls, applied as national allocations of catch, provide participants with relatively high levels of flexibility since they are free to choose the measures they apply at a national level to operate within those catch limits.

#### *Application elsewhere*

The Commission for the Conservation of Southern Bluefin Tuna has allocated a TAC for southern bluefin tuna among its members since 1994, although catch limits have been agreed and allocated between the three original members (Japan, Australia and New Zealand) since 1985. Monitoring and surveillance of catch to ensure country allocations are not exceeded is the responsibility of each country.

ICCAT has adopted allocated quotas in its East and West Atlantic and Mediterranean bluefin fisheries; its North Atlantic albacore fishery; and its South and North Atlantic Swordfish fisheries. TACs have generally been set and allocations made for periods of 3-4 years.

#### *Potential application in the WCPO*

The scientific research and expertise available in the WCPO means that the capacity exists to set TACs for the main tuna species. The WCPFC could choose to allocate these TACs as quota for one or more species. If so, given the interaction between the catch of the longline and purse seine fisheries, there may be benefits in allocating quotas for at least the three main species (bigeye, yellowfin and skipjack). There are a range of ways in which national catch limits could be set or allocated and this might be a substantial task for the Commission. Depending on the basis upon which an allocation of catch might be made, the lack of reliable catch statistics, especially with respect to fisheries in Indonesia and the Philippines, may be a constraint.

Establishing the time period for TAC adjustments would be an issue in the WCPO. In general, adjusting TACs in an international regulatory framework is more cumbersome and less timely than making adjustments at a national level. Ideally the time period for adjustments would be shorter for the purse seine fishery in the WCPO because it takes younger fish (reflecting IATTC experience with essentially annual adjustments for yellowfin), and longer for longline fisheries targeting older fish (reflecting the ICCAT experience with, largely, three year periods).

Whether allocated quotas should be transferable or not may depend in large part on the institutional capacity available in the short term to administer a system of transferable rights.

There is high inter-annual variability in tuna abundance in the different areas within the WCPO. An allocated quota system would need to incorporate sufficient flexibility to deal with this. Seasonal transfers of quota and/or the incorporation of carryovers/unders of quota might need to be considered.

A combination of high levels of observer coverage, port monitoring of landings, at-sea inspection together with a catch documentation scheme might be required.

#### **Trip/Vessel/Country limits**

Output controls can also take the form of catch limits per trip or per vessel. In the absence of 100% observer coverage these measures are likely to result in increased discards.

In an international context it is possible to limit the total catch of vessels from each participating country to their catch in a specified earlier year or time period. This could be done without setting a scientifically based TAC but would serve to entrench the historical position of participants. Such an approach raises problems associated with excluding new entrants, or providing for the development aspirations of some members. These issues can be addressed by applying the limits only to those countries reaching a threshold on catch or

number of vessels, or exempting developing coastal states from the limits. However, this means that there is no effective upper limit on catch. Such measures require substantial monitoring.

#### *Application elsewhere*

The Indian Ocean Tuna Commission's (IOTC) Working Party on Tropical Tuna (WPTT) considered the use of trip limits on skipjack catches by purse seine vessels as a means of reducing mortality on juvenile bigeye and yellowfin tuna but found that it would be difficult to implement, would lead to a decrease in skipjack catch, only a possible reduction in the number of sets on fish aggregation devices (FADs) (and hence reduction in mortality of bigeye and yellowfin) and increased discards of skipjack (IOTC 2003).

ICCAT and IATTC have set catch limits for participants based purely on catch history in a particular period.

- In 2001, 2002, 2003 and 2004 ICCAT limited the catch of Atlantic bigeye by Contracting and Cooperating Non-contracting Parties to the average taken in 1991 and 1992. However, the restriction does not apply to participants whose reported catch in 2000 was less than, initially 2000t, now 2100t. Carryover/under of catch to the following year's limits was provided for.<sup>10</sup>
- IATTC has limited the 2004 longline catch of bigeye in the EPO by Contracting Parties to a level not exceeding their catch in 2001<sup>11</sup>.

#### *Potential application in the WCPO*

Given the relatively small quantities of bigeye and yellowfin tuna taken in the purse seine fleet in the WCPO the imposition of skipjack trip/vessel limits in order to reduce the impact on bigeye and yellowfin is likely to have similar impacts to those identified in the Indian Ocean.

A system whereby countries are restricted to their catch in a particular period but with exceptions to cater for smaller, developing fleets may have some value as a short-term measure. Such a system may have merit as an interim arrangement, pending, for example the development of longer term allocated controls on catch or effort, by restricting further expansion of industrial fisheries. However, in the long run it is unlikely to control overcapitalisation or overexploitation since it does not restrict the total catch.

Monitoring and enforcing catch limits would be relatively onerous in the WCPO given the diverse nature of the tuna fisheries. However it may be feasible to design a monitoring and enforcement arrangement for bigeye (at least for longline-caught bigeye) given the lower volume of the bigeye catch compared to yellowfin and the nature of bigeye markets.

## ***Input controls***

Input controls directly restrict one or more of the group of inputs (eg vessels, gear, fishing time) which, in combination, produce total fishing effort and, ultimately, catch. Input controls do not directly control catch, but can more directly control the rate of fishing mortality, if catchability remains relatively constant. Many fisheries managed under input controls require analysis of effective fishing effort and its relationship to catch in order to adjust controls regulating effective fishing effort in the fishery over time.

Like output controls, input controls can apply to a fishery, a specified area, a fleet or gear type and, if allocated, can be allocated according to nations, fleets, fishing enterprises or vessels.

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<sup>10</sup> ICCAT Recommendations on Bigeye Tuna Conservation Measures (01-1, 02-1 and 03-1).

<sup>11</sup> IATTC Resolution on the Conservation of Tuna in the Eastern Pacific Ocean (C-03-12)

Input controls remain a widely used fisheries management tool. This is despite widespread recognition that they generally fail to prevent over-exploitation and the development of over-capacity. This failure stems largely from so-called "capital stuffing" where restraints on one or more inputs are compensated for by investment in other inputs. A control on, for example, the number of vessels does not preclude remaining vessels fishing for longer, using new technology to fish more efficiently, setting more hooks, using larger nets, increasing the use of transshipping and support vessels, or increasing FAD use. As a result, input control regimes tend either to need regular adjustment of the total allowable effort (TAE) to take account of effort creep, or to become subject to a complex web of ever-increasing regulation as new attempts are made to wind back capacity, effort and catch.

Input controls need to be gear specific in order to avoid the substitution of one gear type for another, eg a single longliner by a super seiner.

Some input controls lend themselves to transferability, eg licences, numbers of days that can be fished, number of nets or hooks and units of vessel capacity or engine horsepower. In such cases a TAE that will produce what is estimated to be the sustainable harvest is determined and, generally, allocated between participants.

Input controls may cater better for inter-annual fluctuations than output controls in an international setting where it is difficult to adjust TACs quickly or substantially, and especially where catchability is relatively constant. They may also be easier and less costly to monitor and enforce than output controls, especially those in multi-species fisheries where output controls require separate TACs to be set for a range of species. The risk to corruption of data is also lower under input controls since they do not provide an incentive to fishers to misreport catch. Input controls do not provide any additional incentive to discard and high-grade catch (FAO 1997).

The effectiveness of input controls can be increased where they are applied within the framework of community-based fisheries management arrangements where the rights enjoyed by the community encourage fisher behaviour that promotes conservation.

At the international level, input controls generally provide less flexibility than output controls. As noted above, national catch allocation schemes leave countries with flexibility to choose management measures that keep their catches within the allocated limits. With capacity or effort allocations, there is much less flexibility available to countries in the implementation of limits at domestic/national levels.

Input controls relate generally to controls on capacity in terms of the number or size of vessels, or on other measures of effort such as fishing days, and hook numbers or hook days. These two forms of input control are discussed separately below.

## **Capacity**

Measures to control capacity may restrict:

- the number of participants (vessels or licences); and/or
- the type, size or power of vessels; or
- some measure of the aggregate fishing capacity (number times size).

Restriction of boat numbers/licences is a very coarse proxy for effort. On their own, limits on the numbers of vessels and/or licences are generally ineffective since, as discussed above, other inputs are used to increase the effort of the limited number of boats. In addition, where the vessel limit represents a reduction in existing numbers, the impact on effort in the fishery will be determined initially by the relative efficiency of the boats that depart and those that

remain. Such measures are, therefore, usually accompanied by restrictions on the size or power of vessels and vessel replacement policies, which restrict the size of new vessels to that of the replaced vessel.

Capacity limits are often seen as contributing more positively to enhancing the economic viability of fleets than some other options, and economic objectives are often important in the design and implementation of arrangements for capacity limits.

#### *Application elsewhere*

Capacity limits are the most widely used measure for limiting tropical tuna fishing. The other three tropical tuna Commissions all have in place some form of capacity limits.

- The IATTC has applied, in the past, limits on purse seine capacity based on allocations of carrying capacity to Contracting Parties and other cooperating States. Currently, it has in place limits on the entry of new purse seine vessels based on the IATTC Regional Vessel Register, and on expansion of capacity of existing purse seine vessels<sup>12</sup>. The IATTC also committed itself in 2000 to the adoption of a Plan for Regional Management of Fishing Capacity giving priority to management of fishing capacity in the tuna purse seine fishery but also seeking to address management of longline capacity. The IATTC has considered an overall size limit for individual purse seine vessels.
- ICCAT has applied, since 1999, a measure limiting the number of vessels >24m length overall (LOA) that each Contracting and Cooperating Non-contracting Party, may operate in the Convention Area to the average number of its vessels that fished for bigeye in 2001 and 2002<sup>13</sup>. The restriction applies to States and entities that caught on average more than 2,000 tonnes (now 2100t<sup>14</sup>) in the previous five years. A limit on gross registered tonnage (GRT) also applies.
- The IOTC has adopted a measure restricting the number of vessels >24m LOA, and GRT, of those Contracting Parties and Non-contracting Parties that have more than 50 vessels on the IOTC Vessel Record, to the number registered in 2003. A vessel replacement policy also applies.<sup>15</sup>

#### *Potential application in the WCPO*

The Fourth meeting of MHLC and PrepCon III adopted resolutions that " ...urged all States and other entities to exercise reasonable restraint in respect of any expansion of fishing effort and capacity in the Convention Area and to apply the precautionary approach forthwith...."<sup>16</sup>.

The Parties to the Palau Arrangement have had in place, since 1993, a limit on the number of purse seine vessels that can be licensed to fish in their waters (the source of around 75 per cent on average of the catch of the major regional purse seine fishery). The limit is currently 205 vessels. The Parties have announced their intention to restructure the Arrangement to limit effort (in vessel days) rather than capacity.

The US Multilateral Treaty with Forum Fisheries Agency (FFA) member States sets a limit on the number of US purse seiners that can be licensed by these States.

Moving beyond the general formulations relating to limits on capacity in the WCPO as set out in the MHLC and PrepCon resolutions would require progress on allocation.

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<sup>12</sup> IATTC Resolution on the Capacity of the Tuna Fleet operating in the Eastern Pacific Ocean (Revised) (C-02-3).

<sup>13</sup> ICCAT Recommendation on Fishing Vessels >24m LOA (98-3)

<sup>14</sup> ICCAT Recommendation on Bigeye Tuna Conservation Measures (02-1)

<sup>15</sup> IOTC Resolution on the Limitation of Fishing Capacity of Contracting Parties and Cooperating Non-contracting Parties (03/01).

<sup>16</sup> Resolution of the Preparatory Conference relating to illegal, unreported and unregulated fishing and limits on fishing capacity, 22 November 2002 (WCPFC/PrepCon/22)

Implementing broader limits to purse seine capacity in the WCPO could draw on the experience in the EPO with the use of catching capacity and well size. In the longer term, the effectiveness of purse seine capacity limits as a measure to address sustainability concerns related to bigeye and yellowfin would depend on the extent of any effort creep in the form of an increase in fishing power per unit of capacity, and on the success of the participants in adjusting management to account for it. Effort creep could be substantial in the WCPO given the potential for further gains in fishing power per unit of capacity from factors including increased transshipping, faster port turnarounds and increases in catch per set, including increases from the use of more FADs.

In the short term, purse seine capacity limits by themselves might not make a substantial contribution to addressing the sustainability concern in respect of bigeye. Indeed, they might increase fishing mortality on bigeye from purse seining by the current fleet if the capacity limit led to greater use of FADs to maximize catch per unit of capacity. However, capacity limits could contribute to avoiding further increases in fishing mortality on bigeye and yellowfin by deterring further investment in additional new purse seine vessels. Purse seine capacity limits would be relatively easy to monitor and enforce in the WCPO compared to some other options, but implementation would have to address the complexities associated with definition and measurement of individual vessel capacities, that have arisen in the EPO for example.

The main aim of longline capacity limits in the WCPO in the short to medium term would be bigeye conservation. The diversity of tuna longline operations makes the application of capacity limits (and most other measures) to longline fleets more complex. This is reflected in the measures adopted or considered by the other tuna Commissions, which only cover larger longline vessels (> 24m LOA). The exclusion of smaller longline vessels from a capacity limit would be a more serious limitation in the WCPO where the operation of smaller, locally-based longliners is more important and growing. However, a limit on the number of large longliners might contribute significantly to bigeye conservation in the short term if it prevented large freezer tuna longliners transferring their effort to the WCPO in response to the capacity limits imposed by the IOTC and moves in this direction by the IATTC.

### **Other forms of effort control**

Measures to control effort may include those that restrict the amount of time, usually the number of days fishing units can spend fishing or the number of input units such as hooks or a combination of inputs such as hook/days. Such controls are a finer specification of fishing effort than capacity limits such as vessel numbers or sizes. Effort controls can be implemented as a competitive or allocated quota system.

Under a competitive system participants would fish as hard as possible in order, for example, to maximize their share of the available days. This provides an incentive to maximize catching capacity and will be likely to encourage the race to fish as described under competitive quotas. Without the addition of capacity controls, a competitive system of fishing days may encourage an increase in capacity and, in the long term, further problems in the WCPO and elsewhere.

An allocated system provides each participant with a specified number of days or other units of effort and, while there will still be an incentive to increase capacity, since catch is not limited, the incentive is reduced by the absence of the need to compete. However, effort measures will necessarily involve the determination of a TAE, eg number of days/hooks, and where allocated, a basis for allocation. As with TACs, the accuracy of the TAE will be important to the success of the scheme. However, where inter-annual variability in abundance is a factor a TAE tends to avoid fluctuations in the rate of fishing mortality more effectively.

Effort quotas can be difficult and costly to enforce. Monitoring of effort levels such as days fishing could be monitored by the use of a vessel monitoring system (VMS). However, regulation of measures such as levels of hook use would require the development of new monitoring arrangements and high levels of in-port and at-sea inspection.

#### *Application elsewhere*

In 2001, the IOTC recommended that non-Members of the Commission whose vessels fish for bigeye tuna reduce their fishing effort in 2002 to below that of 1999 levels<sup>17</sup>. The Resolution did not define how effort should be measured.

The IOTC's WPTT has considered both a reduction in the number of purse seine vessels and the imposition of a minimum number of days that a purse seine vessel must remain in port after unloading. The WPTT found that a reduction in the number of vessels could be difficult to implement given the differences in efficiency between vessels and that increasing time in port may also be difficult to implement and its impact could be reduced by increased transshipping at sea (IOTC 2003).

#### *Potential application in the WCPO*

The World Tuna Purse Seine Organization (WTPO) has implemented short-term effort limits for purse seining in the WCPO based on requiring vessels to tie up for a fixed number of days related to vessel carrying capacity, at a time when tuna prices were depressed (WTPO 2003). The Parties to the Palau Arrangement have indicated their intention to shift the Arrangement from being based on a capacity limit (number of purse seine vessels licensed) to a fishing days limit (purse seine vessel days allocated between the Parties).

The scope for applying effort limits to purse seine fishing in the WCPO could be related to the potential for extending the WTPO measure and the proposed Palau Arrangement purse seine days limit. Limiting purse seine fishing days would likely be more effective than limiting purse seine capacity in addressing sustainability concerns in respect of bigeye and yellowfin in the WCPO but would be more difficult and more expensive to enforce. Applying compulsory tie-up periods for purse seine vessels in port between trips could reduce purse seine effort in the short term and would be relatively easy to enforce, but would be costly to the fleet.

The diversity of longline operations and numbers of vessels involved in the WCPO would seem to make it relatively complex to apply any form of vessel day, hook or hook day limits to tuna longline fishing at the regional level in the short term, though these approaches may be practical and effective at the national level.

## **Technical measures**

Technical measures are used to regulate the output that can be obtained from a specific amount of effort. Such measures generally attempt to influence the way fishing is conducted and the efficiency of the fishing gear (FAO 1997) to achieve a specific purpose in a given fishery. The technical measures discussed below are:

- gear restrictions;
- area and time restrictions;
- minimum size restrictions;
- compulsory retention; and
- penalties.

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<sup>17</sup> IOTC Resolution on Limitation of Fishing Effort of Non-members of IOTC whose Vessels Fish Bigeye Tuna (01/04)

## **Gear restrictions**

Gear restrictions can take the form of prohibitions on the use of gear or restrictions of gear type or size. From an economic perspective, gear restrictions usually lead to inefficiency and raise the cost of catching fish. A range of gear restrictions is discussed below.

### ***(a) gear type, design, selectivity***

The size and design of nets can influence the total catch, catch of particular species and or catch of a particular size of fish. Restrictions on depth of net might be able to be used to avoid particular species in the water column. If, for example, bigeye are found at the bottom of mixed schools, limits on net depth might reduce the purse catch of bigeye but would also reduce catch of all species not just those for which there are sustainability concerns.

Net mesh size may be set to allow certain species/sizes of fish to escape. Additional features, such as grids, may be added to allow bycatch of specific species to be removed or to escape.

Restriction of net depth would require high levels of observer coverage (to preclude additions to the net at sea), port inspection and maritime surveillance. The use of grids would require regular in-port inspections of nets to ensure grids were incorporated in all nets.

Possible restrictions on FADs as a form of gear restriction are discussed separately below.

#### *Application elsewhere*

Net depth limits have been considered by a number of tuna Commissions as a means of reducing the catch of bigeye tuna in purse seine catches. IATTC research has demonstrated that the depth of FADs and purse seine nets have less of an effect on catches of bigeye, yellowfin and skipjack tunas per set than do location and time of year (IATTC 2001). The shallower thermocline in the EPO may mean that this finding may be less applicable in the WCPO where the deeper thermocline might make net depth more important.

IATTC has conducted some trials of grids for the release of juvenile tunas, particularly sorting grids. While more development and assessment is required, results to date indicate that sorting grids would be easy to monitor and inexpensive (IATTC 2001).

#### *Potential application in the WCPO*

It is not clear what role the depth of nets has played in the increase of purse-seine catches of bigeye that was observed from 1996 onwards, since deeper nets had begun to be adopted in the early 1990s (Lawson 2003a). However, the increased catches may be related to the use of deeper nets in conjunction with the increased use of FADs from 1996 onwards, primarily in areas with a deeper thermocline. Some analysis of the potential of net depth limits in the WCPO has been carried out and it was found that it was unlikely that such limits would be effective in limiting bigeye catch in the region (Opnai 2002).

The results of grid research and trials in the EPO should be monitored. However the results may not be transferable to the WCPO where the purse seine fishery is focussed on skipjack rather than yellowfin. A grid with gaps large enough to reduce catches of juvenile bigeye and yellowfin would also allow the escape of a large proportion of the potential skipjack catch.

### ***(b) methods to reduce search time***

Fishers use a range of technology to assist in identifying schools of fish and hence reduce search time and increase the efficiency of fishing. Constraints on the use of such technology necessarily impede that efficiency. The use of sonar, radar and helicopters to search for fish could be banned in order to slow down fishing operations and, theoretically, reduce catch. Such measures would affect all fishing operations, not just those for species of concern, and would, therefore, come with significant economic cost. Monitoring and surveillance would be relatively straightforward, based largely on in-port inspections.

#### *Application elsewhere*

No applications of such controls have been identified.

#### *Potential application in the WCPO*

It is believed that the use of helicopters, at least in the US fleet, in the WCPO has declined significantly in recent years as fishing on drifting FADs became the predominant, and less expensive, technique (Gillett *et al.* 2002) and 'bird radar' improved. Thus restrictions on use of helicopters may have relatively less impact than direct controls on FAD use.

The impact on fishery wide efficiency and catch, of restrictions on the use of technology such as sonar and radar, would be significant and needs to be weighed up against the contribution these measures would make to addressing sustainability concerns for specific species.

#### **FAD<sup>18</sup> restrictions**

Controls on FAD use might take the form of a:

- prohibition on FAD use in the WCPO;
- prohibition on FADs on an area and/or time basis;
- prohibition on FAD use once a trigger catch limit of juvenile bigeye and yellowfin, was reached;
- restriction on the number of FADs deployed/vessel;
- restriction on the number of sets on FADs; or
- restriction on the design of FADs that can be used.

A blanket prohibition on FADs would reduce effective effort in the short term although it may result in a return to the use of other methods such as helicopters to increase catches from free swimming schools. Total purse seine catch could be expected to fall, at least in the short term, but with a lower level of fishing mortality on juvenile bigeye (which are predominantly in the purse seine catch), and on juvenile yellowfin (since the average size of yellowfin taken in sets on free swimming schools is larger than the average size of yellowfin taken in sets on FADs). Purse seine fleet costs would rise, and the economic position of the purse seine fleet, which relies predominantly on skipjack catch, could be significantly affected by such a measure. The economic position of the longline fleet would be expected to improve with enhanced bigeye and yellowfin catch rates and sizes. Total prohibition would require extensive and ongoing maritime and aerial surveillance.

Use of FADs could be restricted to certain areas and/or times. Again, such closures would affect all catches of the purse seine fleet for the period of the closure, but the closure would be determined on the basis of when catches of the more vulnerable species were largest, and the benefit/cost ratio of the closure for the fishery for a limited time/area closure should be higher than under a blanket closure. Compliance with time-area closures on FAD use would require 100% observer coverage on vessels that continue to fish on free swimming schools in the closed areas, and VMS coverage and regular aerial and maritime surveillance to ensure that other vessels are not in the closed area.

Bans on FAD use triggered by a catch limit of a species would require comprehensive monitoring of landings to estimate catch of the species, which is likely to be impracticable in most fisheries. The alternative, estimating quantities of juvenile fish caught, compromises the integrity of the measure. Compliance during the closure would be as for time-area closures.

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<sup>18</sup> Unless otherwise indicated a reference to FADs includes all types of floating objects, natural and artificial.

The number of FADs that a vessel could deploy could be restricted by limiting the number of FADs or the number of FAD beacons that can be carried. However monitoring the number of FADs a vessel is using may be difficult (IATTC 2001) since:

- some FADs become lost because transmitters malfunction or are lost;
- vessels may share the use of FADs; and
- vessels may use frequency-scanning equipment to find FADs deployed by other vessels.

The number of FAD sets per vessel could be restricted. This may be extremely difficult to monitor and will have a significant impact on total purse seine catch. Compliance with a limit on the number of FADs used by a vessel or the number of sets that a vessel may make on FADs in any period would require 100% observer coverage and regular maritime surveillance.

Research may identify FAD designs that attract more, larger fish and fewer juveniles. No such designs are currently available.

#### *Application elsewhere*

ICCAT introduced a closed area/season for the use of FADs in 1999<sup>19</sup> whereby a three month closed season applies in the Gulf of Guinea, a major nursery ground for bigeye tuna. Analysis by the Standing Committee on Research and Statistics of the impact of the closure on tropical tuna stocks indicates that the measure has been effective in reducing fishing mortality on bigeye from fleets which complied with the closure, but the benefits of the measure have been undermined by increasing effort and non-compliance.

In 1999 the IOTC's Scientific Committee identified time/area closures of fishing grounds to fishing on floating objects as the best option to reduce catches of small bigeye tuna by purse seine vessels (IOTC 1999). In 2003 the WPTT assessed a number of time/area closure scenarios. The IOTC has not taken a decision on the introduction of such a closure.

The IOTC WPTT has considered the impact of a limitation on the number of FADs and/or the electronic equipment used on FADs. However its analysis concluded that there was a lack of baseline information on the number of FADs currently deployed and that the measure, while directly addressing the issue of mortality of juvenile bigeye and yellowfin, would require 100% observer coverage (IOTC 2003).

Between 1998 and 2001, the IATTC imposed catch limits on juvenile bigeye which triggered a blanket prohibition on sets on all types of floating objects across the EPO<sup>20</sup>. The closure was triggered in 1998 and 1999, but not in 2000 and 2001. Following this experience, the IATTC has moved away from the approach of a closure for sets on floating objects because it tended to come into force only in years when there was high recruitment, and because there were significant compliance problems with defining sets on floating objects.

IATTC has also investigated the potential of area/time closures for sets on floating objects reporting in 2001 that it had "...not been possible to find small areas and times for which it is possible to predict unusually high catches of small tuna." As discussed below, the IATTC has now moved to time/area closures to all purse seining, rather than to sets on floating objects.

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<sup>19</sup> ICCAT Recommendations on Closed Area/Season for Fishing with FADs in E. Trop. Atlantic (98-1) and on closed Area/Season to FADs (99-1).

<sup>20</sup> IATTC Resolution on Bigeye Tuna, June 1998; Resolution on the Conservation and Management of Bigeye Tuna in the Eastern Pacific Ocean, July 1999; Resolution on Bigeye Tuna, 16 June 2000; and Resolution on the Conservation of Bigeye Tuna in the Eastern Pacific Ocean, 21 June 2001.

#### *Potential application in the WCPO*

Time/area restrictions on sets on floating objects and bans on sets on floating objects once a trigger catch of bigeye catch has been taken have been favoured in other areas because they involve the most direct control on FAD use. However, bans on sets on floating objects once a trigger level is reached have the same disadvantages as a competitive TAC. In addition, both these bans and time/area restrictions on sets on FADs may have a high economic cost in terms of other purse seine catch foregone. This is particularly important in the WCPO given the low proportion of bigeye and yellowfin in the purse seine catch relative to that in other oceans. In the WCPO, time/area closures would have to be applied over relatively broad areas, unless more specific nursery or spawning areas are identified. Such closures might be more like the broader area closure recently considered for the EPO than the closure over a more limited nursery area applied in the Atlantic Ocean, and would therefore be likely to lead to higher economic costs than a closure over a more limited area.

The comprehensive monitoring of landings required where a catch limit triggers a FAD ban is only likely to be possible in the WCPO, where landing sites are numerous, by requiring vessels to land catch at designated ports where monitoring programmes are in place.

In the WCPO, limits on the use of artificial FADs that were not applied to other floating objects would increase sets on naturally occurring floating objects such as logs. Floating log numbers fluctuate (particularly with rainfall on landmasses), and are higher in the west. As a result a limit on artificial FADs that did not cover natural floating objects may encourage fishing effort to the west.

While there are practical difficulties in managing limits on floating objects the limitation of FAD numbers or FAD sets per vessel may be more practical than other FAD control measures.

#### ***(c) restrictions on use of tender vessels***

Tender vessels support, and hence increase the efficiency of, vessels fishing on FADs by deploying FADs, provisioning the fishing vessels etc. Banning their use would reduce the number of FADs a vessel can deploy without stopping the use of FADs completely. The impact will depend on the extent to which purse seiners rely on supply vessels (how many purse seiners utilize tender vessels and what impact they have on catch rates). Over time vessel operators would be likely to find ways of circumventing the impact of the ban.

Compliance with a limit on the use of tender vessels would require 100% observer coverage and regular aerial and maritime surveillance, or VMS on all carrier/tender/supply vessels.

#### *Application elsewhere*

The IOTC WPTT has considered the impact of a ban on the use of supply vessels to the purse seine fleet. Preliminary information on the use of supply vessels in the Indian Ocean fishery suggests that the use of tender vessels may result in higher catch rates but the overall effect is difficult to quantify (IOTC 2003).

The IATTC has prohibited the use of tender vessels in the EPO<sup>21</sup>.

#### *Potential application in the WCPO*

Tender vessels are not widely used in the WCPO so the impact of a ban on current catches may be minimal. It may, however, preclude the wider adoption of the practice.

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<sup>21</sup> IATTC Resolutions on Bigeye Tuna, June 1998 and on Fish-Aggregating Devices, October 1998.

#### **(d) restrictions on at-sea transshipment**

At-sea transshipment allows fishing vessels to stay at sea for longer and hence increases available fishing time and effort. At-sea transshipment can be prohibited in an attempt to reduce effort. Such a measure would decrease fishing efficiency for all species and have an impact on fishery-wide catches.

##### *Application elsewhere*

The IATTC has prohibited the transshipment of tuna on the high seas by purse seine vessels fishing for tunas in the EPO<sup>22</sup>.

##### *Potential application in the WCPO*

Transshipment of tuna in the WCPO will be regulated under Article 29 of the WCPF Convention. Section 1 of Article 29 provides that:

*‘In order to support efforts to ensure accurate reporting of catches, the members of the Commission shall encourage their fishing vessels, to the extent practicable, to conduct transshipment in port.’*

Section 3 provides that:

*‘The Commission shall develop procedures to obtain and verify data on the quantity and species transhipped both in port and at sea in the Convention Area and procedures to determine when transshipment covered by this Convention has been completed’*

Section 5 generally prohibits transshipment at sea by purse seine vessels as follows:

*‘...subject to specific exemptions which the Commission adopts in order to reflect existing operations, transshipment at sea by purse-seine vessels operating within the Convention Area shall be prohibited.’*

Transshipment at sea is prohibited in the national waters of Members of the FFA under the FFA Harmonised Minimum Terms and Conditions for Foreign Fishing Vessel Access.

While the provisions of the WCPF Convention originate from a concern to ensure accurate reporting of catches, they can also serve to limit the effect of increasing the fishing power of purse seiners over time, and Commission Members might have regard to this effect when framing the procedures called for in section 3 of Article 29.

#### **Area and time restrictions**

Area/time limits attempt to reduce catch of a species generally, or at a particular stage of its life cycle (spawning stocks or juveniles) by prohibiting fishing either during specified times or seasons (time closures) or in particular areas, or a combination of the two. Time limits may also specifically limit the number of days at sea. Time/area closures can also be used in relation to certain types of fishing or use of certain gear, eg FADs as discussed above.

The impact of area and time restrictions of a closure is difficult to estimate since the extent to which operators compensate by increasing fishing in other areas/at other times is unknown. However they appear to have some potential to reduce mortality on bycatch species, depending on the pattern of catches that results from the displaced effort. The feasibility and effectiveness of time and area limits will depend on whether there are predictable seasonal and annual patterns in catch, spatially and temporally. Such closures may be an effective means of protecting nursery grounds or spawning stocks but are more difficult and more costly to apply in the case of highly migratory species with large spawning areas and long spawning seasons.

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<sup>22</sup> IATTC Resolution on Fish-Aggregating Devices, October 1998

Marine protected areas (MPAs), are designated areas of water that are permanently subject to special protection measures ranging from no-take zones to provision for fishing by some gear types in, for example, some depths of the water column. MPAs are particularly useful for the protection of 'critical habitats' such as nursery or spawning areas. However MPAs would need to be large and moveable to be an effective tool for highly migratory species.

#### *Application elsewhere*

The IATTC recently considered proposals for broad time/area closures, including a proposal for a two month closure of the western area of the EPO in which most of the bigeye catch of the EPO is taken – this would have been west of 95°W in the EPO, which overlaps in part with the WCPFC Convention Area. Ultimately, the IATTC decided to prohibit purse seining:

- during December 2003 in an area which combines part of the area where bigeye catch has been highest with an area of substantial yellowfin catches in the past; and
- for six weeks in August/September 2004 across the EPO<sup>23</sup>.

The IOTC WPTT has assessed a number of possible area/time closures of the purse seine fishery and estimated potential reductions in the catch of juvenile bigeye and juvenile yellowfin. While the WPTT found that such a measure could improve the long-term yield per recruit it stressed the uncertainty in its findings flowing from the unknown extent to which additional catch is taken outside the closed area. The analysis indicated that the benefits would flow to the purse seine, driftnet and longline fisheries for yellowfin but only to the longline fishery for bigeye. It would, however, reduce skipjack catch, be difficult to enforce and may lead to a redirection of effort to other areas in the Indian Ocean (IOTC 2003).

#### *Potential application in the WCPO*

The effective use of area/time closures in the WCPO would rely on the identification of areas/seasonal patterns of larger than average catches of the species in a particular area/time. Studies to date indicate that there is no apparent seasonal pattern that would support the imposition of such limits in the WCPO (Opnai 2002).

A closure to all purse seine fishing in an area for a specified time could be enforced through a VMS, without the need for observers. Such a closure would relate to both sets on free schools as well as FADs. Depending on the extent to which skipjack catch is taken on free schools this may unnecessarily restrict the catch of skipjack.

### **Minimum size restrictions**

A minimum size restriction requires fish below a certain size to be returned to the sea or for schools of predominantly small fish to be avoided. Minimum size restrictions rely on the economic disincentive associated with the waste of fishing time/costs involved in catching fish that have to be discarded to cause fishers to actively avoid those fish. However fishers may not be able to gauge fish size well and compliance with size limits tends to be low.

The effectiveness of this disincentive will depend on the extent to which the fisher can, in practice, avoid the catch of a certain size of a particular species and the proportion of total catch represented by that species. If the latter is relatively small there is little disincentive to change fishing practice.

An alternative measure, based on size, is the abandonment of high juvenile sets. This measure relies either on visual inspection of the catch composition prior to completion of the set or the development of technology that can determine the size composition of the school

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<sup>23</sup> IATTC Resolution on the Conservation of Tuna in the Eastern Pacific Ocean (C-03-12).

prior to setting. In the former case the timing of the decision as to when to release the fish is critical in order to avoid significant mortalities. The latter approach would avoid this problem. These approaches would reduce but not eliminate catches of small fish. Where mixed catches are taken, identification of the species could prove problematic either visually or by technological means. If the technology were able to discriminate by species it would minimize the impact of restrictions on one species on the catch of others.

Compliance with such an approach is likely to be difficult since it relies on either a visual judgement about the size/species composition or an interpretation of information provided by technology. Complete observer coverage would appear to be necessary. Any measure which affects the size composition of the catch, or reporting of size composition, has technical implications for stock assessments.

#### *Application elsewhere*

ICCAT introduced a minimum size restriction of 3.2kg on yellowfin in 1973 and on bigeye in 1980<sup>24</sup>. These regulations have not been adhered to (ICCAT 2003).

The IOTC WPTT considered size limits for bigeye and yellowfin and found that the impact would depend on the extent to which the size limits were adhered to and the survival rates of fish returned to sea. Given the current technology survival rates are likely to be low.

IATTC has indicated the need for research of the potential application of technology, eg acoustic technology, to determine the size and perhaps species of fish in a school before setting on it. The technology is, however, likely to be expensive (IATTC 2001).

#### *Potential application in the WCPO*

In the WCPO, any minimum size measure would have to be applied both to bigeye and yellowfin since it is not possible to differentiate at sea between juvenile of these species.

### **Compulsory retention**

The intention of such a policy is to financially penalize those that catch large amounts of small fish. This may be effective if small fish make up a significant share of the total catch, because the vessel will be forced to bring to shore fish that are not economic to land and this should provide an incentive to avoid such catches. A risk involved in such a strategy is that fishers develop a market for the small fish, eliminating the disincentive to avoid them. Compliance would require 100% observer coverage to avoid dumping, port inspections of catches, use of VMS to minimize the chance of transshipment and regular maritime and aerial surveillance.

#### *Application elsewhere*

The IATTC has introduced a pilot programme (2001 to 2004) requiring full-retention of bigeye, skipjack and yellowfin taken by purse seine vessels (unless not fit for human consumption).

#### *Potential application in the WCPO*

This has potential application in the WCPO if monitoring and enforcement are adequate.

### **Penalties**

This measure relies on the imposition of an administrative or economic penalty if fish of a certain quantity, proportion of catch or size are taken. Measures may include compulsory tie-up periods or short term bans on use of particular methods (eg FADs). They require high levels of monitoring and enforcement because of the strong incentive to the individual operator to dump catch to avoid the penalties.

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<sup>24</sup> ICCAT Recommendations on Yellowfin Size Limit (72-1) and Bigeye Size Limit (79-1).

#### *Application elsewhere*

No examples of these measures by other tuna Commissions have been identified. However members of the WTPO agreed to apply monetary penalties to vessels that breached the purse seine vessel tie-ups implemented by the Organization in early 2003.

#### *Potential application in the WCPO*

The impact of such a measure on total purse seine catch of tunas would depend on the level of bigeye/yellowfin catch at which the penalties were applied. There are also very large differences in reported rates of bigeye catch between different purse seine fleets and different purse seine vessels in the WCPO. This approach might enable measures to reduce bigeye bycatch to be targeted at vessels and fleets that are the major cause of the problem without disturbing the operations of others. Enforcement capacity would be a critical determinant of its applicability in the WCPO.

### **Feasibility of Management Options**

The analysis of management options has identified a range of issues regarding their feasibility as conservation measures for bigeye and yellowfin in the WCPO. These include:

- The other three tuna Commissions concerned with the management of tropical tunas (IATTC, ICCAT and IOTC) have all committed substantial effort to addressing broadly similar issues relating to conservation of bigeye and yellowfin tunas that are outlined in the SCG2 report, that are now being faced by the PrepCon, and that are likely to be priority issues for the WCPFC Commission.
- A wide range of measures has been applied by the other tuna Commissions and an even wider range has been considered.
- The experience and analyses of other tuna Commissions offer valuable information on the effectiveness or otherwise of several different forms of these measures.
- From the information available it is not clear that the strategies put in place through the other tuna Commissions are regarded as working satisfactorily and the Members of the other Commissions generally continue to seek better ways to address sustainability concerns related to bigeye and yellowfin.
- While there are substantial similarities between the WCPO and other tropical oceanic regions in the nature of sustainability issues with respect to bigeye and yellowfin, there are also some substantial differences. These include:
  - The scale of the WCPO tuna fisheries, with larger catches, more vessels, more landing and transshipment points and more countries actively participating (Lawson 2003b)
  - The relative balance of catches in high seas and in waters under national jurisdiction, with most of the WCPO tuna catch being taken in waters under national jurisdiction
  - The difference in the status of the Commissions, with the WCPFC needing to give substantial attention in its early years to establishment tasks, but created under a Convention designed to give it, and its Members, in time, a generally fuller range of duties, powers and programmes than the other tuna Commissions
  - The relative importance of skipjack in the WCPO tuna fishery as a whole and the purse seine fishery in particular. Skipjack has been around 60-65% of the total tuna catch in the WCPO compared to 20-50% in the three other tropical oceanic regions. Bigeye and yellowfin, on the other hand, are a smaller component of the WCPO catch and a smaller component of the purse seine catch in general than elsewhere.
  - The economic costs incurred by the purse seine fishery under some management options directed at reducing catch of juvenile bigeye and yellowfin tuna are likely to be significantly larger in the WCPO than in other areas given the much lower proportion of these species and the much higher proportion of skipjack taken in the purse seine fishery in the WCPO in comparison to that in other areas.

- There may be large differences in costs between options in terms of both the direct cost of monitoring and enforcement and the broader economic costs involved.
- Most of the options identified would require strengthening of monitoring programmes, including observer programmes, port sampling, VMS, statistical documentation programmes and establishment of new enforcement measures. This applies particularly to the application of various technical measures to purse seine fishing, and options involving real-time monitoring of catch and effort.

The decisions facing countries participating in the PrepCon and the WCPFC are:

- the immediate action that the WCPFC can take to preclude further increases in fishing mortality of bigeye and yellowfin tuna;
- the action that can be taken to reduce bigeye mortality if current stock assessments for bigeye tuna are confirmed;
- the preferred long-term management for highly migratory species in the WCPO; and
- the programme of work, including the gathering of further information and/or scientific advice, required to ensure that the Commission is in a position to implement these actions within the necessary timeframe.

Both feasibility and effectiveness will determine the choice of management measures. In the short term the driving forces include the feasibility of moving quickly to establish comprehensive observer, in port monitoring and vessel monitoring programmes and whether progress can be made on allocation. Against this background the range of feasible options in the short term, and in the medium to longer term might be described as follows.

In the short term, two broad groups of measures would seem potentially feasible.

- The feasibility of applying some form or forms of national capacity, effort or catch limits by state, territory and entity in the short term would be likely to depend on whether PrepCon and/or the Commission could make sufficient progress on the development of allocation criteria.

Applying national capacity limits for purse seine vessels could draw on the experience of the IATTC, noting the issues related to definition and measurement of purse seine capacity. Applying national longline capacity limits could draw on the experience of ICCAT and IOTC, noting that these limits generally apply only to larger vessels and larger fleets. Applying national effort limits for purse seine vessels could build on the proposed new structure of the Palau Arrangement, using VMS for monitoring fishing days, but it would be more difficult to develop a similar arrangement to manage longline effort. It might also be feasible in the short term to apply national catch limits for bigeye, at least for the longline component of the bigeye catch, based on monitoring through a catch documentation scheme. Applying national catch limits for yellowfin in the short term would be more complex.

- Feasible options in the short term that do not require progress on allocation are likely to be largely limited to some of the technical measures discussed above, which generally apply only to purse seining. In the main these measures require increased monitoring capacities, especially on-board observers, and monitoring of landings, which should be achievable. If so, then technical measures that might be feasible in the short term include time/area closures (related either to closures on sets on FADs, or on all purse seine fishing) and limits on numbers of FADs being used by individual vessels, noting that IATTC experience and analysis points to practical difficulties with measures relating to limiting the use of FADs and sets on FADs.

Other technical measures that might be feasible with stronger monitoring and compliance capacities include restrictions on the use of tender vessels, tight regulation of transshipment at sea and various size-related measures (minimum sizes, compulsory retention of juveniles). In addition, an input control that might be feasible in the short term without resolving the allocation issue is some form of competitive limit on fishing days for purse seine fishing.

In the medium to longer term, technological developments, enhanced monitoring programmes and enforcement measures, and agreement on allocation criteria and processes would make a wider range of options feasible.

- In the medium term, with enhanced real-time monitoring of landings, it would be feasible to operate a competitive catch limit which led to closures of purse seine fishing, and/or fishing by other gears, when overall annual catch limits were reached for bigeye or yellowfin, following the kind of approach that has been used by the IATTC.
- In the longer term, comprehensive, rigorously applied output controls, in the form of TACs with national allocations of catch limits appear likely to be the most effective option for managing the large, multi-species, multi-gear tuna fisheries of the WCPO.
- Technological development in FAD and net design and in equipment that can provide better information on the size and species composition of tuna schools might also provide options in the longer term to complement and increase the effectiveness of more comprehensive catch or effort limits for bigeye and yellowfin management.

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**PREPARATORY CONFERENCE FOR THE COMMISSION FOR THE  
CONSERVATION AND MANAGEMENT OF HIGHLY MIGRATORY  
FISH STOCKS IN THE WESTERN AND CENTRAL PACIFIC**

Fifth session  
Rarotonga, Cook Islands  
29 September – 3 October 2003

WCPFC/PrepCon/34  
3 October 2003

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**RESOLUTION OF THE PREPARATORY CONFERENCE IN RESPONSE TO THE  
RECOMMENDATIONS OF THE SECOND MEETING OF THE SCIENTIFIC  
COORDINATING GROUP ON SUSTAINABLE FISHERIES MANAGEMENT**

*Recalling* the resolutions adopted at the fourth session of the Multilateral High Level Conference (MHLIC IV), on 19 February 1999, and the third session of the Preparatory Conference for the Establishment of the Commission for the Conservation and Management of the Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, on 22 November 2002, in which the participants, *inter alia*, urged all States and other entities concerned to exercise reasonable restraint in respect of any regional expansion of fishing effort and capacity,

*Noting* that, since the adoption of the aforementioned resolutions, some fishing industries are reportedly still building or have already built a large number of purse seine fishing vessels to be deployed in the Western and Central Pacific Ocean to target tuna species covered by the Convention,

*Recognizing* the need to apply the precautionary approach to fisheries management,

*Considering* that the second meeting of the Scientific Coordinating Group (SCG) held in July 2003 recommended that fishing mortality of both yellowfin and bigeye not be increased from current levels,

*Recognizing* that the second meeting of the SCG further cautioned that if current stock assessments for bigeye tuna were confirmed, practical management actions to decrease fishing mortality would be required to prevent further decline in stock,

*Noting further* that the SCG considered that the lack of data from Indonesia and the Philippines was a serious concern because of its substantial contribution to the uncertainties in the stock assessments and requested that participants in the fifth session of the Preparatory Conference consider as a matter of urgency ways to assist in improving this situation,

*Taking into account* the interests and aspirations of developing States, particularly small island developing States, and of territories and possessions, in developing their national fisheries in accordance with their commitments under international law and instruments;

*Recognizing* the importance of existing regional licensing and other arrangements to participants,

*Recalling* article 30, paragraph 2 (c), of the Convention, and the need to ensure that conservation and management measures do not result in transferring, directly or indirectly, a disproportionate burden of conservation action to developing States Parties, territories and possessions,

*Recalling further* article 10, paragraph 3, of the Convention, which provides for the development by the Commission of criteria for the allocation of the total allowable catch, or the total level of fishing effort, and

*Noting* the likely entry into force of the Convention by the middle of 2004,

*The participants in the fifth session of the Preparatory Conference for the Establishment of the Commission for the Conservation and Management of the Highly Migratory Fish Stocks in the Western and Central Pacific Ocean held at Rarotonga, Cook Islands, from 29 September to 3 October 2003, resolve to:*

1. *Request* the Interim Secretariat to prepare a paper on management options, to be delivered to the next session of the Preparatory Conference, on how the Commission could respond to sustainability concerns in respect of bigeye and yellowfin identified by the second meeting of the SCG,
2. *Invite* the Commission at its first session to consider management options in respect of bigeye and yellowfin,
3. *Encourage* participants to consider financing proposals seeking to improve the collection of catch effort and size composition data, especially from the domestic fisheries of Indonesia and the Philippines,
4. *Strongly urge* participants to fully implement the previous resolutions of MHLC and the Preparatory Conference calling for participants to exercise reasonable restraint in respect of any expansion of fishing effort and capacity in the Western and Central Pacific Ocean, and to note that certain States, territories, fishing entities and other entities continue to breach these resolutions,
5. *Urge* participants, and particularly those from States, territories, fishing entities and other entities continuing to breach the MHLC IV and Preparatory Conference resolutions, to take measures to prevent their nationals from building and operating new purse seine vessels in the Convention Area under foreign flags, unless those vessels have been constructed to operate under legitimate licences,
6. *Strongly urge* States, territories, fishing entities and other entities who have continued to breach these resolutions since the original MHLC IV resolution to reduce any overcapacity they have created, and
7. *Urge* that any information on activities contrary to the provisions of this resolution should be reported to the next session of the Preparatory Conference and circulated to all participants.

3 October 2003