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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)**

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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
OFP	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

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

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: • assists identification of data flows and system components; and, • assists integration process between data collection process and data storage design.	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

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, transhipment, 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
▪ Restricted access to premises where data are held, whether in electronic or hard copy format. ▪ Hardware access limited to valid data users, server access limited to database administrators/engineers. ▪ Secure offsite backup storage	▪ Integral database system security including username and password protected access to processed and pre-processed data. ▪ Internet security provisions - firewalls ▪ Restricted levels of access to data reflecting user requirements. ▪ Encrypted and password protected means of data transmission, including FTP sites, CD-ROMs, diskettes etc.

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 confidentialities 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

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

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 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.
- Breeches 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)**
Overarching	Security policy (I)	Policy review (T, F)	Policy review (T, F)
	Confidentiality policy (I)		
	Interim data handling arrangements (I)		
DBMS development	Needs assessment (I)	System selection (T)	
		Development & implementation - process mapping; detailed specifications (tables, screens, reports, interface etc.) (T)	
		System testing – prototyping (T)	
DBMS management		Support and maintenance – ongoing modifications, upgrades, training (T, F)	Support and maintenance – ongoing modifications, upgrades, training (T, F)
Routine data processing	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)
Stand-alone projects / programmes			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	• Coordination with analysts to develop database (DB) • DB manager has major role with DB • On-site expertise available for maintenance; • "Ownership" of DB and its uses	• DB development is labour intensive over finite time and requires specific skills • Short-term needs may not match long-term needs • Funding may limit staff and diminish system function	• Core task of Commission • Responsive to needs of member states and analysts	• DB may not be available to receive data on time • Insufficient human resources to process data
Consultant: Contractor provides guidance and coordinates with staff as needed (e.g. development, stand-alone projects)	• Similar to in-house, but use services as needed • Combine with staff • No long-term commitment required • Objective, unbiased approach • Instils urgency - delivery against defined timelines	• In-house capabilities may not be sufficient to handle subsequent problems • Cost may outweigh benefits for small projects	• Can free database staff for long-term needs • Flexibility - hire specific expertise as and when needed	• May be significant lead time associated with identifying and evaluating contractors • Contractor may not meet standards • Bias towards an inappropriate solution
Outsource: Contractor performs functions off-site	• Cost efficiencies – capital costs & operational costs • Access to best of breed solutions • Offers a readily scalable solution	• Lower on-site expertise • No coordination with analysts • Extensive oversight needed from staff • Requires staff cognoscente of all functions • Requires full documentation • Slower response to problems • Few service providers with equivalent experience	• Opportunity to devolve data functions - frees resources • Can search for best quality • Change contractor if necessary • Capital outlay risks mitigated	• Contractor may not meet standards • Security-confidentiality breach • Contractor may not have long-term view • Dependency on contractor • Consistency lost – change of contractor • Contractor may not understand needs fully • Bias towards a particular solution • Risk of shadow system in-house • Lack of "ownership"

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

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

Table 7.1 Hardware & software configurations (Part 1)

Organisation	Server & Client machines	Upgrade policy	Database
OFP	Separate Database, Web and Mail servers. Database server specifications include: HP3000 900 MHz; I Gb RAM; Data storage - 6 drives 2 x RAID0, 3 x RAID5, 1 Hot swap Client machine minimum specifications include: Pentium 4; 1.7 Ghz processor; 512 Mb RAM; 80 Gb Hard drive. 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.	No routine replacement cycle. Upgrades chiefly motivated by software compatibility.	**Visual Fox Pro (VFP)** Relational database including administrative databases and metadata: Data registry database; Global reference tables
FFA	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. • Servers - HP 9000 • Memory - 10 x 5Gb HD. • Standard networking protocols such as TCP/IP	Hardware upgraded when perceived necessary to support programmes.	**Relational database – Oracle v 7.3.2** • UNIX operating system • ODBC software for database connectivity 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	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	**MS SQL Server** In house custom design and development. All major data sets integrated where possible

Organisation	Server & Client machines	Upgrade policy	Database
CCSBT	Combined file and database server Compaq 1.25 Gb RAM RAID type HD Broadband internet connection	Informal upgrade policy, predominantly driven by operating system compatibility. The system is 2 years old – server lifespan expected to exceed 5 years and 4 years for client machines.	**MS SQL Server** For simplicity and flexibility, some links (particularly to the "CODES" table) are maintained through triggers and stored procedures rather than via referential integrity constraints. Date and time stamps used to manage data. Do not use public metadata standards although description fields are included for internal database administration purposes.

Table 7.1 Hardware & software configurations (Part 1 - continued)

Organisation	Server & Client machines	Upgrade policy	**Database**
IATTC	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	Flexible hardware standard set to accommodate change. Bi-annual capacity and obsolescence evaluations.	**MS SQL Server**
ICCAT	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.	Machines replaced at least every 4 years	Server End (Windows 2000 Server) Data base software: SQL-Server 2000
IOTC	Client server configuration	No information available	Data base software: MS SQL Server

Table 7.2 Hardware & software configurations (Part 2)

Organisation	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
OFP	Standard routines including: referential checks, reports and, standard loading routines based on custom queries written in visual basic –using custom query building software (*Quick Query*). No other analysis software bar standard MS products. Any transformation and adjustment to data undertaken in a development version of the database in the first instance.	Visual Fox Pro (VFP) front-end (MS ACCESS front-ends developed for SPC clients) Comprehensive custom designed data entry system; the system is under continual development, paperless solutions are under investigation including FTP logsheet transfer. Comprehensive post processing query and data retrieval system also written in VFP – 80-90% of queries are pre-written. A professional licence is held by OFP that permits 3rd party software and subset dissemination.	No scheduled review Upgrades when necessary, driving force is compatibility. Extensive software testing prior to upgrades incl. patches upgrades
FFA	Custom written VFP routines for: Verification Analysis Data retrieval	MS ACCESS – based on the following principals: 1. Assist developers in building applications timely and efficiently, 2. Achieve high levels of software quality and minimise time and effort required for program maintenance, 3. Create systems that closely satisfy user requirements, 4. Establish common, consistent and easy-to-use user interface across the applications portfolio.	Upgrade as and when available
Organisation	Analysis software Embedded controls and processes	Client interface	Software upgrade policy
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	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: • the Tag Recapture module; • the Trade Information Scheme module; and, • the Reference File module. 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

OFP	8 permanent staff • 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 • 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. • 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. • 1 x Fisheries Database Supervisor is responsible for supervising the processing of data, maintaining data processing software, and compiling data summaries • 4 x Data Entry Technicians responsible for data entry and other secretarial duties, as required. 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 if data submissions. These include a port sampling supervisor, an observer supervisor, and a port sampling and observer trainer. IT system management is handled independently of the OFP by the SPC IT unit that handles operating systems and server backup.
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	Currently database development task assigned to Japan National Research Institute for Far Seas Fisheries – dedicated staffing details not available
CCAMLR	Data manager – supported by data entry/administrative staff
CCSBT	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. • 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. • 1 x administrative officer who occasionally assists with data entry.
IATTC	IATTC employs 7 permanent IT staff including: • 1 x System manager • 1 x Assistant system manager • 2 x Data administrator • 2 x Programmers • 1 x Graphics/web designer 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.

Table 7.3 Human resources (continued)

ICCAT	4 permanent staff compile, verify, update and disseminate data, as follows. • 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) • 2 general service staff for data entry, verification and validation, and secretarial duties.
IOTC	6 permanent staff :- • 1 x Data manager • 1 x Assistant data manager 1 x Data analyst / programmer • 1 x Webmaster • 2 x general support staff

Table 7.4 Data security

Organisation	Data security provisions
OFP	The OFP makes specific provision to ensure security and confidentiality of all data submissions Access to unauthorised users is restricted through: • Firewall protection • Integral operating system based password and username requirement for access to data. • Automatic system lock with password protection is instigated after 5 minutes • Restricted access to data for authorised users – e.g. scientists only have access to data through the query system (read-only access) • Development system (db command line) access restricted to database developers. *External users:* • SPC Fire wall – logically secure from external attack. • 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). • Virus checking software is regularly updated *Physical security:* • All hardcopy data are stored in locked file cabinets in a secure area of SPC. • Offices locked out of hours • Access to hardware (servers restricted to IT personnel (locked room)
FFA	Both physical and logical security solutions applied. • 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). • 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.
ISC	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.
CCAMLR	See Data Confidentiality Table 7.5

Table 7.4 Data Security (continued)

Organisation	Data security provisions
CCSBT	The CCSBT has recently agreed policies relating to data security. *Electronic data security* • The Database Manager will control the level of access that is allocated to individuals. • 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. • The Secretariat's computers will have screen savers with password protection. Screen savers will have a "wait" time of less than 10 minutes. • 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. • 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. • 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. • Backups of CCSBT data (e.g. tapes, disks) will be password protected and/or be stored in an external secure environment. *Physical data security* • 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). • 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. • 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. • Physical copies of electronic data provided to the Secretariat (e.g. CD's) will be destroyed or returned to the supplier of the data.
IATTC	Standard physical and logical security arrangements apply
ICCAT	Standard physical and logical security solutions apply • Access to the data base centre is limited to Staff working in this section. • Daily and monthly backup facilities using 50 GB on tape drive • A bank safe deposit box is rented for the storage of backup files • An anti-virus shield is installed on each computer
IOTC	Procedures for safeguarding records and databases include: • 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. • 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. • 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.

Table 7.5 Data confidentiality

Organisation	Data confidentiality
OFP	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). • Annual catch estimates, by gear type, flag state and year, are considered to be in the public domain. • 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. • 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. • Catch and effort data grouped at a finer level of time-area stratification may be released with authorisation from the sources of the data. • 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. • 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. 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. Policies relating to length data are the same as those detailed for catch and effort data 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.
FFA	Confidentiality policy in place to protect VMS data - ownership retained by individual FFA member countries
ISC	Public domain: Total catch and effort aggregated over entire North Pacific with caveat that some discards in N Pacific not reported. 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

Table 7.5 Data confidentiality (continued)

Organisation	Data confidentiality
CCAMLR	CCAMLR has a series of rules for access to data. 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. 2. If scientists wish to publish analyses that include CCAMLR data, they must obtain permission of the data owner/originators. 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. 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. 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). 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) (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. (b) The originators/owners of the data should retain control over any use of their unpublished data outside of CCAMLR. (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. (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. (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 *Selected Scientific Papers* 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. (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

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	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. 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. 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.
IATTC	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 & effort data summaries on 5x5- quarter resolution are available on request. Coastal state agencies may be provided 1x1- month catch & 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. 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.
ICCAT	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.

Table 7-5 Data Confidentiality (continued)

Organisation	Data confidentiality
IOTC[1]	The IOTC has a defined policy for releasing catch-and-effort and length-frequency data: • 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. • 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: o A Working Party will specify the reasons for which the data are required. o 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. o The identity of individual vessels will be hidden in fine-level data unless the individual requesting this information can justify its necessity. o 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. Data submitted to working parties • 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.

[1] The IOTC policy on data dissemination was modelled on the OFP policy (David Ardill, IOTC, pers. comment)

8 List of Organisations Contacted

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	Senior Scientist
Secretariat of the Pacific Community - Offshore Fisheries Programme (SPC-OFP)	Kim Duckworth John Hampton Peter Williams Timothy Lawson	Research Data Manager Principal Fisheries Scientist Fisheries Database Manager Principal Fisheries Scientist (Statistics)