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Report of the

FAO/SPC REGIONAL WORKSHOP ON IMPROVING INFORMATION ON STATUS AND TRENDS OF FISHERIES IN THE PACIFIC REGION

Apia, Samoa, 22–26 May 2006

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PREPARATION OF THIS DOCUMENT

This is the final version of the report of the FAO/SPC [Food and Agriculture Organization of the United Nations/Secretariat of the Pacific Community] Regional Workshop on Improving Information on Status and Trends of Fisheries in the Pacific Region that was held in Apia, Samoa, from 22 to 26 May 2006.

FAO; SPC.
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ABSTRACT

The FAO/SPC Regional Workshop on Improving Information on Status and Trends of Fisheries in the Pacific Region was organized jointly by the Secretariat of the Pacific Community through its Coastal Fisheries Programme and FAO. Representatives from eighteen countries/territories in the Pacific region were invited. With the overall objective of facilitating the effective generation and use of fishery data and information for sound policy development and responsible fisheries management, the Workshop reviewed the relevance and adequacy of the existing national fishery information and data collection systems and examined viable options to improve the quality of fishery data and information, which suit specific settings of subregions (Melanesia, Micronesia and Polynesia) and are operational in a budget and manpower limited situation.

CONTENT

APPENDIXES

BACKGROUND

1. Knowledge of the status and trends of capture fisheries, including socio-economic aspects, is a key to sound policy development, better decision-making and responsible fisheries management. Adequate and reliable fishery information is also required validation of fishery policy and for tracking the performance of fisheries management. Furthermore, there has been a high level of public interest in terms of sustainable use of fishery resources and there is an increasing need for relevant information to reach at community level.

2. The collection and analysis of fishery data is a costly, time-consuming and an effort-intensive exercise. Fishery line agencies, which in many cases suffer from chronic problems of budget and human resource limitations, often struggle to produce reliable information in a timely manner. Poor quality of information creates a general sense of distrust on fishery information among intended users (e.g. policy-makers and fisheries managers) which results in non- or very limited use of fishery statistics. This would further lead to a situation where low priorities/attentions are given to data collection activities. Thus a vicious circle of problems is created, which continues to hampers effective fishery administration and management based on the information.

3. Many fisheries in the Pacific region are typically characterized as multispecies/multigear tropical fisheries, in which a large number of small-scale operations predominate. Conventional data collection methods that are primarily designed to monitor large-scale commercial fisheries in temperate waters may not be always adequate if applied to such fisheries. The geographically scattered archipelago, coupled with high degrees of dependency on aquatic resources among coastal communities, is another marked characteristic, which illustrates spatial dispersion of fishing communities and diversity of their activities. This poses additional difficulties in data collection in terms of logistics and data collection methods. There are no easy and immediate solutions to deal with such difficulties associated with fisheries in small island countries and to eventually end the vicious circle of problems. Only continued and dedicated efforts could pave the way to lessen the problems.

4. Development or improvement of any fishery data collection system requires a logically structured approach.[1] The structured approach includes a sequential pathway, starting from the understanding on “Why data are needed?”, through the clarification of data requirements (What data need to be collected?) and the consideration of “How data will be collected?”. Periodical review of these fundamental aspects of data collection systems (i.e. to validate why, what and how) is important since data collection systems need to be responsive to the dynamics of the fisheries sector as well as to the changing needs for fishery information.

5. FAO and the Secretariat of the Pacific Community (SPC) have been working on this challenging task of improving the quality of fishery information through a series of joint activities, which include:

- FAO Pacific Islands Regional Workshop on Fishery Statistics (Noumea, July 2001)
- SPC Regional Policy Meeting on Coastal Fisheries Management (Nadi, March 2003)
- SPC/WPRFMC/FAO Workshop on Fisheries Legislation and Community-based Fisheries Management (Honolulu, April 2005)
- SPC/FAO Training Workshop in Fisheries Management and Statistics (Nadi, November 2004)

[1] FAO. Guidelines for the routine collection of capture fishery data. FAO Fisheries Technical Paper 382. Rome, FAO. 1999.

6. This regional workshop was designed to be in line with these earlier activities as a part of collaborative efforts between FAO and SPC for the improvement of fishery information and improvement of fisheries management at large.

OBJECTIVES OF THE WORKSHOP

7. Overall objective of the workshop was to facilitate the effective generation and use of fishery statistics and information as a foundation of sound policy development and responsible fisheries management in the Pacific region. More specifically it was tasked to:

i) review existing national fishery information and data collection systems in the region, taking account of critical aspects of the systems, namely: a) linkage with policy/management objectives; b) institutional arrangement/coordination; c) data collection strategies; and d) data collection methods as well as e) assessment of small-scale (subsistence) fisheries;

ii) examine viable options to improve the quality of fishery data and information, which suit specific requirements of different sub-regions (Micronesia, Melanesia and Polynesia) and are operational in a budget and manpower limited situation; and

iii) exchange of knowledge and experiences in designing and developing the fishery statistics and data collection systems among participating countries.

ORGANIZATION OF THE WORKSHOP

8. The workshop was jointly organized by the FAO Subregional Office for the Pacific Islands (under a regional project GCP/RAS/183/JPN: Support for improvement of statistics on coastal and subsistence fisheries and aquaculture), FAO FishCode-STF Project[2] and SPC Coastal Fisheries Programme.

Preparation

9. Prior to the workshop, a questionnaire survey was conducted to review and describe national fishery data and information collection systems in a comprehensive and comparative manner. The information obtained by the survey was compiled as "Country reviews of fishery information and data collection systems" and was used as a working paper for the workshop.

10. The country review report contains information on the following:

- **General information related to fisheries** includes the information that has implications on fishery data collection (e.g. geographical characteristics of coastal areas, administrative divisions and ethnicities, cultures and traditions of fisheries communities).
- **Structure of the fisheries sector** is concerned with the description of structural characteristics of the fisheries sector (national categories of fisheries), which includes the information on major categories and sub-categories, target resources, fishing methods and gears used, operational characteristics (fishing zones, landings and major markets, etc.), size of fleet (if available) and existence of management measures/plans.

[2] An FAO global project for improving information on status and trends of capture fisheries formulated under the umbrella of the FishCode Programme "*Assistance to developing countries for the implementation of the Code of Conduct for Responsible Fisheries*".

- **Fishery policy and management objectives** are important information to determine requirements of fishery information. The source of the information is also identified in this section (e.g. fishery law, sector development plan, mission statement of fisheries department, etc.).
- **Status of statistical reporting** consists of a) fishery statistics reported to FAO and b) fishery statistics reported at the national level.
- **Fishery information and data collection system** describes key elements of the system including: a) Objectives of fishery data collection; b) Main institutions involved in fishery data collection; and c) Legislative framework for fishery data collection. All the components of the system are categorized into three major subject areas (offshore fisheries; coastal fisheries and post harvest) and described in a standardized format; which encompass:
  - Institution in charge.
  - Scope of data collection.
  - Type of monitoring.
  - Mode of monitoring (routine, periodic or ad hoc).
  - Time reference.
  - Data source.
  - Data unit.
  - Strategy (complete enumeration or sampling).
  - Population size.
  - Collection method.
  - Data management.
  - Finance.
  - Data items collected.

11. A preliminary regional synthesis and thematic comparative analysis of the national data collection systems was conducted based on the information provided in the country reviews and presented at the workshop as background for discussion.

Scope

12. The workshop addressed data collection on capture fisheries, both oceanic fisheries and coastal fisheries in the Pacific. Aquaculture was not included since this important subsector requires different approaches. Special emphasis was placed on coastal fisheries during working group sessions while oceanic fisheries was given a lower priority as they are considered to be well-monitored by regional fisheries bodies.

Strategies

13. Data collection in a budget and manpower limited situation: limited financial and human resources allocated for data collection have been a common problem among countries in the region and it is fair to assume that this problem would persist. Therefore the workshop focused on practical approaches that can be implemented in a budget and manpower limited situation rather than unrealistically seeking a solution for the budget and manpower problem.

14. Subregional approach: the workshop sessions include plenary discussion and working group discussion to promote active participation of the participants. For working group discussion, countries of the same ethnic and geographical subregion were grouped together with the objective of effectively addressing the difference in cultures, customs and traditions.

PROGRAMME, VENUE AND PARTICIPANTS

Programme and venue

15. The Workshop was held at the FAO Subregional Office for the Pacific Islands (SAPA) in Apia, Samoa, from 22–26 May 2006. The workshop agenda and timetable is given in **Appendix A.**

Participation

16. Communication between information users and providers is essential for good data collection/management, whereby information providers have a clear understanding of the requirements of users while information users become aware of the limitations of the information that need to be reflected in their decision making. In this connection, the workshop invited two participants from each country, of whom one should be a senior fisheries officer (representing the user of fishery information) and the other should be a technical officer directly involved in fishery data collection (representing the provider of information). A total of 30 participants from 18 countries/territories (American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon islands, Tonga, Tuvalu and Vanuatu attended the workshop. Participant list is in **Appendix B**.

OPENING OF THE WORKSHOP

17. Following an opening prayer by Pastor P. Pelenato, Mr Aru Mathias, Officer-in-Charge of the FAO Subregional Office for the Pacific Islands (SAPA), on behalf of Dr Vili Fuavao, FAO Subregional Representative for the Pacific, welcomed the participants and the resource persons in the FAO premises. He introduced that at the sixth Meeting of FAO South West Pacific Ministers for Agriculture, Ministers encouraged FAO to assist countries in strengthening fisheries management by improving data collection in cooperation with regional organizations as a basis for effective policy-making and management of fisheries and aquaculture. FAO has been working with SPC in this direction and the Strategy for Improving Information on Status and Trends of Capture Fisheries (Strategy-STF) is an important instrument for this purpose. Mr Mathias stressed that this regional workshop is another marked collaborative effort with SPC for improving fisheries information and management in the region (**Appendix C**).

18. Mr Frank Magron, Reef Fisheries Information Manager, on behalf of the SPC Director of the Marine Resources Division reminded the participants that SPC is committed to fisheries information. Although most concerted effort by SPC has been with tuna fisheries statistics, where SPC has a regional database and stock assessment programmes for over 25 years. With the PROCFISH project, SPC has embarked on a strategic regional long-term effort to help its members to develop quantitative information on coastal fisheries. He introduced that SPC is in the process of developing a coastal fisheries statistics “model” aimed at helping countries develop sustainable coastal fisheries and aquaculture monitoring systems at the national and territorial level (**Appendix D**).

19. Mr Sala Fata Pelenato, Honourable Associate Minister for Agriculture and Fisheries of Samoa, officially opened the workshop. He stressed the availability of fishery information is a key to allow countries and regional organizations setting sound fishery policy and management plans. Fishery data collected regularly are very useful for planning future

activities, in particular, for those subsectors that develop very rapidly such as game fishing industry in the South Pacific. He mentioned that fish is an important component of the daily diet for a great part of the population in Samoa and 72 percent of the fish consumed in Samoa is supplied by fishers from the villages. Mr Pelenato also expressed his appreciation for the support provided by FAO, SPC and USP in the fishery field and wished a successful meeting (**Appendix E**).

REGIONAL AND INTERNATIONAL EFFORTS TO IMPROVE FISHERY INFORMATION

Introduction of FAO FishCode-STF Project

20. Mr Alexis Bensch presented activities of the FAO FishCode-STF Project, which has been designed to support the implementation of the FAO Strategy-STF. The Project places special emphasis on the small-scale fisheries and promotes a methodological approach for the improvement of fisheries data collection systems in the manpower and budget limited context. It has also exerted efforts to develop inventories of fisheries, marine resources and data collection systems as important steps toward the improvement of fisheries data collection systems The availability of these inventories enables fishery planners and resource managers to identify gaps and shortcoming in fisheries/resource monitoring and management and they can also serve as valuable analytical tools for various purposes. Inventories of fisheries and marine resources are being developed by mobilizing national and regional expertise with technical guidelines provided by FAO. Participation to these inventories is also the entry point to the Fisheries Global Information System (FIGIS) developed by the FAO Fisheries Department. A number of regional fisheries bodies are using this system to report and share information on fisheries resources under a partnership agreement (Fishery Resources Monitoring System-FIRMS[3]).

The fishery statistics compiled by FAO

21. Mr Luca Garibaldi of the FAO Fishery Information, Data and Statistics Unit (FIDI) delivered a presentation on FAO fisheries statistics. He stressed the importance of FAO fishery databases as they are the only source of comprehensive global fishery statistics. The schedule for the yearly inquiry on fishery statistics, quality control and dissemination of data were illustrated. The need to comply with internationally adopted standards (responsibility of the flag State in reporting the data, data in live weight equivalents) was also reminded. The tools made available by FAO (i.e. Western Central Pacific species identification guide and the ASFIS[4] list of species) to facilitate the correct species identification and reporting were presented.

22. Although the main purpose to collect fishery statistics remains for its use at national level, assembling of national statistics in a global database provides the possibility of regional and global analyses and trend studies. This was shown by the presentation of charts based on capture fishery data by the Pacific countries as extracted from the FAO database. Additionally, the use of data from the FAO database in the preparation of FAO publication such as SOFIA[5] and for various studies was illustrated.

[3] www.firms.fao.org

[4] The Aquatic Sciences and Fisheries Information System The species list is downloadable at www.fao.org/fi/statist/fisoft/asfis/asfis.asp

[5] The State of World Fisheries and Aquaculture (SOFIA), FAO Fisheries and Aquaculture Department's premier advocacy document.

23. The delegates raised various questions on how data for aquarium fish and specific products like giant clams should be reported to FAO. It was explained that aquarium fish should not be reported as capture statistics but that data available on the trade (import-export) of these live animals are included in the FAO Fishery Commodities database.

24. Concerning the giant clam and similar products, their reporting may look as rather complex given that these species are cultivated to produce meat and the shell sold as an ornamental product. In theory, the quantities produced for edible purposes should be reported in live weight equivalents, applying a conversion factor if only the meat weight is available, while the weight of the shell sold for ornamental purposes should be reported as one of the species items included in the ISSCAAP[6] group "Pearls, mother-of-pearl, shells". If the reporting national correspondent would encounter difficulties in applying this procedure, it is however requested to report additional informational on the data submitted (e.g. meat weight, live weight, ornamental shells only, etc.).

25. While it is necessary to avoid duplication of effort through enhanced exchange of information between FAO and regional organisations, it was also mentioned that the nature of data submitted to the various bodies are different in term of level of aggregation and type of data submitted. FAO recognized the need for acknowledgement of countries contributions and emphasises the need of regular submission of data.

26. To the question about the quality assessment of information sent to FAO, it was answered that it can only be done when a change of trend or anomaly highlight a possible error. When this happens, the country is contacted to correct or validate data submitted. In absence of reply or in the case of missing data, figures are estimated using data of previous years, information provided for others species groups or additional aggregated data when available.

27. A demonstration of a FAO's statistical software, FishStat+[7], was performed to the participants and copies of the software with capture datasets from 1950 to 2004 were included.

Review of activities under the FAO project GCP/RAS/183/JPN

28. Mr Izumi briefed on the ongoing 5-year regional project, GCP/RAS/183/JPN "Support for improvement of statistics on coastal and subsistence fisheries and aquaculture" which was trust-funded by the Government of Japan and informed of its completion in October 2006. Under the project objectives and its planned activities, a series of regional workshops were conducted in cooperation with the SPC Coastal Fisheries Programme. A study on assistance in improving data collection/fishery statistics was carried out in selected countries (e.g. Marshall Islands, Palau and the Federated States of Micronesia). He informed that reports of the workshops and the studies were produced on completion of each activity and submitted to the project participating countries as well as the donor country.

Case studies on the status of data collection in the Pacific

29. Ms Josie B. Perez, FAO consultant, presented the results of a study on fisheries statistics and data collection carried out in the Federated States of Micronesia in September-October 2005. It was reported that fishery data collection had been conducted separately in the four

[6] International Standard Statistical Classification for Aquatic Animals and Plants.
[7] Downloadable at www.fao.org/fi/statist/FISOFT/FISHPLUS.asp

states of the Federated States of Micronesia and the lack of communications, coordination, harmonization and support between the national and state governments was a problem. The participant from Federated States of Micronesia also pointed out that the lack of feedback to the communities surveyed had resulted in lower willingness of communities to participate to subsequent surveys. He clarified the reasons for recent reduction observed in data collection effort in Federated States of Micronesia, which were: i) termination of funding by the national government due to the lack of response by states; ii) reticence of traditional communities to contribute to surveys; iii) termination of financial support from the United States of America under a Compact of Free Association. Nevertheless, one state is continuing socio-economic surveys.

30. Ms Evelyn Perez of the Bureau of Marine Resources (BMR), Palau, delivered a short presentation on data collection activities of BMR She reported that the organization structure of the BMR is currently under revision with the objective to centralize the information collected on fisheries. She noted that Geographic Information System (GIS) is now used for data analysis. Palau is willing to disseminate the system to other countries in the Micronesia subregion as well as at regional (e.g. SPC and SPREP[8]) and international (i.e. FAO) levels. In this context, Palau expressed its interest to collaborate with FAO and SPC and requested some assistance to harmonize information and improve reporting.

31. Following this presentation, the interest of the use of GIS was discussed. It was mentioned that the geo-referencing of the information produced by a population census or household surveys can provide useful information for the stratification of sample-based studies and spatial extrapolation of data, although implementation of GIS requires considerable technical expertise and human resource inputs. The regional PROCFISH project run by SPC is collecting baseline geo-referenced information (coastline and LandSat-7 images), which is distributed to SPC members countries/territories. Fisheries related GIS layers can be mapped on top of these baseline layers. It was suggested that the ongoing re-organization of the BMR should be the occasion to revise the fisheries data collection systems, starting with the definition of new policy and corresponding data requirements.

Review of planned activities under the SPC Coastal Fisheries Programme (CFP)

32. Mr Ueta Fa'asili, Coastal fisheries management adviser, presented the review of planned activities under the SPC CFP based on CFP Work Plan 2006-2008. The activities have three components with specific objectives.

33. Component 1 is for the reef fisheries with the objective of assisting governments and administrations in the development of scientifically informed and socially achievable coastal ecosystem management systems, including coastal living resource components of national ocean policies. Component 2 is for aquaculture whose objective is a regional support framework for economically, socially and environmentally sustainable aquaculture planning, research and development by the Pacific Island governments and private enterprises. Component 3 concentrates on nearshore pelagic fisheries, aiming the governments and administrations to develop domestic nearshore commercial fisheries within a sustainable ecosystem context. There are three components of activities to achieve these objectives, namely, in-country assistance, capacity building and provision of information.

34. The in-country assistance will work with the national counterparts on various requested areas such as: i) inshore research on finfish, invertebrate and socio-economic surveys with

[8] Pacific Regional Environment Programme, which is headquartered in Apia, Samoa.

emphasis on how these contribute to the livelihood of the communities and how the communities are affected by marine protected areas (MPAs); ii) development of national fisheries programme specifically to enhance production like tilapia, improve the quality of fish, fishing gears and methods, development of community-based fisheries management (CBFM) programmes and assistance in institutional strengthening; and iii) development of coastal fisheries legislations (Fiji, Samoa, Tonga and Tuvalu).

35. Capacity building will be done through regional training, national training and training attachments. Provision of information will be attained through development of posters and manuals, preparation of information sheets, publicity materials and newsletters.

36. In the open discussion, one question was raised on how the training activities will be prioritized. The response to this question was that the activities cannot be prioritized since each country has its own priority needs. Hence, SPC will make proposals and ask the countries to respond. Whatever the outcome, SPC will then act on this training; however, the funds should also be considered.

SPC's experience with dissemination of databases and associated software for coastal fisheries management and issues to be considered

37. Mr Frank Magron, Reef Fisheries Information Manager, updated the participants on SPC activities on dissemination of databases and associated software for coastal fisheries management. Starting with the need of databases to ensure the conservation and usability of collected data, he highlighted the complementary use of database management systems (DBMS) and spreadsheets as well as the need of a front-end application to hide the complexity of the database to the end-user performing data entry and retrieval. A quick comparison of common DBMS showed that free "express" versions of large enterprise editions are suitable for fisheries departments. SPC Reef Fisheries Observatory chose SQL Server 2005 Express among them.

38. SPC releases a database along with a front-end called RFID for reef fisheries related assessments following the PROCFish/C methodology (finfish, invertebrate and socio-economic surveys) and is currently developing methodological manuals that will be distributed with software/database. Participants were invited to provide some feedback on their needs for types of surveys relevant to inshore fisheries management and not met by the current application.

SPC-ComSec-UNU/FTP-USP Initiatives[9] and its training programme

39. Ms Milika Naqasima-Sobey of the University of the South Pacific (USP) provided a brief overview of the first consultative meeting to prepare the Fisheries Stock Assessment and Fisheries Statistics training course to be conducted later in 2006 for Pacific Island fisheries personnel. The discussion centred on the objectives of the course, a draft course syllabus and the expected outcomes of the course. The main aim of the course is to provide the participants with the theory and the "hands on" application of the analytical methods currently in use in fisheries science. The format of the course will be lectures in the morning followed by practical sessions in the afternoon using computers and the program Excel. Emphasis will be placed on providing a step-by-step instruction on how the different analyses are carried out. It is expected that it will also help to demystify the mathematics behind these methods.

[9] ComSec: Commonwealth Secretariat, UNU/FTP: The United Nations University Fisheries Training Programme in Iceland.

40. The proposed course syllabus has three main sections: Marine Ecology, Scientific Measurements and Quantitative Biology. Fish stocks can not be considered in isolation. They interact with their physical environment and with other species. An understanding of the environment and ecological processes and interactions lays the necessary groundwork. The students will then be taught the importance of proper sampling design; why, how and what to sample. The third section of the course will deal with the estimation of different population parameters. The estimation of mortality, growth and use of surplus production models are just three of the topics that will be covered in this section. Multispecies models will be mentioned cursorily as they are largely still in the conceptional stage, rather the limitations of the single species models in multispecies situations will be highlighted. The details of the course syllabus will be finalized at the second consultative meeting in June 2006. There will be a follow-up course in November 2007 where it is planned that the same participants return to USP after having had a year to collect the necessary data on a chosen topic. The details and the topic for the second course are still under discussion.

THEMATIC PRESENTATIONS

Regional synthesis and thematic comparative analysis of the national data collection systems

41. Messrs Shunji Sugiyama and Alexis Bensch, FAO FishCode-STF Project, presented results of the regional synthesis that was conducted based on the information obtained from "Country review of fishery information and data collection systems".[10] This regional synthesis and comparative analysis was primary aimed at: i) critically assess the relevance and validity of the existing national fishery information and data collection systems in the Pacific region; ii) identifying information gaps and the shortcomings of the systems; iii) to explore viable options to collect fishery data in a cost-effective manner with minimum requirements of manpower.

42. FAO recommends a structured approach in developing/improving routine collection of fishery data[11], which includes a sequential pathway, starting from the understanding of **WHY** data are needed, through the clarification of data requirements (**WHAT** data need to be collected) and the consideration of **HOW** data should be collected. The regional analysis employed this structured approach and followed the logical pathway in the process of reviewing national data collection systems. Guiding questions used in this review, which corresponded to each step of the logical pathway is given in the **Appendix F**.

Information requirements

43. Periodical review of national fishery policy and management objectives is useful in terms of updating requirements for fishery information. The latest policy and management objectives of participating countries were analysed and the results indicated that they are now extended to a variety of subject areas such as: i) Resource use; ii) Fisheries management; iii) Environment; iv) Food security; v) Social development; vi) Employment and vii) National economy (see **Tables 1 and 2**). It seemed that excessive attention was no longer given to offshore industrial fisheries but adequate priorities/attentions were recently directed toward small-scale inshore fisheries.

[10] See footnote 3.
[11] For more details, refer to FAO Fisheries Technical Paper 382 (see footnote 1).

Table 1. Major subject areas of policy/management objectives in the Pacific region

Major areas	Examples
Resource use (RU)	▪ Sustainable use of fishery resources ▪ Rehabilitation and enhancement of fishery resources ▪ Minimize post harvest losses
Fisheries management (FM)	▪ Effective management of fisheries ▪ Reduced competition among fisheries ▪ Introduce appropriate harvesting techniques
Environment (EN)	▪ Conservation of coastal habitat/ecosystem ▪ Conservation of biodiversity ▪ Regulate destructive ways of fishing
Food security (FS)	▪ Increased production ▪ Equitable and improved supply of fish protein ▪ Improve the nutritious status of rural communities
Social development (SD)	▪ Improve livelihood of fishing communities ▪ Enhance socio-economic benefits of fisheries
Employment (EM)	▪ Provide income-generating opportunities
National economy (NE)	▪ Increase export of fishery products
Others (OT)	▪ Support of developing fishery infrastructure

Table 2. Countries' focus in policy/management objectives

Country	Areas of policy/management objectives							
	RU	FM	EN	FS	SD	EM	NE	OT
(Micronesia)								
Federated States of Micronesia	●	●			●	●	●	
Kiribati		●			●	●	●	●
Marshall Islands	●	●					●	
Nauru	●	●	●	●	●	●	●	●
Palau	●		●	●		●	●	●
(Melanesia)								
Fiji	●	●	●	●	●		●	●
New Caledonia	●		●				●	
Papua New Guinea	●	●	●	●	●		●	●
Solomon Islands	●	●			●		●	●
Vanuatu	●	●		●	●		●	●
(Polynesia)								
Cook Islands	●	●			●	●	●	
French Polynesia	●		●		●		●	
Niue	●	●	●		●		●	●
Samoa	●			●	●		●	●
Tonga	●	●		●	●		●	●
Tuvalu		●		●			●	●
Score (x/16)	**14**	**12**	**7**	**8**	**12**	**5**	**16**	**11**

44. Such shifts in policy emphasis will inevitably bring new requirements of information. The implications of these policy shifts in data collection would be that:

- Data collection would need to extend its subject coverage to inshore fisheries, especially artisanal/subsistence fisheries, rather than narrowly focusing on revenue generating offshore industrial fisheries and fish processing industry;
- Data collection would need to take into account people's dimensions in addition to resource dimensions through the conduct of socio-economic surveys; and
- Data collection may be required at the same level of management unit. In the case of decentralized management of fisheries where the management unit is a province, district or community, fishery information and data may need to be collected, analysed and managed at this level.

45. It was suggested that countries look into these points and critically review the relevance of fishery data items currently collected in relation to recent policy and management objectives. Without periodical review, a fishery data collection system would continue to collect a set of data that has been traditionally collected but may no longer be relevant to new requirements of information users. In doing so, it would be necessary for countries to have clear statement of data collection objectives, which enable them to identify appropriate indicators. **Table 3** presents major subject areas of data collection objectives and **Table 4** shows summary of data collection objectives and required indicators identified by countries. It was pointed out that there was a general lack of the process to define objectives of data collection in many countries in the region.

Table 3. Major subject areas of data collection objectives

Subject areas	Some typical examples of data collection objectives
Status of resource (SR)	▪ To monitor status/trends of fishery resources ▪ To assess the level of production by species ▪ To assess the impacts of management measures on resources ▪ To study biological characteristics of commercial species
Structure of the (fisheries) sector (SS)	▪ To monitor changes in the structure of the sector ▪ To understand the distribution patterns of fishing communities ▪ To assess the fishing capacity
Fishing operation (FO)	▪ To understand the characteristics of fishing operations ▪ To track the shifts of fishing grounds ▪ To assess the level of fishing efforts
Fisheries administration (FA)	▪ To monitor the implementation of fisheries projects ▪ To assess the performance of extension activities ▪ To ensure compliance and enforcement of regulations
Status of fishing communities (SC)	▪ To monitor the socio-economic status of communities ▪ To monitor the level of fish consumption in the communities
Status of environment (SE)	▪ To monitor environment parameters ▪ To monitor the status of critical habitats
Trade/marketing (TM)	▪ To monitor volume and value of exported products ▪ To monitor volume of fish sold at domestic market
Others (OT)	▪ To assess economic performance of fishing entrepreneurs ▪ To fulfil reporting obligations to regional organizations

Note: Some objectives of data collection can be a combination of those listed above. For example such objective as "to monitor performance of fishery management plan" may have to have SR and SC above as performance indicators.

Table 4. Summary of data collection objectives and required indicators identified by countries[12]

Objectives	Required indicators and variables
(Status of resource) (1) To monitor the status of fishery resources - In relation to the type of fishery and/or type of fisheries commodity - By type of resources by province* - In particular for those inshore resources that are vulnerable to exploitation - For management of the target fishery resources - For conservation for fish and fishery stocks - For evaluation of the performance of management plans	▪ Catch by species, by fishery, by fishing area and by province ▪ Size distribution by fishery by area ▪ Fishing effort by fishery by area ▪ Biological information on resources ▪ Resource assessment survey (fishery independent surveys), ▪ Fisher's perception of trends (production, market, gear, etc.)
2) To assess the stock size in different fishing areas**	▪ Stock assessment indicators by fishing area
(Structure of the sector) 3) To understand the structure of the fisheries sector, in particular that of artisanal subsistence fisheries	▪ Community/fisher organizations ▪ Fisheries licenses
(Fishing operation) 4) To monitor profitability and sustainability of professional fisheries	▪ Catch by species, by fishery and by area ▪ Fishing effort ▪ Biological information on resources ▪ Micro-economic performance indicator
5) To understand organizational behaviours of fishers	▪ Seasonal patterns of fishing operation ▪ Proportion of home consumption/sales ▪ Types of fish products produced ▪ Community/fisher organizations
(Fisheries administration) 6) To monitor and evaluate the implementation of development/management plans	▪ Level of participation in the fisheries ▪ Production from development projects ▪ Level of compliance of management measures
7) To monitor the activities of fisheries centers and government supported fishing projects	▪ Catch and sales of fish by the project ▪ No. of fishing trips
(Fishing community) 8) To understand peoples' participation to fishery related activities	▪ Level of participation by type of activities (gender disaggregated)

[12] This summary is based on the information obtained from Cook Islands, Fiji, French Polynesia, Kiribati, Papua New Guinea, Solomon Islands, Tonga and Vanuatu.

Objectives	Required indicators and variables
(Environment) 9) To assess the impact of habitat loss as a result of coastal area development on fisheries resources	▪ Areas covered by mangroves and healthy coral reefs ▪ Level of coastal areas development and rehabilitation status
(Trade/marketing) 10) To assess the impact of fisheries trade 11) To monitor (domestic) market trends	▪ Market trends ▪ Quality and quantity requirements/standards ▪ Demands for fish, feasibility of new value added products
(Others)	
12) To assess needs for fishery development, management and conservation of resources	▪ Concerns raised from communities with regard to fisheries, ▪ Status indicators of resources ▪ Perceptions/observations by fishers ▪ Unemployment rate, etc.
13) To assess the fisibility of development of fisheries	▪ Feasibility study and resource assessment ▪ Socio-economic indicators
14) To assess and monitor contributions of the fisheries sector in terms of GDP, national food production and livelihoods of rural communities 15) To assess the effectiveness of the public investment	▪ Social economic impact on fishing communities ▪ Fish exportation and local consumption ▪ Level of employment/participation within the fisheries sector ▪ Macro economic indicators

* In Vanuatu, the Fisheries Department supports decentralized management of fisheries resources and provides technical assistance to provincial governments. In provinces, it is often the case that attentions are given to development oriented activities rather than management oriented ones. Province-wise information is essential to provide adequate advice in this context. In addition, the type of government supports to promote fishing activities in rural areas need to be chosen by taking it into account the status of resources in the area.

** This is necessary to provide a basis for assessing applications of fishing licenses and fishing projects

Institutional arrangement

46. It was confirmed that chances of having shared responsibilities for data collection among different institutions[13] seem to be minimal in the Pacific region; small understaffed fishery line agencies would have to bear the large responsibilities of collecting whole spectrum of necessary fishery related data. This will inevitably impose significant administrative and financial burden on the agency. Nevertheless, there is at least the national statistics office that has been playing an important role in fishery related data collection. It was reported that population census, agriculture census and household income and expenditure survey in this region often incorporated a number of fishery related questions and generated valuable frame

[13] As it is the case in larger countries, where, for example, fishery line agency is responsible for routine collection of fishery production and operation related information while research institutions take charge of conducting ad hoc scientific surveys on specific aspects of fisheries/resources and large statistical operations to collect structural information of the fisheries sector are conducted by the national statistics office.

information of fishing households/operations. It was reminded that fishery line agencies should establish a good working relationship with the national statistical office and try to utilize such valuable opportunities of large nation-wide statistical operations.

Scope and coverage

47. Data collection on coastal commercial and subsistence fisheries has been very limited or non existence in many countries. It is apparent that focuses in data collection are still placed on offshore tuna fisheries and export oriented processed production (see **Table 5**).

Table 5. Overview of subsectoral coverage in fishery data collection

Country	Offshore/ industrial			Coastal commercial			Subsistence			Post harvest/ trade	
	SI	PI	OI	SI	PI	OI	SI	PI	OI	SI	PI
Cook Islands											
Federated States of Micronesia											
French Polynesia											
Fiji											
Kiribati											
Marshall Islands											
New Caledonia											
Palau											
Papua New Guinea											
Samoa											
Solomon Islands											
Tonga											
Vanuatu											

SI: Structural information such as number of fishers/boats/gear and type and size of boats/fishing gears.

PI: Production information such as quantity of catch/landings/sales

OI: Other information such as operation related indicators of fishing trips, biological indicators, socio-economic indicators, etc.

Complete or nearly complete coverage Partial coverage

Data collection strategies and methods

48. Small scale fishery sector, including artisanal commercial and subsistence fisheries, is characterized by numerous and dispersed landing sites, multigear and multispecies fisheries, which has financial, logistics and technical implications in the implementation of data collection.

49. Sample-based approaches or full enumeration strategy associated to data collection methods based on mandatory or voluntary reporting are principally used for the monitoring of the production along the distribution chain between fishers and consumers (surveys targeting markets, purchases of fish products by fish dealers or restaurants, processing establishments or exports). Collaboration between fisheries-line national agencies and other institutions like

office of statistics is a cost-effective way to collect the structural information requested to raise indicators obtained by sample-base data collection systems (e.g. census of population). Socio-economic indicators are collected through household surveys. These indicators are recognized as appropriate for the monitoring of subsistence fisheries in which the major part of islander households are participating.

Data management

50. Concerning data management, the regional review highlighted the need to enhance capacities on the use of database management systeMs National fishery line agencies should have in their staff some database management experts to assist fishery officers in the conception, development or maintenance of DBMS

51. Indicators produced by Pacific countries for the monitoring of small scale fisheries are mainly production oriented. Spatial dimension is not sufficiently taken into account in the analysis of indicators. Minimum requirements regarding data collection in ad hoc external funded project could favour national capacities to produce trends analysis in small scale fishing sector.

52. Some participants mentioned that data is being collected by countries since many years, but there is lack of analysis capabilities at national level. Moreover, coverage and quality data collected is not always suitable to produce the indicators required at national level. For this reason, review of the existing data collection scheme is necessary with some assistance.

Use of censuses and household income and expenditure surveys (HIES) for fishery purposes

53. Ms Josie B. Perez introduced how major statistical operations such as censuses and household surveys can be used for fishery purposes. The censuses being referred to were the census of population and census of agriculture and/or fisheries. She showed the comparison of census and survey (see **Table 6**) and explained that the Census of Population is basically conducted for: i) provision of baseline information to be used in the trend analysis and projection, etc.; ii) generation of sampling frame that can be used to select sample households for focused surveys conducted between census years; and iii) provision of small area statistics. In the context of the fisheries sector, it can be used to generate baseline information on:

- average fishing household size;
- number of male-headed and female-headed fishing households;
- number of household members engaged in fishing (occupation and industry related to fishing);
- number of household members employed as wage and salary earners in fishing;
- number of self-employed household members in fishing; etc.

Table 6. Differences between census and survey

Census	Survey
• Conducted every five or ten years • 100% coverage of households • More expensive • Inclusion of general but limited topics • Use as benchmark data • Generates small area statistics • Can be used as sampling frame	• Conducted more frequently • Using sample households • Cheaper than a census • Inclusion of more detailed topics but dealing in one subject matter • Use in more specific purposes • Generates data at the national level or provincial/district level • Use the census in drawing sample households

54. Ms Perez noted that these statistical information can also be cross-tabulated by sex, age and highest grade completed. Similarly the census of agriculture and/or fisheries can generate:

- number of male-headed and female-headed fishing households;
- number of fishers;
- number of hours worked in fishing;
- total catch and/or harvest;
- number of fishing gears and equipment used; and
- number of fishing boats.

55. These can also be cross tabulated by types of fishing activities of household members; kind of fishing gears; size and tonnage of boats used; fishing grounds/sites and fish landing areas, etc.

56. When constructing sampling frame for intercensal surveys, list frame can be produced from the Census of Population or Census of Agriculture/Fisheries, for example:

- List of household heads with at least one member who is engaged in fishing as self-employed or working without pay in fishing activity/operation or in subsistence fishing activity.
- List of fishing villages (with households whose members are engaged in fishing.

57. It was reminded that when incorporation of fishery related questions in the census of population is considered, such questions should be limited only to the involvement of households in any type of fishing activities. Putting so much burden on the contents of the census of population might cause problems during enumeration and later in the processing and generating of the list frame.

58. With regard to the generation of small area statistics, the census of population can produce the information on demographic and socio-economic profile of the smallest political/administrative unit of the country (e.g. fishing villages) such as population, sex, age structure, highest grade completed, occupation and industry of population engaged in fishing. Similarly, the census of agriculture and/or Fisheries can produce the information on the structure of fishing activity by the smallest political/administrative unit of the country or the next higher political/administrative unit, say district, depending on the coverage of this census.

59. As for the use of household surveys such as HIES on fishery purposes, it was explained that they can be used for more specific purposes such as:

- To identify the number of poor fishing households using a given minimum income that can buy the basic needs.

- To determine the poverty indicators of the poor fishing households.
- To find out the consumption pattern of households on fish and other marine products.
- To determine the average income and average expenditures of fishing households.
- To establish indicators on food insecurity of fishing households.
- To determine the sources of income of fishing households.

60. Question asked during the open forum was on the timing of the conduct of the census of agriculture whether it is possible to conduct it in the year after the census of population. The response to this was to allow first the results of the census of population to be released and have the sampling frame available before the census of agriculture/fisheries will be undertaken. Two years after the census of population can be the distance in conducting the census of agriculture/fisheries.

Strategies for data collection in a budget and manpower limited situation

61. Mr Shunji Sugiyama delivered a presentation on strategies for data collection in a budget and manpower limited situation, which was aimed at offering some ideas to conduct fishery data collection in a cost effective and efficient manner. He introduced six key strategic elements that are summarized as follows:

1) **Minimum requirements**: ***differentiate "need to know information" from "nice to know information"*** – It was stressed that current use of fishery information needs to be reviewed periodically to update the information requirements. In a budget and manpower limited situation, option is not always to collect more information but sometimes to trim down the scope of data collection.
2) **Effective use of external resources:** ***do you really have to do everything?*** – Effective partnerships and coordination with other (non-fishery) institutions were encouraged.
3) **Clear understanding of characteristic of fishery subsectors:** ***know your target*** – data collection methods that are originally designed for larger fisheries in temperate waters may not be adequate for coastal small scale fisheries in the region. As a first step to employ adequate data collection approaches, the importance of understanding the characteristic of the target population (fisheries) was highlighted.
4) **Combination of active and passive data collection:** ***consider if you should measure it or they can report it*** – It was suggested to consider adequate approaches to suite the setting and characteristics of the target population (e.g. an effective combination of "active" and "passive" data collection).
5) **Use of alternative approaches:** ***be creative and flexible in considering options*** – In the case of monitoring activities and production of subsistence fisheries, where routine collection of data can be very effort-intensive and expensive, the application of alternative approaches (e.g. use of proxy measurements) would be an option.
6) **Attain cooperative mind of fishers and others;** ***incentives and trust are the key*** – To attain data providers' understanding and cooperation on data collection activities is, essential for improving the quality of information. Several examples of doing so were introduced.

62. A more detailed description of key strategic elements is provided in the **Appendix G**.

THEMATIC GROUP DISCUSSION

Objectives and process of thematic group discussion

63. The group discussion session was designed to provide an opportunity for participants to practice logically structured process of designing/reviewing data collection systems, during which it was also aimed to:

- define information requirements for the issues relevant to participating countries;
- explore viable options to collect data in a budget and manpower limited situation through brainstorming discussions;
- outline required actions to generate identified information.

64. Discussion groups were made on an ethnic and geographical grouping of the Pacific countries so as to take account of the differences in cultures, customs and traditions in considering appropriate data collection approaches. The country composition of each group was as follows:

- **Micronesian Group** (*Facilitator: Mr Josie Perez, FAO consultant)*:
  Federated States of Micronesia, Guam, Kiribati, Nauru, Marshall Islands and Palau.
- **Melanesian Group** (*Facilitator: Mr Shunji Sugiyama, FAO)*:
  Fiji, New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu.
- **Polynesian Group** (*Facilitator: Mr Alexis Bensch, FAO)*:
  American Samoa, Cook Islands, French Polynesia, Niue, Samoa, Tonga and Tuvalu.

65. During group discussion, active facilitation was provided with a brainstorming technique known as "Cardstorming". The participants were provided with cards and requested to write their ideas on a card. All the ideas (cards) were posted on the wall in front of participants for viewing and discussion. This method helps stimulate brainstorming and facilitate communication among participants. The use of cards also provides operational convenience in the process of sorting, clustering and organizing ideas.

66. In order to facilitate logical thinking in designing/reviewing data collection systems, group discussion was structured to follow sequential steps as descried below:

Step 1: Selection of policy/management issues for discussion

The group discussion started with a session to clarify WHY fishery data and information were required. Each country was requested to identify three policy/management issues considered important in their respective countries. It was an intention of this workshop to take real issues for group exercise/discussion so that the results of discussion would reflect real situations in the countries even though the session was conducted in a form of exercise. Firstly, participants shared the issues with other group members and examined if there were issues shared by other countries and/or if there were issues, for which they had the common grounds. Based on this discussion, each group chose two issues to be dealt with during the rest of group discussion sessions

Step 2: Identification of policy/management questions

To have a list of policy/management issues (objectives) will not automatically guide a fisheries officer to come up with a list of information requirements. When fishery policies are being developed or when fisheries management plans are being formulated, fishery planners and managers may come up with a number of questions that need to be answered in order to take appropriate actions. These policy/management questions actually indicate the information requirements for a particular issue. In this session, participants identified policy/management questions that were related to the selected issue.

Step 3: Defining objectives of data collection

Identified policy/management questions were then translated into the objectives of data collection.

Step 4: Identification of information requirements (data items)

With a clear statement of objectives of data collection, information requirements can be identified. Participants listed information and data items required to meet objectives of data collection.

Step 5: Consideration of important factors that influence data collection

Implementation of a data collection system will be influenced by various factors and it is desirable that these factors are identified and taken into account in the design of a data collection system. Important factors include:

- characteristics of the activity/situation to be monitored;
- spatial coverage of the statistical population to be monitored;
- stakeholders;
- institutions concerned.

The way in which a set of data are collected needs to be tailored to the structure of the fisheries in question and their operational characteristics have also implications to data collection. Looking at spatial coverage is important in terms of considering necessary logistics for data collection. Identification of stakeholders at this stage will help in the process of identifying appropriate data source. As explained earlier, cooperation and coordination with other institutions is vital for cost-effective data collection.

Step 6: Data collection strategies and key attributes of data collection programmes

In a real situation, there must be a national process of prioritizing information requirements prior to this stage, which should be conducted with the involvement of major stakeholders. However, due to time limitation, prioritization of information requirements was not included in the group work. For the sake of practice, participants picked up a few key indicators for the selected management issue of each country and examined how best they could be collected. In order for a data collection programme to be designed to suit the structure and characteristics of target population, participants were guided by facilitators to carefully cover key attributes of a data collection system, details of which are described in the **Table 7**.

Table 7. Key attributes of a data collection component

	Attributes	Description/remarks
1	**Type of monitoring**	Broad categories of survey type: e.g. landing survey, market survey and household survey etc.
2	**Mode of monitoring**	Routine, periodical or ad hoc
3	**Scope of data collection**	In terms of fisheries, population concerned
4	**Geographic coverage**	It can be in relation with administrative divisions of the country
5	**Time reference**	Year of inception and termination (if applicable)
6	**Data source**	e.g. fishers, household members and market operators
7	**Size of the statistical population**	The total number of individual units in question

	Attributes	Description/remarks
8	**Data collection strategy**	Complete enumeration or sample-based
9	**Enumeration unit**	Unit for data collection
10	**Stratification**	If sample based, criteria of stratification
11	**Sample size**	Percentage of statistical population
12	**Data collection method**	e.g. questionnaires, direct observation, reporting etc.
13	**Data items included**	List the data items collected by the programme
14	**Data management**	In terms of use of software
15	**Data analysis**	Extrapolation of sample data, process of analysis etc.
16	**Dissemination**	Media used, frequency of reporting, target audience
17	**Remarks**	Constraints/limitations

Policy/management issues and information requirements (Steps 1 to 4)

67. Each subregional group selected two issues as listed below. A full list of national issues identified by participants is given in the **Appendix H**.

Micronesian Group

- Depletion of edible marine species.
- Addressing land-based issues on marine ecosystem (pollution, erosion, landfills, sedimentation, etc.).

Melanesian Group

- Concern raised over localized depletion of sedentary species (sea cucumbers, lobsters, *trochus* and giant clams) in coastal areas.
- Managing frequent occurrence of conflicts between resource owners and users.

Polynesian Group

- Avoiding overharvesting of reef resources.
- Maintaining the human population in the remote islands.

68. For the first issue, it was remarkable that all groups selected a similar issue (i.e. depletion or overexploiting of inshore resources) but in a different context. Micronesian group focused on national food security aspect of the issue while Melanesian group looked more at export oriented income generating aspect of the issue. As for the second issue, each group selected a different subject area; Micronesian group took an issue related to interactions with other sectors; Melanesian groups had an issue of conflict management in customary reefs; and Polynesian group's choice was a social issue of peoples' migration away from remote islands. It was, in fact, a good combination of issues of different nature. Since each issue would require different approach and a different set of information, participants can share the discussion results and learn each other.

69. It was highlighted that information requirements identified in this manner could precisely indicate the required level of details (e.g. catch by type of gear and by area, quantity sold by species, etc.). The detailed results of the step 1-4 were presented in the **Appendix I**. It was reminded that when this process of identifying information requirements is conducted at national level, it is important to involve key stakeholders (e.g. main users of information) in the process possibly through consultative meetings/workshops.

Consideration of important factors that influence data collection (Step 5)

70. The practice in this session identified some information that clearly illustrates the importance of considering these factors. For example:

- In Solomon Islands, there are at least 12 different ways of harvesting reef resources. If catch and effort are the data items to be collected, adequate breakdown of catch data and different units of fishing effort may be required in data collection.
- In a country where beche-de-mer is harvested only for exporting purpose, monitoring of this fishery could be effectively done at a market channel. However, in a country where beche-de-mer is also harvested for domestic consumption, the same approach can be applied. This is a case that cultural difference in food habit influences the data collection.
- It was confirmed that there are a number of potential partners in data collection. Institutions identified by this exercise include non-fishery government agencies (e.g. national statistics office), local government units, research institutions, public institutions (schools/hospitals), industries, NGOs and local communities. This suggests that fishery line agencies should not work in isolation from these potential partners in planning and implementing data collection.

71. The detailed results of this group discussion session are given in the **Appendix J**.

Data collection strategies and key attributes of data collection programmes (Step 6)

72. Each country practiced designing (a) data collection programme(s). Types of data collection chosen by each country are summarized below. The participants of the Polynesian group decided to take this exercise to collectively describe the data collection programmes for 2 issues chosen from step 5 in a general context (not in a country specific context).

Landing surveys

Guam: to monitor scuba spear fishing of groupers
Nauru: to monitor grouper fisheries
Fiji: to monitor illegal fishing activities
Polynesian group: to monitor grouper and surgeon fish fishery

Market surveys

Palau: to monitor giant clam collection
Kiribati: to monitor bonefish fishery
Marshall Islands: to monitor rabbitfish fisheries
Nauru: to monitor commercial production of groupers
Polynesian group: to monitor commercial production of grouper and surgeon fish

Household surveys

Federated States of Micronesia: to monitor mangrove crab fishery
Marshall Islands: to determine levels of catch and fishing effort
Nauru: to determine the level of participation to grouper fisheries
Polynesian group: to determine the consumption of fish products and the percentage of subsistence fishing activity

Reporting from a data source

Papua New Guinea: mandatory reporting on the purchase of sedentary species
Solomon Islands: mandatory reporting on the purchase of sedentary species

Others

Vanuatu: To determine the level of participation to fisheries through an agriculture census.
Vanuatu: To monitor status of reef resources through underwater visual census.
New Caledonia: Socio-economic survey on fishers.
Polynesian group: an underwater visual census to monitor the abundance of giant clams.

73. The results of group work can be found in the **Appendix K**.

Proposed plan of action

74. Based on the results of previous group works, participants drafted a proposed plan of actions to implement the data collection programme in their respective countries, with which participants were requested to specify the timeframe for actions as well as assistance required from FAO and SPC. Each country presented its plan in the group and group members scrutinized the plan for further improvement. By-country proposed plan of action are attached in the **Appendix L**.

CONCLUSIONS AND RECOMMENDATIONS

75. The workshop gave the participants an opportunity to review FAO Strategy for improving information on status and trends of capture fisheries (the Strategy-STF). The workshop recognised that Strategy-STF and SPC Strategic Plan for fisheries management and sustainable coastal fisheries in the Pacific Islands are important instruments. The workshop requested FAO and SPC to further exert the efforts to assist countries in the pacific region to implement the Strategy-STF and SPC Regional Strategic Plan.

76. The workshop noted that regional review of fishery data collection systems in the Pacific is a useful reference for improving national fishery data collection systeMs It was recommended that countries further exert the efforts to complete the country reviews of fishery information and data collection systems and that FAO FishCode-STF Project compile them as a technical document to be published and distributed to the participating countries.

77. It was suggested that FAO FishCode-STF Project continue to work with countries to complete the inventory of fisheries and resources. Countries are urged to provide reliable fishery data to the annual FAO global inquiry on fishery statistics.

78. The workshop agreed that finance and human resource constraints are common and persistent problems among many countries in the Pacific, which may not be immediately and easily solved. The situation is further worsened when relatively small fishery line agency with limited logistics capacity has to deal with numerous and scattered remote island communities. However, the workshop stressed that it is important to take these constraints as given conditions and to consider the best use of available resources for the effective data collection in a budget and manpower limited situation.

79. It was recommended that each country continue to evaluate/develop fishery data collection systems by applying the structured approach introduced during the workshop, which follows a sequential pathway of the understanding on WHY data are needed, through the clarification of data requirements (WHAT data need to be collected) and the consideration of HOW data will be collected.

80. The results of regional synthesis indicated that a shift in policy emphasis was evident in this region; adequate policy and management priorities/attentions have now been directed

toward small-scale inshore fisheries. This shift has inevitably brought new requirements of information, which have important implications in data collection such as:

- Data collection would need to extend its subject coverage to inshore fisheries, especially artisanal/subsistence fisheries, rather than narrowly focusing on revenue generating offshore industrial fisheries and fish processing industry.
- Data collection would need to take into account people's dimension in addition to resource dimension through the conduct of socio-economic surveys.
- Data collection may be required at the same level of management unit. In the case of decentralized management of fisheries, where management unit is province, district or communities, fishery information and data may need to be collected, analysed and managed at the same level of management.

81. The workshop recommended that countries look into this aspect of new information requirements in reviewing national fishery data collection systeMs It was confirmed by the regional review that the coverage of coastal commercial fisheries and subsistence fisheries in data collection has been very limited. Although there are several national efforts to monitor, for example, production from inshore fisheries, the quality of data collected are mostly very poor and the meaningful coverage of the subsector is hardly achieved.

82. Participants identified a number of policy/management issues, for which fishery information can provide a basis for sound decision making. These include:

- Maintaining the population (residents) in the remote islands.
- Assessment of the degrees of contribution by small scale fisheries to food security in different islands.
- Monitoring of marine products supplied to the domestic market in order to secure sustainable supply of fish.
- Sustainable development of coastal fisheries.
- Depletion of edible marine species.
- Preventing overharvesting of reef resources.
- Concern raised over localized depletion of sedentary (or non-migratory) species.
- Concern over sustainability of deep bottom fishery.
- Addressing land-based issues on marine ecosystem.
- Managing frequent occurrence of conflicts between resources users and resource owners.

83. Many countries mentioned the importance of managing sedentary species and reef/demersal fish resources (beche-de-mer, giant clam, trochus, green snails, mangrove crabs, groupers, parrot fish, etc.), which are vulnerable to overexploitation. The workshop explored ways of monitoring the production and marketing of these resources. It was also noted that although the biological information on these sedentary species is important for management, it is often difficult and costly to collect it. It was suggested that such information could be shared among countries in the region to reduce the cost of data collection.

84. It was apparent from the results of regional synthesis that there had been difficulties in defining the objectives of data collection in many countries. Without clear statement of data collection objectives, it would be difficult to identify appropriate indicators to be informed to the users. Poorly defined objectives of data collection imply that data collection may have not considered the needs of information users.

85. During the group discussion, it has been observed that many countries had indicated interest to develop/improve landing surveys, market surveys and consumption surveys. The market surveys and landing surveys are commonly used in the region to assess the commercial part of fisheries production and to monitor fish prices. The workshop recommended that countries evaluate the appropriateness of landing and market surveys in providing accurate and reliable estimates of production related information.

86. It is noted that sample based survey is a cost-effective way of collecting data; however the use of this type of survey has been very limited in the Pacific region. Even when it is practised, there is a tendency that it produces inaccurate results. This is partly attributed to the lack of valid frame information for selecting appropriate samples and to the lack of technical knowledge to apply sampling methods. It was viewed by many participants that developing user friendly manual for sampling design would encourage them to undertake sample based survey.

87. It was introduced to the participants that non-fishery types of data collection activities could also produce the information that directly meets the data needs of the fisheries sector and/or the information used for developing cost effective ways of data collection. Population census, for example, offers a precious opportunity to reach all the households in the country and produces valid frame information for various purposes. The workshop recommended that countries exert due efforts to explore the availability of existing data/information and also the possibility of coordinating with other institutions/initiatives such as the national statistics office, to use the existing data collection activities for fisheries purposes, namely the census of population, census of agriculture, household income and expenditure survey and other administrative information (business license, vessel registration and resource maps).

88. The workshop recognised that data management, analysis and dissemination have been very weak in many countries in the Pacific region. Although it appears that spreadsheet software is widely recognized as a useful tool for data analysis in the region, the use of DataBase Management Systems (DBMS) was encouraged for data entry and management in the workshop. SPC PROCFish project will provide necessary assistance if countries intend to introduce a DBMS

89. With regard to analysis of data, the SPC-ComSec-UNU/FTP-USP initiatives and its training programme plans to conduct a training course aimed at improving the national capacity to analyse fishery data for management purposes.

90. Dissemination of information is essential in terms of satisfying the needs of information users and providing feed back to the data providers. In doing this, the data must be analysed and interpreted in a way that intended users can understand and use the information. It was stressed that data providers need to recognise the benefits of providing data, which would contribute to more accurate reporting of data. The benefits to the data providers can be: i) providing them with a broader view of the subsector concerned; ii) indicating their contribution to the fisheries sector; and iii) informational material to promote their business.

91. Participants realized that practical exercise of the logical process of designing/reviewing fishery data collection systems was a good learning opportunity for them to apply this approach at the national level as it provided step-by-step guidance to set up a national plan of action.

92. The workshop recommended that participants share the knowledge they have obtained and tools they have learnt from the workshop with other staff of national fishery line agency and other stakeholders so as to facilitate their active participation and cooperation in the

process of improving national fishery data collection systems. The workshop stressed the importance of involving various stakeholders including policy-makers, resource managers, technical officers in charge of data collection, data providers and other users of information in the process of improving national data collection systems.

93. Countries are encouraged to further elaborate the proposed plans of action that was developed during the workshop in consultation with the head and other officers of the fishery line agency. The FAO and SPC actively support the implementation of proposed plan of actions to improve the information on status and trends of fisheries in the Pacific region.

94. FAO and SPC continue to work together for the further assistance of improvement of fisheries information in the region.

APPENDIX A

Workshop timetable and programme

Day/time	*Provisional agenda*	*Resource person*
DAY 1 (Monday, 22 May 2006)		
09.00	• Official Opening ▪ Opening Prayer ▪ Opening remarks ▪ Opening remarks ▪ Opening address	 Pastor (Pelenato) FAO (Fuavao) SPC (Adams) Samoa (Hon. Minister)
09.45	*Morning Tea/Coffee*	
10.15 10.25 10.40 11.00 11.30	• Meeting procedures • Background and Objectives of the workshop • Review of activities under FAO GCP/RAS/183/JPN Project : Support for improvement of statistics on coastal and subsistence fisheries and aquaculture • Review of activities under SPC Coastal Fisheries Programme • Introduction of FAO FishCode-STF Project	FAO (Izumi) FAO (Izumi / Sugiyama) FAO (Izumi) SPC (Fa'asili) FAO (Bensch)
12.00	*Lunch*	
13.30	• Regional synthesis and thematic comparative analysis of the national data collection systems	FAO (Sugiyama/ Bensch)
15.20	*Afternoon Tea/Coffee*	
15.40 16.20	• Case study on status of data collection / fishery statistics systems in Federated States of Micronesia and recommendations • Case study on status of data collection / fishery statistics systems in Federated States of Micronesia and recommendations • Fishery statistics compiled by FAO	FAO Consultant (Perez) Palau (Perez) FAO (Garibaldi)
17.00	Close of Day 1 sessions	
DAY 2 (Tuesday, 23 May 2006)		
08.30	• SPC's experience with dissemination of databases and associated software for coastal fisheries management in the region and issues to be considered	SPC (Magron)
09.30	• Introduction to thematic group discussions on "*improving fishery data collection in a budget and manpower limited situation*" • Grouping (subregional groupings)	FAO (Sugiyama)
10.00	*Morning Tea/Coffee*	
10.30	• Group discussion session 1 (Objectives of data collection)	Facilitators (FAO/SPC)
12.00	*Lunch*	
13.00 13.45	• Presentation on group discussions • Introduction to group discussion session 2 (Information requirements) • Group discussions	Facilitators (FAO/SPC) FAO (Sugiyama)
15.00	*Afternoon Tea/Coffee*	
15.00	• Group discussions	Facilitators (FAO/SPC)
17.00	Close of Day 2 sessions	

Day 3 (Wednesday, 24 May 2006)		
08.30	• Introduction of SPC-ComSec-UNU/FTP-USP Initiatives and its training programme	SPC (Naqasima-Sobey)
10.00	*Morning Tea/Coffee*	
10.30	• Use of population census, agriculture census and HIES for fisheries • Strategies for data collection in a budget and manpower limited situation	FAO Consultant (Perez) FAO (Sugiyama)
12.00	*Lunch*	
13.30 13.45	• Introduction to group discussion session 3 (Designing a data collection programme) • Group discussions (continued)	FAO (Bensch) Facilitators (FAO/SPC)
15.00	*Afternoon Tea/Coffee*	
15.30	• Group discussions (continued)	Facilitators (FAO/SPC)
17.00	Close of Day 3 sessions	
DAY 4 (Thursday, 25 May 2006)		
08.30	• Field trip on Upolu in cooperation with the Samoa's Fisheries Division	
12.30	*Lunch*	
14.00	• Presentation on group discussion session 3	
14.30	• Proposed plan of actions for improving information on status and trends of fisheries (Group discussion session)	Facilitators (FAO/SPC)
15.30	*Afternoon Tea/Coffee*	
15.50	• Wrap up of group discussions • Follow-up activities and partnerships for improving fishery information	Facilitators (FAO/SPC)
17.00	Close of Day 4 sessions	
DAY 5 (Friday, 26 May 2006)		
09.00	• Wrap-up discussions	
11.30	• Closing ▪ Closing remarks ▪ Closing remarks	SPC (Fa'asili) FAO (Fuavao)

APPENDIX B

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APPENDIX C

Opening remarks
by the FAO Subregional Representative for the Pacific Islands

Pastor Pelenato, Honourable Associate Minister, Members of Diplomatic Corps, participants, friends and ladies and gentlemen.

On behalf of the FAO Subregional Representative for the Pacific, Dr Vili Fuavao, who is currently on mission, I extend to you all warmest welcome to Samoa and in particular to the Subregional Office, in the occasion of the FAO/SPC Regional Workshop on Improving Information on Status and Trends of Fisheries.

As you are aware, global analysis of fisheries and fisheries resources has been a focal point for FAO over the years and it is based on FAO's annual fishery statistics questionnaires and other statistical information available from the countries and the regions. Knowledge on the status and trends of fisheries is a key to sound policy development, better decision-making and responsible fisheries management. FAO continues to assist countries in further improving data collection / fishery statistics under the Strategy for Improving Information on Status and Trends of Capture Fisheries adopted at FAO's twenty-fifth session of Committee on Fisheries (COFI) in 2003.

At the sixth Meeting of FAO South West Pacific Ministers for Agriculture held in Rarotonga, Cook Islands, 1–3 June 2005, Ministers expressed strong support to the need for sound management and sustainable use of coastal fisheries resources. In recognition of this, Ministers encouraged FAO to continue to assist countries in further strengthening fisheries management by improving data collection/fishery statistics in cooperation with regional organizations as a basis for effective policy-making and management of fisheries and aquaculture.

Since 2001, FAO and SPC have been closely working together in a series of activities in the region. Such as:

- Pacific Islands Regional Workshop on Fisheries Statistics held in Noumea in July 2001.
- Regional Policy Meeting on Coastal Fisheries Management held in Nadi in March 2003.
- Regional Training Workshop on Fisheries Management and Statistics held in Nadi in November 2004.
- Regional Workshop on Fisheries Legislation and Community-based Fisheries Management held in Honolulu in April 2005.

This week's Regional Workshop is another opportunity for us and another collaborative work with the SPC's Coastal Fisheries Programme for the improvement of fisheries information and fisheries management at large.

We look forward to this week's regional workshop, discussions and its outcomes, which will further guide us to the better management of fisheries resources at national and regional levels. Wishing you a successful workshop and enjoyable stay in Samoa.

Thank you for your attention.

APPENDIX D

Opening remarks
by the Secretariat of the Pacific Community

On behalf of the Director of the Marine Resources Division I would like to apologize for the absence of a member of the SPC Executive at this important workshop, however this meeting follows on from a series of regional meetings, including the Forum Fisheries Committee meeting. I was however asked to deliver an opening address on Tim's behalf.

The Director notes that there was a meeting two weeks ago in Sydney, to launch the AusAID 2020 strategy, which will plan Australia's aid to the region for the next few years. At that meeting, the importance of good information, particularly quantitative information about Pacific Island fisheries and other primary production sectors, became very clear. National, regional and international planning depends on good information. In particular economic growth and sustainable development depend upon it.

If you are infinitely rich you can throw money at any problem at the time it arises. If you are not so rich, like those of us around the table, you have to prioritise. You have to be able to identify the most important issues and pick out those where your money will be best spent to achieve the greatest future effect.

Information about fisheries is also important to fisheries management and conservation, but here local-level verbal information and community processes are also relevant. When it comes to national economic and trade planning, hard information is essential.

SPC is heavily committed to fisheries information, both quantitative and qualitative.

The first step, with PROCFISH/C, has been to develop an initial regional benchmark assessment of the state of coastal fisheries and this is now moving into its reporting phase. We are planning to follow up over the next few years with strategic assistance to members in developing more formal coastal fisheries and aquaculture monitoring processes, bearing in mind all the time what is appropriate and achievable.

We have outlined the basic SPC coastal fisheries statistics "model" at previous FAO and SPC workshops. That is to help those members that need it to set up a system for monitoring locally relevant indicators, with the occasional comprehensive survey accomplished with regional or external assistance as necessary to look at the status of fisheries and artisanal fishing. This survey would look not just at the status of stocks but the status of social and economic aspects of coastal fisheries. Most countries already have good trade statistics and there it is more a matter of compiling export licence information and extracting the fisheries figures from national databases.

We will be developing a more complete explanation of this model as part of a project proposal under the broad umbrella of applying the ecosystem approach to fisheries. And as the primary focus of this proposal we will be seeking assistance to help you develop sustainable coastal fisheries and aquaculture monitoring systems at the national and territorial level, for those members that do no already have them. This will be supported by a regional-level service to provide technical and scientific support and facilitate the occasional comprehensive surveys that I mentioned earlier.

Ladies and gentlemen, my Director asked me to convey his warmest regards and wishes you well in this workshop. In particular SPC will be interested to learn what you – our member countries and territories – consider to be the most appropriate and achievable things to monitor and report on when it comes to the development of your individual fisheries administrations, to achieve your international reporting targets as well as providing meaningful input into your national and local planning processes.

APPENDIX E

Keynote address
by the Honourable Associate Minister for Agriculture and Fisheries, Samoa

It is with great pleasure that I welcome you all this morning to this "Regional Workshop on Improving Information on Status and Trends of Fisheries". This has a strong focus on the availability and usefulness of information.

Such an information body is the foundation for sound policy development and research working group, for fisheries management in our Pacific region. It is also useful for the future planning of recreational activities.

Just two weeks ago, there was a very active participation in this area at the Home of Samoa International Game Fishing Association. One particular area of interest is the information providing an early signal as part of alert system. It stimulated appropriate actions to manage threats that are faced by those who invest in the sea. Without an alert system, one could expect some difficulties. During the last 2–3 years in Samoa, some of those in the long-line fishing industry have felt huge losses due to low catches.

In regards to food security, fish is our saviour. I am certain all of us here are "born fishermen" and are well aware that fish is a common part of our daily diet.

We, in the Pacific, are very fortunate to be small island countries surrounded by the sea. In the year 2000, over 62 million tala worth of fish was consumed in Samoa and 72 percent of that was a contribution by our people in the villages. Economically, commercial fishing has been a major foreign exchange earner for Samoa. The Tuna Industry represents about 60 percent of the national export and generally, this has been very good for the past 5 to 7 years.

The challenge for us now is to ensure that we have a sustainable supply of fish at an affordable price in the future.

On behalf of our Government, I extend our appreciation of the financial support and other forms of assistance from FAO, SPC and USP.

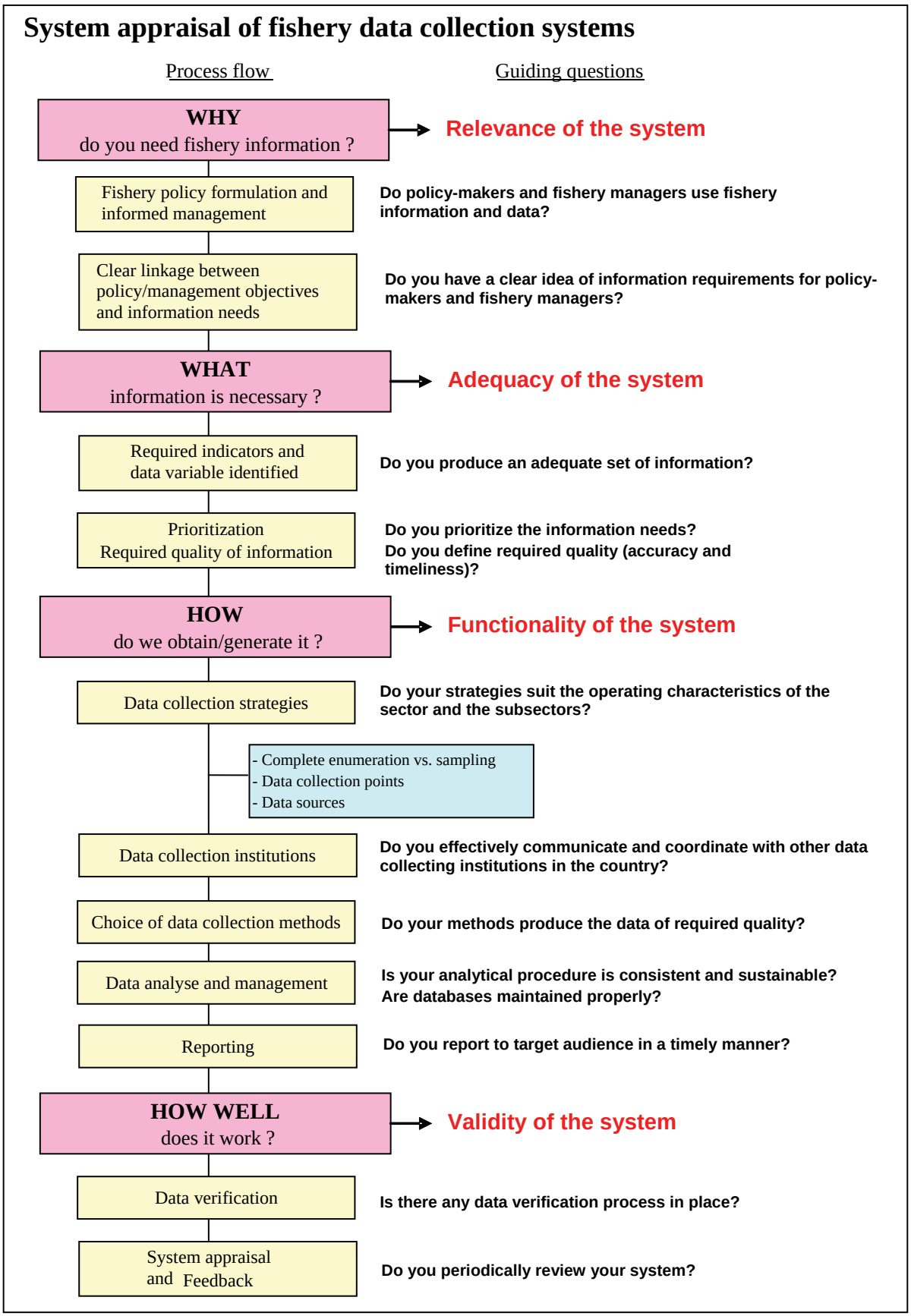
I also wish all participants a very comfortable and enjoyable stay in Samoa.

In closing ladies and gentlemen, I would like to declare this workshop officially open.

Soifua.

APPENDIX F

Guiding questions to review fishery data collection systems



APPENDIX G

Strategies for data collection in a budget and manpower limited situation

1) **Minimum requirements**: ***differentiate "need to know information" from "nice to know information"*** – It is often the case that the types of fishery data are adopted from somewhere else and they are collected as a routine of the fishery line agency without considering the needs for the data. It would be useful to review current use of fishery information and clarify who are using the information for what purpose. If there are some data that no one is currently using, it would be necessary to re-consider if collection of such data should be continued. In a budget and manpower limited situation, option is not always to collect more information but sometimes to trim down the scope of data collection. It is vital that major stakeholders (users of information) are involved in the process of re-defining information requirements.

2) **Effective use of external resources: *do you really have to do everything?*** – It is always worthwhile to check if required information already exists with other institutions before initiating any data collection activities. Field visits by STF project staff to selected countries in the region confirmed that non fishery intuitions do collect fishery information in the Pacific countries (see the section 7.1 Institutional arrangement above). It is encouraged that fisheries officers communicate with those intuitions and establish a good working relationship for coordinated data collection efforts. Where appropriate, countries should endeavor to incorporate fishery related questions into census/surveys conducted by other (non-fishery) institutions (see the section 7.2). In Vanuatu, for example, there were three fishery-related questions that have been incorporated in the census questionnaire:
   - Household uses a private canoe/boats.
   - Household uses a shared/ community canoe/boats.
   - Household goes fishing for subsistence purpose and/or for commercial purpose.

   With these questions, subsistence fishing households/commercial fishing households have been identified and number of boats was counted with their location. This provides valid frame information for constructing cost-effective sample-based household surveys (stratification of the fishing villages, numbers of households to sample).

3) **Clear understanding of characteristic of fishery subsectors: *know your target*** – data collection methods that are originally designed for larger fisheries in temperate waters may not be adequate for coastal small scale fisheries in the region. As a first step to employ adequate data collection approaches, it is important to have a clear understanding of characteristic of the target fishery(ies). To do this may require to simply focus on: (i) Who are in the subsector; (ii) What they have and do; (iii) Where they are located; (iv) Where and When they operate; and (v) How they operate. In this connection, the way to analyse production/distribution path was introduced. Population census and HIES can also be used to obtain a part of such information (see also the section 7.2).

4) **Combination of active and passive data collection: *consider if you should measure it or they can report it*** – Although it is likely that better quality information would be produced by direct measurement of production or monitoring of fishing activities by qualified fisheries officers themselves, this would not always be a viable option for small fishery line agencies in the region. An effective combination of "active" data collection (e.g. fisheries officers visits the filed for data collection) and "passive" data collection (e.g.

fishers send reports of their production to the agency) is hence required. The choice of the type would depend on cases since various factors including the characteristic of the fisheries and existing legislative framework would influence the decision. For example, if a meaningful portion of production is physically gathered at a certain place, it would make sense to consider sending a fisheries officer to the place for data collection. On the other hand, when there is a supportive legislative framework for data collection (e.g. report of catch can be made as a condition for a fishing licence), passive way of data collection can be considered.

5) **Use of alternative approaches:** ***be creative and flexible in considering options*** – In a budget and manpower limited situation, data collection strictly adhered to "text book" approaches may not always be feasible. Fisheries officers need to be flexible in considering approaches to generate necessary information of required quality. One example can be seen in the case of monitoring activities and production of subsistence fisheries. Because of their informal and dispersed nature, monitoring of subsistence fisheries is effort-intensive and expensive and hence doing this on a routine basis may not be achievable. However, if a comprehensive survey on subsistence fisheries is once conducted (possibly with donor support), quality data produced by the survey can be used as benchmark information to estimate key variables in the following years. After certain years another effort can be made to conduct a similar comprehensive survey to update the information[14]. In this way reasonably reliable information can still be produced to make sound policy and management decisions. If a routine collection of data on subsistence fisheries is attempted but only manage to produce an incomplete set of data with partial coverage, the information generated in such manner may not be useful for any information users. An illustration of this model case is given in **Figure 1**.

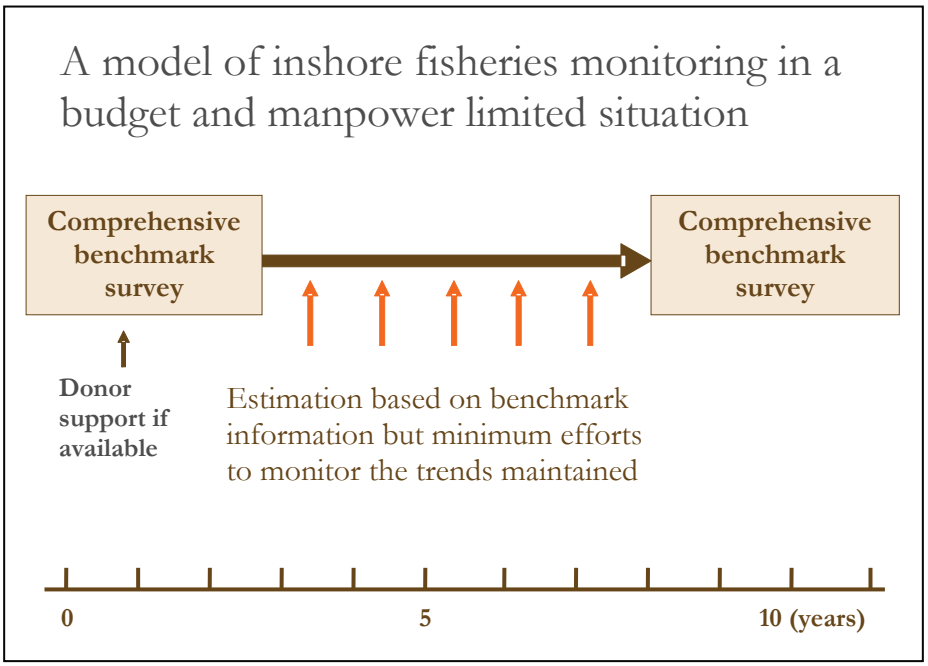


Figure 1. An example of alternative approaches to generate fishery information

[14] In this way, rationale to request necessary funds can be more convincing to national financial authority and/or external donors.

The use of proxy measurements is also an option. For example, if fishery line agency needs to have an idea of the level of subsistence production, direct measurement is extremely difficult but fish consumption data can be used to estimate the likely level of subsistence production with reasonable reliability. With this information, policy-makers and financial authorities would pay more attention on this important production sector possibly with additional resources allocated. Many Pacific countries regularly conduct a household income and expenditure survey that often provides detailed fish consumption data.

6) **Attain cooperative mind of fishers and others; *incentives and trust are the key*** – Fishers and others involved in fishery related activities are important data providers in fishery data collection. Their understanding and cooperation is, therefore, essential for effective implementation of data collection. However, they are not always willing to provide data to government agencies as they often see that data collection is linked to taxation or enforcement of regulations.

   Fishing communities that practice co-management of fisheries usually work very closely with local fisheries officers and mutual trust can also be found there. In those communities fisheries officers are not, at least, at odds with local fishers. Furthermore, in the framework of co-management, local communities are not only providers of information but also users of information. In a situation where local communities trust the words of fisheries officers and fully understand the objectives of data collection and where local communities recognize the needs of information to manage their own resources, they can be cooperative and more motivated to provide accurate data.

   Another possible way of attaining cooperative attitude of fishers toward data collection is to provide adequate incentives[15]. A good example can be found in Palau; BMR maintains commercial production data by individual fisher. Those fishers who wish to have a loan from the bank but do not posses properties to offer as collateral come to BMR for a certificate of his annual commercial production. Local bank may take this certificate as collateral and approve a loan.

[15] "Adequate" incentives do not mean those in monetary terms, which may not be sustainable and often cause adverse impacts.

APPENDIX H

The list of policy and management issues identified by participants

Country	Policy/management issues
Cook Islands	▪ Data collection of islands where no fisheries officer is stationed ▪ No proper central storage facilities for costal fisheries data ▪ Need for a fishery statistician to work for data analysis purposes
Federated States of Micronesia	▪ Decline in inshore fish species ▪ Issuance of licences for foreign boats ▪ Prevalence of illegal fishing
Fiji	▪ Inventory of all customary fishing ground (410 in total) ▪ Information on subsistence fisheries ▪ Fisheries department (and local divisions) needs to come up with adequate number of licences issued for each customary fishing areas (currently number of licence issued is not controlled)
Guam	▪ Managing scuba night spear-fishing ▪ Managing land based activities in order to minimise erosion/pollution effects on near shore resources (coral reef and seagrass, etc.) ▪ How to deal with too much fishing activities, especially with gears that are very efficient (monofilament gillnet, scuba, fish finders, etc.)
Kiribati	▪ Concerns on bonefish resources (sustainable supply) ▪ Frequent occurrence of conflicts and specific prices
Marshall Islands	▪ Integrating relevant entities/agencies to address crosscutting issues to take on ecosystem approach towards managing resources (to engage in the "Micronesian Challenge"[16]) ▪ To safeguard the coastal resources for food security (fisheries management plans + fisheries management organizations +conservation areas) and promote alternative livelihoods ▪ Standardizing a fisheries database that will include coastal information – commercial/subsistence/artisanal fisheries
Nauru	▪ Depletion of edible marine species (i.e. groupers) ▪ Integration of land-based issues that impact marine environment (e.g. sewage outlets and pollution) ▪ Promote co-management and resource conservation programmes
New Caledonia	▪ Increase the coverage of the inshore fishing activities including commercial, subsistence and leisure fishing ▪ Increase the quality of the reported statistics ▪ Optimize the relationships between bodies involved in data collection (coordinate the data collection systems)
Niue	▪ Need to evaluate the effectiveness of community based management of marine resources for conservation/recovery purposes ▪ Concern raised over sustainable supply of marine resources to support growing population in Niue ▪ Concerns over ciguatera poisoning of fish

[16] It is a regional framework that is aimed at poising the Micronesian island governments toward achieving the targets and objectives set forth in the Convention on Biological Diversity and the Millennium Development Goals.

Country	Policy/management issues
Palau	▪ Demand for parrotfish (humphead, Napoleon wrasse) – regulated species because of overfishing ▪ Uncontrolled harvest of wild giant clam
Papua New Guinea	▪ Conflicts on user rights and fishing rights ▪ Depletion of sedentary fishery resources ▪ Depletion of inshore lobster resources
French Polynesia	▪ How to maintain the human population in the remote islands ▪ How to assess the socio-economic contributions of the lagoon and reef fisheries to the local community ▪ How to raise the professionalism of the fishers involved in the small-scale nearshore pelagic fisheries
Samoa	▪ To monitor the depletion of sedentary species ▪ Management plan for the marine resources especially the coastal fisheries ▪ Improvement of the legal framework, legislation, ordinances concerned with coastal fisheries
Solomon Islands	▪ Need to improve the monitoring of catches of the inshore/coastal fishing sector ▪ Need to manage the inshore/coastal resources ensuring long-term conservation and sustainable utilization and maximizing benefits ▪ Species specific management plans
Tonga	▪ Overharvesting of marine species ▪ Stock assessment ▪ Fisheries contribution to economic growth of the country
Tuvalu	▪ Growing population and its effect on reef fish especially on Funafuti, capital where 40 % of population reside. ▪ The increase of spear fishing especially at night and its effect on the corals/supply of fish ▪ Amount of fish harvested for subsistence purposes
Vanuatu	▪ Decline in sedentary species ▪ Concern for sustainability of deep bottom fishery ▪ Managing conflict between resource users and resource owners

Note: Some countries listed issues related to data collection instead of policy/management issues.

APPENDIX I

Summary tables of the group work results (information requirements)

1) Micronesian group

Issues	Management questions	Objective of data collection	Information requirements
Depletion of edible marine species	What is the total consumption of marine species?	Determine species used for self consumption	– Qty: weight/value – Qty by type of species – Qty consumed/sold locally/exported – Qty by process (fresh, canned, smoked)
		Determine species used for commercial use	
	Are the marine products harvested getting smaller in size?	Determine the changes in size of marine species	– Size of marine species harvested and use (subsistence, sales, exports) by species – Breakdown by types of gears used for harvesting marine species
		Identify the different types of fishing	
	How much harvest (catch) can you do without negatively affecting of stock?	Determine the total annual catch	– Annual total catch by species – Estimates of available stocks of marine species – Fishing effort–time spent fishing, no or fishermen, fishing ground area – No. of months (open season)
		Determine the available stock of marine species/habitat	
	What are the biological characteristics of marine species that make them vulnerable to over-exploitation?	Identify which species are slow growing and easily harvested	– Growth rate, fecundity info from research, spawning season
Addressing land-based issues on marine ecosystem	What is the watershed?	Determine the hydrology of the watershed	– Elevation data, slope – Location of rivers – Type of vegetation along rivers
	What are the major land-based activities affecting the marine eco-system?	Identify the major land-based activities affecting marine ecosystem	– Types of land-based activities – Use of chemicals (fertilizers, pesticides, etc.) on the lands along the rivers – No. of households along rivers
	What is the impact of land-based issues on marine ecosystem?	Determine the impacts of land-based activities affecting the marine ecosystem	– Effects of the land-based activities – Erosion, sedimentation, landslide, runoff – Growth of algae, eutrophication – Health status of corals

2) Melanesian group

Issues	Management questions	Objective of data collection	Information requirements
Managing frequent occurrence of conflicts between resources owners and users	Who are involved in the utilization of marine resources in the areas concerned	To identify and monitor the number of different fishing units	– Details of fishing licence issued in the area – Details of boat licensed in the area – People who participate in fishing in the area (including occasional collectors of marine products)
		To identify other stakeholders	– Buyers active in the area – potential buyers/middlemen – Resource owners
	How fishery resources are harvested in the areas?	To identify target species	– Production by species
		To identify fishing gear used	– Number of fishing gear
		To identify fishing areas	– Location of fishing areas
		To identify vessel type and characteristics	– Number of boat by type and size
		To monitor the extent and frequency of fishing	– Fishing effort – Fishing trips /week
	What are the occurrences and distribution of resources?	To identify commercial resources harvested and monitor the quantity	– Production by species in the area
		To monitor the areas they are caught	– Fishing ground
	How local management areas are demarcated?	To identify boundary of fishing areas	– Maps and charts
		To identify boundary of management areas	– Map and charts
	How wealth is distributed?	To monitor household income	– Income for fishing per week – Income from other sources per week
		To monitor household expenditure	– Expenditure by items
		To monitor standard of living	– Household assets
	What are the social status and relations of people concerned	To study social status of different ethnic groups	– Rightful resource owners in the area – Ethnicity composition – Age group and gender
		To study social hierarchy of the community	

Issues	Management questions	Objective of data collection	Information requirements
	How much is the demand for fish?	To study peoples' preference to fish	– Price of fish
		To monitor sale of fish	– Sales of fish by species by day
	What is the local management capacity	To study degree and extent of provincial/local/chief's authorities	– Degree of jurisdiction – Management measures imposed in the area
		To study institutional arrangement in the area	
	What is the existing legal frame work?	To review existing legislation at different management level	– Content of legislation
Concern raised over localized depletion of sedentary species in coastal areas	Who are stakeholders involved?	To identify fishers	– Details of fishing/boat licence issued in the area – People participate in fishing
		To identify buyers	– Business licence – Processing licence
		To identify exporters/importers	– Exporters/importers licences
	To what extent do people depend on these fisheries	To monitor level of dependence	– Income from these fisheries and others – Income for these fisheries by season – Hours spent on harvesting these species
	What are resources utilized?	– To identify species harvested – To monitor the production – To study biology of species	– Catch by species by area – Size by species by area – Area and season of spawning
	What is the status of resources?		
	What is the level of exploitation?		
	– How fishing is conducted in the area	– To identify fishing methods used	– Type of gear
		– To identify fishing ground	– Location of fishing areas
		– To monitor fishing efforts	– Total hours of fishing – No. collected by methods
	– How marine organisms are processed and distributed?	– To monitor production of processing plants	– Type and quantity of products
	– What are the market forces? – (domestic and export)	– To monitor the trends of purchase price of products	– Price of products by species/grade – International price

Issues	Management questions	Objective of data collection	Information requirements
		– To monitor demand for the products	– Exported quantity and value by type of products
		– To monitor exported value and quantity	
	– What is the existing regulatory framework?	– To review existing legislation at different management level	– Content of legislation (size limit, closed season and closed area)
	– How effectively regulations are enforced?	– To identify different mode of enforcement	– Fishery laws, by laws and regulations
		– To monitor the level of compliance	– Occurrence of illegal activities
	– How effective are those regulations in place?	– To measure the effectiveness of the regulations	– Production trends – Size distribution of catch

3) Polynesian group

Issues	Management questions	Objective of data collection	Information requirements
Avoid overharvesting of reef resources	What is the status and trend of reef resources?	Analysis of catch, effort and CPUE time series	– Catch: number, length, weight and value of fish for the subsistence and commercial categories – Fishing effort
	What are the fishing methods?	Identification of the more destructive methods	– Type of fishing method – Number of fishers by subsistence, commercial (full-time and part-time), recreational
		Determine the selectivity of the different fishing gears used	– Type of fishing gear – Fish size – Species composition by gear
	Who are the resources users?	Identify different types of users	– Number of consumers – Number of post harvest/outlets, hotels/restaurants, exporters
	Which the exact fishery resources are over-harvested?		

Issues	Management questions	Objective of data collection	Information requirements
Maintain the human population in the remote islands	Can fisheries provide enough food and income for the population of remote islands?	Determine the abundance of the resources	– MSY for main commercial species – Species identification for current and possible commercial species
		Determine value of production	
		Determine the economic contribution of fisheries to local people	– Production of marine and other food items – Average income from fishery products for fishers
		Determine availability and relative contribution of food type	– Diet composition – Food consumption per caput
		Determine the human population structure	– Population size and ages distribution
	What are the reasons of the migration?		

APPENDIX J

Summary tables of the group work results (important factors)

1) Micronesian group

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
GUAM	Depletion of edible marine species	– Scuba spearing	All of Guam	– Subsistence and commercial fishers – Consumers	– Spear fish association, Fisheries office
FEDERATED STATES OF MICRONESIA	Depletion of edible marine species	– Introduction of new fishing methods	Fishing grounds	– Community residents	– Community management group
KIRI-BATI	Depletion of edible marine species	– Scuba fishing	Whole Kiribati	– Fishermen from outer islands	– Government
MARSHALL ISLANDS	Depletion of edible marine species	– Reef fisheries	All of Marshall Islands	– Market operators – Boat owners – Land owners – Whole community – Local government council – Commercial/subsistence fishers – Recreational fishers	– Marshall Is Marine Resources Authority – Economic Policy Planning and Statistics Office
NAURU	Depletion of edible marine species	– Scuba spear fisheries, – Deep bottom fishery	All Nauru	– Consumers, subsistence	– Fisheries office

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
PALAU	Depletion of edible marine species	– Spear-fishing, – Net fishing, – Bottom line fishing – Collecting fisheries	Fishing grounds nation wide	– Markets – Tourism industry – Recreational and commercial fishing associations	– Bureau of marine resources – Office of planning and statistics – Palau International Coral Reef Center – Coral Reef Research Foundation – Palau Conservation Society

2) Melanesian group

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
FIJI	Management of customary reefs	– Unlicensed night diving – Gillnetting (use of 3" nesh size) – Destructive fishing (explosive and chemicals)	– Night diving - Lomaivit, Kadavu and Lau districts – Gillnetting - Rewa district – Explosives - Ba, Tavua, Ra coasts and Bua districts	– Tourism – Resource owners – Environment Dep. – Provincial offices – Native land and fisheries commission – NGOs – Other government departments concerned – Trades – Compliance institutions (Navy/Police)	– Fiji Locally-Managed Marine Area Network (FLAMMA) – School of Marine Science, USP – SPC – Provincial administration
	Depletion of sedentary species	– Hooker gear for collecting mollusks – Aquarium fish collection	– Hooker gear - Bua and Yasawa districts – Aquarium fish - Nabukebuke, Nadumumai and Coral coast and Malolo districys – G. clam - Yasawa and Makogai District		

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
NEW CALEDONIA	Management of customary reefs	– Trolling – Small scale long line – Drift net – Drop line around FADs – Scuba fishing	Provincial waters (up to 12 nm)	– Distributors of fish – Tourist industry – Exporters – Importers – Consumers – Buyers – Investors – Administrative institutions – Fishers – Ice makers – Freeze storage operators – Retailers	– IFREMER – Universities (Local and France based) – WWF – UNESCO
	Depletion of sedentary species	– Trochus – BDM – Lobster – Oyster – Giant Clam			– Provincial fisheries offices (3 provinces) – Local government office (SMMPM) – Statistics Office (ISEE) – Customs – Economic affairs office (DAE) -central and provincial
PAPUA NEW GUINEA	Management of customary reefs	– Live Reef Food Fish fisheries – Sedentary resource fisheries (BDM, Trochus , GC) – Gulf of Papua prawn fisheries – (Methods) – Hand line – Free dive – Trawling	– LRFF - National (3 provinces) – Sedentary resources National (15 provinces) – GoP Prawn - National (2 provinces)	– Diving industry – NGOs – Churches – Game fishing associations – Youth groups	– National Statistics office – NGOs – Provincial fisheries offices – ADP project (CFDMP) – Airline and shipping agent – Papua New Guinea national bank – Papua New Guinea legal systems – All fisheries – Stakeholders
	Depletion of sedentary species	– BDM fishery – Trochus Fishery – Green snail fishery (Methods) – Free dive	National (15 provinces)		

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
SOLOMON ISLANDS	Management of customary reefs	– Night diving – Reef gleaning – Spear fishing (diving) – Kite fishing – Drop-line fishing – Tow line fishing – Dredging (for BDM) – Gillnet – Kura (traditional fishing) – Scuba diving fishing – Dynamite fishing – Poison leaves	Operational areas of buyers in Honiara	– Exporters – Resource owners – Fishermen associations – Researchers – Buyers (schools/hospitals/hotels)	– National Statistics office Customs and exercise – NGOs - Solomon Islands Locally Managed Marine Area (SILMA) – Provincial fisheries centers – SPC – City councils – Central bank
	Depletion of sedentary species	– Trochus – BDM – Lobster – Giant Clam – Aquarium fish			

Country	Issues	Fisheries concerned	Spatial coverage	Stakeholders	Institutions concerned
VANUATU	Management of customary reefs Depletion of sedentary species	(Target resources) – Trochus – BDM – Giant Clam – Aquarium fish – Game fish – Bottom fish (Methods) – Night diving – Hooker/scuba – Crowbars/piece of metal for G. clam – Drop-line/longline – Free dive/snorkeling – Trolling	Shefa provincial waters	– Provincial governments – Traditional resource owners – Resource users – Resorts/diving operators – Other government agencies – NGOs – Coastal communities	– National Statistics office – Environment Unit – Customs – Fisheries department – Fishermen's associations

3) Polynesian group

Country	Issues	Fisheries concerned	Relevant information regarding this fishery	Spatial coverage	Stakeholders	Institutions
COOK ISLANDS	Overharvesting of reef resources	Giant clam: *T.maxima*	100% subsistence No marketing	2 Islands: Rarotonga and Aitutaki	Island councils	Ministry of marine resources
			Ongoing data collection: 1 assessment 10 years ago 1 hatchery (aitutaki) => reintroduction of T.derasa T.Gigas (1 side of the island) Only for meet consumption	Lagoon	Population	Ministry of outer islands

Country	Issues	Fisheries concerned	Relevant information regarding this fishery	Spatial coverage	Stakeholders	Institutions
AMERICAN SAMOA	Overharvesting of coastal resources	Groupers and surgeon fishes fishery		Reef coastal area	Fisher communities fish markets	Statistics Division of Department of Commerce
NIUE	Overharvesting of reef resources	Clams	No ongoing data collection	Western side of the island	Communities	Fisheries department
					Local market	IWP (international waters project)
SAMOA	Overharvesting on reef resources	Groupers fishery	Fishing season from may to July Ongoing data collection: fish spawning surveys (2 years project finishing in 2007)	Country level (2 islands) Inshore and off shore	Fishers Communities Road side Outlets, 2 markets, hotels and restaurants	Ministry of agriculture and Fisheries – Fisheries Division Statistics department
TONGA	Overharvesting of reef resource	Sea cucumber	Exported and market locally	All the islands	Fishers Exporters Communities	Ministry of fisheries Ministry of statistics
FRENCH POLYNESIA	Maintain human population in remote islands	Lagoon and reef fisheries	No ongoing data collection	Tuamotu atolls	Local population Local authorities	Ministry of the sea – fisheries office Ministry of Agriculture – rural development unit Ministry of Finances – Statistics institute Economic affairs office

APPENDIX K

Summary tables of the group work results (data collection programme)

1) Micronesian group

Country	GUAM	FEDERATED STATES OF MICRONESIA	REPUBLIC OF PALAU	KIRIBATI	MARSHALL ISLANDS		NAURU		
Management Issue	Scuba spearing of groupers	Depletion of mangrove crab	Depletion of giant clam wild stocks.	Depletion of bonefish	Decline of rabbitfish population (and other target species)		Depletion of grouper fish		
Type of monitoring	Landing survey	House hold survey	Market survey	Market survey	Market survey	Fish catch survey	Market survey	Landing survey	Household survey
Scope	Large groupers	Mangrove crab fishery	Giant clam wild stocks	Bonefish fishery	All commercial fisheries	Commercial and subsistence	Grouper commercial fisheries	Grouper fishery	Grouper fishery
Key Information requirements	Catch data	Quantity and value	Quantity (count)	Quantity and price by species	Quantity, size and price by species	Catch, effort, Number of fishers involved, weight, size, location	Quantity and price	Catch and effort	Number of persons, involvement in fisheries activity
Mode of monitoring	Routine (8 times per month)	Periodic	Routine	Routine	Routine	Periodic	Routine	Ad hoc	Periodic
Geographic coverage	Island-wide	State /Municipality	National	National	Main market centers (Ebeye and Majuro)	National	The main fish market and private enterprises	3 landing sites	National
Time reference	1982 to present	Past quarter (every quarter)	2007	Past month	Annual (FY)	Annual (FY)	Past month	Past week	Every 5 years (last in 2002)
Data source	Scuba spear fishers	Household	Restaurants	Market operators (agents)	Fish retailers and restaurants	Fishery households	Fish dealers	Fishers	Household
Size of the statistical population	50 fishers	1 000 households	500	350 agents	23 establishments in Majuro (1 in Ebeye)	Unknown	60 fish dealers	50 fishers	1 000 households
Data collection Strategy	Sample-based	Sample-based	Total enumeration	Total enumeration	Full compliance	Sample-based	Sample-based	Sample-based	Sample-based

Country	GUAM	FEDERATED STATES OF MICRONESIA	REPUBLIC OF PALAU	KIRIBATI	MARSHALL ISLANDS		NAURU		
Enumeration unit	Fishing trip	Household	Monthly sales	Daily sales	Daily purchases	Fishing trip	Daily sales	Fishing trip	Household
Stratification (if sample based)	Major landing sites	Systematic, stratified by state	NA	NA	NA	5 fishers, community atoll, 2 weeks/2 seasons/ year	In time: 3 days a week randomly	In space: 2 out of 3 landing sites, type of boats: canoes, OBM boats	In space: fisheries officers by district, in time: 2 days a week
Sample size (% statistical pop.)	100%	10% of the total households	100%	All fish agents	Right now, only in Majuro but not only 15/23 compliance so far	Depends on the atoll sampling	80% of daily sales	10% fishing trips	20% of households
Data collection method	Structured interviews	Questionnaire	Voluntary reporting structured interview	Structured interviews	Invoices are issued to participating establishments and requested to fill out whenever purchasing fish	Fish catch recording sheets worth $10 per set	Structured form	Structured interviews	Questionnaire
Data items included	Catch	Quantity and value	Quantity (count)	Quantity and price by species	Qty in weight and price per species	Spp, qty in wght, fishing method, fishing trip, number of fishers, location	Quantity and price per species	Catch (kg) by species, Hours spent fishing	Household composition, days eating fish / week, Fishing activity: professional, part-time, subsistence
Data management	Foxpro	SPSS, CSPro and Microsoft Access	Excel and Access	Access	Excel	Excel	Excel	Excel	Dep. of Statistics/SPC
Data analysis	Extrapolation	Data aggregation by state	Spatial analysis using GIS	By Island	Extrapolation and grouping by fish categories, price unit, month and area	Extrapolation and grouping by spp, fishing method, location and collection period	By dealer	Extrapolation and grouping by species, district and month	Data aggregation

Country	GUAM	FEDERATED STATES OF MICRONESIA	REPUBLIC OF PALAU	KIRIBATI	MARSHALL ISLANDS		NAURU		
Dissemination	Reports	Web site, newsletter, publication and media	Community meeting, Media, Quarterly and Annual Reports	Radio, newsletter	MIMRA annual report, report sent to Local Government, web site	MIMRA annual report, report sent to Local Government, Web site	Fisheries Newsletter, Media, Radio	Fisheries Newsletter	Report sent to communities and institutions
Remarks			Lack of funding, shortage of staff		Securing budget, full compliance by participating establishment, staff shortage, still evolving system	Same as above mentioned	Data analysis not undertaken effectively. Not effective monitoring in place yet		

2) Melanesian group

Country	PAPUA NEW GUINEA	VANUATU		SOLOMON ISLANDS	NEW CALEDONIA		FIJI
Management Issue	Depletion of sedentary species	Depletion of sedentary species		Depletion of sedentary species	Depletion of sedentary species	Management of customary reefs	Management of customary reefs
Key Information requirements	Qty and price by species	Participation to fishing activities	Size of species	Quantity by species by province	Fishing efforts	Composition of fishing society	Indicators for the occurrence of illegal fishing
Type of monitoring	Catch record questionnaire	Agriculture household survey	UV Census	Locally purchase reports	Socio economic survey	Census	Landing site surveys
Scope	All licensed sedentary fisheries	All fisheries		Commercial fisheries			All fisheries conducted in customary areas
Mode of monitoring	Routine	Ten years Interval	Annually	Quarterly reports collect from buyers	Regular (when fishermen give log book	5 years or more	Ad hoc (surprise)
Geographic coverage	National (15 Provinces)	National	Fishing area Specific	All Provinces	Provinces – All country		Specific target areas

Country	PAPUA NEW GUINEA	VANUATU		SOLOMON ISLANDS	NEW CALEDONIA		FIJI
Time reference	Annual	June 2006 (Already plan)	Every two years	1991	Every year minimum	Last in 2005	Yearly Jan - Dec
Data source	Licence, buyers and exporters	Household though National Statistics Office	Surveyors	Buyer	Fishermen, provinces, population		Fishers Buyers
Population size	75 Exporters	Unknown	NA	10 Exporters	440 fishermen	300 000 population	500 fishermen
Data collection Strategy	Total Complete enumeration	Complete enumeration	Sample	Complete enumeration	Sample	Complete enumeration	Sampling in time
Enumeration unit	Monthly	Household					
Stratification	NA	NA		NA		NA	Twice a week
Sample size	NA	NA		NA		NA	
Data collection method	Mandatory reporting of catch report	Structured Interview	Standardized UV form	Mandatory reporting	Mandatory reporting	Structured Interview	Direct Observation
Data items included	Qty, price, quality, species, areas	Number of person involved in fisheries activity	Fishing/Collection	Quantity by species by province, Buyers Species sold Prices of species Fishers, Village/Province	Species by weight/gear/time/ area	No., age, sex of each fisheries by ethnic	Quantity - explosive Size - net mesh sizes Species - irregular increase in sale
Data management	Excel Access	Unknown	ProcFish Database	Access and Excel	Unknown		Unknown
Data analysis	Production Trend relating to TAC	Calculate the level of participation by province	Estimation of average size of species	Production trend of size by species by province	Return rate of log book and extrapolation	Unknown	Degree of Compliance
Dissemination	Local media - radio and newspaper	Web site		Dissemination upon request	Biannual Reports	Reports and Media	Radio Reports Provincial Meetings

Country	PAPUA NEW GUINEA	VANUATU		SOLOMON ISLANDS	NEW CALEDONIA		FIJI
Remarks	No records from buyers from within localized areas	No constraints		Error in the forms eg. no species name	Difficult to calculate fishing effort	Questionnaire design problem Duplication of institution	Lack of Finance, personnel and transport. Aggressive response from fishermen

3) Polynesian group

Management Issue	Overharvesting of reef resources: giant clam	Overharvesting of reef resources: Groupers and surgeon fishes		
Key Information requirements	Abundance Distribution of sizes	Commercial production	CPUE by fishing method and type of fishing boat, discards, species composition and fish size by fishing method and type of fishing boat	Subsistence production
Type of monitoring	**Underwater visual census**	**Market survey**	**Landing survey**	**House hold survey**
Scope	Giant clam fishery	Commercial inshore fisheries	Inshore fisheries	Whole population
Indicators	Abundance index	Qty and numbers, price by species and by invoice	% of production not marketed (indirect measurement of subsistence production) CPUE by fishing method by species or species group discards	Average consumption % of what is bought and what is got for free
Mode of monitoring	Periodic	Routine	Periodic	Ad hoc
Geographic coverage	Reef area (< 3meters depth)	Island	Main landing areas	All the island
Time reference	1 time a year			
Data source	Fishery officers	Retailers (markets, restaurants, hotels, etc.)	Fishers	Households
Size of the statistical population	N.A.	25 fish dealers	Unknown	Provided by the last population census

Data collection Strategy	Sample-based (transects)	Full enumeration	Sample-based	Sample-based
Enumeration unit	Transect (4m x 100m)	Invoice	Fishing trip	Household
Stratification	Spatial	None	By fishing method By type of boats (commercial, artisanal)	By type of community
Sample size (% statistical pop.)	12 transects by 100meters selected randomly - Maximum nb of sites according to the HR allocated	N.A.		
Data collection method	Direct observation	Mandatory reporting	Structured interview (logbook type)	Questionnaire
Data items included	Number of individuals and size of each individual	– Number, quantity and price by species – Name of the fisher (used in combination with logbook samples to estimate non-commercial part of the landings)	– Catch by species – Time spent fishing – Discards (for commercial) – Sub-samplings of length	– Consumption of fishery product – % of what is bought and what is got for free – number of adults and number of kids
Data management	Now use of Excel. willing to use database management system if available at no cost	Database management system (MS-Access)	MS-Access Database management with forms and reports	Specific data base management system
Data analysis	– Length frequency – Density: extrapolation to the site and to the whole coral reef (reef length estimated from map) – GIS if possible	– Total catch – Prices by species by month by type of retailer	– Average CPUE by type of boats and by fishing method – Estimation of non-commercial part using the difference between logbook and invoices from the market survey – Length frequency by species, fishing method and type of boat – Species composition of catch by fishing me	– Estimation of the total fishery products consumption: summing samples and extrapolation in time and in space (communities not sampled)
Dissemination	– Scientific report for scientists – Summary report for communities	Annual report sent to communities and data providers	– Scientific report – Report for managers – Organization of workshop with data providers	– Scientific report – Report for managers – Report to communities
Remarks	– "on-the-job" training of GIS – Statistics training Assistance for database development			– could be done in collaboration with office in charge of statistics – develop capacities of analysis and use of this type of information

APPENDIX L

Proposed plan of actions

Micronesia

1) Federated States of Micronesia

Issue addressed	Depletion of mangrove crab	
Type of monitoring	Household survey	
Phase	**Activity**	**Timeframe**
Planning	User meeting and budget planning	1/07
Designing	Design of questionnaires	2/07
Training	Enumeration/Surveys	3/07
Data collection	Actual enumeration	5/07
Survey quality control	Editing/validation	6/07
Data tabulation	Data entry	7/07
Data analysis	Table development	8/07
Report writing	Procedural history and Report printing	9/07
Data dissemination	Users meeting, CD, media	10/07

2) Guam

Issue addressed	Depletion of large groupers due to scuba fishing	
Type of monitoring	Landing survey	
Phase	**Activity**	**Timeframe**
Info gathering	Survey market for reef fish currently sold Info from older fishers about fish resources	
Analyse historical data	Historical creel data/market survey for fish caught in years prior Analyse historical catch by methods to observe trends	
Strategizing	Budget constraints Forms Field survey sampling design Target fishing method (scuba spear) Which ports Survey protocols Public campaign design	
Training staff	Use forms Training in interview protocols to reduce bias Species identification	
Public awareness	Approach fishers ie program Fishermen cooperative Village meetings Advertise program to public	

Implementation	Collect data/quality control	6/07-> 6/08
	Data input/quality control/analysis	7/08
Report generation	Tech paper, PPT, brochure	8/08
First engage fishers with draft report	Clarification of results/methodology	8/08
Dissemination, final report	General public Fisher association Legislative	9/08

3) Marshall Islands

Issue addressed	Decline of rabbitfish population (and other target species)	
Type of monitoring	Market survey and Fish Catch Survey	
Phase	**Activity**	**Timeframe**
Planning and design		11/05
Preparation	Consultation with Local Government Council	12/05
	LGC legalize the activity Announce to retailers Train LGC counterparts	12/05
	Distribution of invoices to retailers and restaurants	1/06
Data collection	Monthly collection +data entry (Excel)	
Analysis	Compile + analyse monthly results for comparison w/ fish catch data (origin, price, qty sold…)	1/07
Reporting	Finalize report +distribute	

4) Kiribati

Issue addressed	Depletion of bonefish	
Type of monitoring	Market survey	
Phase	**Activity**	**Timeframe**
Planning	Budget meeting	1st quarter 07
Designing	Interviews	6/07
Data collection	Total enumeration	10/07
Data entry	Data entry	1st quarter 08
Data analysis	Pivot table	5/08
Report writing	Report printing	10/08

5) Nauru

Issue addressed	Depletion of grouper fish	
Type of monitoring	A combination of market survey, landing survey and household survey	
Phase	**Activity**	**Timeframe**
Review of available data	Analyse market data Target species	7/06
	Review questionnaires	7/06
Training	Reviewed quest.	7/06
Data collection and entry	Ongoing	7/06
Data analysis	New data	2/07
Report writing	Printing, ed	3/07
Dissemination	Newsletter, media, radio	4/07
Budget review		4/07

6) Palau

Depletion of giant clams - ongoing program

Issue addressed	Depletion of Giant Clam wild stocks.
Type of monitoring	Market survey
Activity	**Timeframe**
Planning and design	**2000**
Public education program => capacity and awareness	
Preparation of areas => nurseries	
Acquisition of protective materials	
Acquisition and planting of juvenile clams	
Routine monitoring on growth survival	
Development of specialized markets	

Melanesia

7) Fiji

Issue addressed	Depletion of sedentary marine species
Key information requirements	Indicators for illegal fishing
Approach for data collection	Ad hoc (surprise) landing surveys to supplement routine collection of data

Proposed action	**Remarks**
▪ Secure funds (annual budget from licensing section of DOF) ▪ Recruitment of staff (casual workers) – project staff ▪ Conduct technical brainstorming meeting among officers concerned in DOF to identify information requirements and design questionnaires ▪ Consolidate existing resources available within DOF (developing data base and listing queries etc.) ▪ Training of field staff (casual workers) ▪ Pre testing of questionnaire in 3 sites (one each in the Western, Northern and central divisions) ▪ evaluate the results of pre-testing and revise the questionnaire if necessary ▪ Full implementation from April 2007 ▪ Analysis ▪ Disseminate the information among DoF officers and planning of corrective measures if occurrence of destructive fishing is evident	Technical assistance to design questionnaire may be needed from FAO/SPC 3 months for design and pre-testing phase

8) Solomon Islands

Issue addressed	Concerns for the depletion of sedentary marine species
Key information requirements	Quantity by species by province
Approach for data collection	Reporting of commercial production from local retailers

Proposed action	Remarks
▪ Internal meeting among officers concerned among BFMR to have better understanding of the issue and planed approach to address the issue ▪ Organize a consultative workshop with stakeholders (including buyers) to review local purchase form ▪ Finalize form design by incorporating vies and comments from stakeholders ▪ Recruitment of new staff ▪ Training on new staff ▪ Funding support logistics for report form collection ▪ (Option is to ask buyers to send the report to DFMR) ▪ Briefing session for buyers on how to fill up the form properly ▪ Implementation of data collection at least for one year (from Jan 2007) ▪ Obtain export documentation from customs to verify the accuracy of local purchase reports.(ad hoc) ▪ MOU with NGOs to share the data ▪ Analysis of data – where is the high production areas, seasonal variation of the production etc. ▪ Improve dissemination of the information to different users (other government department provincial government) ▪ Quarterly and annual report to be prepared	Two staff members are planned to be recruited (Sep 06) apart from this activity – budget has already been allocated. They will engage in data entry and liaison with buyers NGOs are implementing various surveys (biological, socio-economic) on the sedentary species in a number of areas. They are also in need to have a Broader (national) picture of the sedentary species fisheries.

9) Papua New Guinea

Issue addressed	Depletion of sedentary marine species
Key information requirements	Species, size and catch rates
Approach for data collection	Structured interview at landing sites (on a voluntary basis) to supplement and validate mandatory report of catch from licensed buyers/exporters

Proposed action	**Remarks**
▪ Determine time schedule (sampling during open season 16 January – 31 October) ▪ Selection of sampling areas – High production areas – Medium production areas – Low production areas ▪ Determined based on historical data set ▪ Designing survey (questionnaire, UVC) ▪ Produce project proposal (include all above) ▪ Organize consultative meeting to discuss draft proposal ▪ Finalize proposal and submit for fund allocation ▪ Organize personal, logistics, etc. (Partnership arrangement with NGOs) ▪ Pre-testing of survey ▪ Conduct survey ▪ Analyse results and produce recommendations to effect policy change to address “localized depletion issue ▪ Consultative meeting (all stakeholders) ▪ Review and monitor	Scope: selected local level government areas Data collected: species, size, catch, price by area, effort Data analysis: production, catch and effort by area by species , size distribution by area Dissemination: workshop, local radio and news paper

10) Vanuatu

Issue addressed	Depletion of sedentary marine species
Key information requirements	People's participating in fisheries activity
Approach for data collection	Use of Agricultural Census

Proposed action	Remarks
▪ Coordinate with National Statistics Office/Steering Committee for Agriculture Census to include questions to identify h/h fisheries involvement activities (Committee already started last week)	Next Census planned for June 2006

Issue addressed	Depletion of sedentary marine species
Key information requirements	Species by size by fishing area in Shefa Province
Approach for data collection	Use of UVC survey method as used by SPC/Procfish project

Proposed action	Remarks
▪ Fisheries Department to get appropriate staff SCUBA certified	Ad hoc on an individual or group basis
▪ Consult with SPC ProcFish staff to provide UVC (re)training for SCUBA certified fisheries staff and office staff, as well as further assisting in providing checks on data quality (ProcFish standard UV census method to be applied)	Deposit official request ASAP for implementation in 2007
▪ Consult with local chiefs/communities/traditional reef resources owners to seek approval for survey work in their areas	Send out official requests (letter), use fisheries extension officers when in these areas to meet personally with them
▪ Consult with and seek support (partial funding etc.) from Shefa Provincial Government ▪ Analysis – seek for technical assistance to SPC Proc Fish ▪ Dissemination Fisheries Department has the awareness programme in the communities and this programme will be used for dissemination	Shefa Provincial Government discusses 2007 budget in November 2006 If to implement in 2007 then needs Ministerial Budget Committee Consideration in June 2006

11) New Caledonia

Issue addressed	Harmonizing ...
Key information requirements	Fishing effort
Approach for data collection	

Required action	Remarks
▪ Establish inventory of stock assessment survey methods used in various area ▪ Consultative meeting among stake holders to raise the issue of non-comparative ways of surveys conducted in various areas and brief them the need of harmonized ways of ..... ▪ Promote application of the same method of data collection and analyse in each province ▪ Make more stock assessment to compare the efforts to make more appropriate regulation ▪ Make more consultation between all institutions and stakeholders ▪ Promote (implicate) all stakeholders understanding on the needs of long-term development	

<u>Polynesia</u>

12) Cook Islands

Objective: To extend coastal resources data collection to the Islands with no Fisheries Officer stationed. **Study Proposal:** To estimate fish species caught/consumed on these islands for subsistence use only **Type of system(s):** Household Survey **Who will be involved:** Fisheries Department in collaboration with Department of Statistics **Data collection Strategy:** sample-based: selection of a sample of villages in the 7 islands. **Data collection method:** Direct with questionnaires	**Context:** Subsistence fishery Island population 200-300 Household number is 50-100 8 islands with a fisheries officer and 7 islands with no Fisheries Fish is the main protein source. Fish consumption considered homogeneous along the year

Required action	Remarks
▪ **Step 1**: Establish connection between Fisheries Department and Office of Statistics ▪ **Step 2**: Establish the list of indicators that would be obtained from the data collected – consumed species – number and size of fish by species consumed – frequency of fish in daily diet – household composition (males and females by age class) – other which could be needed for other purposes, etc. ▪ **Step 3**: Establish the Sampling scheme (collaboration of expert) ▪ **Step 4**: Establish draft questionnaire ▪ **Step 5**: Selection of a database management system, which might have to be tailored to the study	<u>Past activities:</u> Agriculture and Fisheries census in 2000 by the statistics department <u>Assistance requested:</u> Expert in consumption survey

▪ **step 6**: Estimate the cost of the study and finalized the project proposal ▪ **Step 7**: Select data collectors and training of data collectors ▪ **Step 8** Presentation of the survey to the communities (awareness) ▪ **Step 9**: Trial of the questionnaire and eventually adjustment of the questionnaire ▪ **Step 10**: test and finalization of the data entry interface of the database management system ▪ **Step 11**: Time schedule of data collection ▪ **Step 12**: field data collection according to the time schedule	

13) Niue Islands

Objective: Estimate marine edible species poisoned by ciguatera. **Spatial coverage:** Main harbor western (side) **Data collection method:** Transect surveys	**Context:** identify exacted area affected, what is the % of marine edible species affected, who are the resources user

Required action	Remarks
Step 1: Seek advice on survey methodology and technical assistance from SPC including for sampling. **Step 2**: Identify indicators to be collected –density and size frequency by area **Step 3**: Estimate the cost and finalize the project proposal **Step 4**: Seek donors **Step 5**: Prepare survey plan **Step 6**: Survey training conducted by SPC experts **Step 7**: Time schedule of data collection **Step 8**: Prepare survey and sampling equipments (diving gears, fish tested kits, etc.) **Step 9**: data collection and sampling **Step 10**: data sample cleaning **Step 11**: Data entry and validation **Step 12**: Data analysis **Step 13**: Report writing	<u>Past activities:</u> – Samples taken in 2002 with SPC expert Bieng Yetting – Public awareness <u>Assistance requested:</u> – Technical assistance from SPC – Financial assistance

14) Samoa

Issue: Depletion of mullet fish (ANAE) **Objective:** To manage the spawning and aggregation sites of mullet fish. **Study Proposal:** To identify and monitor the spawning season and aggregation sites of mullet fish **Type of system(s):** Literature review, household surveys (mainly fishers) and biological survey **Who will be involved:** Communities, fisheries division, retailers (outlets) and statistics department **Spatial coverage:** 4 islands (2 main and 2 small islands) **Data collection Strategy:** sample-based and GIS	**Context:** – Aggregation sites – Spawning time /season

Required action	Remarks
Step 1: Establish connection between fisheries division and statistics for household survey **Step 2**: Identify list of indicators for household survey – Management practice – Sites (habitat) and time (aggregation) – Ethno-biological knowledge on mullet fishery **Step 3**: List of indicators for the biological survey length, weight and gonad weight **Step 4**: Establish household questionnaire and a form for biological sampling of mullet fish **Step 5**: Selection of database management system **Step 6**: Estimate the cost of study: – Household (1 a year), transportation cost, Accommodation, Food, Printing, Faire, equipment – Sampling: fish cost (samples) and equipment for 1 whole year **Step 7**: Set time frame **Step 8**: Select data collections and training of data collection **Step 9**: Presentation of the household survey to the community **Step 10**: Trial of the household questionnaire **Step 11**: Data collection according to the time frame **Step 12**: Data entry – Store – Analyse – Output results **Step 13**: Draft report **Step 14** : Final report **Step 15** : Management Plan elaboration **Step 16**: Awareness	<u>Past activities:</u> – Stock assessment survey (1990) – Market monitoring surveys (annually) <u>Assistance requested:</u> – SPC/FFA information on mullet fishery

15) Tonga

Objective: To evaluate the possibility to start harvesting and commercialize introduced trochus niloticus in Tonga **Who will be involved:** Fisheries staff **Spatial coverage:** Main island (1 of 3) **Data collection method:** Transect surveys	**Context:** *Trochus niloticus* was first introduced in Tonga from Fiji and Vanuatu in the 90s. Some of the introduced individuals were released to the known sites and some were kept in the fisheries hatchery for spawning

Required action	Remarks
Step 1: Seek advice on survey methodology and technical assistance from SPC including for data base management **Step 2**: Identify indicators to be collected density and size frequency by area **Step 3**: Estimate the cost and finalyse the project proposal **Step 4**: Seek donors **Step 5**: Prepare survey plan **Step 6**: Survey training conducted by SPC experts **Step 7**: Time schedule of data collection **Step 8**: Prepare survey equipment (diving gear, etc.) **Step 9**: Data collection **Step 10**: Data cleaning **Step 11**: Data entry and validation **Step 12**: Data analysis **Step 13**: Report writing	<u>Assistance requested:</u> – seek assistance on survey methodology from SPC – financial assistance

16) Tuvalu

Objective: To estimate the amount of fish consumed in the country **Type of system(s):** Household Survey **Who will be involved:** Fisheries Department in collaboration with Department of Statistics **Data collection Strategy:** sample-based: selection of a sample of villages in the main island and in 4 outer islands **Data collection method:** Direct with questionnaires	**Context:** – All the fishery production is consumed locally (no export) – There are 8 islands with 10.000 habitants in 1560 households – 40% of the population reside on 1 island – Fish is more consumed in outer islands – Consumption pattern of fish considered homogeneous along the year

Required action	Remarks
<u>First Month</u> **Step 1:** Establish connection between Fisheries Department and Office of Statistics **Step 2:** Establish the list of indicators that need to be obtained – Consumed species – Number and size of fish by species consumed – Frequency of fish in daily diet – Household composition (males and females by age class) – Others that would be needed for other purposes, etc. **Step 3**: Establish the sampling scheme (collaboration of expert)	<u>Past activities:</u> Census in 2002 by the statistics department <u>Assistance requested:</u> Expert in consumption survey

Step 4: Design draft questionnaire **Step 5**: Selection of a database management system <u>Second Month</u> **Step 6**: Estimate the cost of the study and finalized the project proposal **Step 7**: Select data collectors and training of data collectors **Step 8**: Presentation of the survey to the communities (awareness, radio talk to communities) **Step 9**: Trial and adjustment of the questionnaire **Step 10**: Test and finalization of the data entry interface of the database management system **Step 11**: Time schedule of data collection <u>Third Month</u> **Step 12**: Field data collection according to the time schedule **Step 13**: Data entry and validation **Step 14**: Data analysis including raising of consumption in order to estimate the whole consumption by island (stratification) **Step 15**: Scientific report **Step 16**: Report to non scientific users (dissemination to managers and to communities)	

The FAO/SPC Regional Workshop on Improving Information on Status and Trends of Fisheries in the Pacific Region was organized jointly by the Secretariat of the Pacific Community through its Coastal Fisheries Programme and FAO. Representatives from eighteen countries/territories in the Pacific region were invited. With the overall objective of facilitating the effective generation and use of fishery data and information for sound policy development and responsible fisheries management, the Workshop reviewed the relevance and adequacy of the existing national fishery information and data collection systems and examined viable options to improve the quality of fishery data and information, which suit specific settings of subregions (Melanesia, Micronesia and Polynesia) and are operational in a budget and manpower limited situation.

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