Comprehensive Report

IOTC-OFCF Project

(April 2002 ~ March 2007)

April 2007

Indian Ocean Tuna Commission (IOTC)
Overseas Fishery Cooperation Foundation of Japan (OFCF Japan)

iotc ctoi Indian Ocean Tuna Commission Commission des Thons de l'Océan Indien

OFCF **Oversea Fishery Cooperation Foundation of Japan**

CONTENTS

ACRONYM OF FISH

Code	English Name	Scientific Name
YFT	Yellowfin tuna	*Thunnus albacares*
SKJ	Skipjack tuna	*Katsuwonus pelamis*
BET	Bigeye tuna	*Thunnus obesus*
ALB	Albacore	*Thunnus alalunga*
SBT	Southern Bluefin tuna	*Thunnus maccoyii*
LOT	Longtail tuna	*Thunnus tonggol*
FRI	Frigate tuna	*Auxis thazard*
BLT	Bullet tuna	*Auxis rochei*
FRZ	Frigate & Bullet tunas	*Auxis spp.*
KAW	Kawakawa	*Euthynnus affinis*
TUN	Tunas & Bonitos *NEI	*Thunnini and Sardini* *NEI
COM	Narrow barred Spanish Mackerel	*Scomberomorus commerson*
GUT	Indo-Pacific king mackerel	*Scomberomorus guttatus*
STS	Streaked seerfish	*Scomberomorus lineolatus*
WAH	Wahoo	*Acanthocybium solandri*
KGX	Wahoo and seerfishes *NEI	*Scomberomorini* *NEI
SWO	Swordfish	*Xiphias gladius*
BLM	Black Marlin	*Makaira indica*
BUM	Blue Marlin	*Makaira nigricans*
MLS	Striped Marlin	*Tetrapturus audax*
SFA	Indo-Pacific Sailfish	*Istiophorus platypterus*
SSP	Short-billed spearfish	*Tetrapturus angustirostris*
BILL	Billfish *NEI	*Xiphioidei* *NEI
TUX	Tuna-like fishes *NEI	*Scombroidei* *NEI
SKH	Sharks*NEI	

*NEI: Not elsewhere included

Foreword

It is our pleasure to offer this Comprehensive Report on IOTC-OFCF Project, which has been implemented since 2002, to all people engaged in data collection and statistics in the field of tuna and tuna like species fisheries, the authorities and the private sector in IOTC Members, especially in developing coastal countries in the region.

The IOTC-OFCF Project is funded by OFCF and involves the participation of staff from the IOTC Secretariat, working in conjunction with two OFCF experts attached to the Secretariat. A Memorandum of Understanding (MOU) between the two parties has been reviewed and agreed to annually, and the Project has been continuing for 5 years.

Thanks to the work of a dedicated team of Project staff together with national counterparts, we have established cooperative programs in the region that are making difference. However, the resources of the Project are finite and they cannot replace the long-term national commitment needed to establish a solid system. The IOTC-OFCF Project is a capacity building project. That is, it can provide training and the initial resources required to launch a data collection and processing system. But unless there is a commitment on the part of national authorities to provide sustained support to the collection of statistics, there is a risk that these initiatives will not be continued after the Project ends.

To avoid this, we need to create awareness amongst the authorities and the private sector that it is in their best interest to support data collection that will give them the information required to better plan for future development.

Based on this principle, we have provided this Comprehensive Report, which consists of implementation of various Project activities, overall evaluation of Project results and recommendations for future development, and hopefully it could be utilized and be a proof of the achievement of the aim “to contribute to the realization of sustainable utilization of the tuna resources, by improving the accuracy of data collection and statistical systems of the coastal countries in the Indian Ocean”.

Alejandro Anganuzzi
Executive Secretary of IOTC

Copyright and Acknowledgements

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Executive Summary

This is a comprehensive report for the IOTC-OFCF Project. The IOTC-OFCF Project had been implemented for five years from April 2002 to March 2007. Objective of the Project was to improve the accuracy of data collection and statistical analysis of the catch and resources of tuna in the Indian Ocean.

After examination of priority areas which were recommended by IOTC Scientific Committee and relevant working parties, details of Project activities, which would have been put into five major activities to be defined in the Project MOU, were carefully selected and were carried out every year. Five major activities were (1) Fact finding including compilation of Country Reports, (2) Implementation of Catch Monitoring Programs, (3) Trainings and Workshops, (4) Support for development of FINSS, and (5) Finding historical data. Each activity had mutual relation to attain the objective.

The Project dispatched the fact finding mission to 13 countries to assess issues and suitable activity for improvement of tuna statistics. Based on Fact finding, Country Reports for 12 countries were compiled. Considering results of fact findings and Country Reports, various aspects of supports including sampling programs, training courses and workshops were planned and implemented. Sampling programs were carried in Indonesia for monitoring catch of Fresh tuna longlines from June 2002 to December 2006, Thailand for catch monitoring for foreign fresh tuna longline from September 2002 to December 2006, Thailand for catch monitoring for domestic tuna purse seine from November 2005 to October 2006, Sri Lanka for catch monitoring of off shore gillnet/longline fisheries and coastal longline from June 2004 to December 2006, Maldives for mainly collection of size data from artisanal fisheries from June 2003 to March 2005, and Oman for yellowfin size data collection for artisanal fisheries between January and March in 2003. Besides on-site trainings for each sampling program, intensive training on data collection and catch estimation for Indonesia, Thai and Sri Lanka sampling programs were held. Regional Workshop on data collection and statistical systems was held and representatives from 10 countries participated. In order to support for development of FINSS (Fisheries Integrated Statistical System), that software was developed by IOTC Secretariat, training course for FINSS and workshop on database administration system were made. Equipment was provided to Mauritius and Tanzania for utilization of FINSS and further swift data processing. FINSS user's manual was published and distributed to relevant institutes with software. Through fact findings, historical data were collected and computerized. OFCF also provided Fisheries Resource Management Course, and trainees from relevant 10 countries were invited.

Accurate catch, catch and efforts and size statistics were obtained through the Project activities, especially yellowfin and bigeye tuna from fresh tuna longlines. The Project activities were implemented efficiently, achieved the project goals. Most of sampling programs have been continued independently after the Project activities were terminated.

Successful implementation of the IOTC-OFCF Project was recognized at Scientific Committee Meeting in 2006, and continuation of the Project was recommended. IOTC and OFCF are discussing the second phase of the Project.

Fact Finding in Oman (January 2003)

Fact Finding in Sri Lanka (June 2004)

Fact Finding in Tanzania (January 2006)

Fact Finding in Kenya (February 2006)

Indonesia Sampling Program (Jakarta Fishing Port)

Indonesia Sampling Program (Jakarta Fishing Port)

Indonesia Sampling Program (Jakarta Fishing Port)

Indonesia Sampling Program (Cilacap Fishing Port)

Indonesia Sampling Program (Cilacap Fishing Port)

Indonesia Sampling Program (Benoa Port)

Indonesia Sampling Program (Benoa Port)

Indonesia Sampling Program (Benoa Port)

Indonesia Sampling Program (Data Management in RIMF)

Indonesia Sampling Program (Jakarta Fishing Port OFCF Monitoring)

Thailand Fresh Tuna Sampling Program (Phuket)

Thailand Fresh Tuna Sampling Program (Phuket)

Thailand Neritic Tuna Sampling Program (Phuket)

Thailand Neritic Tuna Sampling Program (Phuket)

Sri Lanka Sampling Program

Sri Lanka Sampling Program

Sri Lanka Sampling Program

Sri Lanka Sampling Program

Maldives Sampling Program

Maldives Sampling Program

Maldives Sampling Program

Maldives Sampling Program

Training scene for FINSS (WINTUNA) (August 2002)

Training scene for FINSS (WINTUNA) (August 2002)

Regional Workshop on Data Collection and Statistical System (March 2004)

Regional Workshop on Data Collection and Statistical System (March 2004)

Training course on Data Processing and Catch estimation for longline in Jakarta (December 2004)

Training course on Data Processing and Catch estimation for longline in Jakarta (December 2004)

Regional Workshop on Database Management system (February 2005)

Regional Workshop on Database Management system (February 2005)

Training course on Data Collection and Processing for Purse Seine (December 2005)

Training course on Data Collection and Processing for Purse Seine (December 2005)

Steering Committee Meeting for Indonesia Program (May 2004)

Steering Committee Meeting for Indonesia Program (April 2005)

OFCF-IOTC Joint Committee Meeting (May 2004)

OFCF-IOTC Joint Committee Meeting (April 2006)

1. Introduction
1.1 What is IOTC?

The Agreement for the Establishment of the Indian Ocean Tuna Commission (IOTC), elements of which are summarized below, was adopted by the FAO (Food and Agriculture Organization) Council at its Hundred and Fifth Session in Rome on 25 November 1993. The Agreement entered into force on the accession of the tenth Member on 27 March 1996. The Financial Regulations were adopted at the First Special Session of IOTC in Rome on 21-24 March 1997 and the Rules of Procedure were adopted at the Second Session held in Victoria on 22-25 September 1997.

IOTC is an intergovernmental organization established under Article X IV of the FAO constitution. It is mandate to manage tuna and tuna-like species in the Indian Ocean and adjacent seas.

The objective of the Commission is to promote cooperation among its Members, currently 25 members (Australia, China, Comoros, Eritrea, European Community, France, Guinea, India, Islamic Republic of Iran, Japan, Kenya, Republic of Korea, Sultanate of Oman, Madagascar, Malaysia, Mauritius, Pakistan, Philippines, Seychelles, Sri Lanka, Sudan, Tanzania, Thailand, United Kingdom and Vanuatu) plus 4 Cooperating Non-Contracting Parties (Belize, Indonesia, Senegal and South Africa), with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks.

In order to achieve these objectives, the Commission has the following functions and responsibilities, in accordance with the principles expresses in the relevant provisions of the United Nations Convention on the Law of the Sea:

a) to keep under view the conditions and trends of the stocks and to gather, analyze and disseminate scientific information, catch and effort statistics and other data relevant to the conservation and management of the stocks and to fisheries based on the stocks covered by this Agreement;
b) to encourage, recommend, and coordinate research and development activities in respect of the stocks and fisheries covered by this Agreement, and such other activities as the Commission may decide appropriate, including activities connected with transfer of technology, training and enhancement, having due regard to the need to ensure the equitable participation of Members of the Commission in the fisheries and the special interests and needs of Members in the region that are developing countries;
c) to adapt, on the basis of scientific evidence, conservation and management measures to ensure the conservation of the stocks covered by this Agreement and to promote the objective of their optimum utilization throughout in the Area;
d) to keep under review the economic and social aspect of the fisheries based on the stocks covered by this Agreement bearing in mind, in particular, the interests of developing coastal states.

Conservation and management measures binding on Members of the Commission must be adopted by a two-thirds majority of Members present and voting. Individual members objecting to a decision are not bound by it. If objections to a measure are made by more than one-third of the Members of the Commission, the other Members are not bound by that measure; but this does not preclude any or all of them from giving effect.

Recommendations concerning conservation and management of the stocks for furthering the objectives of this Agreement need only be adopted by a simple majority of its Members present and voting.

It is under the responsibility of Members to ensure that action is taken under their national legislation to implement conservation and management measures which become binding on it.

The members of the Commission are also expected to cooperate in the exchange of information regarding any fishing for stocks covered by this Agreement by nationals of any State or Entity which is not a Member of the Commission.

Further information is available on the IOTC website, www.iotc.org .

1.2 What is OFCF?

The Overseas Fishery Cooperation Foundation (OFCF) of Japan was established in June 1973, with the objectives of promoting the development of fisheries in the coastal countries concerned and the effective management of international marine resources conducted by the regional fisheries organization concerned, with both whom Japan has close relationship in the fisheries field, in order to maintain and enhance amicable relationship through technical and economic cooperation.

In order to contribute to the development and promotion of the fisheries in coastal countries concerned, OFCF provides various types of technical cooperation, such as project-type cooperation, dispatch of fisheries technical expert(s) and invitation of overseas fisheries trainees.

a) Restoration of function of fisheries related facilities

OFCF dispatches advisers and engineers with necessary materials and equipment to coastal countries concerned in order to transfer technique in rehabilitation and maintenance of fisheries related facilities and equipment that have been damaged by natural disaster or others causes.

b) Development of fishing grounds, promotion of fisheries, promotion of fish processing and distribution and conducting surveys on living marine resources.

OFCF conducts surveys on the fishing ground development within the Exclusive Economic Zone (EEZ) in coastal countries concerned with related advices and guidance. Studies are executed and technical guidance is provided on the coastal fisheries development and fish products processing and the improvement of their distribution.

c) Measures for the protection of environment and conservation of international fishery resources

The following types of technical transfer are carries out; for research and development in such stock enhancement field as seedlings production and optimum feed development in order to contribute to the restoration of declining fish stocks, for marine resources management and stock enhancement technique within the coral reef area of Pacific island nations to restore declining fish stocks and for improving statistical systems of tuna resources information.

d) Follow-up

Based on the result of assessment and evaluation conducted upon the completion of an OFCF led cooperation project, project follow-up activities are implemented by dispatching expert(s) and by providing necessary material and equipment, in order to complement the project, to further improvement and establish the relevant technique.

In order to promote mutual understanding with fisheries organizations of coastal countries concerned and international fisheries related organizations, OFCF organizes symposiums and meetings on specific themes in the fisheries, such as global resources management.

Further information is available on the OFCF website, www.ofcf.or.jp .

To date, OFCF has extended its cooperation programs to more than 110 nations, regions and international organizations worldwide. These programs are also diverse in nature, ranging from acceptance of overseas technical trainees, dispatch of experts, implementation of project type technical cooperation, and personnel exchange.

1.3 Project Background Information

Systematic data collection has taken place in the industrial fisheries for tuna and tuna-like species in the Indian Ocean since the beginning of their operations in the early 1950s, as well as in the artisanal fisheries of some of the coastal countries. However, efforts to concentrate that information in a centralized database did not begin until 1982, when the Indo-Pacific Tuna Management and Development Program (IPTP) under FAO, started its operations.

The activities of IPTP resulted in a number of advances in the data collection in the region. Sampling programs were implemented in various coastal countries and the data available for most

of the industrial fisheries were centralized. The data-collection responsibilities and the databases collected by IPTP were transferred to IOTC when in 1998. The IOTC Secretariat has been working since then to improve upon the quality and the quantity of the data available.

However, despite the best efforts of IPTP and IOTC, there are still gaps in the information necessary to best manage tuna resources in the Indian Ocean. These inadequacies affect a wide range of the data requested by IOTC, including some of the most fundamental data types such as the nominal catch statistics. Despite the fact that these highly aggregated data are the most likely to be available from reporting sources, more than 35% are considered to be of poor or uncertain quality. The situation is particularly serious regarding the availability of data on size composition of the catch, information which is fundamental for most modern stock assessment techniques and which is missing for important fisheries in the Indian Ocean.

The origin of these problems could be traced, in many instances, to data collection and processing systems which are not appropriate to produce the type of statistics required by the IOTC.

These deficiencies in the data availability have affected the quality of the stock assessments and any management. Unless remedial measures are taken, they will also limit the effectiveness of special research projects such as the proposed Indian Ocean Tuna Tagging Program. To achieve an important improvement in the data situation, it will be necessary to take concerted actions with the countries involved.

Early in 2001, contacts were established between the IOTC Secretariat and OFCF to propose a project that would address the main needs regarding data collection and statistics in developing countries of the region. This project was to benefit from the funding from OFCF and to involve the participation of staff from the Secretariat, working in conjunction with two fisheries experts detached to the Secretariat by OFCF.

The IOTC-OFCF Project was to implement recommendations from the Working Party on Data Collection and Statistics (WPDCS[1]) and the Scientific Committee that could not be implemented in the past because of insufficient resources at the IOTC Secretariat. It was also to address the requests for training put forward by IOTC Members in past meetings, fulfilling the mandate of the Commission to encourage and coordinate activities connected with transfer of technology, training and enhancement, having due regard to the special interests and needs of Members in the region that are developing countries;

The proposal embodied three main principles.

- The activities executed under the project were to follow the recommendations of the Commission and its relevant subsidiary bodies: the WPDCS[2] and the Scientific Committee;
- There was not to be any direct financial implications for IOTC Member countries.
- The activities of the project were to be directed towards reinforcing the statistical systems of developing countries from the region.

The IOTC-OFCF Project has been a landmark for OFCF, as it was the first OFCF' project involving a regional fishery management organization as its partner. Since its foundation, OFCF has been implementing its cooperation programs on a bilateral basis. OFCF decision to go beyond this bilateral framework to engage itself in a multi-lateral cooperation program was based on the recognition by the government and fishery related industries of Japan that, cooperating with international organizations for sustainable utilization of marine resources is indispensable to achieving the goal of adequate conservation and management of marine resources.

OFCF chose IOTC as a suitable partner for several reasons. Compared with other international organizations, IOTC had a relatively short history and therefore needed to set up various measures for resources management in the future. The large proportion of developing nations among its

[1] The WPDCS (Working Party on Data Collection and Statistics) was suspended in 2003, the responsibility of monitoring progress regarding data collection and statistics transferred to the Scientific Committee.

[2] *Ibid*. footnote 1

membership also made IOTC an ideal partner for an OFCF project. Another rational for choosing IOTC was because upgrading data collection and statistical systems was considered to be a good starting point for extending cooperation from OFCF. Fortunately, this offer from the OFCF was made at the perfect timing, since the IOTC was, at the time, needed to improve the accuracy of its statistical data,. The Memorandum of Understanding (MOU) for the Project was signed by both parties in January 2002 (Annex 1), and the Project itself was launched in April of the same year.

1.4 Project title, Objective, Main Activities and Priority Area

Title of the project was "Cooperation Project for Enhancing the Data Collection and Processing Systems for Tuna Resources in the Indian Ocean" (Article 1 of the MOU in Annex 1)

Objective of the Project was to contribute to the realization of sustainable utilization of tuna resources, by improving the accuracy of data collection and statistical analysis of the catch and resources of tuna in the Indian Ocean. (Article 2 of the MOU in Annex 1)

Followings are the activities that were carried out under the Project:

1) Studies to find out the current status of data collection, processing and analysis in the IOTC related countries; (Fact-finding mission to the relevant countries and Country Report to be complied);
2) Providing technical guidance and assistance to the IOTC related countries for reducing the problems unveiled through the studies carried out under 1). This activity can indicate as Sampling programs in priority areas;
3) Holding seminars or workshops for eliminating the problems unveiled through the studies carried out under 1);
4) Supporting the development among the IOTC related countries of the software to be developed by the IOTC for processing fisheries catch data. Workshop on Database Management and Training Course on FINNS (Fisheries Integrated Statistical System, formerly WINTUNA) were included.;
5) Endeavoring to obtain relevant historical data existing in the IOTC related countries that have not been reported to the IOTC; and
6) Other activities that both of IOTC and OFCF consider necessary to implement as project activities.

Priority areas;

The IOTC Secretariat identified the following four main areas of concern relating to tuna statistics in the region. The fisheries targeted by the project were those that were of sufficient size to influence stock assessments or future management measures, or catch fish at sizes not well represented in other fisheries. However, some of the planned activities also benefited developing countries in the region that were not identified by the criteria.

- **Statistics from Indonesia:** Indonesia is a major tuna-fishing nation in the region. However, the data available from Indonesia was, in general, of uncertain accuracy and incomplete until 2002. Of particular concern was the large fleet of Indonesian fresh-tuna longliners. This fleet is catching yellowfin, bigeye and southern bluefin tunas, swordfish and sharks. Catches of other tunas such as skipjack and seerfish species by gears other than longline are also important but not well known.
- **Improving data collection systems in developing coastal countries**: The collection of high quality fisheries statistics in developing countries is an important perquisite for further development of their fisheries, and greatly assists in the assessment of the status of tuna stocks by regional bodies such as IOTC. In addition to **Indonesia**, countries participating under this category include **India, Kenya, Maldives, Oman, Sri Lanka, Tanzania, Thailand, and Yemen.**
- **Statistics from gillnet fisheries**: These fisheries operate primarily from **Iran**, **Oman**, **Pakistan** and **Sri Lanka** and are an important component of the fisheries for tropical tunas,

as they catch a range of sizes that are not usually available to other gears during the same seasons and areas.

- **Statistics from new longline and purse seine industrial fisheries:** These fisheries currently operate from **Iran**, **South Africa**, **Thailand**, **Malaysia, Mauritius** and **Seychelles** and are of major importance in terms of the volumes of tropical tunas they catch.

1.5 Administrative Arrangement

Implementation of the various sampling programs, including provision of equipment, running costs, traveling costs etc were detailed in MOU signed with the collaborating institutions in the country of interest (an example of MOU shown in Annex 2), purchasing contracts with suppliers, consultant contracts for Fact-finding mission, authors contracts for compilation of the country reports, editing contracts for Field Manuals etc. and necessary documentations such as invitations, permissions and others for holding workshops and training courses were prepared by the Project. Technical inputs for those documentations were provided by IOTC and OFCF experts who were involved in the programs. Approval for all contracts and activities was required from OFCF Headquarters (HQ) before implementation.

The Project regularly held an internal meeting among IOTC and OFCF experts once a week or two weeks to discuss project activities and the results of the discussions were reported to OFCF HQ. Yearly, IOTC and OFCF had executive meetings to review activities during previous year and to agree planned activities for that year.

The funds for running the Project were provided by OFCF HQ every two months based on the budget plan, which was applied in the month of May, July, September, November, January and March for the following two months. If one of the plans was not achieved during the two month period, it was either carried over or cancelled..

The funds for sampling programs were usually paid in three installments i.e 45%, 45% and 10% of the total amount respectively based on the MOU. In general, the payment was remitted by OFCF HQ in Japan to the collaborating institution. The same principles were applied to the payments for other contracts with suppliers, consultants and other contactors.

The Project submitted an Accounting report on the running costs of the Project every month to OFCF HQ with accompanying explanations when variations to the approved budget occurred.

When a new program was being planned, to provide some equipment for an opponent institute, we provide both of justification to implement a program and an action plan to utilize the equipment in collaboration with the opponent institute. Some quotations of the equipment should be provided by different suppliers for comparison. After completion of those documentations we will ask the opponent institute to provide an official requesting letter for the program signed by the head of the institute. Then an application with those documentations is submitted to OFCF HQ to obtain its final approval for implementing the program. After the approval is given by OFCF HQ, we proceed to make a contract named Letter of Consignment (LOC) among three parties such as IOTC, OFCF and the opponent institute to conclude the deal. Then a Buy & Sale contact between the Project and the supplier, who offers the cheapest amount on the products of equipment, materials and accessories etc., should be prepared based on the approval of OFCF HQ, too. The payment would be done to the supplier for the products through the Bank transfer from Seychelles or Japan. All equipment provided from IOTC-OFCF Project to programs including IOTC Secretariat is listed in Annex 3.

When IOTC experts travelled as part of the project, the economy class travel costs were covered by the project while the travel insurance costs were covered by the IOTC Secretariat.

2. Implementation and Results

2.1. Strategy of Implementation

For each if the project's priority areas as seen in previous section 1.4 , namely: 1) Statistics from Indonesia, 2) Improving data collection systems in developing coastal countries (Indonesia, India, Kenya, Maldives, Oman, Sri Lanka, Tanzania, Thailand, and Yemen), 3) Statistics from gillnet fisheries (Iran, Oman, Pakistan and Sri Lanka), and 4) Statistics from new longline and purse seine industrial fisheries (Iran, South Africa, Thailand, Malaysia, Mauritius and Seychelles), the experts from the IOTC-OFCF Project examined the information that was available on the fisheries concerned and determined the activities that would be required to improve the situation in each case. The tables in Annex 4 show the countries that were identified for the implementation of activities supported by the IOTC-OFCF Programme, the importance of its fisheries in the IOTC context and the activities that were carried out in each case, if any. The reasons why the IOTC-OFCF did not support some of the activities planned for the different countries are also given.

Over the course of the project one or more of the following activities were initiated in each country to address the project's priority areas.

- Fact finding mission/Country report
- Technology transfer
- Training/Workshops
- Technical assistance

The following section describes the process by which particular activities were selected and assigned to priority work areas. The schematic below outlines the steps taken to determine which activities would be implemented in each country (Figure 2-1).

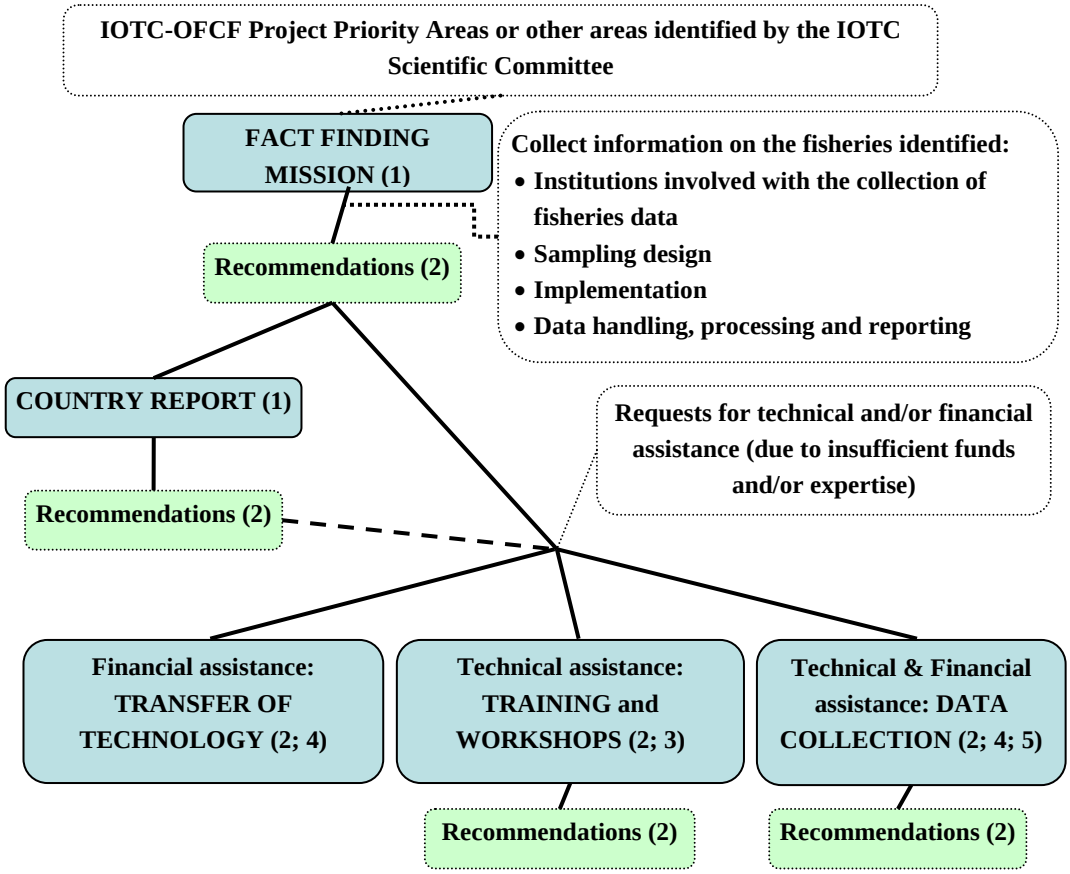

Figure 2-1. The schematic flows for the steps taken to determine which activities would be implemented in each country. Number in the parenthesis indicates the Project Activities in MOU for IOTC-OFCF Project.

Establishing a knowledge base

Although major problems pertaining to fisheries data were already well known to the IOTC Working Parties and the Secretariats data group, the amount of information available to the IOTC-OFCF staff to determine how best to address the problems varied considerably. When sufficient information was available the IOTC-OFCF staff were readily able to decide which actions were the most appropriate to address the problems that had been identified. When little information was available there was an obvious need to include a step to collect more information to be collected. This was mainly achieved through fact finding missions, country reports and an initial workshop involving relevant experts:

- **Fact finding missions**: These consisted of missions by IOTC-OFCF staff to particular countries to identify the institutions responsible for the collection and processing of fisheries data., the types of information that were being collected, and the way in which the statistics were derived and produced. The information collected during a fact finding mission served to three purposes:
    1. To confirm the importance of the issues identified for the fisheries concerned
    2. To assess the level of commitment from the governments in the countries concerned to improving their data collection and processing systems, if required
    3. To be able to determine/confirm which activities and approaches would be necessary to achieve the particular requirements
- **Country reports**: For each country visited, these reports contained an up-to-date description of the current of fishing activities,, the institutions responsible for the collection and processing of fisheries data (including the names and contact details of relevant people), the type of data collected and their use, the major problems related to the collection and processing of statistics, and a list of recommendations to address the issues relevant to OFCF-IOTC Project. The production of a Country Report involved staff from one or more institutions in each of the countries, being responsible for the final edition of the report, with the help of staff from the IOTC-OFCF Project or from other scientists having experience on the fisheries concerned, hired by the IOTC-OFCF as consultants. The publication of country reports came as a follow-up action after a fact finding mission or was decided upon the background information available at the IOTC Secretariat relating to the fisheries data collection and processing systems in the countries concerned. The cooperation from the institutions in the countries involved was, in either case, a pre-requisite before going ahead with the completion of a country report.
- **Major Workshop:** The Mission and country reports contained lists of Recommendations intended to provide guidance for the countries concerned to be able to address the deficiencies identified concerning its ability to produce accurate fisheries statistics. These recommendations were revised during a Workshop that took place after the completion of the first round of Country Reports, and was attended by the scientists from the recipient countries, IOTC-OFCF experts and any other scientists or experts involved. The main objectives of the Workshops were to share the experiences from the different fisheries involved and try to find common solutions to address the problems that had been identified. The recommendations arising from the above activities covered a range of areas, notably:

    Institutional issues: In most countries the collection and processing of fisheries data involves two or more institutions but the systems in use and the statistics produced are frequently conflicting. The main reasons for this are the lack of communication and exchange of data among the institutions involved.

    Data collection issues: These generally included one or more of the following:

    - A deficient sampling design: The sampling strategy in use not being appropriate for the fishery concerned. This was usually a consequence of changes in the

fisheries that occurred over time and sampling designs that were not modified to incorporate the changes that occurred.

- Poor implementation of data collection procedures: The sampling protocols are not strictly followed for data collection on all the fisheries concerned, due to: (a) an insufficient sampling effort whereby the funds allocated to data collection were not enough for the implementation of the activities in the way that they were planned (for most of the fisheries concerned, this reduced the precision of the statistics produced from the data collected); and (b) insufficient supervision which results in the enumerators not doing their jobs to the levels required, despite a good sampling design.

Data processing and data dissemination issues: Most of the problems identified with data processing and data dissemination are due to a lack of adequate computer hardware and/or software in the countries concerned. The main consequences of this are:

- Poor data validation and verification routines: In many cases, data verification was being mainly carried out by hand and this was time-consuming, did not allow for the amount of rigour required and was prone to error.
- Late dissemination of statistics: The lack of adequate hardware and/or software in some countries made it difficult for them to produce the statistics in time, due to a long-lasting data compilation and a laborious data processing.

Identifying how to best proceed in each country

The next step for the IOTC-OFCF experts was to assess if the issues identified for each country could be addressed with support from the IOTC-OFCF Project and exactly what type of actions or activities were required. This is summarised below:

- **For Institutional issues: Training** was used to increase the awareness in the recipient countries of the need for the institutions involved with data collection and processing to communicate regularly and exchange the data collected with a view to improving the quality of the statistics produced. Training sessions were held in the countries concerned or at the IOTC Secretariat headquarters. **Transfer of Technology** was used to increase the capability of the institutions involved in data collection to exchange and verify data. This involved training sessions on the use of the hardware and/or software provided. FINSS (Fisheries Integrated Statistical System), developed by the IOTC Secretariat, was the software of choice in most cases as this software included modules covering the data entry, validation and reporting of fisheries data.
- **For data collection issues: Training** was used to increase the ability of the scientists or other staff responsible for the collection of statistics in the recipient countries to maintain the relevant data collection systems. Training sessions were held in the countries concerned or at the IOTC Secretariat headquarters. **Technical and/or financial support** to one or more institutions in the countries concerned in order to strengthen its capacity relating to the collection of fisheries data. The level of support provided to Data Collection activities varied depending on the following:

(a) The species involved and their levels of catches: In general, the IOTC-OFCF prioritized the implementation of activities for fisheries reporting high catches of yellowfin tuna and/or bigeye tuna and/or albacore and/or swordfish and/or skipjack tuna because these species are of great interest to the IOTC.

(b) The types of fisheries involved: The way in which the fishing units for some of the fisheries identified operated limited, in some cases, the type of support that the IOTC-OFCF was able to provide.

- This is the case with most of the artisanal fisheries identified where large amounts of fishing units usually operate from a large number of landing locations that extend, in most cases, over large areas. The implementation of sampling activities on these fisheries had to be dropped due to the large amount of human and financial resources that had to be devoted to the task, something that was beyond the capacity of the IOTC-OFCF Project.
- *The implementation of field activities relating to semi*-industrial or industrial fisheries was, by contrast, possible in most cases, mainly when the amount of fishing units involved and landing locations were not high.

(c) The types of data required: The programs implemented focused on the the following data types:

- Vessel information: e.g. vessel identification, dimensions Catch and effort data: information on total catches and vessel activities including operating range and average time at sea of the vessels involved.
- Length frequency data: individual lengths of the fish caught.
- Biological data: including length, weight and other biological information on individual specimens.

In general, the above information was collected by strengthening the sampling programmes existing in the countries concerned or implementing new programmes in cooperation with the local institutions responsible for the execution of these activities. In some cases, the data collection activities were extended to incorporate the collection of historical data.

(d) The data collection systems existing in the countries concerned before the implementation of the new activities: The type of activities implemented in each country varied depending on the amount of data that was collected by the local institutions and its quality. The IOTC-OFCF Project tried in all cases to maximize the use of the resources available by modifying the existing sampling schemes rather than implementing new sampling activities from scratch.

(e) The amount of resources available for the implementation of the activities concerned: Prior to initiating a programme in a particular country, the IOTC-OFCF experts evaluated the importance of each fishery basing on the above with a view to sorting the activities according to its importance and estimating the amount of funds that could be devoted to each activity over the total funds available for operation.

- **For data processing** and data **dissemination issues**: **Training** sessions in the countries concerned or at the IOTC Secretariat headquarters were held to: increase the ability of the scientists, database administrators or other staff responsible for the computerization, processing and reporting of fisheries statistics in the recipient countries to use and maintain databases and other processes related with data verification, processing and reporting. **Transfer of Technology** and **Training** sessions on the use of the hardware and/or software provided (e.g. FINSS) were used to increase the ability of the institutions involved with data input, processing and dissemination to produce good quality statistics in time..

Once the IOTC-OFCF and the institutions in the recipient countries agreed on the activities required the IOTC-OFCF drafted Memoranda of Understanding (MOU) to be signed by the

IOTC-OFCF and the counterparts individuals or institutions in the recipient countries. An MOU typically described (see Annex 2 as an example):

- Total funds to be provided by the IOTC-OFCF in support of the activities identified and terms of payment
- Name of the Project, main purpose and detail of the activities to be carried out[1]
- General conditions on the use of funds, responsibilities, intellectual property rights, staff and other legal issues
- Information to be reported to the IOTC-OFCF and reporting timelines
- Date of entry into force and duration
- Commitment from the recipient organization to maintaining the activities implemented or addressing the recommendations issued with respect to those at the end of the support by the IOTC-OFCF.

In general, the results from the activities implemented under the support of the IOTC-OFCF Project were assessed by the experts involved and new recommendations issued regarding the problems remaining in each case. The continuation or the extension of the field activities implemented through the Programme was sought in all cases. To this end, the IOTC-OFCF Project approached the institutions involved in the recipient countries with a view to seek its commitment to the continuation of the activities. This was agreed by all countries, its commitment reflected at the end of the last MOU signed with the IOTC-OFCF. All countries sent also plans that indicated that the activities were to be maintained under the same or similar terms and conditions after the end of the IOTC-OFCF cooperation

[1] The latter included in Annex as Terms of Reference

2.2 Summary of Implementation by the Project Activities

The IOTC-OFCF Project is classified into 6 categories, which are listed in MOU (see Annex 1 or the previous section 1.4). Table 2-1 shows implemented Project activities into 6 categories, which were determined strategically from the priority areas in previous section 2.1. Figure 2-1 also shows implemented activities by countries based on Table 2-1.

Table 2-1. Summary of Implementation by the Project activities

Project Activities	Summary of Implemented Activities
1) Conduct studies of find out the current status of data collection and compilation, as well as statistical analysis in the IOTC related countries (**Fact finding mission and Country Report**)	Fact finding missions to the relevant countries: Indonesia, Thailand, and Oman in 2002, Sri Lanka, Iran, India, Maldives, Mozambique, Mauritius, and Seychelles in 2003, Tanzania and Kenya in 2005. These 11 countries of the Country Reports to be compiled (except one from Indonesia was not prepared through the Project). Mission dispatched to Sri Lanak in 2004, Kenya, Tanzania, and Thailand in 2005 led to some sort of data collection and data processing activities in those countries.
2) Provide technical guidance and assistance to the IOTC related countries for eliminating the problems unveiled through studies carried out under the activity 1) (**Sampling Program**)	The following sampling programs were implemented to improve data collection system: (1) Fresh tuna longline fishery in Indonesia was carried out from June 2002 to Dec 2006. (2) Fresh tuna longline fishery in Phuket, Thailand carried out from June 2002 to Dec 2006. (3) Yellowfin tuna length frequency from artisanal gillnet and Handline fisheries in Oman from Jan to Mar 2003. (4) Length frequency from artisanal pole and line operating in Maldives from June 2003 to March 2005. (5) Offshore gillnet/longline fishery and coastal longline fishery from Oct 2004 to Dec 2006. (6) Neritic tuna fishery by domestic artisanal purse seine from Nov 2005 to Oct 2006.
3) Hold seminars or workshops fro eliminating the problems unveiled through studies carried out under 1) (**Training and Workshop**)	The Regional Workshop on Data Collection and Statistical System held in Seychelles in March 2004, based on compiled Country Reports including Indonesia during 2002 and 2003. Regarding data collection and processing, the followings were held:(1)fresh tuna longline for Indonesia and Thailand in Dec 2004, (2) Gillnet and longline and coastal longline fro Sri Lanka in Mar 2004 and during supervisory trips, (3) Neritic tuna Thai artisanal purse seine fishery in Nov 2005, (4) Industrial purse seine fishery for Kenya and Iran in Dec 2005. Concerning training and workshop on Data processing and database management, training course for FINSS and workshop in the improvement of database Administration system were implemented in August 2002 and Feb 2005, respectively. OFCF annually held Fishery Resource Management Course (FRMC). FRMC was closely related to the IOTC-OFCF Project, and accepted 16 personnel from relevant countries of the IOTC region from 2002 to 2006.

Table 2-1 (Continued). Summary of Implementation by the Project activities

Project Activities	Summary of Implemented Activities
4) Support the development among the IOTC related countries of the software to be developed by the IOTC for processing fishery catch data (**Support for development of FINSS**)	This activity are closely related to the Training and workshop above including training course for FINSS in Aug. 2002, and workshop in the improvement of database Administration system Feb 2005. IOTC-OFCF Project provided PC to Mauritius and dispatched IOTC Expert to train the Mauritius staff to use FINSS software during 2002. A data manager of the Indonesian Sampling program was invited to Seychelles to learn FINSS in May 2003. Technical assistance and training on FINSS Database use were implemented in Dec 2004. FINSS' user's manual was printed in 2004 and has been distributed to the relevant organization with software. At the end of the Project in Feb 2007. assistance on providing PC and Motorbikes to Tanzania in 2007 were made.
5) Find and process the historical data existing in the IOTC related countries that have not been reported to the IOTC (**Historical Data Finding and Computerization**)	Unreported historical data were retrieved through the works in Fact-finding mission to various countries. Computerization of historical sport fishing data from sport fishing clubs was implemented among Kenya, IOTC and OFCF. Historical size data from fresh tuna long line fishery in Indonesia was tried, but data collection was not successful.
6) Others that both of IOTC and OFCF consider necessary to implement as Project activities (**Others**)	Compilation of IOTC Field Manual was made among the outside consultant and IOTC experts, and final compilation for printing is still being under preparation made by IOTC experts.

In the following section, details of project activities will be described according to the above categories of the Activities such as 1) Fact finding mission and Country report, 2) Catch Monitoring Program, 3) Training and Workshop, 4) Support for development of FINSS, 5) Historical Data Finding and Computerization, and 6) Others.

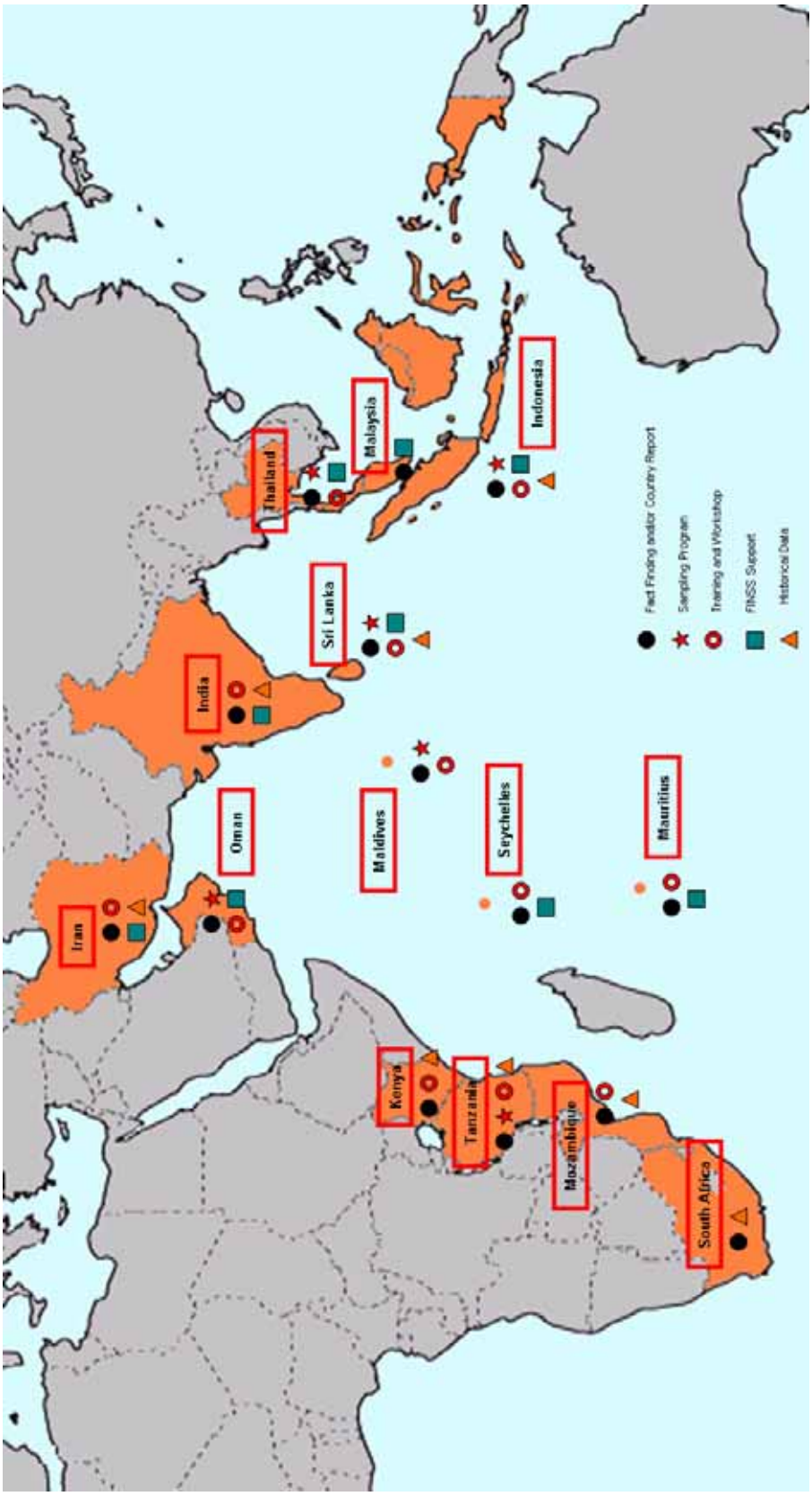

Figure 2-1 Summary of Implemented Project by countries.

2.2.1 Fact Finding Missions and Country Report

The main objectives of Fact-finding missions were for the IOTC-OFCF Project staff to identify the institutions responsible for the collection and processing of fisheries data in the countries concerned, the type of information that was collected and the way in which the statistics were produced. The information collected served three purposes.

1. To confirm the importance of the issues identified for the fisheries concerned.
2. To assess the level of commitment from the governments in the countries concerned to improving its data collection and processing systems, if required.
3. To assess whether any follow-up actions were required.

Following each fact finding mission, a country report was written. Country Reports contained a description of the type of fisheries existing in the countries concerned, the institutions responsible for the collection and processing of fisheries data,, the type of data collected and its use, the major problems identified relating to the collection and processing of statistics, and lists of recommendations to address the relevant issues. The production of a Country Report was involved staff from one or more institutions in the countries concerned. While these people were responsible for the final edition of the report, the project often provided assistance in the form of staff from the IOTC-OFCF Project or from other consultant scientists having experience on the fisheries concerned. Other country reports were written by IOTC-OFCF staff using information available at the IOTC Secretariat.

The major results of the missions are described in the following Table 2-2. Over the 5 years of the project Fact finding missions were dispatched to the following 13 countries: Indonesia, Thailand, Oman, Malaysia, Sri Lanka, Iran, India, Maldives, Mozambique, Mauritius, Seychelles, Tanzania and Kenya. The IOTC-OFCF planned to dispatch the fact finding mission to Yemen and Pakistan due communication disturbance and limited time. Compiled Country Reports were reached to 12 countries by the Project. Results of the fact finding mission led to technical and financial assistances to improve data collection and data processing.

Table 2-2. The major results of the Fact finding missions including compilation of Country Reports**.**

Year	Country	Results
2002	Indonesia	• Completion of the Country Report (by Australia, not the Project) • Collection of information about historical data • Commencement of the sampling program on Fresh tuna longline fishery
	Thailand	• Completion of the Country Report • Commencement of the sampling program on Fresh tuna longline fishery
	Oman	• Completion of the Country Report • Commencement of the sampling program on size frequency of yellowfin tuna
	Malaysia	• Collection of information about historical data only. Country report were not be compiled.
2003	Sri Lanka, Iran, India, Maldives, Mozambique, Mauritius and Seychelles	• Completion of the Country Report for these 7 countries.(The Project did not sent a mission to South Africa, but South Africa submitted her country report.) • Holding the Workshop on data collection and statistical systems upon the participation of those relevant 10 countries to be invited by IOTC-OFCF Project in March 2004. • Commencement of the sampling program on size frequency of tuna and tuna like species in pole and line fishery in Maldives
2004	Sri Lanka	• Commencement of the sampling program on Fresh tuna gillnet fishery
2005	Tanzania	• Collection of relevant information for compiling country

		report
	Kenya	• Collection of relevant information for compiling country report
	Thailand	• Commencement of the sampling program on Neritic tuna purse seine fishery
2006	Tanzania	• Completion of the Country Report • Providing equipment for data collection and processing for both Fisheries Department in Zanzibar and Tanzania in Feb 2007
	Kenya	• Completion of the Country Report • Collection of information about historical data • Commencement of the computerization program on historical size data in sport fishery

Regional Workshop on Data Collection and Statistical System was held at the International Conference Center in Victoria, Seychelles, from 1st to 5th of March, 2004, based on compiled Country Reports. Detail of the workshop is described in section 2.2.3: Training and Workshop.

2.2.2. Sampling Programs

1) Indonesia's Fresh Tuna Longline Fishery

General Information

Priority Area: Statistics from Indonesia

Project title: Multilateral Catch Monitoring Programme Indonesia

Target Fisheries: Fresh tuna longline fishery of Indonesia

Main objectives: Enhancing the data collection and processing system for tuna fisheries in Indonesia, through building the capacity to enable Indonesia to:

- Maintain a complete and up-to-date record of the industrial vessels operating in Indonesia
- Maintain a record of the activities of these vessels
- Produce detailed catch estimates by gear, species and size category for the artisanal and industrial fisheries

Background information

Data on the fisheries

Indonesia is second only to the European Community with respect to the amount of IOTC species caught in the Indian Ocean, accounting for 15% of the total catch in recent years. Tuna and tuna like species are caught by using industrial and artisanal gears:

- Industrial fresh-tuna longliners: Fresh-tuna longliners have been operating in Indonesia since 1973. Around 2,000 fresh-tuna longliners have been operating in recent years and current catches are around 50,000 – 60,000 t, comprising mainly yellowfin tuna and bigeye tuna. Important amounts of southern bluefin tuna are also caught. Fresh-tuna longliners from countries other than Indonesia operated within the Indonesian EEZ or from ports within its territory over the period 1985-1999.
- Artisanal fisheries: A range of artisanal gears -mainly gill nets, troll lines, hand lines, coastal purse seines and, to a lesser extent, pole and lines and other minor gears (fish traps, beach seines, bouke amis, etc.) are used in Indonesia. The catches recorded for these gears range between 100,000-150,000 t in recent years.

The FAO FishStat database was the main source for data on the total catches of tuna and tuna-like species before the implementation of the OFCF-IOTC Programme.

Institutions responsible for the collection of fisheries data

The collection and processing of fisheries data in Indonesia is mainly carried out by three Directorates under the Ministry of Marine Affairs and Fisheries (MMAF):

- Directorate General for Capture Fisheries (DGCF):
    - Directorate of Resources Management (DRM): The Department of Data and Statistics of the DGCF is responsible for the compilation and reporting of fisheries data, including vessel activity data.
    - Directorate of Business Services (DBS): The DBS grants licenses to both domestic and foreign fishing vessels to operate in Indonesia.
- Directorate General of Marine and Fisheries Resources Control (DGMFRC): The PP (former WASKI), under the Directorate of Marine Services Control collects data on the activities and catches of vessels operating in Denpasar fishing port.
- Agency for Marine and Fisheries Research (AMFR): The Research Centre for Capture Fisheries (RCCF) collects several types of research data being also responsible for stock assessment and advice to the MMAF.

Data collection systems before the implementation of the Programme

A fisheries data collection and reporting system was implemented in Indonesia in the early 1970's and remained unchanged until 2002. Data were mainly collected from the Major fish landing places and fishing villages.

The system was based mainly on reports from fishers which were tailored to particular landing places and/or fishing activities.

Data were gathered at the sub-district level, processed (by hand) and the estimates obtained from transferred (in paper) to the corresponding District. Each District compiled the paper files from all the sub-districts under its responsibility, summed the catches and forwarded the results to the Provincial Office, which in turn compiled all the paper files and sent them to the Sub-Directorate of Data and Statistics.

The Research Centre for Capture Fisheries, in collaboration with the Commonwealth Scientific Industrial Research Organization of Australia (CSIRO), has been collecting catch, length and other biological data on Southern Bluefin tuna (SBT) unloaded by fresh-tuna longliners in Denpasar (Bali) since the early 1990's. Although this programme was mainly focused in the collection of SBT data for the Convention for the Conservation of Southern Bluefin Tuna (CCSBT), data on the catches of other tuna and tuna-like species was also collected until the start of a multilateral catch monitoring programme involving several Australian and Indonesian Institutions and OFCF-IOTC.

Major problems identified with previous data collection and processing processes

Experts from the IOTC-OFCF identified the following problems relating to the statistics produced by the DGCF:

- Dysfunctional institutional linkage
    - Lack of communication and data exchange between the institutions involved in the collection of fisheries data
    - Inability of one institution to provide statistics to IOTC standards

- Incomplete data collection
    - Incomplete vessel record: The DGCF grants licenses only to vessels whose GRT is 30 t or above, and a significant number of smaller vessels are not recorded.
    - Incomplete vessel activity record: The Indonesian Authorities do not keep complete records of arrivals, the catches unloaded and departures of vessels to ports in Indonesia.
    - Insufficient data on catch and effort: Some data are collected through interviews of fishers and/or reports from the fishing industry but these reports are not detailed enough due to:
        - The catches reported being inaccurate:
            - The catches of Indonesian and foreign vessels unloaded in Indonesia are recorded as being Indonesian catches
            - The catches of Indonesian vessels not unloaded in Indonesian ports are not accounted for
            - Catches from the Indian Ocean and the Banda Sea (Pacific Ocean) are usually reported as Indian Ocean catches.
            - Bycatch specimens are seldom included in the catch reports
        - Lack of information on the catches by gear and/or species: e.g. all catches of tuna longliners are aggregated as tuna and the catches of artisanal gears not reported by gear and recorded under three or four commercial categories, not individual species.

        - Lack of information on catch and effort by time-area strata for the industrial longline fleet (due to the absence of a logbook system).
    - No length frequency data are collected.
- Poor data processing
    - Most data processing was undertaken by hand and involved subjective decisions with respect to calculations at different levels and transfer of aggregated data which makes it impossible to verify the results
    - Insufficient validation and verification of data: the data that the different institutions collected on the vessels operating in Indonesia and/or its catches are conflicting in most cases.
    - Catches data cannot be broken down by individual gear and/or species or detailed fishing area
    - The statistics are never revised after publication despite new data becoming available
- Data disseminated is out data
    - Late dissemination due to a lengthy compilation process, e.g. the system has too many steps and takes too long (Sub-district ➔ District ➔ Province ➔ DGCF Jakarta) resulting in reports that are already out of date when they are released
    - Data not reported to the IOTC
    - Resulting in the use of data from the FAO FishStat database instead.

Recommendations from the IOTC Scientific Committee

The IOTC Working Parties and Scientific Committee, aware of the above issues, strongly recommended that the Secretariat make every possible effort to improve the quality of catch, effort and size data from fresh-tuna longline fisheries and the species and gear breakdown for artisanal fisheries reporting aggregated catches.

Scientific Committee Report 2000 (paragraph 19) stated:

> *The Committee strongly recommend that the Secretariat should continue conducting the sampling programmes in Thailand and Malaysia and explore ways of implementing similar schemes in other ports of landing of non-reporting fishing vessels operating in the Indian Ocean.*

Historically Indonesia has been one of the most important countries of landing of fresh-tuna longline vessels in the Indian Ocean (see Figure 2-3).

Recommendations on the need to improve the information available on catches per gear and/or species can be found in many reports from the IOTC Working Parties.

Other recommendations relate to the paucity of size data available for longline fisheries and the need to collect more samples from these fisheries.

Actions implemented through the IOTC-OFCF Project

Scope of the Programme

Experts from the IOTC-OFCF Project assessed the types of actions that might assist Indonesia improve the quality of its fisheries statistics.

- The Project considered implementing field activities relating to **artisanal fisheries** but realized that this would require many staff and resources and would be too costly. The Project noted that there was probably no need for substantial changes to the sampling designs for these fisheries and agreed to address the above concerns through other actions such as training and workshops (see section 2.2.3.).
- The implementation of field activities to strengthen the collection and processing of data on **industrial fisheries** was, by contrast, considered to be very important due to:

- he large quantities of tropical tuna and billfish species being caught, and that the species involved were those of great interest to IOTC
- The existing sampling design was not sufficient to obtain good statistics for these fisheries.
- The high discrepancies between the data published by the DGCF and that collected through the existing RIMF-CSIRO cooperation in Benoa.

Such implementation was, indeed, considered possible because:

- Most of the fresh-tuna longline vessels operating in the Indian Ocean are based in three or four ports where the vessels call regularly to unload their catches.
- The catches are unloaded to a number of processing plants in each port, which makes it easy the collection of samples.
- The good results obtained from the sampling conducted by the RIMF and the CSIRO in Denpasar (Bali).

Signature of the Memorandum of Understanding, duration of the activities and total budget allocated

Aware of the problems raised by the IOTC and CCSBT regarding the quality of the statistical data on tunas and related species in Indonesia, the DGCF requested the help of the IOTC-OFCF Project to assist it improve the situation.

The IOTC-OFCF Project prepared two MOU, one for the DGCF and the other for the RCCF. Both MOU involved field and other activities during the year after its signature, on 1st April 2002. The table below indicates the dates, the timeline and values of the agreements until December 2006 (Table 2-3).

Table 2-3. The dates, the timeline and values (US$) of the agreements from April 2002 until December 2006

Institution	Apr 2002 - Mar 2003	Apr 2003 - Mar 2004	Apr 2004 - Mar 2005	Apr 2005 - Mar 2006	Apr 2006 - Dec 2006	Total
DGCF	6,841	9,070	1,000			16,911
RCCF	25,356	40,694	38,383	36,958	28,860	170,251
Total	32,197	49,764	39,383	36,958	28,860	187,162

The IOTC-OFCF activities were complemented by other activities financed through ACIAR[1]-DAFF[2]-CSIRO, mainly to cover the operations in Benoa.

A description of the comprehensive package of support provided by the IOTC-OFCF Project and the ACIAR-DAFF-CSIRO is summarised in the following Table 2-4.

Table 2-4. Summary of support to DGCF and RCCF by three ports

Institution	Type of support	Jakarta	Cilacap	Benoa
DGCF[3]	Transfer of technology	Hardware and software (FINSS) to DBS and Port Authority	Hardware and software (FINSS) to Port Authority	Hardware and software (FINSS) to Port Authority
	Support data input	1 data input staff	1 data input staff	1 data input staff*
RCCF	Transfer of technology	Hardware and software (FINSS) to RIMF[4]		Hardware* and software (FINSS) to RIM[5]

[1] Australian Centre fro International Agricultural Research
[2] Department of Agriculture, Fisheries and Forestry of Australia
[3] Activities discontinued in 2003
[4] Research Institute for Marine Fisheries

RCCF	Support database administration	1 Database administrator Supervisory trips		
	Support data input	1 data input staff		1 data input staff*
	Support field activities	Samplers' office Sampling materials Supervisory trips 7 enumerators	Sampling materials Supervisory trips 3 enumerators	Samplers' office* Sampling materials Supervisory trips* 7 enumerators*

* Funds from ACIAR-DAFF

The following Figures 2-2 and 2-3 indicate proportion of the operational budget (expressed as the percentage of the total operational budget) that the IOTC-OFCF Project spent for the implementation of the Catch Monitoring Programme in Indonesia and proportion that the new catches estimated for the fresh-tuna longline fishery of Indonesia made out of the total catches of fresh tuna longliners estimated for the Indian Ocean (note that the average catches for 2003-05 were used. Based on the fisheries, catch monitoring program showed good cost performance.

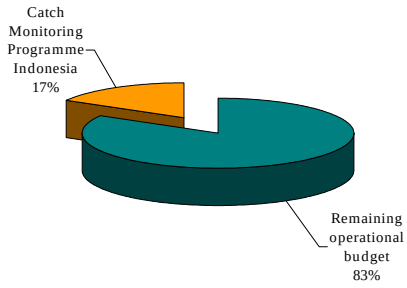

Figure 2-2. Proportion of the operational budget (expressed as the percentage of the total operational budget) that the IOTC-OFCF Project spent for the implementation of the Catch Monitoring Programme in Indonesia.

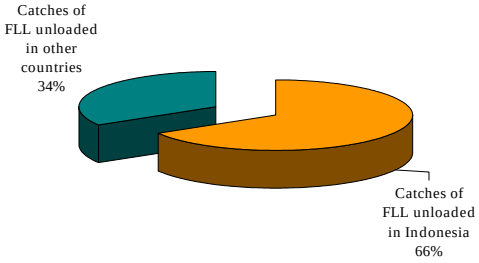

Figure 2-3. Proportion that the new catches estimated for the fresh-tuna longline fishery of Indonesia made out of the total catches of fresh tuna longliners estimated for the Indian Ocean (note that the average catches for 2003-05 were used).

Design of the Multilateral Catch Monitoring Scheme

Representatives from all data collection agencies in Indonesia, the CSIRO and the IOTC-OFCF Project met on several occasions to decide on the new strategy to be implemented. It was agreed that the main priorities for the Indonesian fresh-tuna longline fishery were:

1. Build up a complete vessel record
2. Estimate the total catch unloaded in Indonesia by port, year, month and individual species, including bycatch
3. Estimate catch-at-size for the main species in the catch
4. Estimate catch and effort by time-area strata

It was noted that the estimation of catch and effort was only possible through implementation of a logbook system on fresh-tuna longliners and that such an exercise would be too costly and time consuming to be carried out in the initial phase.

The main actions implemented to achieve 1-3 are summarised below. Note that the design was modified in several occasions due to problems relating to the implementation of the activities.

Vessel Record: The vessel record was derived using a combination of records including:

- The record of licensed vessels from the DBS (DGCF)
- Records of vessel arrivals from the Port Authorities in Jakarta and Cilacap and the WASKI (PP) office in Benoa

[5] Research Institute for Mariculture

- Records of vessel arrivals built from information collected by samplers in the above three ports.

The above activities were supported through IOTC-OFCF funds.

Total catch: Total catch was estimated from sampling by RCCF enumerators in the main three ports of landing of fresh-tuna longline vessels operating in the Indian Ocean: Jakarta, Benoa and Cilacap (Figure 2-4). Although fresh-tuna longline vessels also unloaded in other ports, the catches unloaded were very small and can be estimated by using data from the closest monitored port. The sampling implemented was based on the previous experience by the RIMF-CSIRO in Benoa and the new information available to the IOTC-OFCF.

Catch was estimated according to the following formula:

Catch = average catch per vessel (CPUE) * number of vessel unloadings (Effort)

The data to feed the above formula was collected through RCCF enumerators in Jakarta, Benoa and Cilacap. The way in which such data were collected is indicated below:

CPUE:

- Total enumeration of export-reject fish unloaded from 30% or above of the vessel unloadings per port per plant per month
- Total enumeration of by-catch fish unloaded from 30% or above of the vessel unloadings per port per month

Effort: Total number of vessel unloadings per plant per month

Catch-at-size: Catch at size was estimated by raising the available size samples to the total catches estimated for each species and month (from above). This process involved some processing due to the type of information collected:

- Total enumeration of individual fish weights from 30% or more vessel unloadings per port per month
- Collection of length – weight data for 10% or more of the fish sampled
- Collection of other biological data for important species of tunas and billfish

Sampling in Jakarta and Cilacap was supported through OFCF funds and that in Benoa through ACIAR-DAFF funds.

Figure 2-4. Sampling sites for the Indonesian Catch Monitoring Programme.

The sampling design was modified on several occasions to adapt to the particularities of each port. The changes performed were documented in various reports and papers presented to the IOTC Working Parties.

The software FINSS, developed by the IOTC, was customized to be used for data input, validation and reporting. Most of the data processing was conducted in Access.

Main results

Vessel data (vessel record and effort data): Table 2-5 shows the numbers of vessel unloadings recorded by enumerators in Jakarta, Benoa and Cilacap and the total numbers of vessels active in the three ports during 2003-05. The numbers obtained through enumerators were usually higher than those recorded by the Port Authority in Muara Baru and the WASKI office in Benoa. Some of the vessels monitored by RCCF enumerators were not recorded in the list of licensed vessels maintained by the DGCF.

Table 2-5. Numbers of vessel unloading recorded by enumerators in Jakarta, Benoa and Cilacap and the total numbers of vessels active in the three ports during 2003-05

Year	Port	1	2	3	4	5	6	7	8	9	10	11	12	No. unloadings	No. Vessels
2003	Benoa	325	310	265	296	265	323	292	279	286	291	305	268	3,505	
	Cilacap	31	31	62	46	61	39	29	19	11	9	16	22	376	
	Jakarta	131	156	164	134	165	211	127	95	109	121	101	111	1,625	
	Total	***487***	***497***	***491***	***476***	***491***	***573***	***448***	***393***	***406***	***421***	***422***	***401***	***5,506***	***1,782***
2004	Benoa	310	199	251	226	222	252	234	232	223	202	229	205	2,785	
	Cilacap	37	40	49	37	42	17	6	2	1	5	6	14	256	
	Jakarta	172	111	134	158	144	148	128	144	111	103	103	116	1,572	
	Total	***519***	***350***	***434***	***421***	***408***	***417***	***368***	***378***	***335***	***310***	***338***	***335***	***4,613***	***1,530***
2005	Benoa	248	218	198	205	212	236	218	193	194	237	113	167	2,439	
	Cilacap	26	36	36	55	36	25	34	8	5	15	14	15	305	
	Jakarta	168	144	108	87	137	107	84	69	60	70	39	74	1,147	
	Total	***442***	***398***	***342***	***347***	***385***	***368***	***336***	***270***	***259***	***322***	***166***	***256***	***3,891***	***1,338***

The sampling protocols were strictly followed and the objectives attained in most cases. Figure 2-5 below shows the proportion of vessel unloadings sampled over the total number of vessel unloadings recorded in Benoa and Jakarta, per month and totals for 2002-05. The totality of vessel unloadings was sampled in Cilacap over the duration of the programme. Coverage rates in Jakarta and Benoa were between 40% and 50% for most months.

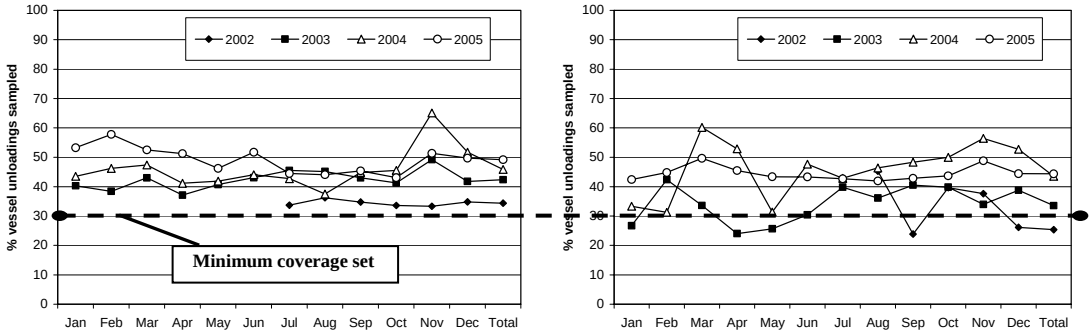

Figure 2-5. Amount of vessel unloading sampled over the total number of vessel unloading (expressed as a percentage) in Benoa (left) and Jakarta (right) during 2002-05, per month.

Table 2-6 below shows the total catches (tons) estimated per species per port by ports for 2003-05.

Table 2-6. The total catches (tons) estimated per species per port for 2003-2005

PORT	YEAR	YFT	BET	SBF	ALB	SWO	MARL	TUX	SKH	OTHR	TOTAL
BENOA	2003	7,405	5,598	555	3,508	1,133	1,313	273	409	477	20,670
BENOA	2004	4,487	4,261	641	2,008	1,245	1,142	164	381	428	14,756
BENOA	2005	4,499	4,125	1,797	1,625	827	963	176	453	528	14,992
CILACAP	2003	842	394	7	168	64	73	29	39	13	1,628
CILACAP	2004	1,078	1,150	4	162	110	52	24	48	2	2,630
CILACAP	2005	653	1,207	34	133	123	31	15	15	53	2,263
JAKARTA	2003	11,913	5,577	1	1,252	1,375	1,931	1,954	2,025	1,594	27,622
JAKARTA	2004	10,479	5,392	0	2,202	1,142	1,158	471	5,437	1	26,283
JAKARTA	2005	6,831	3,709	0	860	841	753	410	3,525	1	16,930
OTHER	2003	812	380	0	85	94	132	133	138	109	1,884
OTHER	2004	484	103	0	47	10	2	1	2	0	650
OTHER	2005	1,021	274	0	133	29	7	1	7	0	1,472
TOTAL	2003	20,973	11,949	563	5,013	2,666	3,448	2,389	2,611	2,192	51,803
TOTAL	2004	16,528	10,906	645	4,419	2,507	2,354	661	5,868	431	44,319
TOTAL	2005	13,004	9,315	1,831	2,750	1,819	1,754	601	4,001	581	35,656

The decrease in catches and number of vessels operating in Indonesia is explained due to:

- a high raise in the prices of fuel
- a decrease in catch rates
- a decrease in the number of licenses granted to fishing vessels by the Indonesian government

The main consequences being that some companies go bankrupt and other sent their vessels to operate in other countries.

The coverage rates for size data were only slightly lower than those obtained for catches, with size data collected for 30% or more of the specimens unloaded in the three ports. Length-weight and length-length data was also collected in the three ports and was used to convert weights into lengths or curved lengths into straight lengths when this was required. Catches-at-size

Evaluation of the results

Overall, the Multilateral Catch Monitoring Programme was very successful for the following reasons:

- the five years of Catch Monitoring underpinned the building of the capacity required for Indonesia to be able to take over the programmes activities
- the Indonesian authorities showed their commitment to the continuation of the activities, presenting a plan of action that involved the allocation of funds to keep the catch monitoring after the end of the IOTC-OFCF cooperation

The catch figures estimated from the Programme have been accepted by the IOTC, CCSBT and Indonesia. Both the CCSBT and the IOTC agreed that the new figures were more representative of the fisheries than those produced before the implementation of the Multilateral Catch Monitoring Programme and encouraged Indonesia to keep the catch monitoring in the future.

Further confirmation of the value of the programme in Indonesia came from IOTC's technical bodies:

Scientific Committee Report 2003 (paragraph 32):

> *It was noted that the sampling activities in Indonesia produced information that is critical for the stock assessments of tunas and billfishes in the Indian Ocean…*

Scientific Committee Report 2005 (paragraphs 30-31):

The IOTC-OFCF noted that the main objective of the project is to build the required capacity in countries of the region and promote awareness in the fisheries administrations so as the implemented activities are taken over and maintained by the responsible countries in the future. The IOTC-OFCF reported positive responses from countries such as Maldives and Indonesia, where a firm commitment exists from the local governments to maintain the activities in the future.

The SC was unanimous in congratulating the IOTC-OFCF Project for its excellent work and most valuable contribution to improving the data available to IOTC and building capacity of its participating countries to implement robust data collection regimes.

Scientific Committee Report 2006 (paragraph 25):

The SC welcomed the commitments made by Indonesia to maintain at least the current activities implemented through the IOTC-OFCF programme and encouraged the other countries that have benefited from the programme to make similar commitments.

Observations of the situation before and after the implementation of the IOTC-OFCF activities in Indonesia are provided in Table 2.7. Note that this evaluation does not cover the artisanal fisheries.

Table 2-7. the situation before and after the implementation of the IOTC-OFCF activities in Indonesia

Before	After
Lack of communication among institutions	Frequent contacts between institutions
Lack of communication with the IOTC	Continuous communication
Incomplete vessel record (DGCF)	Complete vessel record (DGCF-RCCF)
Incomplete vessel activity record (DGCF)	Complete vessel activity record (RCCF)
Total catches inaccurate	Total catches thought accurate
Catches per species NOT available	Catches per species available
Catches per area NOT available	Catches per area NOT available
Size frequency data NOT available	Size frequency data available
Insufficient data validation and verification	Routine validation and verification of data
Too long data processing	Simplified data processing
Late dissemination of results	Results disseminated in time
Data NOT reported to the IOTC	Data reported to the IOTC in time

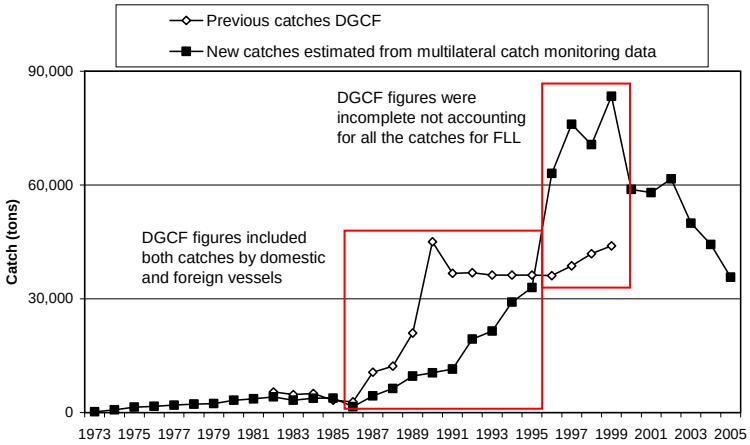

Figure 2-6. Comparisons between catches of Fresh tuna longliners recorded by the DGCF before the implementation of the Multilateral Catch Monitoring program and new catches estimated from the data collected.

Figure 2-6 shows new catches estimated from the data collected. Note that data collected during the program was used along with other information to estimate historical catches for this fishery and that the new estimates refer to catches per species while all previous catches were recorded as yellowfin tuna.

Recommendations for further development

The following activities are recommended to further enhance the collection and processing of data for tuna and tuna-like fisheries in Indonesia:

Industrial fleets:

Concerning Vessel Data.

Currently there are several government agencies in Indonesia that collect a range of complementary data on vessels and these data could be used to verify the completeness of the Record of Licensed Vessels maintained by the DGCF.

It is recommended that the DGCF verifies the completeness of the record of licensed vessels by using the information collected by the Port Authorities or related agencies from all ports of landing.

It is recommended that the Port Authorities or related agencies in each port establish systems to ensure that all vessels calling to port are monitored, including the maintenance of separate records for foreign and domestic vessels.

Concerning catch, effort and size data.

Currently, the use of fishing vessels as carriers makes it very difficult to obtain catch and effort data that is representative of the fresh-tuna longline fleet, including catch by time, area and size class.

To improve the availability of high quality fisheries data it is recommended that (1) a logbook system be implemented on all industrial vessels operating in Indonesia and (2).the multilateral catch monitoring programme (that proved successful in obtaining reliable estimates of catch and catch-at-size for the Indonesian fresh-tuna longline fishery) be continued.

Artisanal fleets

Concerning improving the data from artisanal fleets.

The Report from the 2006 meeting of the IOTC Scientific Committee states the following (paragraph 11):

> The SC made the following recommendations that represent the highest priority areas for members. It is expected that if these recommendations are realised, they will result in a marked improvement in the standing of the data currently available at the secretariat and ultimately the provision of scientific advice to the Commission. The SC noted that these recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.
>
> 1. Improve the certainty of catch and effort data from artisanal fisheries, by:
>
> • Requesting countries having artisanal fisheries, notably **Indonesia** and Sri Lanka, to improve the collection and reporting of species and gear information.
>
> • Requesting members to increase sampling coverage to obtain acceptable levels of precision in their catch and effort statistics.
>
> 3. Increase the amount of size data available to the Secretariat:

Requesting members to collect and report size data for artisanal fisheries for yellowfin tuna taken by gillnet, handline and troll fisheries; in particular Yemen, Comoros and **Indonesia**.

It is recommended that Indonesia keeps taking the necessary steps to achieve the above within the shortest delay.

Concerning the processing of data.

The compilation of statistics from artisanal fisheries involves many steps and hand calculations and subjective decision making these data prone to error and very difficult for the DGCF to verify.

It is recommended that the DGCF sets up a system involving the computerization of data at the point where they are collected and use routines for data checking and validation, the calculation of total catches and for data transfer.

2) Thailand's Fresh Tuna Longline Fishery

General Information

Priority Area: Data collection systems of developing coastal countries

Project title: Catch Monitoring Programme Thailand

Target Fishery/ies: Fresh tuna longline vessels operating from Thailand

Main objectives: Enhancing the data collection and processing system for tuna fisheries in Thailand, through building the capacity to enable Thailand to:

- Maintain a complete and up-to-date record of foreign fresh tuna longliners operating in Thailand
- Maintain a record on the activities of these vessels
- Produce detailed catch estimates by gear, species and size category for foreign fresh tuna longliners operating in Thailand

Background information

Data on fisheries

Fresh-tuna longliners from China, Taiwan,China and Indonesia have been operating at Phuket in Southern Thailand since 1994.

- The fishery in the Indian Ocean is seasonal with most vessels operating between November and March then moving to the Pacific Ocean.

The Andaman Sea Fisheries Research and Development Centre (AFRDEC) in Phuket has been compiling information on the activities and catches of these vessels since 1994. The majority based on reports from vessel owners or shipping agents to the Thailand Customs Department.

Institutions responsible for the collection of fisheries data

Primarily, the collection of data on the activities of fishing vessels is the responsibility of the flag country or fishing entity i.e. the Division of Distant Water Fisheries (Bureau of Fisheries) in China, the Fisheries Agency Council of Agriculture in Taiwan,China and the Directorate General for Capture Fisheries in Indonesia lies.

Department of Fisheries (DOF) of Thailand is responsible for the collection and processing of fisheries data in Thailand. However, their focus is on Thai domestic fisheries and does not extend to foreign vessels operating from Thailand ports[1].

The AFRDEC, under the DOF, collects additional information, mainly for research purposes, from both domestic fisheries operating in the Andaman Sea and foreign vessels based in Phuket.

Data collection systems before the implementation of the Programme

Few data were collected by flag states or entities before the existence of the IOTC and its subsequent activities:

- China has been collecting catch and effort data from its fresh-tuna longline fleet since the beginning of its activities in the Indian Ocean. No size data, however, was collected on board Chinese vessels before the implementation of the IOTC-AFRDEC sampling.
- Indonesia has not collected any information on the catches unloaded from fresh-tuna longliners under its flags operating from ports in countries other than Indonesia. The main reason for this is that all Indonesian vessels are obliged by law to operate from the port or ports specified in the license granted to them by the Indonesia DGCF and therefore landings in other ports are not expected to occur. This, however, has not been the case and

[1] Note that these vessels do not hold licenses to operate within the Economic Exclusive Zone of Thailand, they simply use the Thai ports.

landings from Indonesian vessels have been recorded in Phuket and other Indian Ocean ports.

- No data was collected on the activities of fresh-tuna longliners from Taiwan,China before the implementation of the IOTC cooperation.

The collection of data on the activities of foreign vessels mostly covered on the vessels that had a license to operate within the Economic Exclusive Zone of the country collecting the information and it often involved the collection and reporting of high resolution data (and was in the license agreement).

By contrast, the collection of data on port calls and unloadings from non-licensed foreign vessels in countries other than the flag country - as it is the case with Phuket - is usually carried out for tax purposes and consequently the reporting requirements were less demanding and the data were of a lower resolution.. Before April 2000 the availability of information on the activities and catches of foreign vessels operating from Phuket was limited to the information collected by the Thailand Customs Department. This included:

- Lists of calls from foreign vessels to Phuket per day
- Total catches unloaded through processing plants in Phuket

Following a recommendation from the IOTC Working Party on Data Collection and Statistics, AFRDEC requested in 1999 guidance from the IOTC on how to strengthen the collection and processing of data on foreign fresh-tuna longline vessels operating from Phuket. Scientists from AFRDEC and the IOTC modified the existing sampling design and a Letter of Agreement was signed between the IOTC and the DOF for the new activities to be implemented in Phuket. Support from the IOTC for this work extended from October 1999 to September 2002 thereafter the activities were included as part of the IOTC-OFCF Programme.

Major problems identified with data collection and processing processes

The major problems with the data collection systems that existed before the implementation of the IOTC-AFRDEC cooperation were:

Concerning flag countries or fishing entities:

- No length frequency data was being collected for the Chinese fresh-tuna longline fleet
- For Taiwan,China and Indonesia:
    - Incomplete vessel activity record: Taiwan and Indonesia do not gather detailed information on the activities of their fresh-tuna longline fleets as, for instance, the grounds of operation of such vessels. The number of vessels active per year and ocean is, for this reason, unknown.
    - Incomplete catches and effort data collected: Taiwan and Indonesia do not collect catches and effort data for its fresh-tuna longline fleets due to the lack of logbook systems. The catches of Taiwanese or Indonesian longliners that are not unloaded in Taiwan or Indonesia, respectively, are not accounted for representing the majority of the catches in the case of Taiwan and around 5% of the total catches for Indonesia.
    - No length frequency data collected.
    - No data for these fleets were available before the implementation of the IOTC sampling in Phuket.

Concerning Thailand

- The vessel activity record is incomplete as Thai Customs do not keep complete records of the arrivals, unloadings and departures of vessels to ports in Thailand.
- Catch and effort data collected on foreign vessels are incomplete as no logbook system is in place and data from fishing owners and shipping agents (collected by the Thailand Customs Department) are not detailed enough. In particular:
    - The catches of foreign vessels unloaded in Thai ports are not being fully accounted for as numerous vessel unloadings are not recorded by Thailand Customs

- By-catch specimens are seldom included in the catch reports
- There are no details on the catches by species
- No length frequency data are collected.
- The reports from the fishing industry on the activities and catches of fresh-tuna longliners unloaded in Thai ports are not validated

- Data processing is prone to error as it is done by hand with subjective decision-making
- Data was not widely disseminated — the data collected were only published through reports to the Thai DOF but the information written in Thai was circulated in Thailand.

Recommendations from the IOTC Scientific Committee

The IOTC Working Parties and Scientific Committee, aware of the above issues, strongly recommended that the Secretariat make every possible effort to improve the quality of catch, effort and size data from fresh-tuna longline fisheries.

Working Party on Data Collection and Statistics (page 16, paragraph 5 from the top):

> *The location of possible sampling points was then discussed. It was noted that a very large proportion of the catch for the non-reporting fleets is transhipped at a few ports: Bali and Jakarta (Indonesia), Penang (Malaysia),* ***Phuket (Thailand)****, Mauritius, Singapore and South Africa. In some of these ports there are already sampling programmes working. It was suggested that these ports be considered as potential sampling points and that priorities should be established based on a cost/benefit ratio.*

Scientific Committee Report 2000 (paragraph 19):

> *The Committee strongly recommend that the Secretariat should continue conducting the sampling programmes in Thailand and Malaysia and explore ways of implementing similar schemes in other ports of landing of non-reporting fishing vessels operating in the Indian Ocean.*

Other recommendations relate to the paucity of size data available for longline fisheries and the need to collect more samples from such fisheries.

Taking into account the above recommendations, the IOTC Secretariat provided support to Thailand, Malaysia and Sri Lanka to strengthen the collection of fisheries data on foreign fresh-tuna longliners operating in their respective ports. While the support to Malaysia (2001) and Sri Lanka (2003) was discontinued the year after the implementation of the activities in each country the support to Thailand was maintained throughout 2000-02 and the activities in Thailand subsequently taken over by the IOTC-OFCF Project.

Actions implemented through the IOTC-OFCF Project

Scope of the Programme

The IOTC-OFCF decided to maintain the support for the continuation of the activities in Thailand based on the following:

- The Fisheries Research Institute of Penang (Malaysia) expressed its commitment to support data collection and processing from foreign vessels operating in Penang. The data collected since then have been used in combination with the data collected by the IOTC-OFCF Project in Phuket to estimate the catches of fresh-tuna longliners based in Malaysia.
- Mauritius, South Africa and Singapore proved to be relatively unimportant as ports of call for fresh-tuna longliners. As above, the information collected in other ports were used in combination with the information collected by the respective port authorities to estimate total catches per species for vessels arriving at these ports.

- The support from the IOTC to Sri Lanka (NARA) for the collection of data on the activities of foreign fresh-tuna longliners operating from Colombo and Galle had to be discontinued due to problems with the implementation of some of the activities.
- The support that the IOTC provided to the Thailand DOF for the strengthening of data collection in Phuket during 2000-03 catch and catch-at-size to be estimated for the fresh-tuna longline fleets operating from ports in the eastern Indian Ocean. The Thailand government requested support from the IOTC-OFCF noting that it was unable to secure funds for the continuation of the activities in the short-term.

Given the above, experts from the IOTC-OFCF Project considered that the catches of fresh-tuna longliners operating from such ports could be assessed from the data collected in Thailand. The continuation of the activities in Thailand was, for this reason, recommended.

Signature of the Memorandum of Understanding, duration of the activities and total budget allocated

In response to the request by the DOF of Thailand, the IOTC-OFCF Project prepared an MOU that contained field and other activities during the year after its signature, on 1st September 2002. The agreement was revised and new MOUs signed in successive years, until December 2006 to the values given below (Table 2-8).

Table 2-8. The dates, the timeline and values (US$) of the agreements from April 2002 until December 2006

Institution	Sep 2002 - Mar 2003	Apr 2003 - Mar 2004	Apr 2004 - Mar 2005	Apr 2005 – Mar 2006	Apr 2006 - Dec 2006	Total
DOF	5,660	13,140	12,950	14,480	10,990	57,220

Note that the currency used in the MOU was Thai Bahts being the amounts converted into US$

The type of support provided by the IOTC-OFCF Project is summarised in the following Table 2-9..

Table 2-9. Type of support to AFRDEC, as executing organization, by the IOTC-OFCF Project

Institution	Type of support	Details
AFRDEC under DOF	Transfer of technology	Hardware and software (FINSS)
	Support data input	1 data input staff
	Support field activities	Sampling materials Supervisory trips 2 enumerators

Figures 2-7 and 2-8 showed .proportion of the operational budget that the IOTC-OFCF Project spent for the implementation of the Catch Monitoring Program in Thailand and proportion that the catches of Taiwanese and Indonesian fresh tuna longliners estimated from the data collected in Phuket made out of the total catches of Taiwanese and Indonesian (excluding the catches in Indonesia) fresh tuna longliners estimated for the Indian Ocean (note that the average catches for 2003-05 were used)

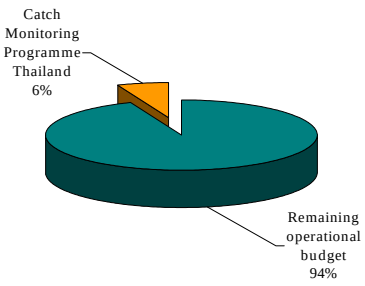

Figure 2-7.Proportion of the operational budget (expressed as the percentage over the total operational budget) that the IOTC-OFCF Project spent for the implementation of the Catch Monitoring Program in Thailand.

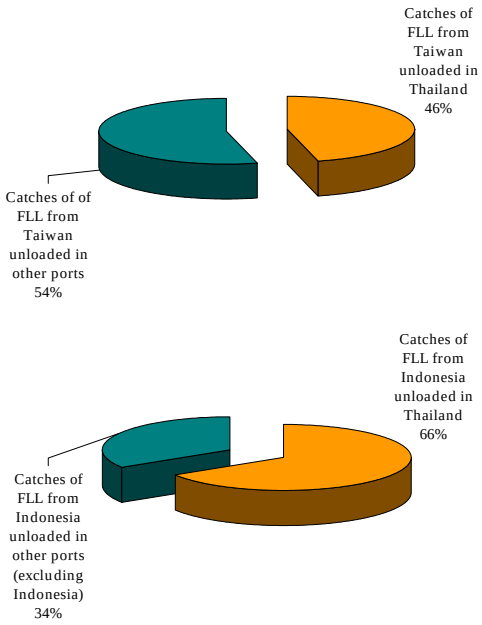

Figure 2-8. Proportion that the catches of Taiwanese (above) and Indonesian (below) fresh tuna longliners estimated from the data collected in Phuket made out of the total catches of Taiwanese and Indonesian (excluding the catches in Indonesia) fresh tuna longliners estimated for the Indian Ocean (note that the average catches for 2003-05 were used).

Design of the Catch Monitoring Scheme

Experts from AFRDEC and the IOTC-OFCF Project agreed to keep the existing sampling scheme, as implemented by the IOTC in 1999. The main priorities for such sampling were to:

1. Build up the vessels record including information on the foreign fresh-tuna longline vessels operating from Phuket and their activities
2. Estimate the total amounts unloaded in Phuket by flag country, year, month and species, including bycatches
3. Estimate catch-at-size by fleet for the main species in the catch
4. Estimate catch and effort by fleet and time-area strata

Although the collection of catch and effort data was considered it was finally agreed that the estimation of catch and effort was only possible through implementation of a logbook system on fresh-tuna longliners and that this exercise was too costly and time consuming to be carried out during the initial phase.

The main actions implemented to achieve 1-3 are summarized below.

Record of vessels and vessel calls: The vessel record was built by using the following records:

- Records of vessel arrivals from the Thai Customs and the Thai Fish Marketing Organization
- Records of vessel arrivals compiled by enumerators through interviews with staff from the processing plants in Phuket

The above information was compiled and records of vessel activities built for each flag.

Total catches: The total catches were estimated through sampling by AFRDEC enumerators in Phuket (Figure 2-9). Although fresh-tuna longline vessels also unloaded in other locations near

Phuket, the catches unloaded were very low and could be estimated by using data from Phuket. The system implemented was based on the previous sampling system implemented by the IOTC.

The catches were estimated, for each flag, according to the following formula:

Catch = average catch per vessel (CPUE) * number of vessel unloadings (Effort)

The data to feed the above formula was collected through AFRDEC enumerators. The way in which such data were collected is indicated below:

CPUE:

- Total enumeration of export-reject fish unloaded from 30% or above of the vessel unloadings per flag per month with coverage rates as even as possible for the different processing plants
- Total enumeration of by-catch fish unloaded from 30% or above of the vessel unloadings per flag per month

Effort: Total enumeration of vessel unloadings per flag per month

Catch-at-size: Catch at size was estimated by raising the available size samples to the total catch estimated for each flag, species and month (from above). This process involved some processing due to the type of information collected, including:

- Total enumeration of individual fish weights from 30% or more vessel unloadings per port per month
- Collection of length – weight data for 10% or more of the fish sampled
- Collection of other biological data for important species of tunas and billfish

Figure 2-9. Location of Phuket in Southern Thailand.

The sampling design was modified in several occasions to adapt to changes in the operation of the vessels. The main change related to the unloading of bycatch specimens and the shift of most of the unloadings to night hours. The sampling of fish at night proved, however, to be very difficult.

The software FINSS, developed by the IOTC, was customised to for data input, validation and reporting. Most of the data processing was conducted in Access.

Main results

Vessel activity: Table 2-10 shows the numbers of vessel unloadings recorded by enumerators in Phuket per flag during 2003-05. Some of the vessel arrivals monitored by AFRDEC enumerators were not recorded in the list vessels maintained by the Thailand Customs.

Table 2-10. Numbers of vessel unloadings recorded by enumerators in Phuket per flag during 2003-05

Year	Flag	1	2	3	4	5	6	7	8	9	10	11	12	No. unloadings
2003	Taiwan	94	94	84	64	16	31	19	14	13	22	35	141	***625***
	Indonesia	4	3	3	8	5	1	2	2	3	8	14	25	***79***
	Total	***98***	***97***	***86***	***73***	***21***	***32***	***21***	***17***	***16***	***30***	***48***	***166***	***705***
2004	Taiwan	92	92	83	29	26	18	18	29	16	18	33	75	***528***
	Indonesia	19	12	12	6	6	2	2	0	4	2	11	15	***91***
	Total	***111***	***104***	***95***	***35***	***32***	***20***	***20***	***29***	***20***	***20***	***43***	***90***	***619***
2005	Taiwan	93	91	71	34	17	15	16	23	12	30	41	59	***500***
	Indonesia	13	10	9	8	4	1	3	1	4	10	14	18	***94***
	Total	***106***	***101***	***80***	***41***	***21***	***16***	***18***	***24***	***16***	***40***	***54***	***76***	***594***

With the exception of the bycatch, the sampling protocols were followed and the objectives attained in most cases. Figure 2-10 shows the proportion of vessel unloadings sampled over the total number of vessel unloadings per flag, year and month. Average coverage rates for 2003-05 ranged between 25% and 45% depending on the year and flag. The distribution of the landings, with most of the catches unloaded between December and March, made it difficult for the enumerators to sample the 30% of the landings during those months. The coverage rates attained are, however, thought sufficient and the catches estimated from sampling data accurate.

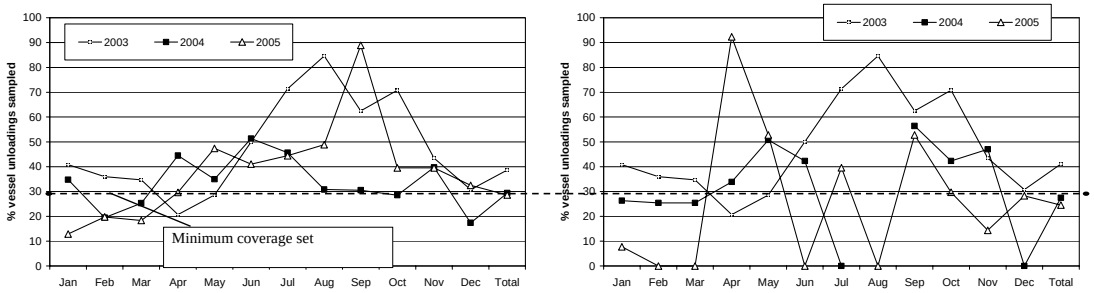

Figure 2-10. Amount of vessel unloadings sampled over the total number of vessel unloadings (expressed as a percentage) in Phuket during 2002-05, per year and month for Taiwan (left) and Indonesia (right).

Table 2-11 shows the total catches (tons) estimated per species per flag country for 2003-2005.

Table 2-11. Total catches (tons) estimated per species per flag country for 2003-2005

FLAG	YEAR	YFT	BET	SBF	ALB	SWO	MARL	TUX	SKH	OTHR	TOTAL
TAIWAN	**2003**	3,150	3,299		41	534	738	32	61	577	***8,432***
	2004	4,724	1,840		8	363	699	209	133	51	***8,026***
	2005	4,318	2,735		37	217	297	9	0	4	***7,618***
INDONESIA	**2003**	208	188		2	14	30	1	1	13	***456***
	2004	619	343		1	59	120	23	15	6	***1,185***
	2005	1,082	764		79	151	129	20		8	***2,234***
TOTAL	**2003**	***3,358***	***3,487***		***43***	***548***	***767***	***33***	***63***	***590***	***8,888***
	2004	***5,343***	***2,182***		***9***	***422***	***819***	***232***	***148***	***56***	***9,211***
	2005	***5,400***	***3,500***		***116***	***367***	***426***	***30***	***0***	***12***	***9,852***

The increase in the catches unloaded in Phuket is attributed to the shift from vessels based previously in Indonesia and Malaysia to Phuket and to an increasing use of vessel carriers to collect catches from fishing vessels on the high seas and transport them to Phuket. Thus, the increase in the catches unloaded would not indicate an increase in catch rates during the period rather being a consequence of such increasing use of carrier vessels.

The coverage rates for size data were only slightly lower than those obtained for catches, with size data collected for 20% or more of the specimens unloaded. Length-weight and length-length data were also collected in the three ports and was used to convert weights into lengths or curved lengths into straight lengths when this was required. Catch-at-size was built upon the data collected for:

- The Chinese and Taiwanese fresh-tuna longline fleets operating in the Indian Ocean
- Fresh-tuna longliners from Indonesia based in ports outside Indonesia

Evaluation of the results

Overall, the Multilateral Catch Monitoring Programme was considered successful for the following reasons:

- The five years of Catch Monitoring resulted in the building of the capacity required for Thailand to be able to take over the programmes activities
- The results from the catch monitoring in Phuket contributed to boost awareness in Taiwan,China and Indonesia regarding the need to improve data collection on their fleets of fresh-tuna longline vessels. In 2006 Taiwan,China provided for the first time, catch estimates for its fresh-tuna longline fishery, for the period 2000-2005 and Taiwanese scientists established contacts with their Indonesian and Thailand counterparts in order to assess ways to monitor the activities of Taiwanese fresh-tuna longliners based in ports in Indonesia and Thailand.

The catch figures estimated from the Programme for the Taiwanese fresh-tuna longline fishery in the Indian Ocean and for Indonesian fresh-tuna longline vessels operating outside Indonesia were accepted by Taiwan,China Indonesia and the IOTC and are considered to be more representative than those previously estimated, both for total catch and catch by species.

Further confirmation of the value of the programme came from IOTC's technical bodies:

Working Party on Tropical Tunas Report 2005 (paragraph 31):

> *The WPTT commended Indonesia and Thailand for the collection of information on fresh-tuna longliners operating from ports in these countries. The WPTT stressed the need to complete the existing information through the collection of information on catches and effort per area. Indonesia informed the meeting that a pilot observer program was currently under way the implementation of a logbook system being one of its objectives.*

Working Party on Tropical Tunas Report 2006 (paragraph 19):

> *Estimation of catches of non-reporting fleets: The collection of historical and current information on the landings of small fresh tuna longliners in ports in the Indian Ocean has improved the accuracy of earlier estimates.*
>
> *Estimation of catch-at-size for Indonesia, Taiwan,China and China fresh tuna longliners: The collection of size data in Thailand, Sri Lanka and Indonesia underpins the estimates of catch-at-size for fresh tuna longliners for 1998-2004 (longliners based in ports other than Indonesia) and 2002-04 (longliners based in Indonesia). CAS tables for these fleets in 2005 are being estimated.*
>
> *IOTC/OFCF sampling programmes: The collection of information on the activities of fresh tuna longliners landing in Phuket and Indonesia has continued during 2005. This*

has led to more complete and accurate estimates of the catches by these fleets. Other valuable data collected under these programmes include length frequencies (which will allow length-length, length-weight and weight-length relationships to be updated).

Scientific Committee Report 2006 (paragraph 17):

The SC also noted with concern reports indicating that large numbers of fresh-tuna longliners that used to operate from Indonesian ports, and whose catches were estimated by existing sampling programmes, have now moved to other areas of the Indian Ocean that may not be covered by catch-monitoring schemes. The SC was informed by the invited experts from Taiwan,China that a consultation meeting with Indonesia has been held in 2006 to discuss possible joint efforts to enhance the monitoring and management of Indonesian longline fisheries. Furthermore, programmes are being undertaken to improve the management of the Taiwanese fresh tuna longline fleet including encouraging the installation of VMS on the vessels fishing in the Indian Ocean. The SC welcomed such efforts and progress and anticipated an improvement in the statistics from this fleet as a result of these initiatives.

Unfortunately the DOF Thailand noted at the end of the IOTC-OFCF Programme that it was not going to be possible for the Thailand government to allocate additional funds to maintain the activities initiated by the IOTC-OFCF programme at the same level. The DOF, however, expressed its commitment to continue catch monitoring using staff from AFRDEC.

Observations of the situation before and after the implementation of the IOTC-OFCF activities in Thailand are provided in Tables 2-12 for Flag countries)and 2-13 for Thailand.

Table 2-12. The situation before and after the implementation of the IOTC-OFCF activities in Thailand for Flag countries

Before	After	Evaluation
Incomplete vessel activity data	Incomplete vessel activity data	Poor
Nominal catches NOT available	Catches provided by Taiwan Catches estimated agreed by Indonesia	Good
Catches and effort per area NOT available	Catches and effort per area NOT available	Poor
Size frequency data NOT available	Size frequency data NOT available from Taiwan, Indonesia or China	Poor

Table 2-12. The situation before and after the implementation of the IOTC-OFCF activities in Thailand for Thailand

Before	After	Evaluation
Incomplete vessel activity data	Complete vessel activity data	Good
Nominal catches inaccurate	Nominal catches accurate (less accurate by-catches)	Fair
Catches and effort per area NOT available	Catches and effort per area NOT available	Poor
Size frequency data NOT available	Size frequency data available	Good
Weak data processing routines	Robust data processing routines	Good

Figure 2-12 shows that catches of Fresh tuna longliners compiled by the Thai Customs and new catches estimated under the IOTC-OFCF cooperation (for Indonesian and Taiwanese fresh-tuna longliners). Note that the data collected during the program was used along with other information to estimate historical catches for this fishery and that the new estimates refer to catches per species while all previous catches were not recorded per species.

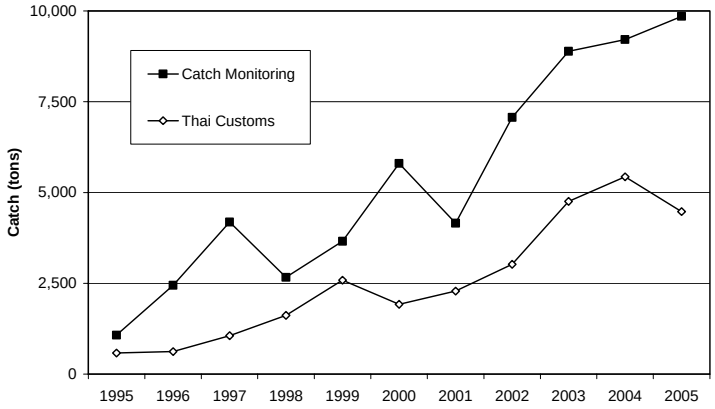

Figure 2-12. Catches of Fresh tuna longliners compiled by the Thai Customs and new catches estimated under the IOTC-OFCF cooperation for Indonesian and Taiwanese fresh-tuna longliners.

Recommendations for further development

The following activities are recommended to further enhance the collection of data for the fisheries of tuna and tuna-like species in Thailand.

Concerning the collection of information on the activities of foreign vessels,

The activities initiated in 2002 proved successful in helping **Thailand** to overcome several of the issues relating with the collection and processing of data from the foreign fresh-tuna longline fleets operating in Phuket. Unfortunately, the Thai government was unable to secure the funds required for maintaining all activities at the end of the IOTC-OFCF Project. The IOTC Scientific Committee, during its 2006 meeting, noted that the collection of information on the activities and catches of foreign vessels unloading in ports of IOTC members and cooperating parties is contemplated in the IOTC Resolution on Port Inspection (IOTC Resolution 05/03) encouraging members to collect and report this information to the IOTC in the future.

Scientific Committee Report 2006 (paragraph 24):

> SC recalled Resolution 05/03 Relating to the establishment of an IOTC programme of inspection in port that obliges countries having foreign vessels operating in their ports to collect data on vessels activities and landings (per species) and report these to the Secretariat annually.

It is recommended that the DOF of Thailand makes every possible effort to maintain the catch monitoring activities in Phuket at the same level they were implemented by the IOTC-OFCF Programme so as to be able to collect and report the above required information to the IOTC.

Concerning to the collection of data for fresh-tuna longline fisheries.

The results from the IOTC-OFCF cooperation were also helpful to increase awareness in Taiwan and Indonesia with respect to the activities of their fresh-tuna longline fleets in the Indian Ocean. Although some of the actions initiated during 2006 might improve the quality of the data in the future there are other areas that would require the attention of Indonesia and Taiwan,China in the early future. Some recommendations pertaining to the collection of data for fresh-tuna longline fisheries are reproduced below.

Scientific Committee Report 2006 (paragraph 11):

> *The SC made the following recommendations that represent the highest priority areas for members. It is expected that if these recommendations are realised, they will result in a marked improvement in the standing of the data currently available at the secretariat and ultimately the provision of scientific advice to the Commission. The SC noted that these*

recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.

2. Improve the certainty of catch and effort data from industrial fisheries by:

Requesting Indonesia and Taiwan,China to collect and report catch and effort data for their fresh tuna longline fleets.

3. Increase the amount of size data available to the Secretariat:

Requesting Taiwan,China to collect and provide size data from their fresh tuna longliners.

4. To estimate the levels of catches of IOTC non-target species by:

Urging members to implement appropriate sampling programmes to collect data on the catches of sharks, sea-birds, sea-turtles and sea-mammals in the first instance.

It is recommended that Taiwan,China and Indonesia implement the above recommendations as soon as possible.

3) Thailand's Neritic Tuna Fishery

General Information

Priority Area: Improving data collection systems

Project title: Enhancement of the data collection and processing system for neritic tuna fisheries in Thailand

Target Fishery/ies: Artisanal purse seine fishery, targeting neritic tunas

Main objectives:

- Assess the precision of the catch estimates produced by AFRDEC and DOF.
- Modify the sampling design to achieve acceptable levels of precision in the catch, effort and size statistics produced from this fishery in the future, if the precision assessed from the current programme is considered insufficient.

Background information

Data on fisheries

The total tuna catch for Thailand from the Indian Ocean in 2005 was 29,216t, of which 58% and 42% were neritic and oceanic tunas, respectively. Skipjack tuna (SKJ), kawakawa (KAW), Narrow-barred King mackerel (COM), and longtail tuna (LOT) were the dominant species in the catch composition followed by Bullet tuna (BLT), Frigate tuna (FRI), Indo-Pacific King Mackerel (GUT), yellowfin (YFT) and bigeye (BET) tunas. Four main fishing gears were used, namely purse seine, longline, gillnet and trawl for king mackerels. By Purse seiner caught 23,072 t, followed by trawlers (4,360 t), gillnets (1,505 t), and longliners (280 t).

In 2005, Thailand industrial tuna purse seiners and longliners operating in the high seas unloaded 15,000 t of tuna and tuna-like species. Foreign fresh-tuna longline vessels operating in the Indian Ocean and unloading their catch in fishing ports in Thailand accounted for around 11,000 t of tuna.

Institutions responsible for the collection of fisheries data

Department of Fisheries (DOF)

DOF is responsible for planning, data input, processing and analysis, and reporting of Thailand's fisheries statistics. There is a Marine Fisheries Sub-group under Fisheries Statistics Analysis and Research Group (FSARG). Provincial Fisheries Offices are responsible for collection of fisheries statistics data under the supervision of FSARG. They collect only data on Thailand fisheries (catches of foreign vessels are excluded in the statistical survey by FSARG).

Marine Fisheries Research and Development Bureau (MFRDB)

MFRDB is part of the DOF and is the organisation that supervises the activities relating to surveys and research on marine fisheries. The Marine Fisheries Technology Research and Development Institute under MFRDB directly supervises survey and research activities by five Marine Fisheries Research and Development Centres. One of the five Marine Fisheries Research and Development Centers, the Andaman Sea Fisheries Research and Development Center (AFRDEC) collaborated in the IOTC-OFCF Project.

Andaman Sea Fisheries Research and Development Center (AFRDEC)

While FSARG is responsible for collecting data throughout the country, for national fisheries statistics, AFRDEC collects data of large to middle-scale fisheries in the Andaman Sea for research purposes. AFRDEC, based in Phuket, also conducts statistical and biological surveys on tunas and tuna-like species caught by foreign vessels (information that is not collected by FSARG.

Data collection system before the implementation of the Programme

AFRDEC has been conducting 11 major landing place survey on local purse seine along Andaman

Sea Coast since 1985 (Figure 2-13). There are five types of local purse seine in Thailand, namely, Thai purse seine, Light luring purse seine, Chinese purse seine, Green purse seine and Tuna purse seine.

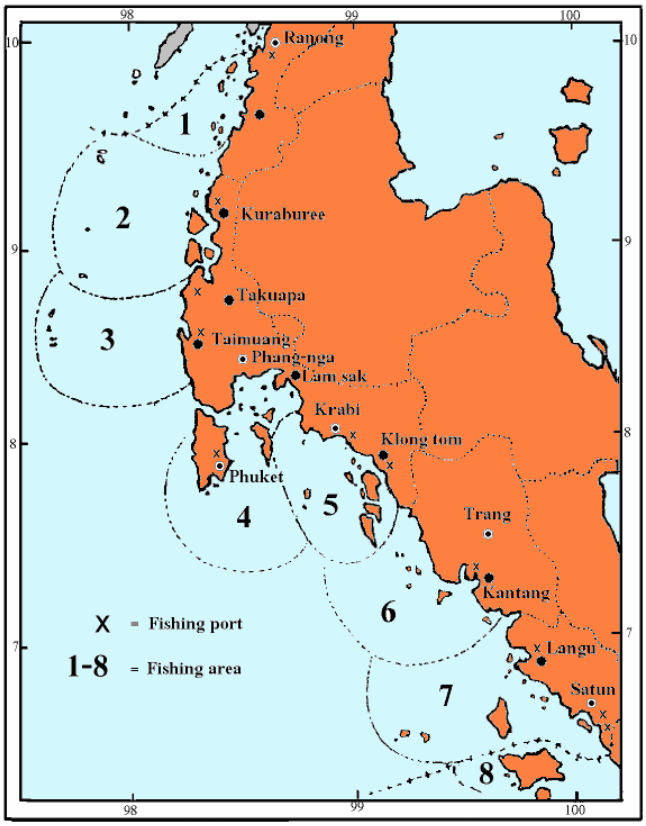

Figure 2-13. Locations of the fishing ports and fishing area along Andaman sea coast.

Staff of Ranong Marine Station and Satun Marine Station carries out survey only in their respective provinces while the remaining provinces are covered by AFRDEC. AFRDEC Survey team members visit each landing place once a month and interview master fishermen to obtain information such as vessel name, fishing gear, fishing days, total weight and species composition of catch. They sample pelagic fish, including neritic tuna from the landing and record length measurement.

AFRDEC sampling team monitor boats from the Fish Marketing Organization (FMO) landing site five days per month.

The procedure use to collect the fishing data utilises two groups of staff:

Group 1, one staff member undertakes an interview with the master fisherman to obtain data from the vessels that unloaded.

Group 2, three staff sample and collect species composition and length measurement of all target species (such as tunas, mackerel, scads, etc). They monitor half of three baskets at random during the catch unloading.

Main problems identified with data collection and processing

The status of the data collection and processing systems in Thailand was reviewed during a Workshop [1] organized by the IOTC-OFCF (March 2004, Seychelles). During this workshop Thailand presented a report The fisheries statistics system in Thailand [2] containing an overview of the main fisheries in Thailand, collection, processing and reporting of fisheries data, and listing the institutions responsible for data collection and research. A list of recommendations to improve the

[1] Regional Workshop on Data Collection and Statistical System, held in Seychelles from March 1-5, 2004

[2] Report with the support of IOTC-OFCF Project

quality of fisheries statistics produced by the Thailand government was also proposed. In this context, DOF and AFRDEC requested that IOTC-OFCF staff assess, in close cooperation with Thai scientists, in which way the recommendations from the report might be implemented. Furthermore, experts from the IOTC-OFCF, using the information available and other information collected during one fact-finding mission in Thailand identified the following problem areas relating to the statistics produced:

- Dysfunctional institutional linkage
    - Dysfunctional institutional linkages: Little effective cooperation between government and fishing communities.
    - Little interaction between FSARG (Statistics Unit) and MFRDB (Research Unit).

- Incomplete data collection
    - low numbers of boats sampled
    - uncertainty about the types and total numbers of vessels engaged in fishing in the zone
    - Potential uncertainty about the information given by skippers during interviews as the number of trips and number of sets cannot be verified.
    - misidentification of neritic tuna species at juvenile stage (in particular bullet and frigate tuna, and longtail tuna and kawakawa)
    - data on length frequency data were considered low
- Poor data processing
    - Data are entered on spreadsheets and there is no data validation implemented at entry.
    - No preliminary basic data analyses are conducted before estimation procedures to identify potential errors.
    - The accuracy of the production estimates made is questionable due to the quality of the data collected.
- Data disseminated is out of date
    - Late dissemination of National Statistics

<u>Recommendations from the IOTC Scientific Committee</u>

Scientific Committee Report 2006 (paragraph 11). Recommended

- to improve the certainty of catch and effort data from artisanal fisheries by *requesting members to increase sampling coverage to obtain acceptable levels of precision in their catch and effort statistics.*
- to increase the amount of size data available to the Secretariat *by requesting members to review their existing sampling schemes to ascertain that the data collected are representative of their fisheries.*

In recent years, Scientific Committee has tried to initiate a working group on neritic tuna.

The Scientific Committee indicated its desire to for a meeting of the Working Party in Neritic Tunas. The Committee recommends that any countries with data on neritic tuna fisheries should contact the Secretariat with this information. The date and venue of the meeting will be determined at a later date after consultations with the interested parties. Scientific Committee Report 2003 (paragraph 85).

Noting that IOTC's neritic tuna species include both oceanic and coastal species, the SC recommended that the WPNT identify which stocks might be best assessed at a sub-regional level. Scientific Committee Report 2003 (paragraph 52).

Given the major issues regarding the paucity of data available for artisanal fisheries, the IOTC-OFCF project, made it a priority to assist improve the quality of catch, effort and size data from neritic tuna fisheries and more generally from artisanal fisheries.

Actions implemented through the IOTC-OFCF Project

Scope of the Programme

Experts from the IOTC-OFCF Project decided on the following actions to assist Thailand assess the quality of the data collection system on neritic tuna fishery:

- The implementation of a pilot sampling program conducted concurrently with the existing AFRDEC and DOF data collection system.
- The analysis of the Information collected to assess changes to sampling design if is required.
- The estimation of the precision for different coverage levels (relating to catch, effort and size data)

Signature of the Memorandum of Understanding, duration of the activities and total budget allocated

Aware of the problems raised by the IOTC regarding the quality of the statistical data on tunas and related species in Thailand, DOF and AFRDEC requested that IOTC-OFCF staff assess, in close cooperation with Thailand scientists, in which way the recommendations might be implemented.

The IOTC-OFCF Project prepared a MOU which encompassed the execution of field and other activities during the year after its signature. The budget provided to AFRDEC to conduct the project was around 15,000 US $.

The type of support provided by the IOTC-OFCF Project is summarised in the following Table 2-14.

Table 2-14. The type of support provided by the IOTC-OFCF Project

Type of support	Details
Transfer of technology	Hardware and software
Support data input	1 data input staff
Support database administration	Supervisory trips Software Training
Support data input	1 data input staff
Support field activities	Training session on the field Sampling materials Supervisory trips 5 samplers

Design of the Multilateral Catch Monitoring Scheme

The program monitored the purse seine vessels targeting neritic species and unloading catches in Phuket Province, and Kuraburi1 / Phang-Nga Province. Sampling data was used to:

- Estimate the numbers of vessels and numbers of vessel unloadings in the two areas covered.
- Estimate the total catch by species unloaded from purse seiners in the two areas (mainly for IOTC species)
- Compare the results above with the information available from other sources (e.g. FMO, Customs, sale slips, etc.)

[1] Note that current FITC (Fishseires Information Technology Cebter) and AFRDEC data collection activities shall be maintained

- Increase the amount of size data available for neritic tuna species
- Estimate catch-at-size (from length frequency data) for IOTC species

Total catches: catches were monitored only in Phuket. The total catch was estimated from the sampling that the AFRDEC-IOTC-OFCF samplers conducted in Phuket.

Catch was estimated according to the following formula:

Catch = average catch per vessel (CPUE) * number of vessel unloadings (Effort)

The data was collected by the samplers :

CPUE:

- Total weight of fish unloaded per vessel sampled in Phuket per month

Effort:

- Total enumeration of vessel unloadings per month in Phuket and in Kuraburi

Species composition:

- The species composition will be estimated through sampling of fish unloaded from selected landings

Size frequency:

- The length-weight data of all the fish sampled and total catches estimated will be used to estimate catch at size through sampling of fish unloaded from selected landings

In the framework of the program, a database was created in Microsoft Office Access 2003 (Access 3.0) to store the data, to identify invalid data or outliers, to identify various problems in the dataset and to display an automatic reports describing:

- The number of records of length measurements by species and by site
- The number of boat sampled by month, by site and by boat type
- The sampling coverage rates by month, by site and by boat type
- size frequency by species

The data checking process was designed to run periodically and report analysed to identify potential problems and advice samplers in their task. The database was backed up weekly and backups were stored at AFRDEC and send periodically to IOTC-OFCF.

Vessel Record and vessel activities:

- It was also decided to build up a vessel record for the coastal purse seine fishery. The vessel record was built by using information recorded during interviews. The names, characteristics and fishing activities (e.g. type/s of gear used, fishing days, and area fished) of all purse seine vessels operating from Phuket and Kuraburi were recorded.

Main results

Considerable progress was achieved during the Neritic Tuna Catch Monitoring Project, in particular:

A vessel record was established: By October 2006, information related to 160 vessels was stored in the database. Information collected from interviews and sampling was entered into the vessel registry.

Data on fishing effort was improved: Daily fishing effort was monitored in both landing sites every working day over the duration of the program. Figure 2-14 shows the number of landings in both landing sites and the number of samplings in Phuket between December 2005 and October 2006.

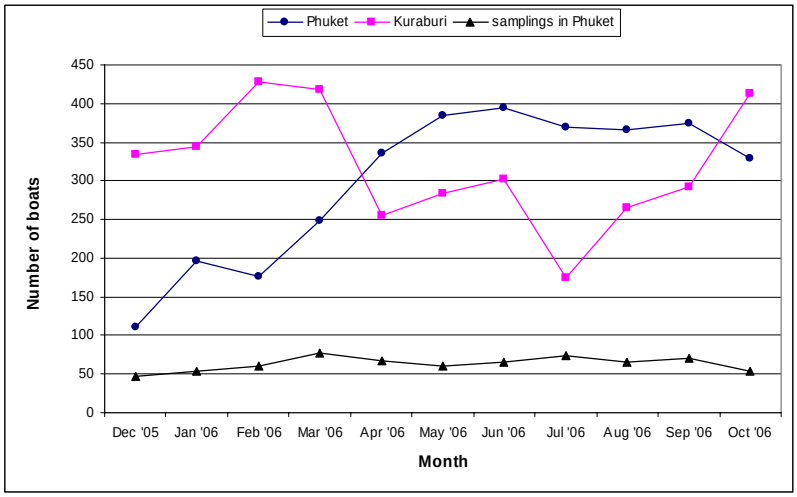

Fig 2-14. Number of landings in both landing sites and the number of samplings in Phuket between December 2005 and October 2006.

Knowledge of the fisheries increased: The information on vessel names, identification and vessel dimensions collected through interviews with skippers has improved the records of vessels operating in each landing site. 3,980 and 3,773 interviews were undertaken in Phuket and Kuraburi, respectively during the programme. This information has greatly improved understanding of the operation of this fleet, and the amount of effort by fishing method in Phuket (Table 2-15). There are mainly four type of purse seine in Thailand, namely Thai Purse Seine (TPS), Light Luring Purse Seine (LPS), Chinese Purse Seine (CPS), and Tuna Purse Seine (TPS). In addition to those, LPS, which is the most common fishing technique used , is sometimes used with TPS (TPS/LPS). In Kuraburi, all the boats use LPS.

Table 2-15. Number of landings per month per fishing method in Phuket

Year	Month	TPS	LPS	CPS	TUN	TPS/LPS	Total
2005	12	4	138	4	0	12	158
2006	1	7	230	3	1	8	249
2006	2	8	211	6	0	12	237
2006	3	23	254	10	0	38	325
2006	4	2	370	16	1	13	402
2006	5	15	387	17	1	26	446
2006	6	23	375	13	1	48	460
2006	7	24	375	17	2	25	443
2006	8	54	325	18	4	31	432
2006	9	20	378	19	3	25	445
2006	10	1	358	12	4	8	383
Total		**181**	**3401**	**135**	**17**	**246**	**3980**

Data from the sampling program has been used to estimate the total amount of fish unloaded by gear type (Figure 2-15). In this analysis, combination of two fishing techniques is not taken into account in this case. The highest catches per trip are attributed to tuna purse seiners whereas the most common fishing technique, i.e. Light Luring method accounted for a significantly lower amount of the catch.

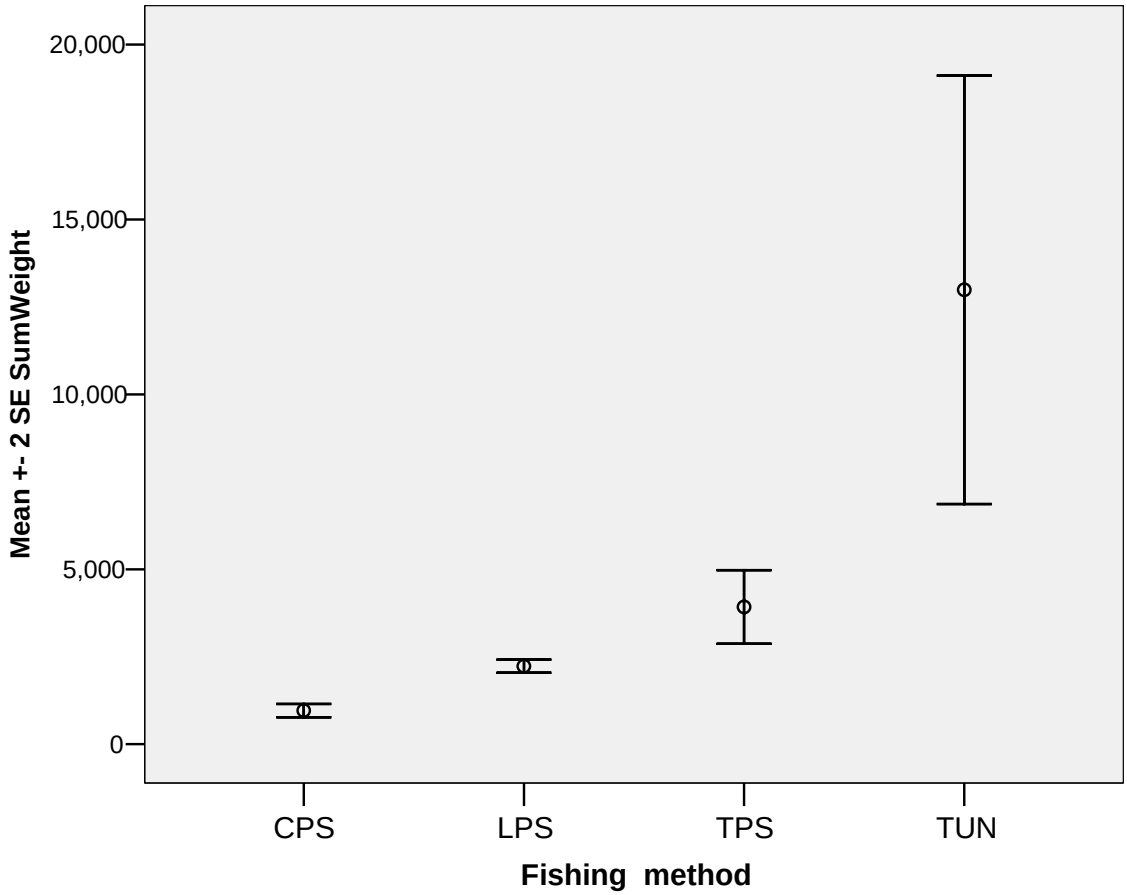

Fig 2-15. Average weight landed by different purse seines in Phuket.

Sampling coverage increased: The previous data collection system covered much fewer few boats sampled per month (Table 2-16) than the new sampling regime (Tables 2-17 and 2-18)

Table 2-16. Number of vessels sampled and landings and monthly coverage in Phuket and Kuraburi with the AFRDEC sampling program

Month/Year	Number of vessels sampled (AFRDEC sampling program)	Number of landings	Coverage (%)	Landings
Nov-05	28	261	10.73	Kuraburi
Dec-05	19	334	5.69	Kuraburi
Jan-06	19	345	5.51	Kuraburi
Feb-06	19	429	4.43	Kuraburi
Mar-06	25	418	5.98	Kuraburi
Apr-06	20	255	7.84	Kuraburi
May-06	13	284	4.58	Kuraburi
Jun-06	9	302	2.98	Kuraburi
Jul-06	17	174	9.77	Kuraburi
Aug-06	20	265	7.55	Kuraburi

Sep-06	15	293	5.12	Kuraburi
Oct-06	20	413	4.84	Kuraburi
Nov-05	78	329	23.71	Phuket
Dec-05	20	338	5.92	Phuket
Jan-06	24	301	7.97	Phuket
Feb-06	19	214	8.88	Phuket
Mar-06	23	375	6.13	Phuket
Apr-06	12	359	3.34	Phuket
May-06	16	386	4.15	Phuket
Jun-06	23	427	5.39	Phuket
Jul-06	16	289	5.54	Phuket
Aug-06	25	337	7.42	Phuket
Sep-06	22	373	5.90	Phuket
Oct-06	26	390	6.67	Phuket

Tables 2-17 and 2-18 present the percentages of boats sampled per fishing method used and global coverage of the fleet per month.

Table 2-17. Number of samplings per month per different purse seines Phuket

YEAR	MONTH	TPS	LPS	CPS	TUN	TPS/LPS	Total
2005	12	2	39	3		3	47
2006	1	5	42	2	1	3	53
2006	2	3	47	4		6	60
2006	3	3	56	7		11	77
2006	4	1	53	7	1	5	67
2006	5	7	49	2		3	61
2006	6	2	47	4	1	11	65
2006	7	6	52	5	2	9	74
2006	8	10	44	7	1	4	66
2006	9	3	57	2	1	7	70
2006	10		49		2	3	54
Total		**42**	**535**	**43**	**9**	**65**	**694**

Table 2-18. Percentage of boats sampled by different purse seines operated and global coverage of the fleet per month

YEAR	MONTH	TPS	LPS	CPS	TUN	TPS/LPS	Overall
2005	12	50.0	28.3	75.0		25.0	29.7
2006	1	71.4	18.3	66.7	100	37.5	21.3
2006	2	37.5	22.3	66.7		50	25.3
2006	3	13.0	22.0	70.0		28.9	23.7
2006	4	50.0	14.3	43.8	100	38.5	16.7
2006	5	46.7	12.7	11.8	0	11.5	13.7
2006	6	8.7	12.5	30.8	100	22.9	14.1
2006	7	25.0	13.9	29.4	100	36	16.7
2006	8	18.5	13.5	38.9	25	12.9	15.3
2006	9	15.0	15.1	10.5	33.3	28	15.7
2006	10	0.0	13.7	0.0	50	37.5	14.1

Information on the species composition is more precise: In the past, the species composition of the landings was only available from a limited sample. The species breakdown from sampling was used to estimate the catches unloaded in other ports by species. Invariably, it is more difficult to identify the juveniles and smaller sized fish. The increase of the number of samples being taken due to increased number of staff improved the quality of the data.
Most fishers agreed widely to provide information on their fishing ground. While the reliability of this information is unknown, it could be used in the future to better estimate and verify species composition. However, it should be noted that the preliminary results from the new monitoring indicates that the information given by skipper is not precise enough in term of species breakdown and data provided by FMO are sometimes incomplete.

A larger amount of size frequency data is now available for the neritic tuna: The amount of size data collected in Thailand in the past was quite low. The current levels of coverage should allowed that catch-at-size be estimated for the first time for this fishery. Table 2-19 gives the number of fish monitor per species per month.

Table 2-19. Number of fish measurements recorded per species and per month

YEAR	MONTH	BLT	COM	FRI	GUT	KAW	LOT	SKJ
2005	12	416	10	312	10	509	201	4
2006	1	180	11	485	31	2017	756	28
2006	2	2723	22	2042	3	4545	417	29
2006	3	443	32	1059		2220	424	171
2006	4	275	50	1231		2260	1551	61
2006	5	2181	24	1623		2565	159	54
2006	6	2300	28	554	22	465	138	132
2006	7	596	5	1164	9	1036	554	261
2006	8	81	17	941	1	982	1484	175
2006	9	1	61	357	88	538	358	130
2006	10	30	20	369	2	552	891	386

No production estimates and comparison with other data sources has been conducted yet.
Complementary analyses will be preformed in the next future.

Evaluation of the results

Overall, the project to enhance the data collection and processing system for neritic tuna fisheries in Thailand has been successful for the following reasons:

- An efficient team based in Phuket was formed and demonstrated their ability to carry out sampling to a good standard
- Data entry improved as samplers were able to undertake data calculations and checking prior to entry. All of them were trained to use the software which improved the accuracy of data entry.

Recommendations for further development

Further improvements to the collection and processing of data for Thailand's tuna and tuna-like fisheries could be achieved by implementing the following recommendations:

1. A Local Supervisor should be employed to monitor the work done by samplers on the field, assist them when they face practical problems.
2. Regular training is an indispensable part of a sampling programme. On-the-job-training is important for addressing technical problems but at the same time the local supervisor will increase his knowledge about the local situation. It will allow also the samplers to answer fishermen questions about the data collection programme. Thus the idea of gathering all staff at one place on the regular basis to give them the opportunity to meet their colleagues

for exchange of experience and to present the results of the program should be consider seriously. This could be one of the solutions for the staffs not to loose their interest in the job and to keep field staff motivated and maintain work quality. It is also that the data entry persons have a good understanding of the sampler's job and to be regularly in contact with the samplers in order to question them and to be able to identify errors more easily.

3. The vessel record needs to be completed
4. As the new catch estimates in Phuket and Kuraburi could differ from those obtained using the previous catch estimation procedure, historical data could be corrected and catches re-estimated.
5. In other landing sites, catch estimates are still uncertain due to many assumptions made in estimating effort data. There is a need to assess the reliability of current effort estimates.
6. Super sampling (sampling with large number of sampler able to cover a very high number of boat during one sampling day) should be undertaken occasionally to gauge the appropriate level of regular sampling required.
7. Noting the small size of neritic species in Thailand waters, increased training and attention with respect to species identification will improve species composition data..
8. Insufficient training of data entry staff can be the cause of high error rates, particularly when they have to interpret doubtful logbook records. Training on basic database concepts is essential for staff that handles the data.
9. Issue reports about the programme and the results obtained to keep government, other institutions and the staff up-to-date with the status of the programme.
10. Introduction of a logbook system to multi-day boats (with some incentives) would improve catch, effort and location data.
11. Observers could be sent onboard to assess the accuracy of the information provided by skippers concerning fishing method, fishing ground.

4) Sri Lanka's Billfish and Tuna Fishery

General Information

Priority Area: Improving data collection systems in developing coastal countries

Project title: Catch Monitoring Programme Sri Lanka

Target Fishery/ies: Offshore Gillnet and longline Fishery and coastal longline fishery targeting yellowfin tuna

Main objectives:

- To improve the accuracy of catch and effort estimates by area and species for both fisheries
- To increase the amount of size frequency data on tropical tuna and billfish species in Sri Lanka
- To implement a data collection system for the coastal yellowfin longline fishery.

Background information

Data on fisheries

Since early 1980's total production of tuna and tuna like species has increased from 25,000 t to around 100,000 t according to National estimates.
The production of the large pelagic fishery (including both coastal and offshore) has increased from 73,000 t in 1994 to around 150 000 t (in 2004).

Institutions responsible for the collection of fisheries data

The statistical unit of Ministry of Fisheries and Aquatic Resources (SU) and the Department of Fisheries and Aquatic Resources (DFAR) are the institutions mandated for data collection in Sri Lanka. The National Aquatic Resources Research and Development Agency (NARA) was identified as the agency to provide statistics to RFMO's. The status of data collection data holding and processing systems in these organisations were reviewed at the beginning of the program.

Statistical Unit of Ministry of Fisheries and Aquatic Resources (SU)

The statistical unit of Ministry of Fisheries and Aquatic Resources is the key entity responsible for collection and reporting of fisheries statistics in Sri Lanka. It receives fisheries data reports from a range of sources and also collects some a small amount of raw data itself (e.g. visits to Colombo fish markets and few special surveys). The specific functions of the SU are to collect, analyze, report fisheries statistics collected by the various agencies involved and in doing so, maintain the national data records. The SU is in charge of estimating total catch, and the number of vessels operating and maintaining a boat registry. They also collect information on fish consumption, trade etc.

Department of Fisheries and Aquatic Resources (DFAR)

Fisheries Inspectors attached to the District Fisheries Offices collect fish catch and effort data from the coastal and offshore fisheries from beach landing sites and fishery harbours. Under their present sampling scheme, data collection covers only some of the boats fishing for tuna but there is no comprehensive data collection on tuna fisheries as a whole. The Department of Fisheries is also mandated to licensing fishing crafts/operations and gears.

Data collection system before the implementation of the Programme

National Aquatic Resources Agency (NARA) has been engaged in catch & effort data collection since early 1980's main for use in research and stock assessment. In 1986, the Indo-Pacific Tuna Development and Management Programme (IPTP) provided assistance to NARA to conduct a sampling programme to monitor tuna landings. In 1993 the Ministry of Fisheries and Aquatic Resources Development (MFARD) launched a six years fisheries development project with the financial support of Asian Development Bank (ADB) including a 2 year sampling programme. In

1994, NARA was able to introduce a comprehensive sampling programme through the technical and financial assistance of FAO/ TCP Project for the period of 1994-1996. After this time, the samplers hired for the above programmes were absorbed to NARA and NARA continued the activities.
The concept of sample-based estimation is the base for that sampling programme. This has been basically designed to cover the large pelagic fish species in particular the offshore multi-day boats and in a few cases coastal day boats.
Data was collected by stratified random sampling of boats in each landing sites. Data were collected according to the vessel type and gear information was recorded by interviewing the skippers / fishermen. The data was recorded into eight categories of fish, some of which are highly migratory. These categories are: tuna, marlins, seer fish, swordfish, sailfish, sharks, rays and other bony fish. Six fishing vessel categories (UN1: 5.5 - 7.2 m, UN2A: 8.8 - 9.8 m without ice box, UN2B: 8.8 - 9.8 m with ice box, UN3A: 9.8 - 12.2 m, UN3B: 12.2 m – 15.2 m, UN4: 15.2 - 18.3 m) have been identified through this programme. UN1 and UN2A categories were basically targeted the coastal fishing activities while the rest was targeted by offshore fishing activities.

Main problems identified with data collection and processing

Experts from the IOTC-OFCF, basing on the information available and other information collected during several visits to Sri Lanka identified the following problem areas relating to data collection and processing in Sri Lanka:

- Dysfunctional institutional linkages
    - Lack of communication and data exchange among the institutions involved in the collection of fisheries data
    - Dissemination of two conflicting production estimates for the offshore fishery produced by NARA and Statistical Unit
- Incomplete data collection
    - Incomplete vessel record: Estimating the number of active fishing vessels operating in Sri Lanka has, historically, been difficult due to inconsistencies and limitations of government and port authority vessel registries. According to the available information, there has been no complete boat census carried out since 2002 and the data from previous census are used for the estimate the number of active fishing vessels. While there are rules and regulations related to the registration of boats, these apparently do not function properly due to lack of proper Monitoring Control Surveillance (MCS) systems, thus there is a large number of unregistered boats. Further as the registration numbers are not displayed, there is no way to recognize registered boats from unregistered boats in the landing sites. Boat name appear in most of the boats but several boats may have the same name. This has made it difficult to distinguish boats from each other in the landing sites.
    - Incomplete vessel activity record: Ceylon Fisheries Harbour Co-operation maintains records on the total number of boats registered in a particular harbour as they are responsible for the collection of harbour charges for anchorage. Boats are registered on monthly basis. The Sri Lankan Authorities do not keep complete records of arrivals, catches unloaded and departures of vessels to ports in Sri Lanka. .
    - Species identification is uncertain:
        - A high level of misidentification of yellowfin and bigeye tuna and marlins is likely
    - Insufficient data on catches:
        - Data are collected through interviews to skippers and/or crew:
        - The main part of the landings observed as dry/salted fish was not taken into account for catch sampling.

        - No information about the weight (process or round) was recorded
        - Detail on the catch by gear was not recorded.
        - Catch and effort by time-area strata are not detailed
    - Insufficient data on size frequency:
        - The amount of data on length frequency was low: typically, one length measurement only was recorded on the whole fish measured. Furthermore, as much of the catch was processed onboard, samplers were unable to record any measurements - this represented a potential bias in the results.
        - Bycatch specimens were rarely measured
    - Insufficient verification of field monitoring:
        - The number of the trips made by sampling program supervisors was very low, even though, the purposes of these unannounced visits was to assist samplers in their job, to see if sampling methods and fish identifications are being carried out correctly.
        - Verification of data is essential to ensure that data are accurate and complete.
    - Inaccurate data used to estimate production: The accuracy of the production estimates made over the last 10 years are uncertain as they were based on :
        - (a) the total number of vessels engaged in fishing in the zone by class of vessel,
        - (b) the average number of landings made each month by zone and class of vessel,
        - (c) the average landing size of a species by zone, month and class of vessel,

      The number of vessels actively fishing in the fishery zone (a) used to raise the estimate to the number of vessels within the zone was based on information gathered at the beginning of the program. Due to the lack of updated information these numbers were not updated for the whole period and were kept constant over the period regardless the seasons. The average numbers of landings by a class of vessels in a zone during a given month (b) were also fixed. As the fishing activity and behaviour has experienced a considerable change over the period, the estimates made were not accurate and were probably over-estimated.

- Poor data processing
    - Insufficient validation rules: The database contained validation rules for much of the input data to reduce typographical errors; however, the database still contained mistyped information and invalid data
    - Insufficient verification prior processing: No preliminary data analyses were conducted to identify potential errors before production estimates were made.

- Procedure used to estimate production was prone to high uncertainty

  Potential biases for the estimations come from:
    - Insufficient size frequency data: the average monthly weights were often derived from a small sample (especially for marlins) furthermore they were not allocated to a specific gear. This average was then used to simply convert numbers landed to weights by multiplying numbers by the mean weight.
    - Lack of updated “nominal” weight: Where landings had been recorded as numbers and there were no length samples for the species in that month then a predetermined 'nominal' weight was used. This was generally calculated from

either the annual mean weight from length data for a species or from a 'best estimate' from experienced officers at NARA. The latter was generally the case for bycatch species. For lack of size measurements, these values were either derived from very small amounts of information or not updated at all, nominal weights are therefore highly uncertain.

- Lack of updated information: on the number of vessels engaged in the fishery and on the average number of landings made each month.
- No or low coverage per stratum: which leads to the use of strata substitution

- Data not disseminated or was out of date

Sri Lanka was not in a position to provide statistics according to IOTC standards due to the following:

- Deficiency of the statistic system: The system did not allow Sri Lanka to provide a complete list of the fishing vessel larger than 24 meters in length overall and the catch by gear and / or species.
- Conflicting data: discrepancies between the datasets published by SU and NARA, and marked fluctuations in the catch estimates from one year to another lead the Secretariat to conclude that the data was highly uncertain and produce as uncertain and to correct the annual production.
- Species and gear breakdown: Production estimates for coastal was not provided gear and species wise and had to be corrected by IOTC Secretariat.
- Catch and effort data: for the gillnet/longline fishery catch and effort data are very scarce.

Recommendations from the IOTC Scientific Committee

The IOTC Working Parties, aware of the above issues, strongly recommended that the Secretariat make every possible effort to improve the quality of catch, effort and size data from billfish fisheries and more generally from artisanal fisheries. Recommendations relating to the need to improve the information available can be found in many reports from the IOTC Working Party on Billfish (WPB):

- *The Secretariat should continue to work with scientists from Sri Lanka to ensure inclusion of detailed data on billfish from the relatively large billfish fisheries of that country.*
  (WPB report (2000) chapter 8 paragraph 5 p 15)

- *Improved catch and effort statistics should be collected for artisanal fisheries of coastal countries with the help of IOTC and of the IOTC-OFCF project. This applies to all Istiophorids, but especially sailfish in areas of high recent catches such as Sri Lanka, Iran and Indonesia* (WPB's since 2000)

- *the Japanese OFCF statistical project and recommends that priority should be given to sampling in countries which have substantial catches of swordfish and billfishes which are not properly monitored (e.g.: Sri Lanka gillnet fisheries).*
  The WPB's (2001, 2003)

- The WPB in 2004
  emphasizes its support to the Japanese IOTC-OFCF project and recommends that priority be given to countries with substantial catches of swordfish and billfishes which are not properly monitored or are reported as aggregates

- The Billfish working party recommended since 2000
  that research on istiophorids biology be undertaken and especially sailfish in areas of high recent catches such as Sri Lanka, Iran and Indonesia

Other relevant recommendations relate to the paucity of size data available for gillnet/longline and artisanal fisheries and the need to collect more samples from these fisheries.

Actions implemented through the IOTC-OFCF Project

Scope of the Programme

Using available information the experts from the IOTC-OFCF Project noticed:

- The relatively large quantitative of tropical tuna and billfish species declared by Sri Lanka compared to other countries
- The sampling design was out of date and would need to be modified
- Large discrepancies between the data published by the SU and that collected through the existing NARA sampling program.
- A lack of size frequency data for tuna and billfishes
- The emergence of new fishing companies targeting tuna and billfish for the high quality market (two have been already identified)

The experts identified a range of actions intended to improve the quality of Sri Lanka's fisheries statistics.

- The enhancement of the existing sampling program to strengthen the collection and processing of data on the **offshore fishery, and in particular**:
  - Estimate catch by gear and species
  - Estimate catch at size for main billfish and tuna species
- The implementation of a sampling program to monitor the longline fishery for large yellowfin tuna (**Coastal Fishery**) to better understand the magnitude of the catches of this emerging fishery.

Signature of the Memorandum of Understanding, duration of the activities and total budget allocated

Aware of the problems raised by the IOTC relating to the quality of the statistical data on tunas and related species in Sri Lanka, NARA requested the assistance of the IOTC-OFCF Project.

The IOTC-OFCF Project prepared two MOU which encompassed the execution of field and other activities during the year after its signature. The agreements were signed respectively on 2nd Nov 2004 and on April 2006 with budgets as indicated in Table 2-20.

Table 2-20. Budget provided to NARA to conduct the project in US $

Year	2004	2005	2006	Total
Budget	10,818	18,731	10,562	40,111

The type of support provided by the IOTC-OFCF Project is summarized in the following Table 2-21.

Table 2-21. Type of support provided by the IOTC-OFCF Project to NARA

Type of support	Details
Transfer of technology	Hardware and software (modification of the existing database: PELAGOS)
Support data input	2 data input staff
Support database administration	1 Database administrator Supervisory trips Training
Support data input	1 data input staff

Support field activities	Training session on the field workshop Sampling materials Supervisory trips 6 samplers

Design of the Multilateral Catch Monitoring Scheme

During the fact-finding missions it was noted that the sampling method set up in 1994 had not been adapted to cope with the changes that had occurred in the fishery. Original protocols had become difficult to follow and the original goals difficult to achieve. Aware of the problems encountered by samplers on the field, NARA and IOTC-OFCF decided also in the frame work of this program to adjust the sampling scheme to address the changes.

The program monitored the **offshore fishery** targeting multi-species (which commonly used gillnet or gear combination such as gillnet-tuna-longline, gillnet-shark-longline) and the coastal longline fishery targeting large yellowfin tuna. A sampling strategy was designed to allowing estimation of:

- total effort per time and area;
- total catch by species, time and area:
- size distribution of the catch by species, time and area:

The design was modified on several occasions to overcome problems relating to the implementation of the activities.

It was also decided to build up a vessel record for the offshore fishery.

Vessel Record: The vessel record (offshore fishery) was built by using a combination of records including:

- Survey data - due to a lack of reliable, complete source of effort information, NARA decided to carry out a frame survey and this was started in late December 2004. Unfortunately the survey was interrupted by the 2004 Tsunami. NARA, however, was able to complete the survey but the data were incomplete largely due to the absence of specific identification features of the vessels such as boat name or boat registration numbers.
- Industrial vessels data - the Ceylon Fisheries Harbour Corporation (CFHC) registry collects a range of data on the activities of industrial and multi-day boats in its fisheries harbours. Their interest is preliminarily in the usage of facilities provided by the fishery harbour, collection of harbour fees and to regulate the movements of vessels between their harbours.
- Navy data - the Navy, for the security purposes, records some information about the boats in some major harbours. For example, boat name, registration number, personal information about the crew, boat owners name are recorded when a boat enters into a particular harbour. This information was obtained by official request.
- Fishing Cooperative data - the fishing cooperative Society of Negombo record information on all unloaded vessels (including boat name, boat size and total catch) as a daily commission has to be paid to the cooperative society by any boat which unloads their landings at the Pitipana landing site.
- Sample data - records of vessel unloading collected by samplers on the landing sites.
- Company data - the Thalulah Company is operating with an 8 boats fleet, all the details on its activities was obtained by NARA from the records they maintain at the office at Beruwala.
- Boat identification data - as there was no existing means to obtain accurate information about the fleet composition NARA / IOTC / OFCF decided to carry out a boat registration programme which involved assigning a number to each multi-day boat. For this task a sticker was designed, with a single identification number aside the NARA logo. This operation aimed to get accurate information about the fleet composition and improve catch estimates. This activity was successful and information related to the fishing operation and

boat characteristics were also collected at the time of introducing the sticker to each boat.. This activity not only assisted the data collectors' task but also initiated better contact with the owners, and gave the opportunity to NARA officials to explain the importance and goals of the current data collection program and to collect relevant information concerning the boat characteristics, fishing techniques and strategy used. This has made a considerable improvement to the relationships between NARA and the fishermen.

Estimating total catch (Method 1)

Total catch was estimated from sampling conducted by NARA samplers in each landing site: 23 and 26 sites respectively for the offshore and coastal fishery scattered in the seven statistical zones along the coast (Figure 2-16).

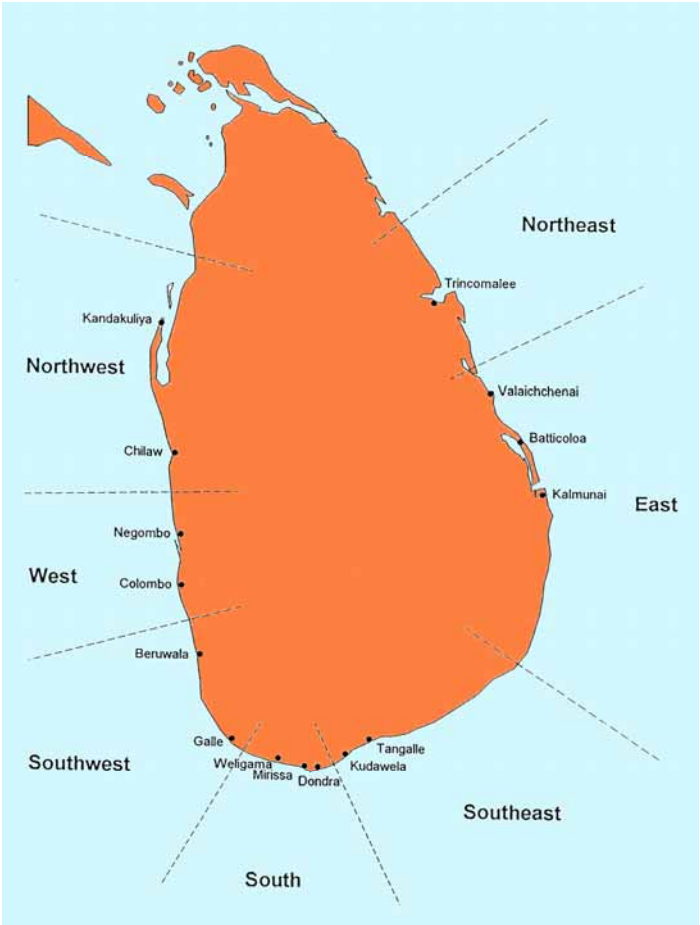

Figure 2-16. Principal landing sites and statistical zone used in estimating offshore and coastal large pelagic production in Sri Lanka.

The sampling system was based on the new information collected during supervisory trips. A selection of and allocation of the number of days of sampling at each landing sites depended on the level of activity — determined by the number of boats operating and the catches recorded previously.

Obtaining accurate estimates of the numbers of vessels per category engaged in fishing is important in deriving accurate estimates of production from this fishery. Estimates of fleet size are essential in order to raise the sampled catch to a total catch estimate. While many vessels have a particular port they might call their "home" port (where they are registered) they may to land their catches at

one of several sites e.g. sites that may be closer to where they have been fishing or where they can get the best price for their catch. In order to overcome these factors, the monthly production is estimated for the offshore fishery and for a fraction of the coastal fishery (UN2A fleet maintaining activity throughout the year) as follows:

Catch = average catch per vessel (CPUE) * number of vessel unloadings (Effort)

Where:

CPUE = Average catch per vessel unloading estimated from samples (comprising all fish unloaded) taken from selected vessel unloadings.

Effort = The estimated number of vessel unloadings per site per month

Estimating total catch (Method 2)

For the rest of the coastal fleet especially for UN1 boats which operate seasonally, there are three basic inputs to the estimation procedure. They are:

- the total number of vessels engaged in fishing in the landing site by class of vessel,
- the average number of landings made each month by landing site and class of vessel,
- the average amount unloaded per species by landing site, month and class of vessel,

In this case the following formula was used

Catch = average catch per trip (CPUE) * Total number of landings (Effort)

Where:

CPUE = average catches per vessel unloading estimated from samples taken from selected vessel unloadings being all fish unloaded monitored in these cases.

Effort = [Average landing per boat] X [Number of active boats in the zone]

Catch-at-size: Catch at size was estimated by raising the available size samples to the total catch estimated for each species and month (from above). This process involved the following processing:

- Total enumeration of individual fish weights from vessel unloadings sampled per site per month
- Collection of length – weight data of the fish sampled
- Collection of other biological data for important species of tunas and billfish

The sampling design was modified on several occasions to adapt to the particularities of each landing site. The changes were documented in various reports and papers presented to the IOTC Working Parties.

A database called PELAGOS was created in 1994 in an earlier version of Microsoft Office Access (Access 2.0) to store the data from a previous FAO/TCP project. Microsoft Office was subsequently upgraded up to the 2003 version and the database converted into the update version of Access. Minor modifications were also made including the adding / updating of tables and data entry forms.

- Another Access database linking PELAGOS tables was designed to identify invalid data or outliers entered, to identify various problems in the dataset and to display automatic reports including average monthly lengths per species
- number of records of length measurements per species and per site
- number of boat sampled per month, per site and per boat type
- sampling coverage rates per month, per site and per boat type
- size frequency per species

- length-length relationships

Major changes to the previous program

The project noted that there was a need of substantial changes to the guidelines given to samplers when collecting information in the field, in particular with respect to:

- The validation of the data collected: In the past, samplers relied mainly on information obtained during the interviews with the skippers and catch data was provided to them by the skipper or the crew. The major sampling unit used was catch per boat per trip. Catch was recorded in either number or weight. With respect to the weight data, it was uncertain whether it represented the whole weight or the landed weight after processing. Obviously, this made the final catch estimates highly uncertain.
- The precision of the weight data collected: the landed weight recorded needed to be accompanied by information on the type of process the fish underwent (i.e. whether it was headed and gutted, gutted, round, dried etc.) and whether the weight was estimated or measured. This is required so the appropriate raising factor can be applied later during the estimation procedure.
- An increase in the amount of length measurements collected: Several alternate measurements (two for tunas and five for billfish) were been proposed for each species to increase the data especially for fish processed on board as this had become the norm in recent years.

There was also a need to conduct complementary tasks to improve the reliability and the quantity of the information, including.

- Supervisory trips: to assess whether protocols can and were being followed and are appropriate for the actual fishing activities and to check that samplers are actually present when they are supposed to be

- Super sampling: was undertaken to estimate the likely accuracy of the estimates obtained through routine sampling and to approach more closely the real total number of landings and quantity of fish unloaded per day in a given landing place. Super sampling was carried out at each of the major landing sites. The goal was to sample all the landings and enumerate all the fish unloaded. NARA / IOTC / OFCF project staff and other extra field samplers were involved in this task.

- Extra biological sampling: as with the super sampling, a large number of staff was used to take length measurements during a sampling day at a major site and derived length–length relationships and curved-straight conversion factors for billfish and tuna. Data on by-catch species which are, rarely sampled during regular sampling due to lack of time was also collected.

Main results

Capacity to undertake catch monitoring

The sampling protocols were not always strictly followed for a range of reasons (described above) therefore some objectives were not achieved. As a result, daily effort was underestimated and the sampling coverage was often lower than expected.

On a positive note, the supervisors demonstrated their abilities:

- to assist samplers when they face practical problems
- to amend wisely the protocols to reach the goals
- to find alternate sources of data to cross-check data obtained from the programme.

- to identify potential changes either indirectly by analyzing the data or by cross–checking different datasets when accurate data were reported by other institutions or detected directly on the field during interviews with skippers or people from the other institutions or by observations noticed by samplers,
- to handle the data in order to extract information from the database, verify and correct the data and finally estimate catches.

Linkages and communication between institutions

Several productive internal meetings were held between NARA, SU and IOTC-OFCF over the course of the project. At the end of the programme, a meeting gathering all governmental institutions involved in fisheries, a representative from the industry and representatives of ICEIDA (Icelandic International Development Agency) was held at the Ministry to present the results of the program. There was general agreement between these bodies on how to proceed in the future.

Improvement of the data collection system and reporting

- **Offshore fishery**
    - **Vessel record:** By December 2006, 1730 stickers had been distributed and all related information related stored in the database. These data contributed greatly to the vessel registry which is expected to be completed in 2007. A list of the vessels will be distributed to samplers to assist them in the recognition of the vessel type during samplings.

    - **Nominal catches:** NARA scientists have completed the 2006 catch estimates for offshore fishery taking into account the changes made in many aspects of sampling and estimation procedures. Production estimates for 2004, 2005 and 2006 are shown in Figure 2-17. Estimates of national production prior to 2005 did not include production from the northwest zone. The estimates of production from 2005 and 2006 made by the present study are lower than the previous estimates obtained in 2004. Production estimates for the two last years indicate that the national production statistics for tuna and billfish could have been overestimated in the past due to several shortcomings of the methodology of sampling and estimation. The difference in estimated production in 2004 is 56% when all species are combined (without sharks) for year 2005. For the principal species, the decrease ranges from 37% for sailfish, 51% for yellowfin tuna, and 59.5% for skipjack tuna to 61% for marlin. The greatest difference relates to sharks where the catch estimate in 2005 was 95% lower than that estimated in 2004 (in addition to the changes attributed to the sampling program an estimation procedure, a decrease ion the production of sharks may be related to a change in fishing grounds, as in earlier years more and more trips were made to distance islands mainly targeted for shark, and because many fishermen shifted from targeting sharks to tuna.
      Estimates were prepared in June 2006, but the results are preliminary as the data collected during the “sticker operation” had not been entered in the database and nominal weights used to convert numbers of fish landed to weights for the by-catch species were chosen arbitrarily. It is especially the case for the sharks, rays and marlins. For 2006, the preliminary results in some sites are consistent with 2005 but the total catch is higher. This is probably due to the tsunami greatly affecting fishing activity in the first quarter of 2005 (Figure 2-17). It is essential that estimates of effort are revised as a range of discrepancies between data collected by administration and fishermen cooperative sources have appeared. The reasons for variability associated with this information are difficult to understand and evaluate. Information on field conditions should always accommodated in the sampling regime and estimation procedures. Supervision trips revealed that the number of active boats was higher than expected and that some sites showed a higher activity than previously. Fishing techniques and strategies have changed over time as well. Regular checking should allow Sri Lanka to provide more accurate

nominal catches data in the future. The useful next step would be to review and where necessary revise the historical data.

Table 2-22. Production estimates for the main species/groups (in tonnes) in 2004 (previous sampling regime) in 2005 & 2006 (NARA/IOTC/OFCF sampling regime) for the offshore fishery

Species/ Group	2004	2005	2006
BET	93	52	243
SKJ	62,242	25,182	29,826
YFT	29,677	14,590	14,057
MAR	3,934	1,521	1,169
SFA	3,117	1,977	2,502
SHK	32,000	1,712	1,829
SWO	1,376	660	1,118
Total	**132,439**	**45,693**	**50,744**

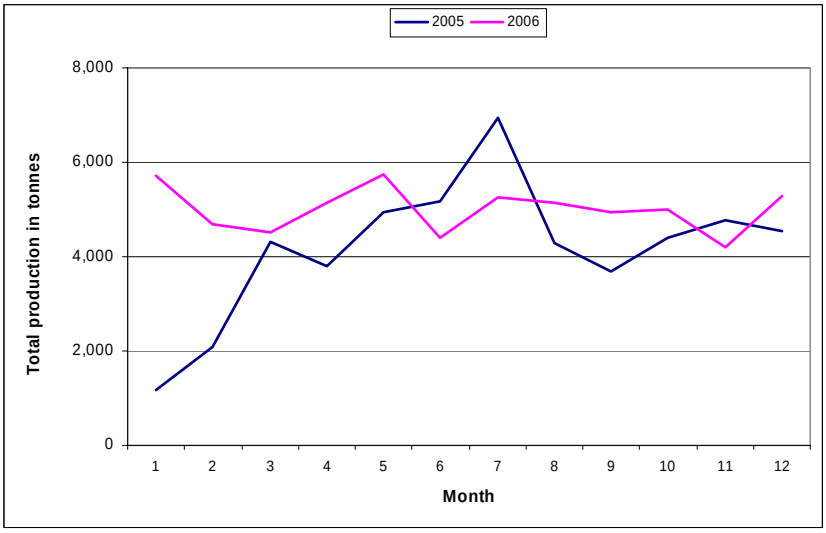

Figure 2-17. total monthly production of the offshore fishery in Sri Lanka in 2005 and 2006, all species combined (Bigeye tuna, Marlins, Others, Rays, Seer fish, Sailfish, Shark, Shark, Swordfish, Other tuna, Yellowfin tuna).

- **Species composition** (Figure 2-18)**:** species composition in 2005 and 2006 are quite consistent. The dominant species are skipjack and yellowfin tuna which represent respectively 88 and 87% of the total production of the offshore fishery. These two species were also dominant in 2004. As mentioned above, the catches of sharks decreased markedly in 2005 and 2006.

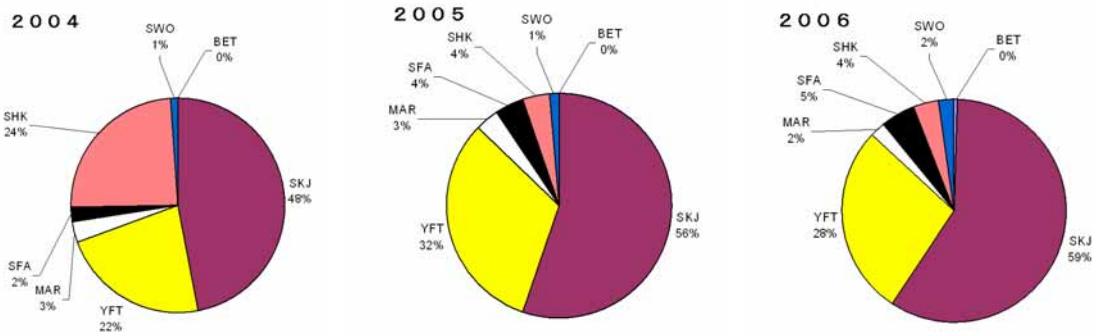

Figure 2-18. Species composition of the offshore fishery in 2004, 2005 and 2006.

- **Catch and effort by area:** skippers were reluctant to provide this information during interviews. The only reliable information on fishing grounds comes from a study conducted by NARA in 1998. However, given the large changes in the fisheries since 1998, these data probably no longer reflect the fisheries. Consequently estimates of catch and effort by area are not available.

- Catch and effort by gear: skippers used a combination of gears during one fishing trip, mainly longline and gillnet. It is sometimes not possible to allocate catches to a specific gear, thus catches in the case of offshore vessels reflect a combination of both gears.

- **Size frequency:** The number of fish length measurements taken increased from 27,033 in 2005 to 34,512 in 2006. While the numbers of measurements for yellowfin and skipjack tuna increased, the numbers of measurements for billfish which was already low decreased markedly. In addition, 744 individual weights and the information on fish processing were recorded in 2005 and 922 sets of data were recorded in 2006. Length-length data were also collected and will be used to convert alternate lengths into standard lengths when required. In 1995, the number of length measurements taken was about twice the current number. While changes in the tasks given to samplers could explain this decrease, it is highly desirable increase the number of measurements taken, in particular for billfish.

- **Coastal fishery**
  - **Nominal catch:** The total catch is estimated to be 12,000 t in 2004, 21,000 t in 2005 and 26,000 t in 2006.
  - **Species composition** (Figure 2-19)**:** Species composition has changed markedly in recent years. In 2006, yellowfin tuna was the dominant species (45% of the catch) followed by skipjack (15%). Billfish represented 24 % of the catch.

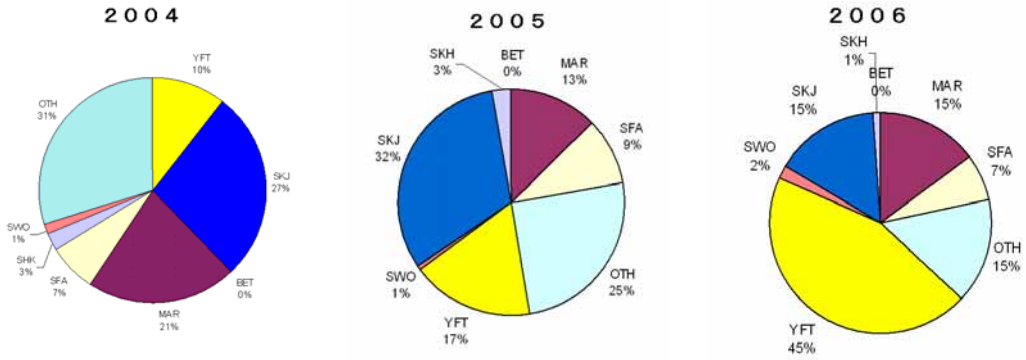

Figure 2-19. Species composition of the coastal fishery in 2004, 2005 and 2006.

  - **Catch and effort by area:** for the smallest boats (UN1) and for the majority of the other coastal vessels (UN2A) operating from 1 to 3 days, it is relatively straight forward to allocate fishing grounds and therefore estimate catch and effort by area.
  - **Size frequency:** The number of fish length measurements decreased from 2,715 in 2005 to 1,967 in 2006. The number of measurements for tuna and billfish is very low.
  - **Catch and effort by gear:** the activity of the smallest boats (UN1) monitored is very seasonal and they used only small longlines while other coastal boats may use a combination of gears and it is difficult to allocate vessel size to a specific gear and subsequently estimate catch and effort by gear.

Evaluation of the results

- Institutional linkages
  - At the end of the program, the Director General for Fisheries expressed his interest in improving the current statistical system and committed to create a Central Statistical Unit.

- Previous instances whereby NARA and the SU produced conflicting production estimates may be a thing of the past as the SU agreed with the latest catch estimates produced by NARA.

- Data collection

The two years of Catch Monitoring proved successful in building the capacity required for Sri Lanka to be able to take over the activities initiated and maintained throughout the programme. Despite an important increase of the samplers (6 additional persons), the project noted that some objectives could not be reached. Thus, the number of boats sampled was not sufficient, the number of fish sampled low… These failures are mainly due to:

- Inability of samplers to quickly grasp new protocols and tasks despite training.
- Long distances between landing sites, and that the time, location, and size of landings is difficult to predict.
- Motivation of the samplers: maintain motivation was important in order to maintain the work quality. Thus, regular meetings where staff meet at one place to give them the opportunity to meet their colleagues for exchange experiences, to present the results of the program and to remind them about the reasons and objectives of the programme are an essential component of any data collection programme.

- Data
  - Vessel record: A new boat registration system is expected to be implemented in 2007 by the Department of Fisheries with the financial assistance of FAO and ICEIDA. The completion of the "sticker operation" and the implementation of this new census should enable the number of active fishing vessels operating in Sri Lanka to be well estimated.
  - Effort data: As explained above, an estimate of effort is an essential factor to raise the sampled catch to a total catch for the whole fleet. At this stage, ongoing collaboration between institutions is needed to cross-check and validates the information used to derive the estimates of effort.
  - Catch per gear: Most of the offshore fisheries catches fell, so far, under the combination gillnet/longline (G/L), a part of the catches can now be allocated strictly to longline. For the coastal fisheries, it is also possible to allocate a portion of the catches to specific gear.
  - Catch and effort: Small improvements only have been made in this area.
  - Size frequency: the number of length measurements for yellowfin and skipjack tuna should allow accurate catch-at-size estimates, but this is not the case for billfish as the number of length measurements is still too low. Size frequencies should be associated with the gear, as size ranges can differ significantly.
  - Biological data: the amount of data available to derive robust length-length relationships is still insufficient. Allometric length/weight relationships and nominal weights used to convert numbers landed to weights landed have either not been completed for all species or revised for those species for which the equations exist. A raising factor to convert dry Skipjack into round weight has not yet been established.

The second MOU (paragraph 9) specified that in recognition of the considerable support given by IOTC-OFCF in this program and in the spirit of good faith with respect to the continuation of the program into the future, the Recipient Organization agrees to take over the sampling program at the termination of this Agreement.

IOTC-OFCF Project received a detailed plan and budget for the continuation of this sampling program. A commitment was made to keep the catch monitoring after the end of the IOTC-OFCF cooperation.

The catch figures estimated from the Programme were agreed by the IOTC and the SU and will be used as catch figures for Sri Lanka. Both the SU and the IOTC agreed that the new figures were better quality than those produced before the implementation of the Multilateral Catch Monitoring Programme and encouraged Sri Lanka to keep the catch monitoring in the future.

IOTC Working Party on Tropical Tunas Report 2006 (paragraph 16):
The WPTT acknowledged the valuable work being undertaken by NARA in conjunction with the IOTC-OFCF Project. In particular, the WPTT noted that the project has highlighted some possible major discrepancies in the Sri Lankan catch statistics that need to be further examined. The WPTT was highly supportive of the work currently being undertaken in Sri Lanka to continue.

Scientific Committee Report 2006 (paragraph 21):

The SC was unanimous in congratulating the IOTC-OFCF Project for its excellent work and most valuable contribution to improving the data available to IOTC and building capacity in the participating countries to implement and strengthen data collection regimes. The SC also congratulated the participant countries for the improvements achieved in their fisheries data collection systems.

Recommendations for further development

The activities initiated in late 2004 proved successful in helping Sri Lanka to overcome several of the issues raised by the IOTC. There is however several other areas that will need the attention of the Sri Lankan government to improve its data collection and processing for its tuna and tuna-like fisheries:

- Institutional linkages

1. It is of the utmost importance to find means to maintain the sampling regime implemented during the project or risk the loss of valuable data. Manpower is needed to maintain the sampling effort and therefore data quality.

2. Several agencies are involved for the marine fisheries statistics systems in Sri Lanka and the relationships and roles are complex. Discrepancies were observed when crosschecking the data collected in the program with data from other sources. A standardization of the data collection, a stronger collaboration between the different institutions and exchange of data and expertise would improve the fishery statistical system in Sri Lanka.

3. Regular reports and information from the programme need to be distributed widely to keep all stakeholders including staff up-to-date with the achievements, developments and status of the programme.

- Sampling programme

4. An increase in sampling effort of the two large pelagic fisheries is required to obtain accurate effort and catch estimates by area and species and increase the amount of size frequency data collected for tropical tuna and billfish species in Sri Lanka.

5. Small pelagic and large pelagic fisheries sampling should be considered separately.

6. The “sticker operation” should be completed as soon as possible to 1. Obtain an estimate of the size and make up of the fleet and 2. Better understand the movements of vessels and fishermen along the coast.

7. Local Supervisors be included in all field sampling programmes. The supervisors are required to monitor the job done by samplers on the field, assist them when they face practical problems; and provide feedback on the achievements of the programme and engender team spirit. .

8. Any data collection programme needs to be regularly reviewed and modified if necessary.

- Data collection

9. Biological sampling should be increased in order to construct reliable length-length relationships and get more accurate monthly average weight for target species and bycatch and by gear. The quality of these values directly affects the accuracy of the production estimates.

10. As the new catch estimates differ from those obtained using the previous catch estimation procedure, historical data should be corrected and catches re-estimated.

11. A regime of periodic super sampling should be included in any data collection programme.

- Estimation procedures

12. Catch estimates are still uncertain due to the many assumptions made in estimating effort data. There is a need to assess the reliability of current effort estimates.

13. Catch estimates for 2005 and 2006 should be revised as soon as nominal weights and average weight per species and per gear have been reviewed and updated.

14. Catch estimate procedures should be well documented and the use of particular datasets and raising factors should be objective as possible and scientifically defendable.

- Data processing

15. The current database should be revised and definitively convert into an alternative database systems more robust (Oracle, SQL server, etc.).
16. Training on database concepts and practical training are essential for the staff who handles the data.

- Other matters

17. Introduction of a log book system to multi-day boats (with some incentives) to collect more accurate catch/effort data together with position/ indication of fishing ground would greatly improve the fisheries statistics..

18. Billfish is an important component of the catches in Sri Lanka, research on biology of Istiophorids caught in the area exploited by both fisheries could be conducted as recommended by the IOTC WPB.

5) Maldives Artisanal Fishery

General Information
Priority Area: Improving data collection systems in developing coastal countries
Program title: Maldives length frequency sampling Program
Target Fishery/ies: Artisanal Pole and Line and other artisanal fishery operating in Maldives
Main Objectives:

- Increase the coverage for size sampling data from the Maldives artisanal fisheries by increasing sampling effort and area covered.
- Increase the precision of the estimates of catch and effort for the fishery by using the data from above.

Background information
Data on fisheries
Maldives is an archipelago of about 1,200 islands, located in the Indian Ocean west of Sri Lanka and India. Maldives depends greatly on its fisheries both socially and economically. Tuna fishing has been a major activity in Maldives for more than a thousand years. In 2003, the catch of skipjack tuna was over 100,000 t (Table 2-23) and this equated to more than 20% of the total of skipjack caught in the Indian Ocean. The pole and line tuna fishery using live bait as artisanal fishery is the most important fishery in Maldives and accounts for around 80% of total recorded fish catch. The main target species are skipjack and juvenile yellowfin tuna.

Table 2-23. Catch statistics for Maldives in 2003

Species	Catch (t)
Skipjack	108,329
Yellowfin	22,914
Dogtooth tuna	746
Kawakawa	2,406
Frigate tuna	4,356
Others	16,664
Total	**155,415**

Institutions responsible for the collection of fisheries data
The collection and processing of fisheries data in Maldives is mainly carried out by two organizations under the Ministry of Fisheries, Agriculture and Marine Resources (MoFAMR). Statistics Database Management Services, SDMS, (presently Economic Research and Statistics Service) is responsible for the collection, processing and reporting of fisheries statistics. The Marine Research Center (MRC) under MoFAMR provides the weight conversion factors to estimate catch from number of fish.

Data collection systems before the implementation of the Program

Catch and effort data
The current fisheries statistical system was established in 1970 and covered five categories of fish (large skipjack; small skipjack; yellowfin; kawakawa; frigate tuna) and two categories of fishing vessel (Masdhonis and Vadhu dhonis). Catches were recorded from each island each fishing day and the data were compiled by month and by atoll. This system has produced an excellent time series of tuna catch and effort data. Essentially the same system is still in place today, although it has been modified slightly over the years. As part of the system, a record of the catch from every boat that goes fishing is completed each day on every inhabited island. The form is usually completed by a clerk in the island office. Data may be provided to that person by the boat owner of skipper verbally, in a written note, or as a copy of a receipt for fish sold. Malé is the most important

landing site in the country and a slightly modified system of recording catches is used there. The Malé system has the following components:

- Skippers or owners of vessels landing in Malé are required to record daily catches on a form entitled 'Fishery Report for Vessels Based in Malé'. This form is essentially the same as the island Daily Report Form; it records the same species varieties as well as a measure of fishing effort. These forms have space for two weeks' records and have to be submitted to MoFAMR within two weeks.
- An SDMS inspector visits the fish market in the afternoon of every fishing day (Saturday to Thursday) and records catches by each masdhonis that lands fish. Landings by other classes of vessel are generally not recorded. For each vessel landing, details of the boat, catch (by standard categories) and baitfish used are recorded in a logbook.

In addition to the daily and monthly records from each island and Malé, MoFAMR/SDMS has access to some commercial fisheries data. The most important dataset in this regard is that of MIFCO tuna purchases (MIFCO is a part government-owned company, and comes under the aegis of MoFAMR). The dataset includes information on tuna purchases (by species and size category, with numbers and total weight) and price by individual boat. For much of its history, MIFCO had a near monopoly on tuna collection, processing and exports. As a result the MIFCO database is of enormous value for statistical and research purposes.

Length frequency data

Length frequency data are collected by MRC. These data are required for estimating average weight conversion factors. At Malé market some length frequency sampling of landings has been carried out intermittently by MRC staff since 1984. Tuna length frequency data have been collected more regularly (although only intermittently during 1998-2002). MRC staff has also collected some length frequency data on a variety of species and fisheries in the atolls during the course of field trips and research cruises. In the atolls, MRC has overseen a series of tuna length frequency sampling programs. During 1994-97 (with Technical Assistance from the World Bank /IDA through the Third Fisheries Project) a different approach to regional tuna sampling was tried whereby active fishermen from seven islands were employed on a temporary basis to measure the tuna catches from their own vessels. This approach proved effective in obtaining tuna length frequency data. The scheme, however, had to be cut back due to shortage of local funding after the project was completed in 1997.

Data processing

The prime responsibility for processing fisheries data lies with SDMS in MoFAMR. Daily catch records are reported by radio from each island to their Atoll Office daily. These reports form the basis of a daily report to the Minister; this report includes not only a summary of tuna catches by atoll but also of tuna purchases by MIFCO and, more recently, the daily tuna purchases of private parties. At the end of each month, each island's Daily Report Forms are summarized (by hand and on the islands) onto the Monthly Fishing Report. These are forwarded from each island to their Atoll Office. From there the forms are forwarded to MoFAMR.

SDMS processes the bulk of its tuna fisheries data using a computer system called FIREPLUS (Fisheries Recording System Plus). FIREPLUS was designed with the primary aim of processing data from the traditional tuna pole and line and troll fisheries. FIREPLUS can convert catch numbers to catch weight using user-specified conversion factors. A table format allows conversion factors to be specified for each species category by month and by atoll.

<u>Main Problems identified with data collection and processing</u>

Experts from the IOTC-OFCF, using information available and other information collected during a fact finding mission to Maldives identified the following problem areas relating to the statistics produced:

- Data collection
    - <u>Species identification</u>:

        - misidentification for tuna at juvenile. All juvenile yellowfin and Bigeye were recorded as yellowfin.
    - Lack of personnel:
        - The number of samplers was not enough to cover efficiently all atolls.
        - The number of the supervisory trip was very low, even though, the purposes of these unannounced visits is to assist samplers in their job, to see if sampling methods and fish identifications are done, to assess that protocols designed initially can be followed and still reflect the real fishing activities.
    - Insufficient data on size frequency:
        - from 1993 to 1996, over 600,000 tunas were measured in eight sites. Average weight conversion factors for each species category by quarter and region as collecting size data, were obtained. Since then however, fewer length frequency data have been collected and mainly from Male Island.

- Data processing
    - Non updated data
        - total catches are raised using size data classifications derived from the data collected and reported by samplers and fishermen. Only one conversion regardless the size is used for each species with no variation for month or atoll. The use of the same weight conversion factors year after year regardless of season and location is controversial. Consolidation and new development for conversion factors was needed.
- Data reporting
    - Data not provided:
        - Lack of catch and effort information for the baitboat fishery of Maldives since 1994
        - Lack of size frequency data since 1998.

Recommendations from the IOTC Scientific Committee

The IOTC Working Parties, aware of the above issues, strongly recommended that the Secretariat make every possible effort to improve the quality of catch, effort and size data from artisanal fisheries and to make every possible effort to obtain detailed catches, effort and size data for the Maldives pole and line fishery. Recommendations regarding the need to improve the information available can be found in many reports from the IOTC Working Parties and in the Scientific Committee reports:

The Committee agrees with the suggestion that priority should be given to yellowfin tuna in the next assessment. It was indicated that many of the previous results from the Working Party on Methods (WPM) would be useful also for yellowfin, but concerns were raised about the availability of data, in particular catch-and-effort and size frequency from artisanal and longline fisheries. (Scientific Committee report 2001, paragraph 46, p 6)

Lack of catch and effort information for non-reporting longline fleets (fresh tuna longliners from Taiwan,China and NEI-DFRZ), the purse seine fishery of Iran, the longline fisheries of Indonesia and Seychelles and many artisanal fisheries, mainly Indonesia, India and the baitboat fishery of Maldives (since 1994). Scientific Committee report 2004, paragraph 10, p8)

The WPDCS reviewed the situation of the data holdings at the Secretariat, noting improvement in several areas, including the retrieval of historical datasets from several countries, better estimation

of the catch of fresh –tuna IUU vessels, progress in the sampling programs under the scope of the IOTC-OFCF Project. The scarcity of size-frequency data from the longline and artisanal fisheries continues to be a major impediment for the application of rigorous stock assessment. (Scientific Committee report, 2005, paragraph 17, p 8)

For tropical tunas, the SC noted the need to obtain size data from the gillnet fisheries operating off Oman and Yemen, baitboats in Maldives and to increase the amount of size data collected from the main longline fisheries. (Scientific Committee report, 2005, paragraph 17 p 8)

Actions Implemented through the IOTC-OFCF Project

Scope of the Program

After termination of the regional sampling program supported WB, the MRC attempted to resume the scale of the sampling including increase of the size data at extended sampling sites. MRC requested support to the IOTC-OFCF Project increase the sampling effort for size data temporarily until the government of Maldives could take over the funding. .

Based on the information available and the request from MRC, the IOTC-OFCF Project agreed to the follow the request to strengthen the size data collection on artisanal pole and line fishery in Maldives, and consequently to help improvement of the quality of its fisheries statistics.

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Signature of the Memorandum of Understanding during of the activities and total budget

The IOTC-OFCF Project prepared an MOU that included field activities during the first year. This MOU was signed in June, 2003.

At the beginning of the program, MRC expected Maldives Government would allocate the budget within one year; however, this did not eventuate so the program was extended to another fiscal year (up to March 2005).

The total of budget allocated in 2003 and 2004 was US$ 19,579 and US$ 20,465, respectively, including provision of equipment and support (Refer to Table 2-24).

Table 2-24. Type of support provided by the IOTC-OFCF Project to MRC

Type of support	Details
Transfer of technology	Hardware
Technical assistance	Protocols and data processing
Support field activities	training Sampling materials Supervisory trips 8 samplers

Design of the sampling

The program monitored the landings of pole and line vessels in five atolls including the capital. The goal was to increase the collection of size data from these artisanal fisheries.

Before the beginning of this program, a Maldivian training team visited the atolls and trained the samplers in measuring tunas and in entering data. The sampling method used was based on the one employed in the regional tuna length frequency sampling program in 1993, i.e. using master fishermen as samplers.

These fishermen-samplers recorded as many fish lengths from their daily catch as possible. They provided these length data with the other forms to Island Office. Monitoring for sampling activities was made regularly by MRC. All length data were collected by MRC when MRC officer visited at Island Offices and data entry work was done in MRC.

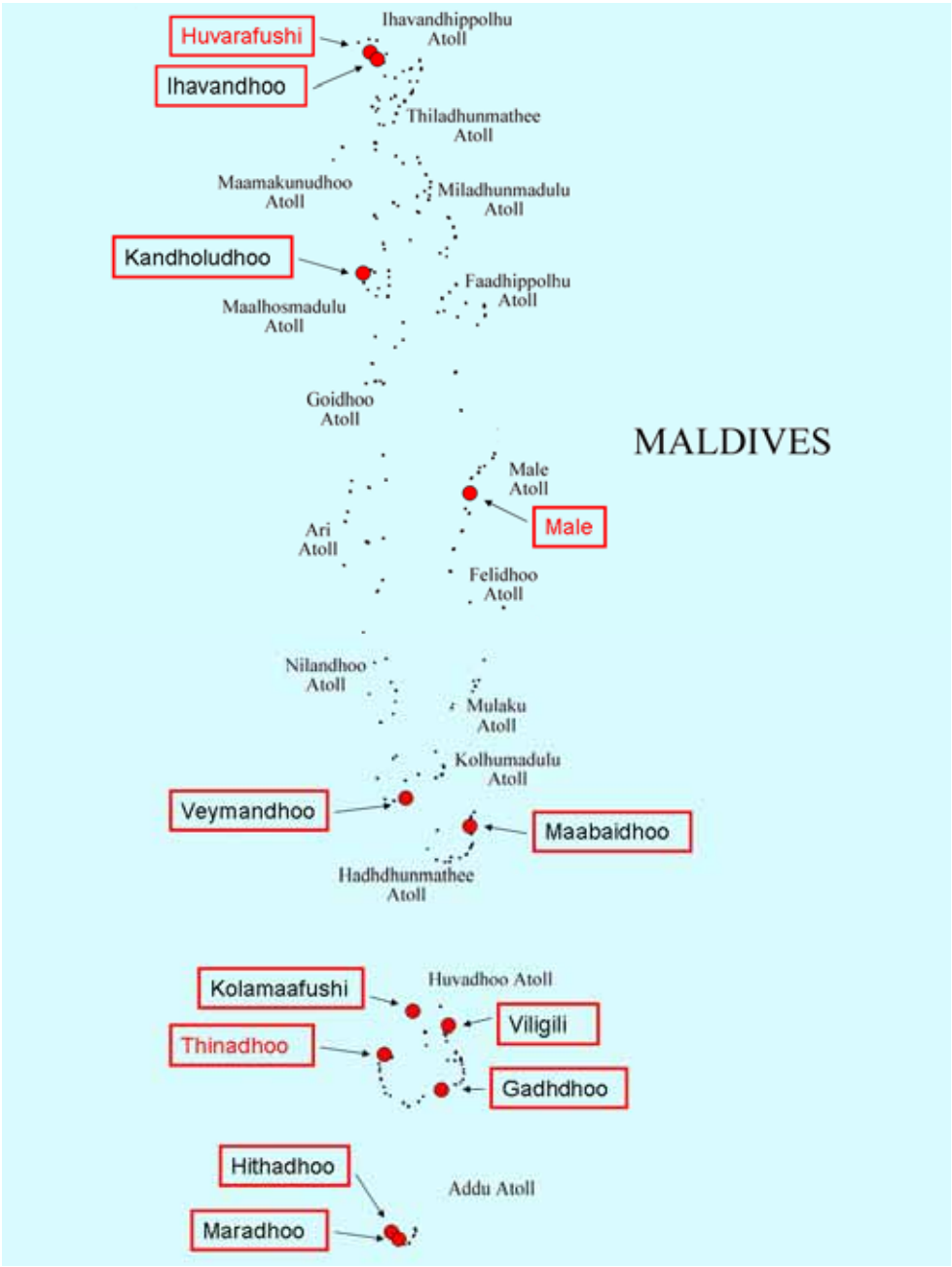

Figure 2-20. Locations of samplers of MRC-IOTC-OFCF Sampling Program in Maldives. Name of islands in red figure shows samplers employed by MRC

In addition, a MRC staff member from Male was trained on data entry.
Supervisory trips were conducted in each site every six months to ensure the work is being carried out as planned, to verify, and correct if necessary, the data collection procedures.

Results of the Program

Through the MRC-IOTC-OFCF Program, wider coverage of length data collection (Figure 2-20 and Table 2-25) was obtained. Government of Maldives (MRC) has carried out data collection form the following three sampling islands (name of atoll): (1) Huvarafushi (Ihavandhippolhu Atoll), Male (Male Atoll), and Thinadhoo (Huvadhoo Atoll). In addition to these islands, IOTC-OFCF Project provided fund to carried our length data collection at the following eight islands with name of atolls: (1) Ihavandhoo (Ihavandhippolhu Atoll), (2) Kandholudhoo (Maalhosmadule Atoll), (3) Veymandoo (Kolhumadulu Atoll), (4) Kolamaafushi (Huvadhoo Atoll), (5) Viligili (Huvadhoo Atoll), (6) Gadhdhoo(Huvadhoo Atoll), (7) Maradhoo (Addu Atoll), (8) Hithadhoo (Addu Atoll). A fisherman sampler from Hithadhoo Island from Addu Atoll had an

accident at the end of 2003, so in the last of the sampling program period, a fisherman sampler in Maabaidhoo Island from Hadhdunmathee Atoll was substituted.
The total number of measured fish is shown in Table 4. Figure 2-21 shows number of measured fish for Maldives and IOTC-OFCF from Jan 2003 (prior to the program started) to Dec 2004. Number of fish measured increased three to four times under the program. Most of fish measured were skipjack and yellowfin tuna (Figure 2-22).
The Program greatly increased the amount of size data that were derived from a wider area. MRC is proposing to revise catch estimations based on these data, but a longer time series of information is highly desirable.
All size data have been entered into a database and are available for stock assessment purposes.

Table 2-25. Number of fish measurements by island from January 2003 to March 2005

(A) Number of length sample measured in 2003

			2003												
No	Island	Fund	1	2	3	4	5	6	7	8	9	10	11	12	Total
1	Ihavandhoo	IOTC/OFCF	0	0	0	0	0	0	2,208	176	5,542	4,883	6,021	6,836	25,666
2	Huvarafushi	Maldives	2,505	1,894	0	1,578	876	297	4,037	3,565	3,555	4,745	7,703	6,192	36,947
3	Kandholudhoo	IOTC/OFCF	0	0	0	0	0	0	0	824	2,447	2,408	1,682	802	8,163
4	Male	Maldives	484	2,082	1,941	804	0	139	2,818	2,746	2,565	2,872	2,140	4,819	23,410
5	Veymandoo	IOTC/OFCF	0	0	0	0	0	0	0	204	0	0	972	536	1,712
6	Kolamaafushi	IOTC/OFCF	0	0	0	0	0	0	0	544	919	1,061	1,745	1,280	5,549
7	Viligili	IOTC/OFCF	0	0	0	0	0	0	0	3,040	2,212	1,760	3,872	3,520	14,404
8	Thinadhoo	Maldives	3,256	2,828	3,865	4,533	1,818	2,468	1,624	1,888	1,605	1,092	2,520	3,243	30,740
9	Gadhdhoo	IOTC/OFCF	0	0	0	0	0	0	138	2,122	3,602	2,266	2,069	2,213	12,410
10	S.hithadhoo	IOTC/OFCF	0	0	0	0	0	0	4,011	4,399	2,979	3,196	1,936	0	16,521
11	Maradhoo	IOTC/OFCF	0	0	0	0	0	0	2,440	3,966	4,336	2,921	2,249	3,041	18,953
		Total	6,245	6,804	5,806	6,915	2,694	2,904	17,276	23,474	29,762	27,204	32,909	32,482	194,475
		IOTC-OFCF	0	0	0	0	0	0	8,797	15,275	22,037	18,495	20,546	18,228	103,378
		Maldives	6,245	6,804	5,806	6,915	2,694	2,904	8,479	8,199	7,725	8,709	12,363	14,254	81,097

(B) Number of length sample measured in 2004 and 2005

			2004											2005			
No	Island	Fund	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	Total
1	Ihavandhoo	IOTC/OFCF	5,030	4,474	2,646	85	0	5,040	6,532	5,582	4,747	5,760	9,582	8,599	7,616	2,458	5,032	73,183
2	Huvarafushi	Maldives	1,999	3,272	2,301	859	2,247	4,031	3,567	2,290	1,247	1,159	3,454	1,315	NA	NA	NA	27,141
3	Kandholudhoo	IOTC/OFCF	2	521	2,469	0	1,723	2,868	1,357	2,285	2,480	0	0	0	0	182	0	13,887
4	Male	Maldives	1,037	2,031	1,283	1,819	1,301	282	704	2,061	3,809	0	224	151	NA	NA	NA	14,702
5	Veymandoo	IOTC/OFCF	1,032	1,519	0	0	1,489	1,476	0	1,169	922	1,509	1,585	1,541	1,007	0	0	14,209
6	Kolamaafushi	IOTC/OFCF	209	900	0	0	1,437	1,034	1,449	0	0	1,371	0	944	1,114	2,016	975	12,052
7	Viligili	IOTC/OFCF	2,818	3,265	3,220	0	0	2,165	2,640	3,168	2,336	4,081	3,680	3,165	2,263	2,687	4,380	39,968
8	Thinadhoo	Maldives	1,100	2,013	1,865	798	1,046	889	0	2,658	3,085	4,326	2,688	2,526	NA	NA	NA	22,994
9	Gadhdhoo	IOTC/OFCF	2,942	40	2,005	2,113	3,345	1,817	1,878	4,919	3,806	3,263	3,902	3,274	818	3,762	3,785	41,669
10	L Maabaidhoo	IOTC/OFCF	0	0	0	0	0	0	0	0	78	1,595	443	466	989	2,003	1,826	7,400
11	Maradhoo	IOTC/OFCF	1,574	2,035	2,190	603	320	660	1,154	0	2,800	3,611	691	2,465	2,392	2,934	3,336	27,765
		Total	19,043	20,773	17,979	6,477	12,908	21,062	19,281	24,132	25,310	26,755	26,259	24,466	16,279	16,842	19,234	295,800
		IOTC-OFCF	14,507	13,457	12,530	3,001	8,314	15,860	15,010	17,123	17,169	21,270	19,893	20,474	16,279	16,842	19,234	230,963
		Maldives	3,536	7,316	5,449	3,476	4,584	5,202	4,271	7,009	8,141	5,485	6,366	3,992	NA	NA	NA	64,837

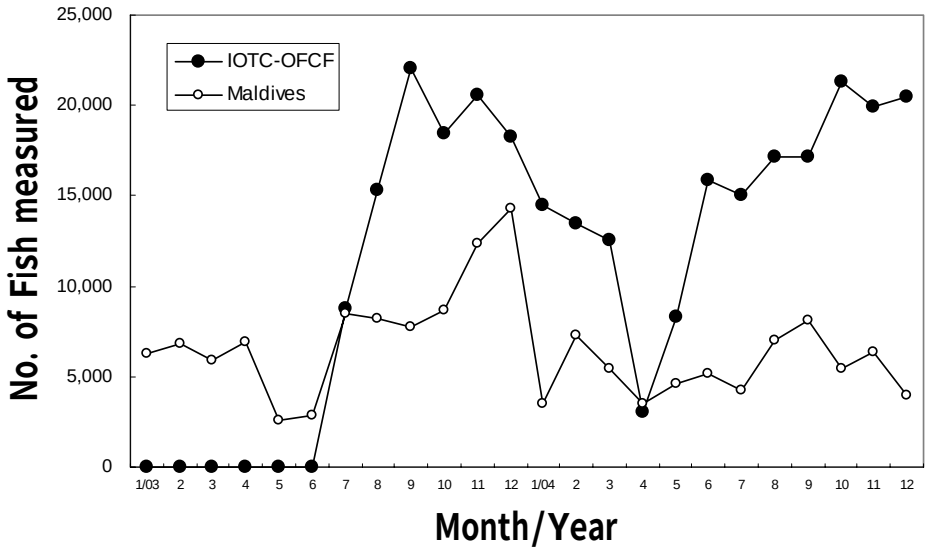

Figure 2-21. Monthly number of fish measured by Maldives and IOTC-OFCF in 2003 and 2004.

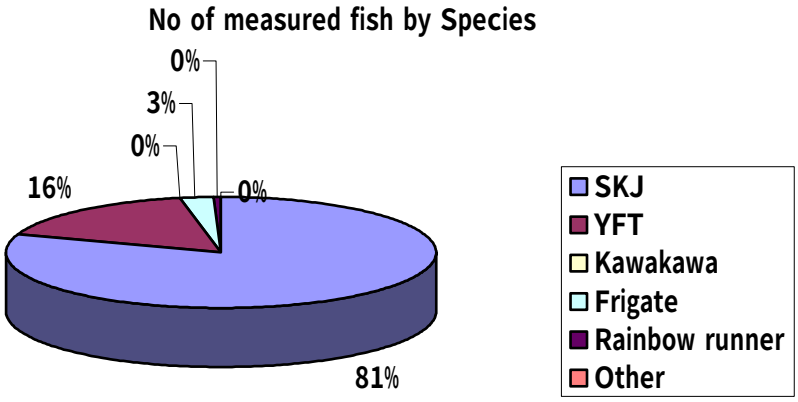

Figure 2-22. Percentage of by species for number of fish measured in July – Dec 2003.

Evaluation

The objective is to increase the coverage for size sampling data from the Maldives artisanal fisheries by increasing sampling effort. The implications are that this increased sampling might have on the estimation of catches for the fishery. The amount of area covered was largely successful. Improvements to the precision of the estimates of catch and effort are expected eventually, but these will take longer to achieve.

While MRC indicated their intention to continue the activities at the beginning of this program, no firm commitment was evident at the termination of the Project in March 2005. The IOTC-OFCF-MRC program gave new impetus for re-activating the sampling program, by direct injection of funds to support employment of fishermen's samplers. The present posts created from Government funds could be considered as a direct result from the support of IOTC-OFCF Project Table 2-26.

Table 2-26. New plan of employment of local fishers as samplers after April 2005.

Atoll	Island	No of fisher's sampler
Ihavandhippolhu	Huvarafushi	1
Thiladhunmathee	Kulhudhuffushi	1
Maalhormadulu	Maduvvaree	1
Faadhippolhu	Naifaru	1
Nilandhoo	Kudahuvadhoo	1
Hadhdhunmathee	Maavah	1
Huvadhoo	Viligili	1
Huvadhoo	Thinadhoo	1
Ari	Mahibadhoo	2
Male'	Male'	2

During the period of this program, Maldives Government accepted a MRC proposal to increase the number of enumerators to the levels that the MRC-IOTC-OFCF program employed. MRC received a budget for employment of extra enumerators and Maldives expressed its desire to continue a similar scheme for the collection of length data.

Recommendations

It is recommended that methods of measurement be standardized. Currently at Male, MRC measure curve length along the tuna body using a tape measure, and skipper enumerators measure a straight length use a measuring board. While most of fish are skipjack and the differences are probably small, it is better practice to use a common method.

It is recommended that the small sized bigeye tuna caught by the pole and line fishery be measured.

While the Program greatly improved the amount and coverage of size data available to IOTC, the data for the period 1999-2002 is not currently available to the Commission for stock assessment purposes. It is recommended that these size data be provided to the IOTC Secretariat so they can be used to better understand the status of the tuna stocks.

It is recommended that studies be carried out to assess the quality of the catch estimates produced in years were the sampling coverage was low.

6) Oman's Artisanal Fishery

General Information

Priority Area: Improving data collection systems in developing coastal countries
Project title: Yellowfin tuna length-frequency sampling program
Target Fishery/ies: Yellowfin tuna gillnet and handline fisheries in artisanal fisheries of Oman
Main objectives:

Strengthen the current sampling in Oman to incorporate the routine collection of size data from the artisanal fisheries, notably for yellowfin tuna'

Background information

Data on fisheries

In the traditional fisheries sector, it is estimated that there are around 27,000 fishermen operating 13,000 boats, these typically include skiffs (4-8 m fiberglass or aluminium boats), houri (3-10 m wooden boats powered by outboard motors), shasha(3-4 m boat made from palm fronds) and launches (over 12 m long powered by inboard diesel engines). Shasha account for 8% of the traditional fishing boats, houri for 7%, launches for 3%, and aluminium skiff and fiberglass skiff for the remaining 79%. Theses boats use mainly gillnet and some handline.

Total catch from traditional fisheries was estimated at about 125,300 t in 2001, and valued at RO 52 million. The most important species include yellowfin tuna, Longtail tuna, kingfish (these are large pelagic fish), sardine, Indian mackerel, Indian oil sardine (small pelagic fish), emperor, grouper, seabream (demersal fish), cuttlefish, shark, lobster, shrimp and abalone.
The catch of yellowfin tuna, longtail tuna and Kingfish were 6,259 tons (5%), 6,011 tons (5%), and 2,785 tons (2%), respectively.

Industrial fisheries

20 domestic longliners started operating in 2003 not being the statistics for this fleet available to the IOTC. No data are available on the operation of foreign vessels in Oman or their catches, if any.

Institutions responsible for the collection of fisheries data

The Directorate General of Planning and investment development

Under this Directorate, the Fisheries Statistics Section of Statistics and information is solely responsible for designing of the landing survey.

The Directorate General of Fisheries Resources (DGFR)

DGFR is the office of the Ministry of Agriculture and Fisheries responsible for fisheries in the Sultanate of Oman. The Directorate is subdivided into two branches; one for Fisheries Research and Extension another that deals with monitoring, control and surveillance, and licensing operations. The institution responsible for fisheries research along the coast, in each Governorate, the Marine Fisheries and Research Centre, is the branch of Fisheries Research and Extension.

Data collection system

Traditional fisheries

Fish landing data are obtained from surveys undertaken at 32 major landing sites along the Oman coast.
The survey was established in 1985, and there has been no major change since then. The landing survey covers all major landing sites in each Governorate and Region along the coast.
The landing site survey covers all fishing methods. The number of visits to each landing site each month is determined by the Fisheries Statistics Section. Samplers record landing time, vessel type, license number and number of crew for all fishing boats landing their catches on each visiting day, according to the order of their arrival to the site. Then they usually sample every fifth to seventh fishing boats and record fishing hours/days, fish species and number of fish, average weight and

total weight, fishing gear used and unit price by species. More boats are sampled fish number of boats landing is low.
Effort data collected by landing site samplers includes the number of fishing boats and fishing hours/days and number of crew for each landing fishing boat.
Currently, around 45 families, 63 species of fish and 12 kinds of other aquatic animals landed in Oman are encountered.
Landing site samplers estimate number and average weight of each fish species landed by eye only.
The Marine Science and Fisheries Centre had conducted a regular biological survey program on the catches of local vessels landing at the sampling sites for the period of 1987 – 1997. This survey included data collection on weight, number and size frequency of important species including yellowfin tuna. At present, the Centre is conducting a survey project on demersal fish, including the collection of size frequency data for the important demersal species.

Industrial fisheries
The captains of all trawlers and longliners must submit a Fishing Operation logsheet to the Observance and Fishing Permit Department at the end of each fishing trip. The Department then sends the logsheet together with the inspection report to the Fisheries Statistics Section. The format of the logsheet is prepared by the Fisheries Statistics Section. Data on catch by species, by fishing ground and by fishing day are collected from the logsheet. The logsheet for longline vessels includes only yellowfin tuna, black marlin, mahi-mahi, sailfish, shark and swordfish. The logsheet for trawlers includes about 40 species of demersal fish. The fishing areas are divided into squares of 30 miles x 30 miles which are further divided in nine smaller squares of 10 miles x 10 miles. The activity of industrial fishing vessels is being monitored by VMS (Vessel Monitoring System). Effort of each fishing vessel is indicated by number of fishing days in a month.
The logsheets submitted by the captains of fishing vessels are the main source of data. Surveillance officers check if there is difference between catches reported by captains and actual catches. The charges to be paid to Ministry of Agriculture and Fisheries Resources by each fishing vessel (RO 27 per t) are based on the catches estimated by the inspectors.
Captains report only number and total weight of fish by species in the logsheet. No size frequency data are collected.
It is not clear if both domestic and foreign vessels are bound by the above reporting requirements.

Main problems identified with data collection and processing

Experts from the IOTC-OFCF, using available information and other information collected during one fact-finding mission in the Sultanate of Oman in May 2002 identified the following problem regarding the statistical system for collecting information on the artisanal fisheries.

- Data collection
    - No yellowfin tuna size frequency data are collected on a routine basis:

      The sampling system did not include the routine collection of size-frequency information for yellowfin tuna. This information is available from 1987 to 1996 as it was collected as part of a special research project by MRS (and was analysed in a M.SC. thesis by Mr Yuma Al Mamry, published in 1996). However, these data were never entered into a database.

      There is a need to improve the statistics from gillnet fisheries, especially those in the northern Arabian Sea, including the Gulf of Oman. Gillnets are important components of the fisheries for tropical tunas, as they catch a range of sizes that are usually not available to other gears during the same seasons and areas. Overall, the artisanal fisheries in the Sultanate of Oman catch 5000-7000 t of yellowfin tuna per year using gillnet and other gears (mainly between January and March).

Recommendations from the IOTC Scientific Committee

The IOTC Working Parties, aware of the above issues, strongly recommended that the Secretariat make every possible effort to improve the quality of catch, effort and size data from artisanal

fisheries. Recommendations on the need to improve the information available can be found in many reports from the IOTC Working Parties and in the Scientific Committee reports:

The situation of the data holdings for nominal catches and catch-and-effort data has improved considerably in the past year, although the scarcity of size-frequency data from the longline and artisanal fisheries continues to be a major impediment for the application of a rigorous stock assessment (from the Working Party on Data Collection and Statistics, 2001 and in 2003). Scientific Committee report 2001, paragraph 15, p 2 and 2003, paragraph 19, p 6)

The Committee agrees with the suggestion that priority should be given to yellowfin tuna in the next assessment. It was indicated that many of the previous results from the Working Party on Methods (WPM) would be useful also for yellowfin, but concerns were raised about the availability of data, in particular catch-and-effort and size frequency from artisanal and longline fisheries. (Scientific Committee report 2001, paragraph 46, p 6)

The Committee expressed further concern regarding the extensive lack of catch and effort and size frequency statistics for important artisanal fisheries, especially those operating gillnets.(Scientific Committee report , 2002 paragraph 44, p 6).

For tropical tunas, the SC noted the need to obtain size data from the gillnet fisheries operating off Oman and Yemen, baitboats in Maldives and to increase the amount of size data collected from the main longline fisheries. (Scientific Committee report, 2005, paragraph 17 p 8)

While these factors might explain the high catches of industrial fisheries in a small area off eastern Africa, there are also reports of exceptionally high catches by the commercial and artisanal fisheries from Yemen, Oman, Iran, South Africa and Maldives. (Scientific Committee report (2004 p 37, 2005, p 47 and 2006 p68)

Actions implemented through the IOTC-OFCF Project

Scope of the Programme

Using the information available, experts from the IOTC-OFCF Project assessed the type of actions that might help the Sultanate of Oman to improve the amount of size data collected.

The implementation of a yellowfin tuna length-frequency sampling program for the artisanal fisheries was considered very important because of:

- The large quantities of yellowfin tuna being caught by the artisanal fisheries
- The seasonality of these fisheries operating in Arabian sea and targeting fish with a range of sizes that is usually not available to other gears
- The lack of size frequency data for yellowfin tuna

Signature of the Memorandum of Understanding, duration of the activities and total budget allocated

Aware of the problems raised by the IOTC regarding the quality of the statistical data on artisanal fisheries, the Directorate General of Fisheries Resources (DGFR) requested the help of the IOTC-OFCF Project to be able to overcome such issue.

The IOTC-OFCF Project prepared a MOU which encompassed field and other activities during the year after its signature. The agreement was signed on 22nd January 2003.

The budget provided to DGFR as well as the type of support provided by the IOTC-OFCF project are presented in tables 2-27 and 2-28.

Table 1: budget provided to DGFR to conduct the project in US $.

Table 2-27. The budget provided to DGFR

Additional compensation for six enumerators for the period of 2-1/2 months between 15 January – 31 March, 2003 (200 USD/month for six enumerators during two and half months) 200.00 x 6persons x 2-1/2 months = 3,000.00 For supervisor for the same period. (250 USD/month during two and half months) 250.00 x 1person x 2-1/2 months= 625.00	3,625 USD

Table 2. Type of support provided by the IOTC-OFCF Project to DGFR

Type of support	Details
Technical assistance	Protocols and data processing
Support field activities	Sampling materials Compensation for 6 enumerators and the supervisor

Design of the Catch Monitoring Scheme

The program monitored the yellowfin tuna caught by the artisanal fisheries in the ports of Qurayyat, Sur and Salalah (Figure 2-23) using commonly gillnet or handline. The sampling strategy was designed to:

- Sample Length-frequency classified by the gear/fishing techniques
- Ensure that the number of samples collected was sufficient to obtain an accurate estimate of the size composition of the artisanal catch of yellowfin tuna by gear.

Figure 2-23. Sampling sites (red circles) in Oman.

Main results

The sampling protocols were strictly followed and sampling started in the middle of January 2003 and ended at the beginning of April 2003. During this period a total of 1,593 yellowfin tuna were sampled. The actual numbers of tuna sampled by site and gear is shown in the Table 2-29.

Table 2-29. The actual numbers of tuna sampled by site and gear

1. Qurayyat

(1)Handline

Month	January	February	March	April	Total
No. YFT landed	28	1	0	0	29
No. sampled	27	1	0	0	28
Average Length (cm)	84.4	128.0	0	0	

(2)Gillnet

Month	January	February	March	April	Total
Total no. landed	74	133	125	11	343
No. fish sampled	73	117	122	11	312
Average Length (cm)	83.9	79.6	100.2	106.3	

2. Sur

(1) Handline

Month	January	February	March	April	Total
No. YFT landed	477	203	19	0	699
No. sampled	389	141	18	0	548
Average Length (cm)	88.8	94.9	95	0	

(2) Gillnet

Month	January	February	March	April	Total
Total Landing	15	923	489	25	1,452
No. sampled	12	187	392	23	614
Average Length (cm)	105.9	76.3	98.6	98.5	

3. Salalah

(1) Handline

Month	January	February	March	April	Total
No. YFT landed	0	13	32	17	62
No. sampled	0	10	32	12	54
Average Length (cm)	0	87.6	69.7	57.2	

(2)Gillnet

Month	January	February	March	April	Total
No. YFT landed	0	0	37	0	37
No. sampled	0	0	37	0	37
Average Length (cm)	0	0	117.4	0	

Evaluation of the results

Arrangements were successfully made with the authorities of the Sultanate of Oman to extend their existing sampling program to include length-frequency measurement of yellowfin tuna. The staff was well trained and conducted their work in a highly professional manner and overall, they gained considerable experience in conducting a length-frequency sampling program. However, despite are marked increase in manpower, the amount of data collected was lower than expected.

The timeliness of the production of financial reports became an issue in this project.

There were plans to continue the program for a second year, but this did not eventuate. Similarly analyses of these data were to be conducted by the IOTC and DGFR but to-date this has not happened.

Recommendations for further development
Further development of the length frequency work is recommended as follows.

- According to the IOTC Scientific Committee in 2006, increasing the amount of size data available to the Secretariat is important. In particular, the SC requested members to collect and report size data for artisanal fisheries for yellowfin tuna taken by gillnet, handline and troll fisheries.
- Sampling over a period of a year at a range of sites is needed to obtain information on the seasonal availability of yellowfin also the coast.
- Regular exchange of information about this fishery between Oman and it neighbouring countries is needed.
- Feed back the results of the sampling program to the fishers is needed to promote better understanding about the program and the management of the coastal fisheries overall.
- Length sampling needs to be included under the scheme of data collection conducted by the statistics offices in each region.

2.2.3 Training and Workshop

The IOTC-OFCF Project has implemented various kinds of training and workshop to improve the statistical conditions in terms of data collection, data processing, database management, and estimation of the catch. Capacity building for relevant persons in each program was emphasized as basic needs through the operation in each program. Although various on-site-trainings were carried out, major training courses or workshops were described in this section. Two workshops, five training courses, and annual training course in Japan implemented through the IOTC-OFCF Project are explained according to the template including objectives, target countries, reasons, results and recommendations for each case.

1) Regional Workshop on Data Collection and Statistical System

Item	Detail
Objectives	The objectives of the Regional Workshop were: 1) to evaluate the extent to which the statistical system in each country was able to produce timely and accurate fishery statistics at a degree of aggregation sufficient to permit the need of the country for fishery management, development and socio-economic requirements, as well as international commitments; and 2) to assess the quality of the data provided during the historical time series.
Target Country	India, Indonesia, Iran, Maldives, Mauritius, Mozambique, Oman, Seychelles, Sri Lanka, and Thailand (10 counties)
Reasons	There were basic needs to promote opportunity to call the national counterpart in the field of fisheries statistics and the decision maker of each relevant country in the region to exchange views and issues on fisheries statistics and to assess the quality of data, and statistical procedures in respective countries and to make recommendations on the best approaches through the learning of each experience. In preparation for the workshop, consultants had been contracted for fact-finding mission to the countries selected for expertise in order to compile the country reports, in association with national counterparts, which studies were describing in details the fisheries, statistical system, institutional and physical infrastructure, and the use made by each country of the fishery statistics etc.
Results	The Regional Work shop was held at the International Conference Center in Victoria, Seychelles, from 1st to 5th of March, 2004. Two participants (a senior official from fisheries administration and a national counter part involved in preparation of the country report) were invited. Three consultants who had been involved in the preparation of country reports, and IOTC and OFCF attended. A total of 31 participants were presented. There were four main sessions (1) Presentation of national reports, (2) Case studies, (3) Synthetic questionnaires, and (4) Analysis of statistical Implementation. (1) Presentation of national reports: The national reports of participated countries were presented based on their Country Reports. In addition to presentation of the national reports, IOTC Secretariat presented IOTC Sampling Programs in order to emphasize that statistical system would be dynamically changed as knowledge was gained of the manner in which the fishery operated. (2) Case studies: At the invitation of the Seychelles Fishing Authorities

	(SFA), the participants were able to see the sampling conducted on board an industrial purse seine landing its catch at the fishing port, a commercial packing plant dealing with semi industrial longline, as well as the data input and reporting procedures at the SFA. (3) Synthetic questionnaires: Synthesis of country statistical situation was made, based on questionnaires (Objectives for usage of the statistics, sampling design, identification for the manner of frame, ways of verification, application area and so on). (4) Analysis of statistical Implementation: Based on synthesis from general questionnaire, the followings were discussed: (a) Objectives, planning and institutional arrangements; (b) Data collection system; (c) Catch/Effort sampling; (d) Data processing; (e) Data entry; (f) Validation; and (g) Catch estimation/raising. Issues and constraints identified by participants included lack of sufficient number s of personnel and of budget, insufficient training, difficulties in inter-agency data exchange, inadequate data processing software, and lack of biological data.
Recommendations	(1) A comparison of various systems indicated that the quality of the data produced by the various statistical systems depends more on how effective is implementation, rather than on the design of the program. It was recommended that implementation should be the focus of a permanent and critical review by the official responsible for the program, and special attention should be paid to changes in the mode of operation of the fisheries under monitoring that could require changes in the design of the system. (2) Exchange of data can be the basis fro cross-validation of similar information collected at various sources and could be useful in identifying potential problems with the existing data collection procedures. It was recommended that Inter-agency meetings or other arrangements should be encouraged as mechanism to discuss periodically data-related issues. (3) It was clear that in many countries, high-level officials are not sufficiently aware of the need for collecting information on fisheries activities on a routine basis. Recommendation was to reach out to the relevant authorities and highlight the benefit for the country to monitor properly its fisheries. (4) Data collection is a permanent activity, so training of new personnel through the IOTC-OFCF Project was recommended.

The Official report on this workshop including Country Reports was published in 2004, and the published report was distributed to member countries and relevant institutions in coastal countries in the region.

2) Training for Data Collection and Processing

2)-1 Sampling Fresh Tuna Longline (Indonesia and Thailand)

Item	Detail
Target Area	Fresh Tuna Longline
Objectives	(1) Awareness of importance of tuna statistics; and (2) Capacity building: areas which focus on catch estimation and database processing.
Target Country	Indonesia and Thailand

Reasons	The first training on data collection and data entry was devoted to data collection and data entry methodology in 2003 to staff of RCCF and DGCF (Port Authority, WASKI of Benoa). This is the second training course for participants of Indonesia sampling program under MOU to enhance self-maintenance of the sampling system.
Results	Training Course was carried out at DGCF meeting room in Indonesia in 5 days between Dec. 6-10, and Dec. 13-14, 2004. Training course consisted of three sessions: (a) Sharing knowledge of an importance of tuna statistics with government and private sectors; (b) Acquiring basic knowledge of sampling and estimation process; and (c) Database processing using FINSS. **(a) Session 1: Sharing knowledge of an importance of tuna statistics** 30 participants were presented including Chairman of Indonesia Tuna Longline Association, Chairman of Indonesia Tuna Association, and Chairman of Indonesia Tuna Commission. Mr. Parlin of Director of Fisheries Resources took a chairman in this session. Purpose was to let Indonesian government and private sectors understand an importance of statistics. Series of lecture including utilization of statistics for sustainable use of resources, what kind of data are collected, stock assessment, and management in conjunction with data collections, was provided. Both Private and Government sectors were aware of an importance of statistics through this session. **(b) Session 2: Basic knowledge of sampling and estimation process** There were 20 participants including staff of DGCF and Thai researcher in this session. During this session, topics covered data Collection, planning and monitoring with highlighting estimation of catch. All materials were nailed down to participants. **(c) Session 3: Database administration and Usage of FINSS** There were 20 participants including staff of DGCF and Thai researcher in this session. Topics covered general outline of database, database management, and exercises of specific data management and FINSS. All participants paid keen attentions to handling data.
Recommendations	The following recommendations are made: Government sector should establish communication line with private sector. Results of sampling should be circulated into vessel and processing plants owners. The key role of the local supervisors is a knot between samplers and administrative level. Unloading activities, vessel activities and samplers' activities influence sampling protocols and accuracy of collected data. Local supervisors should be keen of observations for those activities. To enforce those works by samplers, local supervisors should provide periodic training for their samplers. Although there are various ways of catch estimation, systematic

	estimation process is recommended to avoid mistakes of handling data. Deep knowledge of database software such as SQL for database manager is prerequisite.

2)-2 Sri Lanka Gillnet and Thai Nertic Tuna Sampling

a) Training on Data Collection

Item	Detail
Target Area	Offshore Gillnet and longline Fishery and coastal longline fishery targeting yellowfin tuna in Sri Lanka / Enhancement of the data collection and processing system for neritic tuna fisheries in Thailand
Audience	Samplers
Objectives	(1)Awareness of importance of tuna statistics; (2)Presentation of the new sampling regimes (offshore and coastal); and (3)Capacity building: species identification and data collection methodology
Target Country	Sri Lanka and Thailand
Reasons	The first training on data collection was done by the project coordinator and the local supervisor at the very beginning of the program in early December 2004. This devoted training scheduled in January was delayed due to the Tsunami. Its purpose was to explain in detail the objectives of the program, to assist samplers for fish identification and to fill the data collection forms but also to address methodological and operational problems encountered on the field.
Details	Training Course was carried out at NARA meeting room and at Negombo fishing landing site in Sri Lanka in 3 days between 22-24 of March, 2005 and at AFRDEC and at FMO landing site in Thailand during Nov 28-29, 2005. Training course consisted of four sessions in order to reply to the key questions: why collect data? Who are the customers? Which data to collect? And how to collect data? (a) Sharing knowledge of an importance of tuna statistics with samplers; (b) Presenting the new samplings protocols (c) Practice on the field, and (d) Discussion. **(a) Session 1: Sharing knowledge of an importance of tuna statistics** The Purpose was to let samplers understand an importance of statistics and their key role in the system. The presentation included utilization of statistics for sustainable use of resources, what kind of data are collected, stock assessment, importance of this information at a national and regional level and management in conjunction with data collections. **(b) Session 2 : Presenting the new samplings protocols** During this session, basic definitions regarding sampling were given, biological information on each major species and the way to identify them were presented, and major guidelines to conduct sampling and how to fill out the different types of data collection forms were shown. Dedicated materials were provided to

	participants (fish identification, length and processing description plates, and a simplified version of the sampling manual). **(c) Session 3: Practice on the field** All participants were send on the field to review what was taught during the previous sessions and to complete the forms as they conducted a regular sampling altogether. **d.) Session 4 : Discussion** Back to the office, forms were checked with the willing of identify misunderstandings or unclear areas for the benefit of the entire group
Recommendations	Local Supervisor should monitor the job done by samplers on the field, and assist them when they face practical problems. Regular training is an indispensable part of a sampling program. On-the-job-training is important for addressing technical problems, but at the same time the local supervisor will increase his knowledge about the local situation. It will allow also the samplers to answer questions from fishermen about the data collection program. The idea of gathering all staff at one place on the regular basis was to give them the opportunity to meet their colleagues for exchange of experience and to present the results of the program that should be considered seriously. This could be the solutions to keep field staff motivated and maintain work quality.

b) Training on Supervision and Data Processing

Item	Detail
Target Area	Offshore Gillnet and longline Fishery and coastal longline fishery targeting yellowfin tuna
Audience	Local Supervisor/ Data entry persons
Objectives	Capacity building: on supervising and training the samplers, data handling, methodology for estimation of total catches.
Target Country	Sri Lanka
Details	During each trip, time was devoted to help supervisor: (a) to identify potential changes either indirectly by analyzing the data or by cross–checking different datasets when accurate data were reported by other institutions or detected directly on the field during interviews with skippers or people from the other institutions or by observations noticed by samplers; and (b) to handle the data in order to extract information from the database, verify and correct the data and finally estimate catches. In the case of Sri Lanka, preset estimation routines for estimation were difficult to develop each landing site turned out to be a unique case and different datasets and estimation methods were used. It was asked the data operator to attend this working session. It is emphasized that the data entry persons have a good understanding of the sampler's job by regular contact with the samplers in order to question them, so they will be able to identify errors much easier and to reduce errors.

Recommendations	In order to interpret the results, any important observations concerning the fishery and any amendments made to the sampling protocols should be strictly documented. For the same reason, catches estimates procedures should be well documented, the use of dataset and raising factors applied should be justified As mentioned many times in the mission reports, it was noticed that personnel were insufficiently trained to handle database and can not find assistance from computer department in their institute. This situation forces them to restrict their analyses to existing preset procedures. It is of the utmost importance for the staff to have an appropriate training in order not to lose their interest in the job and to improve work quality.

2)-3 Collection and Processing Data in Industrial Purse Seines

Item	Detail
Target Area	Industrial Purse Seine
Objectives	The objective was to provide information and demonstration methods of collecting and processing data on Industrial purse seine fisheries in collaboration with Seychelles Fishing Authority (SFA).
Target Country	Iran, Kenya and Seychelles
Reasons	While data collection and processing system or artisanal fishery has been established, those for industrial fishery, especially purse seine in Iran, need to be developed. Many foreign fishing vessels have been operated in Kenya EEZ and have been unloaded in Mombasa, Kenya, however data collection system has not yet been established. Data collection from industrial purse seine in Seychelles has been established with collaboration of EU and participants from Seychelles intended to share their experiences with the other participants. This training course mainly focused on participants from Iran and Kenya.
Results	Training Course was carried out at SFA training room in Dec. 12-16, 2005. The following topics were covered during this training course. 1. History of industrial purse seine fishing 2. General characteristics of purse seine 3. Purse seine operation 4. Identification for target species and by-catch species 5. Collection of catch and effort data-Data source, verification, and exercises 6. Collection of size data 7. Sampling design 8. Observe unloading of purse seine and practice of data collection on board 9. Data processing 10. Introduction of SFA Purse seine sampling 11. Catch estimation process 12. Overall discussions

	Trainees from Iran and Kenya understood data collection and processing from industrial purse seine. Iranian trainees will use this knowledge to train enumerators for improvement of data collection at port. Kenya trainee will carry out logbook validation and improvement of licensing protocol, and furthermore plan to sampling transshipment in Mombasa port.
Recommendations	The following recommendations are made from trainees: 1. More training to use FINSS and general database from Kenyan. 2. Iran requested further technical advice on site to upgrade their data collection and data processing system. It is necessary to make follow-up training activities, especially enhancement of data collection in Iran and Kenya on site.

3) Training and Workshop on Data Processing and Database Management

3)-1. Training Course for FINSS

Item	Detail
Objectives	(1) To obtain basic knowledge of FINSS (Fisheries Integrated Statistical System) (2) To install and customize FINSS and to make reports using FINSS (3) To familiarize basic FINSS data and administration modules
Target Country	Participated countries with number of participants in parenthesis were: Indonesia(2), India(1), Malaysia(1), Thailand(1), Sri Lanka(1), Oman(1), Mauritius(1), Reunion(1), Australia (1), Spain(1), and Seychelles (2). 11 countries and 13 participants.
Reasons	IOTC has developed the database system called FINSS (Fisheries Integrated Statistical System) that is highly flexible and scalable tool to reinforce data processing system in the region. FINSS (to be distributed free of charge) is multilingual, can easily be modify to cover the specific requirements of a particular national statistical system, and facilitate the reporting of the data required by IOTC. Various countries in the region have already expressed their interest in using FINSS. The IOTC-OFCF Project is to support to hold training course on FINSS as one of the IOTC-OFCF Project activities, so that participants would understand and familiarize the system and basic operation of the FINSS. Feedback from participants accelerate substantially deploy of FINSS.
Results	Training Course was carried out at SFA (Seychelles Fishing Authority) meeting room and IOTC Secretariat in August 6-10, 2002. The following topics were covered during this training course. 1. General overview of FINSS system 2. Basic of database 3. Installation of FINSS 4. Customization of particular need including setting up all necessary tables of codes, changing the layout and etc. 5. Practice of reporting facilities to create simple customized

	reports and graphics 6. Characteristics and working of basic FINSS data module 7. Characteristics and working of basic FINSS administration module 8. Discussions
Recommendations	The purpose of this training course was that participants mastered basic operations of FINSS. Only one recommendation was that participants should continue practicing FINSS operations, using provided material and learned knowledge through the training course.

3)-2 Workshop on the Improvement of Database Administration System

Item	Detail
Objectives	To provide forum to share experiences, compare different database management systems and their improvement, and draw guidelines that could serve in future improvements of regarding the statistical systems of tuna and tuna-like fisheries in their respective countries.
Target Country	Iran, Sri Lanka, Mauritius, and Seychelles.
Reasons	Support and development of FINSS were one of the IOTC-OFCF Project activities. FINSS training course, firstly, was held in Aug 2002. Since then, counties participated in the aforementioned training course kept their interests to use FINSS or their database systems. Data administrators wanted to acquire more deepen knowledge of database management system. The Project, as one of its activities, provided opportunity to hold the workshop for further improvement their database systems and promotion for wider users of FINSS.
Results	This workshop was held in SFA meeting room between Feb 21 and 25, 2005. The following topics were covered: 1. Presentation of countries' database system descriptions, based on questioners 2. Reviewing basic database system 3. Database management system including available database systems and main considerations for choosing database management system 4. Database design including database structure, data relationship, and data integrity 5. Database safety 6. Information flow, errors, and consistency of fisheries data 7. Fisheries database integration 8. Reporting 9. Tracing data changes and the sources of information 10. Discussion
Recommendations	The recommendations to participants were made in the various aspects of Database management systems, Database design, and Data Lineage. It was recommended that organizations and institutions with fisheries database management systems should appoint a database administrator with the appropriate expertise to handle and develop database development and maintenance.

4) Fisheries Resource Management Course (FRMC) in Japan

In response to the urgent needs of the coastal countries to train qualified human resources for developing the fisheries industry, OFCF has been effectively assisting to develop qualified personnel by providing various training courses to meet the needs and by accepting overseas trainees in Japan.

The Fishery Resources Management Course (FRMC) is one of OFCF training courses, and can contribute to the management of international fishery resources in related coastal countries, and to foster amicable relations between the countries and Japan in the fisheries field. The FRMC, one month training course, has been formed since 2002 to build capacities of relevant personnel closely related to the IOTC-OFCF Project.

Outline of the FRMC

FRMC is designed to train qualified persons in the field of fisheries statistics by providing expert training programs, thus enabling participants to acquire deeper knowledge and skills on fishery resources management. Specific training is therefore held at some national research institutes in Japan.

Objectives of FRMC are provided in order to support IOTC-OFCF Project in the following points.

① To learn and obtain basic knowledge about Fisheries Resource management
② To learn how to organize Fisheries Statistical Systems and obtain the knowledge about practical examples for the operation.
③ To learn how to organize Fisheries Statistics required by IOTC as per IOTC standard.
④ To learn and obtain knowledge about effectiveness and utilization of Fisheries Statistics for appropriate Resource Management collectively.

Technical training is given at the National Research Institute of Far Seas Fisheries (NRIFSF), Fisheries Research Agency of Japan, in the following items.

- Introduction of Fisheries Resource Management
  Learning the basics on “Theory and Model”, which is usually engaged in the studies of Fisheries Resource Management, together with the study on the methods of Fisheries Resources Management in Japan including case studies, in aspect of “Coastal Fisheries Resources”, “Far Seas Fisheries Resources”, and “International Fisheries Resources” is scheduled. Further more in the study of “Far Seas Fisheries Resources”, the knowledge about the scheme of Resource Management conducted by IOTC including the ecology, especially focusing the Resources on tuna and tuna like species are set to learn.

- Fisheries Information and Statistical Systems
  Regarding Fisheries Information and Statistical Systems in Japan, the entire flow of statistical data from catch level through district, region and national level to be submitted to international organization is explained in the lecture, then trainees would visit relevant institutions, landing sites and data collection fields to know and learn about field works and also have relevant lectures at the sites.

At the end of this training course participants would make presentation about what they have learnt through the course related to the basic information for compiling the Country Reports as well as the counter measures against various issues in terms of fisheries resource management and fisheries statistics in each country.

Participation

16 participants from different countries into the FRMC from 2002 to 2006 are listed in the following Table 2-30.

Table 2-30. Number of participants of FRMC by countries from 2002 to 2006

Year	Number of Participants	Country
2002	2	Thailand, Indonesia
2003	3	Sri Lanka, Thailand
2004	3	India, Iran, Mauritius
2005	3	Seychelles, Maldives, Sri Lanka
2006	5	China, Indonesia, Kenya, Tanzania, Zanzibar
TOTAL	**16**	**12 countries**

Summary of Results of the Questionnaire

The questionnaire was made on awareness of the issues answered by participants from 2002 to 2006. Summary of the results of the questionnaire are shown as follows.

(1)Are those knowledge and experience obtained through the FMRC being utilized in your work at present?

- We have restarted the registration of fishing vessel for introducing MSC and VMS which we learnt in the FMRC and also commenced data collection of foreign fishing vessels operating in our EEZ. (2003 Sri Lanka)
- Lectures in the FRMC varied broadly and covered important issues timely. We are able to deploy various things from improving data collection systems to many other fields. The knowledge obtained in the lectures of the FRMC is very useful for us to discuss about fisheries and fisheries resources in the meetings. (2003 Sri Lanka, 2005 Seychelles, 2005 Sri Lanka)
- We commenced the sampling program of neritic tunas based on the subjects learnt in the lectures. Furthermore we are improving the data collection systems, sampling methods and processing statistics by exchange of information with Statistics Section of Department of Fisheries. (2003 Thailand, 2005 Sri Lanka)
- We implemented training on enhancing data collection by utilizing what we have learnt in the lectures. Additionally we are trying to implement the studies on growth, age determination, ecosystem and analysis of catch and resources of tuna, as maintaining data collected by regular method with additional biological data such as otoliths, length, weight, stomach contents etc. (2004 India)
- We conducted the Seminar on fisheries statistics for relevant people in the fishery by utilizing the textbooks and materials used in the lectures. (2004 Iran)
- As we commenced using the calipers for length measurement on tunas, which was introduced by National Research Institute of Far Seas Fisheries (NRIFSF) in Japan, the number of length data from Purse seiners was increased. (2004 Iran)
- We experimentally commenced providing service for fishery information by utilizing satellite remote sensing method learnt at JAFIC to 60 tuna fishing vessels. (2004 Iran)
- We try to check errors on fisheries statistical data and to reduce them based on what we have learnt in NRIFSF. (2004 Iran)
- We, Department of Fisheries, were recommended to check errors on fisheries statistical data and could reduce them significantly. (2004 Mauritius)
- We experimentally introduced logbook system, which are used in Pole and line fishery in Japan that we have learnt in NRIFSF, to our fishermen, and the response is good. (2005 Maldives)
- After learning new knowledge and information about various fields in fisheries of Japan through the FRMC, I could understand the position and importance of statistical system operation. (2005 Seychelles)
- Relevant personnel in the Government authorities are interested in the contents of the FRMC and admire them. (2005 Sri Lanka)
- We designed surveys and data collection to be utilized in GIS. (2005 Sri Lanka)

(2) Do you have a plan to utilize what you have learnt in the FRMC?

- We expect further cooperation from OFCF for us to introduce Japanese way of catch data collection system including remote sensing (JAFIC), which is useful for reducing operation costs, GIS that is the basic tool for resource management. (2003 Sri Lanka, Thailand, 2004 India, Iran, 2005 Maldives)
- As the lecture of GIS was very interesting, our Government is expecting OFCF assistance to provide some training about GIS. (2005 Seychelles, Sri Lanka)
- We have a plan to conduct training on enhancing data collection, especially tuna and tuna like species. (2004 India)
- We have a plan to use satellite remote sensing in the fields of fisheries. (2004 Iran)
- We would like to promote fishing technology, fisheries resource management and marketing by implementing fisheries census in regular basis, establishment of database system for fisheries management, and seminars for fishing and fisheries resources based on what we have learnt in the FRMC. (2004 Iran)
- As we learnt that swordfish has different characteristics on growth between male and female, we would like to collect individual information by sex on that species in the future.
- By utilizing the contents and information of the FRMC, especially catch data collection conducted by Fishermen's Cooperatives, we recommended the Government authorities to establish the new data collection system, and then the Government showed its interests and put the things forward to further development. (2005 Sri Lanka)
- We are going to utilize the knowledge and information obtained through the FRMC to our implementation plans in 2007 such as Fisheries Census, stock assessment survey, catch volume and catch & effort survey, and social-economic survey in fishermen's communities etc. (2005 Sri Lanka)

2.2.4 Support for Development of FINSS

One of the IOTC-OFCF Project is to support the development among the IOTC related countries of the software to be developed by the IOTC for processing fishery catch data. This software is called FINSS (Fisheries Integrated Statistical System), which was formally called WINTUNA2000. FINSS is software systems designed to facilitate data-entry, storage, error-checking, processing and reporting of fisheries data. Philosophy of development of FINSS was to be usable for a wide range of fisheries and situations, as such it features a unique modular design that provides flexibility and adaptability.

In order to support fro development of FINSS, the following activities were implemented such as training course and workshop, provision of equipment and publication of user's manual.

Training Course and Workshop

A series of training courses and workshops were held in conjunction to this activity in order to achieve objective. Details of training course and workshop refer to the previous section 2.2.3 Training and Workshop, and summary of the training and workshop is as follows..

FINSS training course: In August 2002, FINSS training course was held in Seychelles with 13 invited participants from 11 countries (Indonesia, India, Malaysia, Thailand, Sri Lanka, Oman, Mauritius, Reunion, Australia, Spain and Seychelles) and new version of the software was provided for each participants. In 2004, technical assistance and training on FINNS Database management were implemented at the field level of each sampling program in Indonesia and Thailand. Preparation on printing FINNS user's manual was conducted throughout the year.

Regional Workshop on data collection and statistical system: In March 2004, Regional Workshop on data collection and statistical system was held in Seychelles with 31 participants from 10 countries with consultants. In a part of presentation of national reports, IOTC secretariat presented FINSS to illustrate the intention of development of FINSS in an open source context, and future hope that wide users would be able to ensure long-term support for FINSS.

Training for Indonesia Data Manager: In May 2003, one Indonesian Database manager was invited to Seychelles to learn FINNS Database management and what he learnt in this training session was utilized in the actual sampling program in Indonesia.

Workshop on Database Management and administration: In February 2005, the Workshop on Database Management and administration was held in Seychelles. Participants were invited from Sri Lanka, Iran, Mauritius and Seychelles, and total numbers of participants were 12 including IOTC experts.

Training on Data Collection and Processing for Purse Seiners: In December 2005, the Training on Data Collection and Processing for Purse Seiners was held in Seychelles, and utilization of FINNS was introduced among Iran and Kenya and FINNS user's manual and CD software were provided for them.

2) Provision of Equipment

Mauritius

In 2002, the assistance on providing PC equipment in Mauritius under Letter of Confirmation (LOC) was implemented and FINNS software was also prepared in this program at the same time. Dispatching the IOTC expert to train the staff in this Institute was also conducted.

Tanzania including Zanzibar

In March 2007, the assistance on providing PC equipment including motorbikes for both Fisheries Division under the Ministry of National Resources and Tourism (Mainland) and the Department of Fisheries and Marine Resources under Ministry of Agriculture, Livestock and Environment (Zanzibar) under LOC was implemented in order to enhance data processing for both Mainland and Zanzibar.

Support of training on FINNS software was not able to be carried out, due to the end of the IOTC-OFCF Project and luck of relevant personnel to have sufficient knowledge of database language such as SQL server

Provided equipment through the framework of the LOC is shown in a list of equipment in Annex 3.

3) User's Manual

In March 2005, the FINNS user's manual was published, which was printed in Mauritius, and being distributed relevant institutions in coastal countries in the region together with the CD of FINNS software.

Remaining area

There are some plans to provide training course to utilize FINNS in Malaysia, Tanzania, Zanzibar and Kenya in the fields that they like to enhance their database.
However, there is necessary condition for the relevant persons involved in the program in Tanzania, Zanzibar and Kenya to have essential and sufficient knowledge of SQL server to utilize FINNS in their Database management system. Same situation is found in NARA of Sri Lanka as well, and the request to support basic training on SQL server has been submitted by them already.

2.2.5 Finding Historical Data and Computerization

IOTC has received required tuna statistics from relevant countries operating in Indian Ocean. Incompleteness of series statistics was found. Efforts of recovery of historical data have been made through the Secretariat. However, there are still a large number of potential sources that need to be explored and mechanisms need to be established for recovering or finding this information.
Unreported data were retrieved through the works in fact-finding mission in Indonesia, Thailand and Oman and computerization of those data are on the process. The information from the Country Reports of India, Mozambique, Sri Lanka and Iran led to the amendment of the catch estimation in IOTC database.
The historical and present catch data from longliners of South African flags operating in South African waters were expected to be retrieved, but it is still difficult to implement the program without coordination among other programs.
In the following section, details of the historical size data available in the processing plant and vessel owners in Indonesia, which are landing records in Benoa and Jakarta, and computerization on historical data from sport fishing clubs in Kenya, are described.

1) Historical Size Data Collection in Indonesia
Background
A large number and long time series of size data of tuna catch is one of essential statistics to make a stock assessment. Size frequency will be estimated to age composition, with age information, which is vital importance in seeing dynamics of population.
Japan and Taiwan/China have provided size data of yellowfin and Bigeye by longlines. Recently, number of size data from Japan has decreased since 1997, and those from Taiwan/China fluctuated. Size frequency statistics from fresh tuna longlines through Indonesia Sampling Program has been obtained since July 2002. Although the data was known to exist, the IOTC Secretariat did not have any information on the sizes caught by fresh-tuna longline fisheries in the Indian Ocean before 2000. The collection of past data from the Indonesian fishery, operating since 1973, was considered very important to increase the quantity and quality of the information available and its potential use for stock assessment.

Implementation
Local supervisors of Jakarta Fishing Port of the sampling program proposed owners of processing plants in Jakarta Fishing Port and Benoa Port and fishing vessel owners through Indonesia Tuna Association (ASTIN) and Indonesia Tuna Longline Association (ATLI) to obtain past size data before 2002.

Results and Evaluation
Unfortunately, except Samudra Besar Processing Plant (PSB) in Benoa Port, which is a semi-government processing plant, past size data information was not provided. Partially, submission of these data might be induced to impose extra tax on the owners of processing plants and vessels, so they were very cautious to provide any past data to the government sector.
From the country report of Indonesia, under-reporting of catch from the owners of vessel or processing plans was described relating tax. These disturbances in collecting statistics including past size data, are beyond one institutional problem. The institutional harmonization is hoped in order to drive sound fisheries data collection.
Samudra Besar Processing Plant (PSB) has already provided to IOTC necessary data from 1978 to 1996. Size data from 1998 to 2002 will be available.

Recommendations
Furthermore, efforts for size data collection from the other owners of the processing plants and vessels will be made by related Indonesia authority. Some more feasibility study on the program is needed.

2) Computerization of Historical Size Data from Kenya Sport Fishing Clubs

Background

Marine Sport Fishing targeting billfish and tunas in Kenya has a long history since 1940s. Fisheries Department (FiD) has been collecting data from Sport Fishing Clubs since then.

District officer of the FiD is collecting catch report from each Sport Fishing Club, however, reporting rate is low and mainly summary of catch is collected at present. Although the FiD has a long history of experiences to collect sport fisheries data, it has not yet achieved to the level to establish sport fishing database in order to make stock assessment. Kenya Sea Angler Fishing Association summarized catch statistics for ten years from season 1990/1991 to 1999/2000 through members. Figure 2-24 shows rough idea of catch from fishing clubs in 7 districts along the Kenya coast. Figure 2-25 shows locations of sea sport fishing clubs in Kenya.

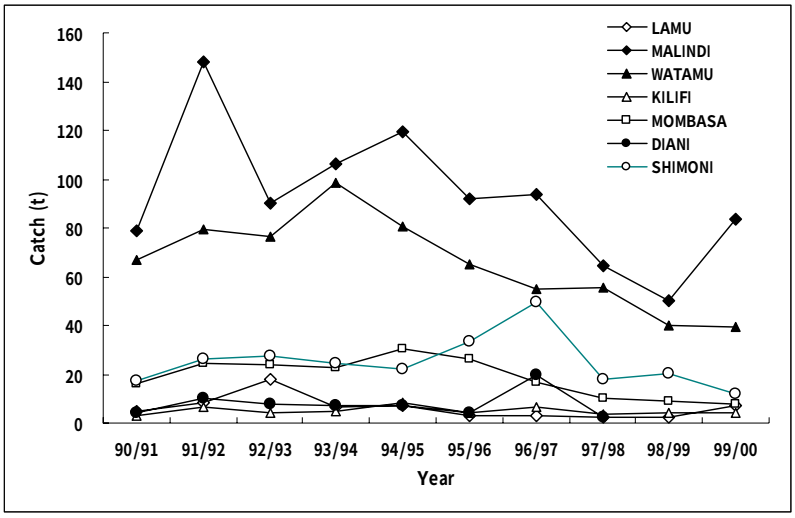

Figure 2-24. Catch from Sea Sport Fishing in Kenya from season 1990/1991 to 1999/2000, based on statistics from Kenya Sea Sport Fishing Anglers' Association.

Figure 2-25. Location of Sea Sport Fishing clubs along Kenya coast.

IOTC-OFCF fact-finding mission to Kenya in February of 2006 found historical sport fishing data at Malindi and Watamu Sport Fishing Clubs. All data were recorded in notebooks by hand.
In this context, the IOTC-OFCF Project decided to implement the computerization of historical data program under the scheme of cooperation among the FiD, Sport Fishing Clubs and IOTC-OFCF Project.
Computerized data through this program is expected to be the first step to establish database for this sector in order to fulfill a scarcity of catch, effort, and length/weight frequency data, especially for billfish in this region. Furthermore, it might be potential to evaluate billfish resources as relative abundance using catch and effort drawn from these computerized data.

Implementation

Kenya FiD and IOTC-OFCF Project signed MOU in July 13, 2006, and this program was commenced from August.
The objective of the program was to computerize historical data from the Malindi and Watamu sea sport fishing clubs operating in Kenyan waters within the duration from August to December, 2006.
The FiD appointed one Program Coordinator and officer in Assistant Director of Fisheries, Marine and Coast, Mombasa (hereafter FiD Mombasa), ensured availability of historical data from both Malindi and Watamu Sport Fishing Clubs, and borrowed their notebooks. These notebooks were photocopied (or scanned) and were retuned to respective clubs within promised date. Based on photocopied data, computerization was made at the assistant director office in Mombasa until December 2006. Available data from Malindi and Watamu sport fishing clubs were from 1987 to present, and from 2000, respectively as shown in Table 2-31.

Table 2-31. Available historical data from Malindi and Watamu sport fishing clubs

Name of Club	Period for available notebooks
Malindi Sea Sport Fishing Club	1987, 1990, 1991, 1992, 1993, 1994, 1995 (Jan and Feb), 1996, 1997, 1998, 1999, 2000, 2001, 2002 (Jan-Jul), 2005 (July-Dec), 2006 (Jan-present)
Watamu Sea Sport Fishing Club	2000, 2001, 2002, 2003, 2004, 2005, 2006(Jan-present)

Appointed data entry persons as temporally employees entered these data.
Kinds of data records kept in both fishing clubs were almost identical, and the following information was available and would be computerized: date of fishing, name of Club, name of boat, species, releasing with or without tag, weight (estimated weight for released fish), number of fish (if aggregated for smaller sized fish), length (length measurement was done for the larger sized fish). For computerizing the data, IOTC-OFCF Project provided specific database, using Access.

Results

The program under the scheme of cooperation among the FiD, Sport Fishing Clubs and IOTC-OFCF Project was functionally worked well throughout the period from August 1 to Dec 31, 2006. Equipment for digital data storage and computerization of data was introduced into Mombasa FiD All data collected from Watamu and Malindi Sea Sport Fishing Clubs were computerized. Tables 2-32 and 2-33 show number of records computerized in Watamu and Malindi Fishing Clubs. Total number of records from Watamu and Malindi Sea Fishing Clubs are 5,351 and 72,691, respectively. Due to missing original notebooks, there were no records from Malindi in 1989/1990, 1995/1996 and 2002/2003.

Table 2-32. Number of monthly records computerized for Watamu Sport Fishing Club from 2000 to 2006

	Month												
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Sub Total**
2000	187	175	107	87	0	0	58	82	48	38	172	92	**1046**
2001	87	61	84	45	0	0	21	44	113	47	139	133	**774**
2002	101	113	116	64	1	0	13	58	49	43	101	114	**773**
2003	M	M	M	M	M	M	M	M	M	M	M	M	
2004	158	115	143	65	0	0	5	62	58	84	164	225	**1079**
2005	135	130	134	41	0	0		75	88	96	115	82	**896**
2006	104	92	115	97	0	0	29	91	129	90	36		**783**
Sub Total	**772**	**686**	**699**	**399**	**1**	**0**	**126**	**412**	**485**	**398**	**727**	**646**	
											Grand Total		**5351**

M: Misiing Data
0: No recod

Table 2-33. Number of monthly records computerized for Malindi Sport Fishing Clubfrom 1987 to 2006

Year/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1987	548	640	512	200	21	21	141	317	168	357	457	564	3,946
1988	M	M	M	M	M	M	M	M	M	M	M	M	0
1989	M	M	M	M	M	M	M	M	M	M	M	M	0
1990	778	854	615	85	3	10	52	232	224	461	710	855	4,879
1991	962	678	550	125	14	55	90	375	282	983	1,295	1,119	6,528
1992	1,387	1,101	541	146	52	26	105	283	227	646	879	976	6,369
1993	907	1,105	698	150	0	0	43	191	273	568	982	923	5,840
1994	904	1,017	711	112	0	0	89	274	371	960	714	1,328	6,480
1995	1,044	1,186	M	M	M	M	M	M	M	M	M	M	2,230
1996	M	M	M	M	M	M	M	M	M	M	M	698	698
1997	592	643	454	71	0	0	91	346	472	501	436	319	3,925
1998	551	293	146	14	9	12	50	149	460	457	388	454	2,983
1999	619	831	285	48	26	59	94	480	558	407	604	440	4,451
2000	826	872	410	18	0	0	199	334	338	236	673	483	4,389
2001	748	895	338	44	12	44	220	187	227	374	543	391	4,023
2002	696	449	394	62	34	80	M	M	M	M	M	M	1,715
2003	M	M	M	M	M	M	M	M	M	M	M	493	493
2004	617	670	495	93	22	30	59	383	173	627	618	554	4,341
2005	626	821	580	105	6	49	89	408	438	631	731	468	4,952
2006	524	618	516	93	23	69	102	324	262	776	964	178	4,449
											Grand Total		72,691

M: Missing Original Data
0 : No Fishing ocurred

Evaluation

The results of this activity for computerization of historical size data collected from Kenya Sport Fishing Clubs are successful, although computerized data was partially still in Excel from Watamu Sport Fishing Club.

The FiD Mombasa will have a plan to continue to collect data from other sea sport fishing clubs with collaboration of District Fisheries Office, Kenya Sea Sport Fishing Association and Kenya Marine and Fisheries Research Institute (KMFRI).

Although shortage of man power disturbs computerization of the collected data, FiD Mombasa will making arrangement of officer from Nairobi to Mombasa office to take responsibility of this work partially.

Through the implementation of the program, Kenya FiD and IOTC seem to establish better communication.

Recommendations

Computerized data are still in Excel worksheet from Watamu Sport Fishing Club. As soon as possible, after error checking, data should be transferred to database provided the IOTC-OFCF Project using ACCESS.

The FiD showed their commitment to continue this activity. It is highly recommendable. In addition to continuation, it is also recommendable that biological sampling, if possible, will be

necessary to measure various parts of measurements in cooperation with fishing clubs.
Analysis of the computerized data also recommended looking at data quality and possibility of utilization for relative abundance index for billfish.
Besides historical data finding from Indonesia and Kenya, the historical and present catch data on South African flags longliners operated in South African waters are expected to be retrieved, but it is necessary to exert more efforts.

2.2.6 Others

IOTC Field Manual

Compilation of IOTC Field Manual was placed an order with the outside consultant working together with IOTC experts, because the time schedule of IOTC experts are too tight to carry out the drafting of those documents. The financial support was taken care by the IOTC-OFCF Project.
By the end of December of 2006, the final compilation of this document was completed, however the final edition for printing is still being arranged under preparation made by IOTC experts, and therefore the printing will be able to be made when the final edition is completed.

Publications

IOTC OFCF Project published the following two documents during 5 years project.

1. Report on regional workshop on data collection and statistical system (2004).
2. A user's guide to FINSS: Fisheries Integrated Statistical System (2005)

3 Evaluation of the Project

The IOTC-OFCF Project goals were to contribute to the realization of sustainable utilization of tuna resources in the Indian Ocean by improving the accuracy of data collection and statistical analysis of the catch and resources of tuna in the Indian Ocean.

In this section an evaluation of how the project met these goals is approached in three ways:
1. An evaluation of the achievements relating to the activities employed by the project.
2. An assessment of the extent to which the data collected under the programmes contributed to an improvement in the overall quality of the fisheries statistics held by IOTC.
3. Feedback from the IOTC and its bodies

3-1. Achievements in relation to the activities and programmes employed by the project

Five activities covering four main priority areas were utilized in the project. The activities are described in detail in Section 2, briefly they included:
(1) Fact finding missions and country reports - studies to find out the current status of data collection and compilation, as well as statistical analysis in the IOTC related countries;
(2) Provision of technical guidance and assistance to eliminate the problems unveiled through studies carried out under (1);
(3) Seminars and workshops for eliminating the problems unveiled through studies carried out under (1) and (2);
(4) Development of computer software for processing fishery catch data; and
(5) Processing historical data that have not been previously reported to the IOTC.

The project focused on the following four priority areas which had been identified as areas of concern relating to tuna statistics in the region. The fisheries targeted by the project were those that were of sufficient size to influence stock assessments or future management measures, or catch fish at sizes not well represented in other fisheries. However, some of the planned activities also benefited developing countries in the region that were not identified by the criteria.

(1) **Statistics from Indonesia**.
(2) **Improving data collection systems in developing coastal countries**: primarily in Indonesia, India, Kenya, Maldives, Oman, Sri Lanka, Tanzania, Thailand, and Yemen.
(3) **Statistics from gillnet fisheries**: primarily from Iran, Oman, Pakistan and Sri Lanka.
(4) **Statistics from new longline and purse seine industrial fisheries**: primarily in Iran, South Africa, Thailand, Malaysia, Mauritius and Seychelles.

The following are highlight of the activities for five years:

- Fact finding activities were conducted and country reports were compiled for 13 countries (Indonesia, Thailand, Sri Lanka, India, Iran, Oman, Maldives, Seychelles, Mozambique, Mauritius, Tanzania, Kenya and South Africa). Collaboration with scientists in each country contributed greatly to the exchange of technical information.
- Training and technical advice on data collection, database design and/or database management was provided to technicians from 12 countries (Mauritius, Thailand, Seychelles, Malaysia, Indonesia, Sri Lanka, Maldives, India, Australia, Reunion, Kenya and Iran)
- A Regional Workshop on Data Collection and Statistical Systems provided the opportunity to review problem areas in each country and increase awareness of importance on Fisheries statistics.
- Field support to sampling programmes was provided in Indonesia, Thailand, Sri Lanka, Maldives, and Oman.

- Publication of a range of documents including: the Regional Workshop Report on Data Collection and Statistical Systems, the FINNS user's manual; a range of sampling manuals or training materials relating to specific fisheries. The IOTC Field Manual is in preparation.

The project provided technical and financial assistances to most of countries except Yemen and Pakistan.

Table 3-1 Examines more closely, the degree to which the specific objectives were met in each sampling program.

Table 3-1-a. The degree to which the specific objectives were met in Fresh Tuna longline fisheries sampling program in Indonesia for priority areas: (1) Statistics from Indonesia and (2) Improving data collection systems in developing coastal countries

Items	Details
Objective	Enhancing the data collection and processing systems for tuna longline fisheries in Indonesia through capacity building
Achievements	1. Improved linkages and communication between data collection agencies (DGCF and RCCF) 2. Introduction of new systems for data collection and processing (introduction of FINSS). 3. Enabling DGCF and RCCF to operate and manage the new system through technical assistance 4. Improvement of statistics for fresh tuna longline fisheries including: (1) Improved data processing through the use of routine validation and verification procedures (2) Improved timing, with respect to the more timely release of data reports domestically and to meet IOTC requirements (3) Improvements to the following statistics: a. Vessel record and Vessel Activity data for Indonesia held at the IOTC are now considered to be complete b. Total catches are considered to be accurate; catches by species and size frequency data are now available 5. The catches estimated from the program have been accepted by IOTC, CCSBT and Indonesia. 6. Indonesia commits to continue the sampling program independently.
Further area for work	1. Additions to the data collected including: (1)A range of complementary data on vessels to verify the completeness of the Record of Licensed vessels maintained at DGCF (2)Catches per area through implementation of logbook system 2. Improvement of artisanal fisheries (w out of scope of the program).
Evaluation	The objective was achieved given the achievements above. The IOTC Scientific Committee accepted acknowledged improvement of statistics and accepted the catch estimates.

Table 3-1-b. The degree to which the specific objectives were met in foreign fresh tuna longline fisheries sampling program in Thailand for priority areas: (2) Improving data collection systems in developing coastal countries and (4) Statistics from new longline and purse seine industrial fisheries:

Items	Details
Objective	Enhancing the data collection and processing system for foreign tuna longline fisheries in Thailand through building the capacity
Achievements	1. Introduction of new systems for data collection and data processing (including introduction of FINSS). 2. Enabling Thailand to operate and manage the new system through technical assistance 3. Improved understanding by the foreign fleets, in particular Indonesia and Taiwan, China regarding the need to report fisheries statistics in Thailand ports 4. Improvement of statistics for fresh tuna longline fisheries including:

	(1) Improved data processing, including use of routine validation and verification techniques (2) Improvements to the following statistics a. Vessel Activity data at the IOTC are now considered to be complete b. Total catches are considered to be accurate; and catches per species and and size frequency data are available 5. Taiwan,China and Indonesia have accepted catch unloading procedures in Thailand. 6. Thailand commits to continue the sampling program independently, but will likely scale down of the program due to budget limitations.
Further areas for work	Implementation of logbook system in Thailand for Thailand and flag countries
Evaluation	Objective successfully achieved given the achievements above. The IOTC Scientific Committee accepted acknowledged improvement of statistics and accepted the catch estimates.

Table 3-1-c. The degree to which the specific objectives were met in small purse seine fisheries sampling program in Thailand for priority areas: (2) Improving data collection systems in developing coastal countries

Items	Detail
Objective	Assessing precision of the catch provided by AFRDEC and DOF and modifying the sampling design for small purse seine fisheries at Phuket area, Thailand
Achievements	1. Provision of anew system for data collection in terms of area covered and increase of amount of sampling effort 2. New database provided to process collected data 3. Enabling Thailand to operate and manage the new system through technical assistance 4. Improved understanding of domestic small purse seine fisheries 5. Improvement of statistics: (1)Data processing, including use of routine validation and verification of data (2)More precise species composition and more size data available.
Further area for work	Analysis has been carried out to compare precision of the catches. Based on the results of this analysis, suitable sampling design can be proposed
Evaluation	While certain achievements were made. the objective cannot be completely evaluated until final analyses are completed.

Table 3-1-d. The degree to which the specific objectives were met in offshore gillnet with longline and coastal small longline fisheries sampling program in Sri Lanka for priority areas: (2) Improving data collection systems in developing coastal countries and (3) Statistics from gillnet fisheries

Items	Detail
Objective	Enhancing the data collection and processing system for offshore gillnet with longline and coastal small longline fisheries sampling program in Sri Lanka through capacity building
Achievements	1. Introduction of modified sampling design to cover wider areas and increase sampling effort, and improve the data processing system. 2. Enabling Sri Lanka to operate and manage the system through technical assistance 3. Improvement of statistics for offshore gillnet with longline fisheries: (1) Improvements to data processing, including use of routine validation and verification of data (2) Improvements to the following statistics: a. Nominal catches for the past two years are now considered to be accurate b. Catch and effort by species is available for 2 years c. Some improvements to the size frequency data have been made d. Some improvements to the catch by gear data have been made e. Some improvements to Vessel Record data have been made

	for coastal longline fisheries: a. Nominal catches for the past two years are considerate to be accurate b. Catch and effort by species is available for 2 years c. Some improvements to the size frequency data have been made d. Some improvements to the catch by gear data have been made 4. Results were presented at IOTC Working Party on Tropical Tunas and Billfish, IOTC accepted the statistics mentioned above. 5. NARA commits to continue the sampling program independently, but may have to scale down of the program due to budget limitations.
Further areas for work	There have been improved linkages and communication between NARA and SU, but new estimated catches have not been included in Sri Lanka's official statistics. Further improvements of interagency linkages are needed. Enforcement of data collection with respect to catch and effort by area for offshore gillnet fisheries and increase of size data for coastal longline fisheries.
Evaluation	The objective was fairly-well achieved. The IOTC Scientific Committee accepted て the improvement of statistics.

Table 3-1-e. The degree to which the specific objectives were met in artisanal pole and line, and other artisanal fisheries sampling program in Maldives for priority areas: (2) Improving data collection systems in developing coastal countries

Items	Detail
Objective	Improving tuna fisheries statistics and stock assessments by implementing a sampling program to collect length frequency data in the EEZ from July 2003.
Achievements	1. Average of 20,000 fish (mostly skipjack and yellowfin tuna) per month during the program as expansion of sampling areas. Expansion of sampling areas and number of fish measured definitely increased reliability of catch estimation reflecting seasonal and geographical changes. Consequently, such estimation of catches in 2003 and 2004 are considered to be more accurate than those of previous years 2. The Maldives government independently resumed the sampling program.
Further areas for work	More suitable weight conversion factors will be revised using these length data.
Evaluation	The objective has successfully attained.

Table 3-1-f. The degree to which the specific objectives were met in artisanal gillnet and handline fisheries sampling program in Oman for priority areas: (2) Improving data collection systems in developing coastal countries and (3) Statistics from gillnet fisheries

Items	Detail
Objective	Strengthening the current sampling in Oman to incorporate the routine collection of size data (mainly Yellowfin tuna) from the artisanal gillnet and handline fisheries
Achievements	Sampling started from the middle of January 2003, and ended by the beginning of April 2003 with 1600 fish sampled.
Further area for work	No analysis of the data was provided. Sampling program is necessary to enforce to increase the amount of size data by Oman
Evaluation	Enforcement of the current sampling program has not yet done, so the objective was only partially met.

Although some activities were not successful (Table 3-1), overall the objectives improve tuna statistics in this regions was largely accomplished.

3-2. Achievements in relation to improvements in the quality of fisheries data held by IOTC

The main goal of this section is to estimate the effects that the IOTC-OFCF activities had on the quality of the fisheries statistics stored at the IOTC Secretariat. At this stage, such an exercise cannot be carried out in quantitative terms because of the lack of estimates of precision for statistics collected before and after the implementation of the IOTC-OFCF activities. In order to carry out a quantitative evaluation more information from the fisheries concerned, especially for years before

the implementation of the Project would be needed.
The present evaluation has been carried out in qualitative terms. Note that although some figures are displayed for information, they are indicative only and do not indicate actual gains in quality. The total catches estimated for 2005 were used to assess the contribution of the activities implemented through the Project to the likely quality of the following data types. The figures used for this report are thought to be the best estimate of total catches for 2005 at the time in which the report was drafted.

The major data categories evaluated included:
Nominal catches data, or the total annual catches estimated for each fishery and/or species. These are highly aggregated statistics for each species estimated per fleet, gear and year for a large area. When nominal catch data are not reported, the Secretariat uses information from alternate sources to estimate them. Gains in data quality might come from improved estimates of total catches and/or improved estimates of catches per gear and/or species. The catches estimated for fisheries or species in countries that received the support of the IOTC-OFCF Project are shown against those for the same fisheries or species, that were reported or estimated by the Secretariat, for other countries
Catches and effort data, or the catches per month and IOTC grid (1 or 5 degrees square depending on the type of fishery) per fishery or species. This information comes usually from logbooks (industrial fisheries), enumerators sampling catches and effort during the unloading of the catches (artisanal fisheries) or a combination of the two (some well monitored industrial fisheries). Catches and effort are not available for all nominal catches strata. When recorded, the catches in these datasets might represent the total catches of the species in the year for the fleet and gear concerned or represent simply a sample of those. Gains in data quality might come from improved logbook and/or sampling coverage, improved gear and/or species breakdown, etc.
Size frequency data, or the catches per month and IOTC grid (5 degrees square for all fisheries) per fishery or species. This information comes usually from sampling of individual fish lengths or weights, onboard, during the unloading of the catches or both. This information, as above, is not available for all nominal catches strata. Gains in data quality might come from improved sampling coverage (in terms of either the number of strata sampled or the number of fish sampled per stratum), improved species identification, measuring tools, type of measurement, etc.

The following categories were identified for the evaluation. The IOTC criteria were used to assign a quality to the statistics obtained from the Project activities or those available from the IOTC database for other countries.
(1) For fisheries from countries that received the support of the IOTC-OFCF Project:
(a) Field activities (sampling programmes): The label **S-OFCF** is used to indicate the degree of improvement expected as a result of a change in the status of the data from what was considered to be of poor quality before the IOTC-OFCF project initiated its support to data collection, to fair or good quality data as a result of the activities implemented being maintained in the recipient countries.
(b) Other activities (other than sampling programmes): The label **R-OFCF** is used to indicate what the improvement would be for each IOTC fishery or species if the recommendations issued from activities initiated by the IOTC-OFCF, other than sampling, were maintained by the countries concerned.
(2) For fisheries from countries that did not receive the support of the IOTC-OFCF Project: two categories are used to indicate the quality of the statistics available aggregated in countries that did not receive any support from the IOTC-OFCF Project:
Good: The statistics are available and are thought to be of fair to good quality
Poor: The statistics are not available or, when available, are considered to be of poor or unknown quality

In general, it can be assumed that improvements in data quality occur for the first category, at least for the duration of sampling under the support of the Project. Improvements in data quality that might originate from the implementation of recommendations by the Project, however, cannot be

evaluated at this stage. Follow-up missions are required to be able to assess to which extent these recommendations have been implemented and evaluate any gains in data quality that might have arisen.
The rationale used for this evaluation is fully explained in Annex 5.

Improvements in fisheries statistics as a result of the IOTC-OFCF-Project

The overall improvement in fisheries statistics for Nominal catches, Catch and effort and Size frequency data collected through the IOTC-OFCF Project are shown in Figure 3-1.

Prior to the IOTC-OFCF project, 38% of the nominal catches and 61% of the catch and effort

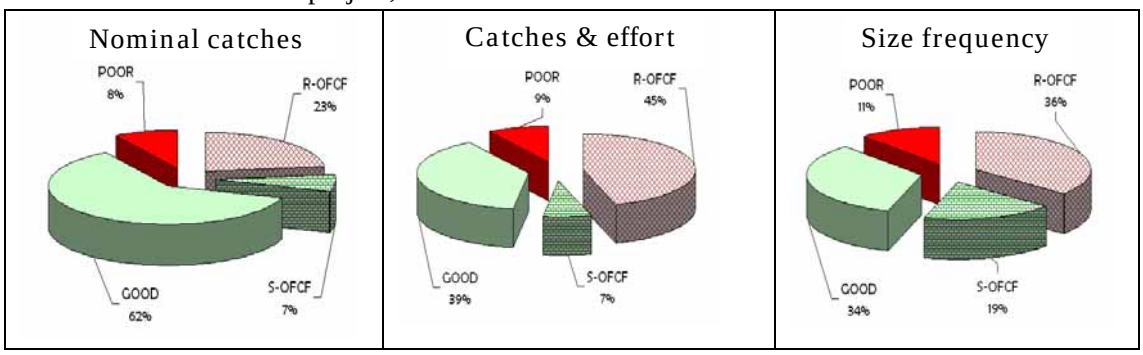

Figure 3-1. Improvement in fisheries statistics with respect to (a) Nominal catch, (b) Catch and effort and (c) Size Frequency arising from the IOTC-OFCF Project.

recorded in the IOTC database were considered to be of unknown or poor quality. The implementation of sampling programmes by the Project led to improved data collection and processing in several countries. As a result, as indication of S-OFCF in Figures 3-1(a) and 3-1(b), around 7% of the nominal catches and 7% catch and effort data collected through sampling program (of the total catches recorded for 2005), were reclassified from poor to good quality.
Similarly, where activities other than sampling programmes were implemented, if these activities were carried out correctly, substantial improvements to the data (indicated as R-OFCF) that makes up the total nominal catch estimates could be expected (Figure 3-1(a)). More marked improvements could be expected in the catch and effort data, depending on the extent to which the recommend activities were implemented (Figure 3-1(b)).
Thus, overall, a marked improvement in the quality of both the nominal catch data and the catch and effort data is a realistic improvement from the project if the methods and recommendations from the IOTC-OFCF project were implemented fully.
Prior to the IOTC-OFCF project, 66% of the size data relating to the total catches recorded in the IOTC database were considered to be of unknown or poor quality. The implementation of sampling programmes by the Project led to an increase in the amount of good quality size data (in relation to total catch) in the order of 19% indicated as S-OFCF in Figure 3-1(c).
Similarly, where activities other than sampling programmes were implemented, if the countries involved followed the advice of the project, moderate improvements in the quality of the size data can be reasonably expected. The combination of implementing the sampling programmes and undertaken a range of other activities could result in a marked improvement in the quality of the size data.

3-3. Feedback from the IOTC and its bodies on the project

In 2006, the IOTC Scientific Committee (SC) was unanimous in congratulating the IOTC-OFCF Project for its excellent work and most valuable contribution to improving the data available to IOTC and building capacity in the participating countries to implement and strengthen data collection regimes. The SC also congratulated the participant countries for the improvements achieved in their fisheries data collection systems.

Furthermore, The SC stressed the need for resources to be made available to continue a programme of improving data collection processes in the Indian Ocean fisheries and recommended that the

Commission consider how such resources might be made available after the completion of the current IOTC-OFCF initiative.

In 2007 the Commission, while reiterating its concern about the lack of statistics from several Members and Cooperating non-Contracting Parties and noted the detrimental effects that the lack of statistics (in particular catch and effort and size data) can have on the stock assessments., acknowledged the valuable contribution the IOTC-OFCF Project had made in the improvement of the fisheries statistics to the Commission. Furthermore, the Commission noted that the IOTC-OFCF project has played its part in boosting participation at working party meetings by assisting coastal countries send scientists to present their country statistics. The Commission Report 2007 (paragraph 20) stated:

The Commission recalled the considerable contribution to data collection that the IOTC-OFCF project made over the last 5 years and noted the Scientific Committee's concerns that further initiatives similar to those undertaken under the IOTC-OFCF project may not be possible in the future unless additional funding is forthcoming. Several CPCs informed the Commission about the advantages of participating in IOTC-OFCF activities and strongly recommended that similar activities be continued.

3-4. Evaluation summary

The IOTC-OFCF project was appropriately administered by the OFCF Staff in Seychelles and in Japan. The Project regularly held an internal meeting among IOTC and OFCF experts once a week or two weeks to discuss project activities for smooth operations, and the results of the discussions were reported to OFCF HQ.

The project was guided by a IOTC-OFCF Joint executive meeting which met annually to review activities during previous year and to agree planned activities for that year.

Furthermore, the following improvements to the fisheries statistics could be expected if the countries involved implemented the sampling programmes and other activities advocated by the project:

- Moderate improvements in the quality of the nominal catches
- Marked improvements in the catch and effort data.
- Marked improvements in the size data

The extent to which these improvements would be realised depended greatly on the collaborating countries willingness to continue implement and maintain the project activities.

The feedback and response from the bodies associated with the IOTC-OFCF Project has been overwhelmingly positive. The project has on many occasions been singled out and congratulated by the IOTC, the IOTC SC and its working parties, agencies within countries for its professionalism and major contributions to IOTC fisheries statistics.

3-5. Recommendations for the Future Improvement of the IOTC Statistics

In addition to the lists of remaining work outlined in Table 3-1, the following list of recommendations for future improvements of the IOTC Statistics was derived by the IOTC-OFCF experts. These recommendations, if implemented could be expected to further improve the situation regarding IOTC fisheries statistics and as such should be seriously considered in any plans for similar initiatives in the Indian Ocean region.

1) Improving awareness of the importance of the statistics

Accurate statistics on tuna fisheries are important for fisheries mangers to make informed decisions regarding the sustainable utilization of tuna stock in the Indian Ocean. The IOTC-OFCF Project recommends that the authorities in all of the countries that fish for tunas and tuna like species in the Indian Ocean be reminded about the importance of fisheries statistics, their obligations under the IOTC, and to the extent possible, improve their fisheries statistics regimes .

2) Improving cooperation among authorities concerned with fisheries statistics within each

country
In many countries, fisheries data are collected by a range of departments and agencies. In some instances, the same data are collected by more than one of these bodies. The IOTC-OFCF Project recommends that the fisheries related agencies and departments in each country clearly understand their roles, collaborate as much as possible, reduce duplication of work, and to the extent possible, exchange data and expertise to contribute to improve the fishery statistical system.

3) Foster the work of field data collection staff.
In the pursuit of fisheries data, field officers visit landing places to interview fishermen or undertake sampling activities on the catches being unloaded. The IOTC-OFCF Project emphasizes importance of the role of the field officers and the need for a responsible officer to supervise both the collection of data and the field staff. Such an officer should

a. Supervise staff to collect data properly as following the data collection protocol.
b. Identify problems of data collection and important issues which might influence data collection protocols or the quality of collected data due and report these to the project managers.
c. Facilitate regular training of field staff
d. Support the field staff in their activities, keep moral up and keep them motivated.

4) Introduce log book introduction and observer programs
The use of logbooks and observer programmes are highly recommended to collect more accurate fishing activity data.

5) Improve data processing
Collected data are highly valuable and should be stored in an appropriate database system. The IOTC Secretariat can recommend an appropriate database system depending on needs and uses.

6) Data feedback to fishers
Feedback of the results of data collection schemes to the fishers, who cooperated with the project is very important to promote understanding about the need for the collection of fisheries statistics and promotes awareness of resource management.

7) Re-estimation of fisheries statistics based on new reliable information
As new information is collected (or obtained form other sources), it is important to revise the estimates of the fisheries statistics.

8) Follow up of the first phase of IOTC-OFCF activities
The next step for the IOTC-OFCF experts or the IOTC alone would be to follow-up on the activities implanted as a result of the IOTC-OFCF project and encourage the institutions concerned to continue their work and where necessary implement the outstanding recommendations from the Programme.

4. Final Remarks of Conclusion

IOTC Tuna Statistics is one of important materials to assess tuna resources in order to utilize sustainable manner of the resources. Basis of the statistics compiled by the IOTC Secretariat are submitted statistics from countries which engaged in tuna fishing or fisheries. Such statistics from each country have to be satisfied with IOTC criteria, so data have to be collected and processes through suitable manners.

The IOTC-OFCF Project coped with priority area, which the IOTC Secretariat identified, by means of activities which the Project MOU defined. Sampling programs were main activities of the Project, and gave prototype to collect more accurate data and to process more efficiently. The project provided various aspects of technical supports to maintain those systems by themselves. As inputs of resources were limited, so some of the issues were remained, however Scientific Committee expressed appreciation of the fruitful results of the Project.

The countries, which the sampling programs were implemented, have to solve or improve furthermore their own tuna statistics as applying the given technical support thought the Project. This report described details of sampling activities and would give various advices to improve tuna statistics. Even though countries failed to receive supports from the Project, they can use this report as a good reference in order to improve their fisheries statistics especially for tuna.

The Scientific Committee stresses the need for resources to be made available to continue a program of improving data collection processes in the Indian Ocean fisheries in November 2006. IOTC Secretariat and OFCF Head Quarters began to discuss positively the Project as the second phase since then.

The IOTC-OFCF Project received a great cooperation from relevant institutes of coastal countries. At the end of the report, IOTC Secretariat and OFCF express our gratuity for these institutes.

Annex

1. MOU of the IOTC-OFCF Project
2. An Example of MOU(Indonesian RCCF Case)
3. List of Equipment Provided for Catch Monitoring Program
4. Activities by Countries in the Priority Area with Fishery Information
5. Project results by fishery and by species

Annex 1. MOU of the IOTC-OFCF Project

MEMORANDUM OF UNDERSTANDING
BETWEEN
OVERSEAS FISHERY COOPERATION FOUNDATION
AND
INDIAN OCEAN TUNA COMMISSION
ON
TECHNICAL COOPERATION PROJECT

The Overseas Fishery Cooperation Foundation of Japan (hereinafter referred to as "the OFCF") and the Indian Ocean Tuna Commission (hereinafter referred to as "the IOTC"), recognizing the need to reinforce the fishery cooperation relationship with each other, and with a view to contributing to the realization of sustainable utilization of tuna in the Indian Ocean, have agreed as follows to implement technical cooperation project which aims at improving the systems of collecting and processing data on resources related to tuna fisheries in the Indian Ocean.

Article 1 Title of the Project

The title of the project shall be "Cooperation Project for Enhancing the Data Collection and Processing Systems for Tuna Resources in the Indian Ocean" (hereinafter referred to as "the Project").

Article 2 Objective of the Project

The objective of the Project is to contribute to the realization of sustainable utilization of tuna resources, by improving the accuracy of data collection and statistical analysis of the catch and resources of tuna in the Indian Ocean.

Article 3 Region of Implementation of the Project

The Project shall be implemented in the IOTC related countries, with the IOTC Secretariat serving as a base.

Article 4 Duration of the Project

Subject to the Japanese government's securing the budgetary measures for implementing the Project, the Project shall commence from April 1, 2002 and shall be in effect until March 31, 2003. However, the duration is subject to extension or reduction, based on mutual agreement by the OFCF and the IOTC.

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Article 5 Implementation of the Project

The Project shall be implemented by the OFCF, the IOTC Secretariat, with cooperation of the divisions/bureaus responsible for fishery statistics of the IOTC related countries, in accordance with this Memorandum of Understanding and the annexed Implementation Plan.

Article 6 Responsibilities of the OFCF

The OFCF shall be responsible for the following:

(1) Appoint the OFCF experts and dispatch them to the IOTC Secretariat;

(2) Cover the wages and allowances of the OFCF experts and their dependents, housing costs, housing security costs, movement costs, medical fees, costs for emergency evacuation, and all auxiliary expenses thereof;

(3) Bear the expenses arising from the OFCF experts' official trips to the IOTC related countries;

(4) Cover the OFCF experts' communication costs including phone, fax and e-mail charges;

(5) Provide the materials and equipment for the Project recognized by both the OFCF and the IOTC as necessary for smooth implementation of the Project;

(6) Bear the expenses for official trips to the IOTC related countries by the international staff of the IOTC Secretariat, recognized by the OFCF as necessary for smooth implementation of the Project;

(7) Bear the expenses for seminars or workshops, recognized by the OFCF as necessary for smooth implementation of the Project;

(8) Resolve any civil affairs involving the OFCF expert's lives or properties that may arise out of their activities under the Project.

Article 7 Responsibilities of the IOTC

The IOTC shall be responsible for the following:

(1) Appoint counterparts from among the international staff of the IOTC Secretariat in charge of the Project;

(2) Assist in finding an accommodation in the Republic of Seychelles for the OFCF experts and their dependents;

(3) Assist in providing the OFCF experts and their dependents with medical treatment at times of illnesses and accidents;

(4) Provide an office furnished with telephone lines which the OFCF experts need for carrying out their tasks under the Project, and also bear the utility (heating, lighting, water) charges for the office;

(5) Obtain permissions for the OFCF experts entering and leaving, staying in and working in the Republic of Seychelles, as well as those for their dependents' entering, leaving, and staying in Seychelles;

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(6) Obtain exemption for the OFCF experts and their dependents from duties imposed on their household goods, and from the income tax and other surcharges imposed on the living allowances for the OFCF experts remitted from overseas as well as on the expenses that are necessary for the implementation of the Project in the Republic of Seychelles;

(7) Obtain exemption for the materials and equipment for the Project from import/export permits by the Republic of Seychelles or the government authorities of the other IOTC related countries, as well as from any levies, custom fees and other surcharges thereof;

(8) Fully support the OFCF experts in case of any third party claims arising from the implementation of the Project, except where it is agreed by both parties that such claims arise from negligence or willful misconduct by the OFCF experts;

(9) Resolve any civil affairs involving the IOTC Secretariat counterparts' lives or properties that may arise out of their activities under the Project.

Article 8 Ownership and use of materials and equipment for the Project

(1) Out of the materials and equipment for the Project, those to be used by the Secretariat shall become the property of the IOTC, upon being delivered on a CIF basis at a port or an airport of disembarkation in the Republic of Seychelles, or upon being purchased in the Republic of Seychelles.

(2) Out of the materials and equipment for the Project, those to be used by the governments of the IOTC related countries shall become the property of the government of the relevant country, upon being delivered on a CIF basis at a port or an airport of disembarkation in the region where the headquarter office of the government authority of the relevant country is located, or upon being purchased in the relevant IOTC related country.

(3) All materials and equipment for the Project provided by the OFCF shall be used exclusively for the implementation of the Project.

Article 9 Executive Committee

Throughout the duration of the Project, an executive committee aimed at a smooth and efficient implementation of the Project and composed of the OFCF and the international staff of the IOTC Secretariat will be established, and convened as necessary when agreed upon by both parties.

Article 10 Reporting

At the conclusion of the Project, a comprehensive report on the Project shall be drawn up through joint efforts of the OFCF experts and the IOTC international staff.

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Article 11 Other Matters

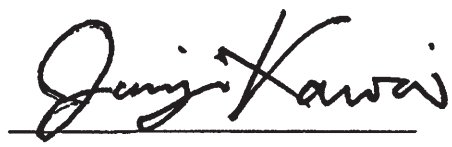
(1) Any other matter arising in connection with the Project which is not covered under this Memorandum of Understanding shall be determined in consultation between both parties.

(2) Any disagreement between the OFCF and the IOTC with respect to interpretation of any provision of this Memorandum of Understanding shall be settled in consultation between both parties.

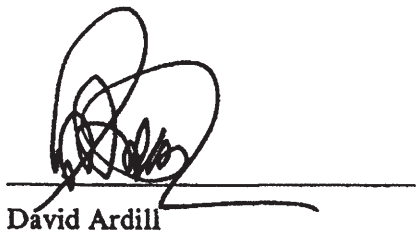
(3) The OFCF and the IOTC shall endeavor to resolve any disputes out of the implementation of the Project by consultation. Disputes will not be referred to any tribunal or third party for settlement.

In witness whereof, the undersigned, being duly authorized hereto, have signed this Memorandum of Understanding in duplicate in the English language, with each party retaining one original copy.

Signed at Tokyo on January 16th, 2002



Junji Kawai
President
Overseas Fishery Cooperation
Foundation



David Ardill
Executive Secretary
Indian Ocean Tuna Commission

IMPLEMENTATION PLAN

This implementation plan is prepared based upon Article 5 of the MEMORANDUM OF UNDERSTANDING BETWEEN OVERSEAS FISHERY COOPERATION FOUNDATION AND INDIAN OCEAN TUNA COMMISSION ON TECHNICAL COOPERATION PROJECT (hereinafter referred to as "the Memorandum") which was agreed between the Overseas Fishery Cooperation Foundation (hereinafter referred to as "the OFCF") and the Indian Ocean Tuna Commission (hereinafter referred to as "the IOTC").

1. Implementation Organizations of the Project

The Project shall be implemented by the OFCF, the IOTC Secretariat, with cooperation of the divisions/bureaus responsible for fishery statistics within the governments of the IOTC related countries that are targeted as regions of implementation of the Project.

2. OFCF Experts and their Counterparts

(1) The OFCF shall dispatch the following OFCF experts:

1) A total of two experts who will be permanently stationed at the IOTC Secretariat throughout the duration of the Project: one, a resources expert; the other, a project coordinator.

2) Should it become necessary to dispatch an OFCF expert with expertise in professional areas deemed necessary for smooth implementation of the Project, in addition to the OFCF experts referred to in 2.(1) 1), the relevant expert shall be dispatched to the IOTC Secretariat or to appropriate IOTC related countries for a duration judged as necessary by the OFCF.

(2) The IOTC shall appoint two counterparts from among the international staff of the IOTC Secretariat: one, responsible for overall supervision of the Project; the other, in charge of practical project activities.

3. Implementation Schedule for the Project

The Project shall be implemented in accordance with an Implementation Schedule to be jointly prepared by the OFCF experts and their counterparts.

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4. Activities under the Project

The following are the activities to be carried out under the Project, the details of which are to be determined through agreement by the OFCF experts and their counterparts.

(1) Conduct studies to find out the current status of data collection and compilation, as well as statistical analysis in the IOTC related countries;

(2) Provide technical guidance and assistance to the IOTC related countries for eliminating the problems unveiled through studies carried out under (1);

(3) Hold seminars or workshops for eliminating the problems unveiled through studies carried out under (1);

(4) Support the deployment among the IOTC related countries of the software to be developed by the IOTC for processing fishery catch data;

(5) Find and process the historic data existing in the IOTC related countries that have not been reported to the IOTC;

(6) Any other activity that may be recognized as necessary by both of the OFCF and the IOTC.

5. Materials and Equipment for the Project

The OFCF shall provide the materials and equipment specified in the attached List of Materials and Equipment. In cases where, within the duration of the Project, the OFCF and the IOTC Secretariat both agree that additional materials and equipment are required, the OFCF shall provide such materials and equipment in accordance with a letter of request to be submitted by the IOTC Secretariat to the OFCF.

6. Other Matters

For any other matters which are not covered by this Implementation Plan, or on any occasion within the duration of the Project when the necessity to make changes occur, decisions shall be made by agreement between the OFCF and the IOTC.

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Attachment

LIST OF MATERIALS AND EQUIPMENT

No.	Item	Quantity
Materials/equipment for the Project office		
1.	Fax machine	1
2.	Photocopier	1
3.	Computer set (lap top)	2
4.	Computer set (desk top)	2
Materials/equipment for the IOTC related countries		
5.	Computer set for data processing	requisite quantity

JK

Annex 2. An Example of MOU (Indonesian RCCF Case)

MEMORANDUM OF UNDERSTANDING
on
Technical Assistance from the Indian Ocean Tuna Commission and
the Overseas Fishery Cooperation Foundation
to
the Research Center for Capture Fisheries, Indonesia

1. Introduction

The Indian Ocean Tuna Commission (hereinafter referred to as "IOTC") and the Overseas Fishery Cooperation Foundation (hereinafter referred to as "OFCF") will provide technical assistance to the Research Center for Capture Fisheries (hereinafter referred to as "the Recipient Organization") with purpose of the enhancement of the data collection and processing system for tuna fisheries in Indonesia, as a component of activities under the "Cooperation Project for Enhancing the Data Collection and Processing Systems for Tuna Resources in the Indian Ocean" which was commenced from April 1st 2002 by IOTC and OFCF. (Refer to Annex A) The funds for the execution of this technical assistance, which is the amount of 36,958 US dollars (equivalent amount of 321,532,000Rs listed in Annex B), will be contributed by OFCF.

2. Purpose

a) The activity for which the funds provided by OFCF under this Agreement shall be used is the Enhancing the data collection and processing system for tuna fisheries in Indonesia (hereinafter referred to as the "project").

b) The background, the terms of reference, the inputs to be provided by the Recipient Organization, IOTC and OFCF, if any, the budget of the project and the identification of the Monitoring/Certifying Officer are given in detail in the attached Annexes A and B, which constitute an integral part of this Agreement.

3. General Conditions

a) Funds provided by OFCF under this Agreement are to be used by the Recipient Organization exclusively in support of the project.

b) The Recipient Organization shall be responsible for the organization and conduct of the project. Neither IOTC nor OFCF will be held responsible for any accident, illness, loss or damage which may occur during the implementation of the project.

c) The use of the official emblem and name of IOTC or OFCF on any publication, document or paper is specifically prohibited without prior written approval from IOTC and OFCF.

d) All intellectual property rights (including copyright) in the work to be performed under this Agreement shall be shared among IOTC, OFCF and the Recipient Organization hereinafter referred to as "the Parties" including the right to use and publish the information obtained under the activities shown in Annex B, in conformity with the data confidentiality policy and procedures established by IOTC. Neither the Recipient Organization nor its personnel shall communicate to any other person or entity any confidential information nor shall it use this information to private or company advantage.

e) The personnel assigned by the Recipient Organization to the organization and running of the project shall not be considered as staff members of IOTC or OFCF and shall not be entitled to any privilege, immunity, compensation or reimbursement by IOTC or OFCF. Neither the Recipient Organization nor its personnel shall be allowed to incur any commitment or expense on behalf of IOTC or OFCF.

f) The present Agreement shall be governed by general principles of law, to the exclusion of any single national system of law.

g) If, after meeting the costs of the project, there are unexpended funds under this Agreement, the Recipient Organization shall return such unexpended funds to OFCF.

h) IOTC or OFCF shall have the right to terminate this Agreement, by written notice to this effect, if it considers that the continued implementation of the Agreement is impossible or impractical:

i) for unforeseen causes beyond the control of IOTC or OFCF;
ii) in the event of a default or delay on the part of Recipient Organization.

i) In the event of the Recipient Organization's non-compliance or partial compliance with the terms of this Agreement, it will refund to OFCF any payment already received by the Recipient Organization in respect of activities that have not been performed to a standard considered acceptable to IOTC or OFCF.

j) In the event of termination by IOTC or OFCF for unforeseen causes beyond its control, OFCF shall complete payment which may be due up to the effective date of termination.

4. Reporting

a) The Recipient Organization shall submit to the IOTC and OFCF, a quarterly progress report no later than 15th of the month following the quarter of submission. The first report submitted should include not only the information gathered during the previous quarter but also all other data retrieved regarding the activities described in ANNEX B.

b) The Recipient Organization shall submit to the IOTC and OFCF, a quarterly itemized "statement of expenditures" (certified by the Chief Accountant or similar officer of the Recipient Organization).

c) The Recipient Organization shall submit to the IOTC and OFCF, a final report within 2 months following the completion of the project.

d) The Recipient Organization shall submit to the IOTC and OFCF, a final statement of accounts showing the utilization of funds as determined under this Agreement by the time of the completion of the project. If the legal status of the Recipient Organization precludes the provision of audited financial statements, a statement certified as to its correctness by the officer responsible for maintaining them will be provided. IOTC and OFCF shall have the right to review anytime the relevant records on financial statement.

5. Terms of Payment

a) For the execution of the project under this Agreement, the OFCF will make available to the Recipient Organization a financial contribution in the amount of 36,958 US dollars. The payments will be made as follows:

i) 16,631 US dollars upon signature of the present MOU;
ii) 16,631 US dollars upon acceptance by IOTC and OFCF of the first quarterly report mentioned under paragraphs 4a) and 4b);
iii) 3,696 US dollars upon acceptance by IOTC and OFCF of the final statement of accounts and the report mentioned under paragraphs 4c) and 4d) above.

b) The sum stipulated in paragraph 5a) above represents the full amount to be paid by OFCF for all services and activities to be provided by the Recipient Organization under this Agreement.

c) OFCF will make the above-mentioned payments in accordance with the banking instructions provided below by the Recipient Organization.

d) Any equipment received as part of this project hereinafter referred to as "Project Equipment" will be considered property of the Recipient Organization, but it must be used exclusively for the execution of activities related to this project until the end of the project.

6. Settlement of Disputes

Any dispute among the Parties arising out of the interpretation or execution of this Agreement shall be settled by mutual agreement.

7. Amendments

Any amendment to this Agreement shall be effected only on the basis of written mutual consent by the Parties.

8. Entry into Force

a) The present Agreement will enter into force upon signature by the Parties and shall be effective until March 31st, 2006. The agreement shall be renewable based on mutual agreement by the Parties.

b) The Recipient Organization must sign three copies of this Agreement and return one to the Executive Secretary of the IOTC and one to the President of OFCF.

Signed on behalf of the Indian Ocean Tuna Commission:

Signature: .....
Alejandro Anganuzzi Executive Secretary of the Indian Ocean Tuna Commission

Date: .....

Signed on behalf of the Overseas Fishery Cooperation Foundation:

Signature: .....
Koichi Sakonju [on behalf of the President of the Overseas Fishery Cooperation Foundation]

Date: .....

Signed on behalf of the Research Center for Capture Fisheries:

Signature: .....
Subhat Nurhakim Director of Research Center for Capture Fisheries

Date: .....

Detailed Banking Instructions (including: the name of the account holder, account number, bank's name and its full address)

Pusat Riset Perikanan Tangkap
BNI 1946 Cabang Jakarta Kota
A/n 001.000036255.002

Annex A: General Overview on the Joint Activities to carry out in Indonesia: Fresh Tuna Longline Data

With catches of tuna and tuna-like species in the Indian Ocean estimated to exceed the 150,000 tons in recent years, Indonesia stands second in the ranking of tuna and tuna-like Indian Ocean fishing nations. The dramatic increase in the catches of tropical tunas and billfishes underwent in the mid-nineties, mostly due to the rapid development of a domestic fleet of fresh-tuna longliners, makes it crucial to obtain the best possible data from the Indonesian fisheries if the status of tuna and billfish stocks in the Indian Ocean is to be properly monitored.

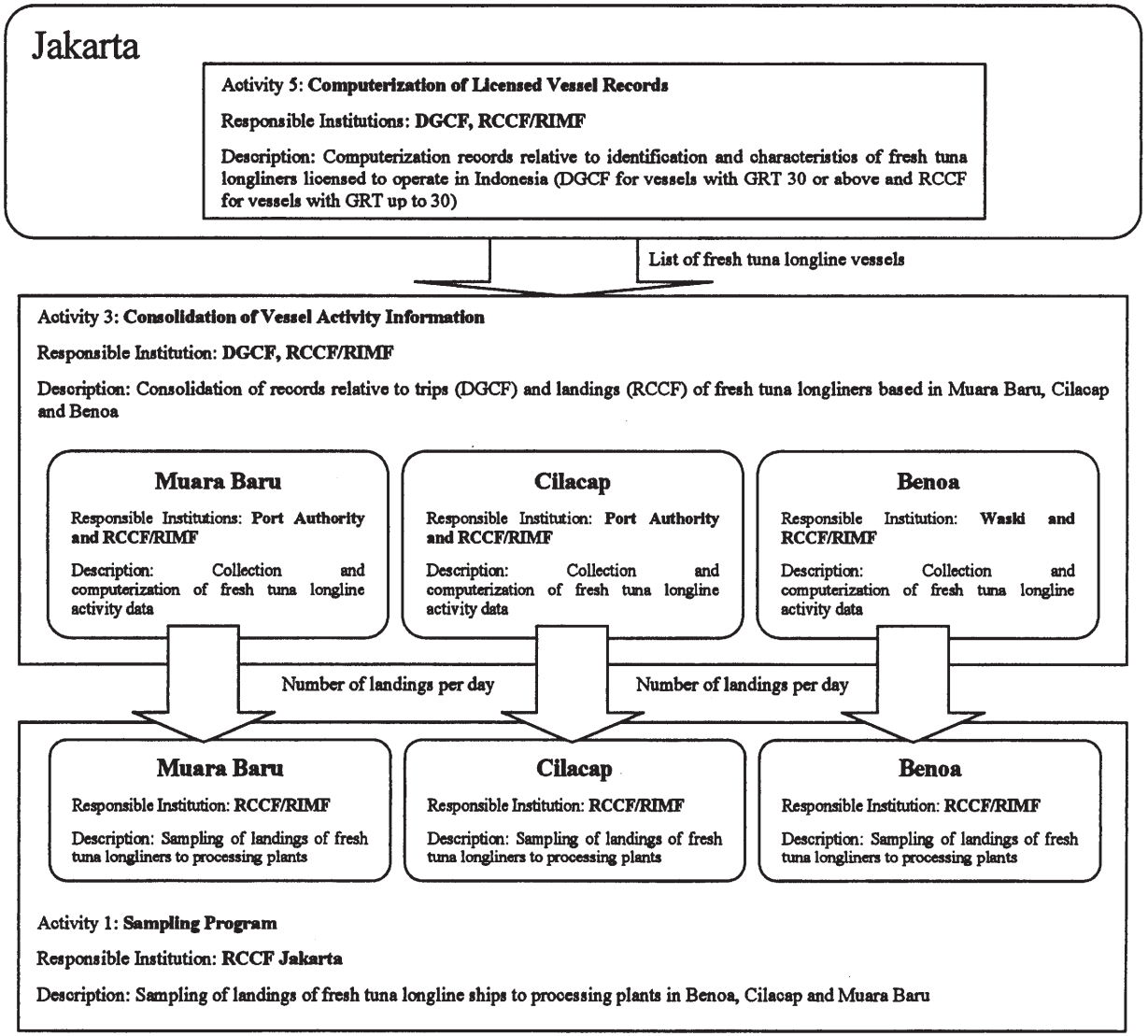
The accession of Indonesia to the status of Cooperating Non-Member Party of the Indian Ocean Tuna Commission (IOTC) confirms its commitment to achieve the common objectives of the IOTC.

The gathering of good quality statistics from all fishing nations in the Indian Ocean stands as first objective of the IOTC since this is the basis upon which all other research and management activities are founded. The Directorate General of Capture Fisheries (DGCF) of Indonesia has been collecting statistics from all fisheries in Indonesia since the early seventies. However, the data collection system currently in use is not well suited to produce statistics with the level of detail required from all IOTC members and Cooperating Non-Member Parties.

This led to the formulation of several projects related to data collection and statistics in Indonesia involving various institutions. These projects are coordinated through a Steering Committee that meets periodically to review progress and provide guidelines. The present Memorandum Of Understanding refers to the activities related with the collection and processing of data from fresh tuna longline vessels in Indonesia (see Table below). Both the DGCF and the RCCF will collect the information needed to estimate the catch by species of Indonesian fresh-tuna longline vessels in the Indian Ocean, which is the main objective. The activities, although listed individually, are highly interconnected, and the success of the project depends fully on the cooperation between the DGCF and RCCF. The flowchart in the next page shows the level of interaction among the different activities and the information that needs to be exchanged.

Activity	Description	Responsible Institutions
Sampling Program (Longline)	Sampling of landings of fresh tuna longliners to processing plants in Benoa, Muara Baru and Cilacap. Coverage expected: Not below 30% of the landings	**RCCF/RIMF** CSIRO IOTC/OFCF
Consolidation of Vessel Activity Information (Longline)	Collection of data on the activities (number of vessel landings) of fresh tuna longliners operating in the Indian Ocean putting in to Jakarta, Cilacap and Benoa Coverage expected: 100%	**DGCF** **RCCF/RIMF** IOTC/OFCF
Computerization of Licensed Vessels records	Computerization of lists of domestic and foreign longliners licensed to operate in Indonesia (including vessel names, identification and characteristics)	**DGCF** **RCCF/RIMF** (IOTC/OFCF)

Flowchart showing the basic data needed to properly conduct the sampling activities in Benoa, Cilacap and Muara Baru. The institutions responsible for the collection and dissemination of the data are indicated in each case.



Annex B: Compilation of Vessel Activity information and Catch Monitoring (fresh tuna longline)

Background

The objective of this Sampling Program is to gather information on the activity, nominal catches per species and size composition of the catches unloaded by fresh tuna longliners to Muara Baru and Cilacap (Indonesia) since the earliest possible.

Data collection and processing will be carried out by Research Center for Capture Fisheries (RCCF) scientists and technicians. The activities described in the Terms of reference below fall under the scope of the cooperative activities carried out by the Indonesian institutions, IOTC-OFCF and CSIRO-ACIAR, involving not only Cilacap and Muara Baru but also Benoa. The information obtained in the three ports will be merged and processed jointly for the calculation of the catches and size composition referred to above.

Terms of Reference

DESCRIPTION OF ACTIVITIES/SERVICES

The data collection and sampling activities will be conducted by RCCF personnel in Cilacap and Muara Baru.

The main activities to carry out under the scope of the Program are:

1. Collection of Vessel Activity information in Muara Baru and Cilacap: RCCF enumerators should record all vessel unloadings (landings) of fresh tuna longliners to Muara Baru and Cilacap. The Sampling Team Leaders should check that the information below is recorded each day:

Port
Date: Day/Month/Year
Vessel Name
Time Vessel Unloading starts
Name Processing Plant
Export-Reject Unloaded (Yes/No)
By-catch unloaded (Yes/No)

   The collection of activity records should take place throughout the duration of the Program covering the 100% of the arrivals of fresh tuna longliners to Muara Baru and Cilacap.

   (Refer to the IOTC Form *Vessel Activity Record* for more details on the use of the data required.)

2. Sampling of the fresh tuna longline landings:

   The sampling will consist on the collection of weight and length data of tuna and tuna-like species unloaded to processing plants in Cilacap and Muara Baru. The samplers should ensure a sampling of the landings representative of all processing plants in each port. The 100% of the specimens unloaded from the longliner chosen for sampling should be monitored.

   Length-length-weight samples of tuna and billfish specimens will be taken as a complement of the routine sampling in order to obtain the data needed to convert recorded lengths into standard lengths for each species.

   (Refer to the IOTC Field Manual, pg. 8-12, for more details on the type of data required.)

3. Computerization of vessel activity and sampling data: All data recorded during the sampling program will be input at the RIMF headquarters in Muara Baru. A database entry person will input the information as it is received by using the IOTC software FINSS in the computers provided by IOTC/OFCF.

The IOTC Field Manual for Data Collection on Tuna Landings from Longliners (hereinafter referred to as the "IOTC Field Manual"), should be used by the sampling team as reference for the completion of the tasks to undertake regarding the Program.

The software FINSS (IOTC) will be used to input all data collected under the program.

The tasks and responsibilities of staff working for the Project are summarized in the Table below:

Post	No. Staff	Terms Of Reference	Details
Project Coordinator	1	Allocation of IOTC/OFCF budget Appointment of Project Staff Coordination of sampling activities through overall supervisor, local supervisors and database administrator Coordinate the submission of data collected through the Project to DGCF Statistics (master database plus catch estimates) Coordinate the Submission of Progress Reports and Financial Reports to the IOTC Secretary	Progress and Financial Reports have to be send quarterly and a Final Report within the month following the termination of the Project. The Progress Report will consist on the compilation of Reports from Overall Supervisor, Local Supervisors and Database Administrator
Overall Supervisor	1	Coordination and monitoring of sampling activities through local supervisors Training of Port Samplers along with local supervisors Reporting to RCCF Project Coordinator, DGCF Statistics and IOTC Secretary on the progress achieved Edition of quarterly reports to the Industry and Project Staff in connection with the Database Administrator	One supervisory trip per port per quarter Completion of Template Report "Details Supervisory Trip" prior to supervision and "Results Supervision" after it.
Local Supervisor	2	Coordination and monitoring of sampling activities Training of Port Samplers Reporting to Overall Supervisor and IOTC Secretary on the progress achieved	One supervisory trip per month (Cilacap), four supervisions per month (Jakarta). Completion of Template Report "Details Supervisory Trip" prior to each supervision and "Results Supervision" once a month (after each supervisory trip to Cilacap and after the four supervisions in Jakarta). Completion of Summary Report on Sampling activities and coverage levels (monthly)
Database Administrator	1	Monitoring the computerization of sampling and vessel activity data, including validation and verification of the data produced Compilation of data from all Project databases (Creation of Master Database) Training of Data Entry Staff Monitoring and transmission of database backups and Master Database Backup Reporting of progress concerning the administration of RCCF project databases to RCCF Project Coordinator, DGCF Statistics	One supervisory trip per port every two months Completion of Template Report "Details Supervisory Trip" prior to supervision and "Database Management Supervision" after it Transmission of database backups through IOTC ftp site to the IOTC Secretariat every two months

Post	No.	Terms Of Reference	Details
		and IOTC Secretary Run procedures to create standard tables and charts to feed template reports to the Industry and project staff in connection with the Overall Supervisor	
Data Input Staff	1	Computerization of Vessel Activity Information Computerization of Sampling Data Database backups and safe storage (external media)	Daily computerization of records using the software FINSS Weekly database backup Safe storage of backups using external media (e.g. CD Rom)
Port Samplers (enumerators)	10	Collection of vessel activity records Selection of Landings to Sample per port and processing plant Sampling of Landings of Fresh Tuna Longline Vessels Sampling data gathering and submission to Local Supervisor in a timely manner (daily or weekly)	As specified in the "IOTC Field Manual for Data Collection on Tuna Landings from Longliners"

DEFINITION OF OUTPUTS, MONITORING AND PROGRESS REPORTING

The flow charts after the text show the sampling and database supervisory flow, flow of the data collected by RCCF staff, sampling and database reporting flow and budget management and progress reporting flow.

The RCCF Project Coordinator will, in cooperation with the IOTC/OFCF Monitoring Officers, assess the progress of sampling and data entry activities by enumerator teams and data input staff in Jakarta and Cilacap during the 15 days following the termination of the Project. A team performance bonus, as specified on next page, Detailed Budget, will be paid to enumerator teams and data entry staff on the basis of the performance of each team. Bonuses will be proportionally broken among the enumerator/data entry team individuals. The criteria to evaluate performance will be:

- Sampling Activities:
    - Reports from Local Supervisors and Overall Supervisor indicating that the objectives of sampling have been achieved (i.e. timely and complete collection of vessel activity records, selection of vessel landings to sample properly conducted, proportional coverage of vessel unloadings per plant and month, good species identification, fish weights and lengths recorded according to sampling design, etc.).
    - Routine data consistency procedures run by database administrator indicating a good quality sampling.
- Data Input Activities:
    - Reports from Database Administrator indicating that data are input properly (e.g. landing and sampling data input timely, data input in a consistent way, data validated after entry through standard reports, manual backups and copies in external media routinely performed, etc.)
    - Routine data validation and verification procedures run by database administrator indicating a low amount of mistakes related with data input.

DURATION AND TIMING

The Program will last from April 1st, 2005 to March 31st, 2006. The collection and reporting of data should take place throughout the duration of the Program. The Program will be extended after its conclusion upon agreement between the RCCF and IOTC-OFCF.

Inputs to be provided in kind by the recipient organization

The RCCF Project Coordinator will nominate an Overall Supervisor, two Local Supervisors and a Database Administrator.

The computerization of the data issuing from sampling will take place in the Database Laboratory of RIMF (Muara Baru).

Inputs to be provided in kind by IOTC/OFCF

IOTC-OFCF will continue the training of Project staff on different aspects of database management and data processing.

Detailed Budget

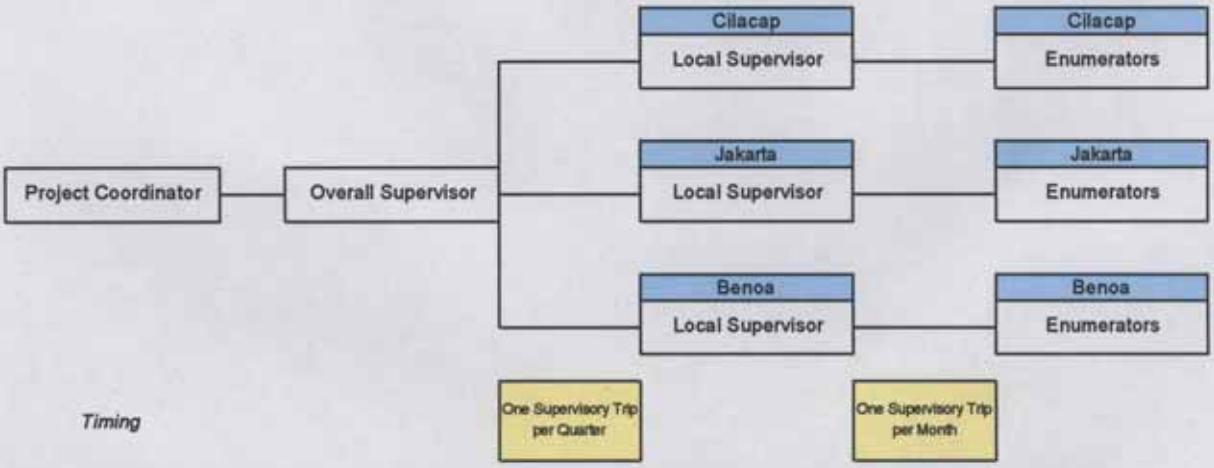
Muara Baru	
1 Database Entry Personnel (1,500,000 Rupees per month)	18,000,000 Rs
7 Enumerators (1,500,000 Rupees per month)	126,000,000 Rs
Rent a room for 7 Enumerators in Muara Baru (20,000,000 Rs/year	20,000,000 Rs
Cilacap	
3 Enumerators (1 million of Indonesian Rupees per month per person)	36,000,000 Rs
Supervision	
Local supervision in Muara Baru (4 days a month car and driver 350,000 Rs/d)	16,800,000 Rs
Local supervision Trip Cost to Cilacap (3 days a month per diem 300,000 Rs, car and driver 350,000 Rs/d)	23,400,000 Rs
Over all Supervision Trip Cost to Cilacap (3 days / 3 month per diem 300,000 Rs)	3,600,000 Rs
Data base management Supervision (750,000 Rupees per month)	9,000,000 Rs
Data base management Supervision Trip Cost to Benoa (4 days / 2 month per diem 400,000 Rs and driver 350,000 Rs/d, Return Air ticket to Benoa 1,622,000 Rs)	27,732,000 Rs
Equipment (Stationery)	
Consumables (forms/photocopying and PC equipment)	30,000,000 Rs
Samplers/Data Entry Staff Team Performance Bonus	
Yearly Allowance (1,000,000 Rs per sampler/data entry staff per year)	11,000,000 Rs
Total Budget	321,532,000 Rs

Monitoring/Certifying Officer

Mr. Koichi Sakonju, from OFCF, and Mr. Alejandro Anganuzzi, Executive Secretary of IOTC, will monitor the proper implementation of the Program and certify to the OFCF headquarters that the terms of the Program have been satisfactorily met and that appropriate payments can be made.

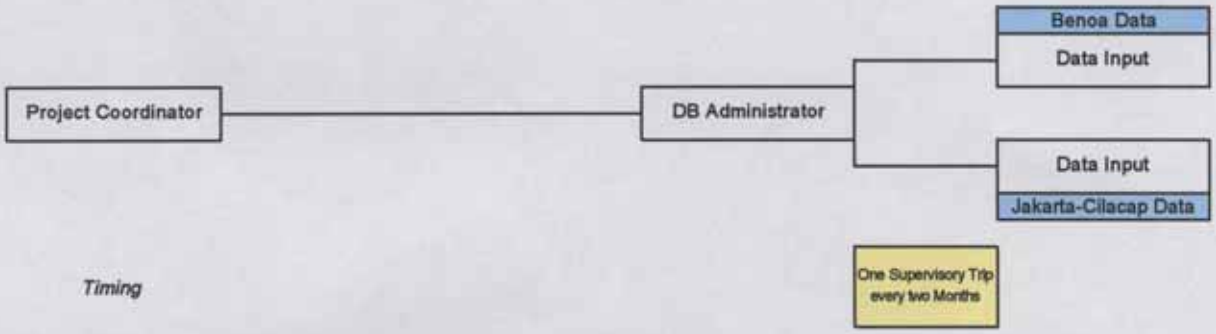
1/ Supervision

Sampling Activities: Collection of vessel activity records and sampling of vessel landings on processing plants



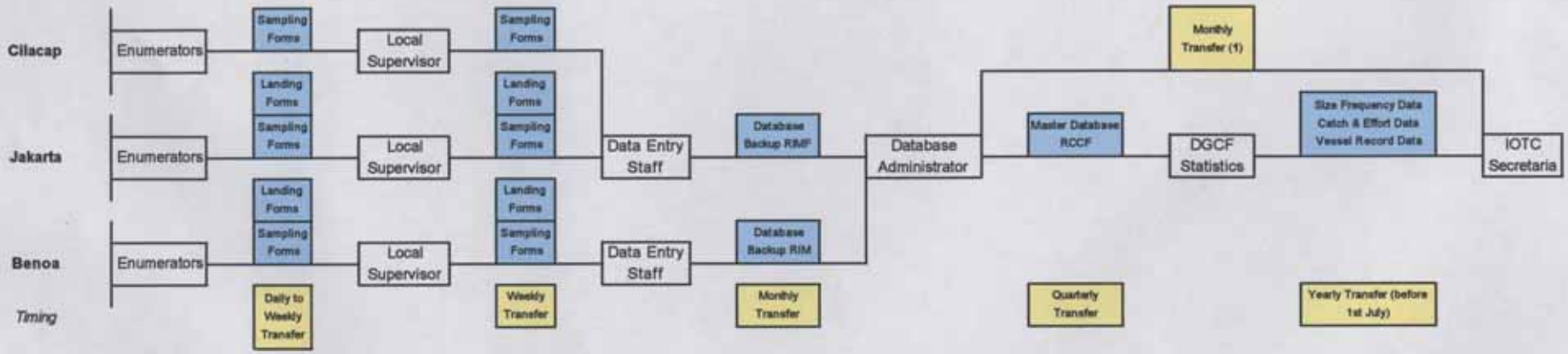
Monthly Reporting: As indicated in MOU RCCF, Annexes B (Definition of Outputs) and C (Details Supervisory Trip plus Results Supervision)

Database Administration Activities: Data Input, Data Validation, Data Processing and Database Maintenance



Bimonthly Reporting: As indicated in MOU RCCF, Annexes B (Monitoring and Progress Reporting) and D (Details Supervisory Trip plus Report for Database management supervision)

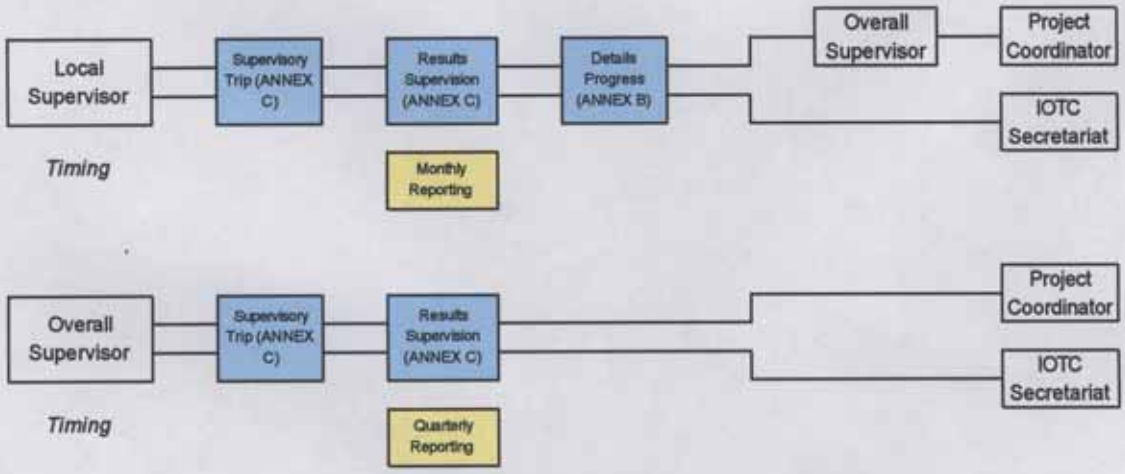
2/ Data Flow:



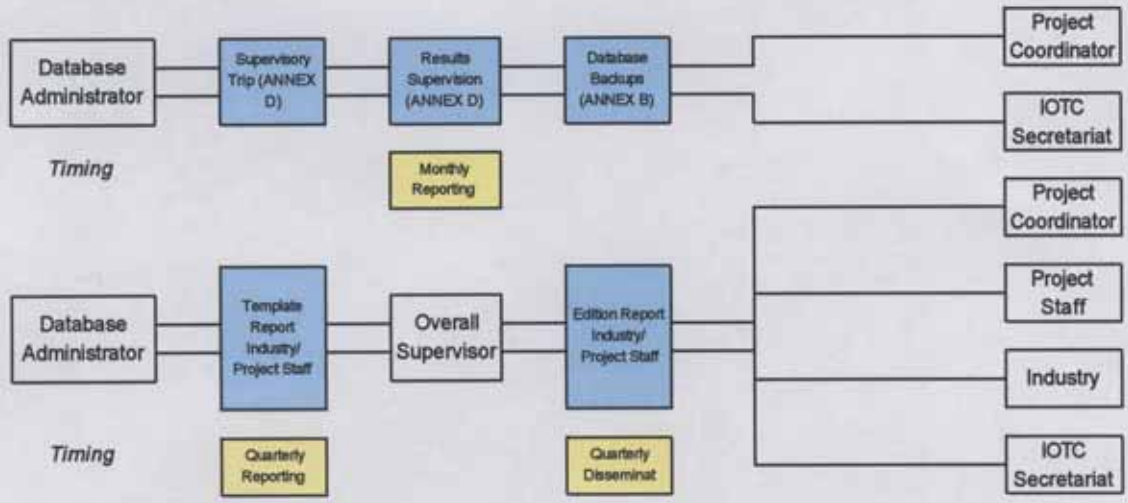
(1) Applies until data transfer, validation and verification procedures are fully implemented

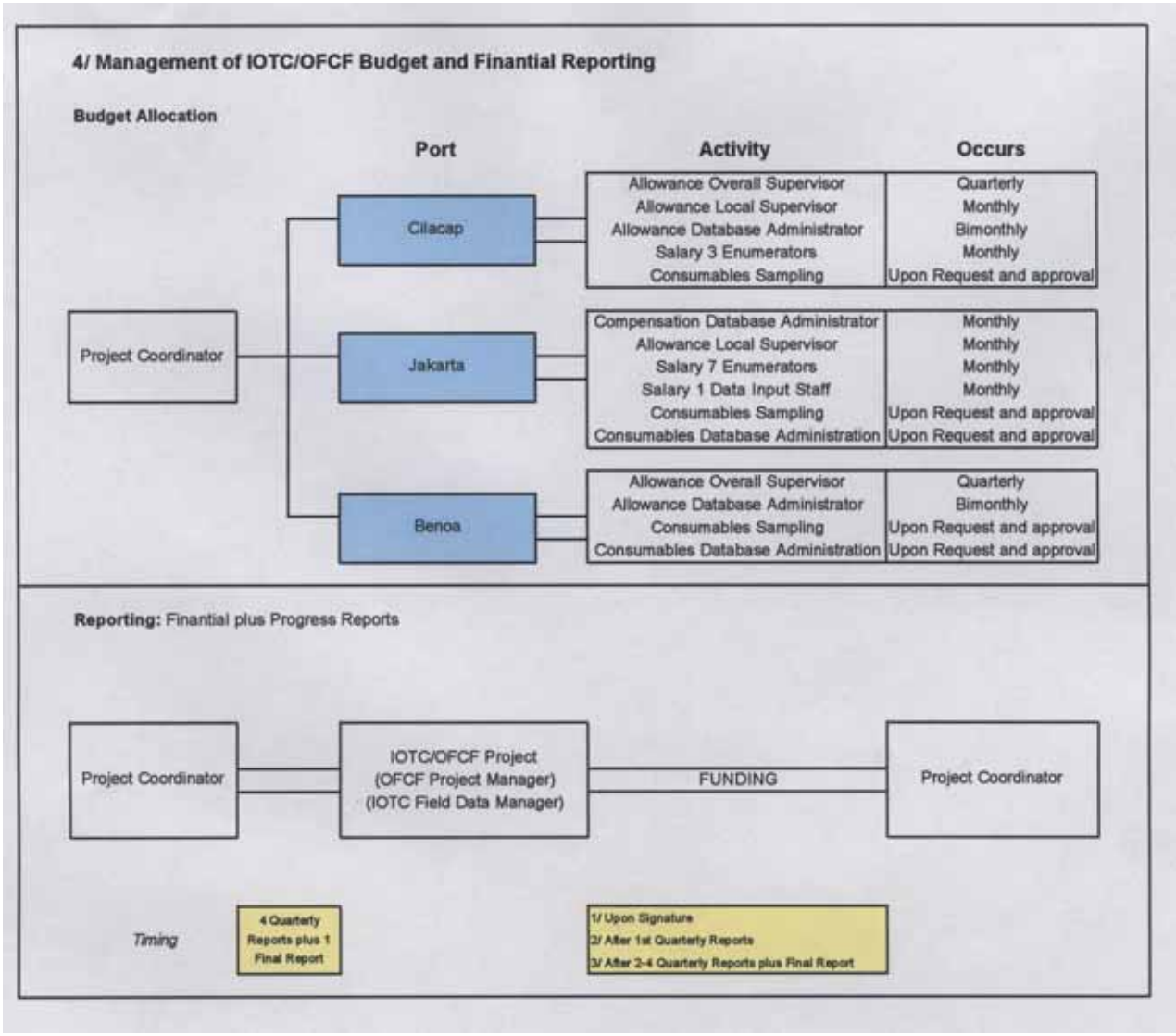
3/ Reporting Flow:

Sampling Activities: Applies to Benoa, Cilacap and Jakarta



Database Administration and Data Dissemination Activities: Applies to Benoa and Jakarta




4/ Management of IOTC/OFCF Budget and Finantial Reporting
Budget Allocation
Port
Activity
Occurs
Project Coordinator
Cilacap
Allowance Overall Supervisor
Allowance Local Supervisor
Allowance Database Administrator
Salary 3 Enumerators
Consumables Sampling
Quarterly
Monthly
Bimonthly
Monthly
Upon Request and approval
Jakarta
Compensation Database Administrator
Allowance Local Supervisor
Salary 7 Enumerators
Salary 1 Data Input Staff
Consumables Sampling
Consumables Database Administration
Monthly
Monthly
Monthly
Monthly
Upon Request and approval
Upon Request and approval
Benoa
Allowance Overall Supervisor
Allowance Database Administrator
Consumables Sampling
Consumables Database Administration
Quarterly
Bimonthly
Upon Request and approval
Upon Request and approval
Reporting: Finantial plus Progress Reports
Project Coordinator
IOTC/OFCF Project
(OFCF Project Manager)
(IOTC Field Data Manager)
FUNDING
Project Coordinator
Timing
4 Quarterly Reports plus 1 Final Report
1/ Upon Signature
2/ After 1st Quarterly Reports
3/ After 2-4 Quarterly Reports plus Final Report

Annex 3. List of Equipment Provided for Catch Monitoring Program

Materials and Equipment List of IOTC-OFCF Project

for Sampling Program (MOU, LOC)

Ser. No	Equipment	Specification	Q'ty	Unit Price(USD)	Price (USD)	Date of purchase	Country Purchased	Organization	Conditions	Stocks	Memo 1(Program)	Memo 2 (Scheme)
1	Desktop PC	Dell Optiplex 240D	1	995	995	24-Jul-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	MOU
2	Printer	HP Laser 1000	1	295	295	27-Oct-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	Additional
3	CD Burner	Yamaha CR RW24x10x40	1	128	128	27-Oct-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	Additional
4	Software	Window XP Pro	1	250	250	27-Oct-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	Additional
5	UPS	BK650MI	1	160	160	29-Oct-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	Additional
6	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	DFRM-DGCF	In use	1	Indonesia Sampling Program	Additional
7	Desktop PC	Dell Optiplex 240D	2	995	1,990	24-Jul-02	Indonesia	PA,Jakarta	In use	2	Indonesia Sampling Program	MOU
8	UPS	BK650MI	1	160	160	27-Oct-02	Indonesia	PA,Jakarta	In use	1	Indonesia Sampling Program	Additional
9	Printer	HP Laser 1000	1	295	295	27-Oct-02	Indonesia	PA,Jakarta	In use	1	Indonesia Sampling Program	Additional
10	CD Burner	Yamaha CR RW24x10x40	1	128	128	27-Oct-02	Indonesia	PA,Jakarta	In use	1	Indonesia Sampling Program	Additional
11	Software	Window XP Pro	1	250	250	27-Oct-02	Indonesia	PA,Jakarta	In use	1	Indonesia Sampling Program	Additional
12	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	PA,Jakarta	In use	1	Indonesia Sampling Program	Additional
13	File Cabinet	Steel made	3	98	295	25-Feb-05	Indonesia	RIMF	In use	3	Indonesia Sampling Program	MOU
14	Server	Dell Server Power 1400	1	2,250	2,250	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
15	Desktop PC	Dell Optiplex 240D	2	995	1,990	24-Jul-02	Indonesia	RIMF	In use	2	Indonesia Sampling Program	MOU
16	Software	Window 2000 Server 5	1	720	720	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
17	Printer	HP Laser Jet 5100A3	1	1,600	1,600	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
18	CD Burner	Yamaha CR RW24x10x40	1	145	145	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
19	Scanner	Umax 5400	2	285	570	24-Jul-02	Indonesia	RIMF	In use	2	Indonesia Sampling Program	MOU
20	Switch	3Cum 16 Port	1	210	210	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
21	UPS	APC Smart 1000	1	525	525	24-Jul-02	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
22	Software	Window XP Pro	2	250	500	27-Oct-02	Indonesia	RIMF	In use	2	Indonesia Sampling Program	Additional
23	Software	Norton Anti Virus 2003 Ver. 9.0	3	75	225	19-Nov-02	Indonesia	RIMF	In use	3	Indonesia Sampling Program	Additional
24	Transceiver	DJ196	3	131	393	28-May-03	Indonesia	RIMF	In use	3	Indonesia Sampling Program	Additional
25	Laptop PC	Compaq 2538	1	1,300	1,300	8-Jul-03	Indonesia	RCCF	In use	1	Thai Fresh Tuna Sampling Prograr	LOC
26	Software	Windows XP Pro	1	175	175	11-Jul-03	Indonesia	RIMF	In use	1	Thai Fresh Tuna Sampling Prograr	Additional
27	Copy Machine	CanonNP1215	1	3,490	3,490	1-Mar-04	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
28	Desktop PC	DDR2 512Mb,Vga Card 1.28Mb, HDD 160GB	1	1,833	1,833	20-Mar-06	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
29	Desktop PC	DDR2 512Mb,Vga Card 1.28Mb, HDD 160GB	1	1,833	1,833	15-May-06	Indonesia	RCCF	In use	1	Indonesia Sampling Program	MOU
30	Desktop PC	DDR2 512Mb,Vga Card 1.28Mb, HDD 160GB	1	1,833	1,833	15-May-06	Indonesia	RIMF	In use	1	Indonesia Sampling Program	MOU
31	Desktop PC	Dell Optiplex 240D	1	995	995	24-Jul-02	Indonesia	DSFB-DGCF	In use	1	Indonesia Sampling Program	MOU
32	Printer	HP Laser 1000	1	295	295	27-Oct-02	Indonesia	DSFB-DGCF	In use	1	Indonesia Sampling Program	Additional
33	Desktop PC	Dell Optiplex GF260SD	1	1,165	1,165	29-Oct-02	Indonesia	DSFB-DGCF	In use	1	Indonesia Sampling Program	Additional
34	UPS	BK650MI	1	160	160	29-Oct-02	Indonesia	DSFB-DGCF	In use	1	Indonesia Sampling Program	Additional
35	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	DSFB-DGCF	In use	1	Indonesia Sampling Program	Additional
36	UPS	BK650MI	1	160	160	27-Oct-02	Indonesia	PA, Cilacap	In use	1	Indonesia Sampling Program	Additional
37	Printer	HP Laser 1000	1	295	295	27-Oct-02	Indonesia	PA, Cilacap	In use	1	Indonesia Sampling Program	Additional
38	CD Burner	Yamaha CR RW24x10x40	1	128	128	27-Oct-02	Indonesia	PA, Cilacap	In use	1	Indonesia Sampling Program	Additional
39	Software	Window XP Pro	1	250	250	27-Oct-02	Indonesia	PA, Cilacap	In use	1	Indonesia Sampling Program	Additional
40	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	PA, Cilacap	In use	1	Indonesia Sampling Program	Additional
41	UPS	BK650MI	1	160	160	27-Oct-02	Indonesia	RIM, Gondol	In use	1	Indonesia Sampling Program	Additional
42	CD Burner	Yamaha CR RW24x10x40	1	128	128	27-Oct-02	Indonesia	RIM, Gondol	In use	1	Indonesia Sampling Program	Additional

43	Software	Window XP Pro	1	250	250	27-Oct-02	Indonesia	RIM, Gondol	In use	1	Indonesia Sampling Program	Additional
44	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	RIM, Gondol	In use	1	Indonesia Sampling Program	Additional
45	UPS	BK650MI	1	160	160	27-Oct-02	Indonesia	WASKI, Benoa	In use	1	Indonesia Sampling Program	Additional
46	Printer	HP Laser 1000	1	295	295	27-Oct-02	Indonesia	WASKI, Benoa	In use	1	Indonesia Sampling Program	Additional
47	CD Burner	Yamaha CR RW24x10x40	1	128	128	27-Oct-02	Indonesia	WASKI, Benoa	In use	1	Indonesia Sampling Program	Additional
48	Software	Window XP Pro	1	250	250	27-Oct-02	Indonesia	WASKI, Benoa	In use	1	Indonesia Sampling Program	Additional
49	Software	Norton Anti Virus 2003 Ver. 9.0	1	75	75	19-Nov-02	Indonesia	WASKI, Benoa	In use	1	Indonesia Sampling Program	Additional
50	Desktop PC	Dell Optiplex GX280	1	1,567	1,567	1-Dec-04	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
51	Digital Camera	Nikon Coolpix5400	1	767	767	1-Mar-06	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
52	UPS	Powerwave9	1	617	617	1-Dec-04	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
53	Motorbike	HJ125K,125cc	3	958	2,874	1-Dec-04	Sri Lanka	Negombo, Berwara,	In use	3	Sri Lanka Sampling Program	MOU
54	Laptop PC	IBM Think Pad with External hard disk	1	2,207	2,207	1-Jul-05	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
55	Printer	Hp LaserJet 1160	1	420	420	1-Jul-05	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
56	External Hard disk	40GB	1	200	200	1-Mar-05	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
57	Fax Machine	Canon FAX-TR177	1	218	218	1-Mar-05	Sri Lanka	NARA	In use	1	Sri Lanka Sampling Program	MOU
58	Scanner	HP Scan jet 3500c	1	150	150	8-Dec-02	Thailand	AFRDEC	In use	1	Thai Fresh Tuna Sampling Progran	MOU
59	Desktop PC Set	Dell OptiplexL60 Mt, HDD 40/7200 516, CD RW Samusung	1	1,400	1,400	8-Jul-03	Indonesia	AFRDEC	In use	1	Thai Fresh Tuna Sampling Progran	MOU
60	Desktop PC	Aries	1	800	800	26-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
61	Laptop PC	ASUS	1	1,150	1,150	26-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
62	UPS	Synergy	1	60	60	26-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
63	Printer	HP Photosmart8030	1	200	200	26-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
64	Scanner	Scan jet 240	1	105	105	26-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
65	Digital camera	Samusung	1	360	360	24-Feb-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
66	Hard disk	250GB	1	395	395	25-Mar-06	Thailand	AFRDEC	In use	1	Thai Neritic Sampling Program	MOU
67	Scanner	HP 3500C	1	115	125	28-May-03	Maldives	MRC	In Use	1	Maldives Sampling Program	MOU
68	Printer	HP 1300	1	375	500	28-May-03	Maldives	MRC	In Use	1	Maldives Sampling Program	MOU
69	Desktop PC	Dell 160L with CD writer	1	1,792	1,792	23-Jul-03	Maldives	MRC	In Use	1	Maldives Sampling Program	MOU
70	Desktop PC	Dell 160L with CD writer	1	815	815	27-Jul-03	Maldives	MRC	In Use	1	Maldives Sampling Program	MOU
71	Printer	HPQ5927A Laser Jet	1	526	526	16-Mar-05	Maldives	MRC	In Use	1	Maldives Sampling Program	MOU
72	Desktop PC	Dell Dimension 4500S with UPS	1	1,470	1,470	30-Sep-02	Mauritius	AFRC	In Use	1	Mauritius Program	LOC
73	Desktop PC	Dell Dimension 4500S with UPS	1	1,595	1,595	30-Sep-02	Mauritius	AFRC	In Use	1	Mauritius Program	LOC
74	Printer	HP Model 1200N	1	583	583	30-Sep-02	Mauritius	AFRC	In Use	1	Mauritius Program	LOC
75	Desktop PC	HP Dx6120	1	1,475	1,475	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
76	Laptop PC	DELL D620	1	2,202	2,202	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
77	Printer	HP 1320	1	481	481	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
78	UPS	APC 630UA	1	120	120	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
79	External Hard disk	250GB	1	285	285	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
80	Digital Camera	Sony Cyber shot	1	625	625	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
81	Memory for camera	D40 1GB	1	147	147	6-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
82	Software	Office2003	2	334	668	6-Sep-06	Kenya	DOF, Mombasa	In Use	2	Kenya Sport Fishing	MOU
83	Software	Norton Anti-virus	2	48	96	6-Sep-06	Kenya	DOF, Mombasa	In Use	2	Kenya Sport Fishing	MOU
84	Memory stick	512MB	2	89	178	6-Sep-06	Kenya	DOF, Mombasa	In Use	2	Kenya Sport Fishing	MOU
85	Furniture	Writing desk	1	212	212	11-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
86	Furniture	Computer Table	1	78	78	11-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
87	Furniture	Chairs	6	52	312	11-Sep-06	Kenya	DOF, Mombasa	In Use	6	Kenya Sport Fishing	MOU

88	Furniture	File cabinet	1	181	181	11-Sep-06	Kenya	DOF, Mombasa	In Use	1	Kenya Sport Fishing	MOU
89	Laptop PC	Toshiba Tecra A8-143	10	1,650	16,500	1-Mar-07	Tanzania	DFMR, Zanzibar	In Use	10	Tanzania Program	LOC
90	Desktop PC	HP, Intel P4, 512MB RAM, 160GB HDD	2	1,500	3,000	1-Mar-07	Tanzania	DFMR, Zanzibar	In Use	2	Tanzania Program	LOC
91	UPS	APC650VA	2	190	380	1-Mar-07	Tanzania	DFMR, Zanzibar	In Use	2	Tanzania Program	LOC
92	Printer	LaserJet 3050	2	420	840	1-Mar-07	Tanzania	DFMR, Zanzibar	In Use	2	Tanzania Program	LOC
93	Laptop PC	Toshiba Tecra A8-143	1	1,650	1,650	1-Mar-07	Tanzania	Fisheries Division, Tanzania	In Use	1	Tanzania Program	LOC
94	Desktop PC	HP Dx6120	5	1,500	7,500	1-Mar-07	Tanzania	Fisheries Division, Tanzania	In Use	5	Tanzania Program	LOC
95	UPS	APC650VA	5	190	950	1-Mar-07	Tanzania	Fisheries Division, Tanzania	In Use	5	Tanzania Program	LOC
96	Printer	LaserJet 3050	5	420	2,100	1-Mar-07	Tanzania	Fisheries Division, Tanzania	In Use	5	Tanzania Program	LOC
97	Motorcycle	Yamaha DT125	2	3,878	7,756	1-Mar-07	Tanzania	Fisheries Division, Tanzania	In Use	2	Tanzania Program	LOC

Note: All equipment in this list have been checked when OFCF experts visited at each place during 2006.

Annex 4. Activities by Countries in the Priority Area with Fishery Information

Country: ***INDONESIA***

Main Problem Area: ***STATISTICS FROM INDONESIA***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Various artisanal gears	166,000	21%	1%				19%		Very Large	<15 m	Coastal	Short	Very Large all in Indonesia
Industrial fresh-tuna longliners	65,000	23%	35%	24%	3%	6%		18%	Large	15 - 30 m	Coastal-High seas	Medium	Low most in Indonesia

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report[1]		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal	Yes	Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Too many resources to be devoted; beyond the scope
Industrial	Yes	Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	No implementation of logbook system (too many resources)

Note: Ins: Institutional, DC: Data Collection, and DPD: Data Processing and Dissemination.

Country: ***SRI LANKA***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM GILLNET FISHERIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal (Coastal)	61,000	9%	14%				13%		Very Large	<15 m	Coastal	Short	Very Large all in Sri Lanka
Semi-Industrial (Offshore)	60,000	23%	22%	100%	100%		36%		Large	10 - 25 m	Coastal-High seas	Medium	Low most in Sri Lanka

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal	Yes	Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	Not all gears considered (too costly)
S-Industrial	Yes	Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

[1] Completed under the support of ACIAR/CSIRO

Country: ***THAILAND***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Coastal purse seine	10,973	31%							Large	10 - 40 m	Coastal	Short	Moderate all in Thailand
Foreign fresh-tuna longliners	2,875	3%	1%		1%				Medium	15 - 30 m	Coastal-High seas	Medium	Low also in other countries

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Coastal PS	Yes	Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Foreign FLL		Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	No implementation of logbook system (too many resources)

Country: ***SULTANATE OF OMAN***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM GILLNET FISHERIES***

Importance of the Fisheries: ***HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal gillnets	18,525	5%	12%						Very Large	<15 m	Coastal	Short	Very Large all in Oman

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes		Y	Y	Y	Y	Y	Y					Y	P	Only size data collected during three months

Country: ***MALDIVES***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal pole and line	108,666	94%	96%	100%			95%		Very Large	10 - 40 m	Coastal	Short	Very Large all in Maldives

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	

Country: ***INDIA***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Various artisanal gears	100,801	14%	2%				1%		Very Large	<15 m	Coastal	Short	Very large all in India

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal	Yes	Yes		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Not requested by India; too many resources to be devoted; beyond the scope

Country: ***ISLAMIC REPUBLIC OF IRAN***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM GILLNET FISHERIES & STATISTICS FROM NEW PURSE SEINE INDUSTRIAL FISHERIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal gillnets	87,649	25%	31%				19%		Very Large	10 - 30 m	Coastal-High Seas	Short	Very Large all in Iran
Industrial purse seiners	9,626	3%	2%	1%			2%		Low	30 - 80 m	Coastal-High Seas	Large	Low most in Iran

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal				Y	Y	Y	Y	Y	Y							
Industrial		Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Need to follow-up the implementation of recommendations by Iran

Country: ***KENYA***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Sport and artisanal fisheries	1,726	<1%			19%				Low	<15 m	Coastal	Short	Low all in Kenya
Foreign Industrial purse seiners[2]									Low	40 – 100 m	High seas	Large	Low most in other countries

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	P	Historical data compiled from some landing locations for sport vessels but not all
Industrial		Yes	Yes	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Co-operation requested; mainly foreign purse seiners from reporting countries

[2] Catches unknown. Most vessels have licenses to operate within the EEZ of Kenya but the majority of the catches are unloaded in ports in other countries

Country: ***MALAYSIA***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM NEW LONGLINE INDUSTRIAL FISHERIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Domestic fresh-tuna longliners	73	<1%							Low	15 - 30 m	Coastal-High Seas	Medium	Low also in other countries
Foreign fresh-tuna longliners	8,872	10%	3%	1%	4%				Medium	15 - 30 m	High Seas	Medium	Low also in other countries

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Domestic LL		Yes	Yes	Y	Y					Y	Y	Y	Y	Y	N	No implementation of logbook system (too many resources for too small a fleet)
Foreign LL		Yes	Yes	Y	Y					Y	Y	Y	Y	Y	N	Sampling implemented in Thailand used to estimate the catches for this fleet

Country: ***MAURITIUS***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Domestic Industrial Fisheries	1,346	<1%							Low	15 - 50 m	Coastal-High Seas	Medium	Low all in Mauritius
Foreign Industrial longliners[3]									Medium	20 – 60 m	Coastal-High Seas	Large	Low most in other countries

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Domestic		Yes	Yes			Y	Y	Y	Y	Y	Y	Y	Y			
Foreign		Yes	Yes			Y	Y	Y	Y	Y	Y	Y	Y			

[3] Catches unknown. Most vessels have licenses to operate within the EEZ of Mauritius but the majority of the catches are unloaded in ports in other countries

Country: ***MOZAMBIQUE***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal fisheries[4]									Large	<15 m	Coastal	Short	Very Large all locally
Foreign Industrial Vessels[5]									Unknown	30 - 80 m	Coastal-High Seas	Large	Low most in foreign ports

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes	Yes	Y	Y	Y	Y	Y	Y					Y	N	Co-operation requested. Catches probably low. Too costly
Industrial		Yes	Yes	Y	Y	Y	Y	Y	Y					Y	N	Co-operation requested; most vessel unloadings did not occur in Mozambique

Country: ***SEYCHELLES***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM NEW LONGLINE AND PURSE SEINE INDUSTRIAL FISHERIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Domestic Industrial purse seiners	33,488	9%	9%	9%		8%	10%		Low	50 – 100 m	High Seas	Large	Low most locally
Domestic Industrial longliners	2,183	1%		1%	1%	1%		1%	Low	20 – 60 m	High seas	Large	Low most abroad

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Purse seine			Yes			Y	Y	Y	Y	Y	Y	Y	Y			
Longline		Yes	Yes			Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Collection of size data recommended but most catches transshipped on the high seas

[4] No regular data collection in place. Catches unknown.

[5] Catches unknown. Most vessels have licenses to operate within the EEZ of Mozambique but the majority of the catches are unloaded in ports in other countries

Country: ***SOUTH AFRICA***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM NEW LONGLINE INDUSTRIAL FISHERIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Domestic Industrial Longliners	595	<1%			1%				Low	20 - 50 m	Coastal-High Seas	Large	Low most locally
Foreign Industrial Longliners[6]									Large	30 - 60 m	High Seas	Large	Low some abroad

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Domestic						Y	Y									
Foreign		Yes				Y	Y							Y	N	Need to collect historical information on the activity of foreign vessels. To follow-up

Country: ***TANZANIA (& ZANZIBAR)***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***LESS HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Sport and artisanal fisheries	2,226	<1%							Large	<15 m	Coastal	Short	Low all in Tanzania
Foreign Industrial vessels[7]									Low	30 – 100 m	High seas	Large	Low most in other countries

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes	Yes	Y	Y							Y	Y	Y	N	Co-operation requested. Catches low. Too costly
Industrial		Yes	Yes	Y	Y							Y	Y	Y	N	Co-operation requested; most vessel unloadings did not occur in Tanzania

[6] Catches unknown. Most vessels unload its catches in ports in South Africa but this information is not available

[7] Catches unknown. Most vessels have licenses to operate within the EEZ of Tanzania but the majority of the catches are unloaded in ports in other countries

Country: ***REPUBLIC OF YEMEN***

Main Problem Area: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM GILLNET FISHERIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Various artisanal fisheries	32,154	8%	25%						Very Large	<20 m	Coastal	Short	Very Large all in Yemen

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal	Yes	Yes	Yes	Y	N											No response from Yemen; No statistical system in place; too many landing places

Country: ***PAKISTAN***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES & STATISTICS FROM GILLNET FISHERIES***

Importance of the Fisheries: ***VERY HIGH***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Artisanal gillnets	30,808	9%	8%				4%		Very Large	10 - 30 m	Coastal-High seas	Short	Very large all in Pakistan

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal		Yes	Yes	Y	N											Lack of time; Too many vessels and landing places

Country: ***UNITED ARAB EMIRATES***

Main Problem Areas: ***IMPROVING DATA COLLECTION SYSTEMS IN DEVELOPING COASTAL COUNTRIES***

Importance of the Fisheries: ***LOW***

Type of Fishery	Av. Catches 1998-02								Type operation				
	Total Catches (t)	% over TC GEAR	Main species and % over total for GEAR in the IO						no.Fishing Units	Size units	Operating range	Trip Duration	no.Landing Locations
			YFT	BET	SWO	ALB	SKJ	SBF					
Various artisanal fisheries	13,742	2%							Large	<15 m	Coastal	Short	Low all in UAE

Main needs identified and type of activities carried out

Fishery	Issue			Solutions Proposed(RE) and Actions Implemented(IM)												Reasons for partial [P] or non-implementation [N]
				Fact F.		C.Report		Works.		Training		Technol.		Data C.		
	Ins	DC	DPD	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	RE	IM	
Artisanal				**Y**	**N**											Initially identified as an important fishery but no action taken due to minor catches

Annex 5. Project results by fishery and by species

Evaluation by Fishery and Species

Present evaluation has been carried out in qualitative terms: even though some figures are displayed for information, those cannot be considered as indicating real gains in quality. The total catches estimated for 2005 were used to assess the contribution of the activities implemented through the Project to the likely quality of the following data types:
Nominal catches data, or the total catches per year estimated for each fishery and/or species. This record is maintained by the IOTC Secretariat being the catches estimated when they are not reported by the responsible countries. Several kinds of data sources are used to complete the catches for fisheries where the information available is considered incomplete. The figures used for this report are thought to be the best estimate of total catches for 2005 at the time in which the report was drafted. Gains in data quality might come from improved estimates of total catches and/or improved estimates of catches per gear and/or species. The catches estimated for fisheries or species in countries that received the support of the IOTC-OFCF Project are shown against those for the same fisheries or species that were reported or estimated by the Secretariat, for other countries
Catches and effort data, or the catches per month and IOTC grid (1 or 5 degrees square depending on the type of fishery) per fishery or species. This information comes usually from logbooks (industrial fisheries), enumerators sampling catches and effort during the unloading of the catches (artisanal fisheries) or a combination of the two (some well monitored industrial fisheries). Catches and effort are not available for all nominal catches strata. When recorded, the catches in these datasets might represent the total catches of the species in the year for the fleet and gear concerned or represent simply a sample of those. Gains in data quality might come from improved logbook and/or sampling coverage, improved gear and/or species breakdown, etc.
Size frequency data, or the catches per month and IOTC grid (5 degrees square for all fisheries) per fishery or species. This information comes usually from sampling of individual fish lengths or weights, onboard, during the unloading of the catches or both. This information, as above, is not available for all nominal catches strata. Gains in data quality might come from improved sampling coverage (in terms of either the number of strata sampled or the number of fish sampled per stratum), improved species identification, measuring tools, type of measurement, etc.

The following categories were identified for the evaluation. The IOTC criteria were used to assign a quality to the statistics obtained from the Project activities or those available from the IOTC database for other countries.

Fisheries from countries that received the support of the IOTC-OFCF Project:
Field activities (sampling programmes): The label **G-OFCF** or **F-OFCF** is used, indicating that the quality of the statistics obtained through sampling program is thought to be fair or good quality, respectively.

Other activities (other than sampling): The label **R-OFCF** is used to indicate what the improvement would be for each IOTC fishery or species if the recommendations issued from activities initiated by the IOTC-OFCF, other than sampling, were maintained by the countries concerned.
In general, it can be considered that the improvements in data quality are a fact for the first category, at least for the duration of sampling under the support of the Project. The improvements in data quality that might originate from the implementation of recommendations by the Project are, however, very premature to evaluate. Follow-up missions are required to be able to assess to which extent these recommendations have been implemented and evaluate any gains in data quality that might arise from such implementations.

Fisheries from countries that did not receive the support of the IOTC-OFCF Project: The following labels below are used to indicate the quality of the statistics available for fisheries or species in countries that did not receive any support from the IOTC-OFCF Project:
Good: The statistics are available and are thought to be of good quality
Fair: The statistics are available and are thought to be of fair quality
Poor: The statistics are not available or, when available, are considered to be of poor or unknown quality

Figures in the following pages show the results of the evaluation for the main fisheries (all species combined) and species by fisheries. The following fisheries are considered:

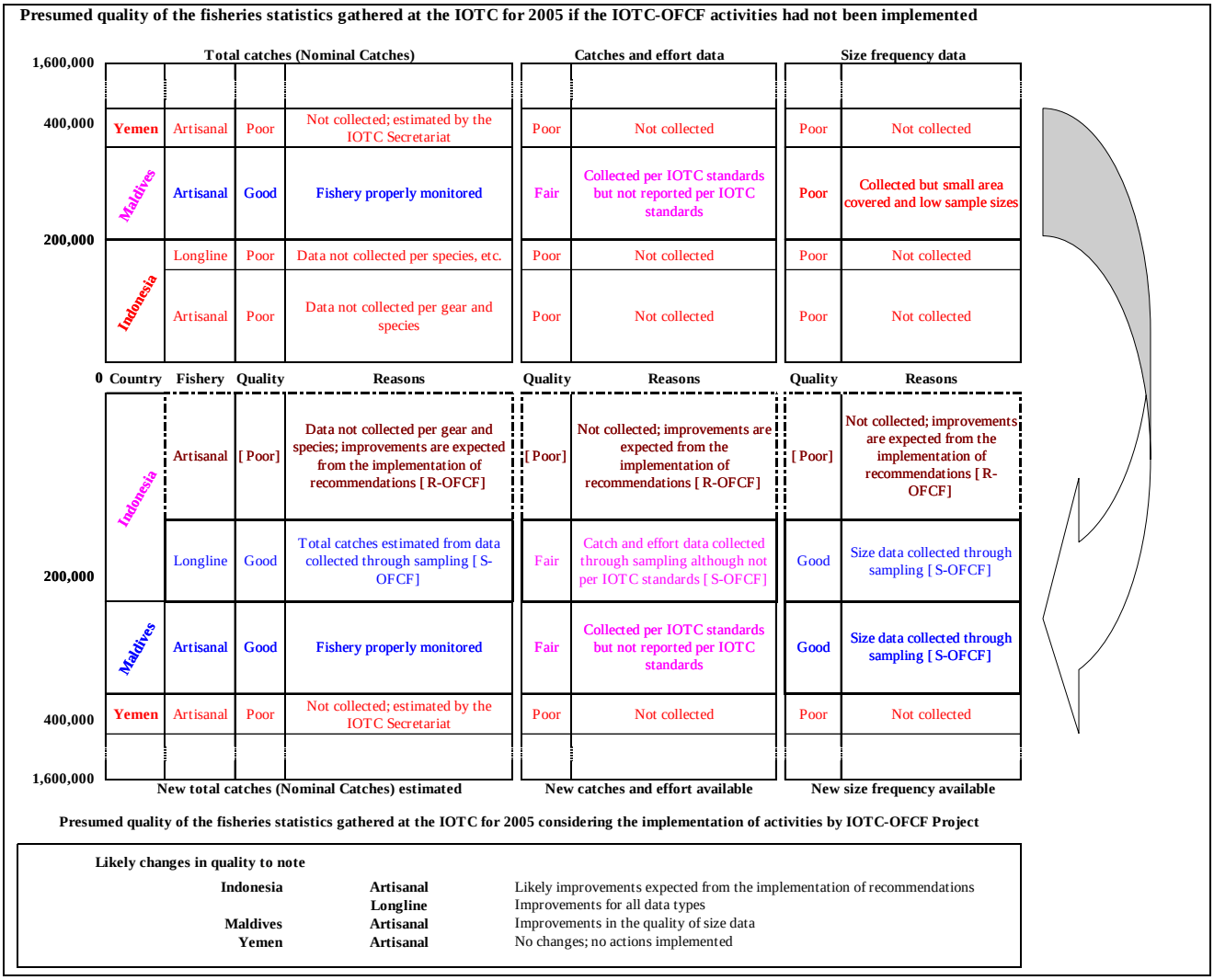
Industrial fisheries:
Industrial purse seine fishery
Industrial [deep-]freezing longline fishery
Industrial swordfish longline fishery
Industrial fresh-tuna longline fishery
Semi-industrial fisheries:
Semi-industrial (offshore) gillnet/longline fishery

Artisanal fisheries:
Artisanal gillnet fishery
Artisanal pole and line fishery
Artisanal purse seine fishery
Artisanal hand line and troll line (including sport fishing) fisheries
Other artisanal fisheries non-identified or not elsewhere included

The following species or species groups:
Tropical tunas: **Yellowfin tuna, bigeye tuna** and **skipjack tuna**
Temperate tunas: **Albacore** and Southern bluefin tuna
Billfish: **Swordfish** and other billfish, including black marlin, blue marlin, striped marlin, Indo-Pacific sailfish and short-billed spearfish
Neritic tunas, including longtail tuna, frigate tuna, bullet tuna, kawakawa, narrow-barred Spanish mackerel, Indo-Pacific king mackerel, streaked seerfish and wahoo
The fisheries and species being the major priority areas for the IOTC-OFCF Project are highlighted (bold font).

The rationale used for the evaluation is explained below and through the example in the next page (Figure A5-1).

Figure A5-1. An example for presumed gains in quality of the statistics recorded in the IOTC database from IOTC-OFCF activities



The statistics recorded for the year 2005 in the IOTC database were used to evaluate the likely effects that the implementation of sampling or other activities initiated by the IOTC-OFCF Project had had over the quality of each data type. Changes in quality will be recorded as follows:

Fisheries for which the statistics were considered to be of **POOR** quality before the implementation of the IOTC-OFCF Programme:

No changes: Countries not receiving the support of the IOTC-OFCF: The statistics would remain poor quality (**POOR** label); this would be the case of Yemen in the below example.

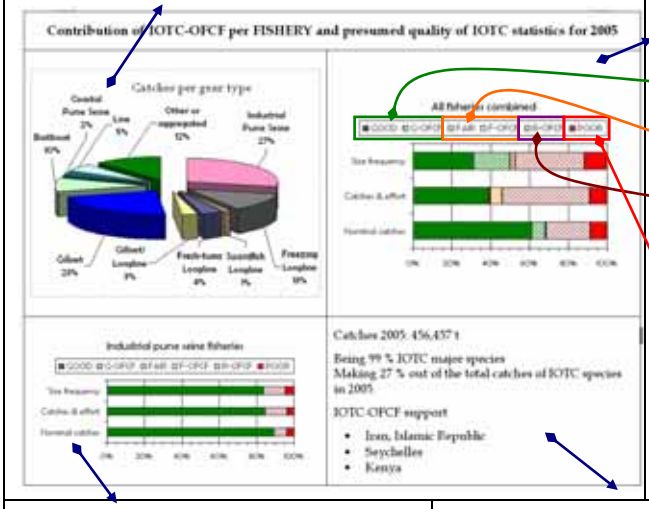
Changing from poor to fair or good quality: Countries receiving the support of the IOTC-OFCF for the implementation of sampling: The quality of the statistics would change from poor quality to fair or good quality, depending on the case (**G-OFCF** or F-OFCF label); this would be the case with the size data for Maldives and all the statistics for the Indonesian longline fishery in the example below.

Might change from poor to good quality: Countries receiving support from the IOTC-OFCF Project in form of training, workshops or other activities: The quality of the statistics would improve if the recommendations issued by the Project are implemented by the institutions in the countries concerned (**R-OFCF** label). This would be the case with the statistics for the artisanal fisheries of Indonesia (recommendations issuing from a country report, data collection and database training and a workshop).

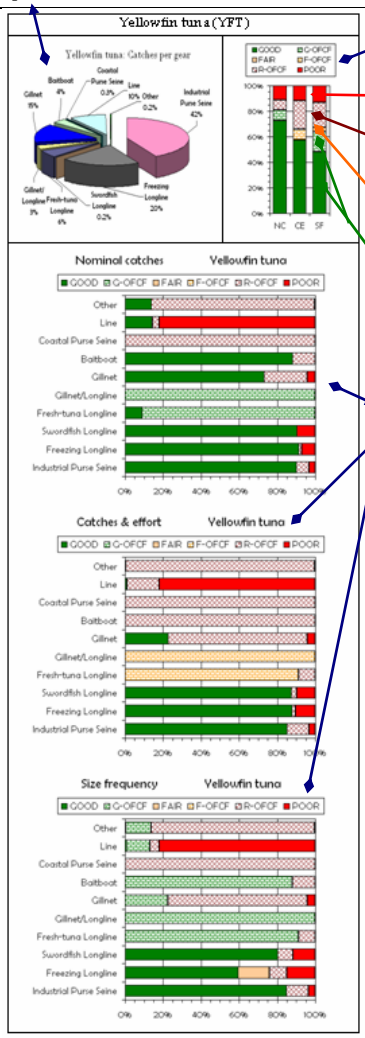
Fisheries for which the statistics were considered to be of GOOD quality before the implementation of the IOTC-OFCF Programme: The statistics would remain good quality (**GOOD** label). This is the case with the nominal catches recorded for Maldives in the example below.

Detailed Evaluation

The information displayed in the charts presented in the following pages is summarized in the below keys:

<table>
<tr>
<td>Proportion (expressed as a percentage) that the total catches recorded for each fishery make out of the total catches of estimated for 2005 (for the species indicated in the previous page)
 
</td>
<td>Amount (expressed as a percentage) of the nominal catches estimated for 2005 (all species and fisheries combined):
• For which the available nominal catches, catches and effort or size frequency data are considered good quality
• For which the available nominal catches, catches and effort or size frequency data are considered fair quality
• For which the nominal catches, catches and effort or size frequency data would be considered good quality if the recommendations issued by the Project were fully implemented
• For which the nominal catches, catches and effort or size frequency data are not available or, when available, are considered poor quality</td>
</tr>
<tr>
<td>Same as above right chart per fishery (all species combined)</td>
<td>Total catches estimated per gear, proportion that the catches of IOTC major species (yellowfin tuna, bigeye tuna, skipjack tuna, albacore, Southern bluefin tuna and swordfish) make out of such catches and proportion that the catches estimated for each gear make out of the total catches estimated for all gears in the Indian Ocean are indicated for each fishery. The list of countries whose fisheries were the aim of recommendations by the IOTC-OFCF is also shown in each case.</td>
</tr>
</table>

Amount (expressed as a percentage) that the total catches recorded for each fishery make out of the total catches estimated for the species for 2005



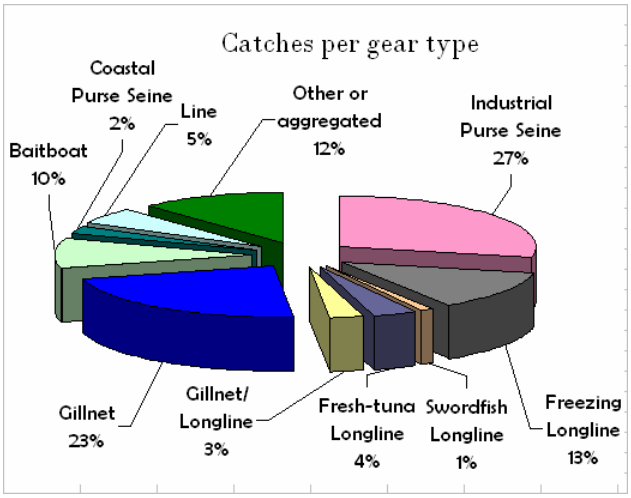
Amount (expressed as a percentage) of the nominal catches of the species estimated for 2005 (all fisheries combined):

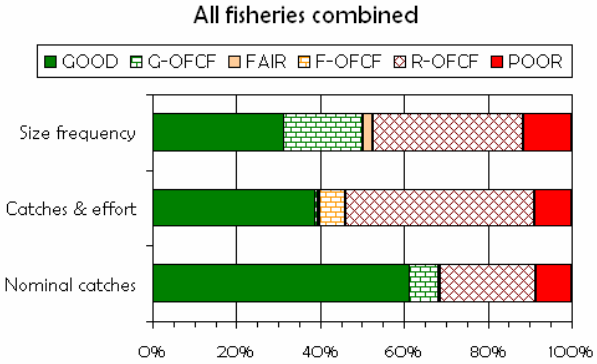
- For which the nominal catches (**NC**), catches and effort (**CE**) or size frequency (**SF**) data are not available or, when available, are considered poor quality ([**POOR**])
- For which the nominal catches, catches and effort or size frequency data would be considered good quality if the recommendations issued by the Project would be fully implemented ([**R-OFCF**])
- For which the available nominal catches, catches and effort or size frequency data are considered fair quality ([**FAIR**], [**F-OFCF**])
- For which the available nominal catches, catches and effort or size frequency data are considered good quality ([**GOOD**], [**G-OFCF**])

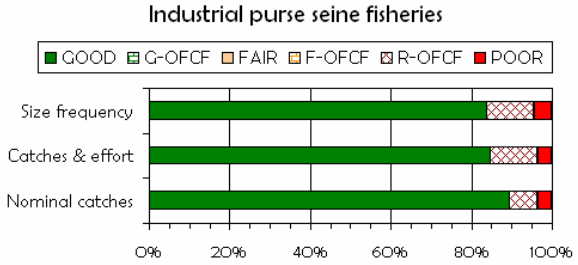
Amount (expressed as a percentage) of the nominal catches of the species estimated for 2005:

Same as above per data type and fishery

Contribution of IOTC-OFCF per FISHERY and presumed quality of IOTC statistics for 2005





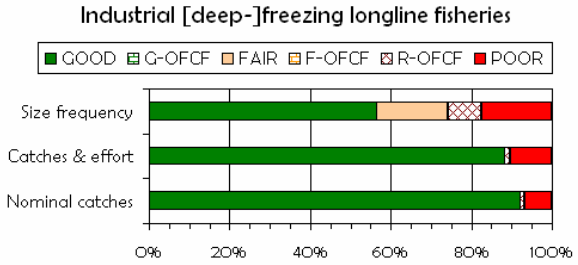


Catches 2005: 456,457 t

Being 99 % IOTC major species
Making 27 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- Iran, Islamic Republic
- Seychelles
- Kenya

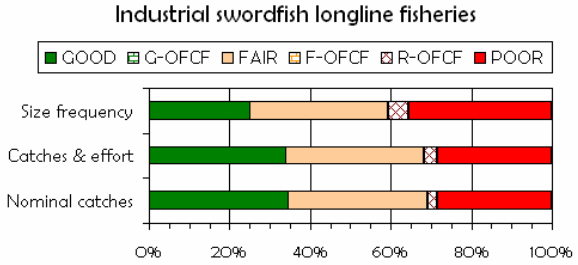


Catches 2005: 200,663 t

Being 97 % IOTC major species
Making 13 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- India
- Mauritius
- Seychelles
- Thailand
- [South Africa]



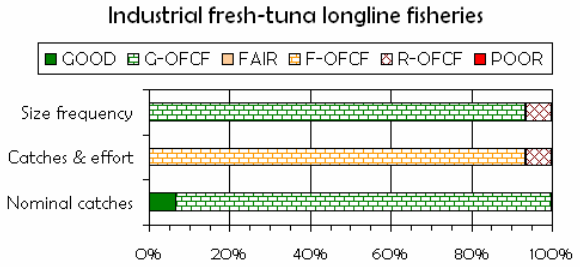
Catches 2005: 15,950 t

Being 98 % IOTC major species
Making 1 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- Kenya
- Mauritius
- Seychelles
- South Africa

Contribution of IOTC-OFCF per FISHERY and presumed quality of IOTC statistics for 2005

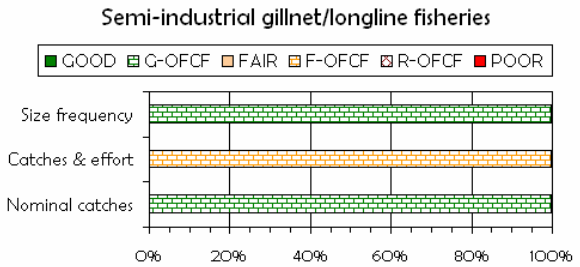


Catches 2005: 57,667 t

Being 93 % IOTC major species
Making 4 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- Indonesia (sampling)
- Maldives
- Malaysia
- Mauritius
- Oman
- Sri Lanka
- Thailand (sampling)

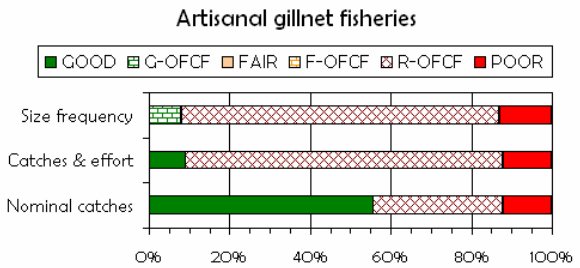


Catches 2005: 46,366 t

Being 87 % IOTC major species
Making 3 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- Sri Lanka (sampling)

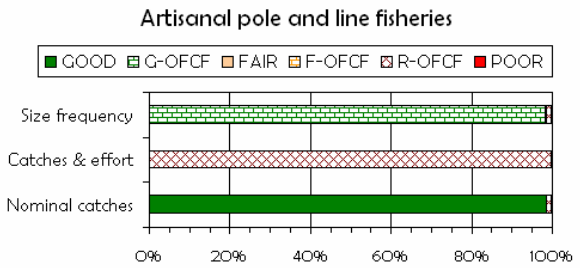


Catches 2005: 361,215 t

Being 53 % IOTC major species
Making 23 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

- Indonesia
- India
- Iran, Islamic Republic
- Kenya
- Sri Lanka
- Oman (sampling)
- Thailand

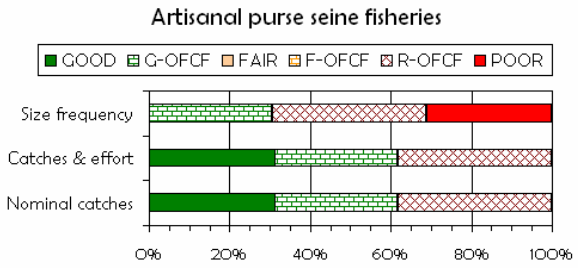
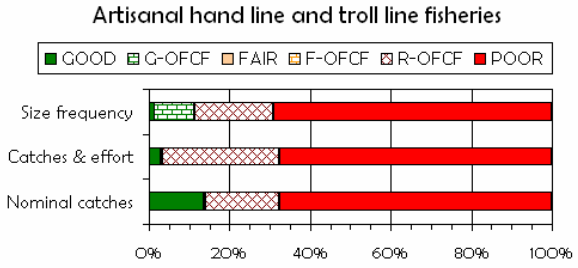
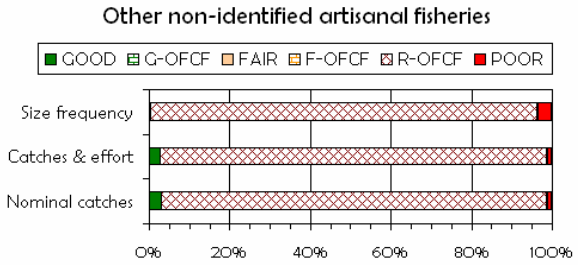


Catches 2005: 155,452 t

Being 96 % IOTC major species
Making 10 % out of the total catches of IOTC species in 2005

IOTC-OFCF support

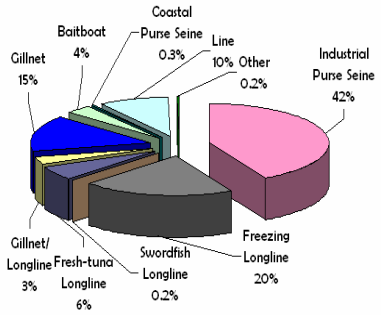
- India
- Maldives (sampling)

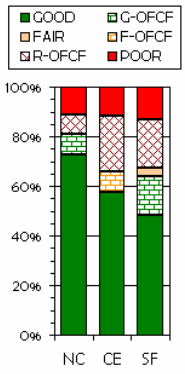
Contribution of IOTC-OFCF per FISHERY and presumed quality of IOTC statistics for 2005	
	Catches 2005: 36,514 t Being 14 % IOTC major species Making 2 % out of the total catches of IOTC species in 2005 IOTC-OFCF support • Indonesia • India • Sri Lanka • Thailand (sampling)
	Catches 2005: 82,872 t Being 62 % IOTC major species Making 5 % out of the total catches of IOTC species in 2005 IOTC-OFCF support • India • Iran, Islamic Republic • Kenya (sampling) • Sri Lanka • Maldives (sampling) • Mauritius • Seychelles • South Africa
	Catches 2005: 191,967 t Being 22 % IOTC major species Making 12 % out of the total catches of IOTC species in 2005 IOTC-OFCF support • Indonesia • India • Kenya • Maldives • Thailand • Tanzania

Contribution of IOTC-OFCF per SPECIES and presumed quality of IOTC statistics for 2005

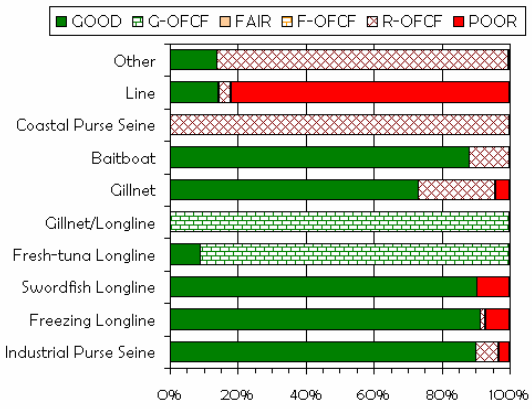
Yellowfin tuna (YFT)

Yellowfin tuna:Catches per gear

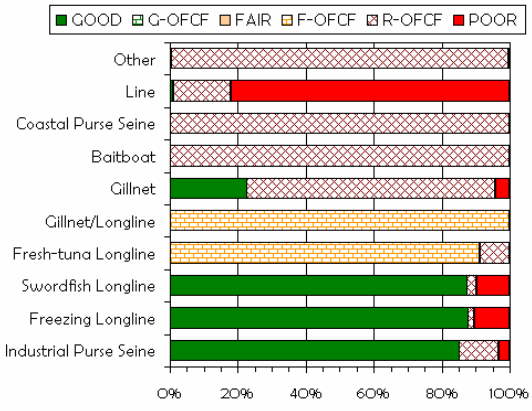




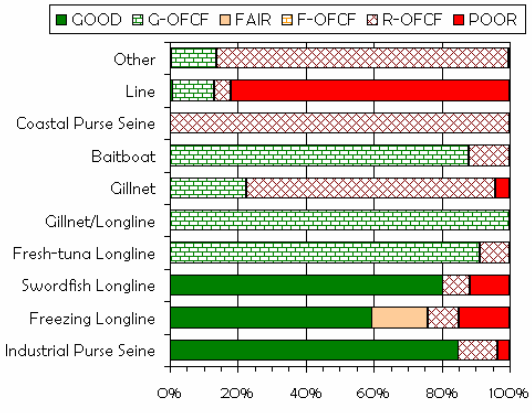
Nominal catches Yellowfin tuna



Catches & effort Yellowfin tuna

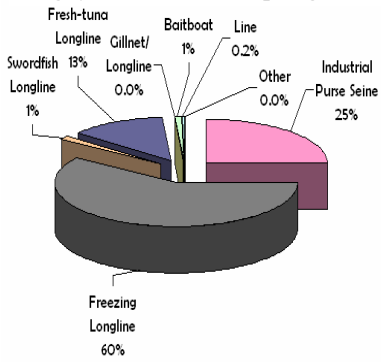


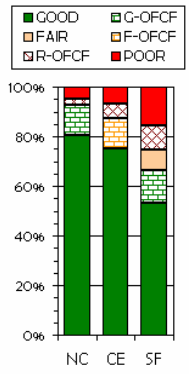
Size frequency Yellowfin tuna



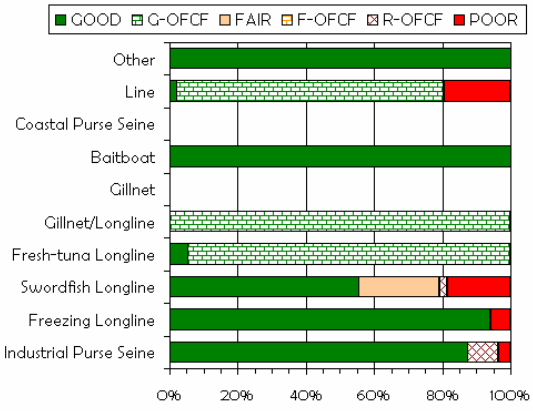
Bigeye tuna (BET)

Bigeye tuna:Catches per gear

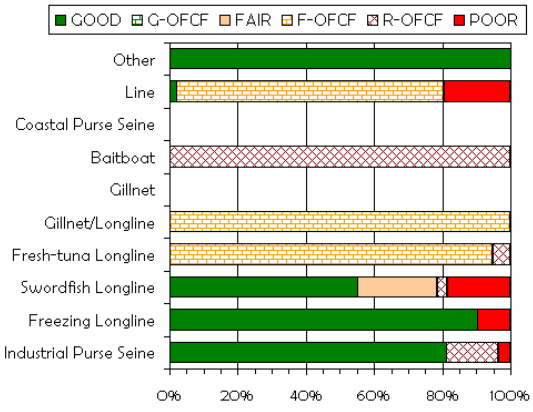




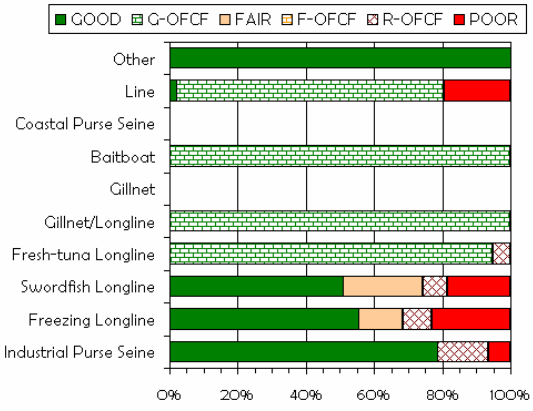
Nominal catches Bigeye tuna



Catches & effort Bigeye tuna



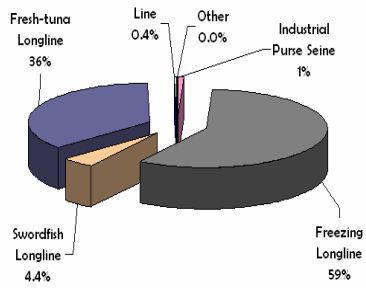
Size frequency Bigeye tuna

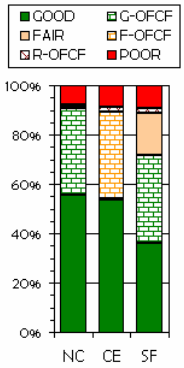


Contribution of IOTC-OFCF per SPECIES and presumed quality of IOTC statistics for 2005

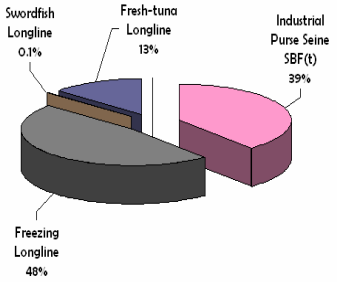
Albacore (ALB)	Southern bluefin tuna (SBF)

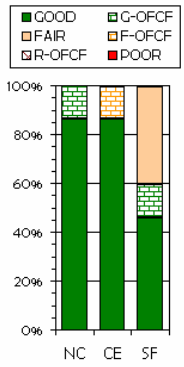
Albacore:Catches per gear



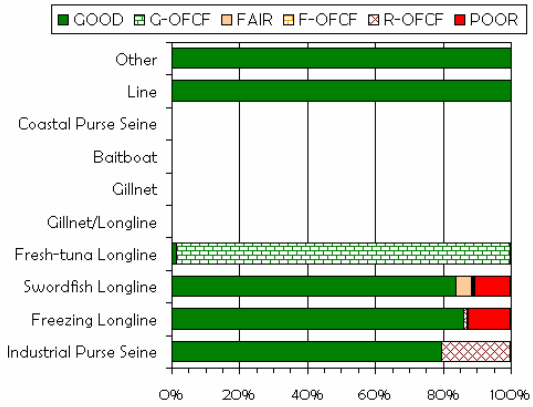


Southern bluefin tuna:Catches per gear

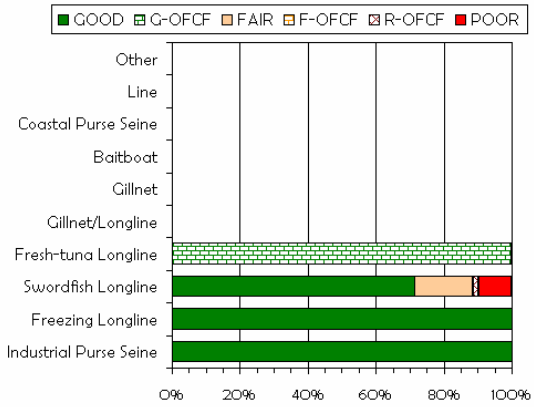




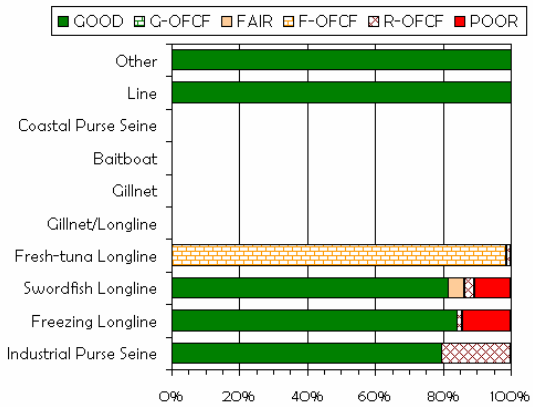
Nominal catches Albacore



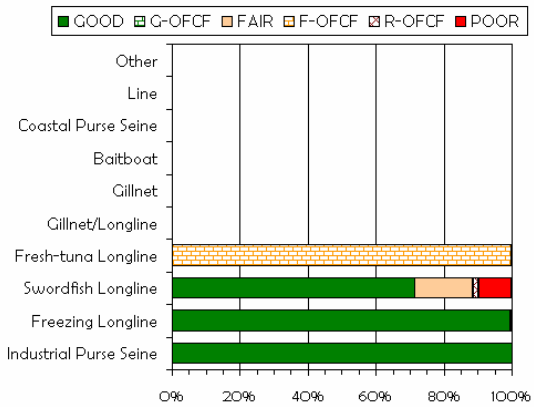
Nominal catches Southern bluefin tuna



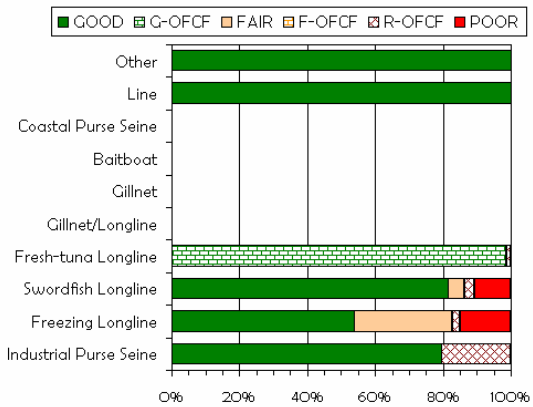
Catches & effort Albacore



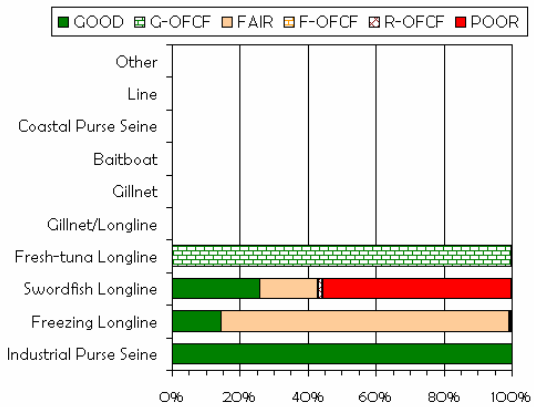
Catches & effort Southern bluefin tuna



Size frequency Albacore



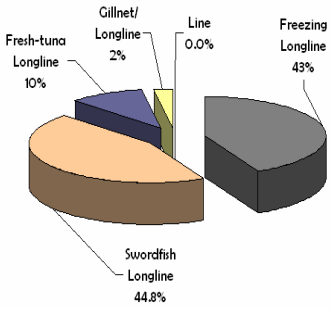
Size frequency Southern bluefin tuna

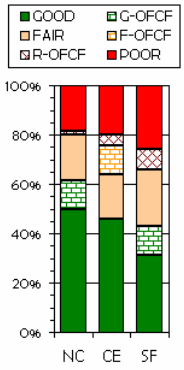


Contribution of IOTC-OFCF per SPECIES and presumed quality of IOTC statistics for 2005

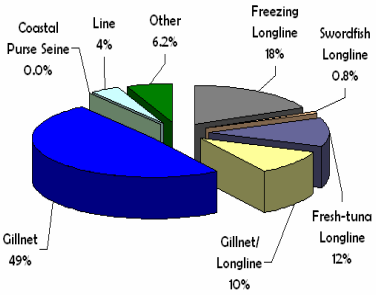
Swordfish (SWO)	Other billfish (OBIL)

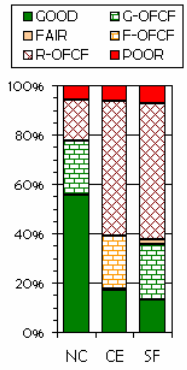
Swordfish:Catches per gear



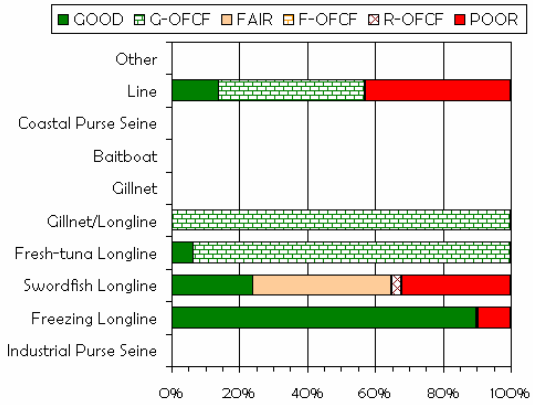


Othre billfish:Catches per gear

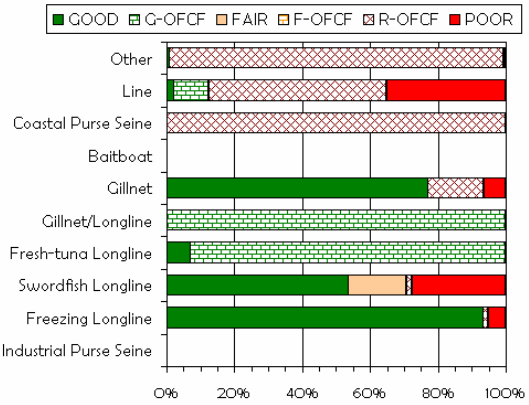




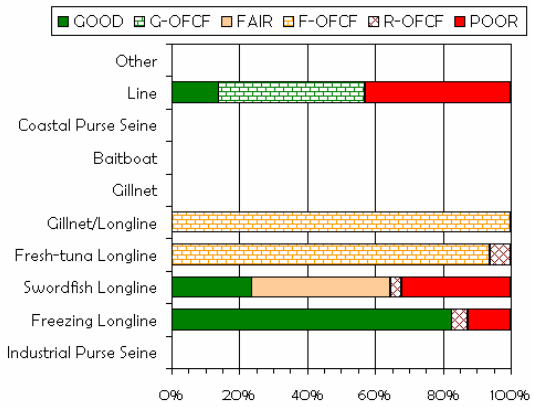
Nominal catches Swordfish



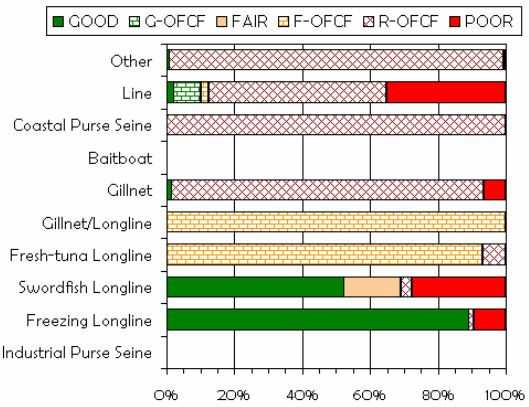
Nominal catches Other billfish



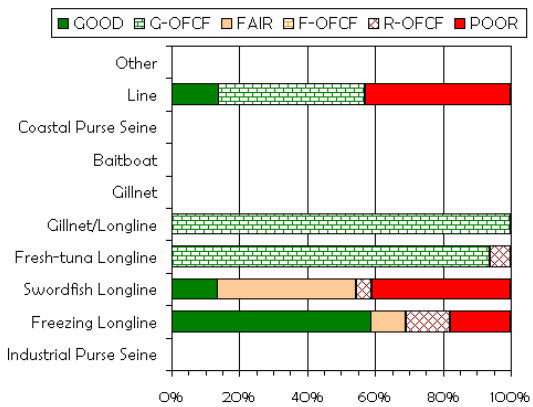
Catches & effort Swordfish



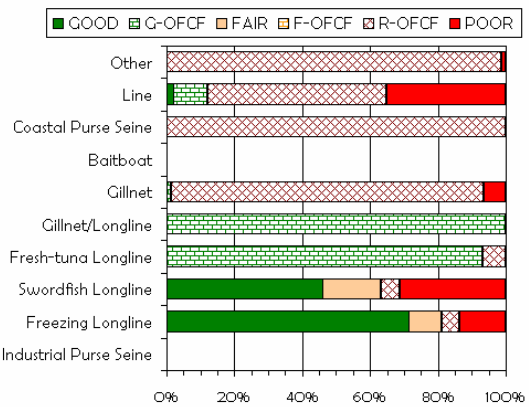
Catches & effort Other billfish



Size frequency Swordfish



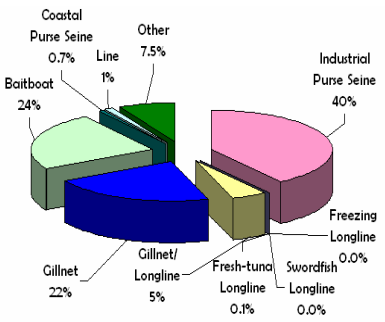
Size frequency Other billfish

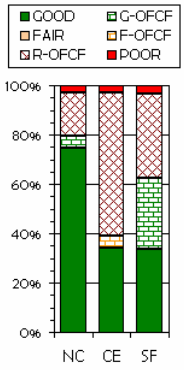


Contribution of IOTC-OFCF per SPECIES and presumed quality of IOTC statistics for 2005

Skipjack tuna (SKJ)

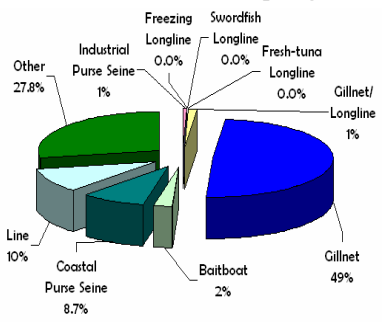
Skipjack tuna:Catches per gear

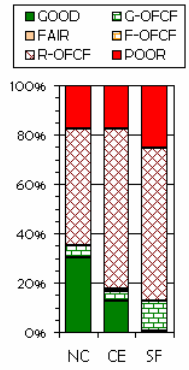




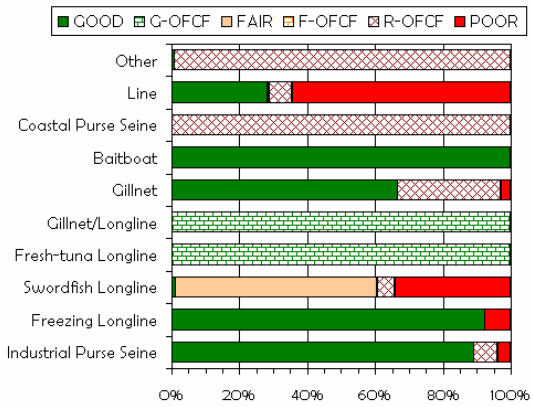
Neritic tunas (KGX)

Neritic tunas:Catches per gear

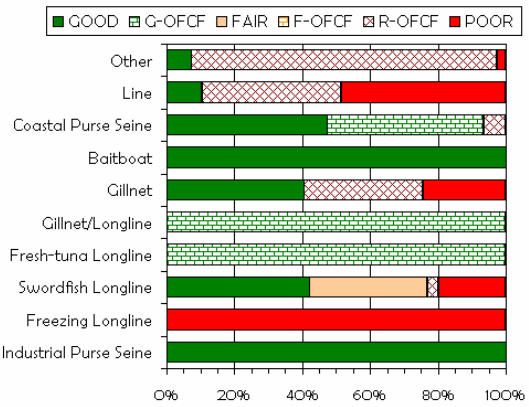




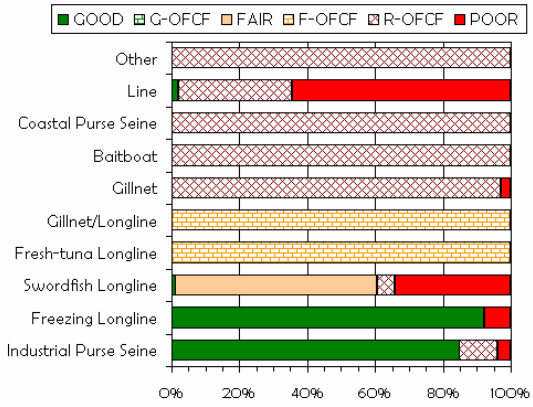
Nominal catches Skipjack tuna



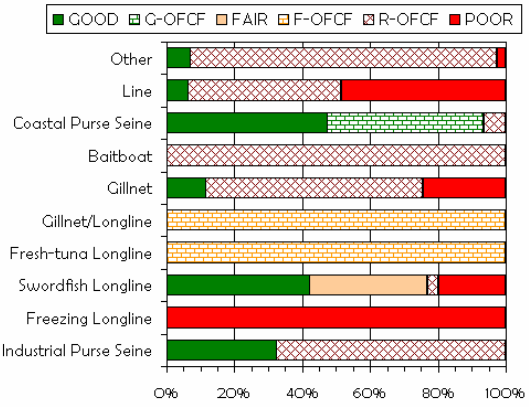
Nominal catches Neritic tunas



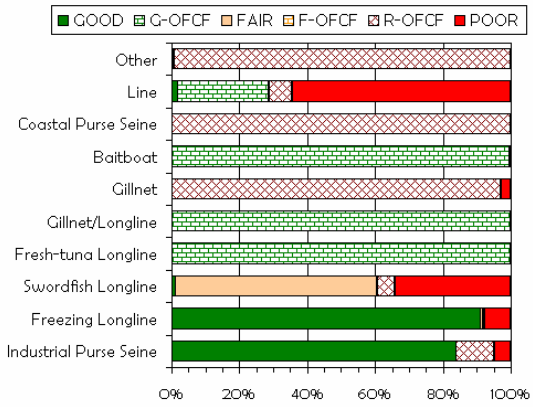
Catches & effort Skipjack tuna



Catches & effort Neritic tunas



Size frequency Skipjack tuna



Size frequency Neritic tunas