Received: 14 & 25 November 2013

Fisheries data collection and reporting system in Sri Lanka

Rekha Maldeniya
National Aquatic Resources Research and Development Agency, Mattakkuliya, Colombo 15

Lashanthi Perera
Ministry of Fisheries and Aquatic Resources Development, Maligawatta, Colombo 10

Prasanna Premawardane
Department of Fisheries and Aquatic Resources, Maligawatta, Colombo 10

Malith Anupam
National Aquatic Resources Research and Development Agency, Mattakkuliya, Colombo 15

Abstract

The large pelagic fisheries of Sri Lanka mainly target tuna and tuna like specie. Over the past years, fisheries have undergone many changes with respect to technological development and also the expansion of the fishing range more towards offshore and deep sea areas. At present fishing is carried out mainly in offshore and some numbers in high seas and coastal waters.

NARA and DFAR are the key institutions engaged in statistics collection by port sampling. Statistics Unit in the Ministry of Fisheries and Aquatic Resource Development plays the major role in the compilation and reporting of the statistics to fulfill the national and international requirements in collaboration with DFAR and NARA. The PELAGOS database handle by NARA is being used to fulfill the requirements of IOTC (Resolution 10/02) continuously as it consist of catch and effort data according to craft – gear combination, craft type, more wider range of species and size categories, for all major large pelagic varieties. The existing two systems had some issues and gaps when catering the requirements of IOTC/RFMO; low sampling coverage, poor species identification, aggregated species & gear wise data and the accuracy of statistics. The uncertainty and the low quality of the statistics have been discussed during the last few years.

Therefore, actions were taken to improve the catch data collection system for large pelagic fishery under the technical advisory of the IOTC and the financial assistance of IOTC/OFCF/BOBLME in 2012/2013 with the participation of corporation of MFARD, DFAR and NARA. The objective of the collaborative project is to strengthen the data collection, processing and reporting system in order to enhance the quality of data by increasing the coverage and representativeness. Thereby improvements were made to: increase the sampling coverage, training of data collectors on sampling and species identification, revision of data collection sheets. Special attention was made to identify shark

and billfish species. Recommendations are forwarded for further improvement of statistical data collection and to minimize the pertaining issues.

1. Background

Fisheries statistics collection in Sri Lanka has a long history which goes back to pre-independent time. An island - wide fishery statistics collection program has been put in place by the Department of Fisheries and Aquatic Resources (DFAR) in the late 1940s. Catch data has been collected from a fixed number of boats and this may have led to certain element of bias. The fishery during this time was rarely extended beyond the costal shelf and the heterogeneity of fisheries was much limited.

Marine fisheries has undergone a rapid and progressive development after independence, highlighting the introduction of motorization and synthetic netting materials in 1960s and introduction of offshore operating multiday fishing boats in the 1980s (Maldeniya 1998) which led to increase in complexity of harvesting. The statistics collection system has not been adjusted to respond to changes in fisheries; employment of new boats and methods, increasing fishing effort, landing sites, fishing grounds etc. Since the system applied only for generate production data, a stock assessment or fisheries management could not be undertaken which is mandatory of DFAR.

A two stage stratified sampling program has been designed by FAO in the early 1970s to improve the statistics collection of marine fisheries; the first stage involving the selection of landing sites and the second stage involving the selection of boat types. However, the sampling system has not been kept pace with changes in the fishery and the estimates based on limited samples as the data collection has been considered to be one of the tasks among the many responsibilities of the Fisheries Inspectors. Catch statistics of large pelagic species was separated only for yellowfin and skipjack tuna, catches of all other tuna varieties and billfish were grouped together as “other blood fish”. Catch data by type of vessel or gear have not been available (Maldeniya 1996).

After the inception of the National Aquatic Resources Research and Development Agency (NARA) in 1981, research staff of the Marine Biological Resources Division (MBRD) of NARA has started a fisheries data collection programme paying special attention to large pelagic catch

and effort statistics. Initially the sampling program was limited to a few major landing centers in the northwest, west, southwest and southern areas. In 1987, NARA was able to establish a comprehensive sampling program for large pelagic fisheries with technical and financial assistance from the Indo-Pacific Tuna Programme (Forster 1987). In 1994, this sampling programme was further strengthened and expanded to the east coast (Williams 1995). Twelve samplers were placed at major fish landing centers in the west, southwest, south, southeast, east and northeast to collect data on catch, effort by craft/gear combination and length measurements for all tuna species, billfish and seer fish in the large pelagic catch. It was basically designed to cover the large pelagic fish species especially landing from offshore multi-day boats and in a few cases coastal day boats were also targeted. Data were collected according to stratified random sampling. Sampling stratification mainly consists of spatial strata (landing sites), technical strata (vessel categories and gear types) and temporal strata (months). The programme provided a database and a reporting system (Maldeniya 1998).

Updating the existing sampling programme began in late 2004 with technical and financial assistance from the Indian Ocean Tuna Commission (IOTC) and the Overseas Fishery Cooperation Foundation of Japan (OFCF). The objective of this collaborative project was to strengthen data collection and processing systems of billfish and tuna fisheries and thereby produce more accurate effort and catch estimates (e.g. by area and species). Further,d increase the amount and quality of size frequency data of these species (IOTC 2005). The framework of the large pelagic database (PELAGOS) (ACCESS 2.0) developed by (Williams 1994), was upgraded to ACCESS 2003 in 2005 under the IOTC/OFCF programme (Dissanayake 2005).

2. Status of available statistic collection systems

At present two different institutions under the Ministry of Fisheries and Aquatic Resources Development (MFARD); DFAR and NARA are engaged in statistics collection of marine fisheries landings. NARA is exclusively engaged in collecting statistics of large pelagic. DFAR runs in two different systems; port sampling and log books. The statistics unit (SU) of the Ministry of Fisheries is responsible in processing and analyzing of fisheries information collected by DFAR. SU also conduct random sampling programme for collecting catch data in order to cross check the validity and accuracy of the catch data being collected by NARA and DFAR.

The national fisheries statistics collection programs run at present by different institutions are summarized bellow.

- Large pelagic fishery sampling programme of NARA
- Monthly administrative records of field officers of DFAR
- Total enumeration system for marine catch estimates of SU/MFAR
- Research based fisheries statistics of NARA

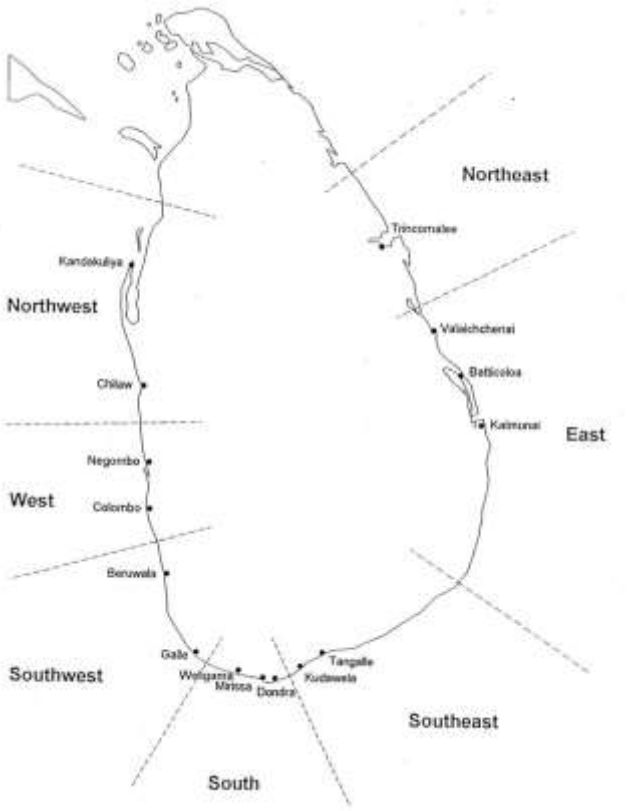
2.1 Fisheries data collection programme of NARA

For the purpose of research and stock assessment NARA is engaged in catch and effort sampling of selected fisheries which include the offshore large pelagic fishery (Table 1). Fisheries statistics of large pelagic is collected through port sampling. Sampling stratification mainly consists of spatial strata (landing sites), technical information (vessel categories and gear types) and temporal information (months). Twelve data collectors are involved in data collection, guided by Research Officers. In addition to the data collators, a few Research Assistants too are engaged in data collection. Research officers of MBRD are regularly monitor the data collection system at field and also reviewed at the moth end by calling all samplers to NARA head office. Sampling coverage is restricted to seven statistical zones (Figure 1) and data collectors have been assigned to cover these zones. Sampling of offshore large pelagic fisheries is carried out in all major landing sites; harbors and anchorages, while effort data is collected at the minor sites on a regular basis. Data are collected mainly according to the vessel types and it is determined on the basis of the size.

Table 1: Type of data recorded in the sampling programme

Type of data	Description
Daily effort	Record the total number of landed boats and sampled boats on each category in a particular sampling site on a particular sampling day.
Catch and effort data	Collect information on: • The species composition of the catch in number and /or weight • Interviews are supposed to be carried out to collect a) The fishing techniques (gear) used in the trip b) Number of crew members c) Gear information (no. of hooks, net pieces)

	d) Information about bait
Biological data	Record the individual fish length both from sampled and non-sampled boats. Weight of fish is recorded either individually or group wise where possible.



Catch data are recorded into eight categories of fish of tuna and tuna like species. These categories are tunas, (skipjack tuna, yellowfin tuna, bigeye tuna, frigate tuna, bullet tuna and kawakawa), marlins (black marlin, blue marlin, and striped marlin), seer fish (Narrowbarred and Wahoo), swordfish, sailfish, sharks (silky shark, blue shark, white tip shark, spot tail shark, thresher shark and hammerhead shark), rays (manta ray, devil ray, eagle ray and guitar fish) and other bony fish.

Figure 1: Statistical zones

The total catch of a boat during one fishing trip is considered as a sampling unit. Data analysis has been made by statistical zone.

In addition, NARA conducts fisheries dependent as well as fisheries independent research to study biological aspects and also stock assessment of species or group of species.

2.2 Field data collection system of DFAR

Field level data collection on catch and effort of marine fisheries is made by all Fisheries Inspectors (FIs) attached to each coastal district. There are about 160 FIs engaged in data collection from beach landing sites and fishing harbors. These data are used to make monthly estimates of fish production by species and type of fishing craft by district level. Generally, there is no set schedule or a standardized sampling system to be followed by FIs within their administrative area and sampling is done once a week. They make eye estimates of production at landing sites they visit and provide monthly estimates of production on standard forms, including information on fish prices and operating fishing crafts. Estimation of production made on the basis of limited number of species or species groups.

Apart from the catch data various other types of data; boat registration, insurance, fish price etc., are also collected by FIs. The boat registry is developed based on this information. A new database on vessel registry has been developed by DFAR with the assistance of ICEDA (ICEIDA 2006). Fishing vessels are categorized into 4 main categories; traditional, FRP/OBM, single day operating boat with inboard engine and multiday boats operate in offshore and high seas depending on design, size and method of propulsion.

2.3 Log Book Programme

DFAR initiated catch data reporting on Log books in year 2012 to overcome limitations in port sampling system, as it provides latitude and longitude coordinates of where fishing activity occurs as well as total catch and catch composition separately by fishing method. There may also be opportunities to collect additional useful data, e.g. on quantities of fish discarded. Though number of awareness programs on log book data entry to streamline the system has been conducted by DFAR the collected data sheets revealed that the data recording by the fishermen were not up to the standard. This may due to poor understanding and low literacy level. At present onboard filling of log sheets by vessel and submitting after every fishing trip to the FIs in respective landing site is a mandatory requirement for licensing of fishing vessels. Depending on the lessons learnt from the present initiative a more user-friendly new logbook is being designed to collect information in complying with Resolution 10/02; Resolution 08/04; Resolution 11/06; Resolution 05/08; Resolution 09/06 and Resolution 98/02. The new log book will come in to operate from year 2014.

3. Reporting System

In the present system SU which is seconded from the Department of Census and Statistics and based in the Development and Planning Division of MFAR plays a major role in analyzing and reporting of data collected by DFAR. SU is one of the two institutions (NARA and SU) which produce overall annual data reports for the fisheries sector of Sri Lanka. Since SU annual report presents the status and performance of marine fisheries sector it is used by both domestic (Central Bank, Department of Census and Statistics and Provincial Councils) and international (FAO) institutions concerned with fisheries data monitoring. However, the PELAGOS database is being used to fulfill the requirements of IOTC (Resolution 10/02) continuously as it is exclusively designed to collet large pelagic fisheries data and consisting of more elaborative data on catch and effort according to craft – gear combination, craft type, a more extensive of species and size categories, for all major large pelagic varieties.

4. Concerns and Issues in Statistics Collection Systems

- At present NARA and DFAR collect statistics on catch and effort in large pelagic fisheries through port sampling by following two different systems as their objectives are quite varied. Thereby different systems yield differing estimates. Since both systems have some shortcomings which make them substandard for provide precise and accurate catch data on the Sri Lankan fisheries. The main weaknesses highlighted include inaccurate, incomplete, limited coverage, insufficient sampling and inconsistent catch data reporting. The establishment and operation of a sound system to collect and disseminate catch and effort statistics is therefore seen as a priority.
- NARA collects comprehensive data of large pelagic fisheries which mainly operate in offshore and high seas by the fleet of multiday boats through systematic port sampling program and less comprehensive information on the coastal fisheries. Although fisheries in northern seas have become normalized at present after 30 years of suppression NARA sampling programme has not been extended to study the fisheries in the northern districts.
- Though the basic structure of the sampling system and sampling methods of DFAR seems robust, has not produced reliable outputs, due to limited inputs. Since both systems are based on port sampling, a number of limitations are inherent to both

systems. Large pelagic fishery resources are multi species in nature. Therefore, spatial and temporal distribution varies. In order to maximize profit, fishing is carried out employing more than one method during the fishing trips. It constrains recording catch and effort data separately by gear.

- Information on fishing ground could not be ascertained through the present system. Further, recording of nominal catch may under representative due to discard at sea or may hold back without unloading.
- In most instances unloading of catch is not made within a day. Partial unloading of the catch sometimes made over 2-3 days. Unloading pattern is mainly influenced by farm gate price. To overcome this it is important to increase the sample numbers.
- Though Log book system is in placed about 2 years ago still unable obtained reference to validate the port sampling system.
- Vessel register is covered all vessels in the fishing fleet but more refine for multiday boats. The boat register keeps track of the total fleet of fishing as well as the active boats, but still seems to have some shortcomings. In the registry, boats that renewed the operational license at stipulated period are considered as active boats of the given year.
- Most species of large pelagic fish are distinctive in appearance and relatively easy to identify. However, closely related species, such as coastal tuna, marlin, sharks bring some problems. Correct identification at the field restrained in two ways; lack of knowledge and also landing of "processed" fish. Billfish, as a group, forms the most distinctive part of the catch. As some boats remove the heads, fins and tails of billfish before storing in their holds to save the space it makes difficult to obtain data separately by species. However, all sharks are landed intact with the head**,** tail, and all fins naturally attached. A more common problem is the misidentification of processed (headed and gutted) catch at port sampling. When identification is difficult catch record as a group. For example, shark, billfish, *Auxis sp* etc.
- Length data may to obtain from random sampling. Thus, not representing the size frequency of the catch. Further, length is measured using steel taps. Since not using calipers it gives curve length rather strait length.

Sri Lanka submits the statistics to IOTC following the Resolution 10/02, mandatory statistical requirements for IOTC members and cooperating non-contracting parties. The estimates of the large pelagic fishery derived by the PELAGOS database is centered to respond the

Resolution 10/02. However, issues and problems pertaining to the present statistic collection systems constrained fully comply with Resolution 10/02.

5. Recent advancement

Over the recent past years number of initiatives were made to improve the fisheries statics collection of DFAR and MFARD; Coastal Fisheries Management Project (CRMP)- Pilot Testing of New Fisheries Data Collection System (2005) and ICE/SL/FIS/2005/3-Collection, Analysis and use of Marine Fisheries Statistics in Sri Lanka (2006); but enable to make much impact to improve the systems.

Therefore actions were taken to improve the catch data collection system of large pelagic fisheries of NARA under the technical advisory of IOTC and the financial assistance of IOTC/OFCF/BOBLME. The present data collection system of port sampling has been upgraded with the assistance of IOTC/OFCF project in 2012. The 2% coverage of data collection of NARA has been increased to10% by assigning 28 DFAR officials for data collection in addition to the 12 data collectors of NARA. It also enable to extent the sampling area covering two districts of North; Mullativu, and Jaffna. A new data collection format was designed with consultation of IOTC data officer.

5.1 Sampling Design

The sampling design of the revised system is composed by setting up a cooperative unit between DFAR, NARA and SU to coordinate data collection, analysis and reporting system. The revised sampling system is basically designed to cover all large pelagic fisheries, including both multiday boats operating in offshore and high seas and also coastal day boats targeting tuna as well.

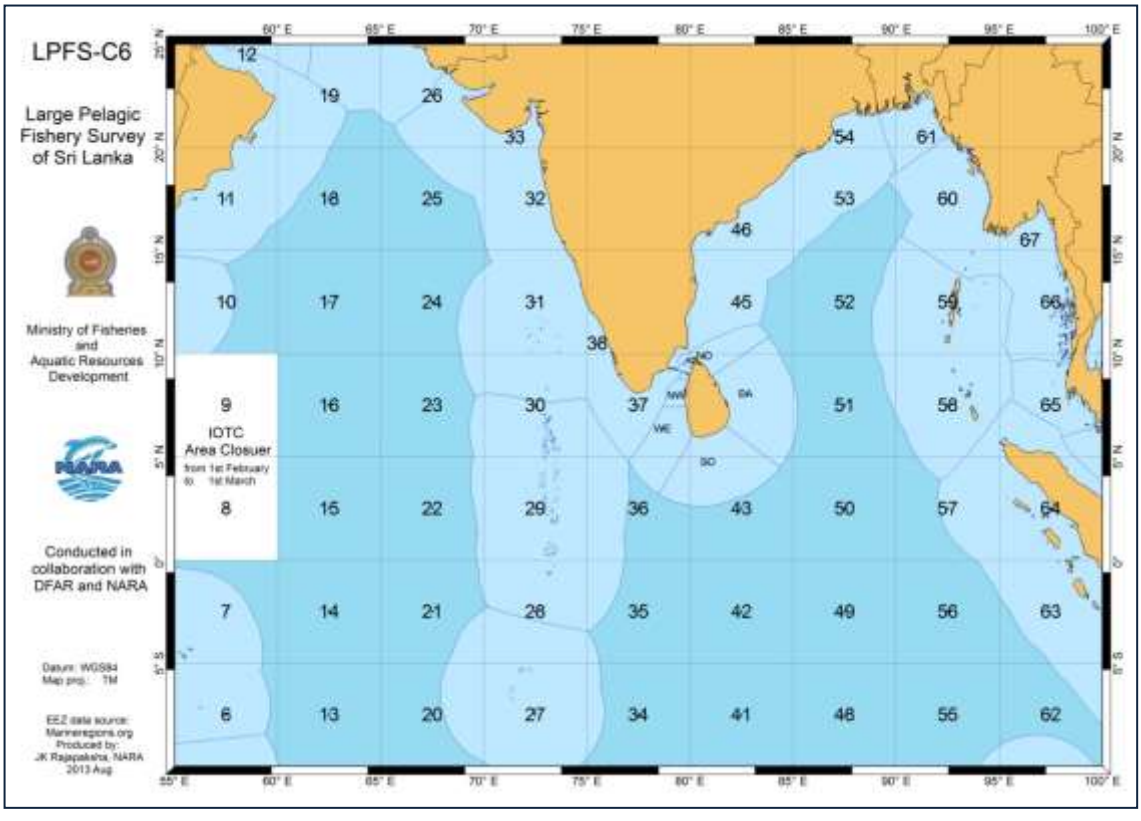
In the present context sampling range is extended covering thirteen coastal fisheries districts out of fifteen; except Mannar and Kilinochchi. The data collection is done in all the major fishery harbours and anchorages where offshore multiday boats are landed and in few cases coastal landing sites where the large pelagic fish species land from the coastal day boats. Accordingly 23 major fishing ports and 10 minor landing sites are covered.

Number of field data collectors is increased. A total of 28 FIs and Fishery Resources Management Assistance (FRMA) of DFAR are newly apportioned for this task. They were trained on sampling and species identification, assigned for data collection at the harbours/ landing centers in addition to the 12 Samplers/ Research Assistance of NARA. Since NARA samplers have long experience in field sampling and fish identification they are made as trainers of the trainees at field level so that the programme is supported internally and enhance sustainability. Special training was given on fish identification of billfish, bigeye and yellowfin tuna and sharks. Identification materials are developed (shark poster, field guild).

Vessels operating in the large pelagic fishery are categorized in to six types considering the LOA, structure of the vessel, fishing trip duration/ area of fishing activities undertaken. The fishing gears mainly used in large pelagic fishing activities in Sri Lanka are considered (Appendix -1).

Since there is limited option in getting spatial data the new sampling strategy has introduced a map to identify the fishing area in large by interviewing the skippers of the vessels. The map reflects the area within 10^0 S to 25^0 N and 55^0 E to 100^0 E. Area within the EEZ has been divided in to five statistical zones to denote North, South, East, West and Northwest areas. The area beyond the EEZ has been divided in to five degree grids and coded (Figure 2).

Figure 2: Fishing zones



The overall monitoring of the survey is done by the Ministry of Fisheries and Aquatic Resources Development and actions are taken to further improvements of the survey considering the practical situation in the field.

5.2 Data collection

Data collectors are supposed to collect daily effort, catch and length weight data at the landing sites. Three data collection forms used to collect the relevant information has been revised considering the present data requirements.

Daily effort - Form – A, the Daily Effort Form (Appendix – 2) is used to list the fish landed vessels/crafts with the relevant information (boat registration number, length overall, last port of call, date of departure and the catch on board) on each category in a particular sampling site on a particular sampling day. After the total landings are listed, the total number of landings and total number of sampled boats are identified according to the boat categories in the Form – A.

Catch –The total catch unloaded by the sampled boat is recorded either by weight or numbers in the Form – B, (Appendix – 3). At the same time information on the fishing operation of the sampled boats such as fishing gears used, fishing area, etc., are also recorded in the same form. Catch composition is recorded for 33 species, bill fish (6), neritic tuna (3), tropical tuna (3), sharks (13), seer fish (2) skates (4) and other bonny fish (2) (Appendix -4)

Length and weight – Form – C, the Length weight frequency data sheet (Appendix – 5) is used to collect individual length and weight measurements of the catches in sampling boats. Curve length of the fish is taken using the measuring tapes while eye estimate or the scale measurement of the individual weight is recorded.

5.3 Data storage

The PELAGOS database was modified and upgraded to MS Access 2007 by the IOTC and installed at NARA and at SU separately for testing. The database is being modified to fit with the updated sampling scheme and data collection forms. The catch estimation and reporting system is still have development.

6. Scientific research

Scientific research required in addressing more specific issues. At present number of studies and research projects are being carried out by NARA in focusing logistics, biological and ecological related issues in large pelagic fisheries.

The following studies and research projects are being done at NARA;

- Estimation of conversion factors- Curve length to strait length; partial lengths to fork length for tuna and tuna like species;
- Case study of fisheries impact on sea turtles
- Case study on the observation of sea bird
- Stock assessment biological study of Indian Mackerel

The following studies will be proposed to undertake in 2014

- Comprehensive study of shark
- Sea turtle nesting in coastal areas

7. Recommendations

Although recent advancement in the statistics collection system of large pelagic fisheries would address many issues listed above, some demand further improvement.

- Log book programme

DFAR introduced logbooks in 2012 to all multiday fishing boats as a part of its efforts to improve the fishery data collection system of the country. However, cooperation from the fishermen in providing correct information seems still poor. Thus, logbook data are not currently use to assess the fisheries performance. Log book data are important as they form a critical part of verification of data of the port sampling programme and also overcome some of the limitation of it. Since VMS is not yet available log book data is vital to study the spatial dynamic of fisheries and the effect on catch rates. Thus, specially attention has to be paid to streamline the log book programme.

The lesson leant over the past two years realized logbook system is difficult to apply to fishers without considerable technical advice and support from IOTC. Log book has to be much user friendly while in par with IOTC standards. The willingness of fishers to complete forms is self- selecting and not random. To guard against potential bias, at least some data needs to be compulsory and fully enumerated or some forced sampling needs to be conducted. However, to validate port sampling data, even a co-operative logbook scheme is likely to be valuable.

- Vessel registry

The vessel register should be considered a part of the fisheries statistics. The identification and details of each vessel are stored in the vessel register. In the process of verification of fishing effort in port sampling programme should match with vessel register.

Present vessel register contained information of all fishing fleet. The fishing fleet of Sri Lank comprised of 54,100 crafts in 2012. Of which 93% were engaged in coastal fisheries. Since the economic life period of coastal crafts is relatively low, thus the rate of replacement is higher than the multiday boats. Large pelagic fisheries are developing rapidly**,** with an ever-increasing offshore fishing fleet. The technical facilities available at DFAR to manage such a large vessel registry are inadequate at present. The present system needs update both technically and logistically.

- Data base

To design and maintain a good database is costly and often beyond the technical capability of the available staff. Raw data entered on the computer needs to be checked and validated in many different ways as possible. Some data should be validated automatically at the time they are entered in the database. For example, the order of magnitude can be checked and rejected if a value has been given in grams where it should have been kilograms. In addition, validate data with other source. For example, log book data or experiment fishing. It is better to facilitate importing of data from other sources. For example, import of oceanographic data

such as SST to relate with CPUE. Further, the present database needs further development including reporting requirements.

New database developed with the technical assistance of IOTC is quite comprehensive; data are entered, edited, and compiled to fulfill various domestic and international reporting obligations. Ensuring staff know how to use the database; this comes down to documentation and training. It is better that IOTC could work with the staff of NARA and DFAR to create the documentation and training and that will be useful of handling the database.

- Research

NARA pays special efforts every year to collect fishery data and information through large pelagic sampling programme and also update database and report timely processed data to MAFRD. Fishery performance is assessed annually. The continuation of the large pelagic research project is expected to set the way for the road map to produce comprehensive data and information on tuna and tuna like species.

The available statistics are quite complicated of studying the status of population/stocks due to the multi-gear nature of the fisheries and also the fact that large variation in design of each gear type. Another problem is that some gears made seasonal modification. These variables make difficult to standardized data to assess relative abundance of fish stocks. It is expected that IOTC would technically assist NARA in such assessment.

In addition, biological studies of tuna; reproductive biology of Indian mackerel are being conducted through BOBPLME programme.

Information on incidental catches, if any, of seabirds, and turtles is also being collected in selected areas but expected to make a comprehensive study with the assistance of IOTC.

- Training

Training is one of the most crucial components in the preparation and successful implementation of a data collection programme and such always be given high priority. Regular training should be an indispensable part of a sampling programme. This will allow the programme to improve, adapt and maintain freshness despite its routine nature. New

staff members on each level have a need for training, but all personnel on all levels need regular training to maintain work quality. The participants should include fishers, data collectors, supervisors, researchers, computer operators, directly responsible data producers and users, and decision-makers. Training courses and workshops are a good means of addressing methodological and operational problems encountered in the implementation of data collection programmes. They provide the opportunity for bringing together staff with different responsibilities and activities, such as data collectors and supervisors, data operators, statisticians and researchers. Enumerators, for example, are often in a situation where they are questioned by fishers about the data collection programme and they should preferably agree with the programme and be able to explain and justify it.

8. References

Dissanayke, D.C.T 2005. Monitoring and assessment of the offshore fisheries in Sri Lanka. The United Nation University. P.O Box 1390, Skulagata 4, 120 Reykjavik, Iceland.

Forster R. 1987. A preliminary analysis of the billfish landings observed on the west coast of Sri Lank*a*. Report of workshop on small tuna, seerfish and billfish in the Indian Ocean, Indo-Pacific Tuna Development and Management Programme. IPTP/87/GRN/13

Indian Ocean Tuna Commission (IOTC). 2005 Field Manual for Data Collection on billfish and tuna landings from offshore and coastal boats in Sri Lanka

Maldeniya, R. 1998. Tuna research and data collection activities in Sri Lanka. 7th Expert Consultation on Indian Ocean Tunas. [December, 2005]

<http://www.iotc.org/English/documents/doc_proceedings.php?mode=proceed&break=group,doc&group%5B%5D=15&year%5B%5D=1998>

Maldeniya, R. 1996. Small boat tuna longline fishery north-west coast of Sri Lanka. 6th Expert Consultation on Indian Ocean Tunas. [December 2005]
<http://www.iotc.org/English/documents/doc_proceedings.php?mode=proceed&break=group,doc&group%5B%5D=15&year%5B%5D=1996>

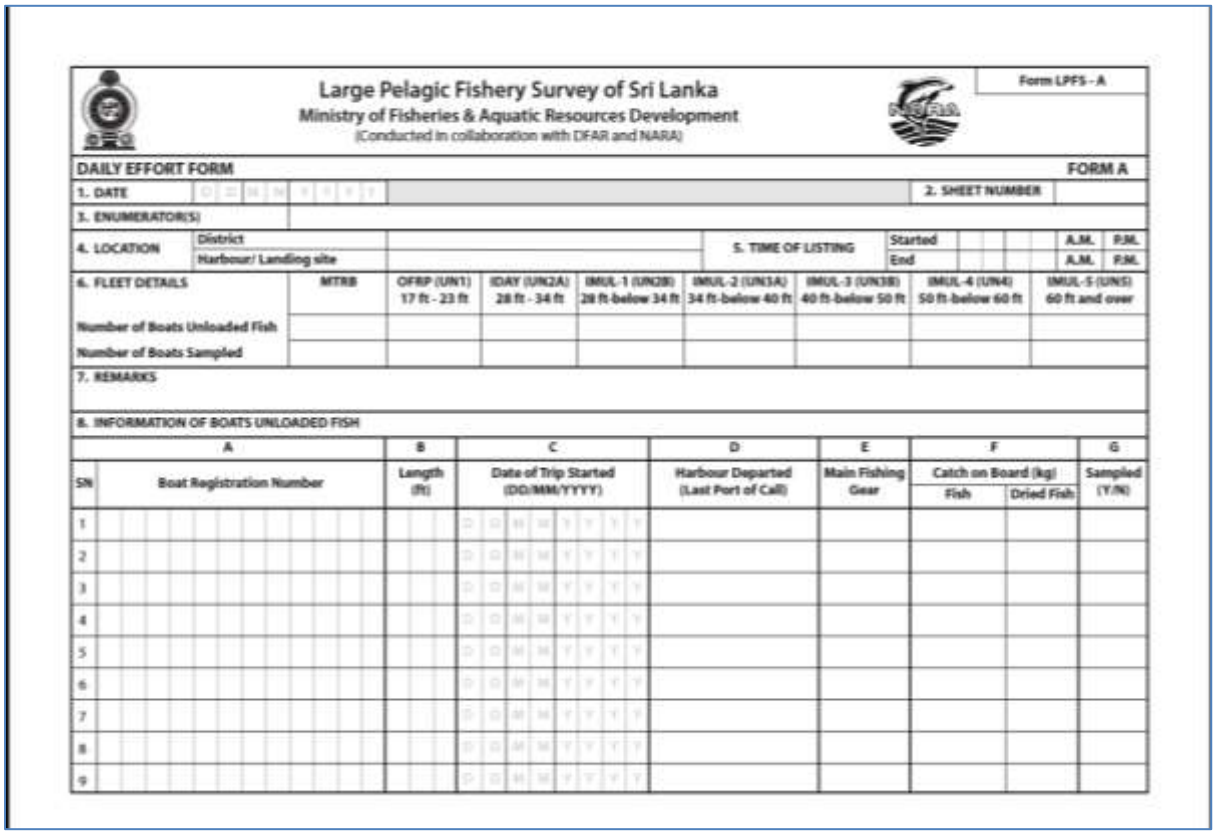
Williams, H. 1994. Field Document: Review of sampling strategies, data needs and estimation procedures for monitoring the Sri Lankan fishery for large pelagic species. Report prepared for the Government of Sri Lanka by the Food and Agriculture Organization of the United Nations. FAO/TCP/2250.

Williams, H. 1995. Field document 1: Review of sampling strategies, data needs and estimation procedures for monitoring the Sri Lankan fishery for large pelagic species. FAO/TCP/2251. FAO: Rome

Appendix 1

FISHING GEAR CODE LIST	
CODE	**FISHING GEAR**
GNLM	Drift Gillnet – Large mesh
SNRN	Ring net
SNPS	Purse seines (Small)
HLTR	Troll line
HLPL	Pole and line
HLHL	Hand line
HLTL	Tuna long line
HLSL	Shark long line
HLSJ	Squid jigs

Appendix 2



Large Pelagic Fishery Survey of Sri Lanka
Ministry of Fisheries & Aquatic Resources Development
(Conducted in collaboration with DFAR and NARA)

Form LPFS - A

DAILY EFFORT FORM — FORM A

1. DATE (D D M M Y Y Y Y) — 2. SHEET NUMBER

3. ENUMERATOR(S)

4. LOCATION — District; Harbour/ Landing site — 5. TIME OF LISTING — Started / End — A.M. P.M.

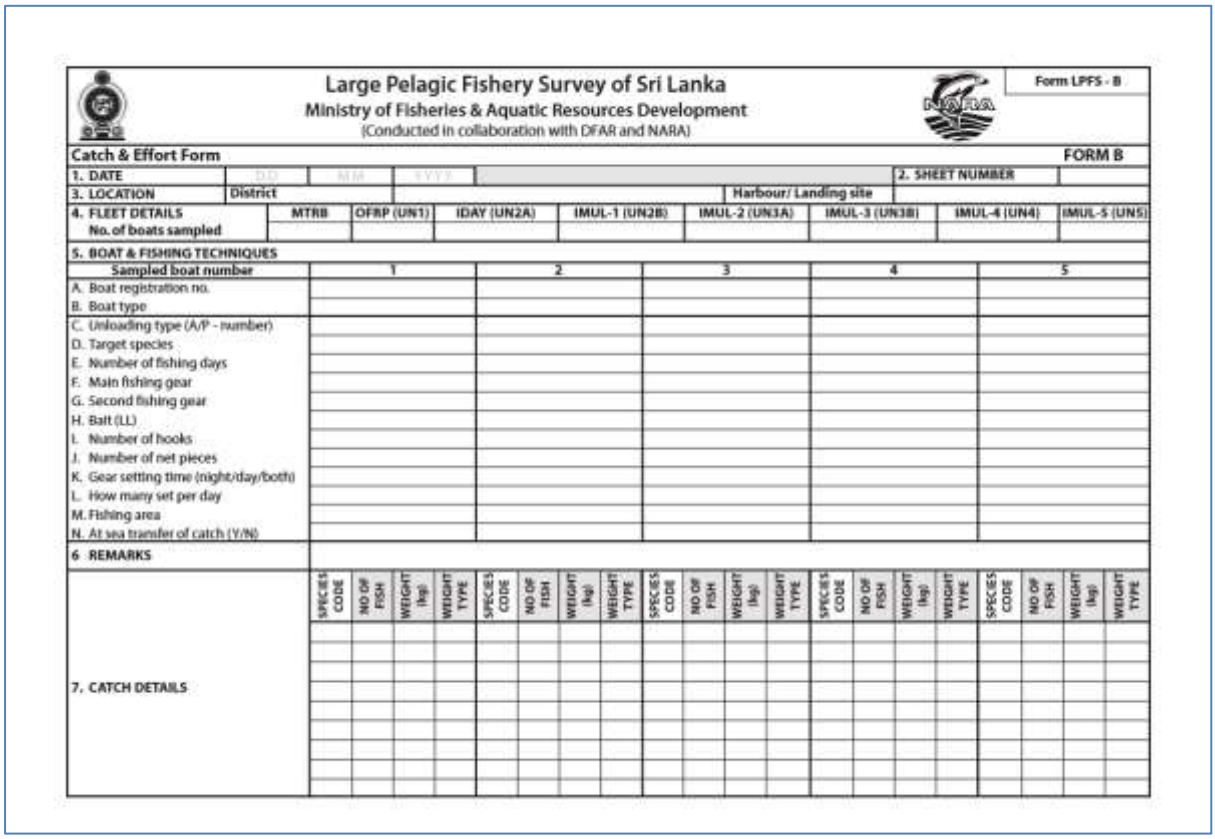
6. FLEET DETAILS	MTRB	OFRP (UN1) 17 ft - 23 ft	IDAY (UN2A) 28 ft - 34 ft	IMUL-1 (UN2B) 28 ft-below 34 ft	IMUL-2 (UN3A) 34 ft-below 40 ft	IMUL-3 (UN3B) 40 ft-below 50 ft	IMUL-4 (UN4) 50 ft-below 60 ft	IMUL-5 (UN5) 60 ft and over
Number of Boats Unloaded Fish								
Number of Boats Sampled								

7. REMARKS

8. INFORMATION OF BOATS UNLOADED FISH

A		B	C	D	E	F		G
SN	Boat Registration Number	Length (ft)	Date of Trip Started (DD/MM/YYYY)	Harbour Departed (Last Port of Call)	Main Fishing Gear	Catch on Board (kg) Fish	Dried Fish	Sampled (Y/N)
1			D D M M Y Y Y Y					
2			D D M M Y Y Y Y					
3			D D M M Y Y Y Y					
4			D D M M Y Y Y Y					
5			D D M M Y Y Y Y					
6			D D M M Y Y Y Y					
7			D D M M Y Y Y Y					
8			D D M M Y Y Y Y					
9			D D M M Y Y Y Y					

Appendix 3



Large Pelagic Fishery Survey of Sri Lanka
Ministry of Fisheries & Aquatic Resources Development
(Conducted in collaboration with DFAR and NARA)

Form LPFS - B

Catch & Effort Form — **FORM B**

1. DATE	DD	MM	YYYY				2. SHEET NUMBER	
3. LOCATION	District				Harbour/ Landing site			
4. FLEET DETAILS	MTRB	OFRP (UN1)	IDAY (UN2A)	IMUL-1 (UN2B)	IMUL-2 (UN3A)	IMUL-3 (UN3B)	IMUL-4 (UN4)	IMUL-5 (UN5)
No. of boats sampled								

5. BOAT & FISHING TECHNIQUES

Sampled boat number	1	2	3	4	5
A. Boat registration no.					
B. Boat type					
C. Unloading type (A/P - number)					
D. Target species					
E. Number of fishing days					
F. Main fishing gear					
G. Second fishing gear					
H. Bait (LL)					
I. Number of hooks					
J. Number of net pieces					
K. Gear setting time (night/day/both)					
L. How many set per day					
M. Fishing area					
N. At sea transfer of catch (Y/N)					
6 REMARKS					

7. CATCH DETAILS

SPECIES CODE	NO OF FISH	WEIGHT (kg)	WEIGHT TYPE	SPECIES CODE	NO OF FISH	WEIGHT (kg)	WEIGHT TYPE	SPECIES CODE	NO OF FISH	WEIGHT (kg)	WEIGHT TYPE	SPECIES CODE	NO OF FISH	WEIGHT (kg)	WEIGHT TYPE	SPECIES CODE	NO OF FISH	WEIGHT (kg)	WEIGHT TYPE

Appendix 4

Form LPFS - C

Large Pelagic Fishery Survey of Sri Lanka
Ministry of Fisheries & Aquatic Resources Development
(Conducted in collaboration with DFAR and NARA)

CATCH SAMPLING FORM (Length & Weight Frequency) **FORM C**

1. DATE	DD	MM	YYYY	2. SHEET NUMBER		OF	
3. LOCATION	District						
	Harbour/ Landing site						
4. BOAT REGISTRATION NO.							
5. ENUMERATOR (S)							
6. REMARKS							

7. LENGTHS, WEIGHTS & SEX (sharks only) OF FISH

A	B		C	D		E		F	
Species Code	Weight Type	Individual Weight (kg)	Sex (M / F)	Length Type	Length (cm)	Length Type	Length (cm)	Length Type	Length (cm)

Appendix 5

SPECIES CODE LIST					
FISH SPECIES	CODE	SINHALA NAME	FISH SPECIES	CODE	SINHALA NAME
Yellowfin (S) below 5kg	YFS	කහ වරල් කෙළවල්ලා (කුඩා)	Dolphin fish	DOF	වන්නා
Yellowfin (M) 5-20kg	YFM	කහ වරල් කෙළවල්ලා (මධ්‍යම)	Other marlin	MAR	වෙනත් කොප්පරු
Yellowfin (L) over 20kg	YFL	කහ වරල් කෙළවල්ලා (විශාල)	Silky shark	FAL	හොඳ මෝරා, ගැඹුර මෝරා
Skipjack (S) below 3kg	SKS	බලයා (කුඩා)	Blue shark	BSH	නිල් මෝරා, සීනි මෝරා
Skipjack (M) 3-5 kg	SKM	බලයා (මධ්‍යම)	Oceanic whitetip	OWT	පොල් කොළ මෝරා
Skipjack (L) over 5kg	SKL	බලයා (විශාල)	Spot tail	SPT	බාකළුවා
Skipjack dry	SKD	බලයා කරවල	Longfin mako	LFM	ටංකිරියා, හුලං යකා
Other dry fish	ODF	වෙනත් කරවල	Shortfin mako	SFM	මීයා, යකා
Skipjack salted	SKT	බලයා ලුණු	Thresher shark	ALV	කස මෝරා
Other salted fish	OSF	වෙනත් ලුණු මසුන්	Bigeye thresher	BTH	කස මෝරා
Kawakawa	KAW	ඇටවල්ලා	Pelagic thresher	PTH	කස මෝරා
Frigate	FRI	අලගොඩුවා	Scallop hammerhead	SCH	උදළු මෝරා
Bullet	BLT	බඩිටා	Smooth hammerhead	SMH	උදළු මෝරා
Bigeye	BET	ඇස්ගෙඩි කෙළවල්ලා	Great hammerhead	GRH	උදළු මෝරා
Other tuna	TUX	වෙනත් ටූනා (ලන්සි කෙළවල්ලා, තෝර බලයා යනාදී මසුන්)	Whale shark	RHN	මණ්ඩූකා මෝරා
			Other sharks	SKH	වෙනත් මෝරා
Narrow barred	COM	අහින් තෝරා	Carangids	CAR	පරව්
Wahoo	WAH	සවරා	Other bony fish	MZZ	වෙනත් අස්ථික මසුන්
Other seer	KGX	වෙනත් තෝරුන් (තෝර අන්පිලා යනාදී මසුන්)	Manta ray	MTR	අලි මඩුවා
			Devil ray	DER	අඟ මඩුවා
Black marlin	BLM	කොප්පරා (කළු)	Eagle ray	EGR	වවුවොලි, පන්ජාඩියා
Blue marlin	BUM	කොප්පරා (නිල්)	Guitar fish	GUF	ගල්ලොලියා මෝරා
Striped marlin	MLS	කොප්පරා (ඉරි)	Other skates	SKA	වෙනත් මඩුවා
Sailfish	SFA	තලපතා	Marine mammals	MAM	ඩොල්පින්, තල්මසා
Shortbill spearfish	SSP		Marine turtles	TUR	කැස්බෑවා
Swordfish	SWO	සප්පරා	Seabirds	SEB	මුහුදු පක්ෂීන්