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MANUAL FOR STATISTICAL DATA COLLECTION ON TUNA AND TUNA-LIKE SPECIES IN THE INDO-PACIFIC REGION (DRAFT)

INTER-REGIONAL

INDO-PACIFIC TUNA DEVELOPMENT AND MANAGEMENT PROGRAMME (IPTP)

Colombo, Sri Lanka

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MANUAL FOR STATISTICAL DATA COLLECTION ON TUNA AND TUNA-LIKE SPECIES IN THE INDO-PACIFIC REGION (draft)

1. Introduction

Since the UNDP/FAO Indo-Pacific Tuna Development and Management Programme (IPTP) was established at the beginning of 1982, the IPTP has commenced to collect existing historical data on tuna and tuna-like species with reporting forms and manual for the collection of historical statistical data on tuna and tuna-like species in the Indo-Pacific region (IPTP Manuals No. 1). This historical data collection is still going on. As a result, the IPTP has completed the first draft on "Indo-Pacific Tuna Fisheries Data Summary" and distributed it to national and international organizations for comment to its finalization.

Now it is the time to commence future data collection although the historical data collection has not yet been completed. The data collection activities for both historical data and future data would be combined into one and be progressed simultaneously.

This manual describes for the national officials who are responsible for data collection and reporting to the IPTP :

1. Background of the IPTP's establishment and its objectives - to establish a tuna data base (statistical system) to support resources assessment and economic study.

2. Basic functions of the IPTP statistical system i.e. data collection, maintaining data file and dissemination of statistics to users.

3. Section 4 describes instruction for respective reporting forms :

4. Section 5 describes design and method of tuna sampling as guide-line to encourage such data collection system in tuna fishing countries in the region.

5. Section 6 describes species identification for each species. (under preparation)

6. As appendices, (1) the IPTP reporting forms, (2) Classification of tuna and tuna-like species, (3) gear classification, (4) type and size of boat classification and (5) Maps of IPTP Sub-area are attached.

2. Background

Tuna and tuna-like species constitute an important fisheries resource, especially in the Western Pacific and Indian Oceans. According to FAO fishery statistics, the 1981 catch of tuna and tuna-like species in the world was 2,453 thousand metric tons, of which the catch in the West Pacific and Indian Oceans was 1,548 thousand metric tons, or 63% of the total catch

The 'highly migratory' nature of tuna and tuna-like species poses special problems for a world community attempting to develop international mechanisms for ensuring that the living resources of the oceans are utilized wisely and shared equitably. Because tuna from a single stock are to be captured in waters under jurisdiction of different countries and on the high seas as well, no nation by itself can take effective action to ensure that stocks are not over exploited or to provide conditions conducive to the economic rationalization of the fishery on the stock as a whole. For this reason, the responsibility for maintaining the stocks in a healthy state and rational development of the fisheries, must be shared between nations. Article 64 of the Law of the Sea states 'the coastal states and other states whose nationals fish in the region for the highly migratory species listed in Annex 1, shall cooperate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions where no appropriate international organization exists, the coastal states and other states whose national harvest these species in the region shall cooperate to establish such an organization and participate in its work'.

The search for effective means of international cooperation is taking place against a background of rapid development of the tuna fisheries in the region. The interest of coastal states in tuna resources has increased

greatly, particularly regarding the opportunity for development of local tuna fisheries, both small-scale and industrial. Furthermore, the coastal and island nations would benefit through concerted actions in international negotiations, licensing of distant-water fleets and marketing of local catches. At the same time, distant-water fishing fleets are seeking new fishing grounds and exploring new technologies in an attempt to increase the effectiveness of their operations. Thus the prospects are for increased total fishing pressure on the tuna stocks and an increased competition for resources that appear to be fully utilized. In the absence of existing multilateral arrangements, distant-water fishing nations are negotiating bilateral agreements with individual coastal nations regarding terms of access. An increasing number of coastal nations are imposing strict terms and conditions on foreign fishing in their fishing zones aimed at deriving material benefits (fees and other forms of remuneration) from foreign fleet activity and in some cases at reducing foreign fishing effort to improve the competitive position of local industries. The coming into being of new regimes is causing increasing problems as distant-water fishing nations face requirements imposed by individual coastal nations and as the coastal nations compete with one another regarding fees to be collected from the foreign fleet. For several years the need for coordination of tuna fishery development as well as management and investigation activities in the Indian and Pacific Oceans has been discussed by both the IPFC and IOFC. At the sixth joint meeting of the IOFC and IPFC Tuna Management Committees held in Perth, Australia in February 1980, it was recommended that funding be sought to initiate this broad coordination and implementation programme.

The UNDP tuna project RAS/79/118 (INT/79/026) which ended in 1981 provided one professional and one consultant to begin investigation of data availability and quality in the countries in the region and to review the need for a broad-based development and management programme. A subsequent project, Indo-Pacific Tuna Development and Management Programme INT/81/034, recruited a Programme Director and Statistician and provided a computer and other equipment to establish a permanent headquarters for the project in Colombo during 1982.

Despite considerable discussions both within the joint meetings of the committees and within the parent commissions, no firm recommendations for management measure by member governments have been made. Differing interests

on the part of coastal and distant-water fishing nations have probably been a major reason for failure to reach decisions on future cooperation. However, another important reason for not making specific recommendations as yet has been the conclusion of the scientists that presently available catch and effort statistics and information on the composition of the catches and on distribution of the stocks are not adequate for precise conclusions. As a consequence, joint meetings of the committees have spent considerable time discussing the development of administrative and financial arrangements aimed at establishing the data base for management.

Fisheries statistics are prerequisites on which scientists depend to assess the effects of fishing on the fisheries resources. Statistical information is also required by the fishing industries of all countries to assist in making decisions on where, how and when to fish and on investment.

Statistics on catch and effort come from national governments who report on the activities of their own flag vessels. For tuna, the problems of collecting accurate statistics are particularly difficult. The mobile fleets of distant-water fishing nations move from ocean to ocean, often landing their catches in ports of other countries for transhipment to markets or export. A number of vessels under the flag of one country fish under charter for international joint venture companies in other countries. There are many gaps in reporting and also a number of cases where the same catch may be reported twice from the flag country and the country where the catches are landed. There is therefore a need to collate catch data from all countries involved in tuna fishing and to cross-check incoming data to ensure that the same catches are not reported twice and that no catches are missed in the report. Such data collections from different countries are best accomplished if the information is collected in a standard manner on an internationally agreed basis.

3. Basic functions of the statistical system

A fishery statistical system can be viewed as having three basic functions i.e. the collection of statistics, maintaining data files in usable form and dissemination of statistics or information to users. Each of these steps is briefly described below.

The tuna statistics to be collected from the countries in the region by the IPTP can be divided into three categories:

(1) Annual catch by species and gear type and the number of boats operated by gear type.

(2) Catch and fishing effort by time-area strata.

(3) Size frequency data by time-area strata.

Other statistics, which might be collected if the situation is allowed, include ex-vessel price of fish at landing centers, cost and earnings on tuna fisheries and bioligical, oceanographic and meteorological data whereas trade information such as whole-sale market price is to be collected by INFOFISH.

3.1 Data collection

Data for the IPTP data base are firstly to be collected by national governments. However, in order to accomplish the inter-regional data base, data collected are to be harmonized with standard concepts and definitions, so that statistics compiled can properly be utilized by administrators, scientists and business circles without any fears of errors and inaccuracy.

In principle, there are two types of methods of data collection i.e. complete enumeration and sampling. A frame survey or fishery census is generally conducted by complete enumeration. This is a more time and money consuming method than sampling. As a matter of fact in most countries in the region, catch statistics are being collected by sampling in which a small number of units are sampled to minimize time and cost without reducing the accuracy. In collection of catch statistics, it is required to estimate not only total catch but also catch by species and gear type. In order to improve national statistics on catch and effort, it is highly recommended that tuna sampling be carried out especially by coastal major tuna fishing countries so that sound data can be available.

In order to facilitate the processing of data by computer, all essential data elements are to be collected and reported using a common form. Since the data being collected are similar to those being collected by ICCAT, the basic design of the ICCAT formats was adopted in the IPTP formats. Also, the ICCAT Field Manual has proven so useful, it was adopted as the model for a similar field manual be produced for this area. The manual should include a description of concepts and definitions of statistics as well as data collection procedure and formats for reporting the data.

3.2 Maintaining data files

Data collected from countries are processed by computer. Upon receipt, the data are checked for their legitimacy according to the concepts and definitions and forwarded for coding of the data, key entry, verification and computer filing. All the original data received and processed are filed into computer tape and statistics are compiled and printed out as necessary.

3.3 Dissemination of statistics

Dissemination of statistics is the most important function in a statistical system and the goal of a programme that is to provide useful information to users. Data summaries and descriptive charts or line plots describing annual catch by such strata as ocean, FAO area, IPTP sub-area, country, species as well as CPUE, etc. should be published and distributed on an annual basis as one of the most basic publications. Various special summaries may be required by member countries or for working parties of the IPFC or IOFC. Copies of the data files on computer tapes will be provided to national laboratories for use by their scientists on a request basis. A catalogue documenting all data contained in the data base will be published and distributed so that member countries, regional and international organizations will know what data are available in the IPTP files.

4. INSTRUCTIONS FOR REPORTING FORMS AND DEFINITIONS OF TERMS USED

4.1 IPTP FORM I CATCH STATISTICS

Concept of catch

The concept catch refers to the landings converted to a live weight basis. The closely related concept landings refers to the quantities on a landed weight basis. In many cases, landed quantities landings are identical to the quantities caught catch.

There are many instances where the catch on board fishing vessels or factory ships are gutted, filleted, frozen, etc. The data on the landings of such products require conversion by yield rates (conversion factors) to establish the live weight equivalents catch at the time of capture. Usually catch data are collected either through a logbook recorded by the skipper on board or at a landing site where the landings are counted. Even if the data are collected at landing sites, the time and area should be adjusted to show the actual time (month) and area (FAO area and IPTP sub-area) of captive. In the case of most coastal fishing catch, it is almost the same as landings in its weight, time and area.

However, in most cases of distant water fishing, the catch differs from the landings in weight, time and area. Therefore, if the data are collected from landing sites, it is necessary to make the adjustment for distant water catch.

Coverage of catch

Catch covers all kinds of commercial, industrial, subsistence and sport fishing for tuna and tuna-like species caught by all types and classes of fishing units in waters of the Indian and Pacific Oceans.

Indian Ocean = FAO Statistical areas 51 and 57. However, the west boundary with the Atlantic Ocean for the FAO statistical area 51 is to be shifted from $30^{\circ}00'$ E to $20^{\circ}00'$ E

Pacific Ocean = FAO statistical area 61, 71, 81, 67, 77 & 87

The catch data should include all quantities caught by fishing craft flying the flag of the reporting country and landed not only in the domestic harbours of the reporting country but also in foreign harbours.

The data should exclude quantities caught by foreign fishing craft and landed in domestic harbours of the reporting countries.

Reporting country

Write the name of the country for which statistics are prepared and reported.

All of the catch statistics should be prepared by a flag country in principle, even though its fishing craft are separated under a fishing license of a foreign country and land their catch in foreign harbours.

In most cases, therefore, the reporting country is the flag country. There is an exception where the statistics are collected only

by the licensing country. In this case, the statistics should be reported by the licensing country for the flag country.

Flag country

Flag country means the country in which a boat is legally registered. Note that the flag country may be different from the country which issues the fishing license.

Year

Insert the figure of a calendar year during which catches are made and statistics are collected (January 1 - December 31) e.g. 1983, 1984. Note that there may be some discrepancies between year of catch and year of landing. As mentioned previously in the concept of catch, year of catch should be applied. If for any reason the year is not a calendar year and a year of catch, make a foot note to explain.

FAO area

Insert a code number of FAO area, e.g. 51 or 57 for the Indian Ocean and 61, 71, 81, 67, 77 or 87 for the Pacific Ocean, where the fishing is made (see a map attached for the FAO area).

IPTP sub-area

Insert a code number of IPTP sub-area, e.g. 1, 2, 3, 4, 5 or 6 for the Indian Ocean and 7, 8, 9, 10 or 11 for the Pacific Ocean, where the fishing is made (see maps attached for the IPTP sub-area).

Type of gear

See Appendix 3 for gear definition and codings.

In case it is not possible to separate catch statistics by gear, list all gears used and make a foot note giving an estimate of the proportion of catches (%) made by each type of gear.

Type and size of boat

In many instances, there are more than one type and size of boats involved in the same type of fishing gear. They might have a different ability of catch efficiency. Therefore, catch should be broken down by types and sizes of boat. (see the Appendix 4 for the classification and codings) If it is not possible to separate catch statistics by type and size class of boat, list all types and size classes of boats engaged and make a foot note, giving an estimate of the proportion of catch (%) made by each type and size of boat.

Catch by species

Insert catch by species for each FAO area, IPTP sub-area, type of fishing gear and type and size class of boat. The species which should be covered by this form as well as other forms include tunas and bonitos, seerfishes, billfishes and others. The table of classification of the species is attached as Appendix 2, with their scientific names, 3 alpha identifiers and code numbers. As only a blank column is provided to fill out species names in the form due to the fact that species vary from country to country, all the species should be listed for each country in the column provided according to the classification.

In case that catch is recorded for mixed species and can not be separated, make a foot note explaining the name of species included and portion for each species, etc.

In this form, catch should cover entire areas of country and all types of fishing units capturing tuna and tuna-like species. If a national statistics covers only part of the area or fishing units, an estimation should be made to cover all.

4.2 IPTP FORM II FISHING BOAT STATISTICS

Concept of fishing boat

Fishing boats refer to the boats which operate in the fishing to capture tuna and tuna-like species in the Indo-Pacific Ocean during the past one year. The boats which are exclusively engaged in carrying fish from the sea (fishing ground) to shore, as carriers are to be excluded. However a boat which is operated to carry fish or to search fish school in association with a fishing boat operating in a purse seine fishery is to be included.

FAO area, IPTP sub-area, type of gear, type and size of boat

The number of fishing boats are to be counted by fishing areas, FAO Area and IPTP sub-area. In case that a fishing boat is operated in both FAO area i.e. area 51 and 57, the boat is counted for each area respectively i.e. 1 for area 51 and 1 for area 57. The number of fishing boats are also to be counted by type of gear and type and size class of boat. In case that a boat is operated in both fishings in the year i.e. tuna longline (Jan - Jul) and skipjack pole and line (Aug - Dec), the boat is counted 1 for longline and 1 for pole and line (baitboat).

Multipurpose and tuna only

In this region, there are many small scale fisheries operating with small size fishing boats. They are mostly not aiming at capturing single species but multi-species. Also there are many industrialized fisheries operating with large size fishing boats and with highly developed equipments, which are specifically designed at capturing single species or one group of species. In order to separate these two types of boats, regardless of size of boat classes in this form, a fishing boat which is aimed at capturing not only tuna and tuna-like species but

also the other species, say sardine, scad, mackerel etc is to be grouped into - Multipurpose - and a fishing boat which is aimed at capturing only tuna and tuna-like species is to be grouped into Tuna Only -.

Registered boat or actually operated boat

The IPTP intends to collect fishing boat statistics under the concept that the boats are actually operated in the fishing but not under registered. There are always some gaps between the statistics on fishing boats actually operated and registered. In some cases, a registered fishing boat is not actually operated and a non-registered fishing boat is actually operated. For fishing boats because target species are easily changeable by changing the type of gear, it is not always possible to maintain the registered target species. On the other hand, in many countries it is observed that there are no such statistics on fishing boats operated but registered. Also it's accuracy of the statistics is unknown in many countries. Under such circumstances, the statistics on fishing boats registered are acceptable, but these two different statistics are to be strictly separated by indicating 'Operated' or 'Registered' in the coloumn of the reporting form.

Unknown fishing area

As a boat is moveable, it is not so easy to establish the statistics on fishing boats by fishing area i.e. FAO area and IPTP sub-area, specifically for distant water fishing countries. Most of the coastal countries however have no problem to produce the statistics because their fleets are mostly operated in the same FAO area and IPTP area.

How to show fishing ground on the statistics by ocean or area in descending order of preference

The following are examples to show the statistics by fishing ground, ocean or area in descending order of preference.

1. Whole oceans (Pacific, Indian and Atlantic Oceans combined)

2. Pacific Ocean (FAO areas 61, 71, 81, 67, 77 and 87 combined), Indian Ocean (FAO areas 51 and 57 combined)

3. West Pacific Ocean (FAO areas 61, 71 and 81 combined), East Pacific Ocean (FAO areas 67, 77 and 87 combined), Indian Ocean (FAO areas 51 and 57 combined)

4. FAO area (FAO area 51, 57, 61, 71, 81, 67, 77 and 87 separately)

5. IPTP sub-area (IPTP sub-area 1, 2, 3 ..... 11 separately).

4.3 IPTP FORM III CATCH AND EFFORT STATISTICS

Purpose

This form III, catch and effort statistics, is one of the most essential part of the IPTP reporting forms. With this form, catch and corresponding effort are to be collected and reported to the data base. The purpose of the collection of these data is to estimate total catch and effort in a given area-time stratum. From these data, catch per unit effort (cpue) can be calculated.

Coverage

For the purpose of the collection of the data mentioned above, the data coverage should be reasonably good, but it is not always necessary to attain 100%, as they can be raised by total catch collected through IPTP FORM I. In this connection, all the important fishing areas, types of gears and types and size classes of boats employed in the tuna fishings in a country should be covered. Thus, it is noteworthy that the form is to be prepared for each FAO area, IPTP sub-area, type of gear and type and size of boat.

Data collection systems

There are two basic methods of collecting data on catch and effort.

(1) Survey at landing centers (or fishing villages)

Data are collected at landing centers where catch is landed, by enumerators with an interview with the fishermen to obtain information on when, where, how much of the fish were caught by what gear and how much effort was used, etc. Since it depends mostly on the fishermen's memory, this method would be effective for coastal fisheries which operates near shore and take a trip for a day or few days. See the section of tuna sampling for details of the survey method.

(2) Survey by logbooks

For large-scale fisheries, particularly for the boats which stay at sea for a considerably lengthy period, it would be effective to collect data on catch and effort by a logbook system.

Generally a large-size boat keeps its own navigation and fishing logs. In many countries, it is mandatory to submit a copy of fishing logs to the government for controlling the fishing and management purposes.

Reporting country	See the section of catch statistics
Flag country	"
FAO area	"
IPTP sub-area	"
Year	"
Type of gear	See Appendix for the classification
Type and size class of boat	"

Unit of catch

Record in either unit metric tons, 100 kgs, 10 kgs or kgs. Data recorded in number of fish are also acceptable.

Unit of effort

Describe unit ir which the effort data are reported.

The unit of effort should be chosen to reflect the effort directly applied to harvest the corresponding catch. Recommended units of effort are listed below in descending order of preference, for each type of fishing gear.

Longline

1. Total number of hooks used
2. Total number of sets of longlines
3. Total number of boat-days fishing
4. Total number of boat-days at sea (out of port)
5. Total number of trips (cruises) made
6. Total number of boats actually engaged in fishing

Pole and line (Baitboat)

1. Total number of boat-days fishing (including scouting days, whether or not fish were actually caught). The number of boat-days spent baiting should be excluded, but can be recorded separately for use in assessing bait stocks.

2. Total number of boat-days at sea
3. Total number of fishing poles used; that is the number of crew engaged in fishing with pole
4. Total number of trips (cruises) made
5. Total number of boats actually engaged in fishing

Purse seine, ring net,lift net (bag net) seine net

1. Total number of boat-days fishing (including scouting days, whether or not fish were actually caught)
2. Total number of boat-days at sea
3. Total number of trips (cruises) made
4. Total number of baots actually engaged in fishing

Gill net

1. Total number of boat-days fishing
2. Total number of boat-days at sea
3. Total number of trips (cruises) made
4. Total number of boats actually engaged in fishing

Trolling, Handline

1. Total number of hook (or line) days fishing
2. Total number of boat-days fishing
3. Total number of boat-days at sea
4. Total number of trips (cruises) made
5. Total number of boats actually engaged in fishing

Trawl

1. Total number of boat-days fishing
2. Total number of boat-days at sea
3. Total number of trips (cruises) made
4. Total number of boats actually engaged in fishing

Traps

1. Total number of trap-days (trap units multiplied by days in the sea)
2. Number of trap units in operation

Data: sampled or 100% coverage

Data recorded in this form will supposedly come from logbooks or surveys at landing centers: 100% coverage of catches in the survey is not generally expected. However, if the data recorded have already been raised to 100% coverage of catches for the correspondent area-time strata, check the "100% coverage" square, and note percentage of original coverage; if not raised, check the "sampled ", and fill in the estimate of the coverage rate of the survey.

Month

"Month" when catches were taken, should be filled in with the corresponding numerals (that is, January 01, February 02, ... December 12).

Area (A)

"Area" where fish are caught is to be generally classified into 1° latitude x 1° longitude area for surface fishery and 5° lat. x 5° long. area for longline fishery.

1° x 1° area should be bordered by each degree latitude and longitude, while 5° x 5° area should be bodered by every 5° of latitude and longitude, starting 0° latitude and 0° longitude.

The area should be indicated in code number based on the system for identifying statistical rectangles below.

The code for area is made up of seven digits

X	X	X X	X X X
Size	Quadrant	Latitude	Longitude

Digit	Representing	Code
1	Size of rectangle	
	1° × 1°	5
	5° × 5°	6
	5° × 10°	1
	10° × 20°	2
	10° × 10°	3
	20° × 20°	4
	No square available	0
2	Quadrant	
	NE	1
	SE	2
	SW	3
	NW	4
3-4	Latitude[1] (expressed in 2 digits)	
5-7	Longitude (expressed in 3 digits)	

[1] Each rectangular area should be represented by the latitude and longitude of the corner of the square closest to 0° latitude and 0° longitude

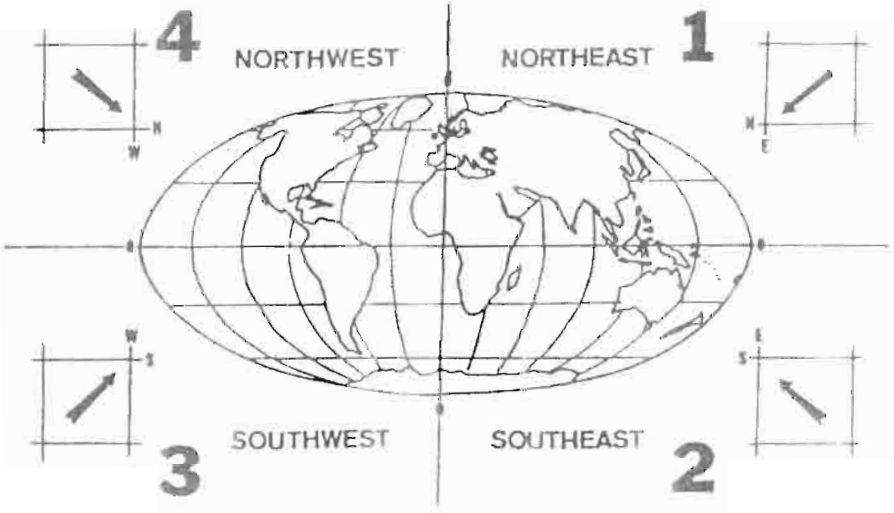


Fig. 1. System for identifying statistical rectangles.

Area (B)

In most cases of coastal fisheires or small scale fisheries, a survey is carried out at landing centers (or fishing villages) to collect this kind of data. In this case, precise fishing areas as shown in the above area (A) are generally unknown, but name of port, region or district etc. are given. Fill in the name of port, region or district etc. according to the survey conducted.

However it is hoped that even in such a case the actual catch area can be estimated and it should be recorded in the area (A), in the seven digit code. If there are more than two rectangles of fishing area represented at a port, region or district a rectangle where the biggest catch occurred should be chosen as representative.

Effort

Describe the effort data in number. (See the unit of effort mentioned previously on page 15)

Catch by species

Record in Kg., 10 Kg., 100 Kg., or metric tons. Data recorded in number of fish are also acceptable.

As species are so varied according to the type of gear and the country, the names of species are not specifically indicated in the form. Please specify the names of species according to the statistics obtained. See the Appendix for the species classification.

4.4 IPTP FORM IV - SIZE FREQUENCY

(IV-1 Actual size frequency and IV-2 size composition of catch)

Purpose

The purpose of collecting size frequency data is to estimate the size composition of catch in order to use it for stock analysis.

Data requirement

For the purpose mentioned above, the size frequency data should be collected for each species and each type of gear and by time-area strata and it is also requested that the size frequency data are compiled and reported in two different levels:

Level 1.

Actual size frequency - frequencies of size of fish measured in the field by the smallest area-time strata.

Subsequently these samples will be converted to represent the catch and compiled by higher level time-area strata for reporting. This will be called:

Level 2.

Size composition of catch - a calculated frequency based on actual size-frequencies of fish wieghed by catches made in corresponding area-time strata.

The data requirements for level 1 and 2 are summarised in Table 1. The data can be reported on IPTP FORMS IV-1 and IV-2. These also can be done as a computer print out (see Table 2) or on magnetic tape.

Table 1 Summary of requirements for size frequency data

	Level 1 Actual size frequency	Level 2 Size compositon of catch
Species	By major species	By major species
Gear	By gear type	By gear type
Area prefarably	$1^{\circ}x1^{\circ}$ area or recognized national fishing grounds for coastal fishing boats and most surface fishing. $5^{\circ}x5^{\circ}$ area for distant water boats particularly longline boats.	Major fishing ground-groups to be specified
At least	$5^{\circ}x5^{\circ}$ area or major coastal regions for coastal fishing boats and most surface fishing. $10^{\circ}x20^{\circ}$ areas for distant water fishing boats, particularly long-liners	
Time intervals	Monthly	Monthly and Quarterly
Reporting country	See the section on catch statistics	
Flag country	"	
Year	"	
FAO area	"	
IPTP sub-area	"	
Species	Fill in the name of species for which data were collected. For the species to be given a priority of sampling, see the section on tuna sampling.	

1975....ALBACORE....AREA 1....QUARTER 1

LM	TAIWAN (1)			KOREA + PANAMA			ALL COUNTRIES		
	WF= 100.07 NS= 8 (9) SW= 7.93 (11)			WF= 24.63 NS= 4 SW= 4.52			WF= 72.68 NS= 12 SW= 12.45		
(14)	N.FISH	PCT.	WEIGHT	N.FISH	PCT.	WEIGHT	N.FISH	PCT.	WEIGHT
60	0	0.0	0.0	1	0.43	0.11	1	0.13	0.33
62	0	0.0	0.0	1	0.43	0.12	1	0.13	0.37
64	2	0.39	1.11	0	0.0	0.0	2	0.27	0.81
66	0	0.0	0.0	1	0.43	0.15	1	0.13	0.45
68	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
70	6	1.17	4.47	9	3.88	1.65	15	2.01	8.11
72	7	1.36	5.71	16	6.90	3.21	23	3.08	13.63
74	15	2.91	13.37	0	0.0	0.0	15	2.01	9.71
76	22	4.27	21.38	21	9.05	5.02	43	5.76	30.35
78	45	8.74	47.56	9	3.88	2.34	54	7.23	41.46
80	40	7.77	45.89	0	0.0	0.0	40	5.35	33.33
82	43	8.35	53.44	7	3.02	2.14	50	6.69	45.14
84	46	8.93	61.82	11	4.74	3.64	57	7.63	55.63
86	54	10.49	78.32	4	1.72	1.43	58	7.76	61.10
88	59	11.46	92.19	13	5.60	5.00	72	9.64	81.72
90	53	10.29	89.08	8	3.45	3.31	61	8.17	74.47
92	35	6.80	63.18	5	2.16	2.22	40	5.35	52.44
94	27	5.24	52.26	6	2.59	2.86	33	4.42	46.39
96	9	1.75	18.65	14	6.03	7.14	23	3.08	34.62
98	14	2.72	31.62	18	7.76	9.82	32	4.28	51.50
100	10	1.94	23.66	6	2.59	3.49	16	2.14	27.50
102	9	1.75	22.71	30	12.93	18.63	39	5.22	71.47
104	4	0.78	10.75	11	4.74	7.28	15	2.01	29.28
106	3	0.58	8.58	10	4.31	7.04	13	1.74	27.00
108	2	0.39	6.08	21	9.05	15.70	23	3.08	50.75
110	2	0.39	6.45	2	0.86	1.59	4	0.54	9.37
112	1	0.19	3.42	1	0.43	0.84	2	0.27	4.97
114	0	0.0	0.0	4	1.72	3.57	4	0.54	10.52
116	3	0.58	11.50	0	0.0	0.0	3	0.40	8.35
118	0	0.0	0.0	3	1.29	2.99	3	0.40	8.83
120	1	0.19	4.28	0	0.0	0.0	1	0.13	3.11
122	2	0.39	9.03	0	0.0	0.0	2	0.27	6.56
124	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
126	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
128	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
130	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
142	1	0.19	7.40	0	0.0	0.0	1	0.13	5.38
TOTAL	515	100.00	793.30 (12)	232	100.00	111.30	747	100.00	904.60
	(10)		51526			5701			54277

LEVEL-1 LEVEL-2

Notes: Circled numbers show the following items*

1 Country
Year
Species
Area
Time
Number of samples
Number of fish measured
11 Sample weight
12 Catch weight of corresponding area-time strata
13 Weighting factor
14 Size classes

Type of gear	Since each type of gear selects different sizes of individuals from the stock, it is essential that samples from all major gears are taken. Since the relative importance of fishing gears varies between countries, a single list of important gears may not be appropriate. Select important gears for each species which covers the significant portion of the catch for each country. For the classification of gear, refer to Appendix 3. It is highly essential that samples from one gear be separated from samples taken by other types of gear. Do not mix samples from various gears.
Port (fish landing centers)	In case of port (fish landing center) sampling only, fill in the name of port where a sampling is done.
Sampling location	Check appropriate location(s) where a sampling is done.
Type of size measurement	Fork length is to be measured for all species of tuna-shaped fishes. Fork length is the length of the fish from the tip of the upper jaw to the fork of the tail. Eye socket fork length is to be measured for all species of billfishes. Eye socket fork length is the length of the fish from the posterior edge of the eye socket to the fork of the tail. See the figure showing the measurement of fork length and eye socket fork in the section on tuna sampling. Check and specify the appropriate measurement which was actually applied.

Time	Fill in year, quarter, month which are recorded as follows: Year : last two digits e.g. 81, 82, 83 or 84 Quarter : (1), (2), (3) or (4) Month : 01, 02, 03,.....11 or 12
Area	As in IPTP FORM III, area is expressed in the code number of 7 digits. Area signifies the location of fish catch from which the sample is taken. This does not signify the location where sampling is conducted. In general, it is disirable to compile size frequency data by small geographic areas to facilitate subsequent compilation for any appropriate region. In case of port (landing center) sampling, it is hoped that the actual location of fish catch can be estimated from the location of port in the rectangular area of 7 digits. If there are more than two rectangular areas, one area representing the biggest catch should be chosen.
Number of samples	Number of groups of fish measured in each time-area stratum. (Level 1 and Level 2)
Number of fish measured	Total number of fish measured in each area-time stratum. (Level 1 and Level 2)
Weight of fish measured	This information is only necessary for Level 1. The data can either be obtained from the sum of actual weight of sampled fish, or the calculated weight based on the length frequencies, using the length-weight relationship. (Level 1 only)

Total amount of catch from which samples were taken	This is the weight of the total catch recorded in each area-time stratum from which samples were taken. (Level 1 and Level 2)
Weighting factor	This is a factor used to weight Level 1 size frequency data to the size composition of catch, Level 2. The data are obtained by dividing the "total amount of catch from which sample taken" by the "weight of fish measured". (Level 1 and Level 2)
Size classes	The size class is generally expressed in 1 cm. intervals of fork length for small fish and 2 cm. intervals of fork length for large fish. For instance, for large fish 2 cm. groups are: 40 cm. - 41.9 cm.; 42.0 cm. - 43.9 cm.;....; 128.0 cm. - 129.9 cm.; 130.0 cm.- 131.9 cm.; etc. All sets of length intervals should start from zero. In forms, the intervals can be expressed by omitting the upper limit; e.g., 40.0-; 42.0-;...; 128.0-; 130.0; etc. Size frequency data must be in number of fish. Percentage is not necessary.

PROCESSING OF RAW DATA

In order to obtain level 2 Size Composition of Catch by area-time strata some data processing must be done. Figure 2 presents a flow chart illustrating the steps to be followed. Essentially, the data processing involves the substitution of missing segments of data and the weighing of the frequencies by catches.

DATA ON SIZE FREQUENCY
IPTP FORM IV - 1,2

CATCH AND EFFORT STATISTICS
(IPTP FORM III)

CATCH STATISTICS
(IPTP FORM I)

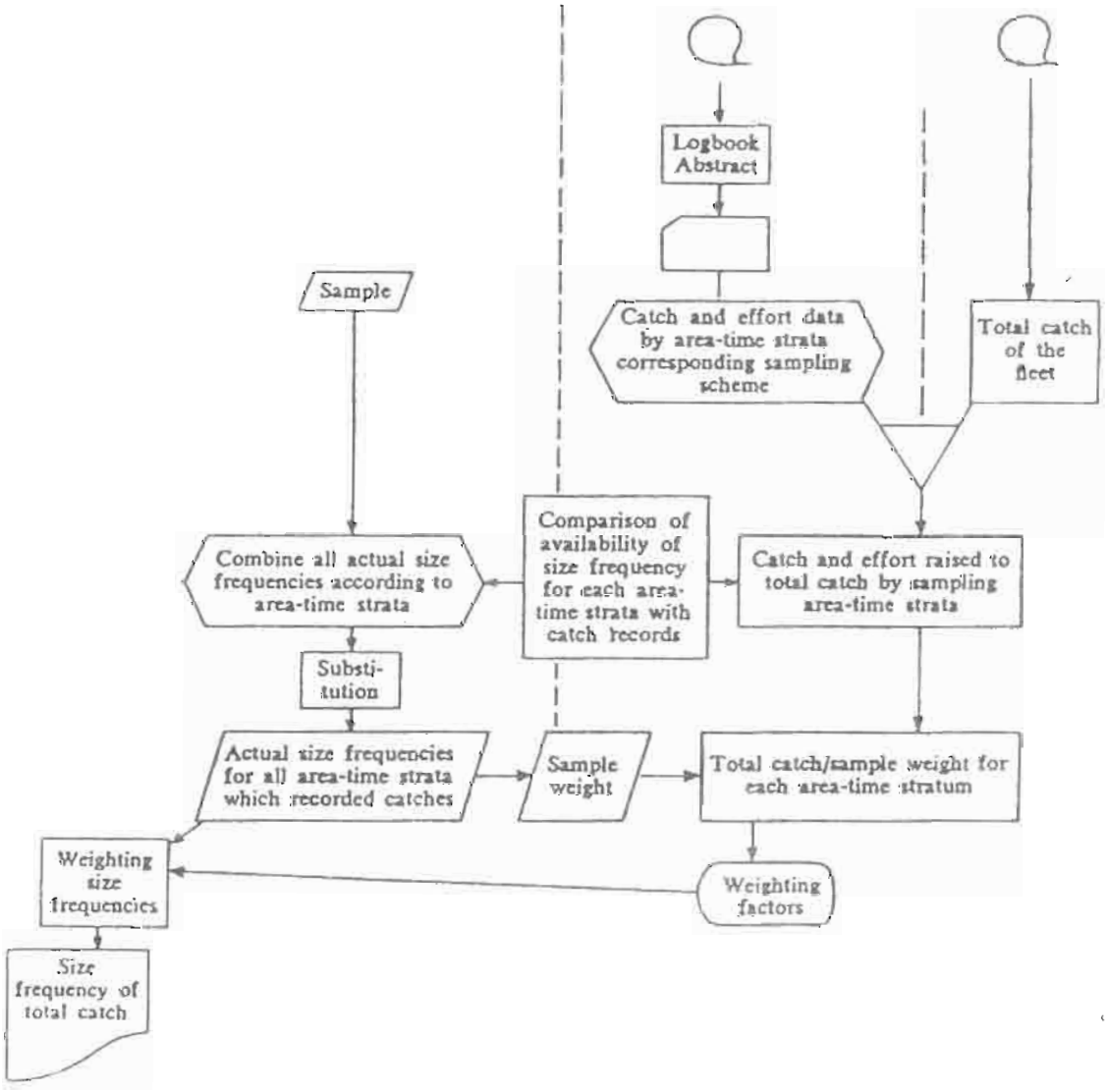


Fig. 2 - Flow-chart for weighting

1) Data substitution

The size data (actual measurements) should be combined by area-time strata adopted according to species.

These combined size data have to be checked for their availability against the total catch and effort data compiled by the same area-time strata. (The total catch and effort data by area-time strata can be obtained by compiling data recorded in IPTP Form III and by raising them to the total catch compiled in IPTP Form I.)

If a catch is recorded for any area-time strata but no size data are available, a substitution of data has to be made. There are several ways to do this.

a) Use size frequencies observed by the same type of fishery of another country in the same area-time stratum.

b) Use size frequencies observed by the same fishery in neighbouring areas during the same time period.

c) Use size frequencies in the same area-time strata but in previous years.

d) Use size frequencies observed in the same area but during the time periods preceding or following the period from which data are missing.

The best substitution varies according to the fishery, season, area, etc. In the surface fisheries a) might be the best solution. In the longline fishery b) or c) would be better than a).

At any rate, the data substitution is very tricky. The resultant catch by size could be completely different depending on how the substitution was made, which even may lead to a different conclusion in the population analyses. It is important that all the substitution procedures adopted should be well documented together with data.

2) Weighing to the total catch

When the substitution is completed, the size frequencies can be raised to a total catch. The weighing should be made for each area-time stratum.

a) Size frequency expressed in terms of number of fish should be converted to weight by using length-weight relationships. Now the fish in each length class is expressed in weight. The sum of those weights will give the estimate of sample weight.

Example. -- Yellowfin tuna

Size classes	Frequencies (No. of fish)	Av. weight of fish	Weight of fish in size classes
52 cm - 53.9 cm	10	2.87 kg	28.70 kg
54 cm - 55.9 cm	12	3.11 kg	37.32 kg
56 cm - 57.9 cm	15	3.47 kg	52.05 kg
.	.		.
.	.		.
.	.		.
Total		250	1050.24 kg*

*Sample weight

If all the fish measured have also been weighed, the above procedure would be unnecessary but the sum of weights can be used as sample weight. (See the section of field record of length frequency)

b) Total catches (in weight) recorded for each area-time stratum can be then divided by the sample weight. This will give weighing (raising) factors. For example: if the catch of yellowfin tuna in corresponding area-time strata is 1520 MT, while the sample weight is 1050.24 kg; the weighing factor = 1520/1.05024 = 1447.2882.

c) Actual size frequency should be multiplied by these weighing factors in order to obtain catch by size.

Example. - Yellowfin tuna Weighing factor = 1447.2882

Size classes	Actual frequencies	Weighed frequencies (No. of fish caught)
52 cm - 53.9 cm	10	14473 (= 10 x 1447.2882)
54 cm - 55.9 cm	12	17367 (= 12 x 1447.2882)
56 cm - 57.9	15	21709 (= 15 x 1447.2882)
.	.	.
.	.	.
.	.	.
Total	250	361822(=250 x 1447.2882)
		======

5. TUNA SAMPLING

5.1 Introduction:

In this section, the system and design for tuna sampling would be discussed in detail with the view to providing a guide-line for national statisticians or scientists who are responsible for establishing a tuna statistical data collection system and to collect and report the data to the IPTP data base.

5.2 Objectives of tuna sampling:

Tuna sampling is generally designed to get size frequency data on tuna and tuna-like species and referred to as 'biological sampling' which in many cases is aimed at collecting not only size data but also stomach contents, etc. However, in this manual, the tuna sampling aims at collecting data principally on size frequency for all types of fisheries, and at the same time to carry out sampling on catch and effort specifically for coastal fisheries. The reason why it aims at collecting data on catch and effort in addition to the size frequency data is intentionally to improve the existing data collection system on catch and effort in the process of getting data on size frequency, for countries in the region.

Although there are a few countries which are exceptional in the region that their tuna data are being collected with considerable high accuracy, in most countries in the region, it is highly recommended to establish a tuna sampling programme, because of lack of proper species breakdown, and poor estimations of catch and effort statistics in the general national statistics. In many countries, there are no effort statistics collected.

5.3 Instructions for survey design and method of sampling

Population:

As in any sampling problem, it is most essential to define the population being sampled and to choose an appropriate sampling unit. In this regard, a survey should be carried out to define the population prior to the sampling. What should be defined in the survey are, for each species, catch or the number of fishing units broken down by types of gear and type and size classes of boat and landing centers.

Species:

Priority will be given to those species most commonly exploited at present. The following species are captured in significant quantities by countries in the Indo-Pacific region and are listed in descending order of importance. Countries with different species ratings should emphasize sampling for their important species.

1. Tunas and bonitos

Katsuwonus pelamis	skipjack	SKJ
Thunnus albacares	yellow fin	YFT
Thunnus obesus	bigeye	BFT
Thunnus alalunga	albacore	ALB
Thunnus maccoyii	southern bluefin	SBF
Thunnus thynnus	nothern bluefin	BFT

Euthynnus affinis	Kawakawa	KAW
Auxis thazard	frigate tuna	FRI
Auxis rochei	bullet tuna	BLT
Thunnus tonggol	longtail tuna	LOT

2. Seerfishes (Spanish mackerels)

Scomberomorus commerson	narrow-barred king mackeral	COM
Scomberomorus guttatus	Indo-Pacific king mackeral	GUT
Scomberomorus lineolatus	streaked seerfish	STS
Scomberomorus niphonius	Japanese spanish mackeral	NPH

3. Billfishes

Makaira nigricans	blue marlin	BUM
Makaira indica	black marlin	BLM
Tetrapturus audax	striped marlin	MLS
T. angustirostris	shortbill spearfish	SSP
Istiophorus platypterus	sailfish	SAI
Xiphias gladius	swordfish	SWO

Types of gear to be measured:

All major types of gear involved in tuna fishings are to be covered by sampling. It is highly essential that samples from one gear be separated from samples taken from other types of gear. Do not mix samples from various gears, since each type of gear is selective for different sizes of individuals from the stock.

A sampling design such as sample size, selection of sampling units and landing centers should be established for each type of gear.

Landing centers to be selected as monitoring sites:

Landing centers, where important species are landed and are covering important types of gear, are to be selected as monitoring sites. It is desirable to select the landing centers as many as possible to be able to cover the important landing centers. Prior to the allocation of sampling centers, a study on the geographical distribution of catch and tuna fishing units would be essential to define the population in terms of the location of landing centers.

Frequency of sampling and sample size:

This is the most important item to be considered before any sampling program is started. Sample size must be large enough to provide the needed information with the required accuracy and a sample size larger than necessary does not provide any statistical benefit and results in waste of time and money. While there are very exact procedures from sampling theory for estimating sample size, these provide us with little benefit since we do not have a well defined experiment and fish populations do not remain fixed in time, location or composition. Hence, a standard procedure will be described below that has proven adequate in most fisheries work.

Based on the theory of sampling, different sample size should be applied to every different subject to be estimated. In this tuna sampling, sample size as well as sampling unit has to be designed separately for every different subject - size frequency of fish and catch and effort. On the other hand, one important factor to be considered for sample size is the cost and samplers (enumerators) available. As a sampling is not possible to implement without the budget and samplers, there are many cases in which the sample size is determined on the basis of the budget and samplers available, rather than on calculated requirements.

It is not simple to answer the question on the number of sampling days required in a month for the tuna sampling. It depends on the number of days/month on which fishing boats come back from fishing and land their fish on the shore and the number of fishing boats/day. In case of large-scale tuna longliner, the number of boats are very limited, and thus it must be necessary to measure the fish every time the fishing boats come back to the landing centers.

In case of a landing center where a large number of small-scale fishing boats land their catch almost every day and continue their landings throughout a month, it is not necessary to sample the catch and effort every day, because there may be a small variance of catch/boat between days/month, but every 3 days, totalling 10 days/month, are necessary. It may be possible to increase and reduce the frequency to every 2 to 5 days, depending on the situation of the number and catch of fishing boats coming to the landing center as well as on the sampler available. Sampling should be avoided during off-seasons for the fishery.

The number of boats to be selected on a sampling day is also dependant on the number and size of catch of fishing boats/day coming into the landing center. On an average, it will be possible for a sampler to sample 10 boats per day. It may be permissible to reduce to 5 boats, depending on the condition. When variance is large, it must be increased to 20 boats.

Note that in case the variance between catch/day is comparatively larger than the variance between catch/boat during a month, the number of sampling days/month should be increased and the number of boats sampled/day should be decreased. When the situation is adverse, decrease the number of sampling days/month and increase the number of sample boats/day.

The needed information on size frequency at the required level of accuracy can usually be obtained by measuring about 500 fish of each species for each sampling area, for each sampling period and for each country gear category. When variances between sample boats and within sample boats are small, even 200 fish may provide adequate data. The following are some explanation on two different fisheries.

(1) Longline fishery (large-scale fishery)

Since the longline catches unschooled fish, at a depth, and since a set extends as long as 120 km to catch a few fish, the variance of fish size between samples from different boats is not larger than the variance of fish size within a sample taken from one boat. Probably, from 10 boats, 50 fish each can be sampled to get 500 fish for each area-time stratum. For small, coastal longliner, it may be better to take from 25 boats (5 days x 5 boats) and 20 fishes from each.

(2) Surface fishery (purse seine, ring net, pole and line, gill net, etc.)

Generally, these gears catch schooling fish near the surface. They make much larger catches in number per day than the longliners, while their area of operations is limited. Generally, fish of similar size tend to form a school. A sample taken from a school has little within-sample variance of fish size. On the other hand, the between-sample variance of fish size taken from different schools tends to be large.

Probably, from 25 boats (5 days x 5 boats) 20 fish each, can be sampled to get 500 fish for each area-time stratum.

These guide lines are only general rules. The samplers or their supervisors should monitor the sampling procedure and adjust the sampling scheme as appropriate.

Unplanned sampling tends to produce an excessively large amount of data from the area and time where and when the fisheries are at peak, while it tends to produce a very poor sample from the area and time where and when fishing is inactive. Measurement should not be made proportional to the size of catch but a more even amount of measurements should be made.

Selection of samples:

Sampling should be carried out periodically, say every third day including holidays, except for the period of off-fishing season and of non fishing days or non-fish landing days.

On each sample day, select sample boats with a fixed interval. For instance, in case of 10 sample boats to be selected for each type of gear:

- less than 10 boats, sample all boats
- 20 boats, sample every second boat
- 50 boats, sample every fifth boat
-100 boats, sample every tenth boat

In this connection, total number of boats incoming to the landing center on the sample day for each type of gear should be previously known.

On each sample boat, fish should be sampled at random. For instance where fish are arranged in line for sale at a market, every certain number of fish can be selected (for example, every fifth fish). If circumstances do not permit the above procedure and one has to select from a pile of fish, it is probably best to separate a section from the pile including fish from both top and bottom, and measure them. Exercise caution because sometimes large fish are selectively placed at the bottom of the pile or vice versa. In this way, if only the fish at the top of the pile are measured, the sample is biased.

Survey method and recording data

Survey is carried out with IPTP FORM V-1 DAILY RECORD OF TUNA SAMPLING, IPTP FORM V-2 FIELD RECORD OF LENGTH FREQUENCY and IPTP FORM IV MONTHLY FORM OF TUNA SAMPLING. Following is a brief description on how to conduct the survey and record data collected.

I. IPTP FORM V-1 DAILY RECORD OF TUNA SAMPLING.

1. For all boats landed

On a sample day, for each type of fishing gear, record the total number of boats landed by type and size of class and their effort and catch by species (kg) appropriately in the form V-1. For species classification, see the Appendix 2. In case where tuna and tuna-like species are by-catch for the gear, include target species accordingly together with tuna and tuna-like species.

The information of all the above can probably be obtained from a market authority or someone else. If not, the sampler should estimate them by himself by the following formula: (1) total number of boats landed x (2) average effort and catch by species per boat. (1) has to be counted by sampler himself during the course of sampling with the help of market authority or someone else. (2) is obtained as a result of sampling by dividing the sum of total catch by species and efforts delivered from fishing boats sampled by total number of fishing boats sampled.

2. For sampled boats

(1) Catch and effort

For each sampled boat, record the following information on the appropriate column of form V-1.

- name / number of boats
- type and size class
- fishing effort
- catch by species (kg)

Method of estimation on catch by species

Tuna and tuna-like species may be landed either in containers or by pieces. Also, catches may or may not be weighed, depending upon the circumstances. When catches are weighed, record weights in the unit of kg. When catches are not weighed, estimate weights as follows:

Landings in containers:

Determine mean weight (capacity) of standard containers at inception of sampling by weighing several containers filled with fish. Check weight of containers at regular intervals. Estimate total weight by multiplying mean weight by number of containers.

Landings by pieces:

Weigh several selected fish and estimate mean weight for each species. Estimate total weight for each speices by multiplying mean weight by number of fish.

Estimation procedures:

Different procedures for estimation of catch by species are to be employed depending on the disposition of the landings. The types of landings and corresponding procedures to be followed are given below as example.

1. Unsorted catches landed in containers:

- Estimate total weight of catch
- Randomly select containers and sort to species
- Weigh each species in selected containers
- Estimate of species A =

$$\text{total weight} \times \frac{\text{weight of species A in selected containers}}{\text{weight of selected containers}}$$

2. Sorted catches landed in containers

- Randomly select containers contained with A species and estimate mean weight of the container

- Estimate of species A = weight of container of species A X number of containers

3. Partially sorted catches landed in containers.

3.1 Sorted portion

- Randomly select containers contained with A species and estimate mean weight of the containers
- Estimate of speices A = mean weight of container of species A X number of containers

3.2 Unsorted portion

- Estimate total weight of catch
- Randomly select containers and sort to species
- Weigh each species in selected containers
- Estimate of species A =total weight

$$X \frac{\text{weight of species A in selected containers}}{\text{weight of selected containers}}$$

4. Sorted catches landed by pieces

- Count number of fish by species
- Randomly select fish and estimate average weight of fish
- Estimate of species A = average weight of species A X number of species A

5. Partially sorted catch landed by pieces

5.1 Sorted portion

- Count number of fish by species
- Randomly select fish and estimate average weight of fish
- Estimate of species A = average weight of species A X number of species A

5.2 Unsorted portion

- Count number of fish for each species
- Randomly select fish and estimate average weight of fish for each speices
- Estimate of species A = average weight of species A X number of species A

In case where counting number of fish is not practical, estimate total weight and weight for each species by taking some samples randomly so that estimate of species A can be obtained by the following formula.

$$\text{Estimate of species A} = \text{Total weight} \times \frac{\text{weight of A species in samples}}{\text{total weight in samples}}$$

(2) Summary of size frequency

This part is to be made for recording daily summary of size frequency data. For each species, number of boats sampled, total number of fish measured and total weight of fish measured should be recorded in form V-1.

II. IPTP FORM V-2 FIELD RECORD OF LENGTH FREQUENCY

This form can be used for field recording of length frequency data. It is designed to be used for each sample day, for each landing center and for each type of gear. A sample boat may cover upto three species but the form can be extended to cover six species in one sheet. For one species, 50 columns are set for data entry on fish length.

Total weight of fish measured

During the course of length measurement, this element of total weight of fish sampled should be scaled and recorded in Form V-2.

This information is used in processing data to convert size frequency data (Level 1) to size composition of catch (Level 2). The data can also be obtained from the calculated weight based on the length frequencies, using the length-weight relationship.

Equipment used for measurement

i) Calipers

Calipers may be the most convenient and suitable tool for measuring large tunas (Fig.3) They are easily made of wood and brass.

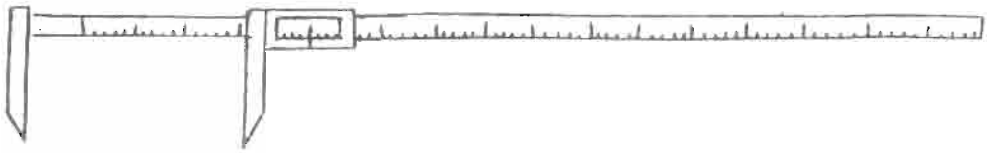


Fig. 3. - An example of calipers.

ii) Measuring board

A measuring board may also be used (Fig.4). Such a board is particularly suitable for measuring small fish.

Fig. 4. - An example of a measuring board.

iii) Tape

A steel measuring tape can also be used, but it is not recommended. If a tape measurement is unavoidable, an attempt must be made to keep the tape straight. The best would be to place a tape on the floor and place the fish on top of the tape, or to place the tape on the floor to the side of the fish being measured.

iv) Photographic techniques

In many countries, fishermen refuse a sampler even to touch the fish. In such a case, photographic techniques might be applied to estimate size composition. The basic principle is to take photographs of fish together with a scale placed in the same plane as the fish. Later, the fish length can be calibrated relative to the scale in the picture. Particular care should be taken so that the camera's line of sight is perpendicular to the plane of the fish.

It is much more costly than measuring directly and provides less accurate data.

What measurements should be taken:

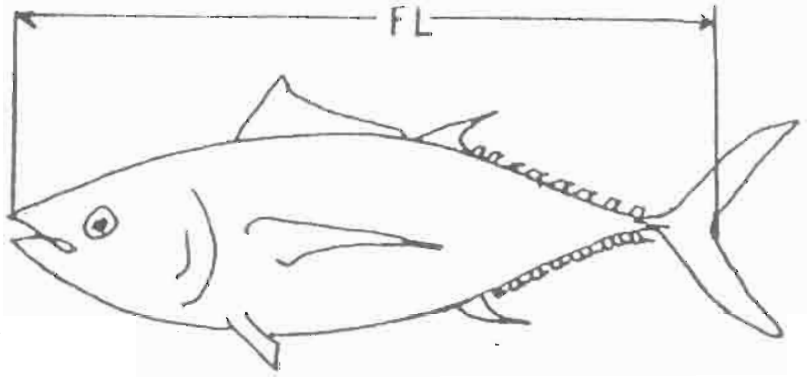
Tunas: All species except billfishes must be measured in fork length, that is, a projected straight distance from the tip of the upper jaw to the posterior tip of the shortest caudal ray (fork).

Billfishes: Billfishes must be measured in eye orbit fork length, that is, a project straight distance from the posterior edge of the eye orbit to the posterior tip of the shortest caudal ray.

The fish should be placed on a flat surface in a horizontal position while being measured. Fish with broken snout or tail, or frozen fish not in a straight position should be rejected.

Record length to the nearest 1.0 cm as below:

13.0 - 13.9 cm = 13 cm.
14.0 - 14.9 cm = 14 cm.



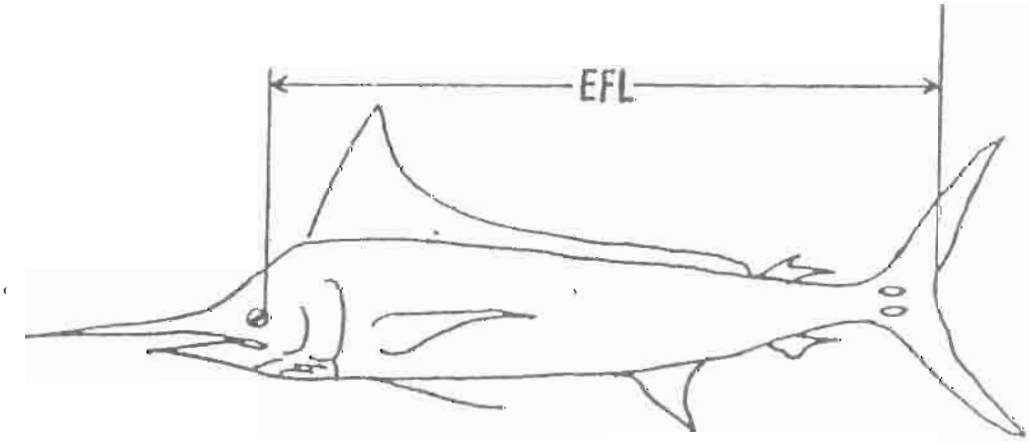


Fig. 5. - Length measurement of tuna and tuna-like fishes. Upper jaw-fork length (FL) is used for all tunas. For billfishes since the bill and sometimes the tip of the low jaw is cut off, posterior edge of eye socket-fork length (EFL) is used.

6. SPECIES IDENTIFICATION

(under preparation)

Appendix 1 IPTP Reporting Forms

IPTP FORM	I	CATCH STATISTICS
	II	FISHING BOAT STATISTICS
	III	CATCH AND EFFORT STATISTICS
	IV-1	ACTUAL SIZE FREQUENCY
	IV-2	SIZE COMPOSITION OF CATCH
	V-1	DAILY RECORD OF TUNA SAMPLING
	V-2	FIELD RECORD OF LENGTH FREQUENCY
	V-3	MONTHLY REPORT OF TUNA SAMPLING

IPTP FORM I

TUNA STATISTICS IN INDO-PACIFIC
1. CATCH STATISTICS

REPORTING COUNTRY ______________ YEAR 19______

FLAG COUNTRY ______________ WEIGHT UNIT ______

FAO AREA	IPTP SUB-AREA	GEAR	TYPE & SIZE OF BOAT	CATCH BY SPECIES										
				TOTAL CATCH										

IPTP FORM II

TUNA STATISTICS IN INDO-PACIFIC
2. FISHING BOAT STATISTICS

REPORTING COUNTRY _____

FLAG COUNTRY _____ YEAR _____ UNIT = NO. OF BOAT

FAO AREA	IPTP SUB-AREA	TYPE OF GEAR	TYPE & SIZE OF BOAT	NO. OF BOATS (_____ *)		
				MULTIPURPOSE	TUNA ONLY	TOTAL

*Insert a word 'Operated' or 'Registered'

IPTP FORM 3I

TUNA STATISTICS IN INI

3. CATCH AND EFFORT STATISTICS

REPORTING COUNTRY _____ (1 2 3)

FLAG COUNTRY _____

FAC AREA _____ (7 8)

IPTP SUB-AREA _____

YEAR 19 (11 12)

TYPE OF GEAR _____ (5)

TYPE & SIZE CLASS OF BOAT _____

UNIT OF CATCH _____ (6)

UNIT OF EFFORT _____

DATA : Sampled ☐ Coverage Rate (13 14) %

100% Coverage ☐ Original coverage _____ %

AREA(A) SIZE	AREA(A) QUADRANT	AREA(A) LAT 27	AREA(A) LONG 29	AREA(B) (PORT, REGION, DISTRICT, ETC)	EFFORT 32	CATCH BY SPECIES: TOTAL 39	45								

IPTP FORM IV-1

TUNA STATISTICS IN INDO-PACIFIC
4.1 ACTUAL SIZE FREQUENCY

REPORTING COUNTRY _____ ☐☐☐

YEAR _____ ☐☐

FLAG COUNTRY _____ ☐☐☐

FAO AREA _____ ☐☐

SPECIES _____ ☐☐

IPTP SUB-AREA _____ ☐☐

GEAR _____ ☐☐

TYPE OF SIZE MEASUREMENT :
FORK LENGTH (CM)
OTHERS (SPECIFY) _____

PORT _____
(LANDING CENTER)

SAMPLING LOCATION : ☐ AT SEA ☐ WHILE UNLOADING ☐ COLD STORAGE ☐ FREIGHTER ☐ CANNERY
☐ OTHERS (SPECIFY) _____

TIME (Month)									
AREA (Lat.-long. area)									
No. of samples									
No.of fish measured									
Weight of fish measured									
Total amount of catch No.									
from which samples taken Wgt.									
Weighting factor									
Size class									
1 cm interval	2 cm interval	3 cm interval							
- .9	-1.9	-							
1.0-1.9	2.0-3.9	-							
2.0-2.9	4.0-5.9	-							
3.0-3.9	6.0-7.9	-							
4.0-4.9	8.0-9.9	-							
5-	0-	-							
6-	2-	-							
7-	4-	-							
8-	6-	-							
9-	8-	-							
0-	0-	-							
1-	2-	-							
2-	4-	-							
3-	6-	-							
4-	9-	-							
5-	0-	-							
6-	2-	-							
7-	4-	-							
8-	6-	-							
9-	8-	-							

IPTP FORM V - 1

TUNA STATISTICS IN INDO-PACIFIC
DAILY RECORD OF TUNA SAMPLING

Day/Month/Year _____

Landing Center _____

Type of gear _____ Sampler _____

1 FOR ALL BOATS LANDED

Type & Size	No. of Boats Landed	Effort			Catch by species (kg)									
		No. of days fishing			Total									

2 FOR SAMPLED BOATS (1) CATCH AND EFFORT

Name of Boat (or Register No.	Type & size class	Effort			Catch by species (kg)									
		No. of days fishing			Total									
Total														

(2) SUMMARY OF SIZE FREQUENCY

Species	No. of boats sampled	Total no. of fish measured	Total weight of fish measured kg

IPTP FORM IV - 2

TUNA STATISTICS IN INDO PACIFIC

4.2 SIZE COMPOSITION OF CATCH

REPORTING COUNTRY ☐☐☐ YEAR ☐☐

FLAG COUNTRY ☐☐☐ FAO AREA ☐☐

SPECIES ☐☐ IPTP SUB-AREA ☐☐

GEAR ☐☐ TYPE OF SIZE MEASUREMENT :

FORK LENGTH (CM)

PORT

(LANDING CENTER) OTHERS (SPECIFY) _____

SAMPLING LOCATION : ☐ AT SEA ☐ WHILE UNLOADING ☐ COLD STORAGE ☐ FREIGHTER ☐ CANNERY

☐ OTHERS (SPECIFY) _____

TIME (Month)									
AREA (Lat.-long. area)									
No. of samples									
No.of fish measured									
Weight of fish measured									
Total amount of catch from which samples taken: No.									
Total amount of catch from which samples taken: Wgt.									
Weighting factor									
Size class									
1 cm interval	2 cm interval	3 cm interval							
- .9	-1.9	-							
1.0-1.9	2.0-3.9	-							
2.0-2.9	4.0-5.9	-							
3.0-3.9	6.0-7.9	-							
4.0-4.9	8.0-9.9	-							
5-	0-	-							
6-	2-	-							
7-	4-	-							
8-	6-	-							
9-	8-	-							
0-	0-	-							
1-	2-	-							
2-	4-	-							
3-	6-	-							
4-	8-	-							
5-	0-	-							
6-	2-	-							
7	4-	-							
8-	6-	-							
9-	8-	-							

TUNA STATISTICS IN INDO-PACIFIC
FIELD RECORD OF LENGTH FREQUENCY

Day/Month/Year ____________________

Landing Center ____________________

Type of gear ____________________ Sampler: ____________

Name of boat: ____________________ Name of boat: ____________________

Type and size of boat: ____________________ Type and size of boat: ____________________

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured ____________ kg

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured ____________ kg

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured : ____________ kg

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured : ____________ kg

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured : ____________ kg

Species : ____________________

No.of fish measured : ____________________

Total weight of fish measured : ____________ kg

IPTP FORM V - 3

TUNA STATISTICS IN INDO-PACIFIC
MONTHLY REPORT OF TUNA SAMPLING

Month/Year ____________________

Landing Center ____________________

Type of gear ____________ Sampler ____________

1. CATCH AND EFFORT

Sampling Date													
Effort	No. of boats landed												
	Total no. of days fishing												
Catch by species	Total												
	YFT												
	SKJ												

2. SIZE FREQUENCY

Sampling Date													Total
Species	No. of boats sampled												
	No. of fish measured												
	Weight of fish measured kg												
Species	No. of boats sampled												
	No. of fish measured												
	Weight of fish measured												
Species	No. of boats sampled												
	No. of fish measured												
	Weight of fish measured												
Species	No. of boats sampled												
	No. of fish measured												
	Weight of fish measured												
Species	No. of boats sampled												
	No. of fish measured												
	Weight of fish measured												

APPENDIX 2

CLASSIFICATION OF TUNA AND TUNA-LIKE SPECIES

Alpha Code	Scientific name	FAO English name	Code number
	(1)Tunas and bonitos :		
ALB	Thunnus alalunga	Albacore	01
BAU	Sarda australis	Australian bonito	02
BET	Thunnus obesus	Bigeye tuna	03
BFT	T. thynnus	Northern bluefin tuna	04
BIP	Sarda orientalis	Indo-Pacific bonito	05
BLT	Auxis rochei	Bullet tuna	06
BUK	Gasterochisma melampus	Butterfly kingfish	07
DOT	Gymnosarda unicolor	Dogtooth tuna	08
FRI	Auxis thazard	Frigate tuna	09
FRZ	A. thazard & A. rochei	Frigate & bullet tunas	10
KAW	Euthynus affinis	Kawakawa	11
LEG	Cybiosarda elegans	Leaping bonito	12
LOT	Thunnus tonggol	Longtail tuna	13
SBF	T. maccoyii	Southern bluefin tuna	14
SKJ	Katsuwonus pelamis	Skipjack tuna	15
SLT	Allothunnus fallai	Slender tuna	16
YFT	Thunnus albacares	Yellowfin tuna	17
TUN	Scombridae	Tunas NEI	19
	(2) Seerfishes :		
CHY	Scomberomorus sinensis	Chinese seerfish	21
COM	S. commerson	Narrow-barred king mackerel	22
BBM	S. semifasciatus	Broad-barred king mackerel	23
DBM	Grammatorcynus bicarinatus	Double-lined mackerel	24
GUT	S. gattatus	Indo-Pacific king mackerel	25
KAK	S. plurilinatus	Kandi kingfish	26
KOS	S. Koreans	Korean seerfish	27
NPH	S. niphonius	Japanese Spanish mackerel	28
QUM	S. queenslandicus	Queensland school mackerel	29
STS	S. lineolatus	Streaked seerfish	30
WAH	Acanthocybium solandri	Wahoo	31
KGX	Scomberomorus spp	Seerfishes NEI	39
	(3) Billfishes :		
BLM	Makaira indica	Black marlin	41
BUM	M. nigricans	Blue marlin	42
MLS	Tetrapturus audax	Striped marlin	43
SAI	Istiophorus platypterus	Sailfish	44
SSP	T. augustirostris	Shortbill spearfish	45
SWO	Xiphias gladius	Swordfish	46
BIL	Istiophoridae	Billfishes NEI	49
OTH	Includes other mixed species of tunas or "unknown speices".		59

APPENDIX 3

GEAR CLASSIFICATION

The gear used in tuna fishing in this region are broadly classified as follows.

Gear	Explanation	Codes	
		Alpha-Codes	Numeric Codes
Longline	A set of lines to which branch lines with hooks are attached. All types and sizes of longlines such as mother-boat longline, foreign-based longline, home-based longline, coastal longline and distant-water longline, are included in this category.	LL	1
Pole & Line	Live bait is chummed to attract tuna schools which are then fished with pole and line. All types and sizes of pole and lines operating in coastal and distant waters are includled.	BB	2
Purse seine	This net is one of surrounding nets and characterized by the use of a purse line at the bottom of the net. The purse line enables the net to be closed like a purse and thus retain all the fish caught. A purse seine is operated by one or two boats with or without an auxiliary skiff. In many cases, the purse-seine is operated in association with Fish Aggregating Divice (FAD) known as "Payao" in the Philippines and with lights in coastal waters.	PS	3

Ring net	Ring net is one of surrounding nets with purse line. It is very similar to purse seine but differs from purse seine in having the bunt in the middle and purse rings at the bottom. The net is operated inthe Philippines in association with "Payao".	RIN	4
Lift net	The fish, which may be attracted by light or bait, are captured in nets consisting of a horizontal netting panel or a bag-shaped net. The net is lifted by hand or mechanically from the shore or from a boat. The bag net operating in the Philippines includes in this category.	LIF	5
Seine net	This can be operated either from the shore (beach seine) or from the boat. The manner of capture is to surround an area of water with a long net with or without a bag.	SEN	6
Gill net	With this type of gear, the fish are gilled or enmeshed in the netting. For capturing tunas and tuna like species, a drift gill net is the most common.	GILL	7
Trolling	A boat equipped with a line or lines, each having one or more hooks. Lines are trolled from the running boat either directly or held by a pole or poles.	TROL	8
Handline	Lines held by hand with or without chumming of bait.	HAND	9

Trawl	A net which is immersed in the water and then dragged for a certain period, either at the bottom or in mid-water. This is a gear not aimed at tuna fish but which incidentally catches them.	TRAW	10
Others	Any other fishing gear not described above.	UNCL	11
Sport gear	All fishing methods (including those described above) not carried out as commercial activity (that is not with the intention of selling fish for profit.)	SPOR	12

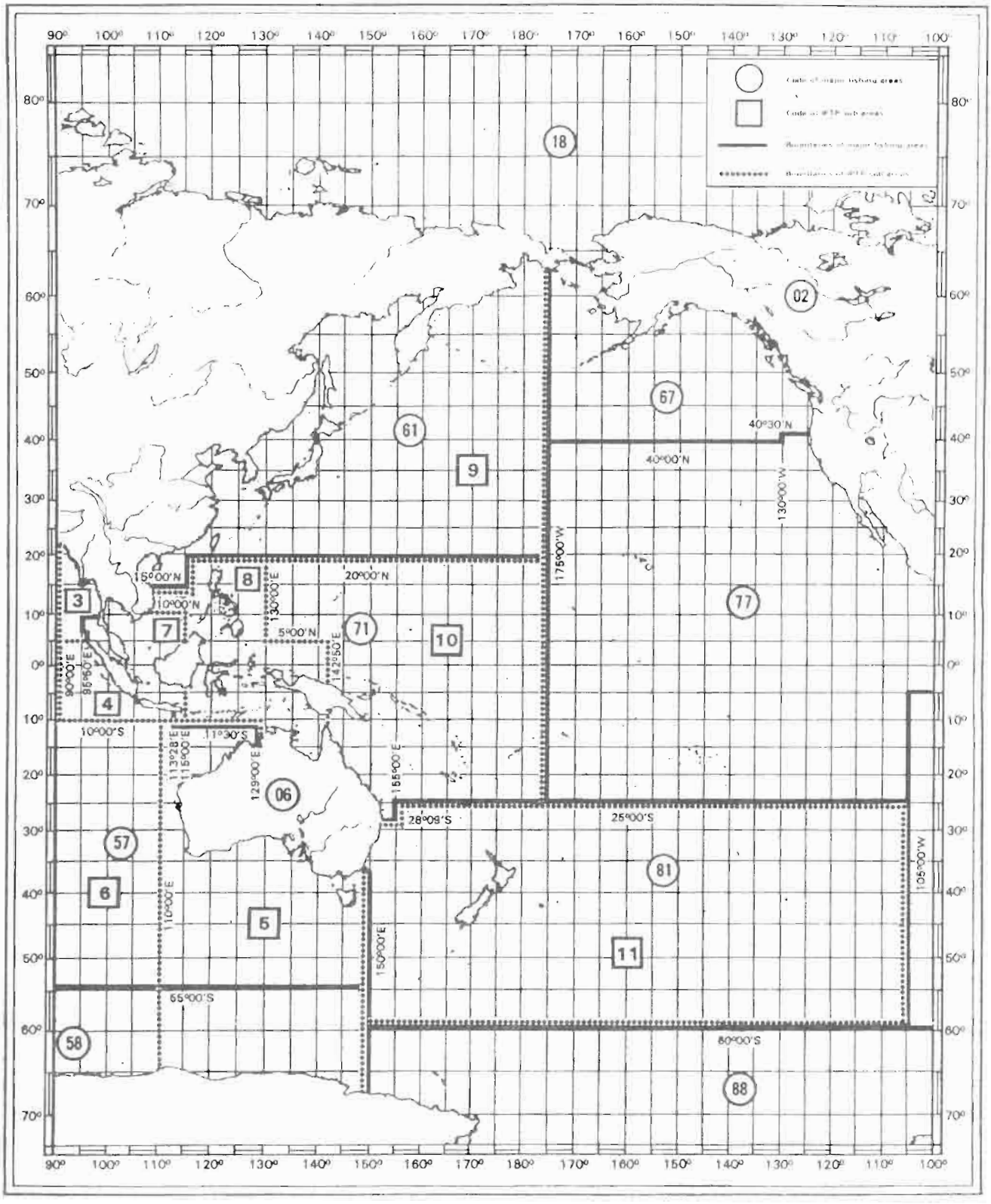
APPENDIX 4

Type and Size of Boat Classification

Type and size class	Code number
Non-mechanized boat	1
Mechanized boat (with either in-board engine or out-board engine)	2
Less than 10 GT	3
10 - 50	4
50 - 100	5
100 - 500	6
500 GT and over	7
Unknown	8

Appendix 5

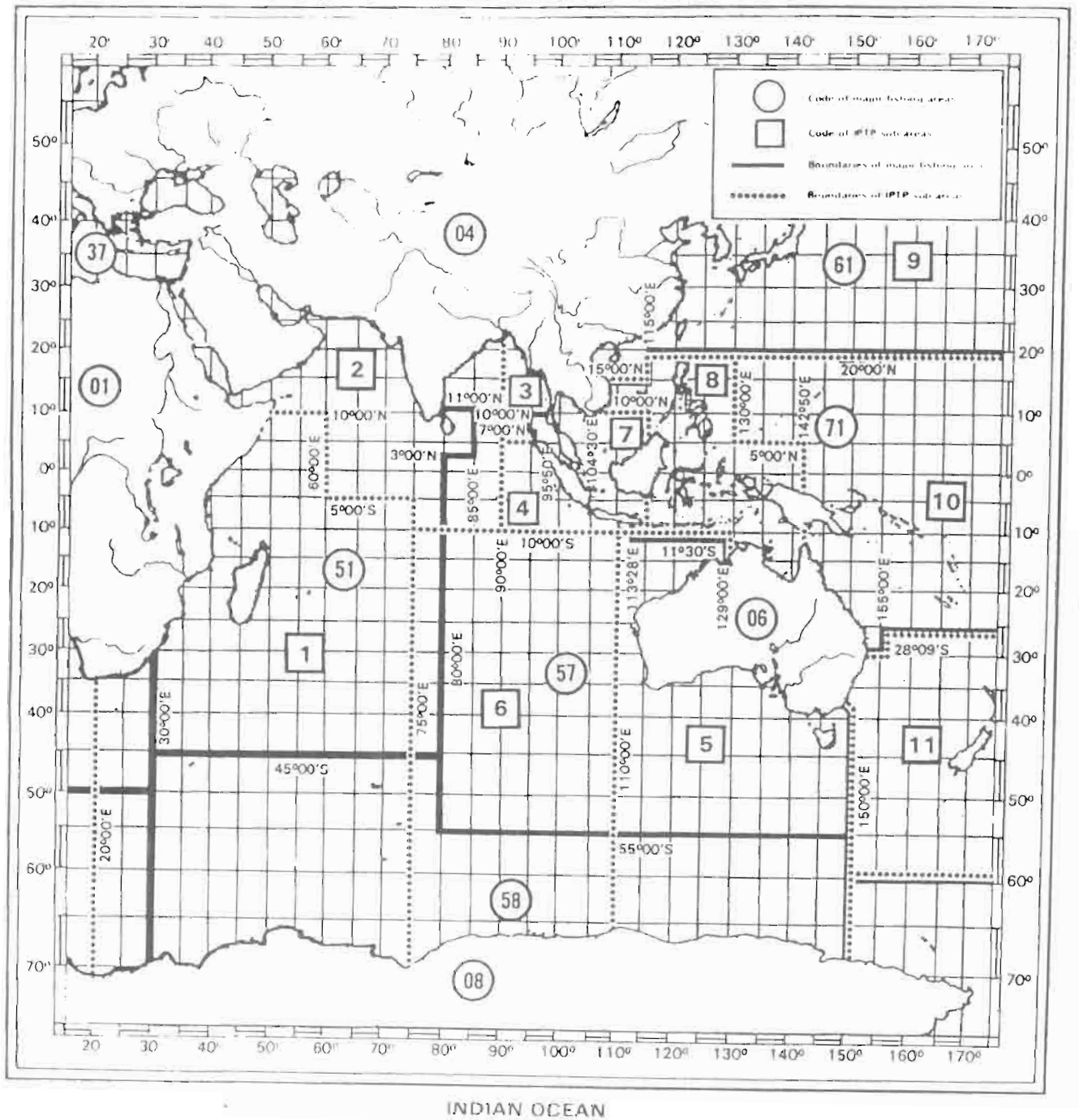
FAO MAJOR FISHING AREAS AND IPTP SUB-AREAS FOR STATISTICAL PURPOSES



WESTERN PACIFIC OCEAN

Appendix 5

FAO MAJOR FISHING AREAS AND IPTP SUB-AREAS FOR STATISTICAL PURPOSES



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