



INDO-PACIFIC TUNA DEVELOPMENT AND MANAGEMENT PROGRAMME



SEYCHELLES FISHING AUTHORITY

SIFA/950F

IPTP/82/GEN/3  
SCS/GEN/82/46

December 1982

REPORT OF THE CONSULTATION MEETING OF THE JOINT  
INDONESIAN/PHILIPPINE TUNA WORKING GROUP

Manila, Philippines  
21-23 October 1981

# IPTP

c/o FAO Representative  
P.O. Box 1505  
Colombo 7, Sri Lanka

or  
c/o South China Sea Fisheries Programme  
P.O. Box 1184 M.C.C.  
Makati, Metro Manila, Philippines

United Nations Development Programme

Executing Agency  
Food and Agriculture Organization  
of the United Nations



Work Plan Implementation  
(General)

IPTP/82/GEN/3  
SCS/GEN/82/46

IPTP/82/GEN/3  
SCS/GEN/82/46

December 1982

REPORT OF THE CONSULTATION MEETING OF THE JOINT  
INDONESIAN/PHILIPPINE TUNA WORKING GROUP

Manila, Philippines  
21-23 October 1981

SOUTH CHINA SEA FISHERIES DEVELOPMENT AND COORDINATING PROGRAMME  
Manila, Philippines  
December 1982

#### **NOTICE OF COPYRIGHT**

The copyright in this publication is vested in the Food and Agriculture Organization of the United Nations. This publication may not be reproduced, in whole or in part, by any method or process, without written permission from the copyright holder. Applications for such permission with a statement of the purpose and extent of the reproduction desired, should be made through and addressed to the Programme Leader, South China Sea Fisheries Development and Coordinating Programme, P.O. Box 117, M.C.C., Makati, Metro Manila, Philippines.

TABLE OF CONTENTS

	<u>Page</u>
1. PURPOSE OF THE MEETING	1
2. AGENDA	1
3. SUMMARY REPORT	1
3.1 Philippine Report	1
3.2 Indonesian Report	2
3.3 Data Collection	2
3.4 Tuna Tagging	2
3.5 Collaboration with the Fishing Industry	3
3.6 Recommendations	3
4. LIST OF PARTICIPANTS	5

ANNEXES

Annex 1 - Summary Report of the BFAR/SCSP Sampling Project - R. Ganaden (Ref. Paper No. 1)	7
Annex 2 - A Review of the East Indonesian Skipjack Pole and Line Fishery - M. Unar (Ref. Paper No. 2)	19
Annex 3 - Landing Statistics - M. Yesaki (Ref. Paper No. 3)	33
Annex 4 - Summary of Project Activities "Establishment of a Biological Data Collection System for Tuna and Related Species in Mindanao (Philippines) and Eastern Indonesia Area" (Excerpts from the Report to the Donors of the Project GCP/RAS/ 089/NOR (Ref. Paper No. 4)	39
Annex 5 - Why Tag Tunas? Skipjack Survey and Assessment Programme South Pacific Commission - R. Gillett (Ref. Paper No. 5)	55

## 1. PURPOSE OF THE MEETING

To discuss and coordinate the ongoing Tuna research activities in Indonesia and the Philippines.

## 2. AGENDA

1. Introduction to the meeting by the Programme Leader of the Tuna Management Project
2. Results of the tuna sampling programme in Philippines and Indonesia
  - 2.1 Report from Philippines
  - 2.2 Report from Indonesia
3. Future activities
  - 3.1 Data collection
  - 3.2 Biological sampling
  - 3.3 Tagging
  - 3.4 Small tuna and other related species
4. Collaboration with the fishing industry
5. Other matters

## 3. SUMMARY REPORT

A Consultation Meeting of the Joint Indonesian/Philippine Tuna Working Group organized by the South China Sea Fisheries Development and Coordinating Programme was held from 21-23 October 1981 at Tradewinds Hotel, Manila, Philippines.

The purpose of the meeting was to discuss the status of the ongoing tuna research activities in Indonesia and the Philippines and establish direction which the programme should take in the future.

The discussion was centered on several areas relevant to the above-mentioned purpose. (See agenda above).

Below are the results of the matters taken up:

### Philippine Report

After the summary of the analysis of the Philippine data, suggestions were made regarding the possible improvements on identification of juvenile tuna less than 14 cm and the description of the principal encircling gears currently utilized in the tuna fisheries with particular reference to the net size and mesh size. The representative of the fishing industry described in general the mesh and net sizes of the larger purse seine used in the Philippine tuna fisheries mentioning that the boats of American origin

utilize mesh sizes that ranges from 3 to 4 1/2 inches while the smaller vessels use mesh sizes from 2 inches up, but it was recognized that some of the smaller boats are using mesh sizes of less than 2 inches.

Comments were made on the attempts of the tuna industry to control fishing activities such as the attempts of the tuna purse seine association to limit the number of payaos to 40 per vessel and to agree on their location and spacing.

### Indonesian Report

The summary on the analysis of the Indonesian data gave information on the condition factor and growth increments, as well as catch, effort and catch rates for the pole and line fisheries. A pilot scheme is being established by a state enterprise to increase the pole and line catches by using payaos but this project is in its early stages and data are not yet available. It was also mentioned that some Japanese vessels are still licensed to catch tuna in the 200 nautical mile limits of Indonesia.

### Data Collection

The analysis on the status of the tuna statistics in Indonesia and the Philippines showed that it is necessary to improve the species breakdown in Indonesia and the information on effort in the Philippines. Regarding the latter, proposals were considered in order to obtain better information on the catches of commercial boats and yields of payaos. This may include observers on board commercial boats, aerial surveillance by government planes of the area where payaos are concentrated, vessel surveillance either by research vessels or fishing boats.

### Tuna Tagging

The consultant from the South Pacific Commission presented the results of a skipjack tagging programme carried out during the previous four years in the islands of the Central and Western Pacific. Useful information was obtained on tuna movement, stock structure, growth, harvest rates, and stock interaction. It was stressed that when a tuna tagging programme is carried out, the benefits are maximized if fish are properly tagged, if methods are consistent throughout the area, and that if an active effort is made to assure that recaptured tags are returned.

Following, the particulars of a tagging programme to be implemented in Indonesia and the Philippines were discussed. Twenty thousand tags was recommended as a minimum required to gain sufficient tag returns as demonstrated by the South Pacific Commission Tagging Programme. Equipment costs for the tagging of 20,000 tuna would be approximately US\$25,000. A reasonable time frame for active vessel operation of the 100 GT class would be around ten months. Recognizing the technical problems of tagging the smaller tunas, it was agreed that skipjack and yellowfin be the target

species. To assure that the results are comparable to those obtained by the large tagging project completed in the Central Pacific, it was stressed that there is a need to use the tagging techniques developed by the SPC. It was pointed out that the proposed tagging project should place special emphasis on learning the impact of the fishery for very small tuna on fisheries in other areas within and beyond the region.

#### Collaboration with the Fishing Industry

A frank discussion was held with the fishing industry in order to establish means and ways of engaging the fishing industry's collaboration referring to:

- (i) information relative to fishing effort and recovery of tags;
- (ii) facilities for sampling and conduct of studies on gear selectivity; and
- (iii) use of a fishing vessel for the tagging programme.

The fishing industry representative (Philippines) expressed that reciprocally they would welcome information on distribution, seasonality of skipjack and yellowfin and on the availability of other species which are potentially marketable.

The representative of the Indonesian fishing sector which comprise skipjack and tuna state enterprises expressed that from their part there is no problem of collaboration and they are open to all requests coming from the research units.

#### Recommendations

After discussing the different points of the agenda, the Consultation Meeting of the Joint Indonesian/Philippine Tuna Working Group agreed on the following:

1. There is a need to expand the sampling to include additional fishing gears which are important in the tuna catches, e.g. bagnets (Philippines) and other small-scale fishing gears (Indonesia). This is necessary in order to expand the range of sizes presently sampled in order to include the smaller sizes (Indonesia) and the larger sizes (Philippines) than presently sampled.
2. It was recognized the need to include in the sampling also other species which are obtained as by-catch of the fisheries for large tuna (e.g. scads and smaller tunas, etc.)
3. It is necessary to expand the area of sampling to cover the area of distribution of the main species (e.g. Sulu Sea, South and SE Sulawesi and Nusa Tenggara Island).

4. It was stressed the need to improve the statistical data collection (i.e. Philippines) in order to include information on the fishing effort.
5. It is necessary to integrate other national ongoing programmes of tuna research into the activities of the Indonesian/Philippine tuna working group in order to make full use of all available information and manpower.
6. It is necessary to continue the present data analysis based on the two years tuna sampling in order to extract all possible information from the available data referring to recruitment, growth, spawning seasons and seasonal abundance.
7. A joint Indonesian/Philippine tuna tagging programme will be implemented as soon as possible along the following lines:
8. An Indonesian pole and line boat will be identified to be utilized in the programme. A mission will travel to Indonesia to examine the available boats and the feasibility of their use for tagging.
9. An integrated Indonesian/Philippine tuna tagging team will be formed to conduct the tagging activities.
10. The tuna tagging programme will follow the general outlines of the one implemented by the South Pacific Commission. Emphasis will be given to the standardization of tagging techniques throughout the region. The tagging area will comprise Irian Jaya, North Moluccas, North Sulawesi, Moro Gulf and Sulu Sea.
11. The tagging personnel appointed will be trained on duty during the first stage of the tagging programme. The South China Sea Fisheries Development and Coordinating Programme will provide the overall coordination and arrange the collaboration with external agencies such as SPC on behalf of the CDMSCS.
12. The programme will be directed to monitor the movements of the tuna fish (primarily skipjack and yellowfin) from the region described to determine the interrelationship with other fisheries in the region and to estimate parameters required in the stock assessment analysis.
13. Referring to the collaboration between the Philippine government's research agencies and the fishing industry it was proposed to establish as soon as possible an ad hoc group representing both sectors to discuss common grounds of interest and ways of collaboration.
14. On the basis of the recommendations listed above a detailed programme of work for the immediate future until the end 1982 and for the long term until end 1984 will be prepared by selected staff of the working group. This team will carry out a detailed



survey of the main areas to be sampled in each country as soon as possible in a series of surveys commencing in 1981. Based on these surveys a detailed workplan and budgets will be prepared indicating the obligations of the governments and the programme.

Following approval by the working group, letters of understanding will be drawn up by the programme so that funds can be committed and secured to proceed with the programme. The external funding support for this programme will be drawn from the RegTuna trust fund project funded by the government of Japan and implemented through the SCSP.

#### 4. LIST OF PARTICIPANTS

##### A. Philippines

###### Bureau of Fisheries and Aquatic Resources

1. Atty. Reuben A. Ganaden  
Senior Tuna Biologist, Fisheries Research Division
2. Mr. Said Mohammad Ali  
Tuna Biologist, Fisheries Research Division
3. Mr. Noel Barut  
Tuna Biologist, Fisheries Research Division
4. Mrs. Salud Ganaden  
Representative from Director's Office
5. Miss Lourdes Bautista  
Senior Statistician, Statistics Section

###### Fishing Industry

6. Mr. Victor Hizon  
President, Tuna Association of the Philippines

###### University of the Philippines

7. Dr. Virginia Aprieto \*  
Professor, College of Fisheries

###### Philippine Council for Agriculture and Resources Research

8. Dr. Elvira O. Tan \*  
Director, Fisheries Research Division

B. Indonesia

Marine Fisheries Research Institute (LPPL)

- 9. Mr. Mohamad Unar  
Director
- 10. Mr. Jacobus Uktolseja  
Senior Tuna Biologist
- 11. Mr. Sedana Merta  
Tuna Biologist

Directorate General of Fisheries

- 12. Mr. Soewito  
Director of Resource and Planning

State Enterprises (Benoa/Bali)

- 13. Mr. Mangara Mulya \*

C. Papua New Guinea

- 14. Mr. Stewart Frusher  
Biologist, Kanudi Laboratory  
Department of Primary Industry

D. SCSP

- 15. Mr. Arthur G. Woodland  
Programme Leader
- 16. Mr. Ramon B. Buzeta  
Senior Resource Assessment Officer
- 17. Mr. Mitsuo Yesaki  
Tuna Biologist
- 18. Mr. Robert Gillett  
Consultant

## ANNEX 1

### Summary Report of the Philippine/BFAR/SCSP Project

#### ESTABLISHMENT OF A BIOLOGICAL DATA COLLECTION SYSTEM FOR TUNA AND RELATED SPECIES IN MINDANAO AND EASTERN INDONESIAN WATERS

Reuben Ganaden, Sr. Tuna Biologist  
Bureau of Fisheries and Aquatic Resources  
Manila, Philippines

#### 1. PROJECT BACKGROUND

This project came about following recommendations from the workshop on the Tuna Resources of the Philippines and Indonesia (Jakarta, 20-23 March 1979). Following the approval of the project by the donor country, Norway, the SCSP in collaboration with the Philippine Bureau of Fisheries and Aquatic Resources implemented the tuna sampling project from November 1979 to December 1980.

#### 2. PROJECT OBJECTIVES

- a. To initiate a system of sampling of tunas and establish the necessary infrastructure for the routine collection and analysis of tuna length frequency and other biological data for the tuna fisheries in Mindanao.
- b. To document the incidence and relative importance of juvenile tunas in the catches.
- c. To obtain information on seasonal variation in the species composition and relative abundance of tunas and tuna-like species especially juveniles.

#### 3. SAMPLING SITES

Following the establishment of the project, a programme of sampling has been implemented in four landing centers in Mindanao. The location of this are: Opol, Misamis Oriental; Sta. Cruz, Davao del Sur; General Santos City, South Cotabato and Labuan, Zamboanga del Sur (Fig. 1). (See donors report).

#### 4. COLLECTION OF DATA

Sampling of species and size composition and total landed catch per fishing gear used were made at the four landing sites by specially appointed sampling and supervising staff.

The sampling procedure in each of the landing centers follow a scheme according to the peculiarities of the fishery in each area. Below is the procedure.

Sampling of ring net boats/purse seiners and other vessel types are carried out every three days (inclusive Saturdays, Sundays and holidays) for a total of ten sampling days for a month. However, in General Santos City, sampling of handline bancas was conducted every five days for an additional five days per month. Each sampling day, a total of ten boats are sampled and the catches are measured and weighed.

For the catch sampled, the information required was filled up in the sampling master form A as shown in Appendix 1.

For each ring net/purse seine boat landing, a maximum of five boxes was sampled based on local categories, i.e., two boxes of small tunas ("piret" or "tulingan" or "pidlayan") and three boxes of larger tunas ("bariles" or "gulyasan").

For each box sampled, the sample was weighed and species sorted out and weighed. At least 25 pieces of each species in the "piret" category was measured and 25 pieces of the larger fish of each species was also measured.

#### 5. SUMMARY OF RESULTS

##### 5.1 Fishing gear (Tables 1, 2)

From the 1980 fishery statistics it is shown that the main fishing gears catching tunas in the Philippines are:

<u>Commercial</u>	Purse seine	52%
	Bagnet	24%
	Ring nets	22%
<u>Municipal</u>	Hook and line	55%
	Gill net	18%
	Ring net	16%

Of these gears during the sampling programme the following were covered in the Mindanao area: purse seine, ring nets, hook and line, troll line and to a second degree, gill nets and beach seines.

Table 1. Commercial fishery production of tuna (1980) in metric tons

Gear Species	Bagnet	Purse seine	Trawl	Ring net	Beach seine	Round haul seine	Gill net	Hook and line	Muro-ami	Total
Frigate tuna (Tulingan)	19 384	20 949	493	11 955	3	170	-	-	-	52 954
Yellowfin and big-eyed tuna (Albacore, tambacol)	280	8 188	41	2 855	-	1	-	-	-	11 365
Skipjack (Gullasan)	148	9 125	171	2 786	-	-	-	-	-	12 230
Eastern little tuna (Oceanic bonito, Katchorita)	1 517	5 296	29	1 510	-	-	3	-	-	8 355
Others	54	2 576	1 026	144	-	-	-	51	1	3 852
Total	21 383	46 134	1 760	19 250	3	171	3	51	1	88 756

Table 2. Municipal fishery production of tuna (1980) in metric tons

Gear Species	Gill net	Hook and line	Long line	Troll line	Beach seine	Round haul seine	Fish corral net	Bag net	Ring net	Spear	Baby trawl	Fish pot	Others	Total
Frigate tuna (Tulingan)	6 426	13 947	773	203	2 878	201	2 605	679	11 275	-	32	-	5	39 024
Yellowfin and big-eyed tuna (Albacore, tambacol)	2 301	30 700	1 197	73	35	32	383	371	1 420	6	-	-	1	36 519
Skipjack (Guliasan)	4 908	9 409	367	41	43	2	205	419	3 083	1	-	-	6	18 484
Eastern little tuna (Oceanic bonito, Katchorita)	4 498	5 201	137	297	113	-	103	757	3 625	-	-	-	1	14 732
Others	3 633	6 915	372	275	12	41	61	49	232	-	46	1	9	11 646
Total	21 766	66 172	2 846	889	3 081	276	3 357	2 275	19 635	7	78	1	22	120 405

Table 3. Comparison of species composition of landing by different gears as determined by biological and statistical sampling

Gear	Species	Biological sampling	Statistical sampling
Purse seine	Skipjack Yellowfin tuna Frigate Eastern little tuna Others	57% 18% 25% 0% 0%	20% 18% 45% 11% 6%
Ring-net	Skipjack Yellowfin tuna Frigate Eastern little tuna Others	55% 13% 31% 1% 0%	15% 11% 60% 13% 1%
Handline	Skipjack Yellowfin tuna Frigate Eastern little tuna Others	0% 99% 0% 0% 1%	14% 47% 21% 8% 10%
Troll	Skipjack Yellowfin tuna Frigate Eastern little tuna Others	22% 73% 3% 0% 2%	5% 8% 23% 33% 31%

## 5.2 Species composition

The main tuna specie caught by type of gear are shown in Table 3<sup>1/</sup>

A total of six species, namely, yellowfin (Thunnus albacares), skipjack (Katsuwonus pelamis), frigate tuna (Auxis thazard), eastern little tuna (Euthynnus affinis), bigeye tuna (Thunnus obesus) and bullet tuna (Auxis rochei) were measured more than once. Length measurement were taken from four fishing gears: ring net, purse seine, handline and troll.

In the analysis of length frequency data, species, fishing gear, time and area strata were considered. However, for purposes of this summary report, all the areas were combined and only skipjack and yellowfin caught by purse seine and ring net were considered.

## 5.3 Juveniles in the catch

Since the main objective of the study was to find out the proportion of small tunas in the catches of various fishing gear, it is vital to know at which size do we consider as juveniles.

Juvenile is defined as a young, immature and underdeveloped individual fish which is basically like an adult except for its size and reproductive capacity.

To estimate the proportion of juvenile in the catches, it is important that the size at first maturity be known. It might be stated that there is no information on the size at first spawning for the different tuna species from the Western Pacific but data exist in other parts of the Pacific Ocean. Based on published works on tunas, we have chosen 55 cm as the size at first spawning for yellowfin and 45 cm for skipjack for purposes of this report. In Fig. 4<sup>2/</sup> it is shown that skipjack tuna caught by purse seine has a length range from 14 to 67 cm with a mode of 29 cm. From Fig. 3<sup>1/</sup> it can be seen that the length range for yellowfin caught by purse seine was 16-145 cm with a mode of 29 cm and those caught by ring nets show a range of 11-160 cm with a mode of 30 cm. For those caught by ring net, skipjack showed a length range of 14-77 cm with a mode of 32 cm.

The proportion of juvenile tunas in the catches of purse seine and ring net were computed using the monthly weighted frequency data combined to give the weighted average length frequency for the whole of 14 months period.

---

<sup>1/</sup> Results from biological and statistical sampling shown together for comparison

<sup>2/</sup> See donors report



This weighted average were recalculated to get the percentage of juveniles of yellowfin and skipjack caught by purse seine and ring nets. In the case of yellowfin tuna, the sampling of ring net catches comprise 98.9% of juvenile fish. Purse seine on the other hand consist of 92% by number of juvenile fish.

For skipjack, it showed that 93.1% of those sampled from purse seine were juveniles, while those caught by ring net the proportion was 98.9%.

From these figures, it can be seen that ring nets catch more juvenile tunas than purse seiners. These proportions obtained from the sampling were then used to calculate the percentage of small size fish from the total tuna catch of each species based on the 1980 statistics.

Table 4 shows the percentage of yellowfin and skipjack caught by type of gear. It can be seen that ring nets and purse seines caught 49.3% of skipjack and 26.2% of yellowfin.

Table 4. Percentage catch of yellowfin and skipjack by different fishing gear in the Philippines, 1980

	Ring net	Purse seine	Hook and line	Gill net	Others	Total
Yellowfin	9%	17.2%	64.5%	4.8%	4.4%	100%
Skipjack	19.3%	30.0%	30.9%	16.1%	3.7%	100%

In terms of number the catch of juvenile skipjack would represent around 47% of the total catch and 25% in the case of yellowfin.

These figures are provisional. In order to estimate a more accurate proportion it will be necessary to express the proportion in the sampling in terms of weight which requires an estimate of the length-weight relationship for these species. These calculations are being undertaken and will be described in the final report.

ANNE

RELEVANT QUESTIONS REFERRED TO THE TUNA SAMPLING PROGRAMME

Although some of these issues may not be able to be resolved on the basis of the present information, the following listing may be useful to direct the attention to some relevant matters that require an answer:

1. What are the most important gears used to catch tunas?
2. What is the species composition of the catch by type of gear?
3. What is the proportion of juvenile fish caught by type of gear by month?
  - a. in the sampling?
  - b. in the whole country catch?
4. What are the seasonal changes in:
  - a. species composition?
  - b. size composition?
5. Is there any evidence of migrational movement along the coast during the year?
6. What is the growth pattern of each specie?
7. What is the spawning season for each specie?
8. What are the spawning grounds?
9. What is the fluctuation of abundance by specie -
  - a. throughout the year?
  - b. between years?

FORM A: GCP/RAS/089/NOR TUNA SAMPLING PROJECT

# DAILY TUNA SAMPLING MASTER FORM

Zone \_\_\_\_\_

Date \_\_\_\_\_

Fishing Ground \_\_\_\_\_

Observer \_\_\_\_\_

Landing Center \_\_\_\_\_

No. of Samples

SAMPLE SERIAL NUMBER	BOAT NAME	NET SETS OR NO. FISHING DA.	FISHING GEAR	TOTAL BOAT CATCH		TOTAL SAMPLE		SPECIES COMP.-MARKET CATEGORIES (Boxes/Kgs.)											
				BOXES	WEIGHT	BOXES	WEIGHT (Kg.)												

## BOATS

Total No. of Fishing  
Boats Landing That  
Date (including night  
landings)

P	R	H	T	G

## CATCH

Total Landed  
Catch by  
Gear Type

P	
R	
H	
T	
G	

(Boxes,  
kg.,  
etc.)

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Fishing Gear Code:

- P - Purse Seine
- R - Ring Net
- H - Handline
- T - Troll
- G - Gill Net

\_\_\_\_\_  
Signature of Observer

FORM B: GCP/RAS/089/NOR TUNA SAMPLING PROJECT

# TUNA LENGTH FREQUENCY

DATE	SAMPLE SER. NO.

Landing Center \_\_\_\_\_

Boat \_\_\_\_\_

Fishing Ground \_\_\_\_\_

Fishing Gear \* \_\_\_\_\_

Observer \_\_\_\_\_

No. Boxes Sampled

Total Weight of Sample  kgs.

BOX	SPECIES		WT	
BOX	SPECIES		WT	
BOX	SPECIES		WT	
BOX	SPECIES		WT	

\* For RN and PS indicate if set made on payao or free school

No Fish Measured  
by Species

--	--	--	--	--

FORM C: GCP/RAS/089/NOR TUNA SAMPLING PROJECT

# MONTHLY REPORT

Zone \_\_\_\_\_

Month \_\_\_\_\_

Landing Center \_\_\_\_\_

Observer \_\_\_\_\_

Sample Dates      1   2   3   4   5   6   7   8   9   10   11   12   13   14   15  
(Circle)          16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

## 1 LANDINGS BY GEAR

GEAR TYPE	DATE																	TOTAL
	BOATS																	
	CATCH																	
	BOATS																	
	CATCH																	

## 2. LENGTH FREQUENCY

SAMPLE																		
	BOATS																	
	BOXES																	
NO FISH MEASURED	SJ																	
	YF																	
	BE																	
	LET																	
	FT																	
	BT																	
	OTHERS																	

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Observer \_\_\_\_\_

Supervisor \_\_\_\_\_

ANNEX 2

A REVIEW OF THE EAST INDONESIAN SKIPJACK POLE AND LINE FISHERY

M. Unar

Research Institute for Marine Fisheries, Jakarta

1. INTRODUCTION

Indonesia's marine fish production in 1978 amounted to 1 029 355 tons of fish, 624 505 tons of which were of the pelagic kinds including 102 171 tons categorized as tuna-like fishes which over Indonesian waters have been popularly called "tongkol". The most important of the species, skipjack (Katsuwonus pelamis) have exclusively been the attention of exploitation. Nevertheless, the landings of this species have reportedly amounted to merely one-third of the related total catch inasmuch as their distribution areas do not reach out far and wide like the Arafura Sea in the east, Java Sea, Malakka Strait, south of South China Sea, on the western side of Indonesia. On the last mentioned area or the Sunda Shelf waters only small tunas have been playing important roles. On the eastern side of Indonesia, starting from the Makassar Strait all the way through the Moluccas and Northern Irian Jaya waters skipjack have been taking a fairly popular position in the daily diet of local communities, and most fishing efforts have been directed toward this resources. The same is true of the several state enterprises established and in operation in Ambon, Sorong and Aertembaga. In 1978 skipjack production over these waters totaled 28 117 tons.

Data on skipjack fishing over the East Indonesian waters clearly indicate that fishing were still limited to catching school of fish on the sea surface, and fishing areas were also limited only to landing base areas.

With the development of landing facilities like piers, cold storage, and carriers, fishing activities began to increase both in intensity and frequency. For example, in 1970 in Ambon skipjack landed by pole and line fishing amounted to around 861.3 tons, and in 1980 went up to 2 108.9 tons.

Local observations, discussions in forums on regional levels, and others, indicated possibilities of stepping up efforts in this fishery. And, the Indonesian Government, aside from being desirous of actively participating in assuring the rational utilization of the resources, had also planned to promote skipjack fishing business in the hope that the small-scale fishermen widely scattered over these waters might all the more positively take part.

## 2. DISTRIBUTION OF SKIPJACK, FISHING METHOD AND EXPLORATORY SURVEYS

### 2.1 Distribution

Fig. 1 shows the distribution of skipjack over Indonesian waters. This species is not to be found in waters of 33 ppt and less salinity. Generally, shallow waters directly effected by land of major islands where rivers empty, are the main causes of lower salinities. These, among others, are the Malakka Strait, south of China Sea; and Java Sea to the western part of Indonesia, where three species of tuna-like fishes represented, and these are Thunnus tonggol, Euthynnus affinis and Auxis thazard. Shallow waters, intensely influenced by major rivers, like those found over Malakka Strait do not keep any member of the latter kinds.

In East Indonesia where skipjack fishing operation is centralized, observation shows the apparent abundance of school of skipjack the year round. Their concentration is usually found near and around islands, around floating logs or bamboo rafts, and also on offshore waters.

On the northern side of the straits among the chain of the Sunda Islands where sea water always flow from the Pacific into the Indian Ocean, observation shows the presence of skipjacks available the year round. Concerning the vertical extension or spread of the school of fish nothing much is known so far except for the fact that from long line catches, skipjack are known to have been found also.

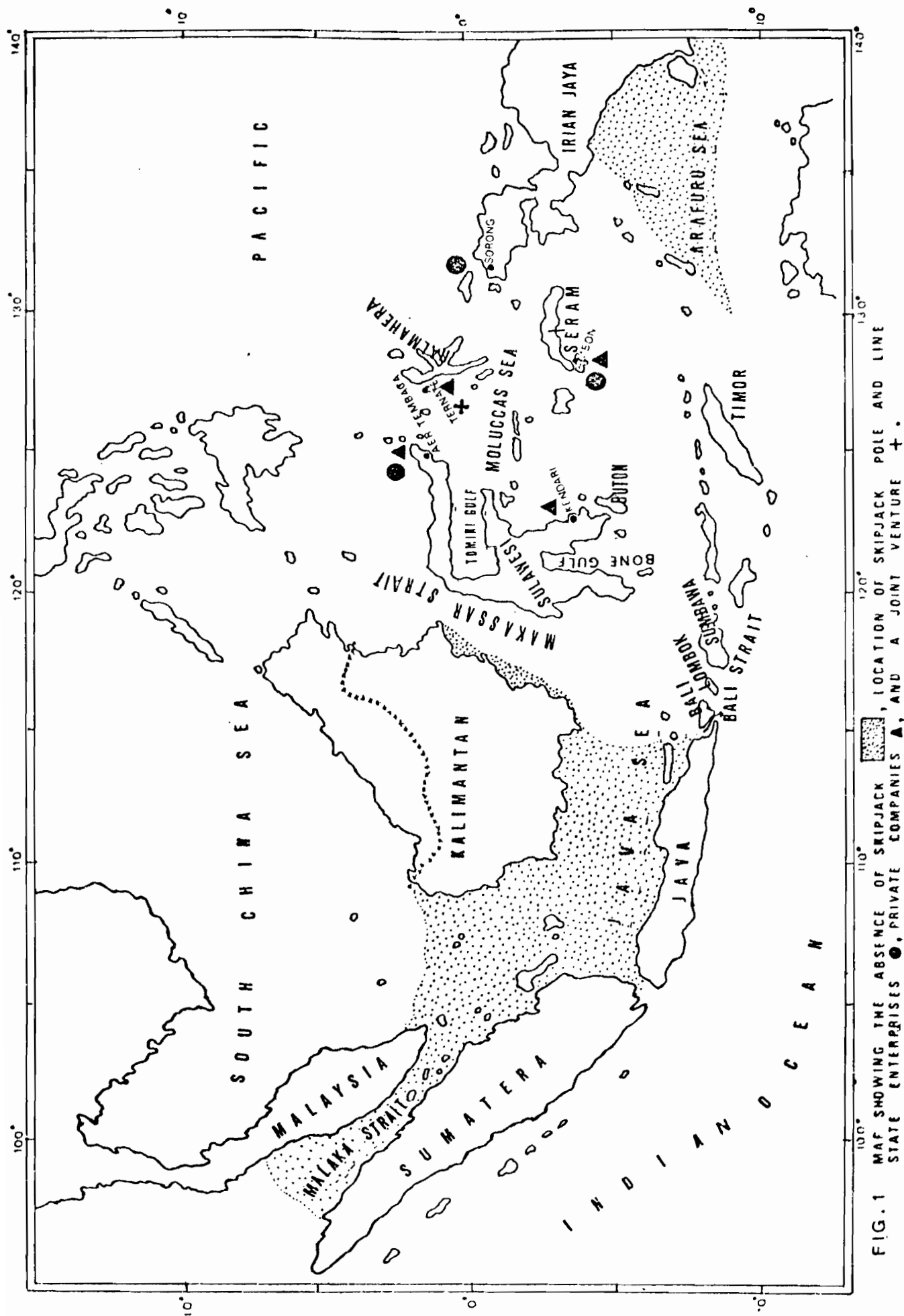
Based on overall landing data available for the year 1978, if the entire Indonesian waters were divided in two, namely, into West and East Indonesia with Makassar Strait down to the Bali Strait as boundary line, the totals for landings of tuna-like fishes from both sides are almost equal with each other, the west side amounting to 45 758 tons, and the east side to 56 413 tons, except that the composition were by far different from each other.

From the total landings of skipjack of 33 515 tons, East Indonesia produced 28 117 tons with the breakdown, Sunda Islands (Nusa Tenggara) produced 1 331 tons; South Sulawesi 4 296 tons; Southeast Sulawesi 2 681 tons; North Sulawesi 5 623 tons; Moluccas 8 665 tons; and Irian Jaya 5 521 tons.

### 2.2 Fishing methods or techniques

Primarily, skipjack fishing on these waters is done by hook and line. And one kind of this is common almost anywhere throughout the seashore which is better known as "tonda" meaning trolling.

A wooden proa in a dimension specially intended to accommodate a one-person crew, is made to pull one or several fishing lines with hooks provided with artificial baits, normally of white-colored sheep wool, dyed in various colors, or of chicken feathers. In Bali fishermen go to sea





at very early dawn, around 0200, with the intention that sunrise should see them at work on fishing ground, and on through high noon.

The proa is capable of moving in high speed with the aid of a sail, in fact, trolling operation on this area practically depends a great deal on what is locally called "East Monsoon" when the wind blows sufficiently hard.

In Ambon, a one-person crew proa rowed in high speed not too far offshore or from home base is definitely capable of being in operation practically the year round. In South Sulawesi, specifically over the Makassar Strait, aside from trolling, fishermen also make use of bamboo rafts equipped with anchors for depths more than 1 000 meters. Those rafts function as fish lures, generally small fishes of the Carangidae family have the habit of taking shelters around and under the rafts. And at a little distance the skipjack and tuna are caught by trolling or handlining. Except on the South Sulawesi, rafts of this kind locally called "rompong" are also found over the waters of North Sulawesi and around the Moluccas, between Ambon and Ceram, in particular.

Another conventional catching or fishing method is the pole and line, using live baits, practiced over the East Indonesian waters. This method or technique still keeps developing. Adopting this technique, local fishermen make use of rowed proas. But proas of this kind are found only in two different places. The first one is to be found in Ternate locally called "funai" and the other one is found in Ambon, locally called "rorehe". Those proas are somewhere around 10-12 m in length with a crew of 6 to 8. Prior to fishing activities the crew would normally go out in search of live bait exploiting beach seines, and what is unique here is the expertise of the fishermen to hold their catches right under their arms, owing to the limitation of space available in the proas due to size limitation, and in an effort to keep the catches from falling back down into water. Motor boats specially designed for skipjack fishing under pole and line technique have for some time been introduced in Ambon, Aertembaga (North Sulawesi), and Ternate, with a single day operation capacity. Their development was not too rapid due to the limited demand for them. In around 1965 when a pole and line model boat had been blessed with a catch of some 100-200 fishes, the captain of the ship would immediately call the operation off for the day even if an ample supply of live bait at times was still available in the tanks. The popular major concern was usually the possibility of market price downfall in the face of competition against other boat catches.

From 1970 on the Government has been promoting its business in skipjack fishing in East Indonesia by increasing the number and working capacity of its fishing boats for the Ambon and Aertembaga operation bases, and by building up a new state enterprise for skipjack in Sorong, Irian Jaya, all of which are equipped with cold storages in order to be able to store and preserve all the catches as well as possible for export purposes. Sizes of pole and line model boats which were still made of wood have been

increased to 30 GT average with the result that they are currently able to operate up to 5 days as well as to avoid limitation in supply of live baits. In Ternate a joint venture employing two pole and line steel boats of 100 GT each is currently being added to with one of the 550 GT size that has introduced skipjack purse seining on the North of Irian Jaya.

### 2.3 Exploratory survey

Around 1972-1974 several exploratory surveys and experimental fishing programmes have been launched in East Indonesia by the government, and by several Japanese fishing enterprises, the results of which are, among other things, as follows:

1. In 1973 the Directorate General of Fisheries launched surveying activities on skipjacks in the Sunda Islands, among others, in the vicinity of the Lombok and Sumbawa Islands, using a 22 GT wooden skipjack boat equipped with a skipjack pole and line fishing apparatus including lift nets in an effort to collect live baits. Fishing activities were concluded in two phases, the first one took place between the months of January and March, and the second, between October and December 1973. The area around the entrance of the Alas Strait which links the Lombok and the Sumbawa Islands was picked up as the central point of the catching activities. The estimated rate of the catches was one-half ton of skipjacks daily. The length frequency of the catches varied between 49 cm and 63 cm on weighing between 2.5 kg and 5.1 kg with an average length of 55 cm, and average weight of 3.5 kg. This exploratory fishing programme was again continued in 1975 in Southeast Sulawesi with Kendari as its base, being the capital city of the province. During the course of this survey, observations on live baits were conducted at 55 stations, and 29 cruises were undertaken in the framework of experimental fishing over three different watery areas, namely, over the areas around Kendari and Buton, during the months of December. These attempts were reported to have resulted in a daily average catch of 692.8 kg, and 522.5 kg respectively. And subsequently, in the Bone Gulf from January through October 1975, with a daily average catch of 250 kg. The average lengths of the skipjack catches on three locations were 53.4 cm, 55.2 cm, and 44.4 cm, respectively, with average weights of 3.63 kg, 3.52 kg and 2.80 kg, respectively.

2. Japanese fishing enterprise utilizing 40 GT boats. This party undertook its exploratory fishing operation to the east of South Sulawesi, of Southeast, and of Central Sulawesi between the months of September 1971 and June 1972. And then between the months of September and November 1972 it operated over the Halmahera waters. In the vicinity of Sulawesi, four of this party's wooden boats conducted a monthly average of 16-day catching activities with a monthly catch average of 22 559 kg or a daily average of 1 332 kg. Total catch throughout the period of survey activity programme amounted to 979 653 kg. Around Halmahera this operation succeeded in obtaining a monthly average catch of 24 718 kg or a daily average of 1 461 kg, with a total catch volume of 243 366 kg of skipjack.

3. Japanese enterprise employing 100 GT steel boats. This firm performed its exploratory fishing programme to the east of South, Southeast, and Central Sulawesi between the months of October 1971 and March 1972 employing five boats with a monthly average of 16 days fishing operation in the course of their experimental survey. Total catches throughout the scheduled catching period amounted to a monthly average of 50 568 kg or a daily average of 3 185 kg of skipjacks.

In the vicinity of Halmahera total catching days increased to 21 monthly during the period of May through September 1971. Total catches throughout this period amounted to 1 528 284 with an average of 61 130 kg monthly, and an average of 2 764 kg daily. During the period of August 1972 through February 1973 monthly average of catching days was 15.

Total catches during this last exploratory fishing programme was 1 260 742 kg making a monthly average catch of 37 519 kg and daily average of 2 325 kg. The results of these two different Japanese firms exploratory fishing operation in terms of total fish catches are found in Fig. 2.

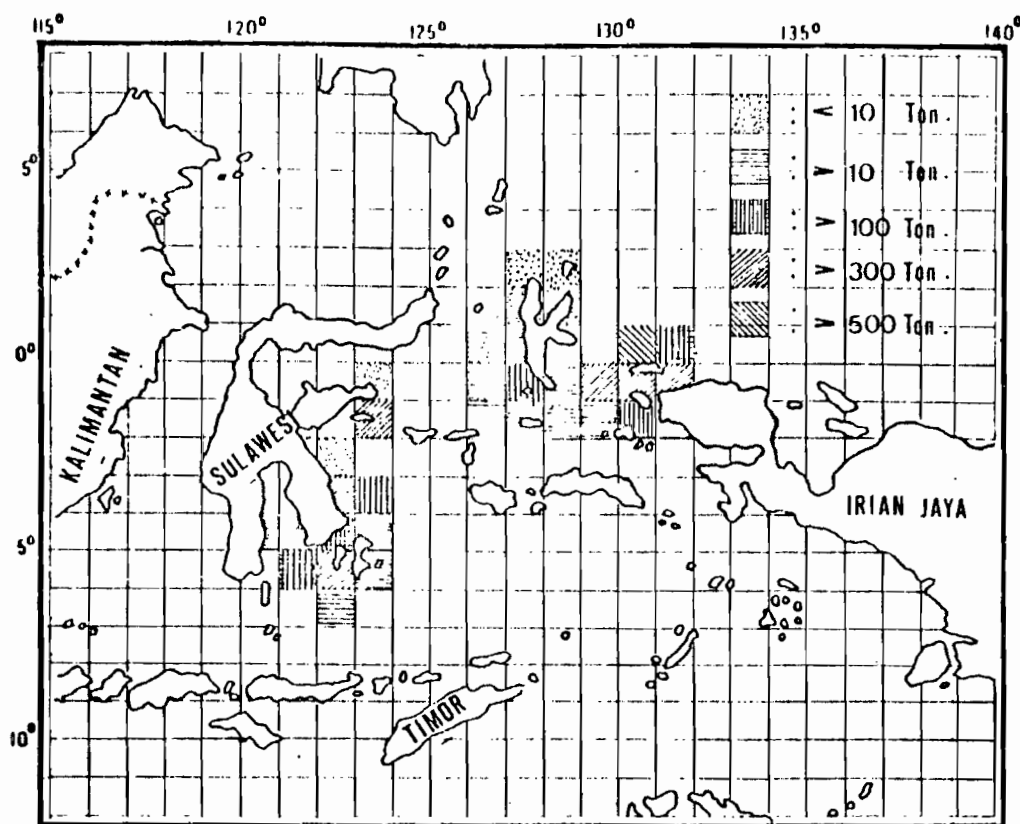


FIG. 2  
EXPLORATORY FISHING BY 2 JAPANESE POLE AND LINE  
COMPANIES, INDICATING THEIR TOTAL CATCHES

Survey on live bait over the duration of the exploratory fishing programmes indicates that bait supply over the aforementioned survey areas was adequate, and it is also true of the results of another survey undertaken by Government boat over the Sunda Islands' waters. The kinds of baits were dominated by Stolephorus spp and Spratelloides spp, followed behind by the sardines and coral reef fishes like juvenile Caesio and Atherenid fishes. A new experimental fishing was conducted, among others, by one joint venture in Ternate using a skipjack purse seiner of 550 GT north of Irian Jaya. The biggest single haul it ever made in the month of February 1979 amounted to 60 tons of skipjack with a mixture of a small number of yellowfins and long-tailed tunas. Subsequently State skipjack fishing enterprise at Aertembaga started making various attempts at skipjack fishing by pole and lines being fixed around bamboo rafts locally called "rompong" with the reported results, among other things, that on one occasion alone its operation using three boats of 30 GT each, aided by the said "rompong", resulted in a 20-ton catch of skipjack.

### 3. SOME ASPECTS IN THE EXPLOITATION OF SKIPJACK

#### 3.1 The role of skipjack state enterprise

Effectuated by the tendencies of ambitious investors to invest capitals in shrimp fishing enterprises toward the 1970s, as if fishing industries were bound to be totally based on shrimp fishing alone, the Government of Indonesia, in this case, the Directorate General of Fisheries, took the initiative in the diversification of kinds of fish commodities following a study on skipjack fisheries in East Indonesia.

State-owned fishing industries at Aertembaga and Ambon needed improvements in working capacity. And better potential markets abroad subsequently being taken into consideration, a step was then taken toward the establishment of another new skipjack fishing center in Sorong, Irian Jaya.

The development of the skipjack fishing project was in line with the Government's policy then, that is through 1974, which gave top priorities to foreign-aided projects to promote and develop export commodities.

Additionally, state fishing enterprises aside from serving as pilot projects, were also intended to serve as stimulants toward the improvement of all fishing industries in the vicinity of the aforementioned projects. With the availability of managerial as marketing facilities in the form of freezing units and cold storages provided by the State, came opportunities for export marketing.

This action moved both the small-scale fisheries community and private fishing industries in the surrounding areas to accommodate other kinds of fish and marine resources which could be stored in the cold storages to be subsequently exported or domestically marketed and consumed.

The development of those State-run projects or industries could be itemized as follows:

1. Aertembaga

The State-run industry having its operational base in the sea port town in North Sulawesi was established in 1961. And in 1972 it started improving its working capacity by securing funds on credit bases in its all-out move to build 30 pole and line boats of 30 GT each.

- 1 cold storage with a 600-ton accommodating capacity
- 1 ice factory with producing capacity of 25 tons of ice daily
- 1 freezing plant of 30-ton freezing capacity daily and other boat repair and landing base equipment

2. Ambon

This Ambon-based industry was also established in 1961, and since 1974 it has come across the following improvements:

- 10 pole and line model boats of 30 GT each
- 2 catcher boats which also have been functioning as carriers weighing 100 GT each
- 1 cold storage of 500-ton accommodating capacity
- 1 ice factory of 50-ton ice produce daily
- 1 freezing plant of 25-ton freezing capacity daily and other facilities

3. Sorong

This project was established in 1973 and was provided with the following facilities:

- 30 pole and line model boats of 30 GT each
- 2 carriers or transport vessels of 600 GT each
- 6 boats designed for bait provision
- 1 cold storage of 1 300 ton accommodating capacity
- 1 freezing plant of 30-ton freezing capacity daily and other facilities

Of the so many constraints the industries were confronted with, among other things, were as follows:

Of the so many kinds of facilities planned to be made, especially the building of skipjack boats, the finishing building time schedules were far from being uniform.

The size of the model 30 GT boat was still new to the experienced fishermen, and this fact could be seen from the volume of their daily catches using this type of vessel in the course of the development of their

business where the skill of fishermen using skipjack fishing boats developed and improved. The best example of this was the fishing center in Sorong which commenced its operation in 1973.

Table 1. Skipjack total catch and catch per vessel per day for the Sorong-based state enterprise (1973-1980)

Year	Total catch	Catch per vessel per day in K.
1973	55.7	287
1974	69.2	323
1975	68.1	457
1976	1 291.5	544
1977	1 771.8	606
1978	4 840.4	1 145
1979	4 338.6	756
1980	3 866.3	1 243

This development is indeed favorable and pleasing inasmuch as individual boat's total daily catch has come close to the projected target of 1.3 tons in the course of last year.

Data on skipjack landings by pole and line fishing method on the other two fishing centers at Aertembaga and Ambon where fishing enterprises are found to be complicated because in addition to the state fish landings there were also landings made by private cooperative's sectors aside from skipjack fishing by trolling.

At Aertembaga the last two years, 1979 and 1980 served as the development peak point of state enterprise having bases on those places which by a total of 20 boats were capable of landing catches of 2 149.4 and 3 737.2 tons, respectively which represented daily catches of 725 kg and 1 087 kg each whereas in the preceding years, at the early start of the usage of boat of 30 GT in 1976, they merely got one-half ton each a day.

Private skipjack pole and line fishing on this area using 28 boats under an average of 9-25 GT weights in the same year produced an annual average of 2 1/4 tons.

The spread effects of the existence of cold storage facility at this fishing center, among other things, was the use of this facility by private sectors, and this state of things has kept on developing with their (private sectors) forward march toward the enhancement of their activities, among other things, in the way of taking initiative to make five steel skipjack fishing boats of 40 GT each.

In Ambon in 1980 state-run enterprise ten boats of 30 GT each were capable of landing a catch of 994.3 tons, which figure is not too much at variance with that in the preceding year, and which reflects a daily catch of 660 kg. On the private sectors' side, record shows that on this area, with 19 pole and line boats (10 boats of 30 GT, and 9 others of 10-17.5 GT) in 1980 they made a total catch of 1 114.6 tons of skipjack. In Ternate, one joint venture employing two pole and line fishing boats of 200 GT each, made a harvest of 1 540 tons of skipjack, and a purse seiner of 550 GT also landed 2 400 tons. Local private companies employing 19 boats of 8-17.5 GT in 1978 and 1980 made landings of 1 258.1 tons of skipjack and 1 248.6 tons, respectively. In Kendari, Southeast Sulawesi, a new development has just recently took place, namely, the development of local private enterprise which are using skipjack fishing boats of minor dimension, and in 1978, available record now shows 12 skipjack boats as being successful of landing a total catch of 2 681 tons of skipjack.

### 3.2 Marketing

Frozen skipjack were exported to several foreign countries, and from records available at port towns serving as skipjack fishing centers, it was learned that Aertembaga, Ternate, Sorong and Ambon exported US\$10 564 085.00 worth of skipjacks.

The state owned enterprise based in Sorong contracts the sales of its export quality fish through agents in Singapore or Japan and obviously finding markets for export purpose has never been a real constraint in this business while prices received by the state enterprise are commonly just about the same with prevailing world prices.

Local communities have a high degree of preference for skipjack, and aside from being consumed fresh, skipjack also are being seasoned by way of smoking and salt-boiling for short-term preservation and prepared as katsuo-bushi or salted for long-term preservation purposes. Experiment in transportation of skipjack to Java has been undertaken by another state-run enterprise with headquarters in Central Java using two refrigerated carriers of 600 GT each. This diversification in marketing apparently is bound to succeed keeping in mind that domestic needs are fairly great, among others throughout the densely populated Java. In March 1980 one of the carriers picked up a total of 160 tons of skipjacks from the new fishing area, Kendari in South Sulawesi.

### 3.3 The exclusive economic zone

In March 1980 the Indonesian Government declared a claim of a 200-mile Exclusive Economic Zone including the Pacific waters north of Irian Jaya and also Indian Ocean to the south. Indonesia's authority and responsibility in the framework of utilizing the high sea resources have become a new issue to Indonesia. Accordingly, in order to be able to meet the ever increasing demand for the supply of those resources including

skipjack, for sound management programmes, information on the resources and their status are urgently needed.

A number of foreign countries in the Pacific have for some time been exploiting the present marine fish resources including those throughout Indonesia's EEZ, among others, the most important ones, tuna fishing by long line method.

In the "fishery talks" conducted between Indonesia and Japan a few months back, particularly on tuna and skipjack fishery, the data there presented showed the total catch (Table 2), and the total number of fishing boats (Table 3) of the Japanese fishing enterprises operating on the 200-mile zone off Indonesia's since the year 1973 through 1979.

Table 2. Catch of Japanese tuna fishery within the 200 mile zone of Indonesia (1973-1979)

Unit: MT

Type of vessel	C a t c h						
	1973	1974	1975	1976	1977	1978	1979
Longliner							
Below 100 GT			2 180	1 407	1 401	4 398	5 281
100-200 GT			1 507	530	173	64	391
Over 200 GT			1 285	638	336	1 547	1 065
Sub-total	3 728	3 739	4 972	2 575	1 910	6 009	6 737
Pole and line	3 474	10 567	708	23	58	0	0
Single purse seiner	426	126	366	2 179	6 554	9 660	15 472
Group purse seiner	0	0	0	0	0	0	0
Total	7 628	14 432	6 046	4 777	8 522	15 669	22 209

Following a casual look at the related data, a conclusion could be instantly drawn that there have been some modifications or even changes taking place in the fishing methods particularly those prevalent on the EEZ waters north of Irian Jaya. Tuna fishing by long line technique kept increasing, but on the contrary, pole and line skipjack fishing kept drastically decreasing, and in the course of the latest years, 1977 through 1979, pole and line fishing boats in operation remained barely four in number, only one in 1978, and also one in 1979, all of which gave way to purse seiners increasing in number in 1979 to become 13 strong boats. The Japanese companies concluded that pole and line fishing have



been less productive in comparison with that by purse seining. Another disadvantage also was the problem stemming out of the rising price of the needed supplies such as fuel, difficulties the crew were confronted with, and last but not least, the problem of marketing, so that steps have been taken to replace the major number of pole and line model fishing boats with a small number of purse seiners, and as a result, in 1979 all 13 of the purse seiners were capable of harvesting 15 472 tons of fish the major number of which were skipjack, of course.

Table 3. Number of vessels operated within the 200 mile zone of Indonesia (1973-1979)

Type of vessel	1973	1974	1975	1976	1977	1978	1979
Longliner							
Below 100 GT	96	61	97	77	105	191	235
100-200 GT	33	35	33	10	5	2	2
Over 200 GT	34	57	62	37	24	36	35
Sub-total	163	153	192	124	134	229	272
Pole and line	86	184	44	11	4	1	1
Single purse seiner	7	6	9	9	11	12	13
Group purse seiner	0	0	0	0	0	0	0
Total	256	343	245	144	149	242	286

Source: Indonesia-Japan "fishery talks"

Tuna fishing by purse seining has at last become a new topic of the day considerations in the context of the development of fishing business over this Western Central Pacific region. The Philippines has all along been improving its tuna fishing business by purse seining, and where indications have shown growing interests on the sides of other foreign countries like the USA, among others, in fishing on this region by purse seining. As has previously been reported, Indonesia has allowed one joint venture boat to introduce purse seining over these waters since 1978.

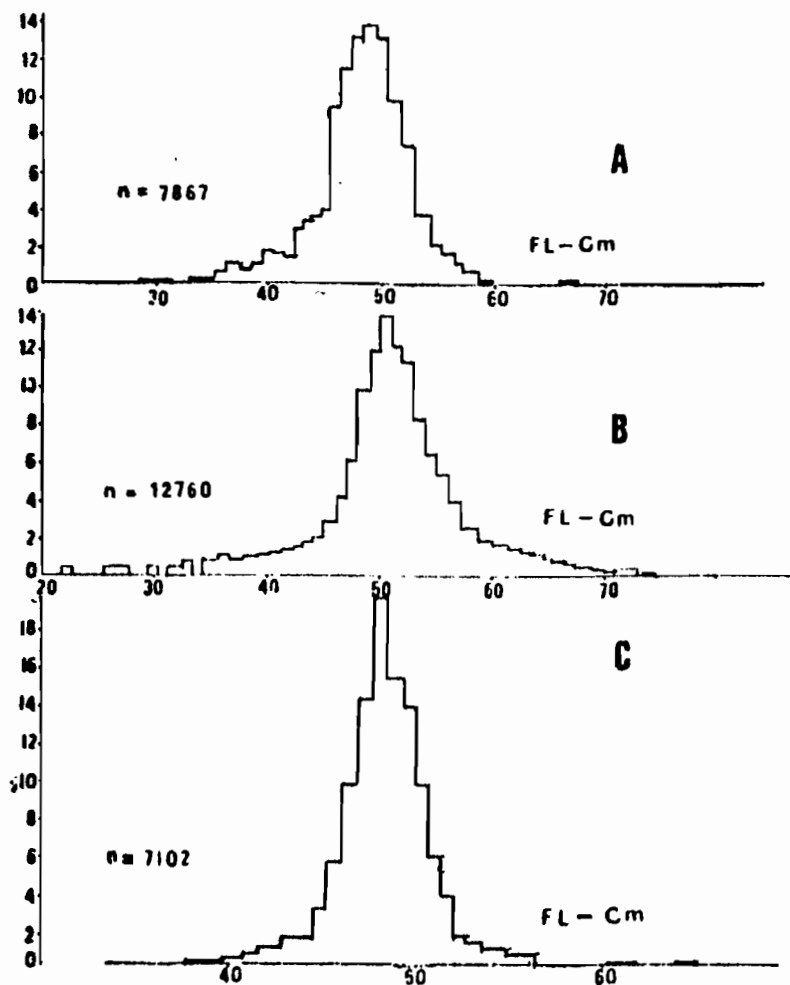


FIG. 3 LENGTH-FREQUENCY DISTRIBUTION OF SKIPJACK, *KATSUWONUS PELAMIS* LANDED BY POLE AND LINE FISHING IN TERNATE (A) SORONG (B) AND AMBON (C) FROM DECEMBER 1979 - DECEMBER 1980

#### 4. STOCK EVALUATION

In these new developments of skipjack pole and line fishery in East Indonesian waters accurate data on catch effort still cannot be provided adequately and this condition suggests that the available data are of only very limited value in assessing the potentials of this region. Also their still limited progress in the development, where usually the fishermen skills are expected to improve, again make it rather difficult to use the available statistics for analyzing the status of the stocks, but anyhow it is ideal that information should be accumulated sufficiently to facilitate the description of the stocks from the western Pacific region. The data required are basically total catches, efforts exerted in exploiting the catches and sizes of fish caught. Experts from highly developed tuna fishing countries like Japan have claimed that the Central Western Pacific Ocean comprise the largest skipjack area. Total landings of skipjack show a steady increase from 57 000 tons in 1970 to 363 000 tons in 1978 and still skipjack is not yet fully exploited as revealed by fairly constant catch per unit of effort against the increase of amount of effective fishing effort.

Recent activities conducted in East Indonesia is limited on monitoring length frequencies of catches landed in Ambon, Sorong and Ternate (Fig. 3). It is interesting to note that length frequencies of skipjack obtained in the last mentioned sites are close to skipjack caught during the surveys 5 and 10 years before around the Western Nusa Tenggara Islands and the east coast of Sulawesi, with the highest range between 52-56 cm.

#### 5. REFERENCES

- \_\_\_\_\_. Fisheries Statistics of Indonesia, 1978. Directorate  
1980 General of Fisheries No. 8.
- Kawakami, Z. Survey of bait and skipjack fishing in Sulawesi Tenggara.  
1976
- Rawung, A. Skipjack survey in West Nusa Tenggara waters, January-December  
1973 1973. MFRI/LPPL II/73 - PL. 043/73 in Indonesian.
- Sidarto, A. On the evaluation of state fishing enterprises. SMFR/78/S  
1978 10 MFRI/LPPL. In Indonesian.
- Uktolseja, J. Length frequency distribution of skipjack landed in Ternate,  
1980 Sorong and Ambon. MFRI/LPPL. Unpublished.
- Unar, M. Trial fishing surveys for skipjack as an early development of  
1972 the Indonesian skipjack fishery. IPFC/72/Sym/36.
- Widodo, J. Survey on skipjack pole and line fishing by joint venture  
1973 companies in the Eastern Indonesian waters. MFRI/LPPL II/73 -  
PL. 045/73.

ANNEX 3

LANDING STATISTICS

M. Yesaki  
Fishery Biologist, South China Sea Fisheries Programme  
Manila, Philippines

Philippines

Landing statistics for the Philippines during 1979 show tuna production was 197, 311 mt, a 7% increase over 1978. These statistics show the 1979 production to consist of 48% yellowfin/bigeye and skipjack tunas and 52% frigate and eastern little tunas. During this year, the municipal fisheries accounted for 60% and the commercial fisheries for 40% of the total tuna landings. The percentage of large tuna landings is higher for the municipal fisheries than for the commercial fisheries (40%).

Landing statistics for the Philippines are available by municipal and commercial fisheries by species and regions. These show the municipal landings of tunas to be highest in Region VI and that of the commercial fisheries in Region XI.

Landings are listed as well by species by types of fishing gears utilized by the municipal and commercial fisheries. These statistics show the bulk of the municipal landings to be by hook/line (58%), ring net (16%) and surface gill nets (12%). The important fishing gears in the commercial fishery are purse seine, ring net and bag net, which account for 63%, 23% and 14%, respectively, of the landings. Hook/line accounted for 35% and purse seine for 25% of the total tuna landings.

Landing statistics are further segregated by municipal and commercial fisheries by species by region by fishing gear.

The landing statistics for this country are reported in considerable detail. However, these statistics may be better in the southern regions where tuna landings are higher and sampling effort has been concentrated. Tuna catches by the commercial fisheries made in the southern regions and off-loaded in the National Capital Region are not monitored in detail. Statistics for the municipal fisheries are probably not as precise as those for the commercial fisheries. The species composition of the landings can be improved as studies show the inclusion of juvenile skipjack reported as frigate tuna.

## Indonesia

Tuna landings in Indonesia during 1978 was 102, 171 mt, a 4% decrease from the previous year. Eastern little tuna accounted for 54% of the total, whereas skipjack accounted for 33% and tunas for 13%. Tuna landings are also given by coastal area and province. The bulk of the landings of skipjack (80%) and tunas (54%) were made in three coastal areas in Sulawesi-Irian Jaya. Eastern little tuna landings were highest in Utara Jawa (25%) and Selat Malaka (12%). Landing statistics for this country are not discriminated by species for municipal and commercial fisheries or by type of fishing gears.

Table 1. Tuna production in the Philippines by species  
1976 - 1979

ISSCAAP GROUP NO.	SPECIES	T O T A L					C O M M E R C I A L					M U N I C I P A L					Unit Quantity: Metric Tons
		1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	1979	1976	1977	1978	
36)	Spanish Mackerels, tunas, bonitos, billfishes . . . . .	138,533	234,883	199,455	216,868	36,262	69,421	55,153	81,635	102,271	165,462	144,302	135,233				
	Spanish mackerels (Maladyong, Tangingi, Tanigue) . . . . .	10,915	15,718	11,924	14,821	3,402	9,034	4,145	3,406	7,513	6,684	7,779	11,415				
	Frigate tunas (Tulingan) . . . . .	28,328	43,007	50,899	79,909	6,101	11,318	20,897	39,694	22,227	31,689	30,002	40,215				
	Yellowfin and Big-eyed Tuna (Albacore, Tambacol) . . . . .	44,478	63,059	47,029	49,224	12,845	12,260	5,519	11,407	31,633	50,799	41,510	37,817				
	Skipjack (Guliasan) . . . . .	29,174	55,090	49,730	45,084	9,816	22,519	14,816	19,834	19,358	32,571	34,914	25,250				
	Eastern little tuna (Oceanic Bonito, Katchorita) . . . . .	23,004	54,744	36,341	23,094	4,098	14,289	9,468	7,269	18,906	40,455	26,873	15,825				
	Sailfishes (Pahabela) . . . . .	1,076	1,162	2,642	.891	-	-	265	-	1,076	1,162	2,377	891				
	Swordfishes (Malasugui) . . . . .	1,558	2,103	890	3,845	-	1	43	25	1,558	2,102	847	3,820				

Source: Fisheries Statistics of the Philippines, 1979, Vol. 29

Table 2a. Commercial tuna production in the Philippines by species, by regions, 1979

ISSCAAP GROUP NO.	S P E C I E S	REGION	TOTAL	I	II	III	NCR	IV	V	VI	VII	VIII	IX-A	IX-B	X	XI	XII
Unit: Metric Tons																	
361	Spanish Mackerels, Tunas, Bonitos, Billfishes		81,835	21	-	40	27,323	13,347	3,033	4,634	1,568	2,786	57	10,526	1,165	16,785	350
	Spanish mackerels (Maledyong, Tangingi, Tanigue)		3,406	11	-	10	195	1,128	427	1,580	3	37	-	-	-	15	-
	Frigate tunas (Tulingan)		39,694	-	-	10	9,162	9,100	1,423	612	1,495	2,337	-	4,069	145	11,316	25
	Yellowfin and Big-eyed Tuna (Albacore, Tambacol)		11,407	-	-	-	4,888	1,090	864	353	5	41	9	1,881	103	2,046	127
	Skipjack (Gulisan)		19,834	-	-	-	11,044	100	108	367	7	52	48	4,335	256	3,405	112
	Eastern little tuna (Oceanic bonito, Katchorita)		7,269	10	-	20	2,034	1,929	211	1,722	33	319	-	241	661	3	86
	Sailfishes (Pahabela)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Swordfishes (Malasugui)		25	-	-	-	-	-	-	-	25	-	-	-	-	-	-

Table 2b. Municipal tuna production in the Philippines by species, by regions, 1979

ISSCAAP GROUP NO.	S P E C I E S	REGION	TOTAL	I	II	III	NCR	IV	V	VI	VII	VIII	IX-A	IX-B	X	XI	XII
Unit: Metric Tons																	
361	Spanish Mackerels, Tunas, Bonitos, Billfishes		135,233	3,571	157	1,592	-	14,166	7,610	26,426	20,405	3,061	9,012	7,417	11,566	21,348	8,902
	Spanish mackerels (Maledyong, Tangingi, Tanigue)		11,415	606	45	81	-	2,543	1,993	1,835	1,331	532	579	61	766	77	966
	Frigate tunas (Tulingan)		40,215	675	41	131	-	5,012	1,145	9,522	15,226	2,071	1,563	550	1,866	946	1,467
	Yellowfin and Big-eyed Tuna (Alba- core, Tambacol)		37,917	797	60	867	-	2,388	928	3,812	1,018	194	1,291	3,434	1,803	16,329	4,896
	Skipjack (Gulisan)		25,250	1,410	-	-	-	3,006	236	8,574	2,231	64	1,235	1,565	1,993	3,669	1,267
	Eastern little tuna (Oceanic Bonito, Katchorita)		15,825	18	1	511	-	537	2,844	135	389	98	4,334	1,657	5,065	12	224
	Sailfishes (Pahabela)		891	46	-	-	-	294	347	-	-	12	-	50	65	77	-
	Swordfishes (Malasugui)		3,820	19	10	2	-	386	117	2,548	210	90	10	100	8	238	82

Source: Fisheries Statistics of the Philippines, 1979, Vol. 29

Table 3. Tuna production in the Philippines for commercial and municipal fisheries by species and gear by statistical fishing area, 1979

ISSCAAP GROUP NO.	SPECIES/GEARS	C O M M E R C I A L												Unit: Metric tons			
		GRAND TOTAL	TOTAL	Bagnet	Beach Seine	Gill Net	Hook & Line	Long Line	Muro-Ama	Purse Seine	Push Net	Ring Net	Round Haul Seine	Trawl	TOTAL	Surface Gill Net	
36)	Spanish Mackerels, Tunas, Bonitos, Billfishes	216,868	81,635	11,074	6	41	706	26	1	50,702	-	18,022	76	981	136,233	18,781	
	Spanish mackerels (Maladyong, Tangingi, Tanigue)	14,821	3,406	428	-	41	52	-	-	1,949	-	24	-	912	11,415	4,052	
	Frigate tunas (Tulingan)	79,909	39,694	7,537	5	-	81	14	1	19,100	-	12,890	64	1	40,215	4,368	
	Yellowfin and Big-eyed Tuna (Albacore, Tambacol)	49,224	11,407	858	-	-	489	-	-	8,760	-	1,294	6	60	37,817	2,027	
	Skipjack (Gulisan)	45,084	19,834	229	-	-	80	12	-	16,734	-	2,719	-	-	25,250	4,435	
	Eastern little tuna (Oceanic Bonito, Kachorita)	23,094	7,269	2,022	-	-	4	-	-	4,137	-	1,092	6	8	15,825	3,459	
	Sailfishes (Panabela)	891	-	-	-	-	-	-	-	-	-	-	-	-	891	182	
	Swordfishes (Malasugui)	3,845	25	-	-	-	-	-	-	22	-	3	-	-	3,820	238	
M U N I C I P A L																	
ISSCAAP GROUP NO.	SPECIES/GEARS	M U N I C I P A L												Unit: Metric tons			
		Bottom Gill Net	Hook & Line	Beach Seine	Long Line	Baby Trawl	Bagnet	Push Net	Lift Net	Fish Corral	Round Haul Seine	Ring Net	Purse Seine	Drive in-Net	Fish Pot	Filter Net	Others
36)	Spanish Mackerels, Tunas, Bonitos, Billfishes	629	78,321	1,231	2,222	171	1,222	11	9	1,615	158	20,255	9,838	-	4	62	704
	Spanish mackerels (Maladyong, Tangingi, Tanigue)	328	4,862	40	41	166	16	-	-	285	30	1,370	9	-	1	-	215
	Frigate tunas (Tulingan)	137	19,070	298	334	-	540	-	9	101	108	10,954	4,116	-	-	40	120
	Yellowfin and Big-eyed Tuna (Albacore, Tambacol)	-	31,491	622	907	-	225	3	-	131	19	2,189	78	-	-	-	145
	Skipjack (Gulisan)	-	11,615	130	362	5	124	3	-	801	-	2,151	5,445	-	-	22	156
	Eastern little tuna (Oceanic Bonito, Kachorita)	164	7,134	53	570	-	317	-	-	273	1	3,611	189	-	-	-	54
	Sailfishes (Panabela)	-	682	11	-	-	-	-	-	-	-	-	-	-	3	-	13
	Swordfishes (Malasugui)	-	3,467	77	8	-	-	5	-	24	-	-	-	-	-	-	1

Source: Fisheries Statistics of the Philippines, 1979, Vol. 29



Table 4. Tuna production in Indonesia by species, 1973-1978

Year	1973	1974	1975	1976	1977	1978
Total	74 521	86 412	86 507	92 440	105 996	102 171
Tunas	11 334	11 236	11 931	9 354	13 204	13 412
Skipjack	26 405	28 060	27 241	30 051	30 410	33 515
Eastern little tuna	36 782	47 116	47 335	52 235	62 382	55 244

Source: Fisheries Statistics of Indonesia, 1978, No. 8

Table 5. Tuna production in Indonesia by species and coastal area

Coastal area	Tunas	Skipjack	Eastern little tuna
Total	13 412	33 515	55 244
Barat Sumatera	2 764	3 242	5 208
Selatan Jawa	47	851	3 923
Selat Malaka	453	1 183	6 850
Timur Sumatera	145	-	2 157
Utara Jawa	14	113	13 539
Bali - Nusa Tenggara Timor	2 640	1 331	4 543
Selatan/Barat Kalimantan	-	-	2 635
Timur Kalimantan	70	9	2 555
Sulawesi Selatan	2 333	6 977	6 351
Sulawesi Utara	2 637	5 623	4 826
Maluku/Irian Jaya	2 309	14 186	2 657

Source: Fisheries Statistics of Indonesia, 1978, No. 8

ANNEX 4

SUMMARY OF PROJECT ACTIVITIES (GCP/RAS/089/NOR)  
"ESTABLISHMENT OF A BIOLOGICAL DATA COLLECTION SYSTEM  
FOR TUNA AND RELATED SPECIES IN MINDANAO (PHILIPPINES)  
AND EASTERN INDONESIA AREA"

1. BACKGROUND OF THE PROJECT

The waters around the Philippines and Indonesia, particularly Mindanao, Celebes Sea and the Pacific Coast has long been a rich fishing ground for tuna and tuna-like species both for domestic and foreign vessels.

With the introduction of modern purse seine fishing techniques commencing in 1975-1976 in the Philippines a dramatic expansion of the total catch of these species and in particular yellowfin and skipjack took place. The use of aggregating devices (payaos) and non-selective gears resulted in an increasing amount of juveniles appearing in the landings.

The Indonesian fishery utilize mainly pole and line which catches much larger specimens. Preliminary samplings show that the skipjack and small tunas caught in E. Indonesian waters are smaller in size than those caught in W. Pacific waters. In Celebes and Moluccas areas for example, juveniles specimens of skipjack (23-40 cm) are often reported in the catches around August/October and December/March. The success in the use of payaos combined with ring nets and purse seines in the Philippines has motivated the Indonesian companies into considering the use of these gears also and if the purse seine fishery in Indonesia follows the same pattern, it could be expected that increasing quantities of undersized tunas would be landed in both countries.

At this stage it was necessary for the tuna researchers in the Philippines and Indonesia to assess the extent of these juvenile catches and carefully monitor the development of the fishery, but due to normal administrative restraints it was unlikely that an appropriate programme of sampling and monitoring in the main tuna landing sites could be launched with the urgency that the matter required.

In 1979 therefore, the South China Sea Fisheries Development and Coordinating Programme (SCSP) following recommendation stemming from the Workshop on the Tuna Resources of Indonesia and Philippine Waters held in Jakarta on 20-23 March 1979, proposed to establish a coordinated Biological Data Collection System for Tuna and Related Species in Mindanao (Philippines) and Eastern Indonesia Area. This programme was financed through the

the Programme of Assistance to Developing Countries in Planning the Utilization of the Living Resources of the Expanded Economic Zones with funding from Norway.

The project was approved in June 1979 as GCP/RAS/089/NOR for a total of US\$65,100 and one year duration. It started operations in November 1979 with the purpose

"to set an operational infrastructure for tuna sampling in the region described and obtain biological data on species composition, length/weight, maturity and seasonality of tunas and related species in the landing of Mindanao (Philippines) and Eastern Indonesia region for stock assessment and management purposes." (See Annex 1)

### 3. PROJECT ACTIVITIES

#### 3.1 General arrangements, workplan and timetable

The project started operations in October 1979 with the recruitment of a Tuna Consultant, Mr. Bernard R. Smith, from the Department of Primary Industry, Papua New Guinea for a total of two manmonths. His terms of reference were:

"to participate in the preparation of a tuna sampling programme for Philippines/Indonesia, identify suitable sampling sites in both countries, prepare list of materials, interview local personnel for the project, and train the local counterparts in the sampling procedures."

Previously, the countries concerned had been informed of the scope of the new project and the cooperation of the government agencies and technical staff, involved in the tuna research both in the Philippines and Indonesia, had been engaged.

In the Philippines a small working group on tunas had been set up in the Fisheries Research Division of the Bureau of Fisheries and Aquatic Resources (BFAR) in early 1979 for the preparation of the SCSP Workshop on Tuna Resources held in Jakarta in March 1979, and some basic statistics and biological information had been gathered under the guidance of the SCSP Senior Resource Assessment Officer and the SCSP Tuna Specialist.

In Indonesia a survey has been conducted in Central Celebes waters (Tomini Bay and Moluccas Sea) in December 1978 - January 1979 by a Tuna Biologist and some assistants from the LPPL (Marine Fisheries Research Institute) but no specialized programme of tuna research was being conducted beyond occasional internal reports prepared for particular meeting on request.

The tuna groups in both countries obtained their information mainly from the statistical department but no regular sampling systems had been set up.

The Tuna Consultant travelled to the main landing sites in the Philippines (22/10-4/11) and Indonesia (19/11-11/12), visited the main fishing companies and held discussions with the research groups in both countries. As a result of his field trip, he prepared a report proposing a network of sampling stations, designed a programme of sampling including appropriate forms and instructed the counterparts on the sampling procedures.

Although the fishery from Indonesia and the Philippines differ in terms of type of gear and field conditions, it was attempted as far as possible to standardize the data collection in order to make the results comparable. Special forms were designed to obtain information on the species composition, type of gear, length frequency, weight, catch per boat, relative abundance and seasonality.

An operational infrastructure was established comprising four sampling stations in Mindanao (Opol, Santa Cruz, General Santos and Labuan) and six in Indonesia (Bitung (two), Ternate (one), Ambon (two) and Sorong (one)).\* In each station two persons were appointed to take care of the sampling and data handling under the supervision of the Regional Fishery Office. The data were summarized once a month and sent to the respective central offices in Jakarta and Manila. Originals were kept at the regional offices for further control.

Under the scope of the project, a Biologist in charge was nominated as head of the programme in each of the countries concerned. These personnel reported to the SCSP Senior Resource Assessment Officer in Manila who was responsible for the overall coordination and supervision of the project.

The data collection started effective 1st of November 1979 although some sampling stations did not become operational until December 1979 due to fish availability or delay in recruitment of personnel.

By December 1979 all stations were operating.

In February 1980 another Tuna Consultant was recruited to prepare an interim data evaluation and advise on eventual modifications to the current sampling system. Mr. Woo Il Choo from Korea was engaged for a total of three months. This expert was mostly concerned with the data analysis and only to a lesser extent on field work so both biologists in charge travelled to Manila to work together with him at the SCSP office.

A quarterly interim report was prepared covering the data from November 1979 to February 1980 and some recommendations were made to improve the data collection. Due to its limited scope (it covers only 1/4 of the data available at present), this report was kept only as an internal document and some aspects of it will be incorporated in the Final Technical

---

\* In Ambon and Bitung both industrial and small-scale fishery were covered but Bitung was incorporated only later to the programme (see 3.3.2. Report of Activities of the project GCP/RAS/089/NOR)

Report summarizing the analysis and results of one full year of sampling. This Final Technical Report will be prepared by the two biologists in charge of the programme in Indonesia and the Philippines with the assistance of the South China Sea Programme to be later published in the SCSP Working Papers series.

The project was officially terminated on 31 December 1980 but has been transferred as ongoing activity to the Governments of Indonesia and the Philippines respectively, who have made provision of funds to take over the cost of the activities from early 1981. Some minor bridging financial support has continued over 1981 with the remaining funds to assist the governments on a smooth take-over and for the preparation of the final report.

#### 4. PROJECT RESULTS

This project was established as a fundamental contribution to the tuna research activities which are being implemented in the W.C. Pacific region. This was deemed essential to provide a sound data base for the resource assessment studies of these stocks and for development and management of this fishery in the participating countries.

Philippines and Indonesia provide a combined annual catch of well over 300 000 MT of tuna and tuna-like species in Mindanao/Celebes Sea/W.C. Pacific area but very little information existed before the initiation of this programme on this important resource.

Recommendations had been made by the Tuna and Skipjack Committees of the IPFC to both countries concerned and to the SCSP to implement a coordinated tuna research programme in the region in order to provide basic information on the development of the tuna fishery and the status of the resources.

The provision of a trust fund under the umbrella of the Norwegian assistance for the EEZ gave the initial thrust that was required to generate this activity and help it to gain momentum until it could be taken over by the respective governments.

The sampling programme initiated in November 1979 in Indonesia was a considerable expansion over the previous activities on this field conducted by the Marine Fisheries Research Institute (LPPL). The present project enabled the Institute to establish permanent sampling stations in 6 localities in the area of Eastern Indonesia with a frequency of sampling the whole year round. On the other hand, this was the first activity of this kind attempted in the Philippines and is being used as a model for similar programmes of control of other pelagic fisheries in the country.

The results of the project in terms of information and data gathering are encouraging. During the year of operation covered by the present report over 2 000 landings were controlled by the project personnel in Indonesia and over 1 500 in the Philippines. During the same period a total of 112

tons of fish were sampled and measured in Indonesia and 58 tons in the Philippines. The data obtained so far provided among others essential information on the incidence of juvenile tunas in the total landing, species composition, recruitment and seasonal abundance of tuna and tuna-like species in the project area. This information is being analyzed by both working groups concerned in the Philippines and Indonesia and the results will be presented in a Final Technical Report that will be published by the SCSP.

The data collected constitute an important piece of information that will considerably expand the knowledge of this fishery and will contribute to the evaluation of the tuna resources in the W. Central Pacific region. It is also of great value to the country concerned which urgently required this information to devise development and management alternatives that could guide the government action in face of standing request for investment and licenses submitted by third nations on the scope of the new EEZ.

Both programmes have become permanent activities in the Philippines and Indonesia and the countries concerned have made provision of funds to keep and expand these activities in their regular plan of operation in the future.

From the project administration's standpoint, it has been an interesting experience for the SCSP to generate and coordinate this activity in two neighbouring countries with a very modest budget by making use of local infrastructure and the regional coordination provided by the programme through its stock assessment activities in the region. The project was generated by consultation between the parties concerned during the SCSP Workshop on Tuna Resources held in Jakarta in March 1979 and its development was monitored by the SCSP regular staff during ongoing activities through 1979-1980. The establishment of the project was reported by SCSP to the 2nd Session of SCORRAD in Hong Kong, 1979.

The experience obtained in this project will also be most valuable for the future activities programmed in terms of tuna tagging in which both countries have expressed their priorities. These activities are bound to start during 1981 and will naturally integrate into the current Research Programme for Tunas in the Philippines and Indonesia.

## 5. RECOMMENDATIONS

Although the project has become an ongoing activity and the SCSP will continue to be associated with it through its regional activities, there are some general recommendations referring to its future development that is worthwhile to express here. Other recommendations of a more technical nature will emerge later on, once the data analysis is completed.

In Indonesia, future sampling should include also the Indian Ocean area. Although there is no firm evidence so far as to possible mixture of Indian Ocean and Pacific Region stocks, the Indonesian catches in the

Indian Ocean area constitute an important part of the total national catch and should be monitored. Provisions are being made to open sampling stations at Aceh and Padang (Sumatra), Pelabuhan Ratu (W. Java) and Benoa (Bali).

The sampling should also be expanded to species, abundance and seasonality of bait fishes which are of **importance to the pole** and line fishery.

It is recommended that the future programme will also include sampling of small pelagics which are caught together with tuna species in the purse seine and ring net operations on "payaos".

Sampling in the Philippines should be expanded to include localities in the Sulu Sea (Negros Occidental), and the important landing port of Navotas, North of Manila where an important proportion of tunas caught in Sulu Sea are landed. One complication that will arise will be to establish the origin of these landings since most of them are done by carriers when the catch is mixed. The collaboration of the fishing industry in order to provide precise information will be essential to monitor these landings.

As both countries have expressed their priority interest in starting and coordinating tuna tagging programme in the project region, a strong effort of coordination will be required to keep both sides fully incorporated and informed of the joint activities. A natural vehicle for this collaboration could be the Regional Tuna Project as funds will have to be committed for regional travel between Indonesia and the Philippines for the tuna staff engaged in the respective programmes.

Table 1. Total catches of tuna and tuna-like species in the Philippines for the commercial and municipal fisheries

Year	C	M	T *	Total **
1976	36 263	102 271	138 534	124 985
1977	69 421	165 462	234 883	215 900
1978	55 153	144 302	199 455	183 994
1979	81 635	135 233	216 868	200 742

\* Include billfish and spanish mackerel

\*\* Without billfish and spanish mackerel

C = commercial fisheries; M = municipal fisheries; T = commercial + municipal

Table 2. Percentage of tunas caught by different gears during 1979 in the project area (statistics regions IX-X-XI, municipal + commercial sector), Philippines

Specie \ Gear	Percentage (%)				
	PS	RN	HL	GN	BN
Skipjack	19.1	34.6	37.3	8.5	0.6
Yellowfin	1.7	13.5	74.2	1.5	9.1
Eastern little tuna	4.2	38.5	38.2	13.2	6.0
Frigate tuna	5.8	62.0	26.2	4.1	1.9
Total	7.3	43.4	40.4	5.2	3.7

PS = Purse seine  
RN = Ring net

HL = Hook and line  
GN = Gill net

BN = Bag net



Table 3. Tuna production in East Indonesia (1977)

	Tuna *	Skipjack	Small Tunas	Total (M. Tons)
S. Sulawesi (Makassar) **	2 333	6 977	6 351	15 661
N. Sulawesi (Bitung & Manado)	2 637	5 623	4 826	13 086
Irian Jaya Moluccas	2 309	14 186	2 657	19 151
Total East Indonesia	7 279	26 786	13 834	47 899
Total Country	13 204	30 410	62 382	105 996

\* Includes all Thunnus sp. plus billfish

\*\* Not covered by the sampling programme

Table 4. Summary of total sampling in Mindanao (Philippines)  
(November 1979 - December 1980)

Nov. 1979 - Dec. 1980	Yellowfin				Skipjack				Frigate tuna			Eastern little tuna			Bigeye tuna			Total Tuna spp. All years (MT)
	PS	RN	HL	TR	Total	PS	RN	HL	TR	Total	PS	RN	Total	HL	TR	RN	Total	
Total boats landing	96	1 125	5 771	369	7 361	96	1 147	787	365	2 395	96	1 151	1 247	566	169	60	795	-
Total catch landed (kg) (sampling days)	78 636	139 665	151 643	6 571	376 515	243 515	567 655	661 2 076	813 915	89 756	343 432	433 188	1 001 7 822	4 929	322 279	5 530	1 638	-
No. of boats sampled	94	985	269	14	1 452	95	993	16	79	1 133	93	1 011	1 104	22	8	5	35	-
No. of samples (box)	207	922	-	-	1 130	204	970	-	1 174	90	171	261	20	-	-	4	4	2 696
No. of fish measured	1 563	11 014	3 962	809	17 348	4 629	22 656	249	300	27 834	3 133	18 427	21 560	77	113	22	212	67 643
Weight of fish measured (kg)	1 921	8 231	129 078	3 617	14 157	4 398	17 862	646	630	23 476	1 488	13 401	14 889	4 929	322	71	5 332	58 988

Table 5. Summary of total tuna sampling in Indonesia  
(December 1979 - December 1980)

Items	Sorong (12/79-12/80)	Ternate (1-12/80)	Ambon (12/79 - 12/80)		Total Sampling *
			Industrial	Small-Scale	
Total boat landings	947	1 417	290	761	3 415
Total catch landed (ton)	2 262.6	734.8	776.1	602.1	4 375.6
No. of boats sampled	262	810	176	761	2 009
No. of samples	388	961	248	740	2 337
No. of fish measured	14 404	8 999	8 155	7 126	38 644
Weight of fish measured (kg)	46 648	20 763	23 437	21 554	112 402

\* Bitung (2 sampling stations) not included in this report

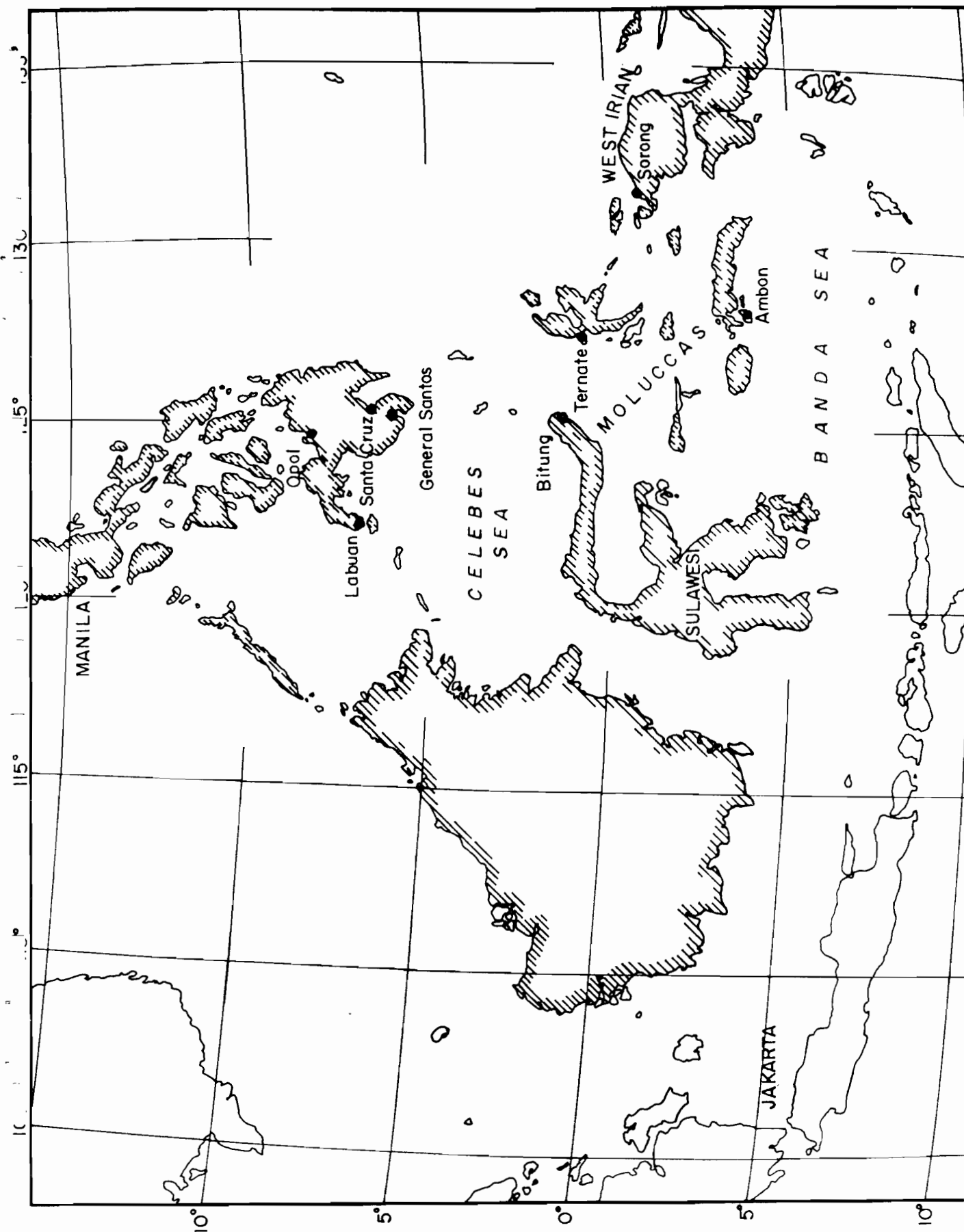


Fig. 1. The map showing the sampling sites in the Philippines and Indonesia for the tuna sampling project

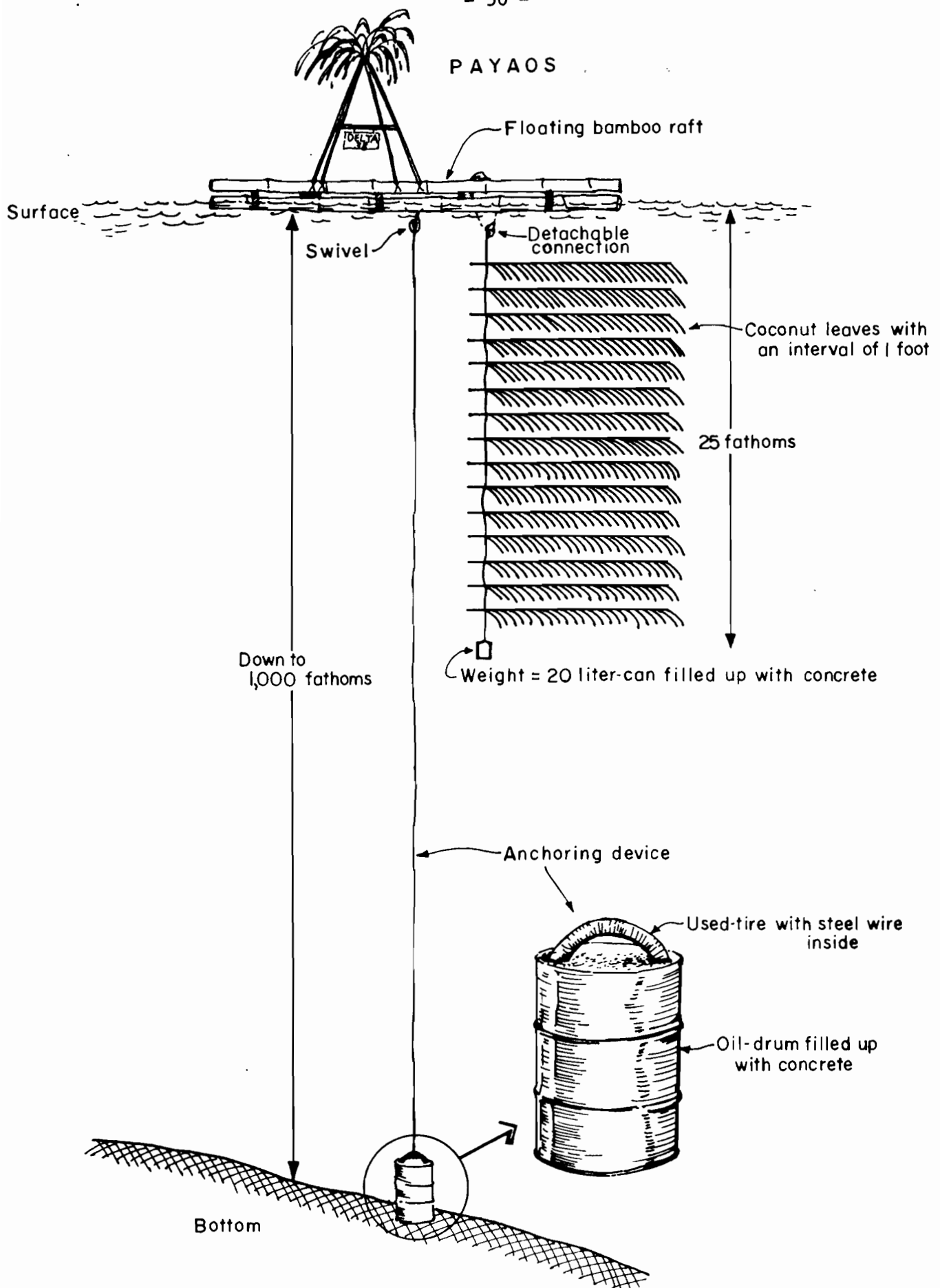


Fig. 2. Philippine "payao"

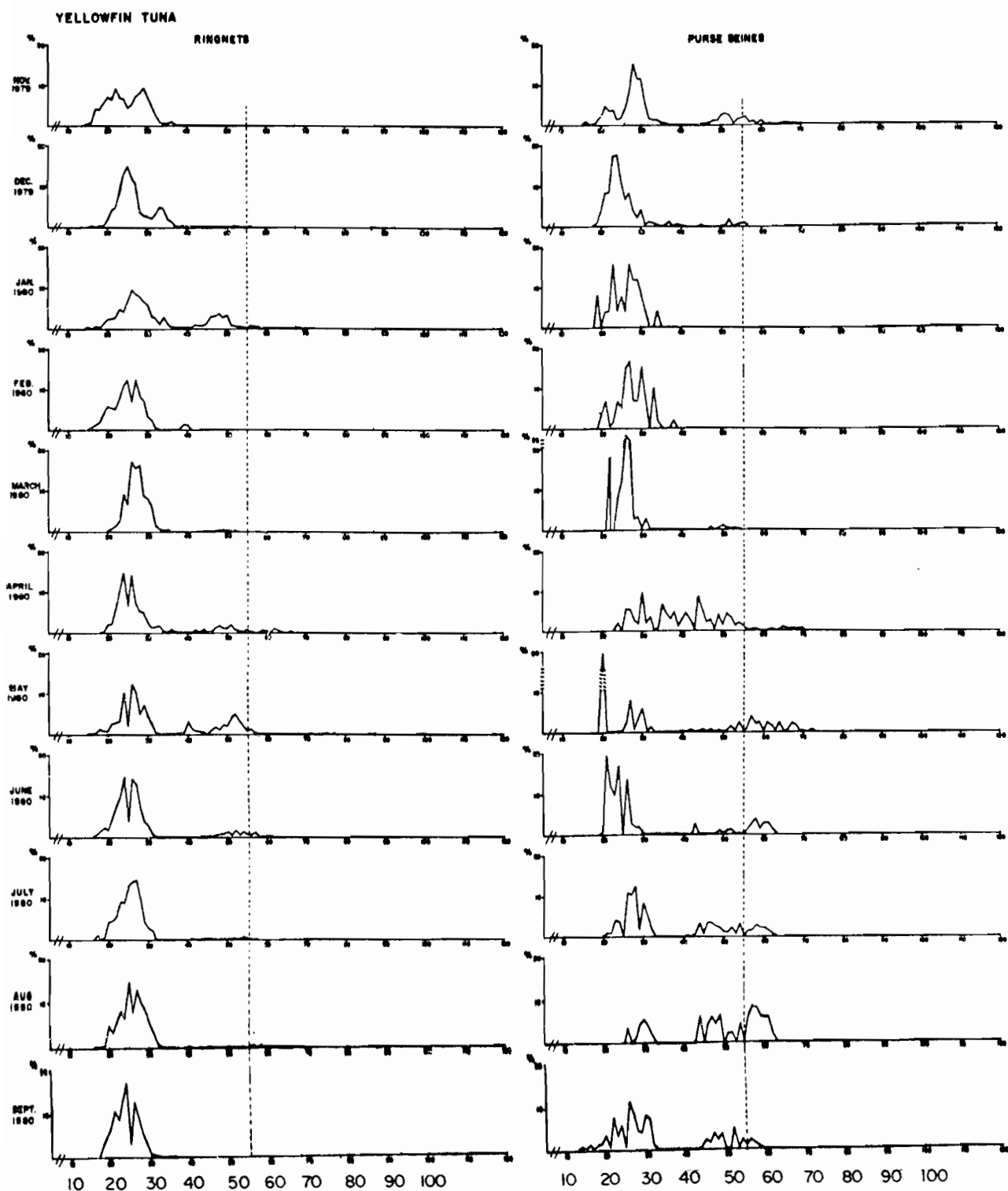
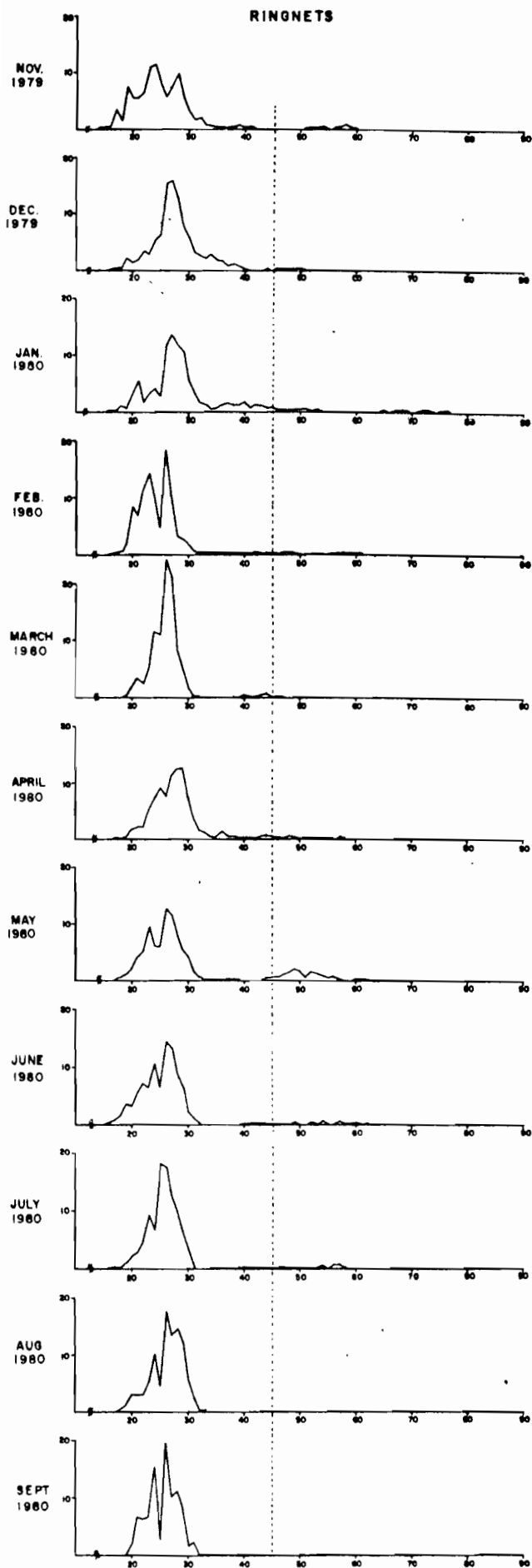


Fig. 3. Length frequency PS/RN Yellowfin - Philippines  
(The dotted lines represent estimated length  
of first maturity.)

SKIPJACK TUNA



PURSE SEINES

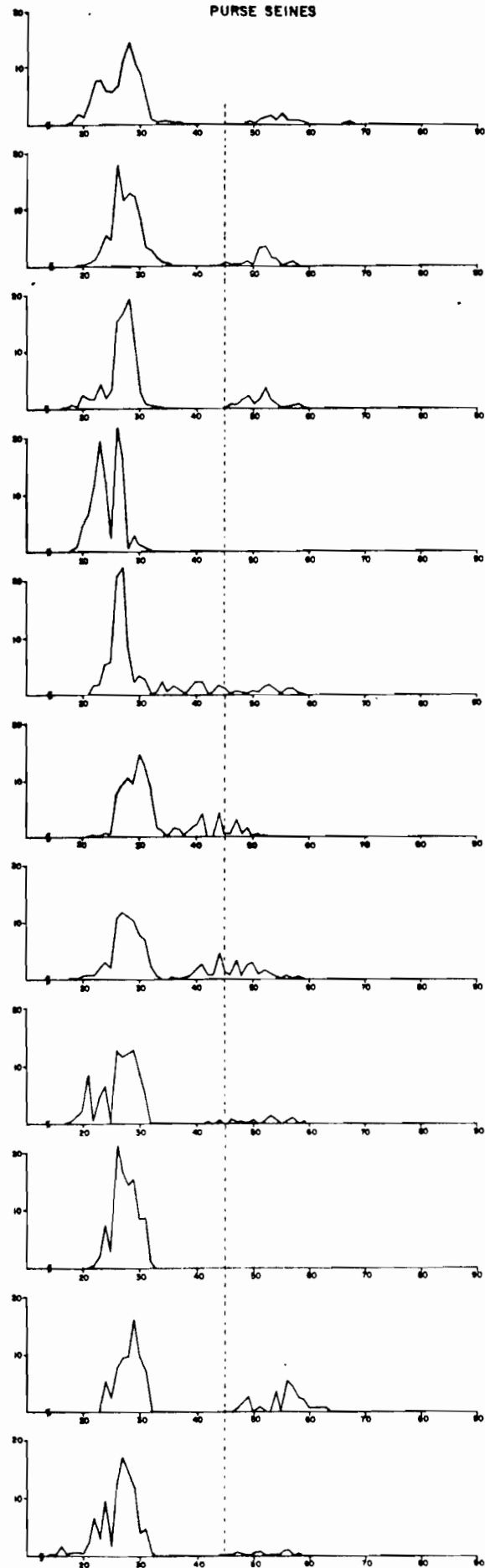


Fig. 4 - Length frequency PS/RN Skipjack - Philippines

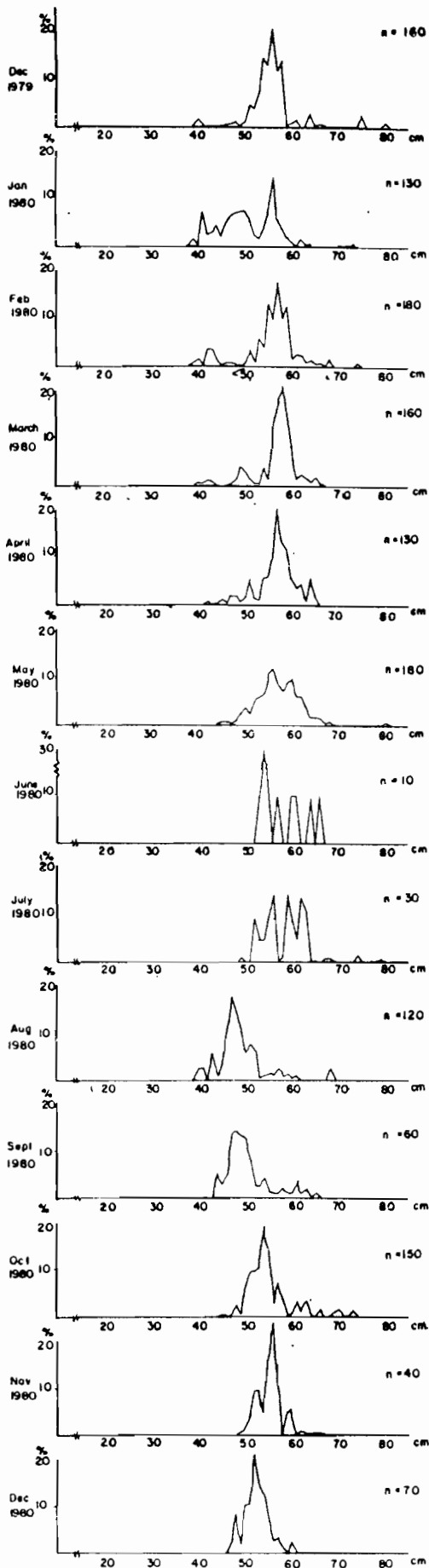


Fig. 5a. Length frequency P/L - Yellowfin - Indonesia

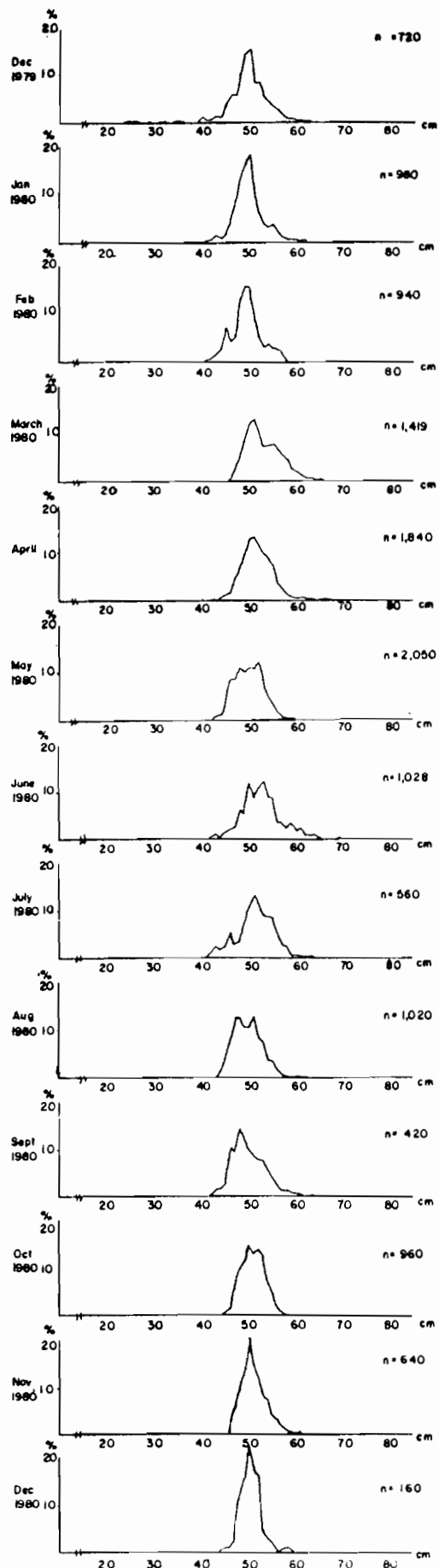


Fig. 5b. Length frequency P/L - Skipjack - Indonesia



## ANNEX 5

### WHY TAG TUNAS?

#### SKIPJACK SURVEY AND ASSESSMENT PROGRAMME SOUTH PACIFIC COMMISSION

R. Gillett, Fisheries Research Scientist  
South Pacific Commission  
Noumea Cedex, New Caledonia

Since August 1977, the South Pacific Commission has been conducting a study of the skipjack resources in 25 countries of the Central and Western Pacific. As a major component in the Programme, a live-bait pole and line fishing vessel was chartered for three 10-month periods for tuna tagging as well as other research. Over 150 000 tunas were tagged and released and to date over 5 500 tags have been returned to SPC headquarters. Tagging tunas can give information on movement, possible migration patterns, growth, fishing gear interaction, harvest rates, and interaction among fisheries in adjacent areas. The following is a brief summary of how the SPC tagging data is being used to give insight into these six areas.

Figs. 1 and 2 are straight line skipjack migration arrows. Barbs on the arrows represent 30 days at liberty. For the purpose of clarity, only one example of a migration between only two 10 degree squares is represented. Although these straight line migration arrows can give insight into stock structure, it is difficult to search for migration patterns without additional information. Any directed movement apparent from tag recovery data may be an artifact of the distribution of fishery/recovery effort. An analyses on which SPC tag returns are weighted for effort is currently in progress.

In the SPC survey, skipjack were measured to the nearest 1/2 centimeter during the process of tagging and most of the subsequent tag returns were accompanied by length data. A summary of the results of the growth study appears in Table 1. A major feature of the data is that growth rates appear to vary considerably with respect to both time and area. In addition to providing basic information on tuna biology, studies on growth are important in yield modelling and can be informative of stock structuring. For example, some researchers feel that growth rate differences between Eastern Pacific and Western Pacific skipjack have some implications of stock structuring.

Competition between various types of tuna fishing gear and between various nationalities (whether direct or indirect) is an issue which is becoming very important in the Western Pacific. SPC tag returns were

usually accompanied by sufficient information to determine gear type and nationality of capturing vessel. This permitted us to determine what portion of the tuna in a particular area were caught by artisanal pole and line, purse seining, and longlining techniques as well as by the nationality of the fishermen. Data received by July 1981 is listed in Table 2.

A plot of the natural log of all SPC skipjack tag returns against time at large is given in Fig. 3. The values represent the returns per month we would expect to see with time if we had released all our tags on the same day. The slope of this line (.20) is equivalent to the instantaneous attrition rate which is the all loss of fish from the fishery whether due to fishing mortality, natural mortality, or movement of fish out of the area. An extrapolation of this line to the y axis has a value of 6.1 which is equivalent to an effective return rate of 466 returns per month. With 139 981 skipjack tagged, this implies an average harvest rate of  $.003/p^*$  per month. The small size of this regional harvest rate as compared to the previously discussed regional attrition rate, .20 per month, indicates that a considerable biological potential for a catch increase exists.

Calculations similar to the above have been performed for individual countries of the South Pacific Commission region. Using the resultant harvest rates in two separate skipjack fisheries in conjunction with the number of tagged fish released in one fishery and recovery in the other fishery, a stock relationship between two fisheries can be quantified. Table 3 presents the preliminary findings of the stock interaction study. The data show that, for example, each month approximately 400/p tonnes of fish move from the fishery in Papua New Guinea to the fishery in the Solomon Islands and that, due to the low harvest rate in the Solomons, these Papua New Guinea fish only contributed 12 tons to the skipjack catch.

The huge distances travelled by some skipjack depicted in Fig. 1 suggests that there is considerable possibility for stock interactions among fisheries, however, from the stock relation study it appears that the interaction is at present quite small.

---

\* P is a factor which corrects for tag shedding, tagging mortality, and non-reporting of captured tagged fish. It is a value between zero and one (ideally close to one).

usually accompanied by sufficient information to determine gear type and nationality of capturing vessel. This permitted us to determine what portion of the tuna in a particular area were caught by artisanal pole and line, purse seining, and longlining techniques as well as by the nationality of the fishermen. Data received by July 1981 is listed in Table 2.

A plot of the natural log of all SPC skipjack tag returns against time at large is given in Fig. 3. The values represent the returns per month we would expect to see with time if we had released all our tags on the same day. The slope of this line (.20) is equivalent to the instantaneous attrition rate which is the all loss of fish from the fishery whether due to fishing mortality, natural mortality, or movement of fish out of the area. An extrapolation of this line to the y axis has a value of 6.1 which is equivalent to an effective return rate of 466 returns per month. With 139 981 skipjack tagged, this implies an average harvest rate of  $.003/p^*$  per month. The small size of this regional harvest rate as compared to the previously discussed regional attrition rate, .20 per month, indicates that a considerable biological potential for a catch increase exists.

Calculations similar to the above have been performed for individual countries of the South Pacific Commission region. Using the resultant harvest rates in two separate skipjack fisheries in conjunction with the number of tagged fish released in one fishery and recovery in the other fishery, a stock relationship between two fisheries can be quantified. Table 3 presents the preliminary findings of the stock interaction study. The data show that, for example, each month approximately 400/p tonnes of fish move from the fishery in Papua New Guinea to the fishery in the Solomon Islands and that, due to the low harvest rate in the Solomons, these Papua New Guinea fish only contributed 12 tons to the skipjack catch.

The huge distances travelled by some skipjack depicted in Fig. 1 suggests that there is considerable possibility for stock interactions among fisheries, however, from the stock relation study it appears that the interaction is at present quite small.

---

\* P is a factor which corrects for tag shedding, tagging mortality, and non-reporting of captured tagged fish. It is a value between zero and one (ideally close to one).

Table 1. Average growth rates for various areas within the SPC region

Unreliable estimates are marked by an X.

<u>Fish at large 31-180 days</u>														
<u>40-49 cm at release</u>								<u>50-59 cm at release</u>						
Area	Reliability	Sample size	Average release length (cm)	Average days at large	Average growth rate (cm/yr)	Standard error (cm)	Standard deviation (cm)	Reliability	Sample size	Average release length (cm)	Average days at large	Average growth rate (cm/yr)	Standard error (cm)	Standard deviation (cm)
Ponape	X	1	48.0	170	21.06	-	-		9	52.6	100	13.67	2.05	6.15
Papua New Guinea		16	46.7	68	20.85	3.62	14.47		292	55.0	65	5.40	0.69	11.75
Solomon Islands		87	44.9	104	12.72	1.20	11.23		42	53.2	96	5.75	2.84	18.43
Kiribati		180	47.6	65	9.46	0.74	9.96		39	51.6	65	1.42	2.05	12.78
Fiji		38	46.0	67	17.23	2.42	14.89	X	12	52.4	66	11.95	6.00	20.79
New Zealand	X	2	45.0	52	-6.75	6.92	9.78	X	3	53.5	62	14.55	1.88	3.26
<u>Fish at large 181-450 days</u>														
Ponape	X	3	48.5	196	13.78	1.76	3.06	X	4	50.9	217	12.89	1.57	3.13
Papua New Guinea	X	3	44.2	271	19.38	4.44	7.70		15	53.8	368	8.23	0.63	2.45
Solomon Islands		77	45.3	267	11.37	0.90	7.90		50	53.2	303	4.06	0.90	6.35
Kiribati	X	1	46.0	408	5.43	-	-		0	-	-	-	-	-
Fiji		20	46.7	316	16.16	0.87	3.91		10	53.0	316	7.01	1.93	6.10
New Zealand		11	46.4	330	8.41	0.86	2.85	X	3	50.8	322	13.44	0.55	0.95

Table 2. Returns by country and boat type up to 26 July 1981

Seven categories of recapture vessels are defined in the column headings. Regionally based commercial vessels include locally-based pole-and-line operations in PNG, SOL, FIJ, KIR, TON and PAL as well as bonitiers operating in French Polynesia. Sub-columns represent species: SJ-skipjack, YF-yellowfin, OT-other. Interpretation of country mnemonics is given in the appendix.

Boat Type	Regionally Based	Artisanal Subsistence Recreational	SPC Tagging Vessel	Japanese Pole-and-line	Seiners	Longliners	Unknown
Species	SJ YF OT	SJ YF OT	SJ YF OT	SJ YF OT	SJ YF OT	SJ YF OT	SJ YF OT
AMS	0 0 0	2 0 0	3 0 0	1 0 0	0 0 0	0 0 0	0 0 0
CAL	4 0 0	1 0 0	13 0 0	17 0 0	0 0 0	0 0 0	0 0 0
FIJ	1878 110 43	1 1 0	93 1 0	2 0 0	0 0 0	0 1 0	0 0 0
HAW	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0
HOW	0 0 0	0 0 0	0 0 0	36 0 0	0 0 0	0 0 0	0 0 0
IND	5 0 0	1 1 0	0 0 0	1 0 0	34 5 0	0 0 0	0 0 0
INT	6 0 0	1 1 0	0 0 0	115 0 0	37 6 0	0 2 0	0 1 0
JAP	0 0 0	0 0 0	0 0 0	10 0 0	0 0 0	0 0 0	1 0 0
KIR	346 0 0	2 0 0	10 0 0	46 0 0	1 0 0	1 1 0	1 0 0
KOS	0 0 0	0 0 0	0 0 0	31 0 0	0 0 0	0 0 0	0 0 0
LIN	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0
MAQ	2 0 0	6 0 0	34 0 0	0 0 0	0 0 0	0 0 0	0 0 0
MAR	0 0 0	0 0 0	0 0 0	9 0 0	0 0 0	0 0 0	0 0 0
MAS	0 0 0	1 0 0	0 0 0	62 0 0	0 0 0	0 0 0	2 0 0
MTS	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0
NAU	0 0 0	0 0 0	0 0 0	4 0 0	0 0 0	0 0 0	0 0 0
NCK	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0
NOR	0 0 0	0 1 0	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0
NSW	2 0 0	0 0 0	0 0 0	1 0 0	1 0 0	0 0 0	1 0 0
PAL	91 0 0	0 0 0	1 0 0	15 0 0	3 0 0	0 0 0	2 0 0
PAM	0 0 0	0 0 0	0 0 0	5 0 0	0 0 0	0 0 0	0 0 0
PHL	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
PHO	0 0 0	0 0 0	0 0 0	32 0 0	0 0 0	0 0 0	0 0 0
PNG	964 20 6	1 0 0	5 0 0	5 0 0	55 9 0	0 0 0	13 0 0
PON	9 0 0	17 1 0	0 0 0	64 1 0	1 1 0	0 0 0	1 0 0
QLD	0 0 0	0 0 0	2 0 0	0 0 0	0 0 0	0 0 0	0 0 0
SOC	27 6 0	11 0 0	16 0 0	0 0 0	0 0 0	0 0 0	0 0 0
SOL	526 11 1	1 0 0	13 0 0	8 0 0	1 0 0	0 0 0	6 0 0
TOK	0 0 0	2 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
TON	11 0 0	1 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0
TRK	7 0 0	1 0 0	1 0 0	48 1 0	2 0 0	1 0 0	0 0 0
TUA	14 0 0	0 0 0	11 0 0	0 0 0	0 0 0	0 0 0	0 0 0
TUV	2 0 0	3 0 0	0 0 0	2 0 0	0 0 0	0 0 0	1 0 0
VAN	0 0 0	0 0 0	2 0 0	3 0 0	0 0 0	0 0 0	0 0 0
WAK	0 0 0	0 0 0	0 0 0	1 1 0	0 0 0	0 0 0	0 0 0
WAL	0 0 0	0 0 0	67 1 0	0 0 0	0 0 0	0 0 0	0 0 0
WES	3 0 0	31 0 0	7 0 0	0 0 0	0 0 0	0 0 0	0 0 0
YAP	0 0 0	0 0 0	0 0 0	23 1 0	16 5 0	0 0 0	2 0 0
ZEA	1 0 0	5 0 0	0 0 0	0 0 0	1013 0 0	0 0 0	3 0 0
???	23 0 0	0 0 0	0 0 0	12 1 0	19 0 0	0 1 0	109 12 0
TOTAL	3919 150 50	95 5 0	280 2 0	557 5 0	1183 26 0	2 5 0	142 13 0

Table 3. Fishery interaction results

Column 4 gives the number of returns in the destination country and only includes tagged fish which were recaptured in fisheries for which we have adequate catch statistics and which were released in one of the six countries given in Table 6. The values in Columns 5, 6 and 8 are obtained from Table 6\*. Column 7, migration coefficients, which are defined in the texts and Column 9, tonnes migrating per month from origin to destination, were calculated as follows:

$$\text{Column (7)} = \text{A2.Column(4)} / (\text{Column(5).Column(6).p})$$

$$\text{Column(9)} = \text{Column(7).Column(8)}$$

where A is the total attrition rate (assumed to be .35 per month for all countries) and p is the correction for early tagging mortality and non-reporting of recaptured tags.

Origin	Destination	Period of release	No. of tags returned	No. of tags released	Harvest rate at destination (month <sup>-1</sup> )	Migration coefficient (month <sup>-1</sup> )	Population at origin (tonnes)	Tonnes per month migrating
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PNG	SOL	79/05	15	3227	.03/p	.01	43,000p	400p
PNG	SOL	79/06	6	4401	.03/p	.006	72,000p	400p
SOL	PNG	77/11	4	1805	.05/p	.005	60,000p	300p
SOL	PNG	80/06	7	3731	.05/p	.005	75,000p	400p
SOL	FIJ	80/06	1	3731	.03/p	.001	75,000p	80p
FIJ	ZEA	78/02	1	4299	.06/p	.0005	14,000p	7p
FIJ	ZEA	78/04	2	3818	.06/p	.001	12,000p	10p
ZEA	FIJ	79/02	20	11623	.03/p	.007	50,000p	400p
ZEA	SOC	79/02	4	11623	.01/p	.004	50,000p	200p

\* Table 6 in Working Paper 9, SPC Regional Technical Meeting on Fisheries, August 1981, Noumea.

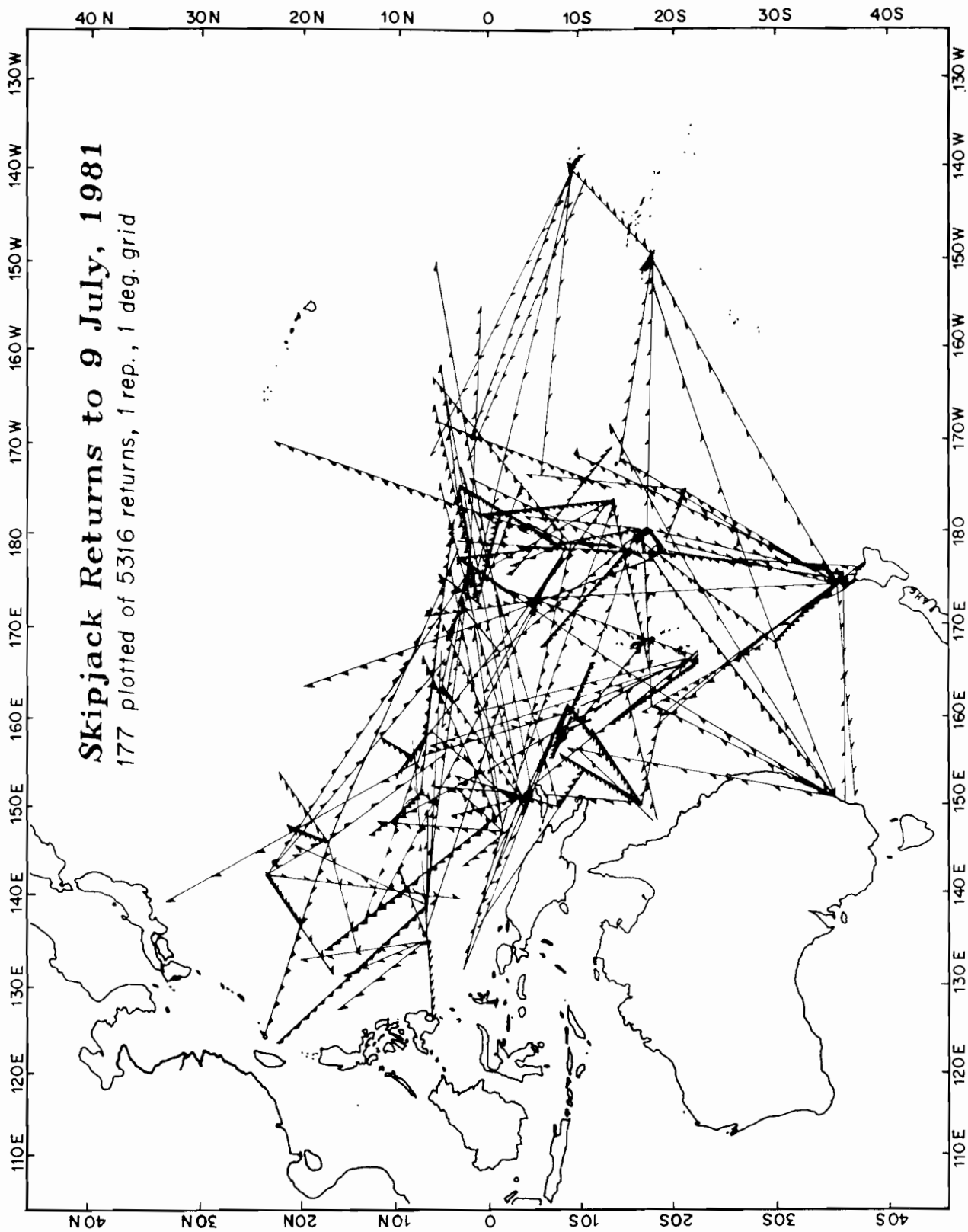


Fig.1 Skipjack migration arrows. The 177 returns plotted here were selected from among the 5316 skipjack returns which had precise recapture data and position information and which were received by 9 July 1981

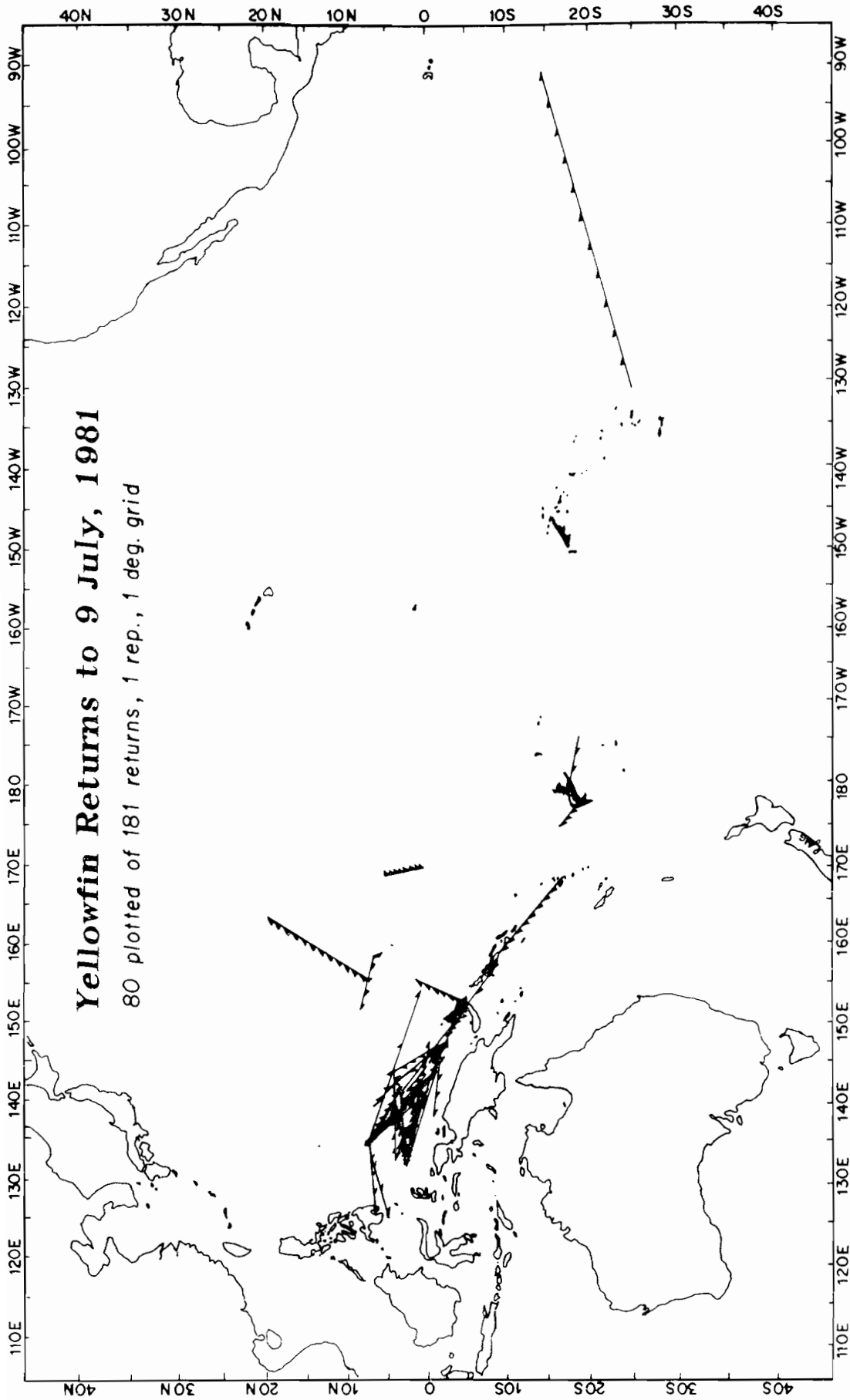


Fig.2 Yellowfin migration arrows. The 80 returns plotted here were selected from among the 181 yellowfin returns which had precise recapture data and position information and which were received by 9 July 1981



## *Aggregate Returns per Month*

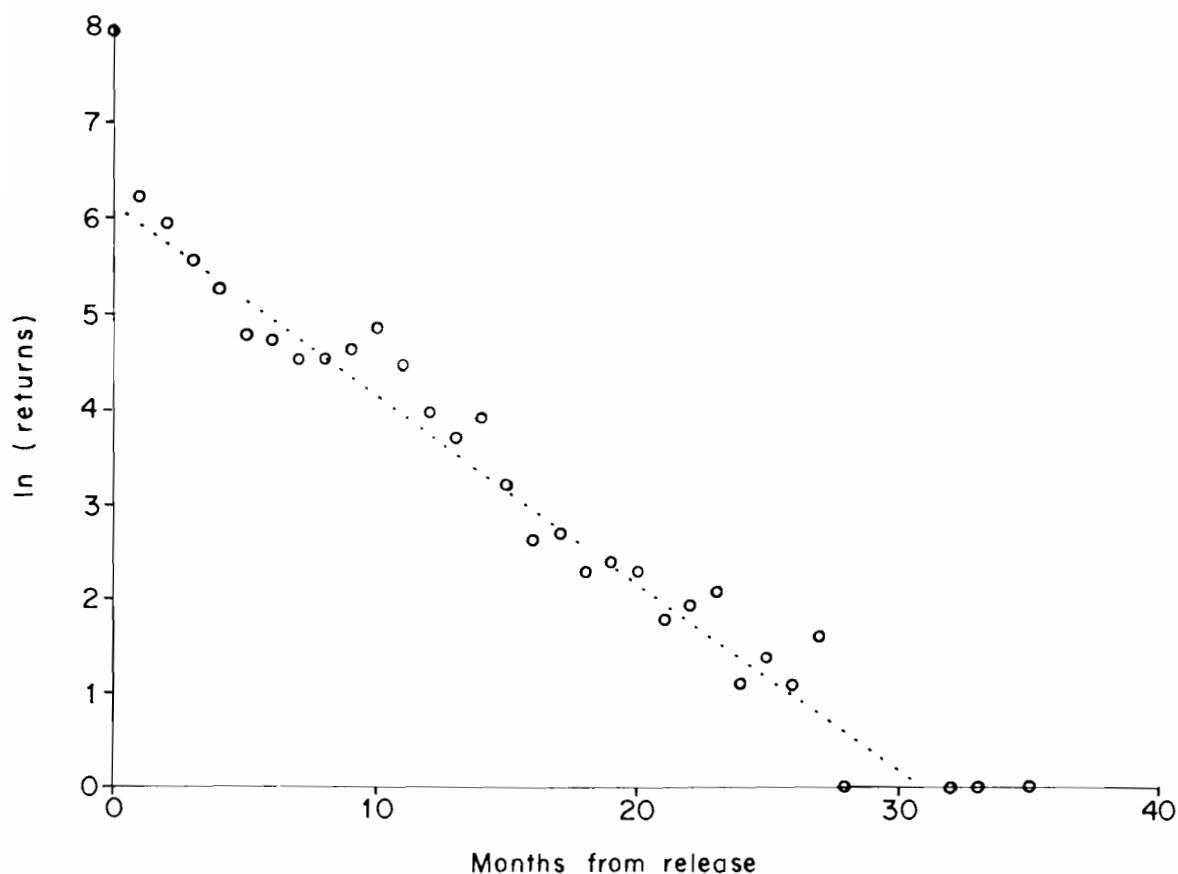


Fig. 3 Logarithmic plot of skipjack returns by monthly time-at-large categories. Includes 5,442 returns received by 23 July 1981. Not included are 736 returns with imprecise date information and 280 recaptures by the SPC tagging vessel

APPENDIX

COUNTRY MNEMONICS

AMS	American Samoa
CAL	New Caledonia
FIJ	Fiji
GAM	Gambier Islands (French Polynesia)
HAW	Hawaii
HOW	Howland and Baker Islands (U.S. Territory)
IND	Indonesia
INT	International Waters
JAP	Japan
KIR	Kiribati
KOS	Kosrae (Federated States of Micronesia)
LIN	Line Islands (Kiribati)
MAQ	Marquesas Islands (French Polynesia)
MAR	Mariana Islands
MAS	Marshall Islands
MTS	Minami-tori shima (Japan)
NAU	Republic of Nauru
NCK	Northern Cook Islands
NIU	Niue
NOR	Norfolk Island
NSW	New South Wales (Australia)
PAL	Pulau
PAM	Palmyra (U.S. Territory)
PHL	Philippines
PHO	Phoenix Islands (Kiribati)
PIT	Pitcairn Islands
PNG	Papua New Guinea
PON	Ponape (Federated States of Micronesia)
QLD	Queensland (Australia)
SCK	Southern Cook Islands
SOC	Society Islands (French Polynesia)
SOL	Solomon Islands
TOK	Tokelau
TON	Kingdom of Tonga
TRK	Truk (Federated States of Micronesia)
TUA	Tuvalu
VAN	Vanuatu
WAK	Wake Island (U.S. Territory)
WAL	Wallis and Futuna
WES	Western Samoa
YAP	Yap (Federated States of Micronesia)
ZEA	New Zealand

ANNEX

SOME ISSUES/PROBLEMS FOR DISCUSSION ON THE TUNA  
TAGGING PROGRAMME FOR INDONESIA/PHILIPPINES

1. Are available Indonesian pole and line vessels compatible with a tagging operation?
2. What vessel will be used in Philippine waters?
3. What will be the cost of a tagging survey?
4. Is blood sampling to be done?
5. How will the tagging personnel be trained?
6. What steps will be taken to standardize tagging techniques?
7. What would be a reasonable time frame for the survey and number of fish to be tagged?
8. What species are to be studied?
9. What special measures will be taken to secure bait where scarce?  
  
    Buying bait?  
    Alternate capture techniques?  
    Cultured species?
10. What steps are to be taken to publicize the programme, assure tags are returned and to distribute rewards?
11. Will accurate catch data from the industrial fishery be available?
12. In addition to tag release data, what other information will be collected?  
  
    Baiting information?  
    Sightings information?  
    Length/frequency?  
    Tuna juveniles?  
    Stomach contents/gonad studies?
13. Is the tagging data to be computerized? Is additional data to be computerized?
14. What tags are to be used?

# PUBLICATIONS OF THE SOUTH CHINA SEA FISHERIES DEVELOPMENT AND COORDINATING PROGRAMME

## WORKING PAPERS

- SCS/74/WP/1 RABANAL, H.R. The potentials of aquaculture development in the Indo-Pacific Region. Manila, South China Sea Fisheries Programme, 1974. 34p.
- SCS/74/WP/2 CRUTCHFIELD, J.A., D.A. LAWSON and G.K. MOORE. Malaysia. Legal and institutional aspects of fisheries development. Manila, South China Sea Fisheries Programme, 1974. 27p.
- SCS/74/WP/3 MARR, J.C. Republic of Vietnam. Legal and institutional aspects of fisheries development. Manila, South China Sea Fisheries Programme, 1974. 20p.
- SCS/74/WP/4 LARSSON, S.O.R., G.C.A. VAN NOORT and E.O. OSWALD. Malaysia. A report on artisanal fisheries of Peninsular Malaysia with particular reference to Kuala Besut. Manila, South China Sea Fisheries Programme, 1975. 58p.
- SCS/75/WP/5 RABANAL, H.R. Irian Jaya, Indonesia. Survey of possibilities and recommendations for development of brackishwater fish production. Manila, South China Sea Fisheries Programme, 1974. 27p.
- SCS/75/WP/6 TUSSING, A.R. Fishery development perspectives. Suh-Region V. South China Sea. Manila, South China Sea Fisheries Programme, 1975. (IPFC 74:Sym 7). 23p.
- SCS/75/WP/7 MURDOCH, W.R. and M.A. MYERS. Republic of Singapore. An assessment of the Jurong Fishing Harbour complex and expansion site on the east bank of the Jurong River. Manila, South China Sea Fisheries Programme, 1975. 46p.
- SCS/75/WP/8 PETERSON, C.L., K.J. ROSENBERG and A.C. SIMPSON. Regional. Trip reports of chartered purse seine vessels Royal Venture and Southward Ho covering Voyages 1 and 2. December 1-13, 1974 and January 5 - February 3, 1975. Manila, South China Sea Fisheries Programme, 1975. 37p.
- SCS/75/WP/9 OSWALD, E.O. and R.E.K.D. LEE. Regional. A proposal for a live bait pole-and-line tuna fishing survey in the South China Sea and adjacent waters. Manila, South China Sea Fisheries Programme, 1975. 38p.
- SCS/75/WP/10 ROSENBERG, K.J. and A.C. SIMPSON. Regional. Trip reports of chartered purse seine vessels Royal Venture and Southward Ho covering Voyage 3. 9 February to 26 March 1975. Manila, South China Sea Fisheries Programme, 1975. 28p.
- SCS/75/WP/11 PETERSON, C.L. Regional. Resource survey of larger pelagic fish. Manila, South China Sea Fisheries Programme, 1975. 32p.
- SCS/75/WP/12 ROSENBERG, K.J., A.C. SIMPSON and C.M. RENWICK. Regional. Trip reports of chartered purse seine vessels Royal Venture and Southward Ho covering Voyage 4. 9 April to 24 May 1975. Manila, South China Sea Fisheries Programme, 1975. 36p.
- SCS/75/WP/13 BAUM, G.A. Kuala Besut II. A supplementary report on selected socio-economic aspects and problems in a fishermen's community on the east coast of Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1975. 43p.
- SCS/75/WP/14 CUERDEN, C. Library services for the South China Sea Fisheries Programme and its participating countries. Manila, South China Sea Fisheries Programme, 1975. 48p.
- SCS/75/WP/15 LAWSON, R.M. Malaysia. An interim report on socio-economic aspects of the development of artisanal fisheries on the east coast of Malaysia. Manila, South China Sea Fisheries Programme, 1975. 29p.
- SCS/75/WP/16 JAMANDRE, T.J. and H.R. RABANAL. Engineering aspects of brackish-water aquaculture in the South China Sea region. Manila, South China Sea Fisheries Programme, 1975. 96p.
- SCS/75/WP/17 MURDOCH, W.R. Malaysia. Assessment of the viability and potential of the joint venture, Majukan Mid-east Sdn Bhd, Kuching, Sarawak as requested by Lembaga Majukan, Malaysia. Manila, South China Sea Fisheries Programme, 1975. 16p. (Restricted)
- SCS/75/WP/18 CLFAVER, W.D. Malaysia. A preliminary design and general arrangement for an offshore purse seine vessel for the east coast of West Malaysia. Manila, South China Sea Fisheries Programme, 1975. 35p.
- SCS/75/WP/19 PISCHEDDA, J.I. Republic of the Philippines. Legal and institutional aspects in the development of the fishing industry. Preliminary observations and identification of the main obstacles. Manila, South China Sea Fisheries Programme, 1975. 35p.
- SCS/75/WP/20 SIMPSON, A.C. Regional. Acoustic surveys of pelagic resources. Report No. 1. Gulf of Thailand, July 1975. Manila, South China Sea Fisheries Programme, 1975. 28p.
- SCS/75/WP/21 CINTAS, D. and C.M. RENWICK. Regional. Report of aerial survey for schooling pelagic fish. 1. Philippine waters, 12-29 June 1975. Manila, South China Sea Fisheries Programme, 1975. 28p.
- SCS/76/WP/22 BAUM, G.A. and J.A. MAYNARD. Tobuan Sual, Pangasinan Province, Central Luzon. A socio-economic study on four fishermen's communities in connection with the Municipal Fisheries Pilot Programme, 1976. 44p.
- SCS/76/WP/23 BAUM, G.A. and J.A. MAYNARD. Panigayan, Lampingan,, Baluk-Baluk and Manangal, Basilan Province. A socio-economic study on four fishermen's communities affiliated to the Basilan Fishing Association (BFA) Isabela in connection with the Municipal Fisheries Pilot Programme. Manila, South China Sea Fisheries Programme, 1976. 62p.
- SCS/76/WP/24 BARICA, J. Nutrient-dynamics in eutrophic inland waters and for aquaculture in some countries bordering the South China Sea with particular reference to mass fish mortalities. Proposal for monitoring programmes, Philippines, Thailand and Hong Kong. Manila, South China Sea Fisheries Programme, 1976. 43p.
- SCS/76/WP/25 ROSENBERG, K.J., A.C. SIMPSON and J.A. MAYNARD. Regional. Trip reports of chartered purse seine vessels Royal Venture and Southward Ho covering Voyages 5 and 6. 13 June to 10 September 1975. Manila, South China Sea Fisheries Programme, 1976. 52p.
- SCS/76/WP/26 MOORE, G.K. Malaysia. Legal and institutional aspects of fisheries development. (2nd working paper). Manila, South China Sea Fisheries Programme, 1976. 38p.
- SCS/76/WP/27 WHEELAND, H.A. Malaysia. Preliminary observations and recommendations concerning the fisheries statistics programme of Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1976. 22p.
- SCS/76/WP/28 MAYNARD, J.A. Regional. Report of aerial survey for schooling pelagic fish. II. Thailand. 20 November to 1 December 1975. Manila, South China Sea Fisheries Programme, 1976. 20p.
- SCS/76/WP/29 BAUM, G.A. and J.A. MAYNARD. Salay, Misamis Oriental Province. A socio-economic study on the fishing population of the seven coastal barrios of Salay Municipality in connection with the Municipal Fisheries Pilot Programme. Manila, South China Sea Fisheries Programme, 1976. 47p.
- SCS/76/WP/30 MURDOCH, W.R. Hong Kong. A preliminary feasibility study to prosecute offshore pelagic stocks from Hong Kong. Manila, South China Sea Fisheries Programme, 1976. 27p.
- SCS/76/WP/31 JOHNSON, R.F. Preliminary report on aquatic pollution in the South China Sea region. Manila, South China Sea Fisheries Programme, 1976. 34p.
- SCS/76/WP/32 WHEELAND, H.A. Preliminary observations and recommendations concerning the fisheries statistics programme of Singapore. Manila, South China Sea Fisheries Programme, 1976. 21p.
- SCS/76/WP/33 BAUM, G.A. and J.A. MAYNARD. Coron Tagumpay - Buswanga Island, Calamianes Group (Palawan Province). A socio-economic study of two rural fishing populations in northern Palawan in connection with the Municipal Fisheries Pilot Programme. Manila, South China Sea Fisheries Programme, 1976. 112p.
- SCS/76/WP/34 JONES, R. Mesh regulations in the demersal fisheries of the South China Sea area. Regional. Manila, South China Sea Fisheries Programme, 1976. 79p.
- SCS/76/WP/35 SIMPSON, A.C. and S. CHIKUNI. Progress report on fishing for tuna in Philippine waters by FAO chartered purse seiners. Manila, South China Sea Fisheries Programme, 1976. 38p.
- SCS/76/WP/36 BONGA, O.B. Vessel specifications and drawings for two 10 m multi-purpose fishing vessels for the small-scale fisheries project. Kuala Besut. Manila, South China Sea Fisheries Programme, 1976. 36p.
- SCS/76/WP/37 SHANG, Y.C. Economics of various management techniques for pond culture of finfish. Manila, South China Sea Fisheries Programme, 1976. 36p.
- SCS/76/WP/38 JOHNSON, H.N. Malaysia. A preliminary study of investment opportunities for the development of small-scale fisheries on east coast of Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1976. 21p.
- SCS/76/WP/39 SHANG, Y.C. Follow-up programmes on economics of aquaculture in the South China Sea region. Manila, South China Sea Fisheries Programme, 1976. 19p.
- SCS/76/WP/40 COOK, J.I. Problems in shrimp culture in the South China Sea region. Manila, South China Sea Fisheries Programme, 1976. 50p.
- SCS/76/WP/41 JOHNSON, H., J. DIBBS and R. NASOETION. Indonesia. A preliminary assessment for small-scale fisheries development in Riau North Sumatra and West Kalimantan Provinces. Manila, South China Sea Fisheries Programme, 1976. 51p.
- SCS/76/WP/42 BAUM, G.A. and J.A. MAYNARD. Bayawan Municipality, Negros Oriental Province, Negros. A socio-economic study on the rural fishing population of Bayawan municipality in connection with the Municipal Fisheries Pilot Programme. Manila, South China Sea Fisheries Programme, 1976. 33p.
- SCS/76/WP/43 MAYNARD, J.A. Philippines. Report on aerial survey for schooling pelagic fish in waters of the South China Sea and Sulu Sea adjacent to Palawan Island. 9-12 March 1976. Manila, South China Sea Fisheries Programme, 1976. 17p.
- SCS/76/WP/44 CHAKRABORTY, D. Fisheries statistics in the Philippines. A plan for a new and expanded data collection programme. Manila, South China Sea Fisheries Programme, 1976. 70p.
- SCS/76/WP/45 MARR, J.C., G. CAMPLEMAN and W.R. MURDOCH. Thailand. An analysis of the present and recommendations for future fishery development and management policies, programmes and institutional arrangements. Manila, South China Sea Fisheries Programme, 1976. 185p. (Restricted)
- SCS/76/WP/46 CLEAVER, W. and O.B. BONGA. Thailand. Preliminary design, general arrangement and lines plans for two pelagic purse seine midwater trawl research vessel. 27.5 m and 24 m lengths. Manila, South China Sea Fisheries Programme, 1976. (Not issued)
- SCS/76/WP/47 CLEAVER, W. Hong Kong. A preliminary design, general arrangement and specifications for a combination pelagic-demersal research vessel. Manila, South China Sea Fisheries Programme, 1976. (Not issued)
- SCS/76/WP/48 SIMPSON, A.C. and W.R. MURDOCH. Regional. Trip reports of chartered purse seine vessel Royal Venture. Trips Nos. 7 & 8. 1 October to February 1976. Area. Moro Gulf. Manila, South China Sea Fisheries Programme, 1976. 17p.
- SCS/76/WP/49. Regional. Trip reports of chartered vessel Southward Ho. Trips 7 & 8. 11 September 1975 to March 1976. Areas. Malaysia and Thailand. Manila, South China Sea Fisheries Programme, 1976. 33p.
- SCS/76/WP/50. Regional. Trip reports of chartered purse seine vessel Royal Venture and Southward Ho. Trip No. 9. Manila, South China Sea Fisheries Programme, 1976. 22p.
- SCS/76/WP/51. Regional. Trip reports of chartered purse seine vessel Southward Ho. Trips 10 and 11. 15 April to 8 August 1976. Area. East, North and West Coasts. Luzon Island, Bohol Sea, Sulu Sea, Moro Gulf. Manila, South China Sea Fisheries Programme, 1976. 20p.

- SCS/76/WP/52 WHEELAND, H.A. Statistics for fisheries development. Regional. Manila, South China Sea Fisheries Programme, 1976. 11p.
- SCS/76/WP/53 CHRISTY, L.C. Republic of the Philippines — Legal and institutional aspects of fisheries development. Manila, South China Sea Fisheries Programme, 1976. 65p. (Restricted)
- SCS/76/WP/54 MAYNARD, J.A. Philippines — Province of Tawi-Tawi project identification and semi-detailed feasibility study relative to improving the status of small-scale fishermen and creating an integrated fishing industry in the Province of Tawi-Tawi. Manila, South China Sea Fisheries Programme, 1976. 110p.
- SCS/77/WP/55 OSWALD, E.O. and J.A. MAYNARD. Thailand — Proposed small-scale fisheries pilot project for Ban Ao Nakam Pom, Rayong Province. Manila, South China Sea Fisheries Programme, 1977. 38p.
- SCS/77/WP/56 MURDOCH, W.R. and P.S. WALCZAK. Regional — Trip reports of chartered purse seine vessel, Southward Ho covering Voyage 12. Area — waters of the Sulu Sea. Manila, South China Sea Fisheries Programme, 1977. 11p.
- SCS/77/WP/57 MURDOCH, W.R. and P.S. WALCZAK. Regional — Trip reports of chartered purse seine vessels Southward Ho and Royal Venture covering Voyage 13. Area mainly Moro Gulf, Philippines. Manila, South China Sea Fisheries Programme, 1977. 18p.
- SCS/77/WP/58 SIMPSON, A.C., W.R. MURDOCH. Regional — Trip reports of chartered purse seine vessel Southward Ho covering Voyages Nos. 14 and 15. Area — Moro Gulf. Manila, South China Sea Fisheries Programme, 1977. 15p.
- SCS/77/WP/59 MURDOCH, W.R. and P.S. WALCZAK. Regional — Trip reports of chartered purse seine vessel Southward Ho covering Voyages Nos. 16 and 17. Area — waters of the Moro Gulf. Manila, South China Sea Fisheries Programme, 1977. 23p.
- SCS/77/WP/60 DOTY, M.S. Seaweed resources and their culture in the countries of the South China Sea region. Manila, South China Sea Fisheries Programme, 1977. 19p.
- SCS/77/WP/61 RABANAL, H.R. *et al.* Shellfisheries of Thailand: Background and proposal for development. Manila, South China Sea Fisheries Programme, 1977. 14p.
- SCS/77/WP/62 CHAKRABORTY, D. Observations and recommendations concerning the fisheries statistics programme of Hong Kong. Manila, South China Sea Fisheries Programme, 1977. 14p.
- SCS/77/WP/63 ———. Observations and recommendations concerning the inland fisheries statistics programme of Thailand. Manila, South China Sea Fisheries Programme, 1977. 15p.
- SCS/77/WP/64 HANSEN, K.A., P. LOVSETH and A.C. SIMPSON. Acoustic surveys of pelagic resources. Report No. 2. Hong Kong, November 1976. Manila, South China Sea Fisheries Programme, 1977. 24p.
- SCS/77/WP/65 CHRISTY, L.C. Republic of the Philippines — Legal and institutional aspects of fisheries development. Manila, South China Sea Fisheries Programme, 1977. 55p.
- SCS/77/WP/66 MURDOCH, W.R. *et al.* A proposal for a small-scale fisheries pilot project in the Pulau Tujuh (Seven Islands) area, Riau Archipelago District, Riau Province, Indonesia. Manila, South China Sea Fisheries Programme, 1977. 69p.
- SCS/77/WP/67 MOORE, G. Malaysia — A new fisheries bill. Manila, South China Sea Fisheries Programme, 1977. 56p.
- SCS/77/WP/68 GEDNEY, R.H. Water supply of the fishery development centre in the freshwater aquaculture at Sukabumi, West Java, Indonesia.
- SCS/77/WP/69 CHAN, W.L. *et al.* Cage culture of marine fish in east coast Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1978. 66p.
- SCS/78/WP/70 LEE, R.E.K.D. Results of small-scale live bait pole-and-line fishing explorations for tuna in the Philippines. Manila, South China Sea Fisheries Programme, 1978. 41p.
- SCS/78/WP/71 MOORE, G. Legal and institutional aspects of fisheries management and development — a new licensing system, Thailand. Manila, South China Sea Fisheries Programme, 1978. 23p. (Restricted)
- SCS/78/WP/72 ANGELES, H.G. Preliminary fish and resources survey along the coast of Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1978.
- SCS/78/WP/73 DE LA CRUZ, Y.T. Malaysia — Small-scale fishermen credit and subsidy programmes — Implementing guideline recommendations (with particular reference to the Kuala Besut Fishermen's Association). Manila, South China Sea Fisheries Programme, 1978. 50p.
- SCS/78/WP/74 CHIKUNI, S. Report on fishing for tuna in Philippine waters by FAO chartered purse seiners. Manila, South China Sea Fisheries Programme, 1978. (Published as SCS/DEV 78/18).
- SCS/78/WP/75 Fyson, J.E. Fishing vessel design proposals for small-scale artisanal fisheries in the Philippines. Manila, South China Sea Fisheries Programme, 1978. 23p.
- SCS/78/WP/76 LAU, F. and CHENG CHOR LUK. Recent innovations in the cage culture activity at Kuala Besut small-scale fisheries pilot project, Malaysia. Manila, South China Sea Fisheries Programme, 1978. 16p.
- SCS/78/WP/77 WHEELAND, H.A. Proposal for further development of fishery statistics programmes in developing countries with particular reference to the South China Sea region. Manila, South China Sea Fisheries Programme, 1978. 6p.
- SCS/78/WP/78 MOORE, G. Legal and institutional aspects of fisheries management and development. A second Interim Report (Thailand) Manila, South China Sea Fisheries Programme, 1978. 37p. (Restricted)
- SCS/79/WP/79 JONASSON, G. and PAISAL KATANYUWONG. Review of fishing activities of the small-scale fisheries project in Kuala Besut, Malaysia. Manila, South China Sea Fisheries Programme, 1979. 23p.
- SCS/79/WP/80 CANSDALE, G.S. Low-cost water filtration system. Manila, South China Sea Fisheries Programme, 1979. 73p.
- SCS/79/WP/81 LISAC, H. Some technical aspects of small-scale fish landing facilities. Manila, South China Sea Fisheries Programme, 1979. 32p.
- SCS/79/WP/82 CHAKRABORTY, D. Catch and analysis of fishermen in Kuala Besut, Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1979. 59p.
- SCS/79/WP/83 THOMPSON, B.G. Thailand — Management of fisheries data — feasibility of computerization. Manila, South China Sea Fisheries Programme, 1979. 24p.
- SCS/79/WP/84 CANSDALE, G.S. Report on second regional consultancy low-cost water filtration. Manila, South China Sea Fisheries Programme, 1979. 48p.
- SCS/79/WP/85 NEW, M. Report of consultancy on the fish nutrition programme at Changi Marine Fisheries Research Centre, Primary Production Department, Singapore. Manila, South China Sea Fisheries Programme, 1979. 8p.
- SCS/79/WP/86 WOYNAROVICH, E. and W.W. KUHNHOLD. Report of consultancy to Penang, Malaysia, regarding animal waste management problem. Manila, South China Sea Fisheries Programme, 1979. 59p.
- SCS/79/WP/87 THOMPSON, D.B. Intermediate technology and alternative energy systems for small-scale fisheries. Manila, South China Sea Fisheries Programme, 1979. 69p.
- SCS/80/WP/88 HECHANOVA, R.G. and B. TIENSONGRUSMEE. Report of assistance on selection of site, design, construction and management of the Ban Merbok, Kedah, Malaysia Brackishwater Aquaculture Demonstration Project. Manila, South China Sea Fisheries Programme, 1980. 154p.
- SCS/80/WP/89 TIENSONGRUSMEE, B. and R.G. HECHANOVA. Malaysia — Evaluation of the site selected, design of project and proposed construction and operations of the MAJUJUKAN Tanjung Tualang Freshwater Aquaculture Centre. Manila, South China Sea Fisheries Programme, 1980. 52p.
- SCS/80/WP/90 SKILLMAN, R.A. Tuna statistics Indo-Pacific and Indian Ocean. Manila, South China Sea Fisheries Programme, 1980. 45p.
- SCS/80/WP/91 TRONO, G.C., JR., H.R. RABANAL and I. SANTIKA. Report of technical assistance on seaweed farming in Indonesia. Manila, South China Sea Fisheries Programme, 1980. 56p.
- SCS/80/WP/92 BILAL, J. and W.W. KUHNHOLD. Marine oil pollution in Southeast Asia. Manila, South China Sea Fisheries Programme, 1980. 85p.
- SCS/80/WP/93 EVANS, E.D. Legal and policy consideration for use of the chartered fishing vessels in Philippine waters. Manila, South China Sea Fisheries Programme, 1980. 35p. (Restricted)
- SCS/80/WP/94 GOMEZ, E.D. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Regional. Revised. Manila, South China Sea Fisheries Programme, 1980. 102p.
- SCS/80/WP/94a SOEGIARTO, A. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Indonesia. Revised. Manila, South China Sea Fisheries Programme, 1980. 65p.
- SCS/80/WP/94b SASEKUMAR, A. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Malaysia. Manila, South China Sea Fisheries Programme, 1980. 80p.
- SCS/80/WP/94c GOMEZ, E.D. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Philippines. Revised. Manila, South China Sea Fisheries Programme, 1980. 88p.
- SCS/80/WP/94d ZOOLOGY DEPARTMENT, UNIVERSITY OF SINGAPORE. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Singapore. Revised. Manila, South China Sea Fisheries Programme, 1980. 76p.
- SCS/80/WP/94e TWESUKDI, P. The present state of mangrove ecosystems in Southeast Asia and the impact of pollution — Thailand. Revised. Manila, South China Sea Fisheries Programme, 1980. 108p.
- SCS/80/WP/95 WHEELAND, H.A. and P.J. HOOKER. Organizational implications of a fisheries information system for the Philippines; specific recommendations regarding BFAR's statistics programme; and a plan for implementation. Manila, South China Sea Fisheries Programme, 1980. 33p.
- SCS/80/WP/96 HECHANOVA, R.G. Technical assistance on the design of government coastal aquaculture projects in Peninsular Malaysia. (A pattern for planning and design of aquaculture facility). Manila, South China Sea Fisheries Programme, 1980. 78p.
- SCS/80/WP/97 LISAC, H. Some aspects of fish utilization in small-scale fisheries. Manila, South China Sea Fisheries Programme, 1980. 32p.
- SCS/80/WP/98 HECHANOVA, R.G. Indonesia — The engineering aspects of selected aquaculture projects. Manila, South China Sea Fisheries Programme, 1980. 79p.
- SCS/80/WP/99 HOOKER, P.J. and E.J. SAVARIRAJ. A fisheries information system for Peninsular Malaysia. Manila, South China Sea Fisheries Programme, 1981. 40p.
- SCS/80/WP/100 HECHANOVA, R.G. Engineering aspects of selected aquaculture projects in Thailand, Manila, South China Sea Fisheries Programme, 1981. 15p. (Annexes A to D)
- SCS/81/WP/101 NAIR, R. Malaysia — A new fisheries bill — 1982. Manila, South China Sea Fisheries Programme, 1981. 15p. (Confidential and restricted)
- SCS/81/WP/102 DELA CRUZ, C. Republic of the Philippines — Fishpen and cage culture development project in Laguna de Bay. Manila, South China Sea Fisheries Programme, 1981. 27p.
- SCS/82/WP/103 GLUDE, J.B., M.A. STEINBERG and R.C. STEVENS. The feasibility of oyster and mussel farming by municipal fishermen in the Philippines. Manila, South China Sea Fisheries Programme, 1982. 100p.

- SCS/82/WP/104 NAIR, R. Regional compendium of fisheries legislation. Vol. I. (Regional (FI/WPSCS/82/1) Fisheries Law Advisory Programme Western Pacific and South China Sea region). Manila, South China Sea Fisheries Programme, 1982. 42p.
- SCS/82/WP/105 NAIR, R. Regional compendium of fisheries legislation. Vol. II (Legislation) (FI/WPSCS/82/2) (Regional Fisheries Law Advisory Programme Western Pacific and South China Sea region). Manila, South China Sea Fisheries Programme, 1982. 585p.
- SCS/82/WP/106 NAIR, R. Draft fisheries regulation. Malaysia. Manila, South China Sea (FI/WPSCS/82/3) Fisheries Programme, 1982. 9p. (Restricted)
- SCS/82/WP/107 NAIR, R. Draft bilateral access agreement. Malaysia. Manila, South (FI/WPSCS/82/4) China Sea Fisheries Programme, 1982. 8p. (Restricted)
- SCS/82/WP/108 NAIR, R. Law of the sea and Fiji. Manila, South China Sea Fisheries (FI/WPSCS/82/5) Programme, 1982. 32p. (Restricted)
- SCS/82/WP/109 NAIR, R. FEZ. Malaysia legislation. Part I. Manila, South China Sea (FI/WPSCS/82/6) Fisheries Programme, 1982. 5p. (Restricted)

- SCS/82/WP/110 GLUDE, J.B. The potential for seafarming in the Riau Archipelago district of Indonesia. Manila, South China Sea Fisheries Programme, 1982. 28p.
- SCS/82/WP/111 DE JESUS, A.S. Tuna fishing gears of the Philippines. Manila, South IPTP/82/WP/2 China Sea Fisheries Programme, 1982. 47p.
- SCS/82/WP/112 WHITE, T.F. and M. YESAKI. The status of tuna fisheries in Indonesia IPTP/82/WP/3 and the Philippines. Manila, South China Sea Fisheries Programme, 1982. 62p.
- SCS/82/WP/113 YESAKI, M. Illustrated key to small and/or immature species of tuna IPTP/82/WP/4 and honitos of the Southeast Asian Region. Manila, South China Sea Fisheries Programme, 1982. 16p.
- SCS/82/WP/114 WHITE, T.F. and M. YESAKI. Tuna fisheries in the Philippines. Manila, IPTP/82/WP/5 South China Sea Fisheries Programme, 1982.
- SCS/82/WP/115 FIDISON, W. FEZ. Malaysia legislation. Part II. Manila, South China Sea Fisheries Programme, 1982. (Restricted)

## WORKSHOP REPORTS

- SCS/GEN/74/1 Report on the workshop on planning and coordinating of resources survey and evaluation in the South China Sea. 28 August to 4 September 1974. Manila, South China Sea Fisheries Programme, 1974. 197p.
- SCS/GEN/76/2 Report of the workshop on the fishery resources of the Malacca Strait. Part I. Jakarta, 29 March to 2 April 1976. Manila, South China Sea Fisheries Programme, 1976. 89p.
- SCS/GEN/76/3 Report of workshop on legal and institutional aspects of fishery resources management and development. 5-8 April 1976. Manila, South China Sea Fisheries Programme, 1976. 95p.
- SCS/GEN/76/4 Report on the training workshop for field enumerators of the Bureau of Fisheries and Aquatic Resources - Philippines. 22-31 March 1976. Manila, South China Sea Fisheries Programme, 1976. 32p.
- SCS/GEN/76/5 UNDP FAO Training course on the management of small-scale fishery enterprises. Kuala Trengganu, Malaysia. 25 August to 26 September 1975. Rome, FAO. 1976. 14p.
- SCS/GEN/77/6 Report of the workshop on the fishery resources of the Malacca Strait. Part II. Jakarta, 29 March to 2 April 1976. South China Sea Fisheries Programme, 1976. 85p.
- SCS/GEN/76/7 Report of the BFAR SCSP workshop on the fishery resources of the Visayan and Sibuan Area. Tighauan, Iloilo, Philippines. 18-22 October 1976. Manila, South China Sea Fisheries Programme, 1976. 26p.
- SCS/GEN/76/8 Philippines. Report seminar on the fisheries statistics survey of the Bureau of Fisheries and Aquatic Resources. 23 July 1976. DNR BFAR SCSP, Manila, South China Sea Fisheries Programme, 1976. 17p.
- SCS/GEN/76/9 Report of the consultative group meeting on small-scale fisheries development in the South China Sea Region. 13-15 December 1976. Manila, South China Sea Fisheries Programme, 1976. 140p.
- SCS/GEN/77/10 Report on the training workshop on fisheries statistics. Malaysia. 12-21 October 1976. Manila, South China Sea Fisheries Programme, 1977. 27p.
- SCS/GEN/77/11 Report on the BFAR SCSP workshop on fishery resources of the Sulu Sea and Moro Gulf areas. 25-29 April 1977, Cagayan de Oro. Manila, 1977. 58p.
- SCS/GEN/77/12 Report of the workshop on the demersal resources, Sunda Shelf. Part I. November 7-11, 1977. Penang, Malaysia. Manila, South China Sea Fisheries Programme, 1978. 58p.
- SCS/GEN/77/13 Report of the workshop on the demersal resources. Sunda Shelf. Part II. November 7-11, 1977. Penang, Malaysia. Manila, South China Sea Fisheries Programme, 1978. 120p.
- SCS/GEN/77/14 Joint SCSP SEAFDEC workshop on aquaculture engineering (with emphasis on small-scale aquaculture projects) Vol. I. General Report. Manila, South China Sea Fisheries Programme, 1978. v.p.
- SCS/GEN/77/15 Joint SCSP SEAFDEC workshop on aquaculture engineering (with emphasis on small-scale aquaculture projects) Vol. II. Technical Report. Manila, South China Sea Fisheries Programme, 1978. 463p.
- SCS/GEN/77/16 A layout of standard tables of fishery statistics in the Philippines. Manila, South China Sea Fisheries Programme, 1978. 162p.
- SCS/GEN/77/17 Report of the workshop on the biology and resources of mackerels (*Rastrelliger* spp) and round scads (*Decapterus* spp) in the South China Sea. Part I. Manila, South China Sea Fisheries Programme, 1978. 70p.
- SCS/GEN/78/18 Report of the workshop on management of resources of the Sunda Shelf, Malacca Strait and related areas. Manila, South China Sea Fisheries Programme, 1978. 14p.
- SCS/GEN/78/19 Report of the BFAR SCSP workshop on the fishery resources of the Pacific Coast of the Philippines. 18-22 September 1978. Manila, South China Sea Fisheries Programme, 1978. 48p.
- SCS/GEN/79/20 Report of the workshop on demersal and pelagic fish resources of the Java Sea. 5-9 December 1978. Semarang, Indonesia. Manila, South China Sea Fisheries Programme, 1979. 60p.
- SCS/GEN/79/21 Report of the workshop on the tuna resources of Indonesia and Philippine waters. Jakarta, 20-23 March 1979. Manila, South China Sea Fisheries Programme, 1979. 35p.
- SCS/GEN/79/22 Report of the BFAR SCSP workshop on the fishery resources of the north Luzon and western coasts of Luzon. 18-20 April 1979. Manila, Philippines. Manila, South China Sea Fisheries Programme, 1979. 57p.
- SCS/GEN/79/23 Report on training course in fishery statistics. 2 October-10 November 1978, Manila, Philippines. Manila, South China Sea Fisheries Programme, 1979. v.p.
- SCS/GEN/79/24 Report of the consultation meeting on management of tuna resources of the Indian and Pacific Oceans. 26-29 June 1979. Manila, Philippines. Manila, South China Sea Fisheries Programme, 1979. 155p.

- SCS/GEN/80/25 Report of the workshop on application and results of acoustic methods for resource appraisal surveys in the South China Sea. Manila, South China Sea Fisheries Programme, 1980. 19p. Annexes 1 to 4.
- SCS/GEN/80/26 Report of the workshop on the biology and resources of penaeid shrimps in the South China Sea area. Part I. 30 June-5 July 1980. Kota Kinabalu, Sabah, Malaysia. Manila, South China Sea Fisheries Programme, 1980. 162p.
- SCS/GEN/80/27 Report of the workshop on application and results of acoustic methods for resource appraisal surveys in the South China Sea. Part II. 19-22 November 1979. Manila, South China Sea Fisheries Programme, 1980. 102p.
- SCS/GEN/81/28 Report of the training course in prawn farming for Asia and the Pacific. Jepara, Central Java, Indonesia. 5 October -- 15 November 1980. Manila, South China Sea Fisheries Programme, 1980. 138p.
- SCS/GEN/81/29 Report on the training course on *Gracilaria* algae. (A training subproject under FAO-UNDP Project RAS/79/041 implemented through RAS 74/013). Manila, Philippines, 1-30 April 1981. Manila, South China Sea Fisheries Programme, 1981.
- SCS/GEN/81/30 Report of the workshop on the biology and resources of penaeid shrimps in the South China Sea area. Part II. 30 June - 5 July 1980. Kota Kinabalu, Sabah, Malaysia. Manila, South China Sea Fisheries Programme, 1981.
- SCS/GEN/82/31 Report of the regional seminar on monitoring, control and surveillance of fisheries in exclusive economic zones. 30 November - 4 December 1981. Jakarta Indonesia. Manila, South China Sea Fisheries Programme, 1981. v.p.
- SCS/GEN/82/32 A selected bibliography of tuna fisheries in the South China Sea region. Manila, South China Sea Fisheries Programme, 1982. 24p.
- SCS/GEN/82/33 Working party on small-scale shrimp prawn hatcheries in Southeast Asia Vol. I. General report. Manila, South China Sea Fisheries Programme, 1982. 30p.
- SCS/GEN/82/34 Report of the training course on small-scale pen cage culture for finfish. 26-31 October and 1-12 November 1981. Laguna, Philippines. Manila, South China Sea Fisheries Programme, 1982. 246p.
- SCS/GEN/82/35 Training on assessment of coastal aquaculture potential, Malaysia. Manila, South China Sea Fisheries Programme, 1982. 62p.
- SCS/GEN/82/36 Provisional list of shrimp and prawn aquaculturists in Southeast Asia. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/37 Report of the training course on growing food organisms for fish hatcheries. Tighauan, Iloilo, Philippines. 3-22 August 1981. Manila, South China Sea Fisheries Programme, 1982. 225p.
- SCS/GEN/82/38 Report on the regional training courses on fishery stock assessment and statistics. Part I. General Report. Samutprakarn, Thailand. 1 September - 9 October 1981. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/39 Report of the training course on seabass spawning and larval rearing. Songkhla, Thailand. 1-20 June 1982. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/40 Working party on small-scale shrimp prawn hatcheries in Southeast Asia Semarang, Central Java, Indonesia. 16-21 November 1981. Vol. II. Technical Report. Manila, South China Sea Fisheries Programme, 1982. 125p.
- SCS/GEN/82/41 Report on the regional training course on fishery stock assessment. 1 September - 9 October 1981, Samutprakarn, Thailand. Part II. Technical Report Vol. I. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/41a Report on the regional training course on fishery statistics. 1 September - 9 October 1981, Samutprakarn, Thailand. Part II. Technical Report. Vol. 2. Manila, South China Sea Fisheries Programme, 1982. v.p.
- SCS/GEN/82/42 Report of the consultation seminar on coastal fishpond engineering. 4-12 August 1982. Surabaya, Indonesia. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/43 Report of the workshop on the development of rural coastal fisheries. 15-24 March 1982, Manila, Philippines. Manila, South China Sea Fisheries Programme, 1982. (for printing)
- SCS/GEN/82/44 Joint IDRC SCSP fish quarantine workshop. 6-11 December 1982. Jakarta, Indonesia. Manila, South China Sea Fisheries Programme, 1982.
- SCS/GEN/79/45 Regional training workshop on joint venture agreements in fisheries. Manila, 15-27 January 1979. Manila, South China Sea Fisheries Programme, 1979. (Report was not made but papers are available at the SCSP Library)
- SCS/GEN/81/46 Consultation meeting of the joint Indonesian-Philippine tuna working group. 21-23 October 1981. Manila, Philippines. Manila, South China Sea Fisheries Programme, 1981. (for printing)

## SCS MANUALS

**SCS Manual No. 1** Handbook on field identification of fishes, crustaceans, molluscs, shells, and important aquatic plants. Manila, South China Sea Fisheries Programme, 1978. 60p.

**SCS Manual No. 2** Manual for the collection of historical data on tuna and tuna-like species  
**IPTP Manual No. 1** in the Indo-Pacific Region. Colombo, Indo-Pacific Tuna Development and Management Programme, 1982. (for printing)

**SCS Manual No. 3** A guide to the organization and management of small fishery library. Manila, South China Sea Fisheries Programme, 1982. (for printing)

**SCS Manual No. 4** Floating netcage fish culture manual. Manila, South China Sea Fisheries Programme, 1982. (In preparation)

**SCS Manual No. 5** Fishpond engineering: a regional manual for small and medium scale coastal fishponds. Manila, South China Sea Fisheries Programme, 1982. (In preparation)

## PERIODIC PROGRESS REPORTS

**SCS/PR/74/1** WOODLAND, A.G. Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1974. Manila, South China Sea Fisheries Programme, 1974. 19p.

**SCS/PR/75/2** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1975. Manila, South China Sea Fisheries Programme, 1975. 40p.

**SCS/PR/75/3** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1975. Manila, South China Sea Fisheries Programme, 1975. 38p.

**SCS/PR/76/4** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 31 December 1976. Manila, South China Sea Fisheries Programme, 1976. 47p.

**SCS/PR/77/5** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1977. Manila, South China Sea Fisheries Programme, 1977. 37p.

**SCS/PR/77/6** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1977. Manila, South China Sea Fisheries Programme, 1977. 19p.

**SCS/PR/78/7** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1978. Manila, South China Sea Fisheries Programme, 1978. 12p.

**SCS/PR/78/8** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1978. Manila, South China Sea Fisheries Programme, 1978. 11p.

**SCS/PR/79/9** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1979. Manila, South China Sea Fisheries Programme, 1979. 12p.

**SCS/PR/79/10** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1979. Manila, South China Sea Fisheries Programme, 1979. 65p.

**SCS/PR/80/11** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1980. Manila, South China Sea Fisheries Programme, 1980. 28p.

**SCS/PR/80/12** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1980. Manila, South China Sea Fisheries Programme, 1980. 25p.

**SCS/PR/81/13** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1981. Manila, South China Sea Fisheries Programme, 1981. 20p.

**SCS/PR/81/14** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1981. Manila, South China Sea Fisheries Programme, 1981. 14p.

**SCS/PR/82/15** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 January to 30 June 1982. Manila, South China Sea Fisheries Programme, 1982. 13p.

**SCS/PR/82/16** Project progress report of the South China Sea Fisheries Development and Coordinating Programme. 1 July to 31 December 1982. Manila, South China Sea Fisheries Programme, 1982.

## COORDINATING COMMITTEE REPORTS

**SCSP/74/1 REP** Report of the *Ad Hoc* Coordinating Committee Meeting of the South China Sea Fisheries Development and Coordinating Programme. Manila, 18-19 June 1974. 27p.

**SCSP/74/2 REP** Report of the first session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Jakarta, Indonesia, 6 November 1974. Rome, FAO, 1974. 22p.

**SCSP/76/3 REP** Report of the second session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Manila, 9 April 1976. 16p.

**SCSP/77/4 REP** Report of the third session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Manila, 24-25 February 1977. 19p.

**SCSP/77/5 REP** Report of the fourth session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Manila, 11-12 October 1977. 21p.

**SCSP/78/6 REP** Report of the fifth session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Manila, 11 March 1978. 16p.

**SCSP/78/7 REP** Report of the sixth session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Manila, 28-29 September 1978.

**SCSP/79/8 REP** Report of the seventh session of the Coordinating Committee of the South China Sea Fisheries Development and Coordinating Programme. Rome, 11-16 October 1979.

## FISHERIES TECHNICAL PAPERS

- SCS/DEV/73/1 WOODLAND, A.G. *et al.* The South China Sea Fisheries. A proposal for accelerated development. Rome, FAO, 1974. 162p
- SCS/DEV/73/2 YAMAMOTO, T. Review of marine fishery statistical system in countries bordering the South China Sea, and proposals for their improvement. Rome, FAO, 1973. 46p. (Cover title: The South China Sea Fisheries Statistical Systems)
- SCS/DEV/73/3 AOYAMA, T. The demersal fish stocks and fisheries of the South China Sea. Rome, FAO, 1973. 80p. (Cover title: The South China Sea Fisheries Demersal Resources)
- SCS/DEV/73/4 KUME, S. Tuna resources in the South China Sea. Rome, FAO, 1973. 18p.
- SCS/DEV/73/5 LING, S. Status, potential and development of coastal aquaculture in the countries bordering the South China Sea. Rome, FAO, 1973. 51p. (Cover title: The South China Sea Fisheries Aquaculture Development)
- SCS/DEV/73/6 MENASVETA, D. *et al.* Pelagic fishery resources of the South China Sea and prospects for their development. Rome, FAO, 1973. (Cover title: The South China Sea Fisheries Pelagic Resources)
- SCS/DEV/73/7 MISTAKIDIS, M.N. The crustacean resources and related fisheries in the countries bordering the South China Sea. (Cover title: The South China Sea Fisheries Crustacean Resources)
- SCS/DEV/73/8 RUCKES, E. Fish utilization, marketing and trade in countries bordering the South China Sea - status and programme proposals. Rome, FAO, 1973. 33p. (Cover title: The South China Sea Fisheries Marketing and Trade)
- SCS/DEV/73/9 DOUCET, F.J. *et al.* Institutional and legal aspects affecting fishery development in selected countries bordering the South China Sea. Rome, FAO, 1973. 32p. (Cover title: The South China Sea Fisheries Institutional Legal Aspects)
- SCS/DEV/73/10 LABON, A. Malaysian long-term fisheries development plan until 1995. Rome, FAO, 1973. 91p. (Cover title: The South China Sea Fisheries Malaysian development plan 1995)
- SCS/DEV/76/11 Development potentials of selected fishery products in the regional member countries of the Asian Development Bank. Manila, South China Sea Fisheries Programme, 1976. 107p. (ADB FAO Market Studies)
- SCS/DEV/76/12 The international market for shrimp. Manila, South China Sea Fisheries Programme, 1976. 105p. (ADB FAO Market Studies)
- SCS/DEV/76/13 The international market for tuna. Manila, South China Sea Fisheries Programme, 1976. 69p. (ADB FAO Market Studies)
- SCS/DEV/76/14 The international market for crab. Manila, South China Sea Fisheries Programme, 1976. 46p. (ADB FAO Market Studies)
- SCS/DEV/76/15 The international market for lobster. Manila, South China Sea Fisheries Programme, 1976. 46p. (ADB FAO Market Studies)
- SCS/DEV/76/16 The international market for cephalopods. Manila, South China Sea Fisheries Programme, 1976. 95p. (ADB FAO Market Studies)
- SCS/DEV/76/17 The European canned fish market: Prospects for *Rastrelliger* spp. Manila, South China Sea Fisheries Programme, 1976. 56p. (ADB FAO Market Studies)
- SCS/DEV/78/18 CHIKUNI, S., A.C. SIMPSON and W.R. MURDOCH. Test fishing for tuna and small pelagic species: Reports on the operation of FAO chartered purse seiners in Philippine and South China Sea waters, 1974-1977. Manila, South China Sea Fisheries Programme, 1978. v.p.
- SCS/DEV/79/19 POPE, J. Stock assessment in multispecies fisheries with special reference to the trawl fishery in the Gulf of Thailand. Manila, South China Sea Fisheries Programme, 1979. 106p.
- SCS/DEV/80/20 Implications of the extension of national jurisdiction for fisheries management and development. Report of an FAO Mission to the Government of Indonesia, 7 January -- 2 February 1980. Manila, South China Sea Fisheries Programme and Food and Agriculture Organization of the United Nations, 1980. 90p. (Restricted)
- SCS/DEV/82/21 to Second Asian fish market study. (SCSP, INFOFISH, ADB FAO SCS/DEV/82/30 market studies). Manila, South China Sea Fisheries Programme, 1982. 10 vols. (for printing)
- FAO species identification sheets for fishery purposes. Eastern Indian Ocean (Fishing area 57) and Western Central Pacific (Fishing area 71). Rome, FAO, 1974. 4 vols.

## TECHNICAL REPORTS CONTRIBUTED TO SYMPOSIA/MEETINGS, ETC.

- RABANAL, H.R. FAO activities in inland fisheries and aquaculture with particular reference 1975 to Asia and the Far East. Manila, South China Sea Fisheries Programme. 17p. (Contributed to the First Fisheries Research Congress, Philippine Council for Agriculture and Resources Research, 7-10 March 1975, Legaspi City, Philippines).
- \_\_\_\_\_. Preliminary report on the Macrobrachium fishery in the Indo-Pacific region. 1975. Manila, South China Sea Fisheries Programme. 20p. (Contributed to the International Conference on Prawn Farming, Vung Tau, Vietnam, 31 March -- 4 April 1975).
- \_\_\_\_\_. Distribution and occurrence of milkfish *Chanos chanos* (Forsk.). Manila, South China Sea Fisheries Programme, 1975. 18p. (Contributed to the National Bangus Symposium, Manila, 25-26 July 1975).
- \_\_\_\_\_. Mangrove and their utilization for aquaculture. Manila, South China Sea Fisheries Programme. 20p. (Contributed to the National Workshop on Mangrove Ecology held in Phuket, Thailand, 10-16 January 1976).
- \_\_\_\_\_. Report of project identification mission to Bangladesh on inland fisheries and 1976 aquaculture. Manila, Asian Development Bank. 56p.
- \_\_\_\_\_. Aquaculture 1976: Focus Southeast Asia. Manila, South China Sea Fisheries Programme. 12p. (Talk delivered at the National Convention of the Federation of Fish Producers of the Philippines, Iloilo City, 26 August 1976).
- SIMPSON, A.C. Some proposals for research related to the understanding of mangrove 1976 ecology and the utilization of mangrove areas. Manila, South China Sea Fisheries Programme. 10p. (Contributed to the National Workshop on Mangrove Ecology held in Phuket, Thailand, 10-16 January 1976).
- COOK, H.L. Some aspects of shrimp culture research with particular reference to Philippine 1976 species. Manila, South China Sea Fisheries Programme. 7p. (Contributed to the Philippine Council for Agriculture and Resources Research (PCARR) Fisheries Workshop, Subic, Zambales, Philippines, 15-17 January 1976).
- RABANAL, H.R. The resources in inland waters: their utilization and management. Manila, 1976. South China Sea Fisheries Programme. 21p. (Talk delivered before the Phi Sigma Biological Society as a contribution to the Deogradas V. Villadolid Memorial lecture series. Manila, Philippines, 26 November 1976).
- \_\_\_\_\_. Aquaculture in the Philippines. Manila, South China Sea Fisheries Programme, 1977. 15p. (Talk delivered before the United States Peace Corps Volunteers, Los Banos, Laguna, Philippines, 11 January 1977).
- RABANAL, H.R. Aquaculture in Southeast Asia. Manila, South China Sea Fisheries Programme. 10p. (Paper contributed to the Fifth FAO SIDA Workshop on Aquatic Pollution in relation to Protection of Living Resources. Manila, Philippines, 17-27 February 1977).
- SIMPSON, A.C. Fisheries research and development in the Philippines: Some recommendations with special reference to resource assessment. Manila, South China Sea Fisheries Programme. 16p.
- RABANAL, H.R. Aquaculture management. Manila, South China Sea Fisheries Programme. 12p. (Contribution to the BFAR FAO-UNDP Training of Regional Trainers in Aquaculture, Lucena, Quezon, Philippines, 19 September to 27 October 1977).
- \_\_\_\_\_. Recent trends in aquaculture. Manila, South China Sea Fisheries Programme, 1977. 13p. (Paper contributed to the Seminar Workshop for Fishery Schools' Administrators, conducted by the Bureau of Fisheries and Aquatic Resources, Manila, Philippines, 24-28 October 1977).
- \_\_\_\_\_. Forest conservation and aquaculture development of mangroves. Manila, South China Sea Fisheries Programme. 15p. (Paper contributed to the International Workshop on Mangrove and Estuarine Area Development for the Indo-Pacific region 14-19 November 1977, Manila, Philippines).
- THOMSON, D.B. Lecture notes on fishing methods, equipment and deck layout of fishing 1978 vessels. Manila, South China Sea Fisheries Programme, 1978. 151p. (Paper presented at the FAO NORAD Course on Fishing Vessel Design, Bangkok, Thailand, October-November 1978).
- RABANAL, H.R. International traffic of live and fish eggs and control of the spread of fish 1978 diseases. Manila, South China Sea Fisheries Programme, 1978. 21p. (Contributed to the Workshop on Tropical Fisheries - their causes and control in Southeast Asia, Puncak, West Java, Indonesia, 28 November to 1 December 1978).
- RABANAL, H.R. and R.O. JULIANO. Aquaculture extension: How it could be a potent 1979 force in fisheries development in the ASEAN region. Manila, South China Sea Fisheries Programme, 1979. (Paper contributed to the First ASEAN Seminar Workshop on Fisheries Extension, Manila 18-25 February 1979).
- THOMSON, D.B. Marine fisheries extension. Manila, South China Sea Fisheries Programme, 1979. 41p. (Paper contributed to the First ASEAN Seminar Workshop on Fisheries Extension, Manila, 18-25 February 1979).
- \_\_\_\_\_. Training requirements of the fisheries of Southeast Asia. Manila, South China Sea Fisheries Programme, 1979. 11p. (Paper presented at the SEAFDEC Consultative Meeting on Fisheries Training, Bangkok, 14-18 May, 1979).
- KUNHOLD, W.W. Aquatic pollution, Classes of pollutants, their occurrence, transport and 1979 dispersion. Manila, South China Sea Fisheries Programme, 1979. 22p. (Lecture given at the Seventh FAO SIDA Workshop on Aquatic Pollution in Relation to Protection of Living Resources - Analyses of Metals and Organochlorines in Biota. Manila, Philippines, 7 May to 9 June 1979).
- \_\_\_\_\_. Effects of aquatic pollution on fish and fisheries. Manila, South China Sea Fisheries Programme, 1979. (Lecture given at the Seventh FAO SIDA Workshop on Aquatic Pollution in Relation to Protection of Living Resources - Analyses of Metals and Organochlorines in Biota. Manila, Philippines, 7 May -- 9 June 1979).
- RABANAL, H.R. The design of research in brackishwater aquaculture. Manila, South China Sea Fisheries Programme, 1979. 7p. (Paper contributed to the Seminar Workshop on Research Methodology and Technical Report Writing, conducted by the Fisheries Training Division, Bureau of Fisheries and Aquatic Resources, Fisheries Training Centre, Cavite City, Philippines, 10-29 June 1979).
- RABANAL, H.R. Production and recent innovations in design and management in aqua- 1979 culture industry in Southeast Asia. Manila, South China Sea Fisheries Programme, 1979. 7p. (Paper contributed to the Asian Seminar and Tour sponsored by the Bank of America, Manila, 6-9 November 1979).
- THOMSON, D.B. The challenge of the 1980's for fisheries education, training and extension. 1979. Manila, South China Sea Fisheries Programme, 1979. 11p. (Paper presented at the First International Symposium on Fishery Education, Fish Processing and Marketing Systems, Mexico, December 1979).
- KUNHOLD, W.W. Some aspects of the impact of aquatic oil pollution on fishery resources 1980. Manila, South China Sea Fisheries Programme, 1980. 25p. (Paper contributed to the International Workshop on the Prevention, Abatement and Combating of Pollution from Ships in East Asian Waters, 3-8 November 1980, Manila, Philippines).



**RABANAL, H.R.** Small-scale shrimp/prawn hatcheries: an overview. *In* FAO/UNDP 1981 Working Party on Small-Scale Shrimp/Prawn Hatchery. Semarang, Indonesia, 15-22 November 1981. Manila, South China Sea Fisheries Programme, 1981. (SCS/GEN/82/40: CP-1:15-18).

**DELMENDO, M. and H.R. RABANAL.** The organization and administration of aquaculture development in Asian countries. Part I. Agricultural Administration 9(1982)61-75.

**RABANAL, H.R. and V. SOESANTO.** Introduction to the taxonomy, biology and fishery 1982 of the giant seaperch or seabass, *Lates calcarifer*. *In* Report of Training Course on Seabass Spawning and Larval Rearing. Songkhla, Thailand, 1-20 June 1982. Manila, South China Sea Fisheries Programme, 1982. (SCS/82/LEC. 1:2-9).

**SOESANTO, V.** Some notes on programmes on seabass. *In* Report of Training Course on 1982 Seabass Spawning and Larval Rearing. Songkhla, Thailand, 1-20 June 1982. Manila, South China Sea Fisheries Programme, 1982. (SCS/82/SBTC/LEC. 22:62-63).

**CHAN, W.L.** Management of the nursery of seabass fry. *In* Report of Training Course on 1982 Seabass Spawning and Larval Rearing. Songkhla, Thailand, 1-20 June 1982. Manila, South China Sea Fisheries Programme, 1982. (SCS/82/SBTC/LEC. 15:34-37).

**RABANAL, H.R.** Status of aquaculture fisheries in the Indo-Pacific region. Manila, South 1982 China Sea Fisheries Programme, 1982. 12p. (Contribution to the FAO/IPFC Workshop on Inland Fisheries for Planners, Manila, Philippines 2-6 August 1982).

## PUBLICATIONS OF THE INTERREGIONAL TUNA RESOURCES DEVELOPMENT AND MANAGEMENT IN INDO-PACIFIC

### WORKING PAPERS

**IPTP/82/WP/1 SKILLMAN, R.A.** Tuna fishery statistics for the Indian Ocean and the Indo-SCS/80/WP/90 Pacific. Colombo, Indo-Pacific Tuna Development and Management Programme, 1981. 86p.

**IPTP/82/WP/2 DE JESUS, A.S.** Tuna fishing gears of the Philippines. Colombo, Indo-SCS/82/WP/111 Pacific Tuna Development and Management Programme, 1982. 47p.

**IPTP/82/WP/3 WHITE, T.F. and M. YESAKI.** The status of tuna in Indonesia and the SCS/82/WP/112 Philippines. Colombo, Indo-Pacific Tuna Development and Management Programme, 1982. 62p.

**IPTP/82/WP/4 YESAKI, M.** Illustrated key to small and/or immature species of tuna SCS/82/WP/113 and bonitos of the Southeast Asian region. Colombo, Indo-Pacific Tuna Development and Management Programme, 1982. 16p.

**IPTP/82/WP/5 WHITE, T.F. and M. YESAKI.** Tuna fisheries in the Philippines. Colombo, SCS/WP/82/114 Indo-Pacific Tuna Development and Management Programme, 1982.

### GENERAL REPORTS

**IPTP/82/GEN/1** Report of the consultation meeting on management of tuna resources of SCS/GEN/79/24 the Indian and Pacific Oceans. Manila, Philippines. 26-29 June 1979. Colombo, Indo-Pacific Tuna Development and Management Programme, 1982. 155p.

**IPTP/82/GEN/2** A selected bibliography of tuna fisheries in the South China Sea region. SCS/GEN/82/32 Colombo, Indo-Pacific Tuna Development and Management Programme, 1982. 24p.

### MANUALS

**IPTP Manual No. 1** Manual for the collection of historical data on tuna and tuna-like species  
**SCS Manual No. 2** in the Indo-Pacific region. Colombo, Indo-Pacific Tuna Development and Management Programme, 1982.