OBSERVATIONS ON TWO JAPANESE PURSE-SEINING OPERATIONS IN THE EQUATORIAL PACIFIC

R.D. Gillett

Tuna and Billfish Assessment Programme
Technical Report No.16

South Pacific Commission
Noumea, New Caledonia
January 1986

Original text: English

Prepared for publication at
South Pacific Commission headquarters, Noumea, New Caledonia
and printed at System Press Pty Ltd, Sydney, 1986

PREFACE

The Tuna and Billfish Assessment Programme is an externally funded part of the work programme of the South Pacific Commission and is the successor of the Skipjack Survey and Assessment Programme. Current responsibilities of the Tuna Programme include compilation and maintenance of a fisheries statistics data base for the commercial fisheries in the region, and biological research on fish stocks which support this fishery. The work of the Programme is presently funded by donations from the governments of Australia, France, New Zealand, and the United States of America. The beneficiaries of this work are the island states of the South Pacific Commission who use the research results in the development and management of fisheries in their Exclusive Economic Zones.

The Technical Report series published by the Tuna Programme documents research results obtained by Programme staff. These reports cover a wide variety of topics and range in content from highly technical material of interest primarily to specialists, to material of much wider interest. The basis for these reports is the ongoing research of the Programme and includes information obtained by Programme staff during the pursuit of their current activities, data contained in the regional fisheries data base, and data obtained during the Skipjack Programme.

Tuna Programme staff frequently have the opportunity to make observer trips on fishing vessels of various nations. SPC observers board fishing vessels at the courtesy of the vessel operators, and the reliability of the information gathered by the observers depends on the willing co-operation of the vessel's crew. Therefore, SPC observers make no attempt to obtain information which could be used for surveillance or enforcement purposes.

The goals of these observer trips are to obtain general information about operations of different types of fishing vessels; to obtain specific information which assists Programme staff in interpreting fisheries statistics; to carry out biological sampling of the catch; and to make other observations which would assist fisheries officers in understanding the operations of the fisheries in their region.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

OBSERVATIONS ON TWO JAPANESE PURSE-SEINING OPERATIONS IN THE EQUATORIAL PACIFIC

1.0 INTRODUCTION

In recent years a South Pacific Commission fisheries scientist made two trips on Japanese tuna purse-seine vessels operating in the equatorial Pacific. Thirty-seven days were spent at sea in June and July 1982 on the 500-gross tonne Takuryo Maru No.1 and a voyage of 21 days was made in February 1983 on vessels of the Matsuo Maru group. Reports from each trip were prepared and circulated after voyage completion. The present report constitutes a compilation and summary of observations made during the two trips.

The South Pacific Commission (SPC) carries out observer work at the request of member countries. These two observer trips were made in response to requests from the Micronesian Maritime Authority (MMA) of the Federated States of Micronesia. The MMA, which has a comprehensive foreign fishing vessel observer programme, wished to have recommendations on the type of information which would be useful and practical for their observers to collect and also desired suggestions on operational and logistical aspects of conducting an observer programme.

Since 1981 the SPC has analysed logbook catch data as part of the regional fisheries statistics component of the Tuna and Billfish Assessment Programme. Operational, effort and catch data from hundreds of vessels are being processed at SPC headquarters. Understandably, with such a large number of vessel operators from several countries filling out the logbook forms, minor problems in data recording arise. Another function of SPC observers is to assist in resolving these problems and in interpretation of the recorded information.

2.0 FLEET OPERATION

During the period of these observer trips the Japanese southern water purse-seine fleet consisted of 39 vessels: 32 vessels in 500-tonne class and 7 group seiners. The larger vessels fish in the 200-mile zones of Papua New Guinea, Federated States of Micronesia and adjoining international waters on a year-round basis. The smaller group seiners fish the same area; however, Japanese Government regulations permit them to do so only during four months of the year.

The 500-GT vessels typically depart from Japan for fishing in southern waters, return to a Japanese port (usually Yaizu) after an absence of 35 to 45 days, unload the catch, and re-depart for fishing after about 6 days in port. During these observer trips, group seining operations left Japan at the end of January and fished in southern waters for four months. The net boat and search boat remained in the fishing grounds for the entire period, while the two carrier vessels (former pole-and-line vessels) alternately transported the catch to either Palau, Guam, Rota, Tinian, or Japan. On the return trip to the fishing ground, fuel, water and supplies were transported by the carrier vessels to the net boat and search boat.

Fishing information and catch results are shared among all the vessels in each of the two types of seining operations on a daily basis. Catches are reported on the Japan Fishery Agency catch form and, additionally, when operating within the 200-mile zone of an SPC member country, on the standard SPC purse-seine logbook.

3.0 THE VESSELS

Specifications of the vessels of the two purse-seining operations observed are given in Table 1.

The Takuryo Maru No.1 (Figure 1) differed somewhat from the typical Japanese seiner of the 500-tonne class in its net retrieval system. The system used to haul in the net, a Norwegian triplex arrangement, required the use of a smaller mast/boom arrangement and clockwise net setting. Other aspects of the Takuryo Maru operation did not differ significantly from other vessels in the Japanese 500-GT fleet.

The Matsuo Maru No.1 and associated vessels (Figure 2) appeared to be representative of the Japanese group purse-seine vessels which fish in the equatorial Pacific.

4.0 SUMMARY OF ACTIVITIES

4.1 Takuryo Maru (500 GRT)

After boarding the vessel in Guam on 19 June 1982, 3.5 days were spent steaming southeast to the fishing grounds. During the following 27 days, 23 sets of the net were made in the 200-mile zone of the Federated States of Micronesia and neighbouring international waters (Figure 3). On July 19 the fish-hold was filled and the Takuryo Maru terminated fishing activity and proceeded towards port. Due to super-typhoon Andy the return trip to Guam was 6.5 days in duration. After a short port call to disembark the observer, the Takuryo Maru departed for Japan where the catch was unloaded in Yaizu.

4.2 Matsuo Maru (group seiner)

En route from Japan to the equatorial fishing grounds, the four vessels of the Matsuo Maru group stopped at Guam on 5 February 1983 for the purpose of observer embarcation. Proceeding onward to the Papua New Guinea fishing zone, the first set was made 7 days later. During a total of 16 days aboard the net vessel, 5 sets were observed in Papua New Guinea and international waters (Figure 3). Transfer was then made to one of the carrier vessels of the group which spent 3.5 days en route to Tinian Island, in the Northern Mariana Islands, where the observer disembarked. The carrier vessel offloaded tuna in Tinian, obtained supplies in Guam, and rejoined the group in equatorial waters where the group fished until the end of May.

TABLE 1. SPECIFICATIONS OF THE VESSELS ON WHICH OBSERVER TRIPS WERE CARRIED OUT

Vessel Name Type of Vessel	Takuryo Maru No.1 Single purse-seine vessel	Matsuo Maru No.1 Net vessel of group seine operation
Owner	Ishihara Suisan Co. Ltd.	Tsujiga Hana Gyogyo Co. Ltd.
Captain	Tomomi Suguwara	Shingaro Kanno
Gross Registered Tonnage	499	116
Length-Beam-Draft	55.3 m - 10.0 m - 6.4 m	31.5 m - 6.9 m - 2.7 m
Number of Crew	22	24 (58 on all vessels of group)
Associated Vessels	1 net skiff, 2 work boats	2 carrier vessels (284 GRT), 1 search boat, 1 net skiff, 1 work boat
Fishing Vessel Registration Number	SO1-898	ITI-134
Radio Call Sign	JCVO	JE2326
Year Launched	1979	1976
Fish Storage Capacity	480 tonnes	0 (all fish loaded directly onto carrier vessel)
Net Dimensions (stated cork-line length and depth)	1500 m x 280 m	1100 m x 230 m

FIGURE 1. THE TAKURYO MARU (top) AND TYPICAL 500 GT JAPANESE PURSE-SEINERS. The net retrieval gear, a Norwegian triplex system, pulls the net by hydraulic rollers mounted on the starboard rail of the work deck.

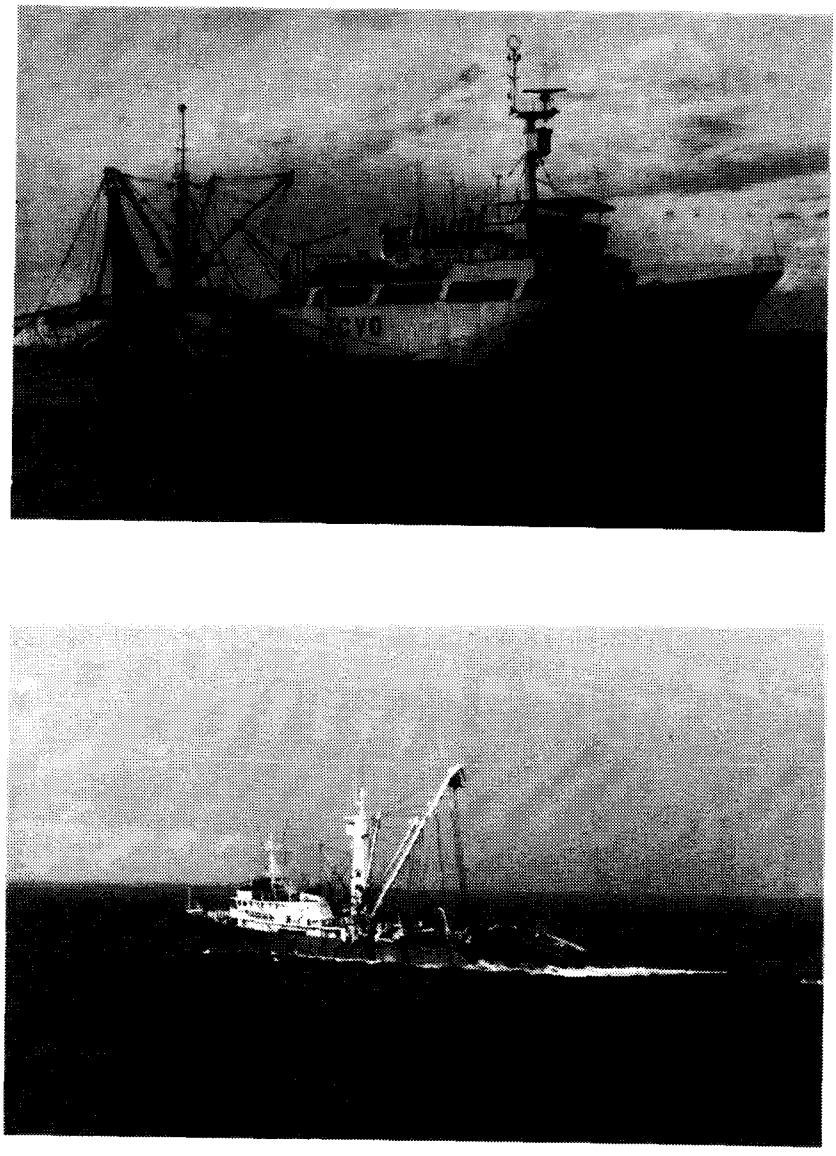


FIGURE 2. THE MATSUO MARU NO.1 (top), THE CARRIER VESSEL (middle), AND THE SEARCH VESSEL

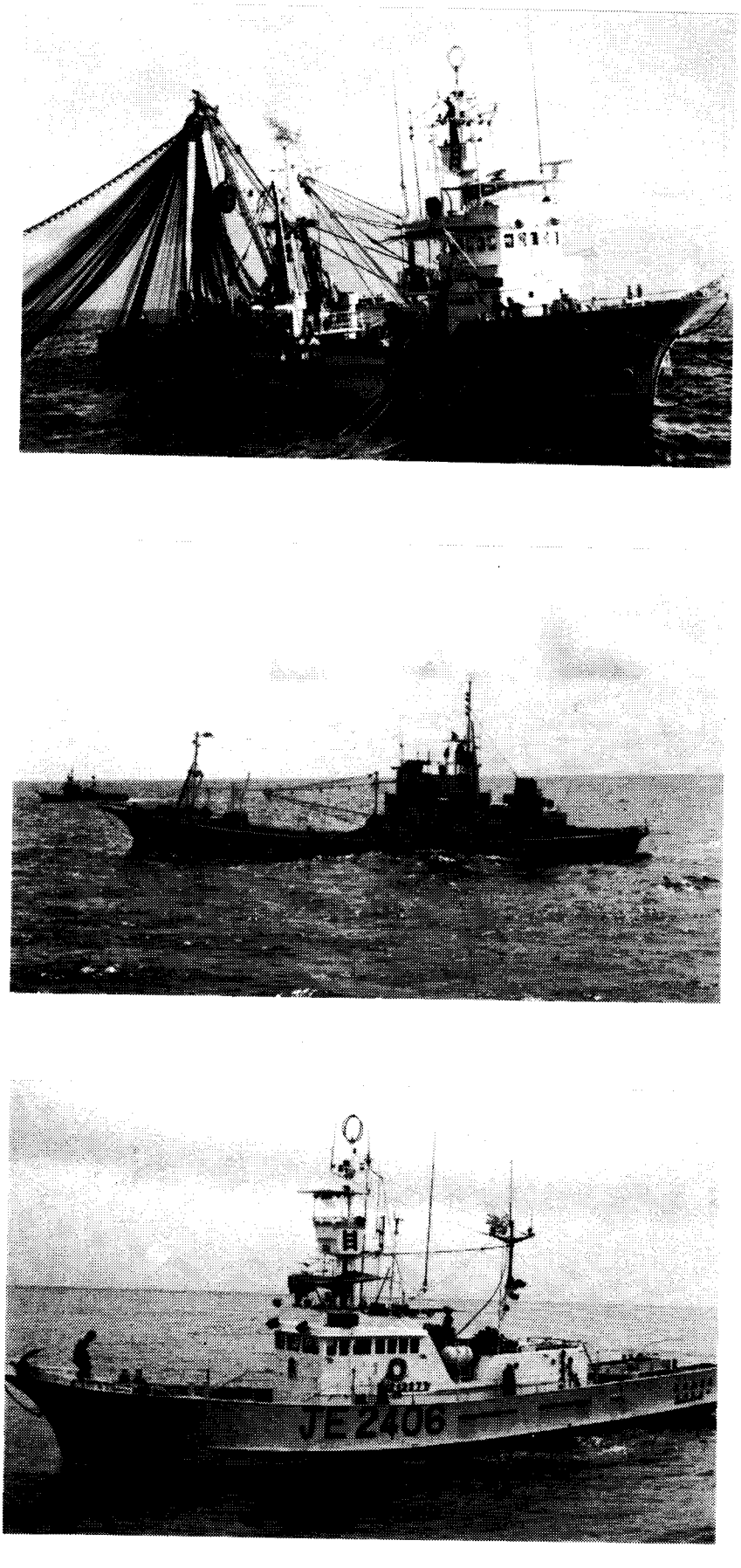
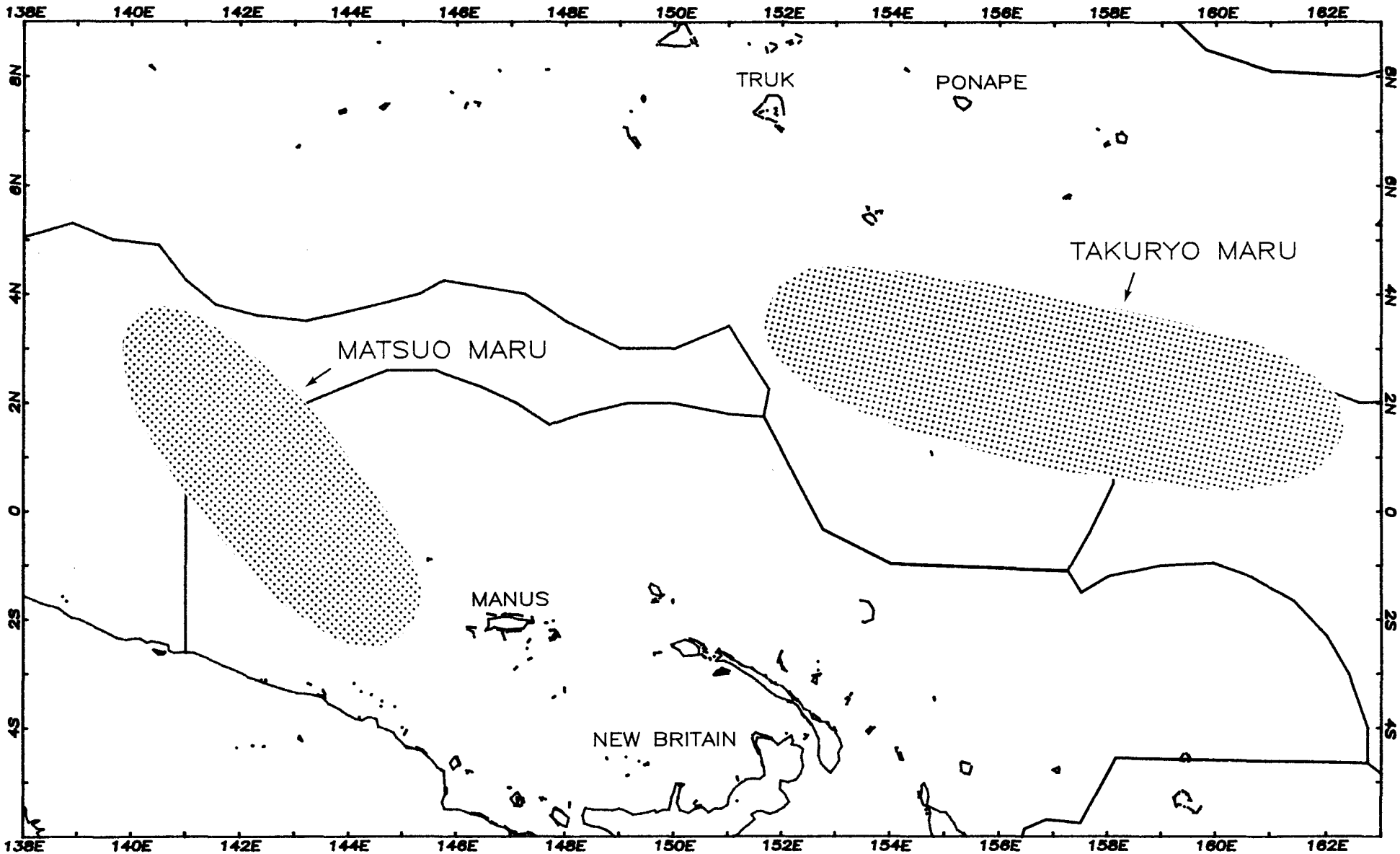


FIGURE 3. THE FISHING AREAS. Boundaries shown are the approximate limits of the various 200-mile zones.



5.0 FISHING PROCEDURES

5.1 Locating the Tuna

On the Takuryo Maru all of the searching for tuna was done from the main vessel. During periods of searching, most of the crew attempted to locate drifting objects (usually logs) or bird activity using binoculars from the upper deck or crow's nest. In the Matsuo Maru group operation, spotting was carried out with binoculars from the net vessel, search boat[1], and one or both carrier boats. While searching, vessels of the group travelled on parallel courses about 3 to 4 miles apart.

The time spent searching varied from day to day. On the Takuryo Maru as soon as an appropriate log was located the crew ceased searching and the vessel drifted for the remainder of the day. On the Matsuo Maru the crew continued searching throughout each fishing day.

On both observer trips, locating a log, the amount of tuna in the vicinity was determined by the use of depth sounders and sonar. A log having significant amounts of tuna was marked with a radio beacon, flashing light, and flag.

The Takuryo Maru No.1 made extensive use of free-floating bamboo rafts. These rafts were constructed aboard the vessel, and were set adrift on the fishing ground after being marked with a radio beacon and flashing light. The fishing techniques used in association with these "artificial" logs were identical to those used with those logs encountered by searching.

Most of the fishing was done around logs; however, occasionally an attempt was made to catch tuna not associated with floating objects. The desirability of setting the net on these school fish was determined by the motion of the school. Only those schools which were "foaming" and relatively stationary were considered appropriate.

5.2 The Set

5.2.1 Log set

Approximately one hour before morning nautical twilight[2] the Takuryo Maru would proceed to a position about 300 metres upwind of the log or drifting raft which was marked by a radio beacon and flashing light. A workboat was lowered into the water to investigate by depth sounder the amount of tuna associated with the log. If a sufficient quantity of fish

---

1. The name, search boat ("jotansen" in Japanese), is somewhat of a misnomer as fewer crew members search from this vessel than from the net boat or carriers, and the vessel itself, being relatively small, is not as desirable a spotting platform as the other vessels.

2. Morning nautical twilight is defined as that pre-dawn time when (in good conditions and in the absence of other illumination) the horizon is not quite visible. On the equatorial fishing grounds this occurs about three-quarters of an hour prior to sunrise, which is defined as the time when the sun's upper limb is on the visible horizon.

was present and the current differential between the surface and 50 metres not too great[1], a decision was made to set the net. About 5 minutes after morning nautical twilight, the Takuryo Maru, steaming at about 10 knots in a clockwise direction around the floating object, would release the net skiff into the water and the set of the net would commence. An average of 5.5 minutes were required to deploy the net and usually about 36 minutes after skiff release the net would be fully pursed[2] as indicated by all 108 rings being lifted out of the water. About 90 minutes of net stacking followed and subsequently fish were brailed from the net onto the working deck of the Takuryo Maru where they were either discarded or stored below.

The net setting and retrieval process of the group seining operation was basically the same except for the latter stages. After most of the net had been restacked on the net vessel, one of the carrier vessels tied onto the cork-line of the net and subsequently all fish were loaded directly onto the deck of the carrier where they were sorted and then stored below.

5.2.2 School fish set

Attempts to catch school fish were made only during daylight hours. The procedures used were similar to that for log sets except the net was set and pursed at a faster rate in an attempt to prevent the fish from escaping. The Takuryo Maru used the work boats to scare the fish away from the net vessel, while the Matsuo Maru made use of the carrier vessel(s), search boat, and work boat to do the manoeuvring.

5.2.3 Graphical representation of fishing details

Figure 4 and Table 2 give the stages of a set and compare a 500 GT seining operation to that of a group purse-seiner.

Fishermen believe that two important factors affecting the success of a set are fishing depth of the net and pursing speed. Figure 5 gives the fishing depth of the net for each set which is a function of size of the net, current differential, and speed of pursing. Figure 6 gives pursing times which are defined as being the elapsed time between skiff release and rings being hoisted clear of the water.

6.0 FISHING RESULTS

6.1 General Results

Catch data for individual sets observed are given in Figure 7, and fishing results of the two observer trips are summarised in Table 3.

---

1. The current differential was determined electronically by the use of Furuno C1-20 current meter. This device gives current speed and direction at two different depths simultaneously.

2. Pursing refers to closing the opening at the bottom of the net by drawing the rings together with a purse cable. After this occurs, fish which may be inside the net have very little chance of escaping.

FIGURE 4. THE FIVE STAGES OF A SET (see Table 2). N=vessel which carries and sets net; NS=net skiff (carried on net vessel); C=carrier boat; S=search boat; WB=work boat (500 GT:carried on main vessel; group:carried on search boat).

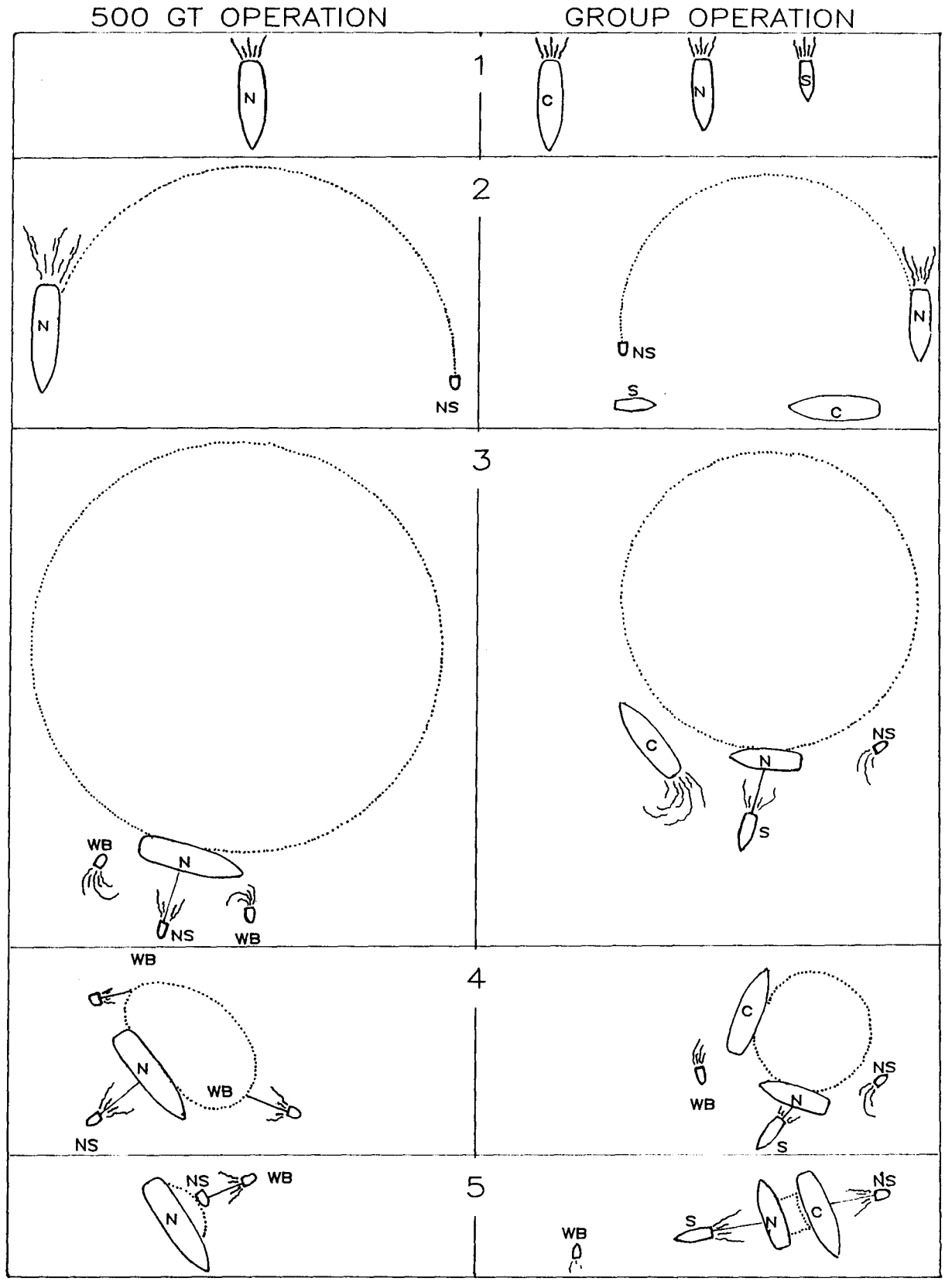


TABLE 2. THE STAGES OF A SET

Stage	500 GT Operation	Group Operation
1. Searching for logs or schools	All searching is done from the main vessel.	Searching is done from the net boat, the search boat, and from one or both carrier vessels.
2. Setting	Net skiff is released and typically the net is set in a counter-clockwise direction. On the Takuryo Maru, however, setting was done clockwise.	Net skiff is released and net set in clockwise direction. Search boat and carrier boat stand by.
3. Pursing the net	Net skiff pulls the main vessel away from the net. Two small work boats are lowered into the water and cruise in circles to scare fish back into the net.	The search boat pulls the net boat away from the net. The carrier vessel and net skiff cruise in circles to scare fish back into the net.
4. Final stages of retrieving the net	The two work boats manoeuvre the cork-line of the net. Net skiff continues to pull main vessel away from net.	Carrier vessel ties onto cork-line of net. Work boat shuttles crew between vessels. Search boat continues to pull net boat away from net.
5. Loading the fish	Net skiff ties onto the cork-line of the net. Work boat pulls skiff away from main vessel. Fish are loaded from the net onto the main vessel.	Net skiff pulls the carrier boat away from net boat. Search boat pulls net boat away from carrier boat. Fish are loaded directly from the net onto the carrier vessel.

FIGURE 5. THE FISHING DEPTHS OF THE PURSE SEINES

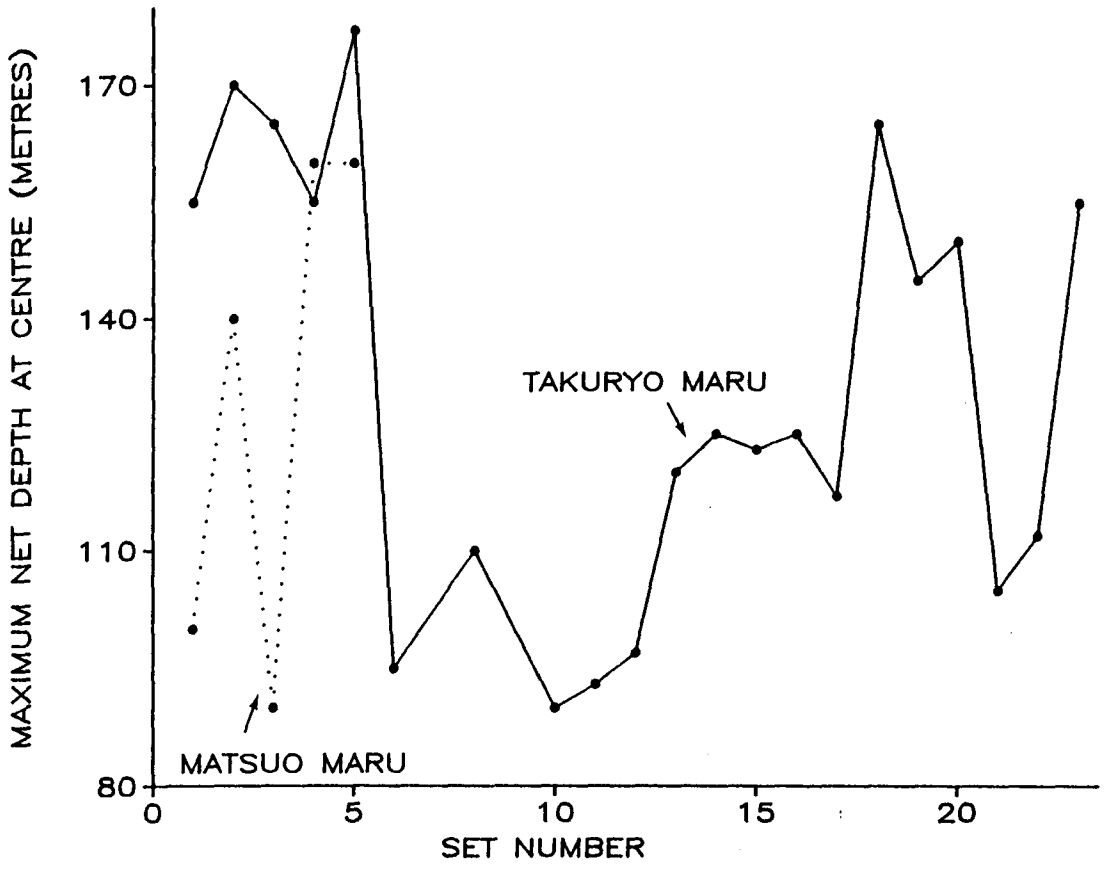


FIGURE 6. TIME REQUIRED TO PURSE THE NET

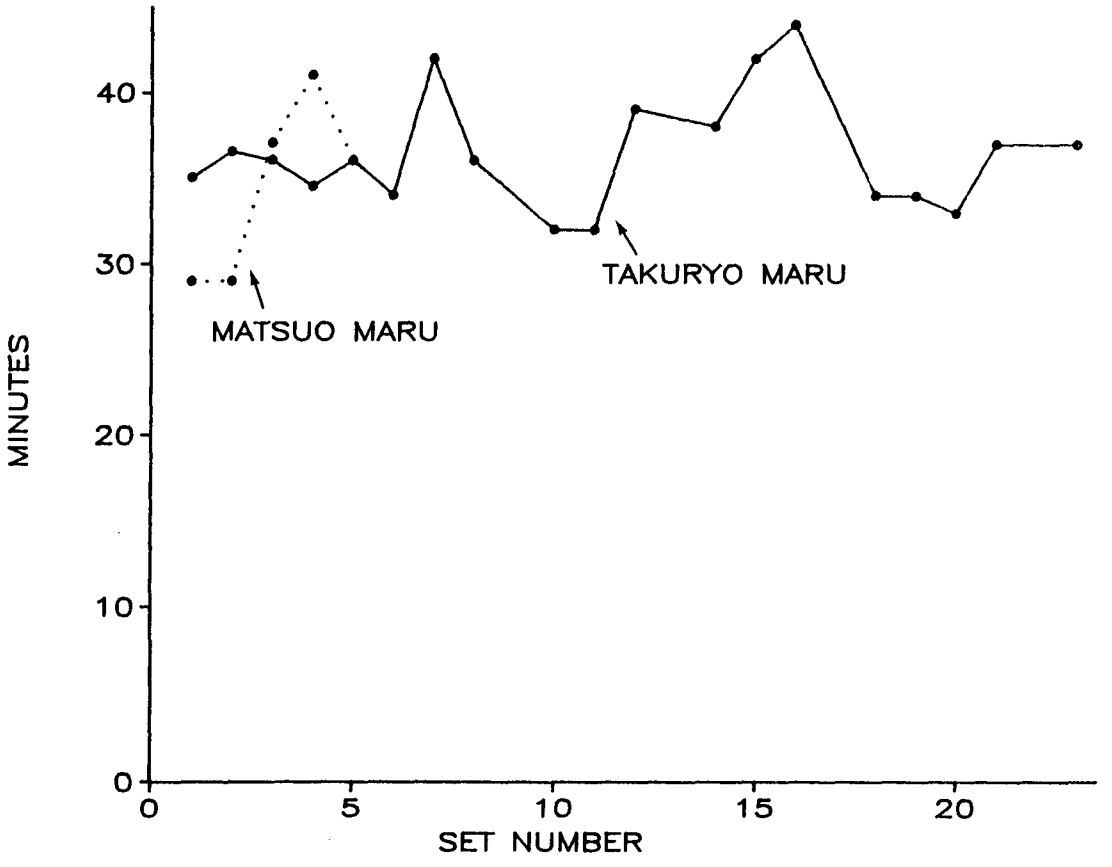


FIGURE 7. TUNA CATCH DETAILS BY SET. School sets are indicated by a star. SJ=skipjack, YF=yellowfin, BE=bigeye.

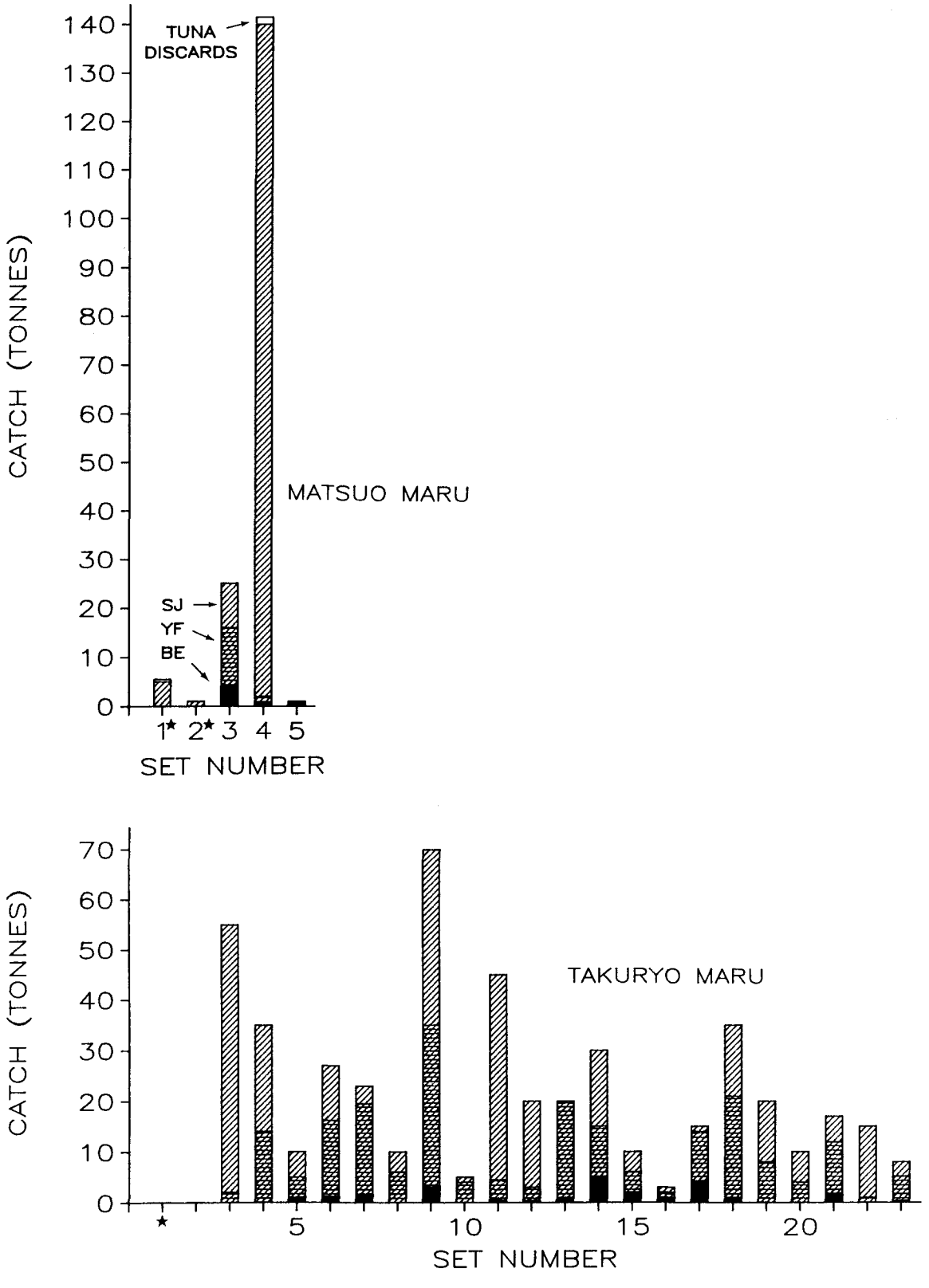


TABLE 3. FISHING DETAILS

	Takuryo Maru (500 GT)	Matsuo Maru (group)
Number of school sets	1	2
Number of log sets	22	3
Total number of sets	23	5
Number of successful* school sets	0	2
Number of successful log sets	21	3
Total number of successful sets	21	5
Tonnes of tuna retained	483	172
Tonnes of tuna discarded	0.2	1.5
Tonnes of other species discarded	6.2	2.2
Average tuna catch per set (tonnes)	21.0	34.4
Average tuna catch per log set (tonnes)	21.9	55.3
Average tuna catch per school set (tonnes)	0	3.3

* A successful set is defined as a set in which at least one tonne of tuna was captured and retained.

Species composition and length frequency information are given in Figures 8 and 9.

The Takuryo Maru and Matsuo Maru failed to make sets on four fishing days and eight fishing days respectively. This lack of setting was attributed to the current differential being to great (5 days), not locating suitable log fish or school fish (3), steaming to a different area (2), being in an area where fishing was prohibited (1), and the water depth being too shallow (1).

6.2 Discarded Fish

Intentional discarding was done due to the fish being undesirable species, undersized, or damaged by the gear. The discards listed in Table 3 and Figure 7 do not include an estimated 80 tonnes of tuna which were lost during a gear malfunction incident on Takuryo Maru set number 3.

The eight tonnes of non-tuna species which were discarded on the two observer trips included in decreasing order of importance by weight, rainbow runner (Elagatis bipinnulatus), blue marlin (Makaira nigricans), scad (Decapterus sp.), triggerfish (Cathidermis sp.), sharks (Carcharinus sp.), dolphinfish (Coryphaena hippurus), wahoo (Acanthocybium solandrii), barracuda (Sphraena sp.), and black marlin (Makaira indica).

Billfish require special mention. During the 23 sets, 16 blue marlin and 1 black marlin were brought aboard the Takuryo Maru, and 4 blue marlin were landed on the Matsuo Maru in 5 sets. On the Takuryo Maru, blue marlin were retained aboard the vessel for sale in Japan, while on the Matsuo Maru they were discarded. It appeared as though blue marlin were associated with almost all of the schools set on during the two trips. However, many of these fish were never actually landed on the vessel due to escaping over the corks or being dumped before brailing. The condition of the escaped fish varied from unharmed to dead.

FIGURE 8. COMPOSITION OF THE TUNA CATCH

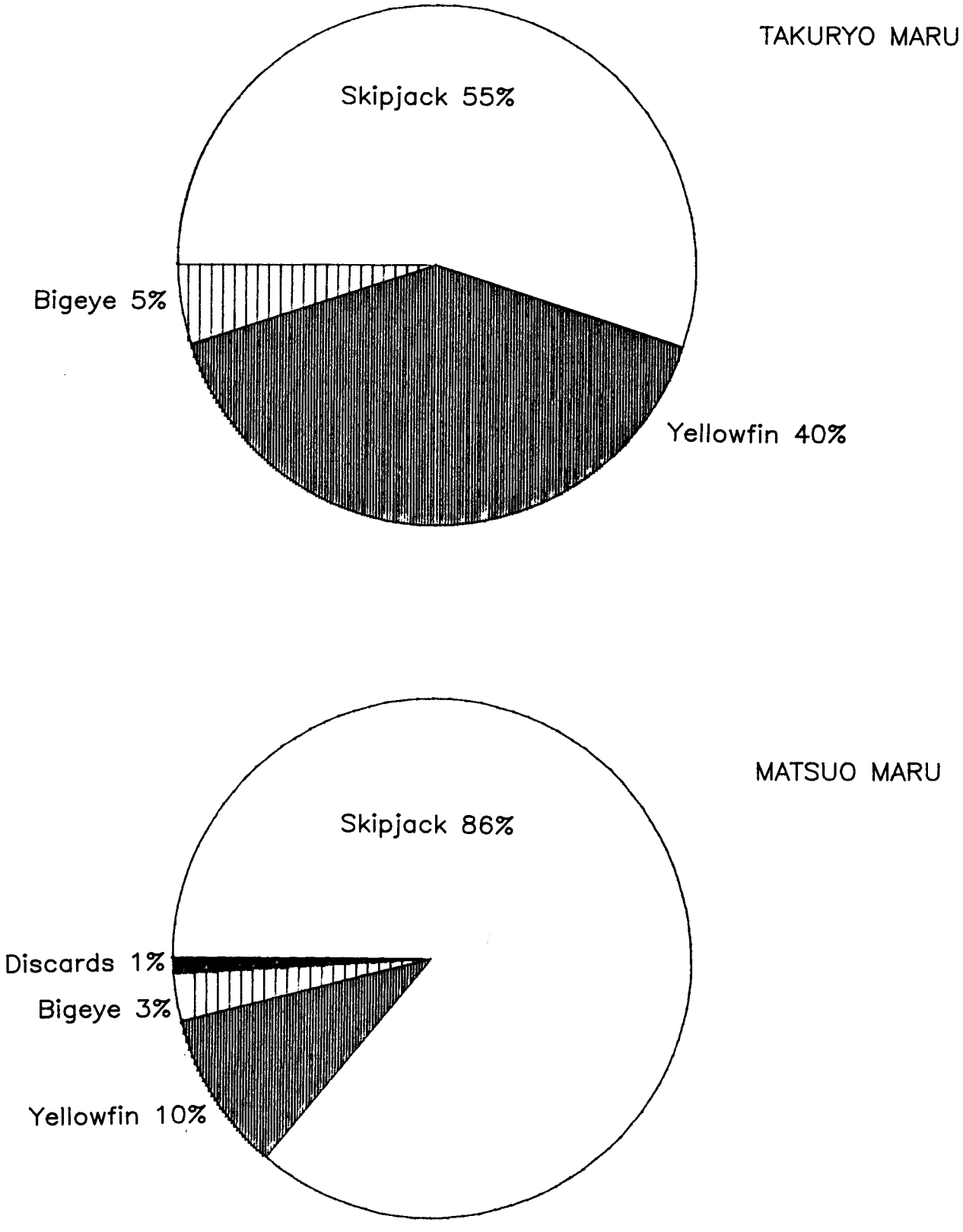
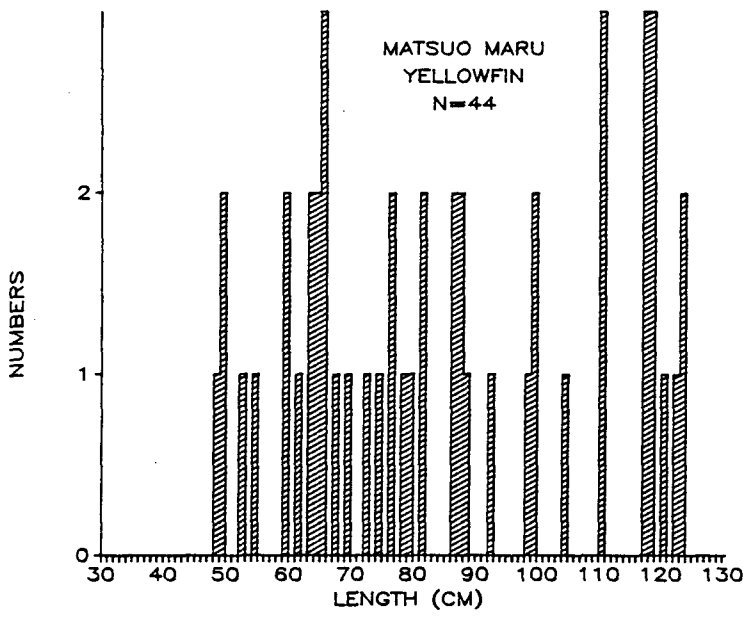
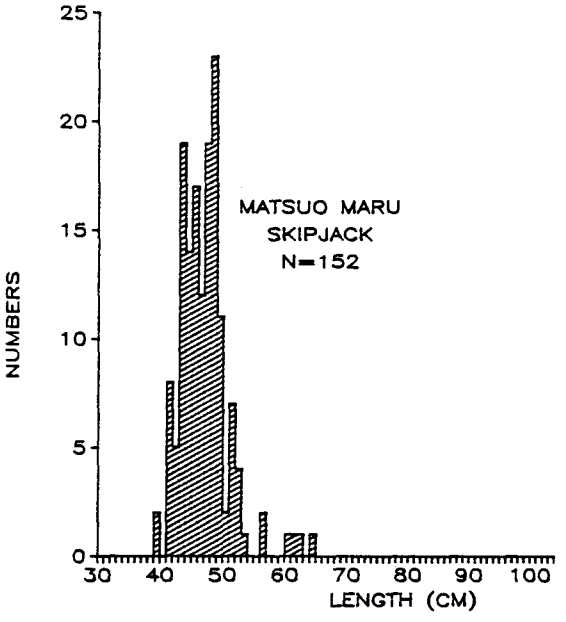
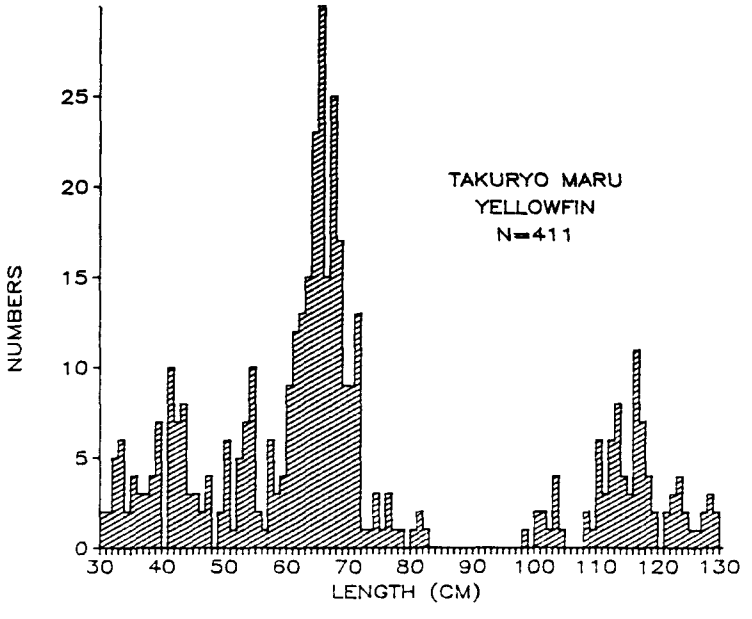
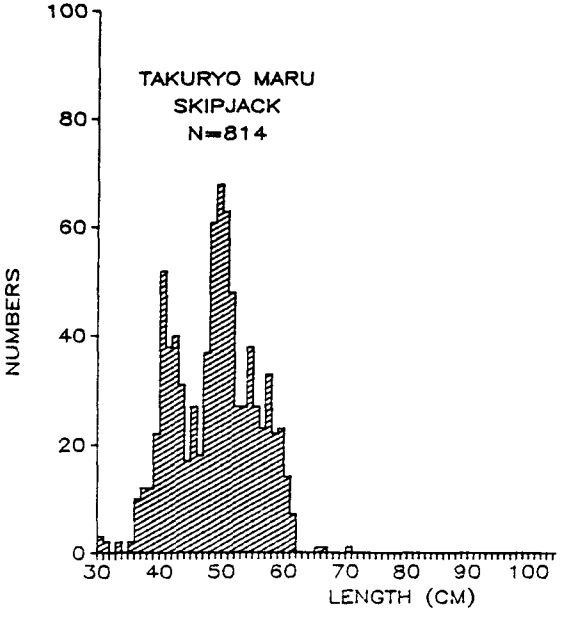


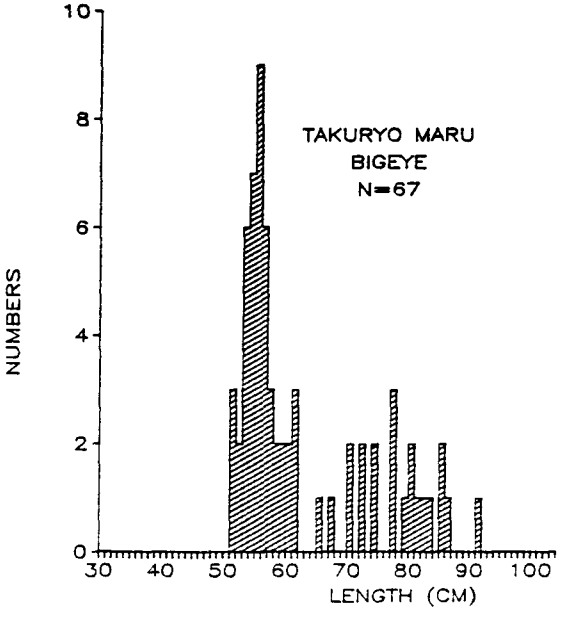
FIGURE 9. LENGTH FREQUENCY INFORMATION











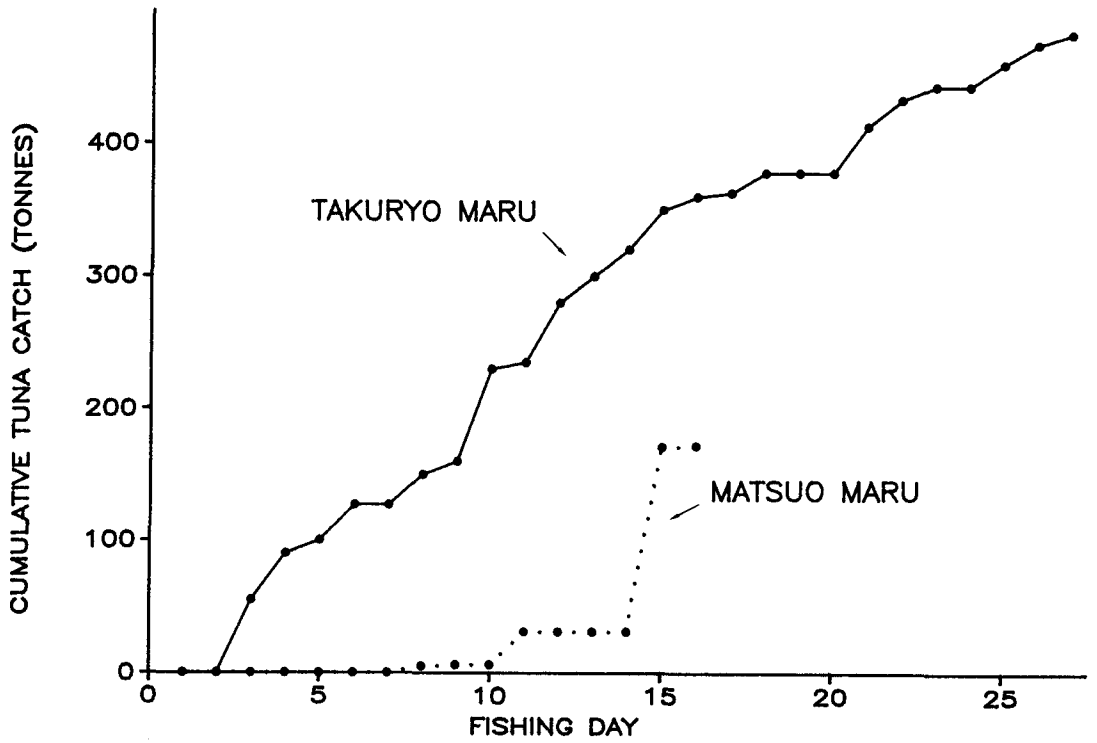
7.0 METHODS USED FOR CATCH SAMPLING

As given in Section 6.0, three types of information were collected from each set. In order of priority, they were: total quantity of the catch, species composition, and length frequency data. The following indicates how this sampling was performed.

7.1 Quantity of Catch

As it is difficult for an observer to determine accurately the total catch in a particular set, this information was obtained from the fishing master and captain. A cumulative total of these estimates was kept (Figure 10). The reliability of the individual set catches was gauged by comparing the running total at the end of the trip with the fish hold capacities of the vessels, which were determined early in the trip and cross-checked with as many sources as possible.

FIGURE 10. CUMULATIVE RETAINED TUNA CATCH



7.2 Species Composition

Before fish were brailed aboard the vessels, the fishing masters were consulted concerning the quantity of fish in the net. The approximate number of brailing scoops that would be made was calculated. The crew was then requested to place the contents of one small scoop at about the middle of the brailing process on deck. These fish were closely examined for species composition by weight. Prior and subsequent brailing scoops were given a quick examination to determine how closely the sampled scoop

approximated the average and the composition estimate was adjusted accordingly.

7.3 Length Frequency

After the species composition was estimated from the abovementioned sampled brail scoop, approximately 100 fish of a single species were chosen randomly and the length from the fork of the tail to the tip of the snout (LCF) was measured for each fish on a measuring board. Using a mini-cassette tape recorder, it was possible to do this measuring rapidly without assistance from the deck crew.

7.4 Sampling Difficulties

The sampling carried out was far from problem free. A discrepancy of about 25% was noted on the Matsuo Maru when the sum of the individual catches was compared to the amount of tuna known to be on the carrier vessel. It was not possible to determine whether this mis-reporting was from one set or many.

The fish appeared to be somewhat stratified by species. It was thought that skipjack, having relatively high metabolic requirements, are the first to die in the confined area of the net. The skipjack sank to the bottom and were consequently more prevalent during the latter stages of brailing.

The main differences in the species composition estimate between that made by the observer and that reported by the Japanese crew concerned the amount of bigeye present. Because the crew had only a matter of seconds to view a two-tonne mass of fish in an individual brailing scoop , this species discrimination, not easy at the best of times, was not done very accurately and consequently bigeye were under-reported by the crew.

8.0 MISCELLANEOUS OBSERVATIONS AND RECOMMENDATIONS

8.1 Sampling

Although an observer may be onboard a vessel for several weeks, the actual time in which catch sampling can take place is limited to the relatively short brailing period. An observer should do everything possible to utilise this sampling time efficiently. As the fork length of a fish can be taken faster and more accurately aboard a vessel than the weight, the length should be measured and, if required, be converted to weight by the use of Appendices E, F, or G. The use of a mini-cassette recorder speeds up the process of recording fish lengths. In the sampling period it is considered better to measure a fairly large sample (approx. 100 individuals) of a single species, rather than much smaller samples of several species. The observer himself should randomly select those fish to be measured and not rely on the crew for assistance who may tend to select those fish which they consider to be "handsome".

Observers should be able to discriminate yellowfin from bigeye and be aware that the amount of bigeye is frequently under-reported. The presence of semi-bouyant, "floating" fish in the net just prior to brailing can be a useful clue that the catch may include a significant amount of bigeye.

8.2 The Standard SPC Purse-Seine Catch Form

The standard SPC purse-seine catch form (Appendix A) appears to be quite useable by Japanese fishermen. A few minor problems, however, are associated with its use aboard purse seiners.

(a) The under-reporting of bigeye is somewhat encouraged by not having a bigeye catch column. Considering the size of the form, a specific bigeye column could easily be added.

(b) The amount of blue marlin mortality was surprising and it appears that information on blue marlin catches is desirable. When these fish are discarded, they are reported together on the form with other species and consequently it is not possible to determine the marlin catch.

(c) Japanese fishermen are not sure whether "fishing" is the general pursuit of fish or confined exclusively to setting the net. On the form the term "fishing" should be replaced with "searching" and/or "setting".

(d) As current frequently dictates whether the net can be set, a "no set due to current" would be useful.

(e) The purse-seine form should specifically state "metric tonnes" as there is potential for confusion with 2000-pound tons.

(f) It is not clear how to treat fish that are received from or given to other purse seiners.

(g) In general, a translation of the instructions of the form into the language of the crew would reduce the amount of non-intentional mis-reporting.

8.3 Other

An observer working on a purse-seiner is exposed to a considerable amount of danger. During the sampling period one must work rapidly in an area where there is potential for personal injury. Transferring between vessels is especially dangerous. A helmet should always be worn during the fishing operation and non-skid shoes are very useful. Observers should have substantial accident insurance coverage.

Communication with Japanese crewmen can be very difficult due to the language barrier. To help overcome this problem a specialised glossary of Japanese fishing terms (Appendix B) was compiled during the two trips.

Future observers may wish to make use of specialised forms for data collection. Appendix C is a fish length sheet onto which length frequency information from the mini-cassette recorder can be transcribed. Appendix D is a daily activities form for observers which may prove valuable for encouraging inexperienced observers to collect useful information. Conversion of length to weight is simplified by the use of Appendices E, F, and G.

9.0 CONCLUSIONS

The 58 days spent on the vessels of the two operations provided valuable insight into the Japanese southern water purse seine fishery. Although information was collected on fishing activity specifically in the Federated States of Micronesia, Papua New Guinea and international waters, the data obtained should also be of interest to countries adjacent to these areas.

Prior to these observer trips, little if any documentation existed on the catches of billfish by equatorial purse-seine fleets. It was somewhat surprising to learn of the magnitude of the blue marlin catch. Caution should be used, however, when extrapolating these catches to all seining activity in the area.

A number of minor problems are associated with the use of the standard SPC catch form. It appears that, with slight modification of the form, these difficulties could easily be overcome and the recorded data would be more accurate and useful.

The observer trips showed that several problems were associated with on-board catch sampling. The information collected should therefore be considered only indicative; however, as it could be extremely useful, observers should be encouraged to carry out this sampling on future trips. Further work on sampling procedures appropriate for purse-seine vessels is warranted.

Group purse-seining operations use more than one vessel to transport the catch to a variety of ports and consequently the monitoring of landings is difficult. The possibility that catches by these vessels are under-reported is considerable.

Countries that place observers on foreign fishing vessels are able to collect operational and catch information which would not be otherwise available. Furthermore, experience from these two trips indicates that by merely having an observer presence in the fleet, an awareness is created on the part of the Japanese fishermen that the island country placing the observer is sincerely concerned about the tuna resources within its jurisdiction.

APPENDIX A. THE STANDARD SPC CATCH FORM

<u>PURSE SEINE VESSEL</u> - CATCH REPORT FOR WATERS OF ....

VESSEL NAME ______________________________
COUNTRY OF REGISTRATION ______________________________
REGISTRATION NUMBER ______________________________
GROSS REGISTERED TONNAGE ______________________________
NAME(S) OF FISH CARRIER(S)
FOR GROUP PURSE-SEINER ______________________________

LICENSE/PERMIT NUMBER ____________________
NAME OF CAPTAIN ____________________
LICENSE/PERMIT
HOLDER'S SIGNATURE ____________________
YEAR ____________ MONTH ____________

	NAME		YYMMDD
DEPARTURE FROM PORT		DATE	
ARRIVAL AT PORT		DATE	

NUMBER OF CREW	

DAY	NOON OR SET POSITION LAT DDMM	N S	LONG DDDMM	E W	SCHOOL TYPE	TIME SET	SKIPJACK CATCH (mt)	SKIPJACK AV. SIZE (kg)	YELLOWFIN CATCH (mt)	YELLOWFIN AV. SIZE (kg)	OTHER SPECIES SPECIES NAME	OTHER SPECIES CATCH (mt)	OTHER SPECIES AV. SIZE (kg)	COMMENTS	DISCARDS TUNA (mt)	DISCARDS OTHERS (mt)	DISCARDS REASON FOR DISCARD
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
					( )									( )			( )
TOTAL											X			X			X

NUMERICAL EXPRESSION OF SCHOOL TYPE, COMMENTS, AND REASON FOR DISCARD
****

<u>SCHOOL TYPE</u>

1 Log
2 Surface
3 Whale
4 Porpoise
5 Raft
6 Other

<u>COMMENTS</u>

1 A full day in transit between fishing grounds or to or from fishing grounds.
2 A full day not fishing due to breakdown.
3 A full day not fishing due to bad weather.
4 A full day searching for fish but no sets made.
5 Part of day searching for fish but no sets made.
6 Set unsucessful for any reason, e.g. fish dive, roll up.

<u>REASON FOR DISCARD</u>

1 Undesirable species
2 Fish too small
3 Vessel completely loaded
4 Other reason - please specify
....

APPENDIX B. A SHORT ENGLISH/JAPANESE DICTIONARY OF FISHING TERMS

Fish/Marine Life

Fish	- Sakana
Skipjack (Katsuwonus pelamis)	- Katsuo
Yellowfin (Thunnus albacares)	- Kihada maguro
Small yellowfin	- Kimeji
Bigeye (Thunnus obesus)	- Mebachi maguro
Small bigeye	- Daruma
Mackerel tuna (Euthynnus affinis)	- Yaito, Suma
Bullet tuna (Auxis rochei)	- Marusodakatsuo
Frigate tuna (Auxis thazard)	- Hirasodakatsuo
Northern bluefin (Thunnus thynnus)	- Kuromaguro
small bluefin	- Kokowa
Southern bluefin (Thunnus maccoyii)	- Minami maguro
Dogtooth tuna (Gymnosarda unicolor)	- Isomaguro
Longtail tuna (Thunnus tonggol)	- Koshinaga
Albacore (Thunnus alalunga)	- Tonbo, Bincho
Rainbow runner (Elagatis bipinnulatus)	- Okiburi, Tsumuburi, Ao
Triggerfish (Family Balistidae)	- Kawahagi
Common dolphinfish (Coryphaena hippurus)	- Shiira
Barracuda (Family Sphyraenidae)	- Onikamasu
Family Carangidae	- Aji
Shark (Order lamniformes)	- Same
Wahoo (Acanthocybium solandri)	- Okisawara, Sawara
Billfish : Swordfish (Xiphias gladius)	- Mekajiki
Sailfish (Istiophorus playpterus)	- Bashokajik
Black marlin (Makaira indica)	- Shirokawa
Blue marlin (Makaira nigricans)	- Kurokawa
Striped marlin (Tetrapturus audax)	- Makajiki
Doublelined mackerel (Grammatorcynus bicarinatus)	- Nijosaba
Whale	- Kujira
Flying fish (Family Exocoetidae)	- Tobi Uo
Porpoise	- Iruka, Goto Kujira
Mackerel (Genus Scomber)	- Saba
Bait	- Esa
Saury (Family Scomberesocidae)	- Sanma
Sardine (Family Clupeidae)	- Iwashi
Herring (Family Clupeidae)	- Nisin
Turtle	- Kame
Seal	- Azarashi
Jellyfish	- Kurage
Crustacea	- Kokakurui
Seaweed	- Wakame

Types of Vessels

Pole-and-liner	- Ippon zurisen
Longliner	- Haenawasen, Magurosen
Purse-seiner	- Makiamisen
500 tonne seiner	- Kaigaimakiamisen, Gohyaku ton no makiamisen
116 tonne seiner	- Kinkaimakiamisen, Hyakujuroku ton no makiamisen
Net boat	- Amisen
Search boat	- Gyotansen
Carrier boat	- Katsuosen no umpansen
Patrol vessel	- Patrolsen
Mothership	- Bosen
Scientific research ship	- Kagukuchosasen

Types of Schools	- Gyogun no shurui
School	- Gyogun, Tsumure
Log school	- Kizuki, Kitsuki
Whale school	- Kujirazuki, Kujiratsuki
Rippler	- Mizumochi
Boiler	- Shirawaki
Payao	- Jinkoryuboku
Porpoise	- Irukazuki
Parts of Purse-Seine Vessel	
Cabin	- Shitsu, Heya
Bathroom	- Furoba
Wheelhouse	- Senkyo, Burizzi
Upper deck	- Jokohan
Galley	- Makanai shitsu
Mess/salon	- Shokudo
Engine room	- Kikan shitsu
Forecastle	- Kohansoko
Fish hold	- Gyoso
Power block	- Ami sabaki, Pawaburokku
Purse winch	- Pasu uinchi
Main skiff	- Lekko boto, Ichigotei
No.2 skiff	- Nigotei
No.3 skiff	- Sangotei
Speedboat	- Speedboto
Chart room	- Kaizu shitsu
Bow	- Omote, Senshu
Stern	- Tomo, Sembi
Port	- Torikaji
Starboard	- Omokaji
Hull	- Sentai
Radio Room	- Museinshitsu
Propeller	- Propera
Mast	- Masto
Deck	- Kohan
Tow rope	- Ote
Parts of Net	
Net	- Ami
Floats	- Aba
Rings	- Kan
Wire ring line	- Kosaku, Wire ropu
Mesh	- Amime
Net needle	- Abari
Net twine	- Ito
Netting	- Amichi, Amiji
Sinkers, leads	- Omori
Mechanics of Setting	
Standby	- Junbi, Stanbai
Set	- Tomo
Let go	- Lekko
Rings up	- Kanmaki shuryo
Stacking	- Yomo
Drying up	- Ami okoshi
Brailing	- Sakana no torikomi
Net roll up	- Bomaki
Net mending	- Ami shuri

Gear

Gaff	- Kagi
Hook	- Tsuribari
Rope	- Tsuna
Binoculars	- Sogankyo
Brailing scoop	- Tamo
Boots	- Nagagutsu
Hard hat	- Herumetto
Gloves	- Tebukuro
Oar	- Kai
Bamboo	- Take
Anchor	- Ikari
Payao	- Payao
Small line	- Himo

Oceanography

Tidal current	- Choryu
Oceanic current	- Kairyu
Seamount	- Yanjin
Current meter	- Choryukei
Sea temperature	- Kaisuion, Kaisui no ondo
Sea surface temperature	- Hyomen suion
Salinity	- Enbun, Enbun nodo
Border between currents	- Shiome

Crew - Senin

Vessel Owner	- Senshu
Captain	- Sencho
Fishing Master	- Gyorocho
Chief Engineer	- Kikancho
Bosun	- Bosun
Crew list	- Senin meibo

Navigation - Kokai

Degree	- Do
Minute	- Fun
Second	- Byo
GMT	- GMT
Speed	- Sokuryoku
Fishing port	- Gyoko
Lighthouse	- Todai
Wharf	- Futo
Territorial sea	- Ryokai
Reef	- Ansho
Course	- Shinro, Cosu
Direction	- Hoko
Noon position	- Shogo ichi
Chart	- Kaizu
Latitude	- Ido
Longitude	- Keido
Radar	- Radar
Satellite navigation	- Eisei koho
Set position	- Tomo ichi
Sonar	- Sonar
Offshore	- Okiai
Steaming	- Kokai
Drifting	- Nagashi
Calm	- Nagi
Rough	- Arai
Storm	- Arashi
Fishing ground	- Gyojo
Wind speed	- Husoku

Geographical Terms

Bay	- Wan, Gata
Island	- Shima, Sho, Iwa, Jima
Archipelago	- Gunto, Shoto, Retto
Peninsula	- Hanto, Misaki, Saki
Strait, Channel	- Kaikyo
Gulf	- Gulf
Reef	- Se, Sho
Coral reef	- Sangosho
Sea	- Kai
Territorial sea	- Ryokai
Ocean	- Taiyo
Seamount	- Yanjin
Port	- Minato

Scientific Terms

Species	- Shurui
Male	- Os
Female	- Mes
Length	- Nagasa
Weight	- Omosa
Gonads	- Seishokusen
Stomach	- I
Fin	- Hire
Fish scale	- Uroko
Gill	- Era
Weighing scales	- Hakari
Measuring board	- Monoshashi
Stomach contents	- I no naiyobutsu
To measure lengths	- Nagasa o hakaru
To weigh	- Omosa o hakaru
Biologist	- Seibutsugakusha
Scientist	- Kagakusha
Fish tag	- Hyoshiki
Tagged fish	- Hyoshiki-gyo
Otolith	- Jiseki
To estimate	- Mitsumoru
Specimen	- Hyohon

Other

Full moon	- Mangetsu
New moon	- Shingetsu
Too much current for set	- Ami o ireru niwa shio ga hayai
Too rough for set	- Ami o ireru niwa nami ga arasugiru
Fisheries co-operative	- Gyogyo Kyodokumia
Fresh fish	- Seigyo
Dried fish	- Kangyo, Hoshiuo
Canned fish	- Kakogyo
Fishing catch	- Gyokakubutsu
Purse-seine fishery	- Makiami gyogyo
Longline fishery	- Haenawa gyogyo
Fishing permit	- Gyogyo kyokasho
Call sign	- Call sain
Base	- Kichi
Vessel name	- Senmei
Incidental catch	- Konkaku

APPENDIX C. FISH LENGTH SHEET (POLE-AND-LINE AND PURSE-SEINE)

FISH SPECIES SAMPLED
ON THIS LOG SHEET ..... VESSEL NAME ..... PRINT YOUR NAME .....
(Use a different sheet for each fish species)

DATE | | | | (Year Month Day)

SET TIME OR POLING TIME | | (Hour Minute)

FISHING POSITION

Latitude | | | | (Deg Min N/S)

| | | | (Deg Min E/W) Longitude

EXAMPLE:
August 10, 1983 2:32 pm
5°17'North 150°09'East

| 8 | 3 | 0 | 8 | 1 | 0 | | 1 | 4 | 3 | 2 |

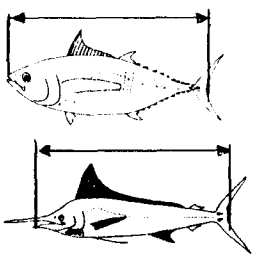
| 0 | 5 | 1 | 7 | N | | 1 | 5 | 0 | 0 | 9 | E |

NO.	LENGTH (CM)	NO.	LENGTH (CM)	NO.	LENGTH (CM)	NO.	LENGTH (CM)
1		26		51		76	
2		27		52		77	
3		28		53		78	
4		29		54		79	
5		30		55		80	
6		31		56		81	
7		32		57		82	
8		33		58		83	
9		34		59		84	
10		35		60		85	
11		36		61		86	
12		37		62		87	
13		38		63		88	
14		39		64		89	
15		40		65		90	
16		41		66		91	
17		42		67		92	
18		43		68		93	
19		44		69		94	
20		45		70		95	
21		46		71		96	
22		47		72		97	
23		48		73		98	
24		49		74		99	
25		50		75		100	

NOTE: (1) Always measure fish to nearest whole centimetre (cm).

EXAMPLE: Fish length 52.4 cm, you write | 0 | 5 | 2 | or | | 5 | 2 |

(2) Tunas - always measure distance from fork in tail to end of snout.
Billfish - always measure distance from fork in tail to tip of lower jaw.



(3) At completion of trip attach all fish length sheets for the trip to log-book maintained by observer.

APPENDIX D. PURSE-SEINE OBSERVER LOGBOOK FORM

VESSEL NAME: YOUR NAME: DATE: DAILY OBSERVER LOG

SET #	SET POSITION: LATITUDE					LONGITUDE						SCHOOL TYPE	TIME SET BEGIN				TIME SET FINISH				MAX NET DEPTH AT CENTER	SEA SURFACE TEMP.		RETAINED CATCH: SKJ	YFT	BET	OTHER	TOTAL	SAMPLE TAKEN ☐	SCAN TAKEN ☐ (CHECK ONE)
	D	D	M	M	N/S	D	D	D	M	M	E/W		H	H	M	M	H	H	M	M	METERS	°C	1/10°							

TOTAL CUMULATIVE RETAINED CATCH FOR YOUR TRIP:

SPECIES AND NUMBERS OF FISH MEASURED:

FOR EACH OF THE ABOVE SETS GIVE ON THE REVERSE SIDE OF THIS PAGE:

A) A small diagram of the setting strategy which includes wind, current (if available, at surface and 50 meters), relative position of log or school in relation to center of net and movement of school during set.

B) Any special difficulties or mistakes during set (e.g. vessel drifted onto net, lots fish gilled).

B) Paste on echo sounder tracing of log or school before or after set (if available).

GENERAL LOCATION DURING MORNING:

MAIN ACTIVITY DURING MORNING: (If no fishing explain why)

MORNING WEATHER:

Sea Condition: (circle one) Calm / Slight / Moderate / Rough

Wind .....Knts

.....Direction

GENERAL LOCATION DURING AFTERNOON:

MAIN ACTIVITY DURING AFTERNOON: (If no fishing explain why)

AFTERNOON WEATHER:

Sea Condition: (circle one) Calm / Slight / Moderate / Rough

Wind .....Knts

.....Direction

FOR FISHING VESSELS WHICH YOU SAW, GIVE NAME, ACTIVITY, CATCH:

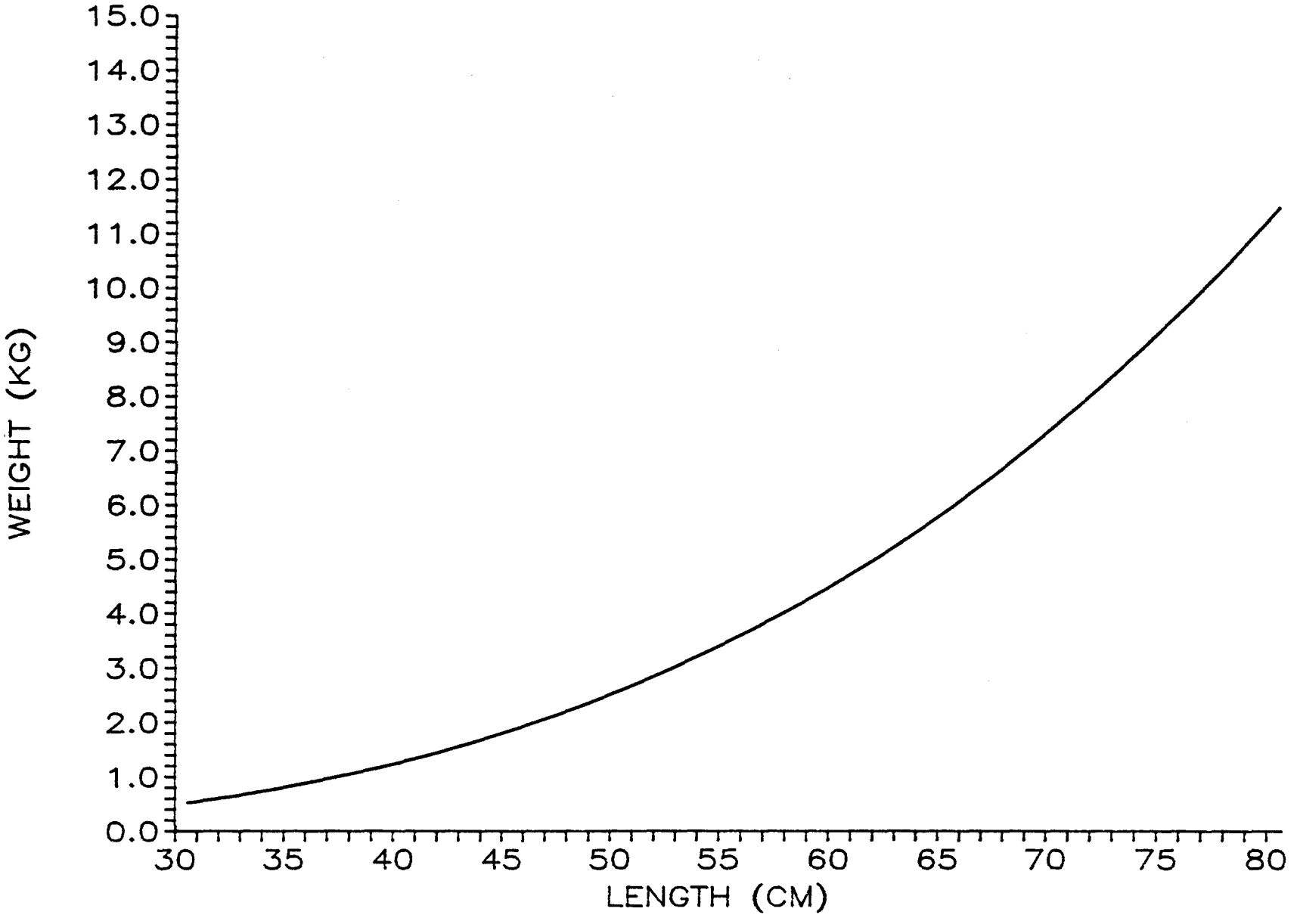
FOR OTHER FISHING VESSELS WHICH YOU LEARNED ABOUT FROM THE CREW GIVE NAME, ACTIVITY, CATCH:

GIVE SOME INTERESTING INFORMATION THAT YOU LEARNED TODAY

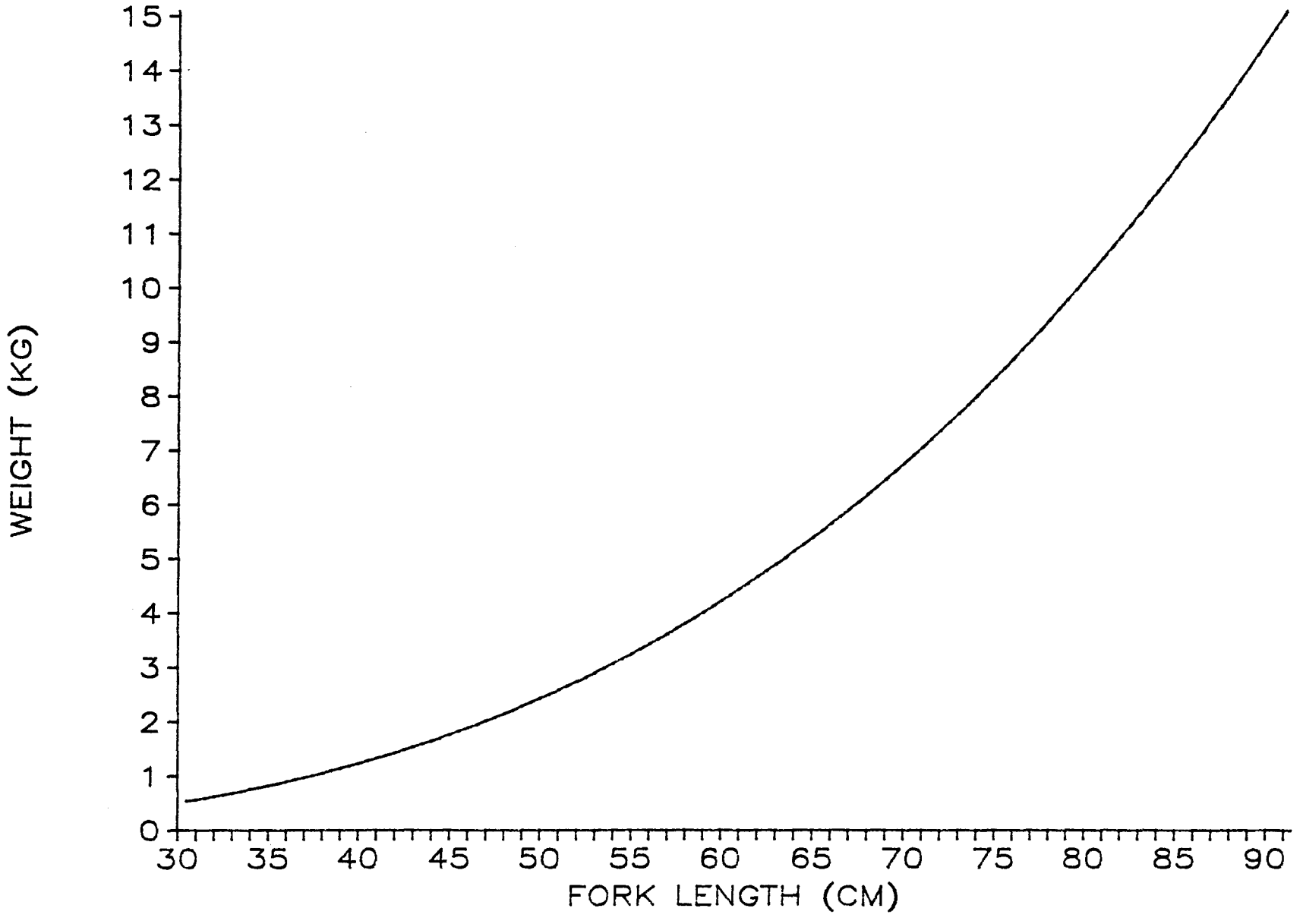
1) From your own observations:

2) From discussions with the crew:

APPENDIX E. LENGTH WEIGHT RELATIONSHIP FOR SKIPJACK



APPENDIX F. LENGTH WEIGHT RELATIONSHIP FOR SMALL YELLOWFIN



APPENDIX G. LENGTH WEIGHT RELATIONSHIP FOR LARGE YELLOWFIN