REPORT ON OBSERVER ACTIVITIES ON BOARD A JAPANESE GROUP PURSE-SEINING OPERATION (24 March - 20 April 1984)

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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 goal of these observer trips is 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.

The staff of the Tuna Programme at the time of preparation of this report comprised the Programme Co-ordinator, John Sibert; Research Scientists, Richard Farman, Robert Gillett, Ray Hilborn, Brian Moore, Renaud Pianet, Tom Polacheck; Systems Manager, Michael Ivanac; Research Assistants, Sam Taufao, Veronica van Kouwen; and Personal Assistant, Carol Moulin.

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1.0 INTRODUCTION

The countries of the South Pacific Commission have recognised that observer programmes are a way to improve the quality of information coming from pelagic fisheries of the region. As a result, the Tuna Programme has been directed to define a set of objectives and to provide support for national observer programmes (Anon 1982).

The opportunity offered by the Micronesian Maritime Authority (MMA) to place a Tuna Programme scientist on board a Japanese group seiner fishing in the Federated States of Micronesia addressed both what had been defined as the main objective of observer programmes, cross-checking of data submitted by distant-water fishing nations under licensing agreements, and the first priority of the Tuna Programme. The purpose of this trip was thus to ascertain possible improvements to the data collection system while assisting MMA with their observer programme.

This report is a description of the observed fishing activities and of the data typically produced by a group-seining operation. Implications from the reporting and sampling methods are also presented.

2.0 SUMMARY OF ACTIVITIES

It had been prearranged for an observer to board the Yakushi group for the duration of one shuttle trip. However, a week in Guam was still necessary to make final arrangements for accommodation on the net boat and for transportation to the fishing grounds. Observer activities in the waters of the Federated States of Micronesia were thus conducted on board the Yakushi group between 2-19 April 1984.

During this period, 6 days were spent in transit to and from the fishing grounds (5°N, 145°E) on board one of the carrier boats, and 12 days were spent on the net boat, Yakushi Maru No.25. Of these, only seven were spent fishing, the rest were spent either searching for fish, moving to new grounds (5°N, 140°E) or looking for a man from the Matsuo Maru group that had fallen overboard. On the morning of 10 April, the first of the 14 sets observed during the next seven days was made. The area fished during this period is shown in Figure 1, and Table 1 summarises the breakdown of activities.

3.0 METHODS

3.1 Equipment

3.1.1 Vessels

A group seining operation consists of a small (116 GRT) net boat, a search boat and two, typically ex-pole-and-line carrier vessels. All the fish caught are loaded onto these carrier vessels which take turns going back and forth to the port to unload and bring back supplies. The net and search boats remain on the fishing grounds at all times with one of the carriers. Table 2 summarises the characteristics of each vessel.

FIGURE 1. NOON AND SET POSITIONS OF YAKUSHI MARU NO.25 (5-16 APRIL 1984)

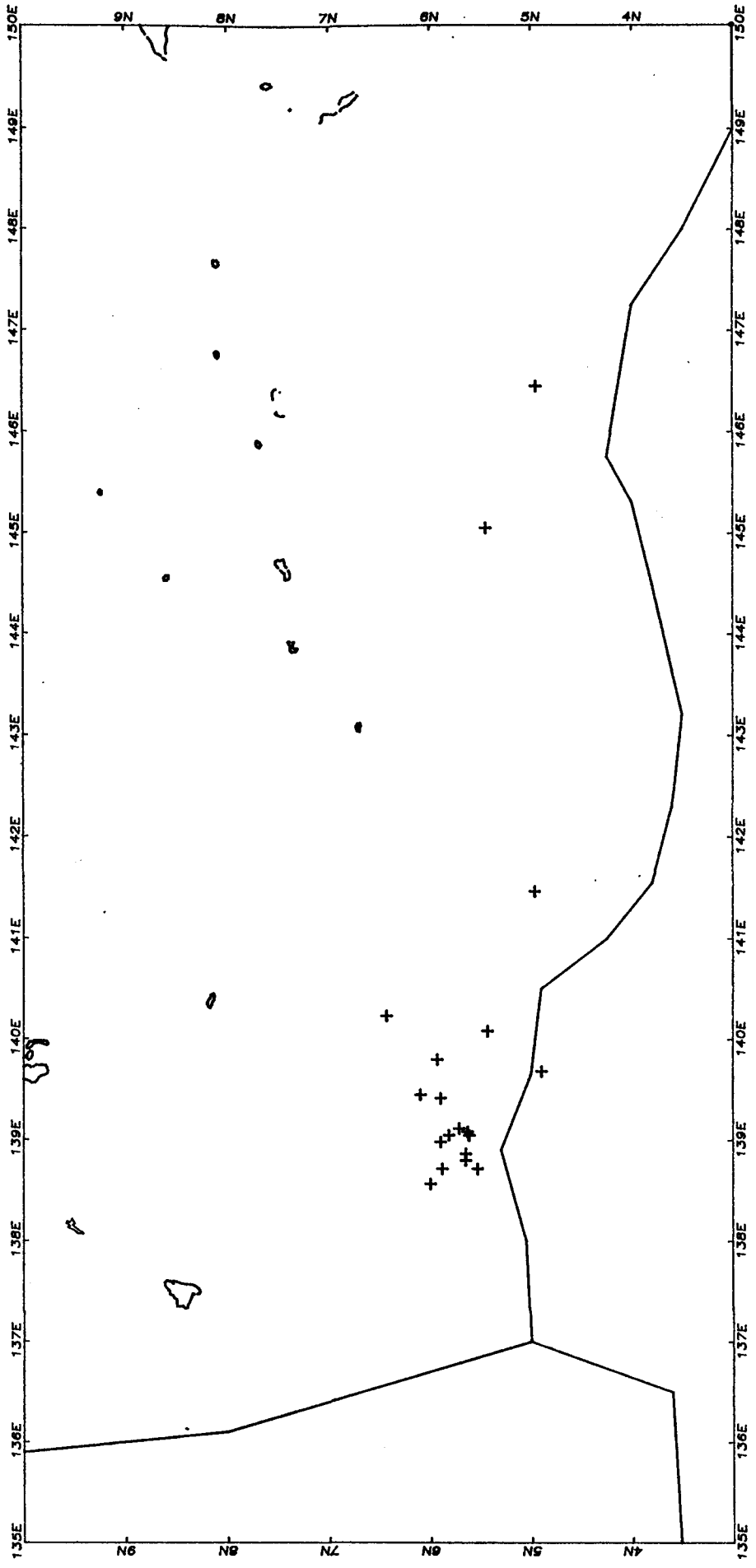


TABLE 1. SUMMARY OF ACTIVITIES WHILE ON BOARD THE YAKUSHI GROUP (2-19 APRIL 1984)

Date	Activity	Hours searched	No. of sets	Total catch (mt)
2/4	Departure	0	0	-
3/4	Steaming	0	0	-
4/4	Steaming	0	0	-
5/4	Fishing (transfer)	9	2	23*
6/4	Searching	12	0	0
7/4	Searching	12	0	0
8/4	Searching	12	0	0
9/4	Searching (lookout)	0	0	0
10/4	Fishing	9	1	7
11/4	Fishing	7	1	5
12/4	Fishing	4	2	10
13/4	Fishing	2	3	16
14/4	Fishing	0	3	48
15/4	Fishing	5	3	21
16/4	Fishing (transfer)	0	1	49
17/4	Steaming	0	0	-
18/4	Steaming	0	0	-
19/4	Steaming	0	0	-
	TOTALS	72	16	179

* Last sets of the previous shuttle trip not taken into account in this report.

TABLE 2. CHARACTERISTICS OF THE VESSELS MAKING UP THE YAKUSHI GROUP

Vessel Name	Use	No. of crew	GRT	LOA (m)	Main engine HP	Fuel (kl)
Yakushi Maru No.25	Net boat	22	116.52	31.50	690	78
Yakushi Maru No.23	Carrier	12	299.64	43.40	540	210
Yakushi Maru No.21	boats	12	286.54	43.30	710	209
Yakushi Maru No.1	Search boat	8	49.56	25.49	300	29

Source: Forum Fisheries Agency Vessel Register

There are two skiffs, one net boat and one search boat skiff. The net boat is used to hold the end of the net during setting and to pull the carrier boat from the net during the brailing operation. The search boat skiff is used to pull flotsam out of the purse. Both skiffs are also used for the transfer of personnel, equipment or supplies.

These groups typically fish the waters around Japan, but seven of them have been licensed to fish the tropical waters during the off-season (February-May).

3.1.2 The net

The net used was built with panels of knotless twine and its declared dimensions were 1590 x 318 metres. This length/depth ratio (5:1) is slightly higher than the average declared for either United States or Japanese seiners (about 6.6:1).

3.2 Details of Operation

3.2.1 Searching

The amount of time devoted to searching for fish is the most important information needed when trying to compare fishing success between vessels and is often used as a measure of effort. Japanese purse-seining in the western Pacific was initially developed to take advantage of the tendency tuna have of associating with flotsam (Suzuki 1981). Searching mainly consisted of locating any floating object susceptible of sheltering tuna and it was usually interrupted if a suitable one was found. The school was then harvested the next morning just before dawn. Searching time thus reflected the occurrence of suitable flotsam rather than the abundance of tuna. As nets got deeper to accommodate a low thermocline and skippers became more experienced with fast-moving fish, more and more free schools have been vulnerable to daytime sets. This change in modus operandi reflects an increase in catchability which needs to be accounted for when measuring fishing success. It is therefore essential to describe searching procedures in order to get an indication of the time spent at this activity.

Searching proceeded with all three (net boat, one carrier and search boat) and occasionally four (the second carrier) vessels steaming abreast approximately two miles apart. On the net boat, most of the crew were on the spotting deck, but only two pairs of binoculars were available and most of the sighting was done from the crow's nest, mostly by the fishing master. When a log or school was sighted, it was investigated by the closest vessel and its characteristics (school size, species composition, behaviour) reported to the fishing master. A daily record of all sightings was kept by the Captain on the onboard computer. This computer, linked to the satellite navigation, kept track of the vessel's course, each encounter with fish or flotsam, and the location of each set. Any sequence could be recalled to orientate the search in productive areas or keep track of individual flotsam. Logs were revisited to monitor the amount of associated fish. Any log selected by the fishing master for the next morning's set was marked with a light and radio beacon to facilitate its relocation. The search then went on until a suitable school was located or in time to get back to the proximity of the marked log by dusk. There, the vessel casted sea anchors and drifted until set time. If the fishing master elected to fish a surface school, all vessels proceeded to position and the set was made.

3.2.2 Setting

All of the 14 sets observed followed the same scenario with minor adaptations for school type and size. The chosen school was approached from starboard and the net was set clockwise. Before pre-dawn log sets, the vessels steamed to the marked log where the search boat was dispatched to investigate the fish concentration. The net boat held back, all lights off, in position to set if the conditions (concentration, depth, current) were right. It took an average of 10 minutes to deploy the net and 35 minutes to purse it. The fishing master, directing the whole operation from the crow's nest, constantly monitored the movement of the school on his echo-sounder. The depth at which he allowed the net to sink (between 120 and 155 m) was a function of the behaviour and the estimated size of the school, with the largest schools generally requiring a deeper net (Table 3). On two occasions he had the pursing stopped for less than a minute, presumably to stop the rise of the chain line. During daytime sets, the skiff, the search boat and sometimes the carrier boat ran in circles in front and behind the net opening to prevent the fish from escaping.

TABLE 3. AVERAGE CATCH AT EACH MEASURED DEPTH

Depth	Av. catch (mt)	No. of sets
120	2.7*	3
130	8	1
135	4	1
140	21	2
148	15	1
154	50	1

* Another set with net depth at 120 m caught 40 tonnes.

Once the rings were up, the net was brought in with a power block on the stern and stacked with a power block at mid-mast until the carrier boat was attached to the net to form a brailing pocket. The remaining slack was then picked up by hand until the fish broke surface, using mechanic rollers on the side of the boat. The uppermost power block on the mast was never used. Although the duration of the set was dependent on the size of the school, on average, the operations were completed in about three hours (Table 4). The fishing operations were always smooth and conducted with a minimum amount of confusion. Searching then resumed until dusk or until the next set. This operation, with up to three sets a day, represented a departure from the more common single daily pre-dawn set operations.

3.3 Data Collection

Catch was monitored by keeping a cumulative total of the fishing master's estimate for each set and a separate total of brail scoops, assuming that one brail scoop is approximately equal to one tonne. These estimates were later compared to the catch report filed by the Captain, and the vessel's carrying capacity.

TABLE 4. DURATION OF THE FISHING OPERATION BY SCHOOL SIZE

Catch (mt)	Duration (hours)
50	3.25
40	2.75
25	2.72
17	2.58
15	2.85
8	2.70
4)	
4)	2.66 (av.)
3	2.58
1	2.42

Species composition was derived from the fishing master's estimate, direct observations and punctual sampling of brail scoops.

Discards received little attention from the crew and there is no record of discards when the fish are moved from one hold to the other. Discards estimates in this report thus refer to those observed during loading.

Five sets were sampled for length composition of either skipjack or yellowfin or both. Setting aside one scoop half way into the brailing process often required changing the configuration of the crane, especially on large sets. Instead, the scoop was spilled on deck where a representative sample was picked out. The crew tended to select fish of a uniform larger than average size and had to be discouraged from helping. However, sampling conditions were still not controlled and small fish, especially skipjack, were under-represented.

4.0 RESULTS

4.1 Catch

According to the ship's specifications, Yakushi Maru No.21 had a capacity of 158.35 tonnes for pole-and-line operations. The fishing master's estimate came to 142 tonnes while the independent estimate came to 156 tonnes. The catch report, filled out by the Captain after the return of the net boat to Guam, and since received by SPC, came to 154 tonnes. Table 5 summarises the catch by species per set according to each estimate. The catch rate was then between 20.3 and 22.3 tonnes per fishing day or between 11.8 and 13 tonnes per successful set for the declared and observed catches.

The percentage of daytime sets was higher than in previously observed operations. On three occasions, the net was set three times per day. However, the average catch during pre-dawn sets, based on the various estimates of total catch, ranged between three and ten times that of daytime sets. It thus appears that time would have been better allotted to the location of flotsam and that the high occurrence of daytime sets is evidence of the lack thereof.

TABLE 5. SUMMARY OF ESTIMATED CATCH PER SET BY SPECIES

Set No.	Skipjack 1	2	3	Yellowfin 1	2	3
1	7.5	6.3	7	0.1	0.7	1
2	2	5	4	0	0	0
3	1.9	4	3	0.1	1	1
4	2	5	8	0	0	0
5	8	8	12	2	2	3
6	0	0	0	0	0	0
7	6	6	17	0	0	0
8	32	32	35	8	8	5
9	1.5	4	1	0	0	0
10	0.8	2	3	0.2	2	1
11	14	14	20	6	6	5
12	0	0	0	0	0	0
13	1	1	3	0	0	0
14	34	34	13	15	15	12
Total (mt)	110.7	121.3	126	31.4	34.7	28
Total %	78	78	82	22	22	18

The reported yellowfin catch was lower than that estimated. However, small fish might have been lumped with skipjack according to unloading categories, while an estimate of species composition by weight might have been overestimated from the length frequency sample. Of the total amount of fish caught (142 tonnes) 77 per cent were skipjack and 23 per cent were yellowfin. Interestingly, the catch reports filed for the previous and subsequent trips during 1984 indicate that no yellowfin was caught, other than during the observed period.

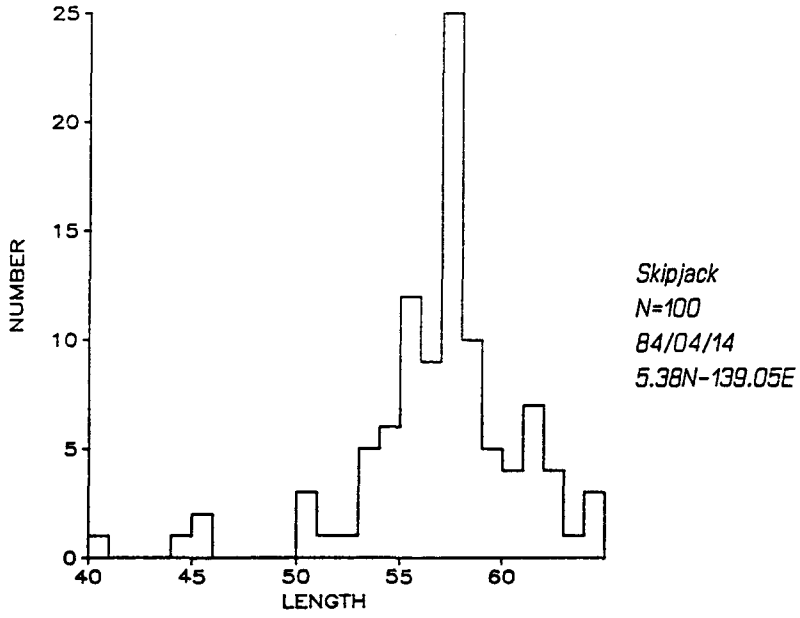
Length frequency distributions are shown in Figure 2. Skipjack show a strong unimodal distribution at 57 cm with poor representation of the smaller classes. However, these categories (40-50 cm) were observed in greater abundance, indicating biased sampling. The inverse was true of yellowfin where large size classes (>75 cm) were observed, but did not occur in the samples.

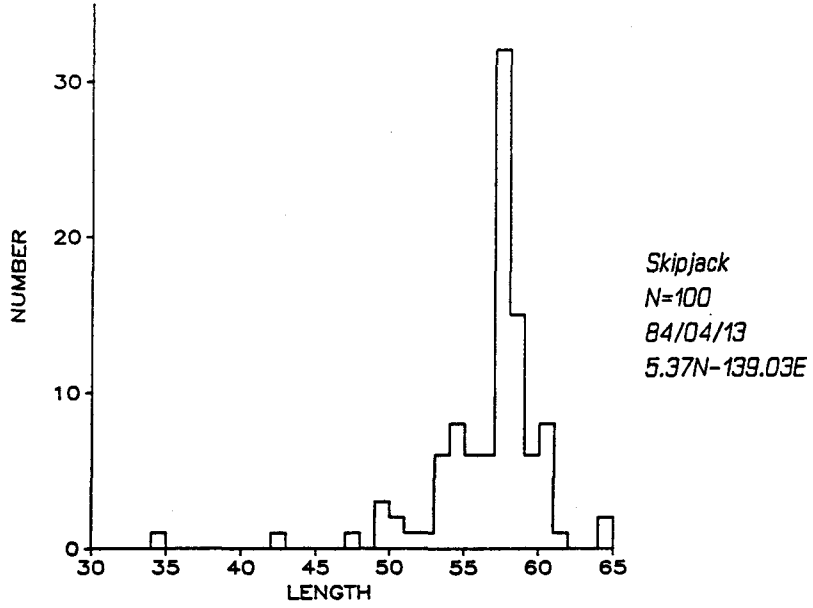
Under the present sampling conditions and with a lack of experience in quickly differentiating bigeye from yellowfin at small sizes, it was not possible to verify the reported absence of bigeye from the catch.

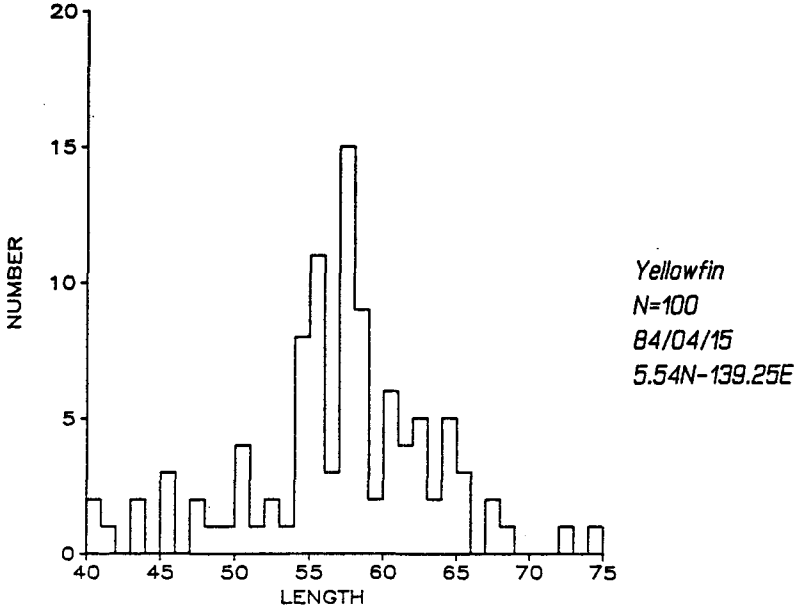
Species composition varied with school type. Log schools were always mixed schools, stratified by species and size. Early scoops brought in billfish, dolphinfish, sharks and small fish (mixed Auxis sp., Decapterus sp., rainbow runner, triggerfish, skipjack and yellowfin) and later scoops, larger skipjack, big yellowfin and smaller sharks. Surface schools were 100 per cent skipjack of rather uniform size.

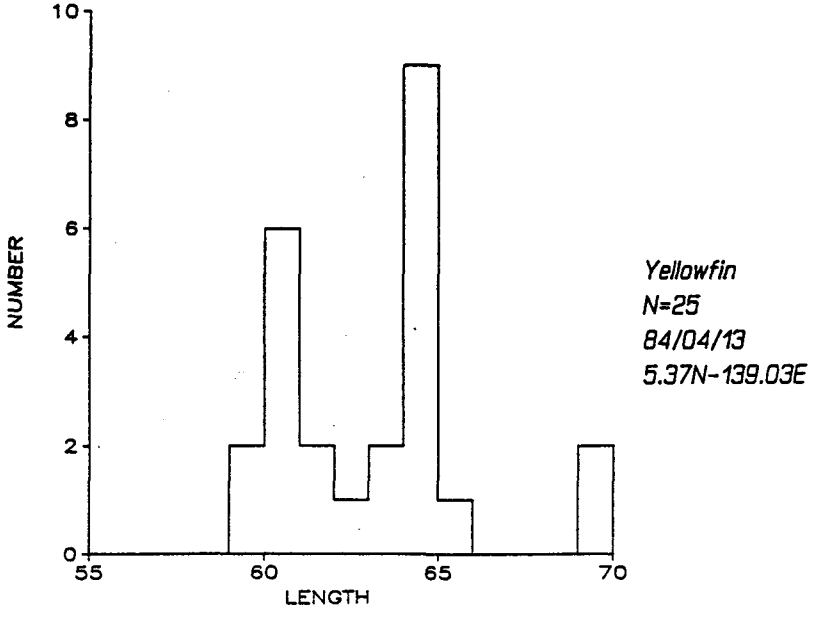
Observed discards of undesirable species were minimal (1.2 tonnes) with billfishes (8 in all) and sharks being prominent (probably about 70% of the discards by weight). Tuna discards amounted to about half a tonne, comprising mainly small fish. The sets were very clean and most of the tuna gilled or tangled could be salvaged.

FIGURE 2. LENGTH FREQUENCY DISTRIBUTION OF PURSE-SEINE CAUGHT YELLOWFIN AND SKIPJACK









4.2 Other Fishing Activities Observed

Eight American purse-seiners were observed on 5 April (5°N, 145°E) and four made pre-dawn sets on 6 April. During the 9 days spent on board between 5°N-6°N and 138°E-140°E, the Yakushi group was in contact with the seven groups in that area and the Hatchiryu, the Kotobuki, the Myojin and the Matsuo groups were sighted. The Hatchiryu and Kotobuki groups reported small catches (approximately 10 tonnes) on 10 and 14 April respectively. Two American purse-seiners were also sighted in the same area but no fishing was observed.

5.0 DISCUSSION

5.1 Accuracy of the Catch Report

The total amount of fish caught is rather similar between the three estimates. There is an improvement in the performance of the vessel after the departure of the observer (Table 6) which, in view of the early season's catch rates, is more likely to reflect better fishing conditions. Indeed, although the proportion of daytime sets has been unusually high all through the season, catch per successful daytime set has increased over time (Table 7). The proportion of yellowfin reported in the catch on the other hand is different from that observed (18% vs. 22%). Although it might have been the result of commercialisation, including small fish as skipjack, since no other yellowfin was reported caught during the three months spent in the 200-mile zone of the Federated States of Micronesia, it looks as if there was a tendency to under-report yellowfin catches. Since in this case yellowfin were unloaded and containerised separately, offloading records may be necessary to get a better estimate of catch composition. Observer port sampling may also give a more representative estimate of the skipjack-yellowfin ratio.

Similarly, there was no report of discards where some were observed. This problem will be much more difficult to address, especially for undersized fish of commercial species, other than by extensive on-board sampling.

5.2 On-board Sampling Problems

The estimates of catch given by the fishing master may have been conservative, especially on smaller sets. Yet the estimate of total catch was reasonably close to the capacity of the carrier boat. Since it may be easier for the Captain of that boat to estimate how much went down its holds, daily records from the carrier boat (as in PNG) may provide more accurate information. Then, extra care has to be taken to reconcile this duplicate information with that of the main form to avoid double reporting.

Species composition (skipjack, yellowfin) is only roughly estimated by the crew. As log schools appear to be stratified by size and species, the current sampling procedures of a brail half way through loading does not provide a representative sample, and increasing sample size to alleviate the problem is not practical. It thus seems that port sampling or offloading records would provide a better estimate of the species composition.

This is also true of sampling for length frequency which, in view of the stratification by size, is thought to underestimate small sizes.

TABLE 6. PERFORMANCE OF THE YAKUSHI GROUP IN THE WATERS OF THE FEDERATED STATES OF MICRONESIA (FEBRUARY-APRIL 1984) BASED ON CATCH REPORTS

	No. of sets		No. of days		Sets/day	Catch/set (mt)		Catch/day (mt)	
	Total	Successful	Reported	Fished	fished	Total	Successful	Total	Fished
February									
(13-18)	7	1	6	6	1.2	0.6	4	0.7	0.7
(22-26)	2	1	5	2	1	5	10	2	5
March									
(1-2)	1	1	2	1	1	30	30	15	30
(23-29)	11	7	7	7	1.4	6.5	10.3	10.3	10.3
April									
(5-16)*	16	13	12	8	2	11.1	13.6	14.8	22.1
(16-30)**	22	13	15	12	1.8	18.7	31.7	27.5	34.3

* The two morning sets of 5 April were not observed. Therefore, they are not taken into account in the values presented in the text.

** Two more sets were made on 16 April after the departure of the observer and are thus included in the performance during the second half of April.

TABLE 7. OCCURRENCE AND CATCH PER SET OF DAYTIME AND PRE-DAWN SETS BASED ON CATCH REPORTS

		Pre-dawn		Daytime	
	No. of sets	% of sets	mt/set	% of sets	mt/set
13/2-18/2	7	29	0	71	0.8
22/2-26/2	2	50	10	50	0
01/3-02/3	1	100	30	-	-
23/3-29/3	11	9	0	91	7.2
*05/3-16/3	16	38	18.8	62	6.4
16/3-30/3	22	5	10	95	17.9

* Includes the two morning sets of the 5th.

Little discard occurs at loading and the bulk of it (especially tuna) occurs during transfer or transhipping unobserved.

Although experience plays a major role in the efficiency of sampling and information gathering, it is doubtful whether rigorous sampling can ever be achieved under the current practice due to the nature of the catch and of the operation.

6.0 CONCLUSIONS

From these observations, and assuming that the role of the observer is to (1) comment on the reporting of the catch of a particular group, including discards, (2) determine species composition of the catch, (3) establish a representative length composition of the catch of each species, (4) gather general information on the fleets' operation, it is believed that future trips would be better spent on the carrier boat.

1. If the duration is one shuttle trip, there is no need for often dangerous transfers.

2. The fishing activities of the fleet can be observed equally well (same radio contacts).

3. The cumulative catch recorded on the carrier boat, as measured by the volume occupied, would be more accurate than the crew's estimates.

4. Loading can be observed closely and initial culling determined.

5. Species composition and secondary culling could be observed and estimated during transfer to the freezer.

6. More rigorous sampling could be performed during the same transfer, increasing sample size with less time limitations.

7. No need to be present during transhipping.

8. Accommodation is usually more spacious.

A port sampling programme with access to the transhipping company records would cover more vessels with one observer and obtain the same species breakdown and length composition. However, fleet operation and discards would not be observed.

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