CANADA FUNDS-IN-TRUST
FI:GCP/INS/056 CAN
Field Document 1
June 1985

F A O/G O V E R N M E N T C O O P E R A T I V E P R O G R A M M E

INDONESIA

PURSE-SEINE FISHING AND TECHNOLOGY

Report prepared by
the Indonesia Fisheries Development Project
(1981-1984)

based on the work of

T. Gestsson
Consultant Masterfisherman/Fishing Technologist

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1985

This report was prepared during the course of the project identified on the title page. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the United Nations or the Food and Agriculture Organization of the United Nations concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

TABLE OF CONTENTS

1. INTRODUCTION

The FAO/CIDA Indonesian Fisheries Development Project (INFIDEP) includes as one of its main programme of activities the conducting of pelagic resources surveys. These surveys are based on acoustic observations (echo-integration, etc.) and are complemented by fishing operations to identify the species found and study their biological characteristics. The survey vessel was the R/V TENGGIRI of the Directorate General of Fisheries (DGF), a 39.2 m (LOA) all-steel purse-seiner, well equipped and alternatively carrying a 640 x 109 m deep-sea purse-seine or a 514 x 60 m net for seining in relatively shallow waters. Details of the vessel specifications are given in Appendix 1 to this report.

The survey effort concentrated on two specific, remotely located areas, namely, around Natuna Island in the southern South China Sea and the Sangihe and Talaud Archipelago, northeast of North Sulawesi.

As the acoustic surveys became under way, it became increasingly clear that the captain and the crew of R/V TENGGIRI needed support in the form of training (Ref. Progress Report No. 3, period 1 February-31 July 1982), in order to achieve a fully efficient use of the vessel for sample fishing.

The present consultant mission was arranged by the INFIDEP project with the aim of meeting that training requirement. The terms of reference for the consultant masterfisherman were as follows:

- to train the captain and crew of R/V TENGGIRI in methods and strategies of purse-seining for small pelagics using sonar, available fish aggregation devices, and light attraction
- to advise on net repairs and maintenance as necessary
- in his capacity as masterfisherman/instructor, to participate in acoustic/exploratory fishing surveys carried out by INFIDEP.
- to act as a general technical adviser on matters related to improvements of fishing technology in Indonesia.

2. SUMMARY OF ACTIVITIES

2.1 GENERAL

After arrival in Indonesia on 5 May 1983 and subsequent briefing and general preparations, the author joined the TENGGIRI in Tahuna, the main town of Sangihe, on 12 May to participate in the remainder of project survey cruise No. 01/8304-05. At that time the vessel was moored and an acoustic calibration programme was in progress. After the first inspection of the vessel, it was found that the TENGGIRI was quite suitable for fish searching and purse-seine fishing. The details of the survey planning and the area covered are given in the corresponding cruise programme appended to this report (see Appendix 2).

2.1.1 Cruise No. 01/8305-06

During this cruise, the large purse-seine (640 x 109 m) was used. Three underwater lamps and four surface lamps were available for light attraction purposes.

During the initial discussions with the captain and his crew, it was reported that brailing of relatively small catches had proved a major technical problem. Clearly, the main cause was the fact that the bunt-boom had never been employed. It was also evident that the bunt-section of the seine was made with excessive netting, and this added to the difficulty of efficient brailing operations.

On 15 May the coverage of the planned survey area was completed and course set for Airtembaga, Bitung, where Messrs Johannesson and Tatang Sujastani disembarked to return to Jakarta. The TENGGIRI then sailed from Bitung on the following day, 16 May 1983, heading westward to pass through the Strait of Makassar. On 18 May a purse-seine operation was performed in the southern part of the Strait. This was purely a test/training operation for initial assessment of the performance of all equipment, net and crew. It should be noted that about one hour was needed to start the skiff's engine due to the poor state of the batteries, and no fish was caught because up to this point no fish concentration had been detected on the echosounder or sighted at surface levels. As the vessel approached the shallow-water area, south of Balbalangan Islands, a few surface schools were observed. However, these were located along strong current boundaries, moving fast and therefore not catchable. Moreover, the area was generally too shallow to operate a 109 m deep net, especially because of rough bottom conditions.

In the morning of 21 May, the area around the Bawean Island was searched and two pelagic schools were detected. Again, unpredictable and frightened movements of these schools deterred catch operations. On the following day, searching was continued in the same area and the net shot on a surface school with a negative result. The main reason was too slow a vessel speed to effectively encircle this fast-moving surface school of small tunas. The shooting was made at a bottom depth of 70 m, so the seine's leadline scooped the bottom as evidenced by the mussels and other organisms brought up by the net. However, there were no damages to the gear and the whole operation went smoothly. No further fishing operations were made during this trip and the vessel returned to Semarang at 09.30 h on 23 May.

2.1.2 Cruise No.02/8306-07

In preparation for this cruise, the large purse-seine was put ashore and replaced by a smaller net, approximately 514 x 60 m. Also, a mini purse-seine (110 x 30 m) was prepared specifically to be used in connection with light attraction to catch fish for calibration purposes. The main emphasis of the cruise was on acoustic surveying, but six days were allotted for catch operations and training of the crew. The survey area was the southern South China Sea with special coverage of the Natuna and Anambas groups of islands (for details see Appendix 3).

Itinerary: The TENGGIRI sailed from Semarang at 17.00 h on 10 June, heading directly to the Anambas area, which was surveyed until 21 June. Subsequently, the vessel returned to Tanjung Pinang where it dropped anchor at 11.00 h on 22 June. After some preparatory work and disembarking of Messrs Johannesson and Tatang Sujastani, the TENGGIRI left Tanjung Pinang at 11.30 h on 23 June and proceeded directly to the Natuna area where surveying began at 06.30 h on 29 June. Due to adverse weather conditions the last two tracks of the survey grid had to be cancelled. The rest of the time available was spent on fishing trials and finally the vessel returned to Semarang at 15.00 h on 7 July.

2.1.3 Trial Fishing

The small seine (110 x 30 m) was operated three times during the period 19, 20 and 21 June after having used both underwater and surface lights over a period of 3-4 hours in an attempt to aggregate a sufficient number of fish. About 10 kg of small fish were caught in one of the settings, but the other two resulted in no catch. Obviously, the main cause of this limited success was the general scarcity of fish in the area. As to the technical aspect, it proved to be somewhat difficult to shoot the net from the skiff because it tended to become hooked on its rail and engine house cover. This problem was then overcome by stretching a special cover over the rail/engine house section of the skiff, beneath the mini seine. During the last trial the engine stopped suddenly, but was promptly fixed. Based on the above trials, there is no doubt that the fish can be caught with the mini purse-seine by shooting it from the stern of R/V TENGGIRI, provided that sufficient number of fish aggregates in the illuminated water column, from the light-boat.

The large seine (514 x 60 m) was shot only once, at 23.00 h on 29 June. On this occasion, both surface and underwater lamps had been lit for four hours prior to the setting of the net. The total catch, taken west of the Island of Natuna, at a bottom depth of 55 m, amounted to 800 kg of sardines and small mackerels.

During a previous survey of this area, fish concentrations had been located with the acoustic search equipment, but no occurrence of surface schools had been observed. Immediately after the brailing of the catch the light equipment was again activated, and at 05.00 h on 30 June the echosounder which was used to monitor the fish aggregation indicated a much greater abundance than during the previous operation. However, there was a strong increase in wind and sea-state, so the fishing operation was called off.

In addition to the fishing operations described above, five more fishing trials were carried out in different parts of the survey area. Only on one occasion did the light system aggregate significant quantities of fish (estimated 1-2 t) to make the setting of the net worthwhile. This occurred at a bottom depth of 50 m west of the island of Karimunjawa, approximately 80 n.mi north of Semarang. However, it became necessary to call off catch operations due to strong "monsoon" winds of 5-6 knots.

Only very few surface schools were observed during the survey. These were generally very thinly spread and constantly moving in unpredictable directions and/or diving out of sight, so any attempt to catch them during daylight hours was futile.

The weather was good with calm sea during the first part of the survey, but during the last eight days a steady, southerly wind prevailed in the South China Sea area, while in the Java Sea it was blowing from southeast and easterly directions.

With regard to the use of the sonar, experience showed that its detection power is very weak and therefore very poor for long-range searching. However, its scanning features make it useful for monitoring movements of short-range targets, provided their echo-strength is sufficient which is usually not the case for thinly scattered surface schools.

The deck arrangements were generally found satisfactory, but it was established that previous operations concerned with brailing the catches were inefficient and very time-consuming. The reason was simply a lack of knowledge as to how to use a bunt-boom instead of using the skiff to suspend the float-line and keeping it from closing the bunt following the brailing phase. It was further observed that after having adjusted the slackness of the frameline for appropriate brailing operations, there was still excessive net out. Hence, it is necessary to modify the tapering of the bunt in order to reduce the netting.

The vessel's skiff appeared to be well designed and suitable, but the starting of its engine was a constant problem and would often take up to one hour. This was due to poor batteries and charging procedures and this problem must be solved for future operations.

2.1.4 Period: 7 July-30 September 1983

The R/V TENGGIRI remained idle during the period from 7 July to 30 September (about seven weeks), due to lack of funds for its operation, and this resulted in the cancellation of two fishing/training trips which had already been planned. This time was therefore utilized, among other things, to give lectures on the subject of modern purse-seine fishing, emphasizing typical differences in vessels/boats, design of nets, equipment systems as well as fish species and areas of operation. The training seminar was attended by the captains and crews of three research vessels and also by some officers of the Fisheries Techniques Development Centre (FTDC).

Also during this period the bunt-boom referred to above was rigged and the bunt-section of the 514 x 60 m seine examined in detail for the purpose of giving instructions on this modification. Moreover, the various high-pressure hydraulic pipes of the winch system were inspected and several of them replaced due to severe corrosive damages.

2.1.5 Fishing Trip/Training - Period: 30 September-7 October 1983

The R/V TENGGIRI departed from Semarang at 10.00 h on 30 September with a northerly course on the Island of Karimunjawa. From this island the course was changed to proceed to the northeast Java Sea. Weather conditions were characterized by medium-to-strong breezes. On 3 October, the TENGGIRI arrived at the area 10-15n.mi south of the Mata Siri Islands where the weather was good and the first school sighted at the surface. After about one hour of manoeuvring the vessel to obtain a shooting position, the net was set, resulting in a catch of approximately 3 t of small tunas (Auxis thazard)[1/]. The light attraction method was deployed during the night of 4 October and some fish concentration was recorded on the echosounder. The net was then shot just before dawn but with negative result. Apparently, the fish were "lost" in the process of luring them from the TENGGIRI's lights over to the light-boat.

The Mata Siri area was then searched until dusk on 4 October, subsequently setting the course towards the Islands of Masalembo, Bawean and Karimunjawa. The area south of these islands was searched but no fish concentrations encountered. Some scouting was also made north of these islands but no fish found. The vessel then returned to Semarang at 06 00 h on 7 October.

1/ Local name: Tongkol

2.2 DISCUSSION/COMMENTS ON THE FISHING TRIP

(a) Only two purse-seine operations were made during this trip. The first was made on a surface school (fast-moving and diving out of sight from time to time) during daylight hours and gave about 3 t of small tuna. The shooting of the net, its pursing phase and brailing of the catch functioned very smoothly. In particular, the captain and the crew were enthusiastic about the bag-boom (brailing boom) arrangement which now had been used for the first time on board the TENGGIRI. This particular purse-seine catch operation also offered an opportunity to correct and improve the general work arrangement, especially connected with the brailing phase, which took only about 20 minutes, bringing the fish alive on deck. Previously, a similar situation and required 3 hours with practically all fish dead on arrival on deck.

(b) The second fishing operation (4 October), carried out just before dawn in connection with 8 hours use of light attraction resulted in no catch in spite of the fact that some fish concentration was recorded on the monitoring echosounder. Apparently the problem here was related to the interplay between the small light-boat and TENGGIRI's light attraction. The adopted procedure involves as a first step, a joint lighting effect with the small boat next to TENGGIRI. When catching operations were to begin, the lamps on board TENGGIRI were gradually switched off in order to lure the fish concentration exclusively into the water column illuminated by the small "light-boat". Subsequently the catcher manouevred into a shooting position encircled the target. In the above case the light-boat had gradually drifted about 100 m away from the master vessel, apparently due to a too-light weighing anchor, and this probably spread the fish as a result of poorly defined light zone and hence fish concentration.

(c) In addition to the above, two light "stations" were made on two different nights. One was made at a depth of 50 m, west off the Island of Karimunjawa and, the second, at a depth of 60 m, southwest of Bawean Island. No fish appeared in the lights on these occasions.

(d) While sailing to the eastern part of the area searched, with an easterly wind prevailing, no fish concentrations were observed at surface levels. In contrast, during the westward scouting of the same area, in a calm sea and good weather, one major surface school was sighted and an attempt made to bring the vessel into a shooting position, but to no avail. Again, adverse behaviour of the fish prevented the catch. In addition, individual fishes, jumping at the surface, were observed at different spots south of the Bawean and Karimunjawa Islands, but these were too widely spread to attempt any catches.

(e) On the night prior to returning to Semarang, the bunt-section of the seine net was pulled out and spread on the deck to explain to the captain and his crew how to reduce its excessive net so as to optimize the bunt-end hanging ratio. A drawing was made of the bunt design and explained in detail how the relevant modifications should be executed 1/. On the same occasion, a lecture was given about the importance of keeping everything in tact for immediate brailing conclusion of the heaving phase, prior to the final "drying-up" phase of the bunt-end. In this respect, it was emphasized that it is much easier to brail the fish live state rather than dead, as in the latter case the fish tend to sink down and strain the net. In extreme cases (for a large net), the dead fish weight may cause the bunt to tear and the catch may be lost. Several modifications were made to the brailer itself in order to make it lighter and easier to handle, as demonstrated during the successful catch operations.

1/ The drawings are filed with the Fisheries Directorate of Indonesia

(f) The 514 x60 m seine has a hanging ratio of 0.70-0.75 towards the end sections, whilst its major section ("mid-section") is hung only 0.76. This is an unusual arrangement because the usual design is the reverse, i.e., with the end-sections hanging less than the mid-sections. It would be advisable to modify the seine so as to increase the hanging ratio of its mid-section to 0.70-0.75. This would enhance the seine's catch efficiency and also reduce the problem of the mid-section's cork-line being pulled down far below the sea surface during normal pursing. At present, this is a very pronounced problem and can only be avoided by a slow pursing operation, thus increasing the escaping possibility as an encircled fish school.

(g) The hydraulic winch system requires immediate attention. All high-pressure pipes which are installed in the open deck area, and hence directly exposed to seawater, are already seriously corroded and should be replaced as soon as possible.

2.3. THE CAPTAIN AND HIS CREW

From the beginning of the author's assignment a most cordial and effective working relationship was established with the captain and crew of the R/V TENGGIRI. Both the captain, Mr Baithur Syarif, and his first officer are most capable, fast to learn and adapt to new or modified methods. The harmonious working relationship on board the vessel is noticeable and can be attributed to the captain's ability to inspire his officers and crew. All crew members participated actively in every aspect of the fishing operations and generally showed a good performance.

However, further training of the crew would be desirable, especially in the many details of the overall work arrangement, which can be of crucial importance for the results of modern purse-seine operations. Such training would have to be given through active fishing operations at sea. A training programme of 6-months duration, including provisions for 15-20 sea-days per month, is recommended.

3. RESULTS AND CONSLUSIONS

Apart from the above-mentioned constraints, overall results are encouraging. As for the training aspect, a significant progress could be observed in the captain's understanding and skill to carry out purse-seine operations.

It is believed that with the present basis and continued practice, the captain and his crew will be able to acquire an adequate level of proficiency in the efficient use of the purse-seine for sample fishing.

However, consideration should also be given to the possibility of arranging a study tour for the captain, and preferably also the chief officer, to join a commercial purse-seiner in a selected country and thus give them an opportunity to have first-hand experience in a modern, large-scale commercial purse-seine fishery.

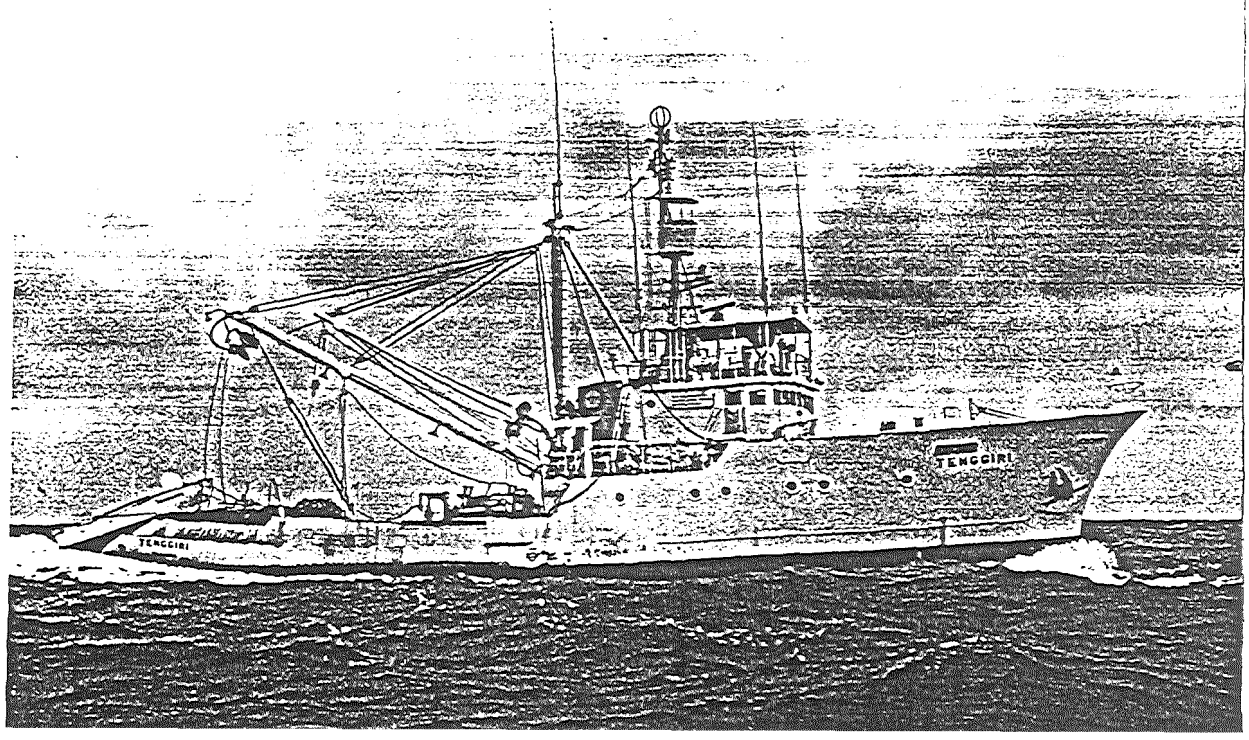
The use of purse-seine in the two project areas was, from the fishing point of view, of very limited success. This reflects the fact that the general catchability of the existing fish "concentrations" is extremely low when compared with an advanced purse-seine. The main reasons appear to be: (a) the generally low level of fish abundance in the areas surveyed, (b) the tendency of the existing fish species (stocks) to remain in a very dispersed distribution pattern, which renders sonars practically useless for fish detection, and (c) the general tendency of higher fish abundance to occur in inshore waters which are too shallow for operation of relatively large purse-seines, say 514 x 60 m. In addition, it was often observed that when the fish schools occurred at the surface level and thus could be sighted by eye, they usually moved too fast and in an unpredictable fashion, or would dive out of sight before the vessel could be manouevred into a shooting position.

Appendix 1

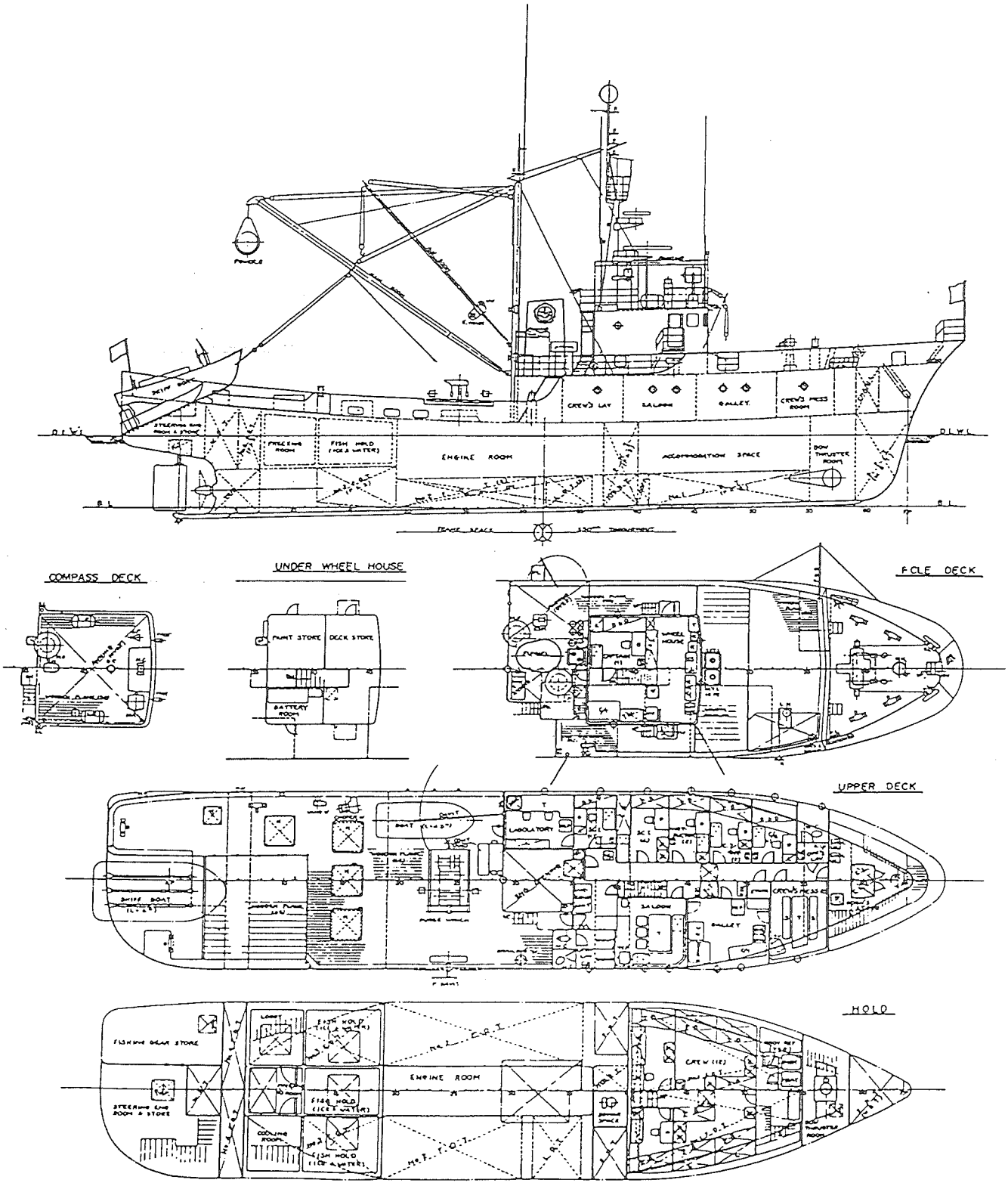
VESSEL SPECIFICATION

NAME	:	T E N G G I R I
OWNER	:	DIRECTORATE GENERAL OF FISHERIES
TYPE	:	Purse Seiner with longlining and squid jigging facilities
DELIVERED	:	December 1979
LENGTH OVER ALL	:	39.2 m
BREADTH	:	8.5 m
DEPTH	:	4.0 m
GROSS TONNAGE	:	303.5 tons
FISH HOLD	:	40.6 m3
FREEZING ROOM	:	12.9 m3
COOLING ROOM	:	8.3 m
COMPLEMENT	:	6 Officers; 12 Crew; 2 Instructors; 5 Scientists; 4 Technicians
MAIN ENGINE	:	NIIGATA, 800 HP at 900 RPM
PROPELLER	:	Controllable pitch
SPEED	:	12.5 knots
BOW THRUSTER	:	KAMOME, 1.2 tf thrust
PURSE SEINE WINCH	:	KAWASAKI, 3 tf at 40 m/min
LINE HAULER	:	IFUI
SKIFF	:	6.2 x 2.8 x 0.9 m
WORKING BOAT	:	FRP, 4.5 x 1.7 x 1.0 m
ACOUSTIC EQUIPMENT	:	2 Fishfinders; 1 Portable Sounder; 1 Scanning Sonar; 1 Catch meter (all Japan Radio); SIMRAD Scientific Sounder Equipment
NAVIGATIONAL AIDS	:	GYRO Compass; 2 Radars; Loran; Radio Direction Finder

R/V TENGGIRI



FISHERIES SURVEY AND EXPLORATORY VESSEL "TENGGIRI" GENERAL ARRANGEMENT



Appendix 2

FAO/CIDA INDONESIA FISHERIES DEVELOPMENT PROJECT

CRUISE PROGRAMME

R/V TENGGIRI - CRUISE NO. 01/8304-5

1. GENERAL

This is the third survey cruise in a total of four cruises that the project plans to carry out in the Sangihe and Talaud archipelago of the North Sulawesi province.

The cruise will include four principal components of activities with approximate time allotments as follows:

Activity	Approximate No. of days
1. Acoustic survey	10
2. Fishing operations	8
3. Calibrations	3
4. Target strength measurements	1
Total:	22

It is estimated that the sailing time to the area and back will be 11 days, and a total of 5 days will be spent on port call. Hence, the whole cruise will have a duration of approximately 38 days.

The TENGGIRI will depart from Semarang on Friday afternoon, 15 April 1983, and sail the most direct route to Bitung, North Sulawesi. After some rest and technical consulatations with the staff of the Government Fisheries Service in Manado, the vessel will leave Bitung on Sunday, 24 April to begin a survey the following day, approximately 12 n.mi southwest of Kahakitang Island (Lat. 3°00'N and Long. 125°22.5'E). After completion of the track shown in Figure 1, the TENGGIRI will arrive in Tahuna, Sangihe, on 27 April, where 3 days will be used for acoustic calibration. The vessel will then proceed to the Talaud archipelago and spend about 6 days on acoustic surveys combined with intense fishing operations wherever these are possible. The survey pattern for the first coverage is shown in Figure 2.

After completion of the survey around the Talaud islands, the TENGGIRI will return to Tahuna on, or about, 7 May. During the period 7-11 May, the crew can rest in Tahuna while the scientists will carry out preliminary analysis of the collected data material. Further development of the programme will then depend on the results and findings of this analysis. However, the vessel is expected to be engaged in active survey and exploratory fishing in the Sangihe area from 11 to 16 May. The TENGGIRI will then return to the harbour of Bitung on 17 May to disembark some of the participants in the survey and to prepare for the return voyage with ETA in Semarang on 23 May.

2. PROGRAMME

Period: 15 April-23 May 1983 (38 days)

Area: Inshore waters and traditional fishing grounds in the Sangihe and Talaud archipelago (see maps and survey tracks in Figs. 1 and 2).

Staff/Crew: BPPL/BPPI/FAO

Ship's Officers:

1.	S. Baithur	-	Captain
2.	Suwardiyono	-	Chief Officer
3.	Antar Nugroho	-	Second Officer
4.	D. Purnomo	-	Chief Engineer
5.	S. Gautama	-	First Engineer
6.	P. Hadiyono	-	Radio Operator

Survey Team:

1.	Tatang Sujastani, M.Sc.	-	Cruise Leader
2.	Ir. Edi Mulyadi Amin [1/]	-	Acoustics/Catch (BPPL)
3.	Ir. Duto Nugroho	-	Bioacoustics (BPPL)
4.	Ir. Bachtiar Gafa	-	Bioacoustics (BPPL)
5.	Ir. Sahabi Marzuki	-	Bioacoustics (BPPL)
6.	Eddy Budi Sukarso	-	Electronic Engineer (BPPL)
7.	Ir. Suwito	-	Acoustics/Exploration (BPPI)
8.	Eris Mulyadi, B.Sc	-	Acoustics/Exploration (BPPI)
9.	Mr K. Johannesson	-	Expert/Acoustics (FAO)
10.	Mr T. Gestsson	-	Consultant/Masterfisherman (FAO)
11.	p.m.	-	The student of Grade IV (last) of Faculty of Fisheries of IPB in practice for his thesis
12.	p.m.	-	Faculty of Fisheries, University of Sam Ratulangi, Manado

[1/] participation not certain

3. OBJECTIVES

The primary objective of the planned survey is to collect acoustic data on absolute abundance and distribution of pelagic fish species in the area.

A second objective is to determine catch compositions by species and by size, from purse-seine sample-fishing; to carry out basic hydrographic work and biological measurements of the important species.

4. ORGANIZATION

Basically, all scientific staff and technicians are responsible to take instructions and/or advice from the cruise leader who will be aided by the FAO team leader. The two scientific leaders will collaborate in establishing the routine survey procedures and monitor the overall data collection. They will also share responsibility for determining the allocation of purse-seine fishing stations for sampling purposes.

Whenever sample fishing becomes desirable, the cruise leader or the FAO team leader will consult with the masterfisherman/instructor and the captain regarding the feasibility of setting the net. Also, the FAO masterfisherman is authorized and encouraged to initiate fishing operations on his own, whenever this becomes desirable. While the scientists are responsible for the design of the survey track pattern and fishing stations from a point of view of sampling, it is the responsibility of the captain (or officer-in-charge) to verify the safety of all vessel and gear operations. Consequently, the captain, master-fisherman and the cruise leader will cooperate closely throughout the survey.

5. EQUIPMENT

Hydro-acoustics

Acoustic observations will be made with a Simrad Scientific Sounder EKS-120 (120 kHz), working in conjunction with a Simrad QM-MK-II analog Echo Integrator. Also, the new computer based SIMRAD digital integrator system will be test-run and used for more detailed data collection. Auxiliary instruments include: a Hewlett Packard storage oscilloscope, an electronic counter, an AC amplifier voltmeter, a signal generator and a test hydrophone for acoustic calibrations.

Hydrography

A baththermograph (BT) type T.S.K. (10-1979) will be used for observations on vertical temperature (and sound velocity) profiles. Also a continuous log of surface temperature will be made with an M-type Electronic Resistance Thermometer manufactured by Murayama Denki Ltd.

Fishing Gear

A 109 x 640 m deep sea purse-seine net.

6. SURVEY METHODS

As established for previous surveys.

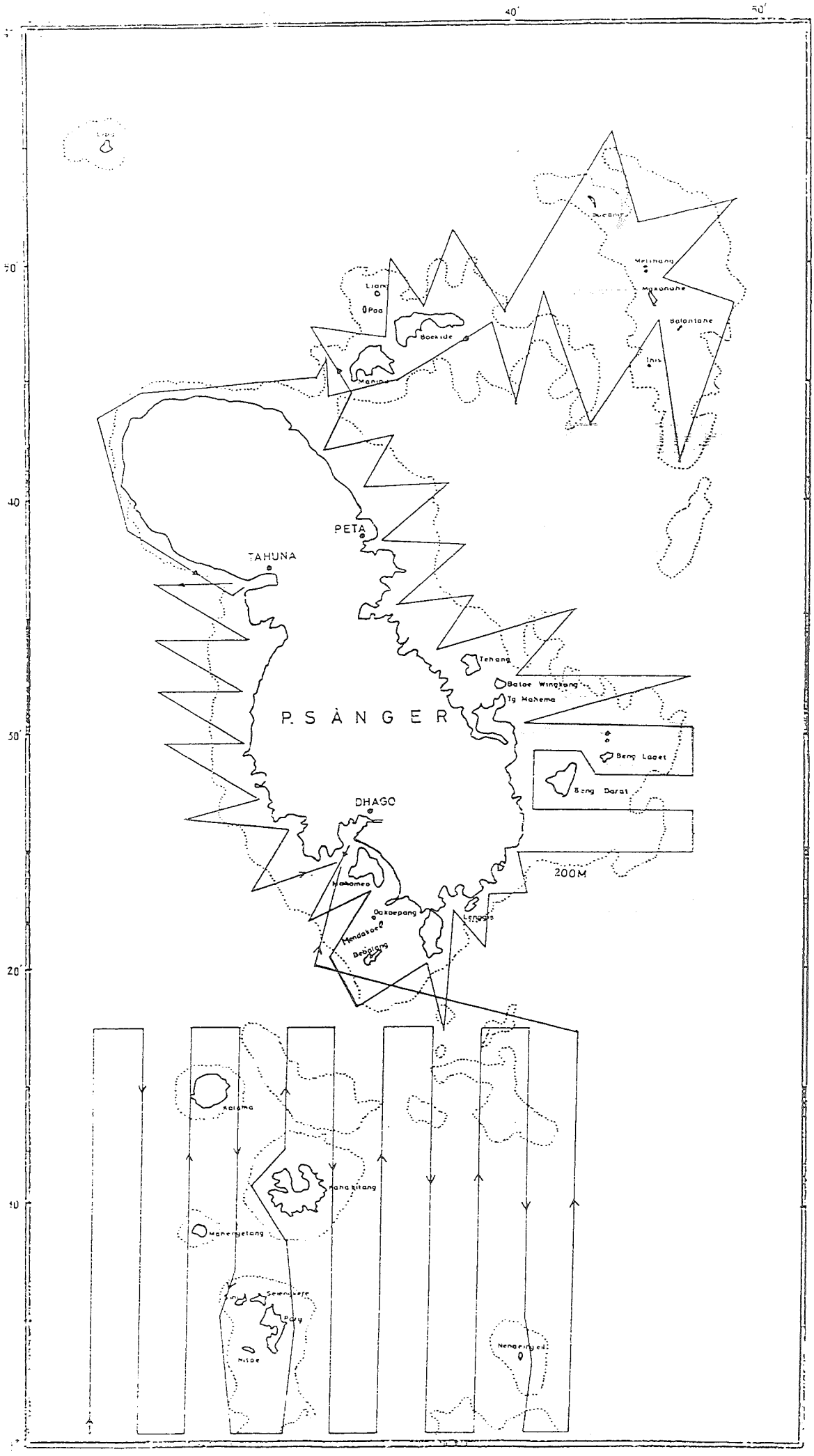

40'
50'
50'
40
50
20'
10
Liang
Poa
Manipa
Melinang
Makanuhe
Balantane
Ihis
PETA
TAHUNA
Tehang
Batoe Wingkang
Tg Mahema
P. SANGER
Beng Laoet
Beng Darat
DHAGO
200M
Mahamera
Dakaepang
Mendatoe
Lenggis
Kalama
Manaxitang
Maherugetang
Nenaringeli

Fig. 1

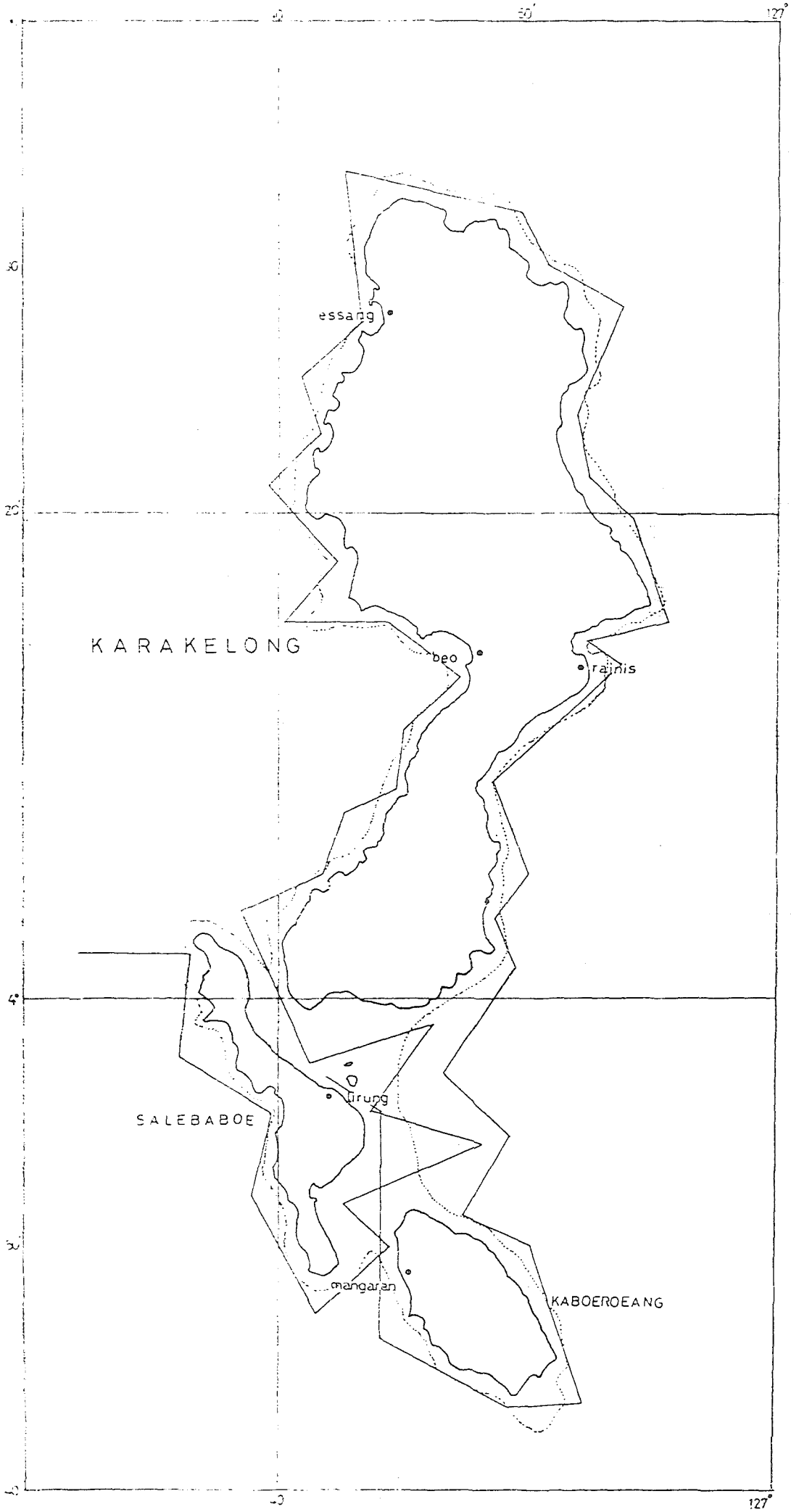

KARAKELONG
essang
beo
rainis
SALEBABOE
tirung
mangaran
KABOERUANG

Fig. 2

Appendix 3

FAO/CIDA INDONESIAN FISHERIES DEVELOPMENT PROJECT

CRUISE PROGRAMME

R/V TENGGIRI - CRUISE NO. 02/8306-07

1. GENERAL

This is the fourth survey cruise in a series of a total of five cruises planned for the Natuna project area.

The cruise will include four principal components of activities. For various reasons it is difficult to give an exact estimation for the time allotment for each component, but the following can be used as a rough guide-line:

Activity	Approximate No. of days
1. Acoustic survey	9
2. Fishing operations	6
3. Live fish calibration	3
4. Target strength measurements	1/2
Total:	18 1/2

Moreover, it is estimated that the total sailing time to and from the principal survey area plus other relevant sailing routes (see Fig.1) will be 9 1/2 days. With two additional days of port call in Tanjung Pinang, the entire cruise is estimated to last for 28 days, i.e., from 10 June to 8 July 1983.

The TENGGIRI will depart from Semarang on Friday, 10 June, and is to sail by the most direct route to Tarempa. Provided that interesting fish concentrations are encountered under way, fishing operations will be carried out. In Tarempa, a few hours will be used to consult with the local authorities concerning the state of the fishery, and to examine possible preparations to be initiated for the planned calibration experiment.

The vessel will then leave Tarempa to commence a survey at position Lat. 3°30'S and Long. 106°E. After completing the survey track shown in Figure 2, the TENGGIRI will return to a place near Tarempa where a suitable calibration site may be found. This activity will continue until 12.00 h on 22 June, at which time the vessel will set course for Tanjung Pinang, arriving there at approximately 06.00 h on 23 June.

After two days of rest in Tanjung Pinang, the TENGGIRI will put out to sea again at 12.00 h on Sunday 26 June and head towards Natuna Island to start working the survey grid shown in Figure 3. After completion of the survey/ fishing programme around the Natuna Island, the vessel will return to Semarang on or about 8 July.

2. PROGRAMME

Period: 15 April-23 May 1983 (38 days)

Area: Inshore waters and traditional fishing grounds in the Anambas and Natuna (see maps and survey tracks in Figs. 1-3).

Staff/Crew: BBPL/BPPI/FAO

Ship's Officers:

1.	S. Baithur	-	Captain
2.	Suwardiyono	-	Chief Officer
3.	Antar Nugroho	-	Second Officer
4.	D. Purnomo	-	Chief Engineer
5.	S. Gautama	-	First Engineer
6.	P. Hadiyono	-	Radio Operator
7.	Koike	-	JICA Engineer

Survey Team:

1.	Tatang Sujastani, M.Sc.	-	Cruise Leader
2.	M. Badrudin	-	Acoustics/Catch (BPPL)
3.	Isar Nasir	-	Bioacoustics (BPPL)
4.	Yunus Soselisa	-	Bioacoustics (BPPL)
5.	Suhendar	-	Bioacoustics (BPPL)
6.	Eddy Budi Sukarso	-	Electronic Engineer (BPPL)
7.	Ir. Suwito	-	Acoustics/Exploration (BPPI)
8.	Eris Mulyadi, B.Sc.	-	Acoustics/Exploration (BPPI)
9.	Mr K. Johannesson	-	Expert/Acoustics (FAO)
10.	Mr T. Gestsson	-	Consultant/Masterfisherman (FAO)

3. OBJECTIVES

The primary objective of the planned survey is to collect acoustic data on absolute abundance and distribution of pelagic fish species in the area.

A second objective is to determine catch compositions by species and by size, from purse-seine sample-fishing; to carry out basic hydrographic work and biological measurements of the important species.

4. ORGANIZATION

Basically, all scientific staff and technicians are responsible to take instructions and/or advice from the cruise leader who will be aided by the FAO team leader. The two scientific leaders will collaborate in establishing the routine survey procedures and monitor the overall data collection. They will also share responsibility for determining the allocation of purse-seine fishing stations for sampling purposes.

Whenever sample fishing becomes desirable, the cruise leader or the FAO team leader will consult with the masterfisherman/instructor and the captain regarding the feasibility of setting the net. Also, the FAO masterfisherman is authorized and encouraged to initiate fishing operations on his own, whenever this becomes desirable. While the scientists are responsible for the design of the survey track pattern and fishing stations from a point of view of sampling, it is the responsibility of the captain (or officer-in-charge) to verify the safety of all vessel and gear operations. Consequently, the captain, master-fisherman and the cruise leader will cooperate closely throughout the survey.

5. EQUIPMENT

Hydro-acoustics

Acoustic observations will be made with a Simrad Scientific Sounder EKS-120 (120 kHz), working in conjunction with a Simrad QM-MK-II analog Echo Integrator. Also, the new computer based SIMRAD digital integrator system will be test-run and used for more detailed data collection. Auxiliary instruments include: a Hewlett Packard storage oscilloscope, an electronic counter, an AC amplifier voltmeter, a signal generator and a test hydrophone for acoustic calibrations.

Hydrography

A baththermograph (BT) type T.S.K. (10-1979) will be used for observations on vertical temperature (and sound velocity) profiles. Also a continuous log of surface temperature will be made with an M-type Electronic Resistance Thermometer manufactured by Murayama Denki Ltd.

Fishing Gear

- One shallow water purse-seine, 60 x 514m
- One mini purse-seine, 110 x 30 m stretched mesh
- Light equipment for fish aggregation purpose
- Calibration cage and keep-net for live fish calibrations

6. SURVEY METHODS

As established for previous surveys.

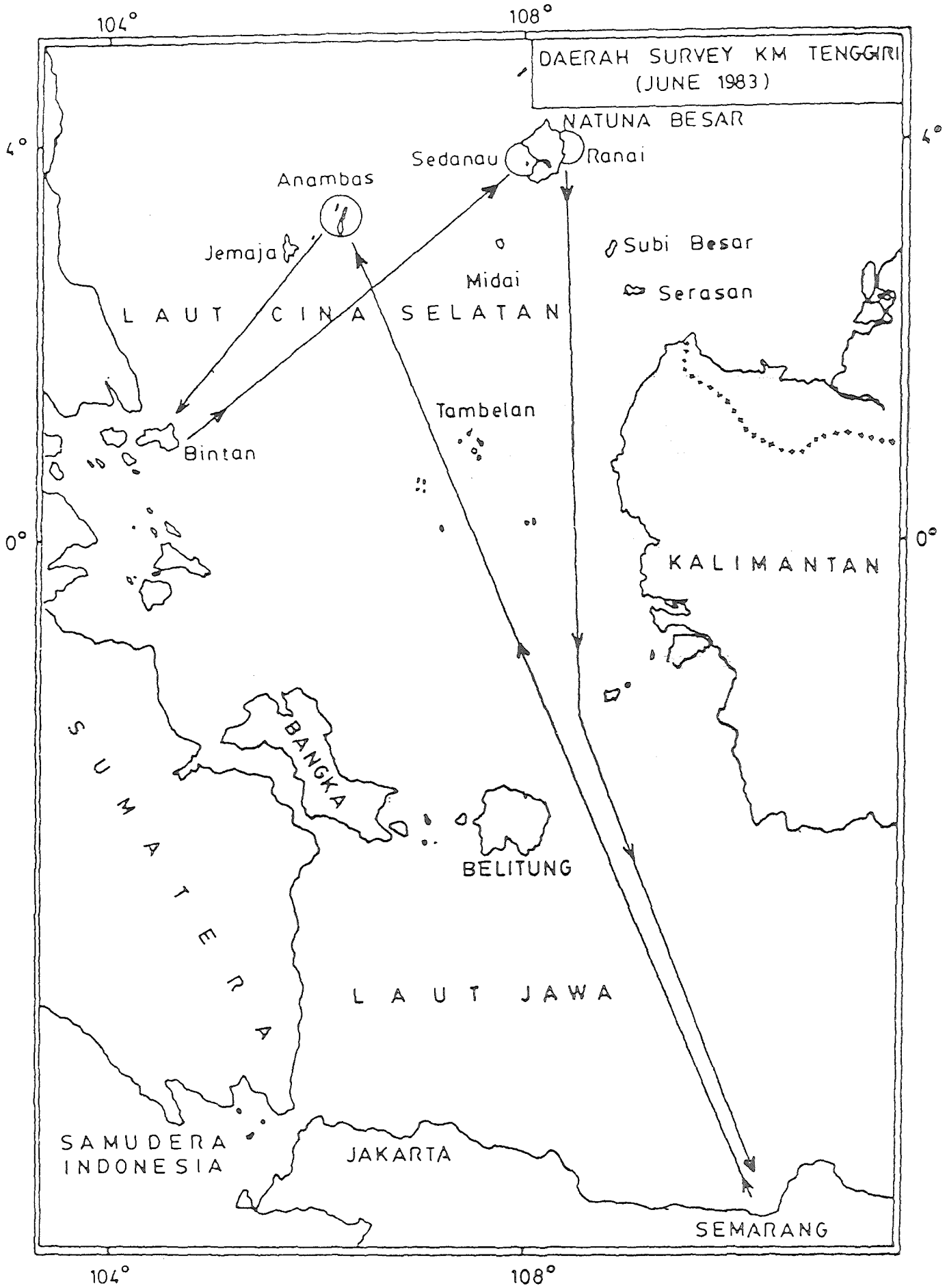

104°
108°
4°
0°
DAERAH SURVEY KM TENGGIRI
(JUNE 1983)
NATUNA BESAR
Sedanau
Ranai
Anambas
Jemaja
Midai
Subi Besar
Serasan
L A U T C I N A S E L A T A N
Tambelan
Bintan
KALIMANTAN
BANGKA
S U M A T E R A
BELITUNG
L A U T J A W A
SAMUDERA
INDONESIA
JAKARTA
SEMARANG

Fig. 1

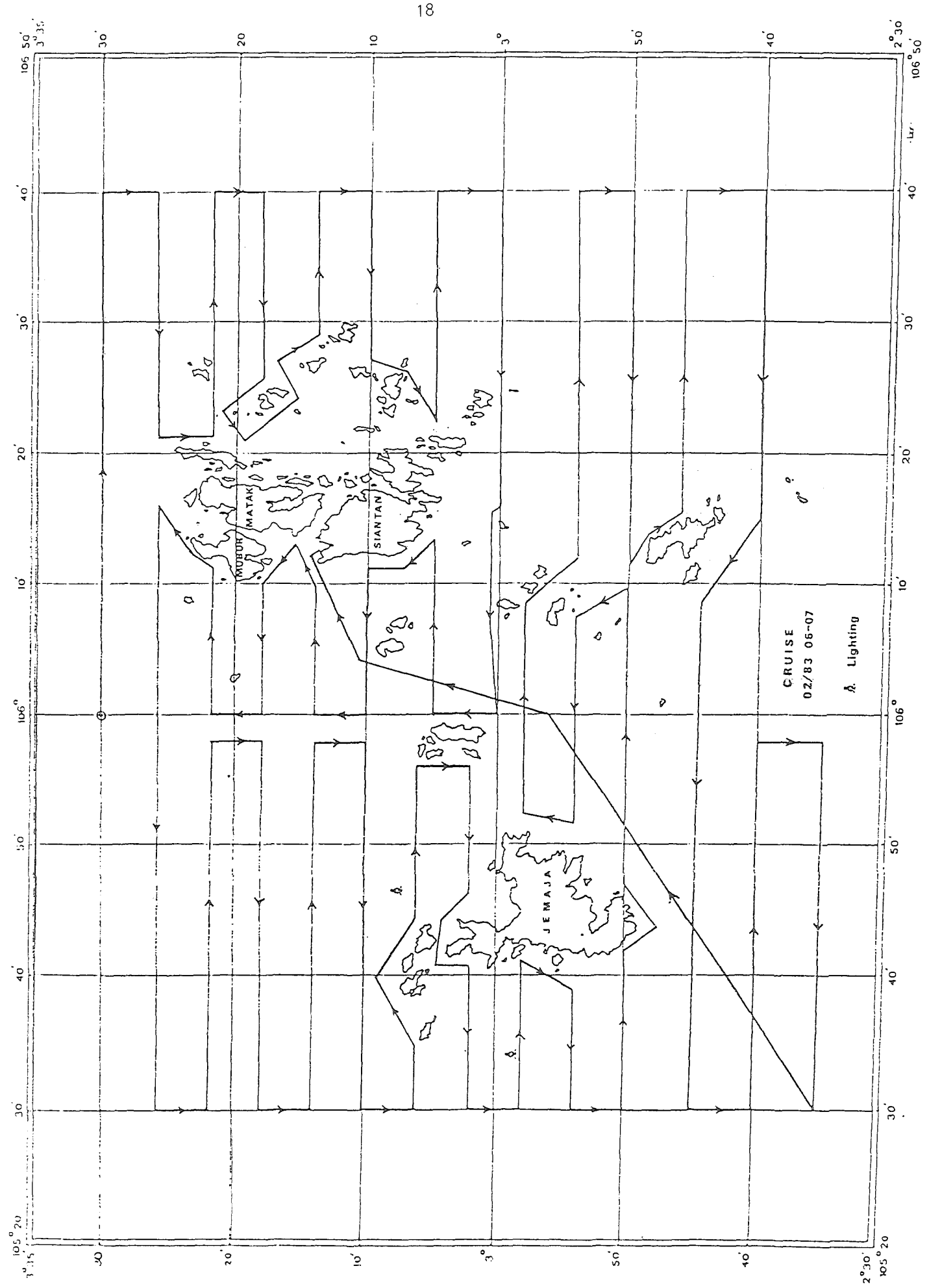


Fig. 2

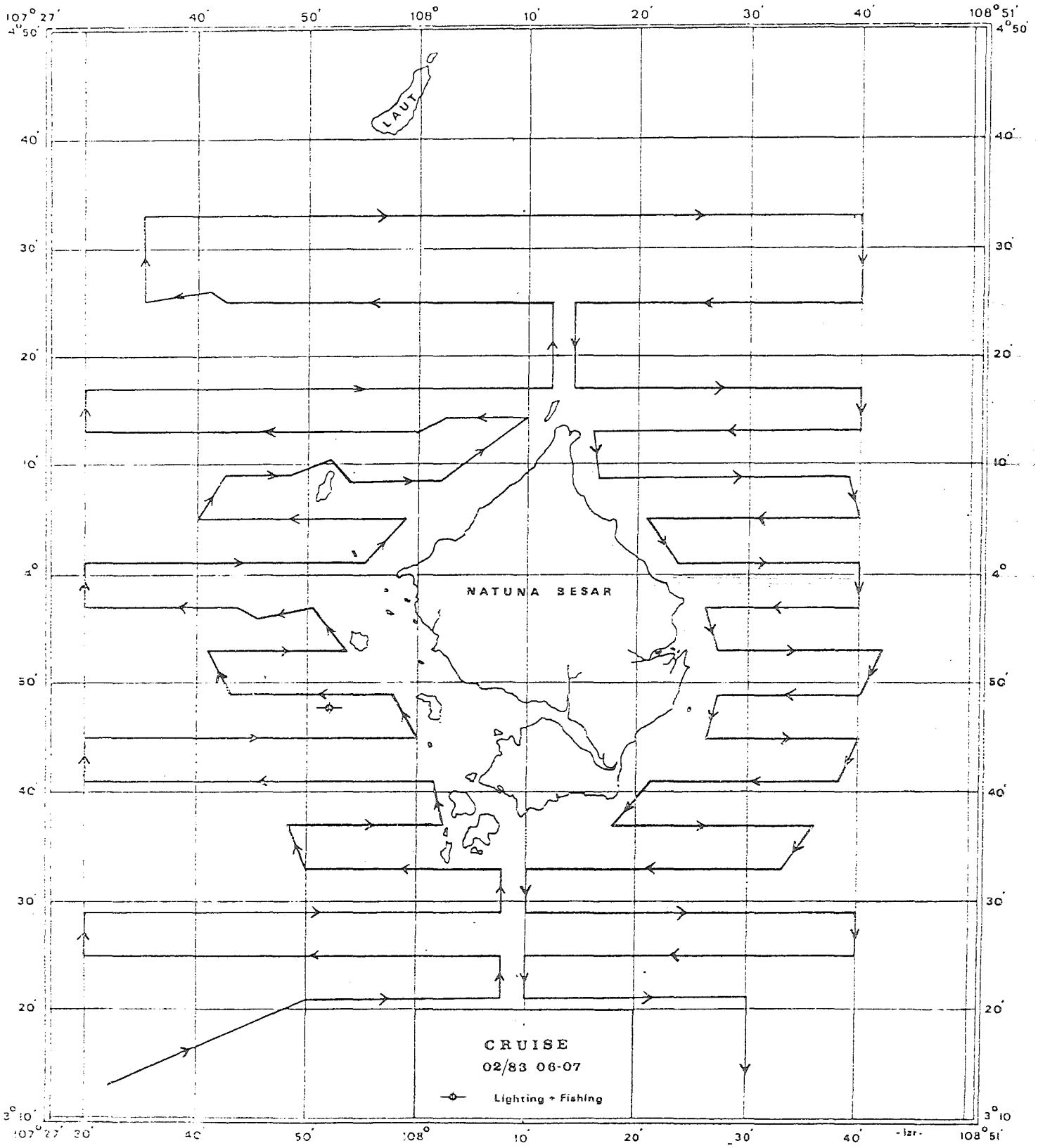


Fig. 3