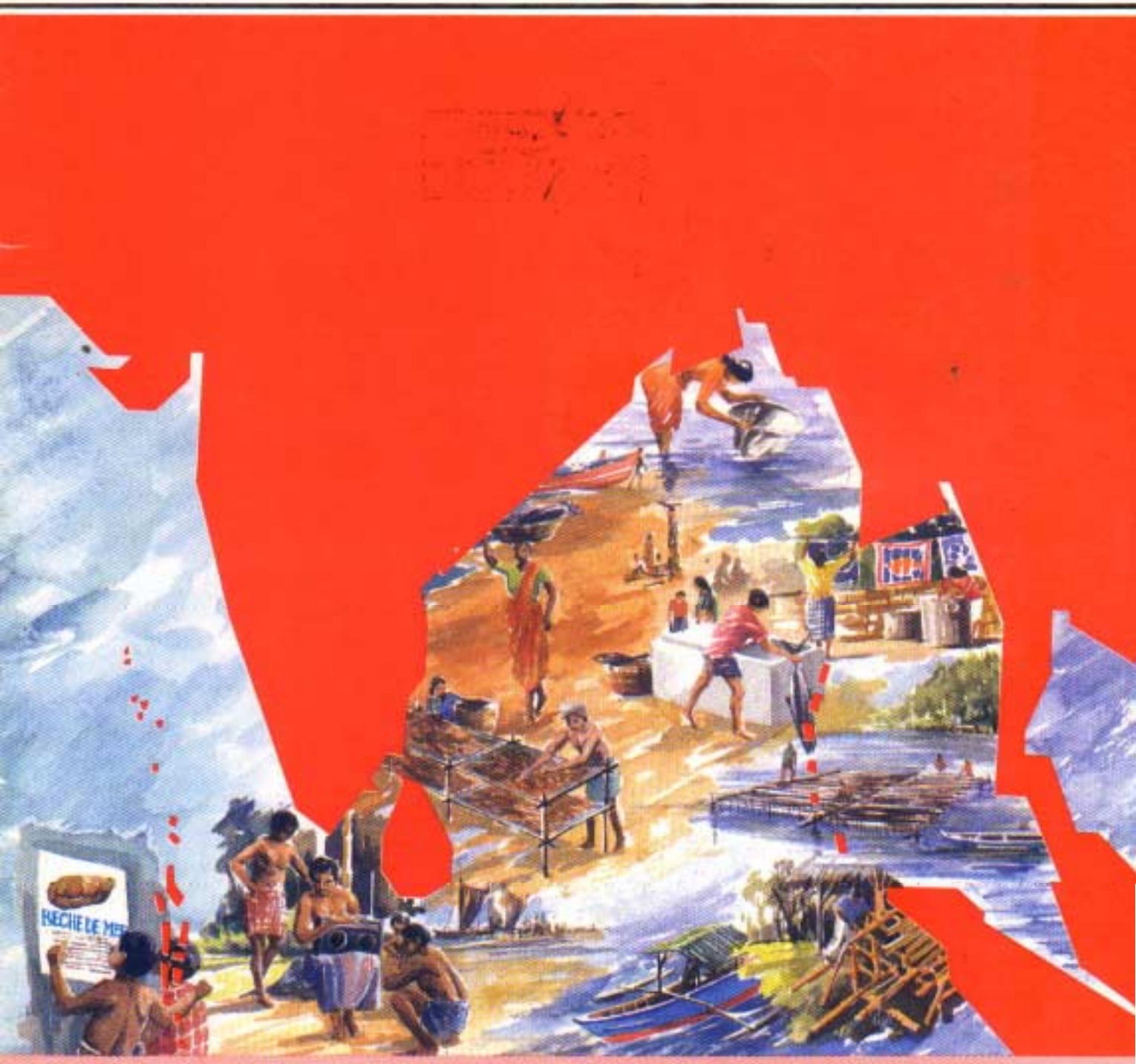
BOBP/REP/57



# Introduction of New Outrigger Canoes in Indonesia



BOBP For Fisheries Development
BAY OF BENGAL PROGRAMME

BAY OF BENGAL PROGRAMME BOBP/REP/57
Small-Scale Fisherfolk Communities GCP/RAS/118/MUL

# Introduction of New Outrigger Canoes in Indonesia

by
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BAY OF BENGAL PROGRAMME
Madras, India
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This report gives an account of the successful attempts to develop and introduce a new type of outrigger canoe for the benefit of small-scale fisherfolk in Nias Island, North Sumatera, Indonesia. It summarizes the activities of canoe construction, training of carpenters, demonstration and long-term fishing trials and discusses the impact and prospects for further development.

The work was undertaken from late 1988 till early 1993 as a subproject under BOBP's "Small-Scale Fisherfolk Communities" project GCP/RAS/118/MUL. The subproject was channelled through the Provincial Fisheries Service (PFS) of North Sumatera but was, to a very large extent, an autonomous unit in Nias with a Field Assistant, Tafonaha Gulo, as the only staff. The Boatbuilder Consultant assisting in construction of prototype canoes and training of carpenters was M Savins, from Australia.

The Bay of Bengal Programme (BOBP) is a multiagency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Shri Lanka and Thailand. The Programme plays a catalytic and consultative role: it develops, demonstrates and promotes new methodologies, technologies or ideas to help improve the conditions of small-scale fisherfolk communities in member-countries. The BOBP is sponsored by the governments of Denmark, Sweden and the United Kingdom, by member-governments in the Bay of Bengal region, and also by UNDP (United Nations Development Programme) and AGFUND (Arab Gulf Fund for United Nations Development Organizations). The main executing agency is the FAO (Food and Agriculture Grganization of the United Nations).



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# 1. *BACKGROUND*

The Eleventh Advisory Committee of the Bay of Bengal Programme (BOBP) recommended in March 1987 that suitable activities in small-scale fishing technology should be identified in Indonesia for development and assistance. The Provincial Fishery Service of North Sumatera (PFS) and BOBP staff, after a survey on the east coast of Sumatera in May 1988, concluded that the pressure on the fishery resources was very high and that there was very limited scope for improvement in technology that could lead to increased earnings of small-scale fishermen. Further investigations, this time on the west coast of Sumatera, indicated that Nias Island (Figure 1, facing page) would be an appropriate location for the upgrading of fishing technology to improve the incomes of fisherfolk. It was felt that there was a low level of exploitation of resources here, and that too within limited ranges and by largely artisanal fisherfolk. A study was conducted in June 1988 and possibilities for increased production of large pelagic species, like Skipjack, Yellowfin, billfish and shark, and demersal species, like Snapper, Bream, Grouper, Emperor and others, were identified.

Nias Island has a population of about 528,000. Agriculture is by far the most important activity, but in all villages along the coast there are communities who earn their main income from fisheries.

The double-outrigger canoe of 4-5 m in length is the only type of fishing craft used in the traditional fishery. The main hull is a dugout; sail and paddles are used for propulsion. There are about 2100 of these canoes, of which about 70 had been motorized with 2-8 hp outboard motors at the time the project got underway.

***Non-motorised outrigger dugout 4-5 m.***

***Outrigger dugout 4-5 m. with outboard motor.***



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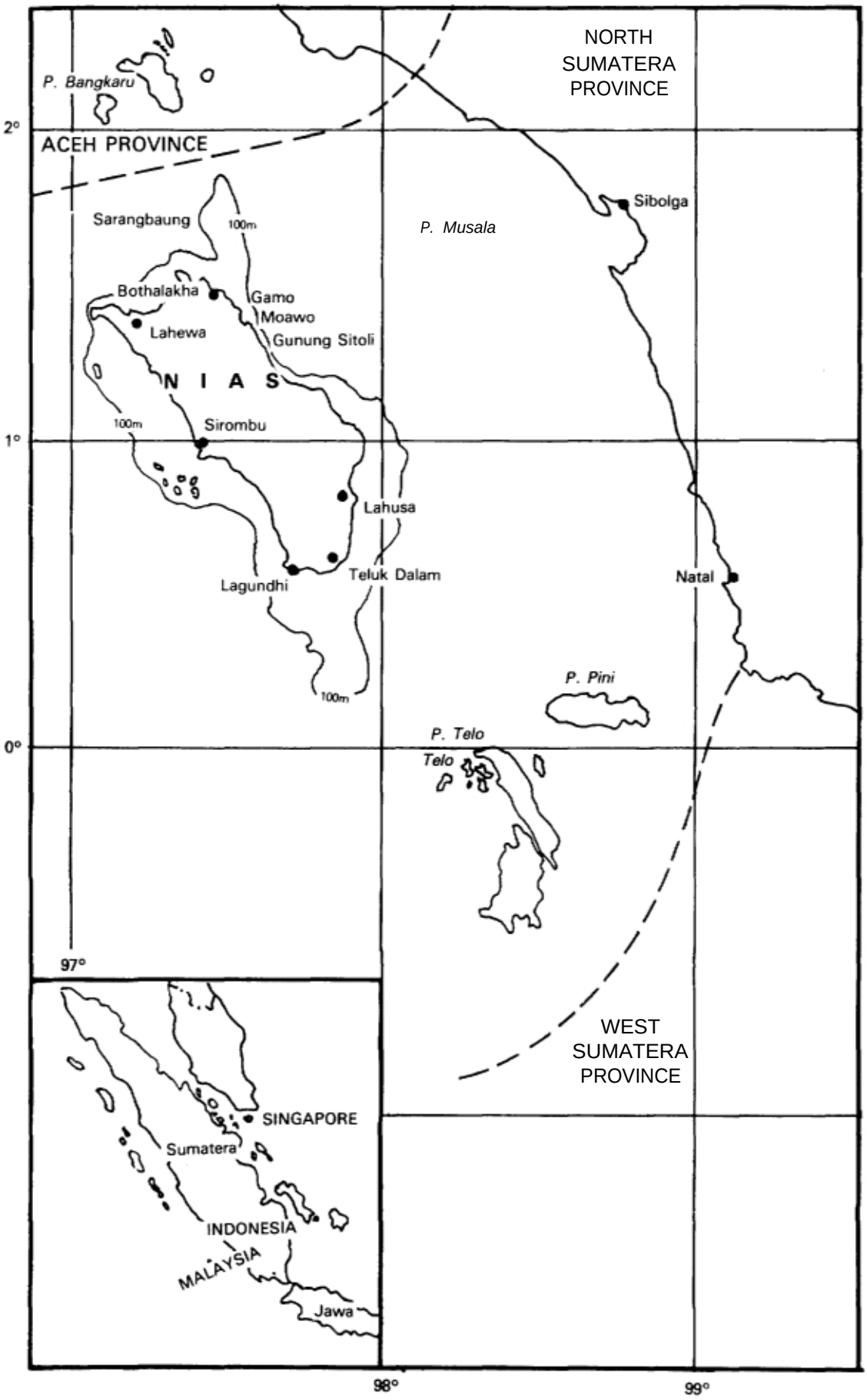
**Fig. 1. Map of** Nias Island



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The size of the outrigger canoes and lack of motorization limited the range of fisbing to close inshore areas and to, mainly, hooks-and-line, for small pelagic and demersal species, and gillnets, for small pelagics. About five larger (6-7 m) outrigger canoes had been fitted with small inboard diesel engines of 5 hp each.

For fishing further offshore with large-mesh driftnets, two types of planked fishing craft had been introduced: The 7-10 m 'speed boat' with a 20-25 hp kerosene driven outboard motor and the 10-12 m 'half-decked boat' with a 12-30 hp inboard diesel engine.

There were about 40 of these fishing craft operating, mainly from Gunung Sitoli and Teluk Dalam.

For a village fishery, none of these introduced planked fishing craft are satisfactory. The 'speed boat' has a high cost of operation because of its outboard motor. The 'half-decked boat', on the other hand, is too heavy and big, which, in the absence of sheltered harbours, makes frequent hauling up on the beach difficult.

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**1.** *Planked 'speed boats' (7-10 m) with outboard motors.*

2. *'Half-decked boat' (10-12 m) with inboard diesel engines (12-30 lip).*

**3.** *Outrigger canoe (6-7 m) with inboard diesel engine.*

2

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In October 1988, PFS staff, together with BOBP's Fishing Technologist and Naval Architect Consultant, visited Nias. During discussions in various fishing centres, it was found that the fishermen strongly desired motorization of their craft, preferably with inboard diesel engines. The fisherfolk also realized there was need for a fishing craft larger than the dugout, but had no clear idea of what type of fishing craft they wanted, since the only alternatives they knew were the 'speed boat', the 'half-decked boat' or the larger fishing boats from Sibolga, all too expensive and unsuitable for village operation.

Experience in other FAO fisheries projects in the Pacific and Shri Lanka had shown the advantage of not moving radically away from the type of fishing craft that the fishermen were used to : the outrigger canoe. This type of fishing craft has the following advantages compared with a monohull:

- Better fuel economy, because the long, slender hull has lower resistance.
- More comfortable to work from, because of the stabilizing effect of the outrigger.
- Easier to haul on to the beach, because the outrigger beams give a good grip for lifting and pushing.
- Lower cost and, therefore, more accessible to the small-scale fisherman.
- Can be constructed by local carpenters in the village.

A subproject, 'Development of Outrigger Canoe Fisheries', was prepared and Phase I of it was planned to have a duration of 18 months, with an expenditure from BOBP of US $ 95,000. If Phase I was successful, the subproject would go ahead with Phase II, pilot introduction of the craft. The subproject became operational in November 1988 and continued till April 1993, both phases being implemented. A chronology of activities is given in Appendix I.

## 2. SUBPROJECT ACTIVITIES — PHASE I

### 2.1 Design and construction of prototype canoes

The BOBP Naval Architect Consultant prepared drawings for three sizes of canoes:

| Desipnation | Length (m) | Engine (hp) | Fishing gear |
|---|---|---|---|
| **INS-2** | **8.0** | **4.5 diesel** | Handline, trollingline, vertical longline and small-mesh gillnet |
| INS-3 | 9.7 | **6.5 died** | Large-mesh driftnet, bottomxt longline, trollingline and handline |
| **INS-4** | **6.7** | **4.5 petrol** | Handline, trollingline, vertical longline, and small-mesh gillnet |

The reason for three different sizes was to meet the needs of diverse fisheries and to determine, from the fishing trials, which canoe would technically and economically perform best and be acceptable to the fishermen. All three canoes would be outrigger canoes of simple design and suitable for village construction.

A BOBP Boatbuilder Consultant supervised the construction of the three prototype canoes and trained local carpenters in Gunung Sitoli in February-March 1989. Six carpenters were selected for training by the PFS and two of them showed considerable promise.



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## *2.2 Fishing trials on the east coast*

The prototype canoes were operated by fishermen in selected villages. Full participation by the fishermen, in the evaluation of the fishing craft, was, thus, assured. BOBP staff assisted over short periods in fishing trials with experimental fishing gear, but otherwise the fishermen themselves decided when to fish, where to fish and with what type of fishing gear.

For logistical reasons, the canoes were operated from various villages on the east coast, north of Gunung Sitoli, from April 1989 until the end of Phase I, November 1990. Since the 8.0 m canoe (INS-2) was the only one operated over a full year from one village, Gamo, the data from this canoe were used for an economic evaluation.

The data on production, costs and earnings showed a yearly catch of 8.4 t valued at Rp 7.2 million *. The cost of the canoe was Rp 3.7 million. The yearly net return was Rp 1.8 million. The accounting rate of return of 49 per cent indicated good prospects for this type of craft provided credit could be obtained for the financing. Other conclusions from the evaluation of the fishing trials are given below**.

### THE FISHERMEN

The fishing trials clearly demonstrated that the most important factor is the fishermen operating the craft. The new canoes have an investment level that requires a certain intensity of fishing and some managerial skills. This is not a fishing craft suitable for part-time fishermen; they would not use it to its full potential. Secondly, the crew members (3 or 4) must be able to work together without conflict under a good, strong leadership.

INS-2 was operated from Botholaka village from April till October 1989 and averaged a catch of 9 kg/trip. Because of this poor performance and conflict among the fishermen, the canoe was moved to Gamo village for operation by another group of fishermen. The catch increased to 59 kg/trip, which illustrates the importance of the crew.

### THE FISHING GEAR AND THEIR OPERATION

The 9.7 m canoe (INS-3) was initially operated from Moawo village using large-mesh driftnets for large pelagic species (tuna, shark and billfish) in offshore waters. The catch was very poor, averaging only 18 kg/trip. During this time, the catch by the monohull driftnetters was also low, but they could partly compensate low catch rates by carrying a larger amount of fishing gear. The capacity of the INS-3 did not permit a similar increase. The increased investment in fishing gear would also make it not so accessible to the target group — the village fishermen. After nine months, the canoe was, therefore, moved to Gamo village and took up the same fishery as INS-2, hook-and-line fishing for demersal and pelagic species. An insulated ice box was used to keep the fish fresh during fishing trips lasting 20-24 hours each.

The main fishing ground was around Sarangbaung island, 23 nm, or about four sailing hours, from Gamo. The catch per trip increased to 79 kg. Handlining for demersal fish became the dominant fishing method for INS-2 and INS-3, contributing 87 per cent of the catch value. Fishing trials with bottom-set longlines for demersal fish did not give any significant increase in catches compared with handlines. Trollinglines used to and from the fishing ground contributed 7 per cent of the catch and the balance came from handlining for tuna species.

- In 1989, US $ 1 = Rp 1600 appx.
- * Details are given in BOBP/WP/77: ***Development of Canoe Fisheries in Sumatera, Indonesia.***



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## THE CANOES

The 6.7 m canoe (INS-4, being the smallest of the prototypes, did not have space for a large insulated ice box and, therefore, could not be utilized for long fishing trips. It was mainly used for hook-and-line fishing for demersal and pelagic species near Gamo. The catch per trip averaged 24 kg, but only seven trips a month were made due to continuous problems with the air-cooled petrol engine. The investment cost of the petrol engine was less than half that of the diesel engine, but this advantage was nullified by higher costs of operation and maintenance. Even at the lower investment, the economic return from inshore fishing would not have been sufficient to cover the cost. Also, operating this craft was to directly compete with the non-motorized outrigger canoes. The trials with the INS-4 were, therefore, discontinued.

The two larger canoes proved suitable for long-range fishing operations with hook-and-line, especially as each could carry a large enough insulated ice box. The catch per trip was higher for the larger (INS-3) canoe, but this was not because of the difference in size but due to crew performance. It was, however, felt by the crew of INS-2 that a slight increase in size would be desirable. On the other hand, INS-3 was considered too big and too difficult to haul on to the beach. The crew of INS-3 were quite happy with the size of the craft, but wanted a more powerful diesel engine.

The construction method, using a double layer crossplanked flat bottom for ease of construction and beaching, proved to be satisfactory and no problems with leaks were reported. The canoes were not protected against Toredo worms with antifouling paint or sheathing, but they were hauled up on to the beach every week for cleaning of their bottoms.

The canoes were tried with both a 'Pacific type', 'single-outrigger' of planked construction filled with polystyrene, and the local type of double-outrigger. The single-outrigger had the advantages of better stability and of allowing one side of the canoe to be free for the operation of the fishing gear. Nevertheless, even after prolonged exposure to the single outrigger, the fishermen preferred the traditional double-outrigger.

## THE ENGINES

INS-2 and INS-3 had the same type of engine, an agricultural and industrial horizontal cylinder water-cooled diesel engine. It was an engine assembled and partly made in Indonesia. Spare parts for it were easily available. Fuel consumption on either of the two outrigger canoes was around one litre/hour. During the trials, the fuel cost was only about five per cent of the gross revenue from the catch.

The engines performed without major problems throughout the fishing trials, but there were some problems related to the engine installation, such as wear on the propeller shaft and stern bush, the engine bed vibrating loose, leaks in the exhaust pipe etc. These faults were rectified by a local mechanic and carpenters.

The 5 hp air-cooled petrol engine in INS-4 was first installed as a long-tail engine on the side of the canoe. The engine was too exposed to spray; the balance of the craft was also affected. A conventional inboard installation was then tried and performed better, but the engine itself did not work satisfactorily.

## MARKETING OF FISH

The fish landed in Gamo was sold by the roadside to local fish merchants, villagers or taken to the market in Gunung Sitoli by the fishermen on bicycles. The total catch of the two outrigger canoes in a year, around 18 t, could be sold fresh at reasonable prices without any problems.



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*INS-2, Tagiri.*


*INS-3, Tuhu*

*INS-4 Turusi.*



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INSULATED ICE BOX

The insulated ice box was essential to enable long-range fishing trips. The ice boxes had a net volume of 0.2-0.3 $m^3$, sufficient for keeping 80-100 kg of fish on ice. This capacity was adequate for trips up to 48 hours. Ice was purchased from Gunung Sitoli and brought to Gamo on a bicycle.

To store the ice and fish in the village, a large insulated ice box was constructed. This large box was extensively used by a small-scale fishing entrepreneur who owned four outrigger canoes in Moawo.

*A roadside fish stall in Gamo.*

*Fish being taken from Gamo by motorbike to the market in Gunung Sitoli.*



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***Ice box*** *for outrigger came. (See picture of* Tagiri on p. 7).

*Large ice* ***box*** *for use* ***ashore.***



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CREDIT

Bank finance was very difficult to obtain in spite of the promising economic results. This would, if it remains the case, limit the introduction of new outrigger canoes to small-scale entrepreneurs who had access to sufficient capital. The only other possibility would be a Government-sponsored project with a revolving fund.

## *2.3 Socioeconomic study*

A socioeconomic appraisal of 11 villages on Nias Island • was made from October 1989-January 1990. Through interviews with fishermen, their problems and the possibilities of development were ascertained. The concerns most commonly expressed were:

The need for more capital to improve their fishing craft and gear. However, the fishermen's notion of where these funds could come from was extremely limited; they knew only of some Government schemes that had been implemented in the past and that had suffered from poor repayment.

The intrusion of larger fishing boats, which, they felt, were responsible for diminishing catches. Fishermen in the south complained about purse-seiners and trawlers from Sibolga. In the north, there was interference from handliners from Sibolga and trollers from Padang. Many of the fishermen also blamed themselves.

- The need for "modern fishing gear", though the fishermen were generally vague when it came to the type of gear they would prefer. They were, however, more familiar with motorization as a technical option. The majority preferred inboard diesel engines to outboard motors in spite of the fact that they were more familiar with the latter. The existing outrigger canoes are almost all too small to accommodate an inboard diesel engine, and the fishermen had no clear idea or specific preference with regard to any other fishing craft. Some mentioned a 2-3 tonne boat for offshore fisheries, because this was a type of craft they had observed coming from outside (the fishermen's ability to propose alternatives must of necessity be limited to what they have seen themselves).
- The problem of price fluctuation when large catches are landed. This is so in all villages except those with good road access to Gunung Sitoli.

The potential for supplementary or alternative income from agriculture is good in some villages. Three villages, however, were identified as having full-time fisherfolk communities and few possibilities to increase agriculture production. They were Hilinamoniha, Teluk Dalam and Sirombu. The best potential for the introduction of new outrigger canoes, taking into account fishermen's familiarity with motorization, would be in Teluk Dalam, Lagundi and Sirombu.

## *2.4 Design of INS-5*

The fishing trials with the prototypes.INS-2 and INS-3 indicated that the best size would be between the two, taking into consideration the space needed to carry an insulated ice box and fishing gear, the limitations caused by the need to haul the canoe up on the beach at regular intervals for cleaning the bottom, and the need to keep the investment as low as possible. This resulted in the design of a new outrigger canoe, INS-5 (See Figure 2, facing page), with the following characteristics:

- Length overall : 8.6 m
- Traditional type double-outriggers
- Diesel engine (6.5 hp continuous duty at 2200 rpm) of the same type as used previously in the INS-3
- Insulated ice box, net volume = 0.3 $m^3$, to store 100 kg of fish with 100 kg of ice

The construction method was to be the same as used for INS-2 and INS-3.

* **BOBP/WP/78** : ***The Firheries and Fisherfolk of Nias Island, Indonesia.***



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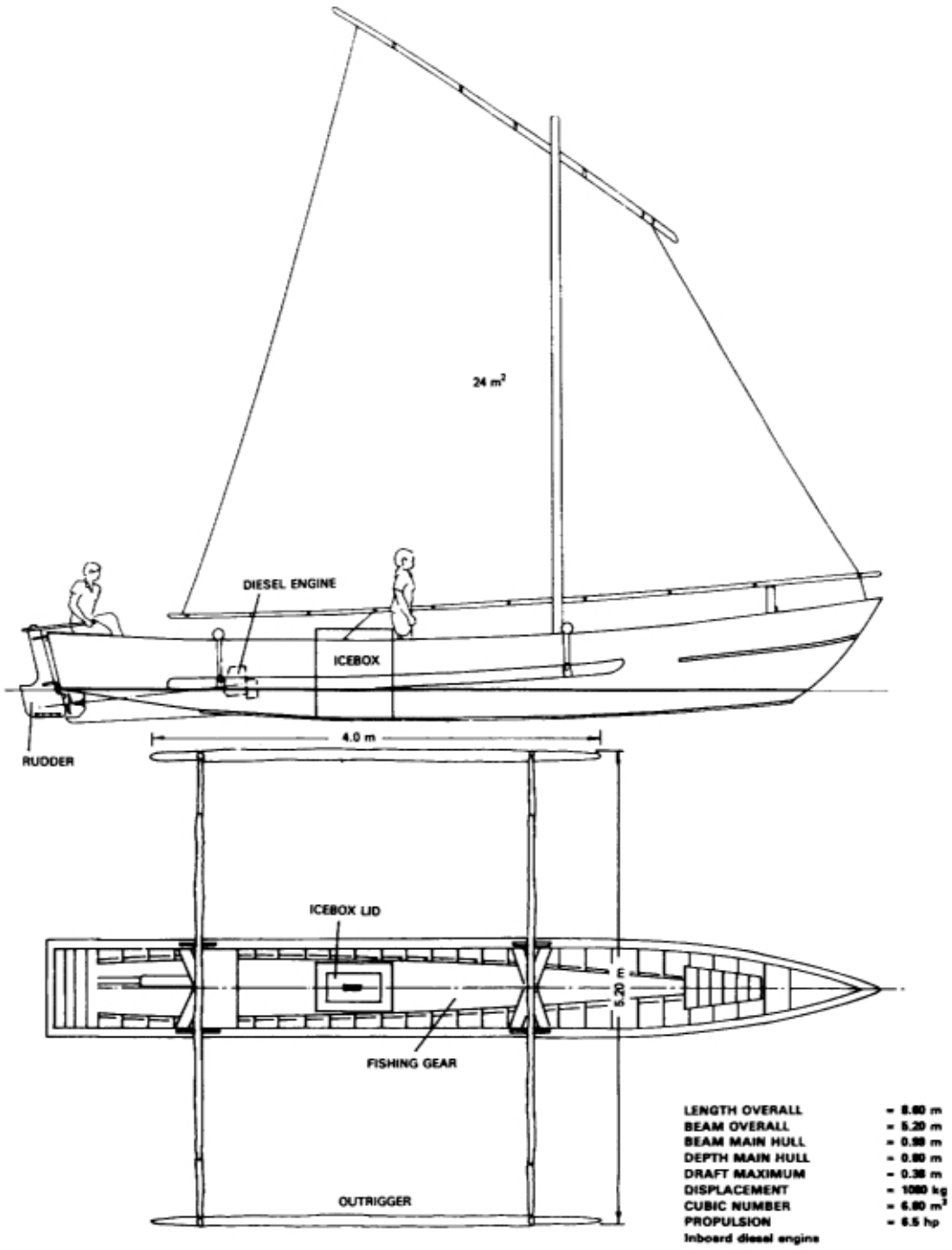
**Fig. 2. INS-5. 8.6 m planked outrigger canoe.**



*INS-5 outrigger canoe.*

## 3. *SUBPROJECT ACTIVITIES – PHASE II*

### 3.1 *Training of boatbuilders in the village*

During July-August 1991, two INS-5 canoes were built in Gamo by four carpenters, two of whom had participated in the first course. Two more carpenters started the course but did not complete it, because of lack of skill and interest. Traning was provided by the BOBP Boatbuilder Consultant.

After completion of the canoes, two of the trained carpenters in Gamo built another canoe, this time without supervision, to test their skill. A boatbuilder from Sirombu participated in building this canoe and later built another on his own in Sirombu. The project therefore financed four canoes of the INS-5 design to train local boatbuilders and for further fishing demonstrations. Three of the carpenters were found to be excellent boatbuilders and could be utilized in future extension of canoe construction.

BOBP's Boatbuilder Consultant kept accurate record of the cost of construction. The cost breakdown of the INS-5 is given in Appendix II. It shows the cost of hull and engine to be Rp *4.5* million (US $ 2300)*. This cost can be reduced to Rp *3.5* million by using a Chinese diesel engine which, costing as it does half the price of other makes, is now becoming popular in Indonesia. A local agent in Gunung Sitoli is selling this make of engine and stocks spare parts.

*Local carpenters building an INS-S outrigger canoe in Gamo.*

* US $ 1 = Rp. 1950 appx. (1991)



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### *3.2 Demonstration of outrigger canoe on the west coast*

Sirombu was one of the villages identified in the socioeconomic study and recommended for further introduction of the new outrigger canoe. The third INS-5, built by the trainee boatbuilders in Gamo, was transferred to Sirombu and a working agreement made with a local fisherman. This canoe, ***Kakap,*** started operation in November 1991. The canoe built by a trained boatbuilder in Sirombu. in late 1991 was called *Cucut* ***Botol;*** it started fishing in March 1992 under a similar agreement with a local fisherman. Fishing methods were the same as in the fishing trials at Garno, mainly hook-and-line fishing for demersal and pelagic species.


***INS-5 outrigger canoe*** Kakap.

**ECONOMIC** RESULT

The main findings after *Kakap* had been operating 13 months and *Cucut BoWl* nine months were that these canoes had been accepted by the fishermen in Sirombu. The two craft had each earned a gross revenue of over Rp 8.0 million in a year. Assuming that the cheaper, Chinese-made diesel engine is installed in the future, the accounting rate of return will be 34 per cent for *Kakap* and 35 per cent for *Cucut Botol,* based on these incomes. It can be seen from Table 1 that the two canoes operating from Sirombu had a considerably higher fishing intensity than the two canoes in Gaino. The gross revenue per trip was about the same for all the four canoes (Rp 30,000-35,0000) but the number of fishing trips a year was 47 per cent higher in Sirombu, which explains the better economic result. After one year of operation, ***Kakap*** was bought by the operating fishermen for Rp ***2.5*** million. This was one sign of acceptance — and another was the construction of a new canoe by a carpenter/canoe-owner in Sirombu.

**Table 1: Data from** fishing trials with INS-5 outrigger canoes (average for one year)

(in Million Rp*)

| Outrigger canoe | *Faomakhoda* | *Samadaya* | *Kakap* | Cucul *Botol* |
|---|---|---|---|---|
| Village | GAMO | GAMO | SIROMBU | SIROMBU |
| Fishing trips (No) | 169 | 192 | 274 | 256 |
| Fishing days (No) | 174 | 240 | 291 | 311 |
| Gross revenue | **5.83** | **5.81** | 8.22 | 8.09 |
| Running cost | 1.97 | 2.50 | 1.86 | 1.91 |
| Crew remuneration | 1.93 | 1.66 | 3.18 | 3.09 |
| Repairs | 0.22 | 0.30 | 1.07 | 0.91 |
| Net boat share | 1.71 | 1.35 | 2.11 | 2.18 |
| Remittance to bank | 1.19 | 1.05 | 1.99 | 1.79 |
| Depreciation | 0.68 | 0.68 | 0.68 | 0.68 |
| Net yearly return | 1.03 | 0.67 | 1.43 | 1.50 |
| Accounting rate of return: | | | | |
| With Yanmar engine | 20% | 13% | 27% | 29% |
| With Chinese engine | 25% | 16% | 34% | 35% |

* US $ 1 = Rp.2000 appx. (1992)



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### *3.3 Pilot credit scheme for two canoes*

Two of the INS-5 canoes built during the training programme in Gamo for carpenters — the ***Faomakhoda*** and the ***Samadaya*** — were delivered to the two groups of fishermen in Gamo who had earlier operated the prototype canoes successfully. The fishermen utilized their savings from the operation of the prototypes to provide the construction material, but the cost of the diesel engine and installation, Rp. 2.5 millions, was covered by a bank loan. This credit could only be obtained from a local bank after BOBP agreed to give a guarantee of Rp. 1 million for each loan.

With a commercial bank interest of 26 per cent, the total amount to be paid — monthly, over three years — was Rp 3.5 million. The situation after 1% years was that the owners of ***Faomakhoda*** and ***Samadaya*** were, respectively, two and three months behind schedule with their monthly instalments. The same crew which had operated INS-2 very successfully during the previous fishing trials, and had grossed an income of Rp 7.2 million in a year, dropped to Rp 5.8 million. The reasons for this are, mainly,

- A reduction in fishing intensity caused by family conflicts;
- Crew disagreement in one case, crew sickness in another; and
- Change in the mode of operation (carrying out combined operations with 3 or 4 small traditional outrigger canoes in fishing areas close to Gunung Sitoli, where the fishing potential is much less than off the coast of northern Nias Island; resumption of fishing operations in northern Nias by the two canoes resulted in substantial increases in their earnings.)

The reduction in yearly income resulted in a drop in internal rate of return from 49 per cent for the INS-2 prototype to 13 per cent and 20 per cent for the new INS-5 canoes (Table 1).

### *3 A Extension efforts*

Except for specific aspects, which required particular skills or expertise, the fisherfolk of Nias Island were deeply involved in the extension work. Carpenters built new outrigger canoes and trained others. Fishermen carried out fishing trials and demonstrated new outrigger canoes to others and fish traders organized ice supplies and marketing of fish for others. After a year, except for the field worker/motivator, the subproject staff played the role of coordinators and facilitators rather than executors of the subproject.

The subproject put a great deal of emphasis on exposing fishermen from other villages in Nias and the Sibolga area to the new outrigger canoes. Fishermen want to see to believe — and, so, selected groups of fishermen were taken to see the canoes under construction in Gamo and to participate in the fishing operations in Gamo and Sirombu. Project field workers, trained carpenters and cooperating fishermen played a very important role in this extension programme and proved to be the best available extension workers.

Monitoring of fishing operations and management of the new outrigger canoes, including bank savings, was one of the main tasks of the field motivator. When fishing operations were monitored by the motivator in Gamo and, later, in Sirombu, bank savings were good for all fishing craft. Savings in Gamo, however, declined when the fishermen there were left on their own to manage the operations; the result was late repayments of the monthly bank loan instalments. This showed the necessity of close monitoring by a motivator of any new fishing craft issued through a financial scheme.

A simple method of constructing these canoes has been explained in word and picture in a manual * produced by BOBP in the English and Indonesian languages. This will facilitate the spread of village construction by local carpenters. The initial feedback from local carpenters has suggested that the manual will prove very useful and facilitate better quality outrigger canoe-building.

A video film on the development of the new outrigger canoes was produced and distributed in and outside Indonesia. It helped the field worker/motivator to introduce the concept of the motorized FRP outrigger canoe and create an awareness of it in other fishing villages in Nias Island.

* BOBP/MAG/12 : ***How to Build a Timber Outrigger Canoe.***



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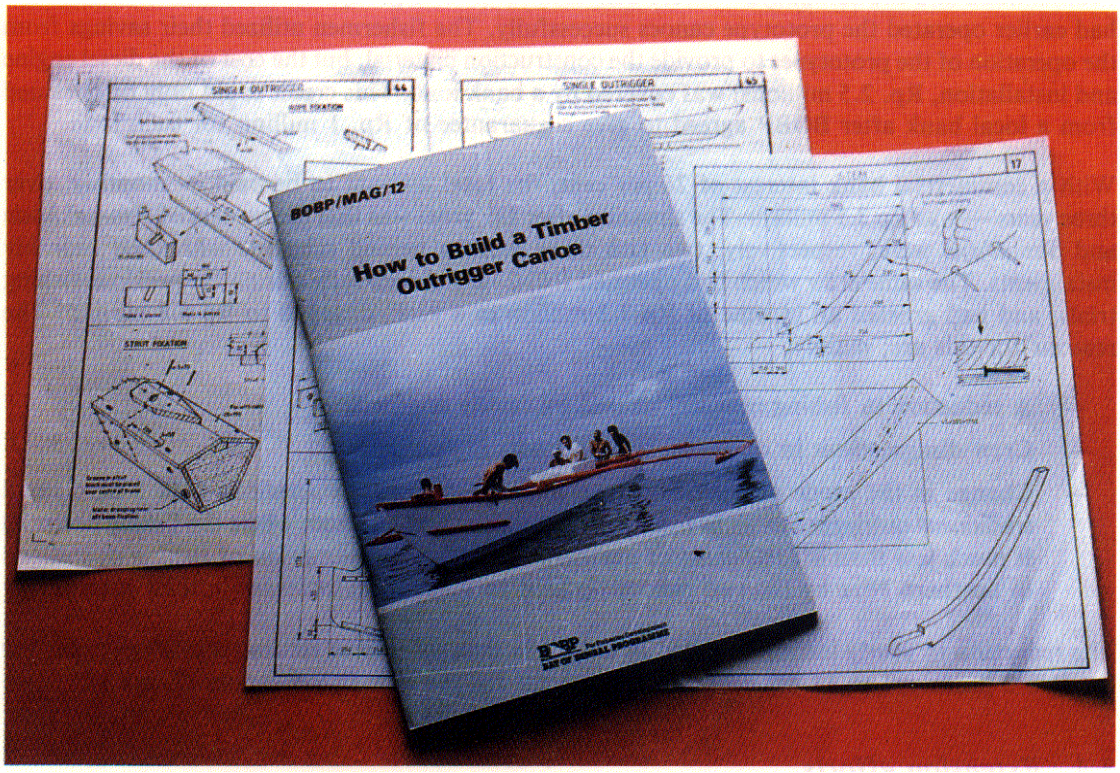


*The BOBP construction manual which explains how a timber outrigger canoe may be built.*

## 4. IMPACT AND PROSPECTS FOR FURTHER DEVELOPMENT

### 4.1 Uptake by the private sector

The successful operation of the prototype canoes in Phase I inspired a small-scale fishing entrepreneur in Moawo, near Gunung Sitoli, to copy the largest outrigger canoe and install a second-hand diesel engine. The saving of Rp 1.5 million in the cost of the diesel engine and the use of cheaper materials and equipment reduced the investment cost by Rp 1.8 million. Other small-scale fishing entrepreneurs followed suit and, from the end of Phase I in October 1991 up to June 1992, about 14 canoes were built in the vicinity of Gunung Sitoli. The quality of construction of these outrigger canoes was, generally, low. The sizes varied from 8 m to 10.5 m, according to available diesel engines, and the needs and means of the owners, but all used the same method of construction as demonstrated by the project.

The 'speed boat', previously used by some of these small-scale fishing entrepreneurs in Moawo, has now been largely replaced by the new type of canoes. The outrigger canoe, with inboard diesel engine, has proven to be the most economical motorized fishing craft in the Nias Island small-scale fishery. The use of this canoe has already spread to other areas along the west coast of Sumatera, Sibolga and, to a lesser extent, to the west coast of Nias Island (Sirombu). The standard of construction will probably vary as much as has been seen so far – from excellent to deplorable – but, eventually, the fishermen and small-scale fishing entrepreneurs will learn that better quality will pay in the long run. The use of hot dip galvanized nails of the specified size will be the most important factor in increasing the service life of the canoes.

### 4.2 Government-sponsored schemes

Seeing the positive results of the subproject in Nias, the PFS organised a scheme for construction of 13 outrigger canoes in Sibolga. The canoes were built by a local boatyard without assistance from any of the trained boatbuilders in Nias. The canoes were financed under a Revolving Fund operated by the PFS. A similar scheme for Nias Island, involving ten outrigger canoes, is planned by the PFS.

*New, larger outrigger canoes commercially built in Gamo* (above) *and Moawo* (below).



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## 4.3 Marketing

Once sufficient quantities of high value Groupers and Snappers were landed regularly by the canoes, local fishermen and small-scale fishing entrepreneurs saw the possibilities of organizing local as well as distant marketing without any input from the project. Iced fish was shipped to Sibolga, then transported to Medan for export by air to Malaysia and Singapore.

In Sirombu, there was no organized effort to market the fish when the two outrigger canoes started operating. However, taking advantage of the great demand for high quality fish and the regular landing of such fish, the road improvements from Sirombu to Gunung Sitoli and the regular RO-RO ferry service between Gunung Sitoli and Sibolga, a small trader in Sirombu soon organized the collection, preservation and transport of the high quality demersal fish landed.

In this operation, a small truck load of ice (20 boxes full) is brought from Sibolga to Sirombu. The boxes and ice are provided free of cost to the fishermen operating the outrigger canoes and, in return, the fishermen sell their catch of quality fish to the trader-cum-supplier of ice at the local market price. After about a week, when enough iced fish has been collected, the fish are sent to Sibolga in the boxes. The fish that are not exported are marketed locally by bicycle or motorcycle traders to villages in the interior.

The roads in Nias Island are being improved through a scheme financed by the World Bank. This will further facilitate the marketing of fish locally and in distant markets.

As has been seen in Gunung Sitoli and Sirombu, local small-scale entrepreneurs will ensure that, in places with good roads or ferry connections, increased production will not result in a drop in prices. There seems to be a large, unsatisfied demand for high quality Snapper, Grouper and other species in North Sumatera.

Teluk Dalam, which is one of the most promising places for further introduction of outrigger canoes, has a regular ferry connection with Sibolga. It will also benefit from the road development linking Gunung Sitoli with other parts of the Island.

The use of insulated ice boxes in the new outrigger canoes has increased the demand for ice. Merchants in Gunung Sitoli initially produced the ice using home freezers. Later, a defunct private ice factory was reopened. A new small ice plant has also recently been built by a small entrepreneur in Teluk Dalam.

## 4.4 Credit

The experience of the subproject shows that small-scale fishermen obtaining bank credit is nearly impossible. As seen with the development in the Gunung Sitoli area, it is the small-scale fishing entrepreneurs who enter into the business of financing and constructing canoes. There is no reason to believe that this will also not happen in Sirombu and Teluk Dalam, but it may be at a slower pace.

The only possibility of small-scale fishermen obtaining finance for a new craft outside the commercial sector will be through Government-sponsored revolving fund schemes such as the one initiated in Sibolga. The current banking policy is not to provide loans to small-scale industries.

## 4.5 Fishery resources

The main species of the demersal resources so far targeted by the new outrigger canoes are Snapper and Grouper. No definitt indication can be given, at present, on the extent of the demersal resource, but from the catch level attained, the sustained landings over the last two years and the large size of fish caught, it appears that the resources are underexploited. It is, however, clear that the area off the east coast of Nias Island, where Phase I was implemented, does not offer much potential. The main fishing area is north, west and south of Nias Island, as shown by the operation of new canoes from Gunung Sitoli in the north and of those from Sirombu in the west. Any expansion in the outrigger canoe fishery should take place in those areas.



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Grouper and Snapper constituted 84 per cent of the catch during the fishing trials from Gamo, 10 per cent were Carangids and 15 per cent various pelagic species caught using trollinglines. The pelagics included Bullet Tuna, a resource which is considered underutilized. The little Eastern Tuna is also caught using hook-and-line fishing. Large tuna (Skipjack, Yellowfin) constituted only 1 per cent of the catch. Hook-and-line fishing on the west coast will, probably, result in greater catches of small and large pelagic species than during the fishing trials on the east coast.

It is not possible, at this stage, to predict how many outrigger canoes the demersal and pelagic resources off Nias Island can support. At this stage of development, there is no need for constraint, but the quantity, species and size of fish caught should be monitored right from the beginning. There is some competition from larger fishing boats from Sibolga and Padang using hook-and-line for demersals and trollinglines for pelagic species. But if the catch rates drop, these boats, having higher operating expenses, would probably have to leave the fishery before the outrigger canoes.



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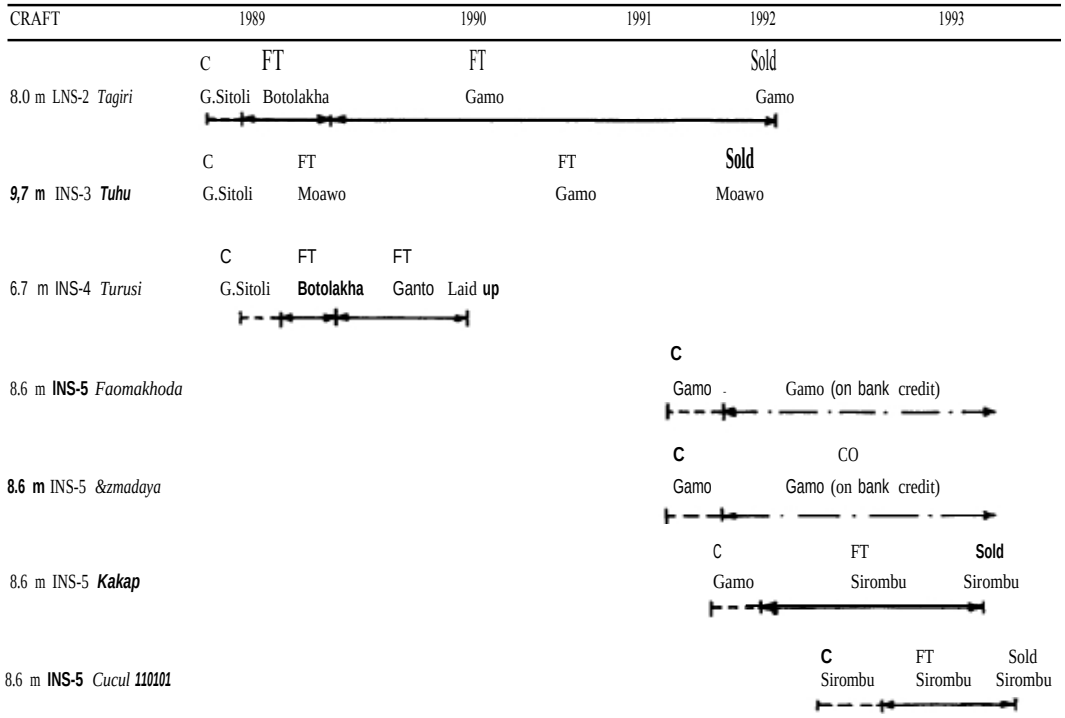
# APPENDIX I

## Chronology of activities




**C** = Construction – – – –
FT = Fishing trials _____
**CO** = Commercial operation — —



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## APPENDIX II

## Cost of INS-5 Outrigger Canoe

| | Rp.* |
|---|---|
| **Hull** | |
| Timber 1.35 m3 sawn | 550,000 |
| Ripping and planing | 117,000 |
| Hot dip galvanized nails, 10 kg | 53,000 |
| Hot dip galvanized bolts | 105,000 |
| Stainless steel bolts and nuts | 19,000 |
| Bituminous compound | 75,000 |
| Paint | 108,000 |
| Polystyrene | 31,000 |
| Miscellaneous | 18,000 |
| **Total Materials** | 1,076,000 |
| **Engine Installation** | |
| Diesel engine Y anmar TF 75, 6.5 Hp @ 2200 RPM | 2,173,000 |
| Propeller shaft, stainless steel | 103,000 |
| Stern tube | 288,000 |
| Propeller | 45,000 |
| Coupling | 105,000 |
| Shaping and fitting charges | 45,000 |
| Engine bed | 90,000 |
| Exhaust system | 86,000 |
| Cooling system | 56,000 |
| Rudder pintles | 23,000 |
| Miscellaneous | 13,000 |
| **Total** | 3,027,000 |
| **Labour Cost** | |
| 400 Manhours x Rp.1000 | 400,000 |
| **TOTAL COST** | 4,503,000 |

* US $ 1 = Rp. 2000 appx. in 1992



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# *PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)*

***The BOBP brings out the following types of publications :***

***Reports*** (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

***Working Papers*** (BOBP/WP/...) which are progress reports that discuss the findings of ongoing work.

Manuals ***and Guides*** (BOBP/MAG/...) which are instructional documents for specific audiences.

***Information Documents*** (BOBP/INF/.. .) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (Boy ***of Bengal News)*** which are issued quarterly and which contain illustrated articles and features in nontechnical style on BOBP work and related subjects.

Other ***publications*** which include books and other miscellaneous reports.

Those marked with an asterisk (*) are out of stock but photocopies can be supplied.

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***33. Nonformal Primary Education for Children of Marine Fisherfolk in Orissa, India.*** U. Tietze, N. Ray. (Madras, 1987.)

***34. The Coastal Set Bagnet Fishery of Bangladesh — Fishing Trials and Investigations.*** S. E. Akerman. (Madras, 1986.)

***35. Brackishwater Shrimp Culture Demonstration in Bangladesh.*** M. Karim. (Madras, 1986.)

***36. Hilsa Investigations in Bangladesh.*** (Colombo, 1987.)

***37. High-Opening Bottom Trawling in Tamil Nadu, Gujarat and Orissa, India : A Summary of Effort and Impact.*** (Madras, 1987 .)

***38. Report of the Eleventh Meeting of the Advisory Committee,*** Bangkok, Thailand, 26-28 March, 1987. (Madras, 1987.)

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1. *Helping Fisherfolk to Help Themselves : A Study in People's Participation* , (Madras, 1990.).
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**NOTE:**

Apart from these publications, the BOBP has brought out several folders, leaflets, posters etc., as part of its extension activities. These include Post-Harvest Fisheries folders in English and in some South Indian languages on anchovy drying, insulated fish boxes, fish containers, ice boxes the use of ice etc. Several unpublished reports connected with BOBP's activities over the years are also available in its Library.

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