Bay of Bengal Programme

Small-Scale Fisherfolk Communities

A STUDY OF THE PERFORMANCE OF SELECTED SMALL FISHING CRAFT ON THE EAST COAST OF INDIA

BOBP/WP/74

FOOD AND AGRICULTURE ORGANISATION OF THE UNITED NATIONS

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Small-scale Fisherfolk Communities GCP/RAS/118/MUL

A Study of the Performance of Selected Small Fishing Craft on the East *Coast* of India

By
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BAY OF BENGAL PROGRAMME
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1992

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This paper compares the economic performance of the beachianding craft (BLC) and several other motorized and non-motorized small-scale fishing craft in three villages on the east coast of India, *viz.* Pentakota (Orissa), Tummelapenta (Andhra Pradesh) and Thirumullaivasal (Tamil Nadu). The relationship between the fishing operations of the different craft and various factors affecting BLC operations are also discussed.

The study, conducted during 1989 through the beginning of 1990, and this paper which reports on it, have been sponsored by the Bay of Bengal Programme's (BOBP) Small-Scale Fisherfolk Communities in the Bay of Bengal (GCP/RAS/1l8/MUL). Assistance in conducting the study and completing this report was received from Theodore Selvaraj, Deputy Director of Fisheries (Marine), Madras (Tamil Nadu), Prabaharadu, Inspector of Fisheries, Thirumullaivasal (Tamil Nadu), Manindra Nath Ghose, Superintendent of Fisheries, Pun (Orissa), C. Ratnama Chary, Manager (Fisheries), Andhra Pradesh State Cooperative Fishermen's Federation Limited, Kavali (Andhra Pradesh), Y. Balaramiah, Fisheries Development Officer, Andhra Pradesh State Cooperative Fishermen's Federation Limited, Kavali (Andhra Pradesh), A. Alexander, Community Development Officer, BOBP, Thirumullaivasal, M. Venkateswar Rao, Data Collector, Pentakota, Avula Ramanaiah, Data Collector, Tummelapenta, P. Dinakara Rao, General Manager, Andhra Pradesh Fisheries Corporation Limited, Kalunada (Andhra Pradesh), V. Ramesh, Marine Engineer, BOBP, Madras, A. Kamilla, BOBP, Madras.

The Bay of Bengal Programme (BOBP) is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The Programme plays a catalytic and consultative role : it develops, demonstrates and promotes new techniques, 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 AGFUND (Arab Gulf Fund for United Nations Development Organizations) and UNDP (United Nations Development Programme). The main executing agency is the FAO (Food and Agriculture Organization of the United Nations).

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<<

CONTENTS *Page*

Tables

<<

Maps

Appendices

<<

1. *INTRODUCTION*

Along the coasts of Orissa, Andhra Pradesh and Tamil Nadu, fishing is carried out mainly by non-motorized, small-scale fishing craft. These traditional craft, which are characterized by a limited operational range, a low carrying capacity and lack of shelter for crew members, are not suitable for fishing offshore and in deep sea areas.

As harbour facilities are few, larger fishing boats can operate only from a limited number of centres. The open, surf-beaten beaches do not give them sufficient shelter during the Northeast Monsoon when the area is also prone to cyclones.

Although various attempts had been made by FAO and the Indo-Norwegian project to develop a motorized beachianding craft, there had not been a long enough and sustained effort to reach a conclusio&. Such a craft needed to be able to operate from the beach, cross the surf, be large enough to carry sufficient fishing gear and be motorized to make the exploitation of resources further offshore economically feasible. Longer fishing trips also implied a greater need for crew protection and fish storage.

The Bay of Bengal Programme (BOBP) began work in 1979 on the development of a beachianding craft that would meet these requirements. Over the next five years, a number of prototypes were built and tested to determine the best hull shape, engine installation and construction method. Eventually the IND-20 fibre glass boat of 8.4 m LOA was put into commercial production. It was later followed by the smaller IND-25 of 6.7 m LOA which was meant to meet the needs of the ***kattumaram*** and *nava* fishermen fishing closer inshore. The total cost of the IND-25 (Rs.92,000), however, is only about 20 per cent less than that of the IND-20 and is, therefore, too expensive for the typical *kattumaram* inshore fishery, while it is too small for the offshore, large mesh driftnet fishery[2].

The IND-20 model became popular among the fishermen and commercial production of it started in 1984. The model has proved its technical viability and, upto the middle of 1990, 199 beachlanding craft (BLC) had been introduced in Andhra Pradesh and Orissa under various assistance schemes and another 25 purchased outright from boatyards.

2. *OBJECTIVES OF THE STUDY*

Besides assessing the economic feasibility of the commercial operations of IND-20, this study also deals with the relationship between the operations of BLC and the traditional artisanal fisheries. Attention has also been paid to the relevance the introduction of BLC has to the poorest section of the fisherfolk communities. The objectives of the study can, thus, be listed as follows

- To investigate the techno-economic and socio-cultural factors which led to the smooth and rapid adoption of the BLC in some communities and to resistance in other communities.
- To investigate whether BLC operations compete with traditional artisanal fisheries.
- To evaluate the economic feasibility of the commercial operations of the BLC in different locations.
- To compare the economic performance of the BLC with that of traditional artisanal craft and other small introduced fishing craft.
- To assess the distribution of income between craft owners and crew members.
- To assess the use of the BLC as a beachlanding craft.

Guibrandsen, 1990
2 Ibid

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Fig. 1 Location of villages selected for study

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3. *METHODOLOGY*

In view of the wide-ranging objectives, different methods of information collection have been utilized. Reports and other documentation already available (see References) on the BLC were used.

Three locations, one in each of the states where the BLC has been introduced (Orissa, Andhra Pradesh and Tamil Nadu) were visited and selected for the study (Figure 1, see facing page).

In Orissa, the study focussed on Pentakota, near Pun, a major fishing centre from which many BLC operate. The study seeks to clarify why the BLC became such a popular craft among the fishermen in this particular centre.

In Andhra Pradesh, Tummelapenta was chosen for logistical reasons, as this village could be easily visited from Madras (about 210 km south of the village). Further, when the locations were being selected, three BLC were operating from here, a relatively large number for one centre (the fishing villages are many in this area, but the BLCs are few and scattered; three is a concentration).

In Tamil Nadu, only two BLC are now[3] in commercial operation. The other fishing craft distributed are no longer being used. When BOBP started demonstration of IND-20 operations in Thirumullaivasal (about 180 km south of Madras), it was decided to combine the effort on data-collection and the monitoring of the fishing craft for the demonstration activity as well for this study. Thirumullaivasal was selected for the demonstration because it is a beach-based village with access to backwaters; thus, beachlanding as well as shallow water access could be demonstrated. The edge of the continental shelf is 30-35 km away, an appropriate distance for offshore fishing, one of the objectives of the trials. It is a *kattumaram* village where fibre glass reinforced plastic (FRP) gillnetters are also based, enabling a comparison between the performance of different types of fishing craft. Basic infrastructure, in the form of marketing and road facilities, ice supply, a nearby mechanical workshop and fuel supply, is available. Another important factor was the positive attitude of the fisherfolk towards the trials.

To assess the commercial economic performance of the BLC and to compare it with the economic performance of other fishing craft, data on expenditure and earnings, area of operation, duration of fishing trips, actual fishing time and fishing gearwise species composition of the catch of different fishing craft types were collected. These data were gathered for one year by educated local fishermen in the selected centres. For this purpose, a questionnaire, which had to be filled in daily, was designed. In Tamil Nadu, the information was collected by the Community Development Officer of BOBP and a Fisheries Inspector from the Department of Fisheries, both of whom were stationed in the village.

To gather information on the social aspects of the introduction of the BLC in the respective communities, the method of in-depth interviews was used. The interviews were conducted by the author, with the assistance of an interpreter, using a pre-determined checklist. Different categories of the fisherfolk population (housewives, fish vendors, fish processors, fish traders, boat-owners, craft-owners, crew members, schoolteachers etc.) were randomly interviewed for this purpose. Sometimes the individual interviews expanded into a group discussion.

Fishing villages adjoining the selected locations were also visited and villagers randomly interviewed. In Tamil Nadu, the interviews were conducted by the Community Development Officer of BOBP using the same checklist as the one the author used at two other locations.

Discussions were also held with officials of the respective Departments of Fisheries as well as with local banks.

[3] Mid-1990

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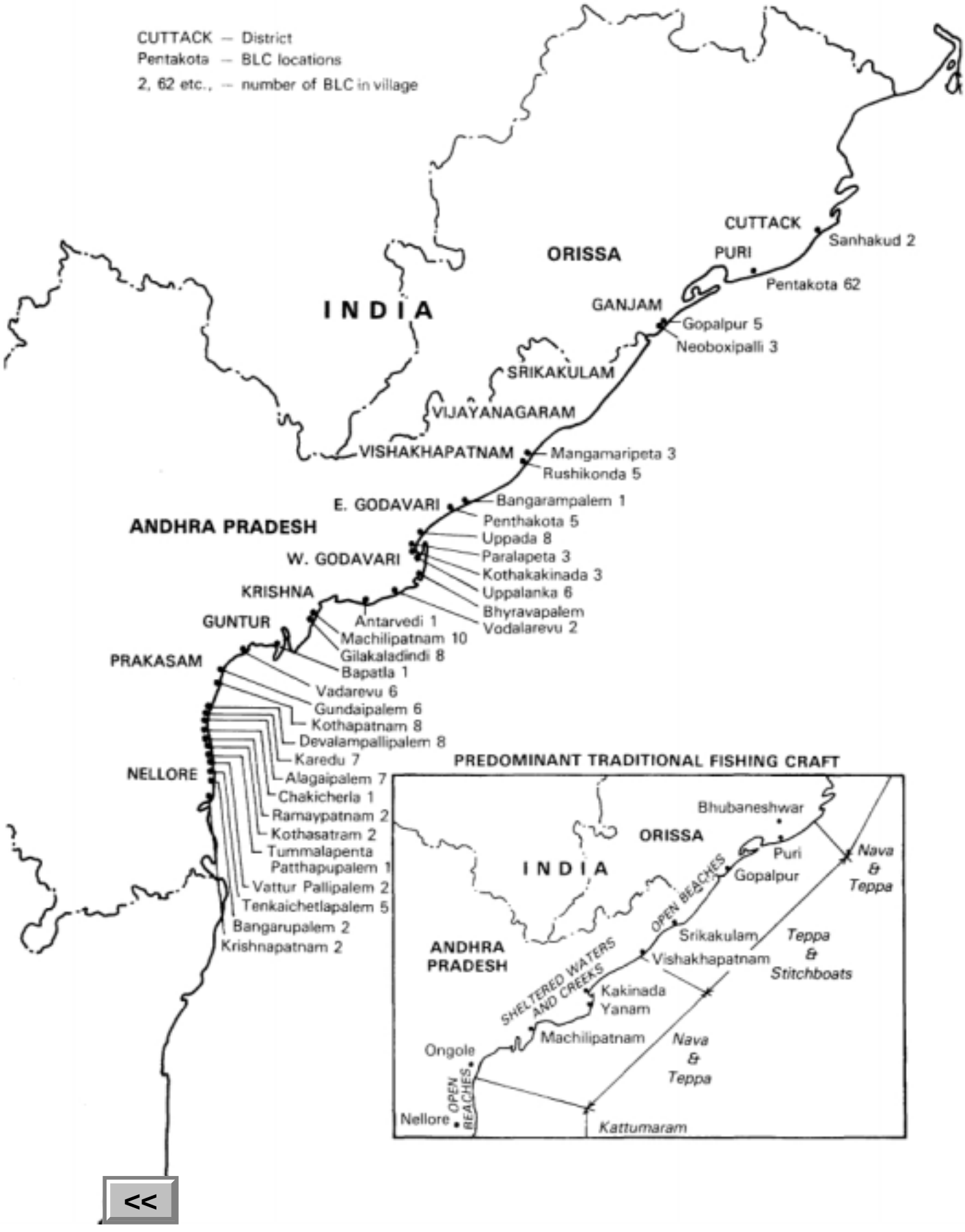
Fig. 2 Location of BLC and areas of predominant traditional fishing craft



4. LIMITATIONS OF THE STUDY

The study was subject to the following limitations:

- In Orissa, 72 BLC were operating[4] from four different villages and in Andhra Pradesh 119 BLC from 28 fishing centres (Figure 2, see facing page). The choice of one village from Orissa for data collection can he considered a representative sample, as the number of villages with BIC operations are few and the centres are relatively close to each other. The selection of one village in Andhra Pradesh, however, means that the representativeness of the findings is limited to the Prakasam District which has a cluster of ten villages with BLC operations. In this area, the environmental factors are similar, whereas the long coastline of Andhra Pradesh has a variety of artisanal fishing operations due to differences in ecological and socio-cultural factors.

- Thirumullaivasal was selected because BOBP had started demonstration of a BLC from this centre to assess its economic feasibility for offshore and deep sea fishing operations. For reasons similar to those applicable to Tummelapenta, the findings are not representative for the whole state of Tamil Nadu, but are limited to this specific area in its Thanjavur Districts. Caution must also be exercised in comparing data collected from the BLC operations in Thirumullaivasal with data on BLC from the other two locations, as the many support services provided by BOBP here may have positively influenced the outcome. On the other hand, factors connected with the trial activity may have had an adverse impact on the results, *e.g.* a new waterpump installation tried out on the BLC initially broke down frequently, due to technical problems, and the nuniber of fishing days increased only when these problems were solved.

- In each village, five fishing craft were selected for data collection. Considering the total number of fishing craft in the three locations — 1199 in Pentakota (1097 non-motorized *teppa*, 67 motorized *teppa* and 35 BLC); 70 in Tummelapenta (67 non-motorized *kattumara,n* and 3 BLC); 271 in Thirumullaivasal (241 non-motorized *kattumaram*, 9 motorized *kattumaram*, 6 FRP gillnetters, 2 BLC, 2 *va/lam* and 11 trawlers) the sample is too small.

- The selected villages were quite distant from each other. The information was collected during several visits at different times over a one-year period. As the visits were relatively short (1-2 weeks), it was not possible to get a complete picture of the dynamics of the respective fisherfolk communities. Further, since most interviews were conducted with the help of interpreters, direct communication was not possible between the author and the fisherfolk.

- Data on fishing time, sailing time and depth of the fishing ground were based on estimates made by the crew members themselves and may, therefore, not be accurate.

- There are two shortcomings in respect of data collection in the design of the questionnaire. The fishing gearwise catch has not been recorded, so that data on catch, specieswise and gearwise, could not be linked during data processing. The questionnaire also does not elicit reasons why the BLC are landed on the beach, so only the frequency of beachlandings is recorded.

In summary, the study has **several shortcomings, of which the most serious one is the small sample of craft. Despite this, it** is **believed that the study has produced a wealth of quantitative and qualitative information. However, the quantitative comparison of economic performance and crew earnings must be interpreted with caution because of the limited sample size and the perennial difficulties in obtaining reliable data on earnings.**

March 1990

With the division of Thanjasur t)istrict in l99t, Thirumullaivasal is ıı Quaid-E-Milteth E)istrict.

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5. *VILLAGES AND FISHING CRAFT/GEAR UNITS SELECTED FOR DATA COLLECTION*

Background information on the three villages selected for the study is given in Appendix I.

5.1 *Differences in the three locations*

The three locations differ from each other in the following respects:-

While Pentakota and Thirumullaivasal have good infrastructure and organized marketing channels, Tummelapenta's location is more isolated.

- In Tummelapenta the villagers derive an income from agriculture in addition to fisheries, whereas in Thirumullaivasal, the population is solely dependent on fisheries. In Pentakota, a few households own agricultural land. It is in Pentakota that more investments have recently been made in fisheries than in agriculture, while the trend in Tummelapenta over the last generation is to move into agriculture. These might be decisive factors with regard to interest in fisheries and might determine the level of investment in this sector.
- A section of the Pentakota fishermen display an intensive migratory pattern. They seem to have flexible attitudes and are receptive to developments. This is also reflected in the relatively large number of motorized traditional craft and BLC purchased so far.
- Fisheries in Tummelapenta seem to be quite stagnant. The replacement of craft is mainly effected under the development project of the Andhra Pradesh State Fishermen's Cooperative Federation (AFCOF), through which relatively large amounts of subsidy are being channelled. *(e.g.* the distribution of *kattumaram* with *50* per cent subsidy).
- In Thirumullaivasal, there are few alternative income-generating activities. So there is a sustained interest in fisheries. Motorization of traditional craft has been taken up and different types of craft are being used.

It can be said that the fisherfolk of the three villages are, to a great extent, dependent overall on the income from capture fisheries. The decreasing catch rate over the last ten years is a matter of major concern in the three villages. Few alternative income sources are available. The population is steadily increasing and the unemployment rate among the educated youth is high. It is, therefore, important to investigate the exploitation of alternative resources further offshore and to deliver the required technology which has proved its economic feasibility for small-scale fisherfolk.

5.2 *Fishing craft selected and their gear*

Along the east coast of India, from the southern districts of Orissa in the north to Tamil Nadu in the south, three types of traditional fishing craft are predominant.

The *katiumaram* (or log raft) is in use in Tamil Nadu and in Andhra Pradesh up to the Godavari delta. It consists of five to seven logs tied together with rope. A sail is used for propulsion, but when the wind speed is insufficient, paddles/oars have to be used. After fishing, the craft is carried to the beach where the logs are untied and put out in the sun to dry. The cost of a *kattumaram* varies between Rs. 4000[6] and Rs. 10,000. The length is about 5-7 m and its weight is approximately 400-500 kg.

Nine out of the 250 *kattumaram* in Thirumullaivasal have been motorized. The 7-9 HP Evinrude kerosene outboard motor is mostly used here.

In Tummetapenta, the fishermen operate both the larger and smaller *kattumaram.* No motorization of traditional craft has taken place in this village, although some fishermen have shown interest in it.

The second type of fishing craft is the boat-type *kattumaram* locally known as *teppa.* This craft is operated along the coast between Kakinada and West Bengal. Its length is about 7-9 m and

6 US $ = I Rs. 17 (appx.) 1989/90

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it is constructed from *reyya karra* or *panugu karra* wood. The cost can be as much as Rs. 28,000, but it is usually got for about Rs. 18,000.

It is the *teppa* that is predominantly used by the artisanal fishermen in Pentakota. Sixtyseven out of 1164 *teppa* operating from this village are motorized with kerosene outboard motors or diesel longtail propulsion units. The most popular are the Lombardini diesel longtail (cost Rs. 12,000/-) and the Johnson kerosene OBM (Rs. 21,000/-). Also used are the kerosene Yamaha OBM (Rs. 18,000/-) and the Evinrude kerosene OBM (Rs. *16,500/-).* The interest of Pentakota fishermen in motorization is considerable.

The third type of traditional fishing craft, the *nava,* is operated from the Godavari delta to north Orissa by migrant Andhra Pradesh fishermen. The *nava* is a planked craft of length about 9-12 m LOA. It is used mostly for daily fishing trips. A limited number of large inboard motorized *nava* are engaged in multi-day offshore fishing.

Apart from the *kattumaram, teppa* and *nava,* the *masula* (stitch craft) and the *va/lam* (planked craft) are found in small numbers along the east coast.

Besides the traditional fishing craft, motorized introduced craft also operate in the same area. Most common among them is the trawler, which can be found all along the east coast. This craft, of length 10-Il m, is powered by a Leyland 70-85 HP engine. The cost of a trawler unit, including fishing gear, is about Rs. 300,000.

In Tamil Nadu, the fibreglass reinforced plastic (FRP) boat, also called gillnetter — as it mainly operates this type of fishing gear — can be found. This craft of 7.25 m LOA weighs *1.5* tonnes and is equipped with a 10-14 **HP** engine. Its cost is approximately Rs. 110,000.

Finally, there is the beachlanding craft (BLC), the main subject of this study. Two models are in use. The smaller IND-25 and the larger IND-20. Both BLC models are made of FRP. They are provided with a sail, crew shelter, nethold, storage place and pivoting engine box. The latter enables the craft to be landed on the beach and to have access to shallow waters.

The craft selected for this study are as follows

PENTAKOTA	:	BLC IND-20 with aircooled diesel engine **(BLC-AC)**
		BLC IND-20 with watercooled diesel engine (BLC-WC)
		Teppa with Johnson kerosene OBM (TEP-OBM)
		Teppa with Lombardini diesel longtail OBM (TEP-LONG)
		Teppa with sail only (TEP-SAIL)
TUMMELAPENTA	:	2 BLC IND-20 with watercooled diesel engine (BLC 1 & BLC 2)
		2 large *kattumaram* with sail (KAT-L1 and KAT-L2)
		1 small *kattumaram* with sail (KAT-S)
THIRUMULLAIVASAL	:	BLC IND-20 with watercooled diesel engine (BLC)
		2 FRP boats with watercooled or aircooled diesel engine (FRP1 and FRP2)
		Motorized *kattumaram* with Evinrude kerosene OBM (MOT-KAT)
		Non-motorized *kattumaram* (NM-KAT)

As several BLC with aircooled diesel engines are in use in Pentakota, this type of fishing craft has also been included in the study, although, at the time of writing, most BLCs were being delivered with watercooled diesel engines. Different *teppa* were selected in order to compare their

1. *The traditional* teppa.
2. *A motorized* teppa.
3. *The traditional* kattumaram.
4. *A motorized* kattumaram.
5. *A* kattumaram *with sail.*
6. *IND-20 with sail, the beachianding craft developed by the BOBP.*

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performances. The *nava*, which regularly operate in Pentakota, were excluded as no *nava* are permanently based there. In Tummelapenta, a selection was made from each category of fishing craft in the village; this was so in Thirumullaivasal too.

The trawler was excluded from the study, as this type of fishing craft is not considered an option for the small fisherman, its purchase requiring substantial investment. As the number of stitch boats and *vallams* operating in the different areas is small, they too were not taken into consideration.

Table l : shows the fishing gear employed by the different fishing craft selected. For fishing gear specifications see Appendix II.

Table 1: Fishing **craft selected and their fishing gear**

PENTAKOT4	*TUMMELAPENTA*	*THIRUMULLAI VASAL*
BLC-AC : — bottom drift gilinet (48 pieces) — mid-bottom drift gillnet' — bottom loneline	B1CI — bottom drift gillnet — trammelnet BLC2 — bottom drift gillnet — trammelnet	BLC — gilinet for large flyingfish (26 pieces) — drift longline (150 hooks) — trolling line (4 lines 20 hooks each) 2 lines 30 hooks each 2 lines 30R4 hooks each 4 lines l hook each — scoopnet and three pieces of small mesh — gillnets 30 mm stretched mesh for use with brush file ERPI — drift gillnet (14 pieces) — trolling line drift longline FRP2 : — bottom drift gillnet (IS pieces) — trolling line — scoopnet and gillnet for llyingfish — driftnet for Indian mackerel
BLC-WC — bottom drift gillnet (12 pieces) trammelnet (12 pieces) — hook-and-line (8/0) (1500 hooks) — hook.and-liae 11/0) (300 hooks) — hook-and-line (large) (300 hooks) — surface drift gillnet* (12 pieces) mid-bottom drift gillnet		
TEP-LONG — trammelnet (8 pieces) — bottom drift gillnet (12 pieces) — hook-and.line (1/0) (300 hooks) — hook-and.Irne (8/0) (1000 hooks) — surface drift gtllnet — rntd-bottom drtft gillnet		MOT.KAT — bottom longline (I set hooks (1/0) (2/0)) — driftnet for Indian mackerel (I net, 60 mm) — gillnet for flyingfish — scoopnet for flyingfish — driftnet for sardine
TEP.OBM : — trantrnelnet (8 pieces) — bottom drift gillnet (20 pieces) — hook-and-line (I/O) (300 hooks) — hook.and-line (8/0) (1800 hooks) — surface drift gillrtet — mid.bottom drift gillnet		
TEP.SAIL : — bottom drift gillnet (16 pieces) — trammelnet (8 pieces) — hook.and.line (8/0) (1200 hooks) — surface drift gilinet for sardine (I net) — trawlnet (1 net)	KAT.Ll : — trammelnet — monofilament gillnet — bottom set skate gilinet KAT.L2 : — trammelnet — monofilament gillnet — bottom set skate gillnet KAT-S : — trammelnet — monofilament gillnet — bottom set skate gillnet	NM.KAT — driftnet for Indian mackerel (1 net, 60 mm) — small mesh driftnet for sardine (I net, 37mm) — trammelnet for shrtmp (I net, 38-40 mm) — bottom longline

* Surface drift gillnet is the same as the bottom drift gillnet and mid-bottom drift gillnet but is used in a different manner

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6. *COMPETITION BETWEEN THE DIFFERENT TYPES OF FISHING CRAFT*

One of the justifications for the introduction of the BLC, and motorized and mechanized fishing craft in general, is that these fishing craft enable fishermen to exploit alternative fish resources further offshore, thereby lessening pressure on the resources fished by the non-motorized, traditional fishing craft operating inshore.

To investigate whether such exploration of alternative fish resources is practised in reality by motorized fishing craft and to get an idea about the present competition between different categories of fishing craft operating at each location, the following were studied

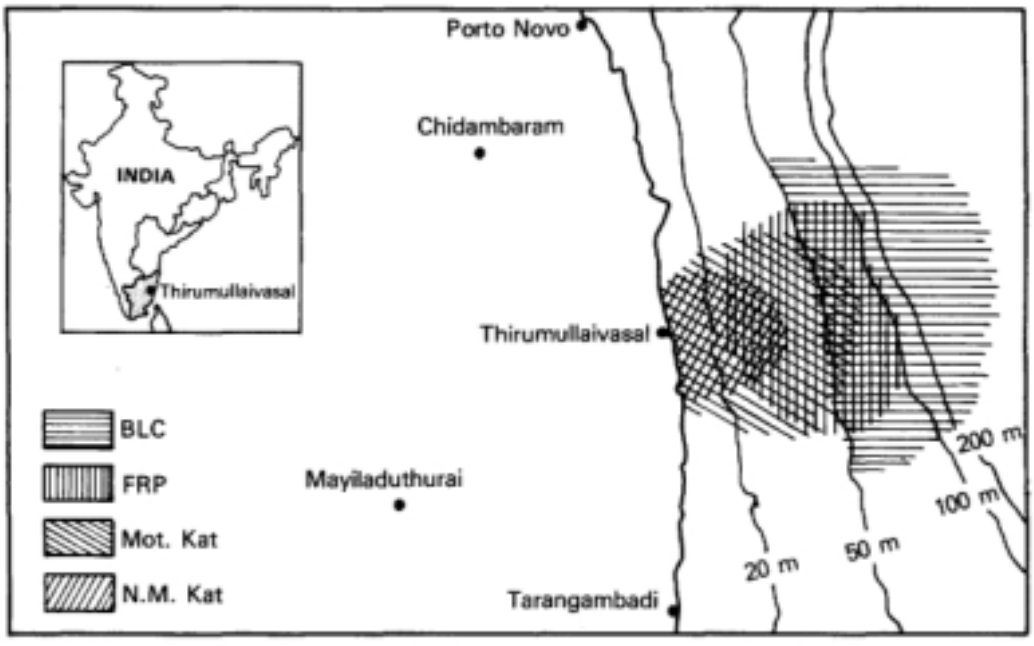
- Data on the area of fishing operations according to depth of the fishing grounds and their distance from the fishing centre.
- Data on the timing of the fishing operations.
- Information on the different types of fishing gear used by each category of fishing craft.
- Data on species caught and the average price received on marketing (as an indication of the size of fish caught).

The discussion below is limited to the issue of direct competition in the fishing operations and does not claim to examine the deeper issue of interaction between the operations and the resource as a whole.

6.1 *Area of fishing operations*

At the time of data collection, information was gathered on the depths of the fishing grounds where the respective fishing craft were operating, as well as on the distance travelled to reach the fishing grounds. The data collected is found in Appendix III. The findings on the area of operation, craftwise, are shown in the maps included in this report. Figure 3 (see below) shows that most of the fishing operations undertaken by the BLC in Thirumullaivasal take place at depths of 50-100 m during 29 per cent of the fishing trips and at a depth of over 200 m during 50 per cent of the fishing trips, thereby partially overlapping the fishing activities of the FRP boats whose main

Fig. 3 Area of fishing operations craftwise, Thirumullaivasal (TN)



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fishing grounds are at depths of 30-100 m (during 61 per cent of their fishing trips) and 50-100 m (during 38 per cent of their trips). The FRP boats, in turn, operate partially in the same area as the motorized *kattumaram* and the non-motorized *kattumaram* when they fish at depths of *30-50* m. The motorized *kattumaram* compete with the non-motorized *kattumaram* in the area between 10 m and 30 m depth. It appears that only the non-motorized *kattumaram* and the BLC fish exclusive areas. For the NM-KAT, this is at depths of 0-20 m southeast of the village, where 66 per cent of their fishing operations take place, while the BLCs' exclusive area is beyond 200 m.

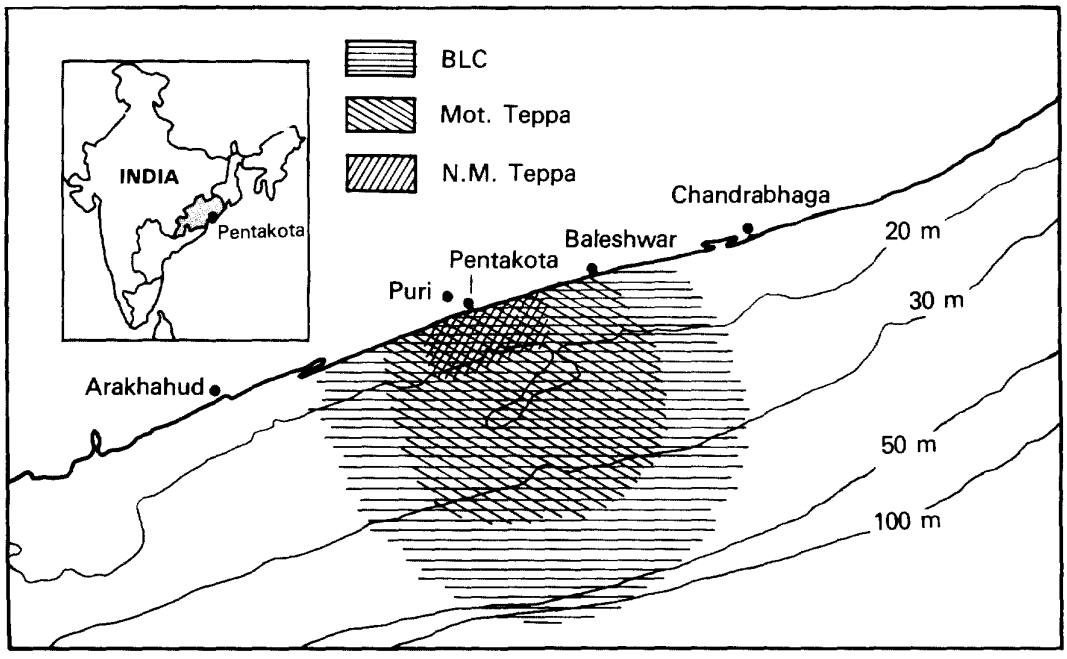
It is remarkable that, in some cases, motorized *kattumaram* venture beyond a depth of 200 m. The FRP boats do not fish in this area due to the limitations posed by the use of gillnets, which are targetted mainly at seerfish.

The second table in Appendix III relates to Figure 4 (see below), the fishing operation in Pentakota near Pun (Orissa). During the months May-July, the BLC go back to their 'home village', Pentakota, in Andhra Pradesh. At the beginning of August, they return to Orissa.

The BLC operating from both locations show a tendency to fish further from the village, though not always further offshore; they definitely do not venture out further than the motorized *teppa.* By fishing further from the village, rather than further offshore, they enter the fishing grounds of neighbouring villages, as was also brought up in a discussion with fishermen during a visit to Moto-Arakhakud. Although competition, and perhaps conflict, within the village may be avoided, friction between villages can be caused by this type of operation. The fact that the fishermen of Moto-Arakhakud did not raise any objections might be due to the fact that, for a large part of the year, they derive their income from fishing in the Chilika Lake. The fishermen of Chandrabhaga, east of Pentakota, also had few objections, as they are migrant fishermen from the same villages in northern Andhra Pradesh as the fishermen of Pentakota. They are also candidates for the next batch of BLC to be distributed under a subsidy scheme.

It can be said that the area of operation of the BLC is different from the area of operation of the non-motorized *teppa* from the same village, but overlaps that of the non-motorized *teppa* from other villages (74 per cent of their fishing operations take place at a depth between 0-20 m). Further, their area of operations is partly the same as that of the motorized *teppa.* Twentyfour per cent of the fishing operations of the BLC and 25 per cent of the fishing operations of motorized *teppa* are carried out at depths of 30 to 50 m. Their area of operation also largely overlaps that of the

Fig. 4 Area of fishing operations craftwise, Pentakota (Orissa)



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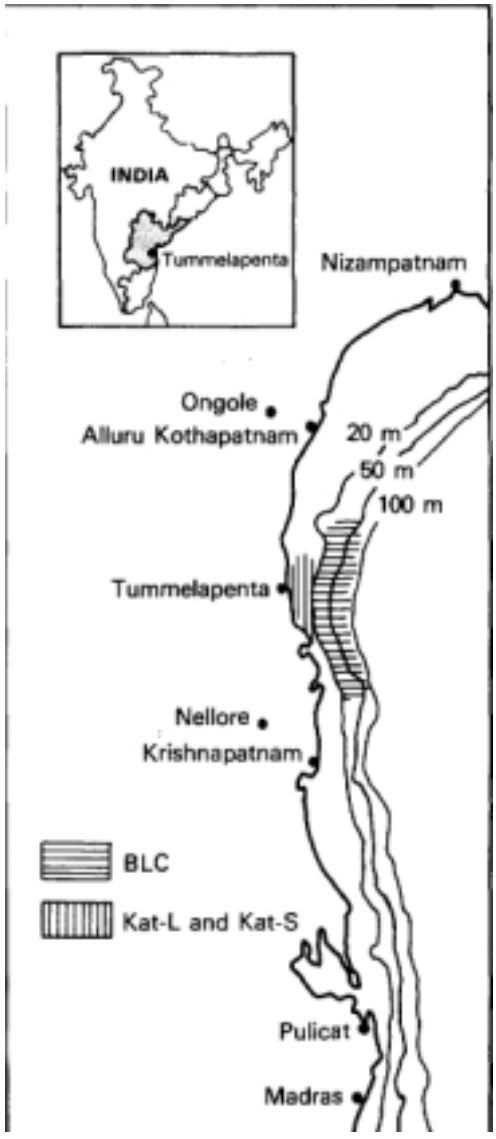
teppa-sail. Fiftyfour per cent of the fishing trips are made to the area 0-20 m depth. Most of the operations of teppa-sails take place in this area (87 per cent). The conclusion, therefore, is that the **BLC** in Pentakota (Orissa) do not operate in an exclusive zone, The way the BLC from Thirumullaivasal do to some extent. Only two per cent of their fishing trips go beyond 50 m depth.

In Tummelapenta, both categories of *kattumaram* and the BLC fish exclusive areas. Although 90 per cent of the fishing operations of the BLC and 32 per cent of the operations of the *kattumaram* take place at depths of 10-50 m, the BLC operate at a distance of 10-20 km from the village, while the *kattumaram* hardly venture beyond 2.5 km from the shore. As in Pentakota (Orissa), the BLC travel longer distances but not in an offshore direction. In Krishnapatnam and Pakal, the BLC follow the same pattern. The major part of the fishing operations of the *kattumaram* takes place at depths of 0-10 m (68 per cent), extending from the shore directly in an eastern direction (See Figure 5, below).

Fig. 5 Area of fishing operations craftwise, Tummelapenta (A.P)



6.2 *Timing of the fishing operations*

The motorized and non-motorized *kattumaram* in Thirumullaivasal depart around 4 or 5 a.m. and return around 9 or 10 a.m. The fishing trips of the non-motorized *kattumaram* are about two hours shorter than those of the MOT-KAT.

In Pentakota, the motorized and non-motorized *teppa* leave around 5 or 6 a.m. and return between noon and 2 p.m. The trips of the motorized *teppa* are about two or three hours longer than those of the non-motorized fishing craft.

In Tummelapenta, the duration and timing of fishing operations do not show a consistent pattern.

It can be said that the traditional craft fish in the early hours of the morning, whereas the BLC go out night fishing, leaving between 11 a.m. and 4p.m., depending on the season, and returning at 8 a.m. the following day. The same applies to the FRP boats. It is only during the months of June and July that the BLC in Tummelapenta directly compete with the traditional craft by fishing for prawn during the day. It is during July that the BLC migrate and. start operating from Pakal and Krishnapatnam.

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6.3 *Types offishing gear used*

Table 2 shows the fishing gear that contribute to the major income of the fishing craft.

Table 2 : **Actual fishing gearwise, by total earnings per fishing craft for one year's operations (Indian Rupees)**

PENTAKOTA

GEAR	*BLC.AC*	*BLC.WC*	*TEP-LONG*	*TEP-OBM*	*TEP-SAIL*
Bottom drift gillnet	51,425	51,675	—	—	—
Drift longline	300	1,290	32,930	37,440	—
Trolling line	—	—	—	—	—
Gillnet for llyingfish	—	—	—	—	—
Scoopnet with brush pile	—	—	—	—	—
Driftnet for Indian mackerel	—	—	—	—	—
Bottom longline	—	—	—	—	—
Driftnet for sardine	—	—	—	—	—
Trammelnet	—	—	910	—	685
Mid-bottom drift gillnet	1,105	1,465	5,475	995	16,972
Surface drift gillnet	—	—	1,000	450	3,665
Trawlnet	—	—	—	—	7,555
Monofilament gillnet	—	—	—	—	—
Bottom set skate gillnet	—	—	—	—	—
Total	52,830	54,430	40,315	38,885	28,877

TUMMELAPENTA

GEAR	*BLCI*	*BLC2*	*KAT-LI*	*KAT-L2*	*KAT-S*
Bottom drift gillnet	11,741	18,328	—	—	—
Drift longline	—	—	—	—	—
Trolling line	—	—	—	—	—
Gillnet for flyingfish	—	—	—	—	—
Scoopnet with brush pile	—	—	—	—	—
Driftnet for Indian mackerel	—	—	—	—	—
Bottom longline	—	—	—	—	—
Driftnet for sardine	—	—	—	—	—
Trammelnet	3,000	8,535	5,570	5,005	5,785
Mid-bottom drift gilinet	—	—	—	—	—
Surface drift gillnet	—	—	—	—	—
Trawlnet	—	—	—	—	—
Monofilament gillnet	—	—	3,425	3,400	3,280
Bottom set skate gillnet	—	—	9,868	8,774	8,743
Total	14,741	26,863	18,863	17,179	17,808

THIRUMULLAIVASAL

GEAR	*BLC*	*FRPI*	*FRP2*	*MOT.KAT*	*NM.KAT*
Drift gillnet	42,582	15,292	37,434	—	—
Drift longline	44,385	600	—	—	—
Trolling line	19,408	2,615	330	—	—
Gillnet for flyingfish	22,270	500	7,976	20,185	—
Scoopnet with brush pile	11,696	—	—	—	—
Driftnet for Indian mackerel	—	2,247	400	17,52!	13,583
Bottom longline		2,061	—	2,450	9,550
Driftnet for sardine				1,955	140
Trammelnel	—	—	—	—	—
Mid-bottom drift gillnet	—	—	—	—	—
Surface drift gillnet	—	—	—	—	—
Trawlnet	—	—	—	—	—
Monofilament gillnet	—	—	—	—	—
Bottom set skate gillnet	—	—	—	—	—
Total	140,34!	23,315	46,140	42,111	23,273

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Unfortunately, the data collected on fishing gearwise catch for Thirumullaivasal could not be used as too many different fishing gear combinations per fishing trip were recorded. However, figures on gearwise catch could be retrieved from a different source. The BLC from Thirumullaivasal gets the bulk of its catch from four gear – the drift gillnet, drift longline, trolling line and drift gillnet for flyingfish. The remainder is caught by the scoopnet with brush pile. The drift longline, trolling line and brush pile are seldom or never used by the other fishing craft. By using the drift gillnet, the BLC directly competes with the FRP boat, as it also operates partly in the same fishing area during the same fishing times. The drift gillnet for flyingfish is used both by the MOT-KAT and the BLC. None of the fishing gear used by the BLC are used by the NM-KAT. In those cases where different craft make use of the same type of fishing gear, the mesh sizes often differ (See Appendix II)

In Pentakota, the BLC receive almost 100 per cent of their earnings from the bottom drift gillnet, a gear not in use by traditional craft. As the motorized *teppa* get most of their catch with the bottom drift longline, which is not used by the TEP-SAIL, these craft do not seem to be competing, at least not on account of fishing gear.

In Tummelapenta, the BLC derive their major income from the large mesh drift gillnet. They compete with traditional craft during the shrimp season by using the trammelnet. The monofilament gillnet and the bottomset skate gillnet are used only by the *kattumaram.*

6.4 Species composition of catch

The species composition of the catch for each type of fishing gear has not been recorded.

Table 3 (opposite) lists the species caught by each type of fishing craft in the three villages. The predominant species caught are marked with a double xx. They constitute the bulk of the total catch for the specific fishing craft in terms of weight and value. (See also Appendix IV.)

In none of the three locations is the catch composition of the BLC similar to that of the non-motorized traditional craft.

There is an overlap between the target (species seaperch, trevally, catfish and shark) of the BLC and that of motorized *teppa* in Pentakota. Both BLC and FRP boats target tuna, seerfish and flyingfish among other species in Thirumullaivasal. Small flyingfish are also caught by the motorized *kattumaram* there.

In Pentakota, the average price received per kilo for trevally is higher for the BLC than for other types of fishing craft (See Appendix IV). This might indicate that the BLC catch larger fish. The same is not applicable to seerfish, catfish and shark also caught by the motorized ***teppa.***

The average price/kg of seerfish, tuna and flyingfish caught by the different fishing craft in Thirumullaivasal is within the same range.

It can, therefore, be concluded that competition exists to a certain extent in the two locations between BLC, FRP boats and motorized traditional craft.

In Tummelapenta, the sole species caught by all fishing craft is shrimp. The average price/kg is in the same range. The different categories of fishing craft must all be tapping the same resource.

Table 3 Species composition of catch, by craft

PENTA](OTA	*SPECIES*	*CRAFT:*	*BLC-AC*	*BLC- WC*	*TEP-LONG*	*TEP-OBM*	*TEP.SAJL*
	Seaperch		xx	xx	xx	xx	
	Hilsa		x				
	Bullish		x	x	x	x	x
	Trevally		x	x x	x x	x x	x x
	Pomfret		x	x		x	x
	Seerfish		xx	xx	x	x	x
	Catfish		xx	x	xx	xx	x
	Tuna		x				x
	Shark		xx	xx	x	xx	x
	Ribbonfish			x	x		x x
	Sciaenids		x	x	x x	x	x x
	Shrimp			x	x	x	x
	Silverbelly					x	x
	Eel			x			
	Anchovy				x	x	xx
	Indian mackerel						x
	Ray						
	Late						
	Sardine						
	Flyinglish						
	Queenfish						
	Others						

Note : x x — Predominant species
x — Other species

TUMMELAPENTA	*SPECIES*	*CRAFT:*	*BLCI*	*BLC2*	*KA T-LI*	*KA T-L2*	*KAT.S*
	Seaperch		x	x			
	Hilsa						
	Billfish						
	Trevally		x	x	x	x	x
	Pomfret		x	x	x		
	Seerfish		xx	xx			
	Calfish		xx	xx			
	Tuna		x	x			
	Shark		xx	xx			
	Ribbonltsh				x	x	x
	Sciaenids						
	Shrimp		xx	xx	xx	xx	xx
	Silverbelly				x	x	x
	Eel			x			
	Anchovy				xx	xx	xx
	Indian mackerel		x	x	x x	x x	x x
	Ray		x	x			
	Late			x			
	Sardine				x	x	x
	Flyingfish						
	Queenfish						
	Others		x	x	x	x	x

Note : x x — Predominant species
x — Other species

THIRUMULLAIVASAL	*SPECIES*	*CRAFT:*	*BLC*	*FRPI*	*FRP2*	*MOT-KA T*	*NM-KA T*
	Seaperch						
	Hilsa						
	Billfish		x		x		
	Trevally						
	Pontfret				is		
	Seerlish		xx	xx	xx		x
	Catfish			x			
	Tuna		xx	xx	xx		x
	Shark		xx	x	x	x	
	Ribbonfish						
	Sciaenids						
	Shrimp					x	x
	Silverbelly						
	Eel						
	Anchovy						
	Indian mackerel			x		x x	x x
	Ray						
	Late						
	Sardine					x	x x
	Flyiugfish		x x	x	x x	x x	
	Queenfish		x				
	Others		x	xx	xx	x	xx

Note : x x — Predominant species
x — Other species

<<

6.5 Conclusions

In Thirumullaivasal, there is no direct competition between the BLC and non-motorized traditional craft in respect of the area of operation, fishing times, types of fishing gear used and species caught.

The BLC, as well as a few MOT-KAT, target large flying fish during the season. Since this fishery has been promoted by the BLC demonstration, it can be considered an unexpected benefit of the project. The competition between the FRP boats and the BLCs' in the fishing area 50-100 m depth with the same type of gear cannot be considered too serious, as this is not the major fishing area of the BLC. The BLC have proven to be a viable alternative to FRP boats. They are safer, more fuel-efficient, beachable, more comfortable and, not least, acceptable to fishermen.

There is no direct competition between the BLC and non-motorized traditional craft in Pentakota within the village's fishing limits, but BLC operations interfere to a limited extent with traditional artisanal fisheries of neighbouring villages. This interference is not serious in view of differences in fishing times, types of fishing gear and target species, but it could lead to inter-village friction at a later date. This, together with the fact that the BLC partially compete with the motorized *teppa* in respect of fishing grounds, fishing gear and species, makes it worthwhile to investigate the future of BLC fishing at the edge of the shelf or beyond it, as carried out in Thirumullaivasal. Such fishing will require only a small increase in running costs for the BLC, as it is not far from the fishing grounds where the BLC at present constitute 24 per cent of the operations.

Since the BLC owners and crew would be reluctant to give up their lucrative seerfish fishing, this fishing operation should be of a complementary nature. It should coincide with the introduction of new fishing gear and marketing studies for the new target species. Trials should be undertaken to assess its economic viability.

From observations and average prices received for fish in the Tummelapenta area, it can be said that the size of seerfish, catfish and shark caught here is relatively small. This is because the BLC operate too close to the shore and use too small mesh drift gillnets. These fishermen are hesitant to venture further offshore. The fact that they are operating in a cyclone-prone area may contribute to this attitude. That many trawlers in this area operate close to shore, interfering directly with local fisheries and causing destruction of fishing gear, could be another reason. Although the BLC do not directly clash with the operations of traditional craft, as fishing times, fishing grounds, fishing gear and target species are different, it would be in their own interest to operate further. offshore. The traditional craft too seldom fish beyond *2.5* km from the shore. They too might benefit by going further offshore.

In summary, it can be concluded that the BLC, except in Thirumullaivasal, which is a special case, are not operated to their full potential. Fishing further offshore and diversification of fishing gear should be promoted.

7. *MARKETING*

There are in the three villages two main ways in which fish is marketed. It is either sold by open auction to traders who come to the beach at the time the catch is brought ashore or it is sold by prior agreement at a fixed price.

Table 4 shows the marketing arrangements. In Pentakota, almost all fish caught by the different types of fishing craft is sold by auction. In the few cases in which the fish is sold by agreement, the catch is mainly shark. This shark is sold to a processor/trader from Kerala who salt-dries it after cutting it into pieces and transports it to Kerala by truck.

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Table 4 : Marketing of fish, by craft and fishing trips

PENTAKOTA	*SPECIES*	*CRAFT:*	*BLC-AC*	*BLC-*	*TEP-LONG*	*TEP-OBM*	*TEP-SA IL*
					No. of fishing trips		
	Openauction		88	110	IIt	94	149
	Agreement		I			7	—
	Total		89	110	IIt	tOt	149

TUMMELAPENTA	*SPECIES*	*CRAFT:*	*RLCI*	*BLC2*	*KAT-LI*	*KA T-L2*	*KA T-S*
					No. of fishing trips		
	Open auction		—	—	20	22	23
	Agreement		71	95	131	126	118
	Total		71	95	51	148	141

THIRUMULLAIVASAL	*SPECIES*	*CRAFT:*	*BLC*	*FRPJ*	*FRP2*	*MOT-KOT*	*NM-KA T*
					No. of fishing trips		
	Open auction		186	79	101	64	140
	Agreement		8	13	16	56	72
	Total		194	92	117	120	212

In Tummelapenta, the catch is mostly sold by agreement — 100 per cent in the case of BLC. In the case of 29 per cent of the landings of the traditional craft, the catch is held over for processing (drying or salting) by family members of the owner or labourers employed for this purpose (see Table *5).*

Table 5 : Form of disposal of fish in Tummelapenta, by craft and fishing trips

	BLC1	*BLC2*	*KAT-L1*	*KAT-L2*	*KAT-S*
			No. of fishing trips		
Fresh	71	95	99	109	103
Salted	—	—	5	6	5
Dried	—	—	47	33	33
Total	7!	95	151	148	141

The BLC dispose of all their catch in the fresh form. During most of the year they migrate to other fishing centres and, therefore, lack any processing infrastructure of their own.

Tummelapenta, which is smaller than the other two villages and relatively isolated, lacks proper infrastructure for marketing of fish. The traders live in the market town of Kavali (10 km away) and cover several villages in the region. To organize the purchase of fish, they have appointed four agents in Tummelapenta. The latter purchase fish, mainly by agreement involving a fixed wage (200 - 300 Rs/month). When there are large catches, they inform the traders who then attend to the buying themselves.

In Thirumullaivasal, in the case of 39 per cent of the landings by traditional motorized and non-motorized craft, the catch is sold by agreement, while for the introduced fishing craft this is true only in nine per cent of the cases.

Most of the fish is sold to four local traders. Sardine and mackerel are sold for a fixed price. Shark, tuna, seerfish and billfish are sold mainly by agreement. Other species are sold by auction. Fish traders bid against each other, but when there's a good catch, they often join together and bargain with the fishermen for lower prices.

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It is generally assumed that fish sold by agreement fetches a lower price than that sold by auction. It is true that in Tummelapenta, where most of the fish is sold by agreement, the prices are relatively low (see Table 6 opposite). Catfish, tuna, shark, shrimp and trevally fetch poor prices compared to the average price for these species in the other two villages. It can, however, be assumed that since both categories of craft do not venture further offshore (see Section **6), smaller-sized fish** are caught here fetching lower prices. Species such as anchovy and seaperch fetch slightly higher prices here than in Pentakota.

In Thirumullaivasal, seerfish and catfish fetch a high price, while the price received for shrimp is low. The remarkably high average price received for shrimp in Pentakota is due to the presence of the high-value tiger prawn in the catches.

It is not possible to discern a consistent pattern between the marketing system and the average price of fish. It must be concluded that differences in price are caused by differences in sizes of fish caught. This argument is supported by the fact that the fishing distance from shore is different for the various categories of fishing craft. It should also be mentioned that the wholesale market destinations are more or less the same. Fish is sent from all three locations to Madras, Bangalore and Kerala. It is only from Pentakota that fish is also sent to Delhi and to the Howrah market in Calcutta.

8. *ANAL YSIS OF PERFORMANCE*

This section discusses the economic feasibilty of the commercial operations of the BLC in the three areas and makes comparisons with the performances of the traditional craft and other types of introduced fishing craft in the area. In making this analysis, however, such factors as the fish resources available for exploitation in each location and the width of the continental shelf, which could also affect comparative economic performance, have not been taken into account. The different types of fishing craft and gear have already been described in Section 5.

8.1 *Economic analysis*

Two different calculations of the Internal Rate of Return (IRR) of each fishing operation have been made. The first calculation is based on the current investment cost for each unit. The second calculation is based on the actual investment cost, taking into account

(i) subsidy schemes for fishing craft, fishing gear and engine, and

(ii) second-hand purchase. (The FRP 1 and FRP 2, as well as the BLC-AC and TEP-OBM operating from Pentakota, have been purchased second-hand.)

The TEP-LONG and TEP-OBM owners received a subsidy of Rs. 3000/- and Rs. 7500/- respectively to purchase outboard motors. The owners of the BLC1 and BLC2 received a 50 per cent subsidy for each unit under the National Cooperative Development Corporation (NCDC) scheme. The ***kattumaram*** in Tummelapenta were bought with a 25 per cent subsidy under the development project of AFCOF.

The BLC-WC was constructed in Pun, cheaper non-marine plywood being used initially. The material had to be replaced with marine plywood, resulting in an additional expenditure of Rs. 40,000.

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Table 6: Average fish prices (Indian Rupees), by craft

PENTAKOTA	*SPECIES*	*CRAFT:*	***BLC***	***MOT-TEP***	*NM-TEP*
	Seapench		8.43	7.98	—
	Hilsa		9.41	—	—
	Billfish		5.94	6.38	6.42
	Trevally		9.12	5.43	5.21
	Pomfret		7.66	6.67	6.82
	Seerfish		10.02	9.50	6.00
	Catlih		6.40	5.98	6.00
	Tuna		7.03	—	3.64
	Shark		6.08	5.35	4.89
	Ribbonfish		7.00	5.78	3.09
	Sciaenids		7.40	6.15	6.28
	Shrimp		90.00	150.00	47.32
	Silverbelly		—	1.33	3.00
	Eel		7.50	-	-
	Anchovy		—	2.50	**4.14**
	Indian mackerel		—	—	4.00
	Ray		—	—	—
	Late		-	-	-
	Sardine		—	—	—
	Flyingfish		—	—	—
	Queenfish		—	—	—
	Others		-	-	-

TUMMELAPENTA	*SPECIES*	*CRAFT:*	*BLC*	*NM-LIT*
	Seaperch		9.40	—
	Hilsa		—	—
	Biflfish		—	—
	Trevally		4.25	3.66
	Pomfret		10.00	10.00
	Sees-fish		10.00	—
	Catfish		3.06	—
	Tuna		3.22	—
	Shark		3.69	—
	Ribbonfish		—	4.17
	Sciaealds		-	-
	Shrimp		51.80	58.45
	Silverbelly		—	3.85
	Eel		5.04	-
	Anchovy		—	5.16
	Indian mackerel		3.04	3.10
	Ray		2.00	—
	Late		10.00	—
	Sardine		—	**4.91**
	Flyingfish		—	—
	QueenIish		—	—
	Others		1.42	2.41

T1URUMULLAIVASAL	*SPECiES*	*CRAFT:*	*BLC*	*FRP*	*MOT-KAT*	*NM-LIT*
	Seaperch		—	—	—	—
	Hilsa		—	—	—	—
	Billfish		3.37	5.00	—	—
	Trevally		—	—	—	—
	Pomfret		—	10.00	—	—
	Seerfish		18.66	18.43	—	8.70
	Catfish		—	16.67	—	—
	Tuna		4.10	3.48	—	—
	Shark		7.85	8.15	7.74	—
	Ribbonfish		—	—	—	—
	Sciaenids		—	—	-	—
	Shrimp		—	—	35.00	36.42
	Silverbelly		—	—	—	—
	Eel		-	-	-	-
	Anchovy		—	—	—	—
	Indian mackerel		—	3.00	5.63	7.19
	Ray		-	-	-	-
	Late		—	—	—	—
	Sardine		—	—	4.17	3.30
	Flyingfish		3.79	3.98	3.01	—
	Queenfish		2.50	—	—	—
	Others		4.06	5.26	3.63	3.71

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The MOT-KAT, NM-KAT and TEP-SAIL were bought new, without any subsidy. The BLC is owned by BOBP and operated by local fishermen. The data are presented in Table 7 (see facing page).

Almost all figures in Table 7 are based on data collected over a one-year period, except for the craft in Pentakota for which only 11 months data were available. A projection has been made for a one-year period in order to assess comparative performance. The BLC1 operating from Tummelapenta was destroyed in the cyclone of November 1989. A projection has been made for this craft for a one-year period by calculating average monthly earnings and costs on available data multiplied by 12. This method, of course, does not take into consideration seasonal fluctuations.

The gross revenue is the total amount earned by the sale of fish.

The variable costs represent the amount spent on diesel, kerosene, lubricating oil, food, bait, ice, repairs and maintenance, crew share and other costs as appropriate. For the traditional craft in Tummelapenta, no variable costs were reported, as no repairs took place, no money was spent on food (since these craft go out only on short fishing trips), there were no fuel costs and the units were family operated.

The fixed costs represent the amount for depreciation and insurance.

The net earnings are the gross revenue less variable operating costs and fixed costs.

The IRR is the internal rate of return.

The break-even point is the variable operating costs plus the fixed costs (equal to total costs) and is the minimum amount that needs to be earned to cover all expenditure on operation and investment.

The B/C ratio is the benefit/costs ratio, representing the total revenue divided by the total costs.

The data in Table 7 show that the B/C ratio of the BLC-AC is just above 1, indicating that the earnings of this fishing craft are just sufficient to cover the costs, leaving little profit to the boat-owner. The fact that the owner gets a crew share irrespective of whether he goes out fishing or not may be the reason why he continues the operations.

Although the gross revenue of the BLC-AC and BLC-WC are almost equal, the BLC-WC is more viable in terms of IRR than the BLC-AC. The main reason for this difference in economic performance is the much higher variable costs of the BLC-AC. The data collected indicate higher costs on repairs and maintenance (Rs.7,555 and Rs. 169 for BLC-AC and BLC-WC respectively), while the amounts spent on crew share are also different (Rs. 15,273 and Rs. 6,360). (See Appendix V)[7].

The .BLC at Pentakota (Orissa)

7. Reasons **for differences in payment to crew are discussed in** Section **9.**

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Table 7 : Data on economic performances of fishing craft (in IRs)

	PENTAKOTA		TUMMELAPENTA		THIRUMULLAIVASAI.
BLC	*BLC-AC*	*BLC-WC*	*BLCI*	*BLC2*	*BLC*
Gross revenue	57633	59378	23586	26,863	140,341
Variable costs	30,398	6,525	11,170	9,585	80,350
Fixed costs	26,225	25,125	26,225	26,225	28,088
	23,600	24,010	20,113	20,113	28,088
Net earnings	1,010	17,728	(13,809)	(8,974)	31,903
	3,635	18,843	7,697	(2,835)	
IRR		23%		(11%)	38%
	9%	23%	(17%)	(6%)	
Breakeven point	56,623	41,650	37,395	35,810	108,438
	53,998	40,535	31,283	29,698	
B/C ratio	1.02	4.43	0.63	0.75	.28
	1.08	1.46	0.75	0.90	

FRPBOAT	*FRPI*	*FRP2*
Gross revenue	23,315	46,140
Vartable costs	13,707	24,593
Fixed costs	23,833	23,833
	24,167	22,807
Net earnings	(14,225)	(2,286)
	(14,559)	(1,260)
IRR	(32%)	(6%)
	(104%)	(4%)
Breakeven point	37,540	48,426
	37,874	47,400
BC ratio	0.62	0.95
	0.62	0.97

Motorized artisanal craft

	PENTAKOTA		TUMMELAPENTA	TIIIRUMULLAIVASAL
	TEP-LONG	*TEP-OBM*		*MOT-KAT*
Gross rexenue	43,980	43,358		42,111
Variable costs	30,542	29,204		29,368
Fined costs	9,335	12,410		8,333
	8,285	13,077		
Net earnings	4,103	1,744		4,410
	5,153	1,077		
1RR	22%	7%		36%
	28%	6%		
Break-even potne	39,877	41,614		37,704
	38,827	42,281		
BC ratio	1.1	1.04		1.2

Non-motorized artisanal craft

	PENTAKOTA	TUMMELAPENTA		THIRUMULLAIVASAL	
	TEP-SAIL	*KA T-LI*	*KA T-L2*	*KA T-S*	*NM-KA T*
Gross revenue	31,502	18,864	17,179	17,809	23,273
Variable costs	14,929	11,318	10,307	10,685	14,911
Fixed costs	8,842	4,117	4,117	4,117	3,833
		3,033	3,033	3,033	
Net earnings	8,091	3,429	2,755	3,007	4,529
		4,513	3,839	4,090	
IRR	54%				100%
Breakeven point	23,411	*15,435*	14,424	14,802	18,744
		14,351	13,340	13,718	
BC ratio	1.35	.2	1.2	.2	1.24
		1.3	1.3	1.3	

NOTE * KAT-LI, KAT-L2 and KAT-S in Tummelapenta are family operated and there is no official' crewshare. To project these costs the following share dixiston from other areas has been assumed Gross revenne minus operating costs divided by five shares (two shares to boat-owner, and three to crew)

NB. For fixed costs., net earnings, IRR, breakeven point and B/C ratio, two figures per fishing craft are given. The first figure is calculated on the basis of the present investment costs per fishtng unit, The second figure represents the actual investment made, taking into account subsidies and secondhand purchase. The latter also means a different service life, so that loner fixed costs do not produce a higher IRR, because of increased depreciation *(e.g.* in the case of TEP-OBM(.

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Table 8: Reasons for not going out fishing

PENTAKOTA	*Reasons* *CRAFT:*	*BLC-AC*	*BLC-WC*	*TEP-LONG*	*TEP-OBM*	*TEP.SAIL*
	Crafirepair	—	—	—	—	**2**
	Fishing gear repair	—	2	1	3	4
	Engine repair	95	2	72	123	—
	Bad weather	97	102	101	57	104
	Festival	14	16	11	14	IS
	Weekly holiday	2	1	19	19	26
	Poor catches	24	82	10	7	24
	Otherreasons	8	**14**	**4**	5	**5**
	No. of non-fIshing days	240	**219**	**218**	**228**	**1$**
	No. of fishing days	89	110	Ill	101	149
	Total no. of days	**329**	329	329	329	329

TUMMELAPENTA	*Reasons.* *CRAFT:*	*BLCI*	*BLC2*	*KAT-LI*	*KAT-L2*	*KAT-S*
	Craft repair					
	Fishing gear repair	16	5		I	4
	Engine repair	4	39			
	Bad weather	22	91	122	125	119
	Festival		4			
	Weekly holiday					
	Poor catches	112	122	88	85	95
	Otherreasons	3	9	4	6	6
	No. 0f non-fishing days	157	270	**214**	**217**	**224**
	No. of fishing days	7!	95	151	148	**141**
	Total no. of days					

THIRUMULLAIVASAL	*Reasons* *CRAFT:*	*BLC*	*FRPJ*	*FRP2*	*MOT-KA T*	*NM-KA T*
	Craft repair	I	14			
	Fishing gear repair	2	4	4		2
	Engine repair	53	16	14	10	
	Bad weather	38	43	43	24	34
	Festival	14	14	14	14	14
	Weekly holiday	36	38	38	37	39
	Poor catches	5	91	70	36	44
	Other reasons	22	53	65	124	19
	No. of non-fishing days	**171**	**273**	**248**	**245**	**152**
	No. of fishing days	194	92	117	120	213
	Total **no. of** days	365	365	365	365	365

Note I : The total number of days for Pentakota are 329 because the data were only available over the period December 5, 1988 — October 31, 1989, while on February 28 and 29, 1989 the questionnaires were not filled **out.**

Note 2: The BLC I was destroyed during the cyclone of November 8, 1989. Data collection for this craft took place over the period March 18, 1989– October 31, 1989.

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Repairs on the air-cooled diesel engine also led to loss of a large number of fishing days for the BLC-AC (see Table 8, facing page). The difference in the total number of fishing days between the two fishing craft is, however, not very big because the owner of the BLC-AC, unlike the BLC-WC owner, seemed to be prepared to make up the loss in fishing days by going out fishing even when poor catches were expected (see Table 8).

Both calculations made for BLC1 and BLC2 (with and without subsidy) indicate that their present operations are not economically viable. The low gross revenue achieved by the two fishing craft, in combination with the total number of fishing days (which do not significantly differ from that of the BLC-AC and BLC-WC) and the large number of fishing days lost due to poor catch, raises the suspicion that resources are scarce in the area of operation of BLC1 and BLC2. This seems to be confirmed by the longer average duration of a fishing trip of BLC1 and BLC2 compared to one of the BLC-AC and BLC-WC (see Table 9).

Table 9 : **Average duration** of fishing **trips and fishing time per fishing trip, fishing** craftwise

LOCA TION	*FISHING* CRAFT	*A VERAGE DURATJON FISHING TRIP (HOURS)*	*A VERAGE FISHING TiME PER TRIP (HOURS)*
PENTAXOTA	BLC-AC	17.8	10
	BLC-WC	17.9	9.5
	TEP-LONG	8.6	5
	TEP-OBM	9.2	5.5
	TEP-SAIL	7.5	5
TLJMMELAPENTA	BLC1	13.9	11
	BLC2	13.7	11
	KAT-LI	6.2	5.5
	KAT-L2	6.4	5.5
	KAT-S	6.2	5.5
THIRUMULLAIVASAL	BLC	14.4	8
	FRPI	10.5	7
	FRP2	12.1	9
	MOT-KAT	6.6	4
	NM.KAT	5	3

The use of only two types of fishing gear by BLCI and BLC2 and the fact that their fishing operations take place close to shore, where only smaller fish are present, has been mentioned in Section 6.

The **BLC** operating from Thirumullaivasal should be considered as a special case since this operation was conducted as a trial project under the BOBP and the Directorate of Fisheries, Tamil Nadu, and received guidance and support services of subproject staff. Initially, it faced technical problems arising out of a new type of water pump for the engine and this caused loss of fishing days (see Table 8). These technical problems have since been solved.

BOBP has withdrawn its support and monitoring services. It is up to the local fishermen to confirm the positive results of the first year during a second year of fishing operations. The trials carried out so far have proved that the operation of the BLC for offshore fishing, targetting mainly tuna, shark and flyingfish, can be economically viable, and should be promoted, as this type of fishing does not interfere with the non-motorized traditional fisheries in the area (see Section 6).

The economic performance of the FRP boats is very poor. The main reason for their not going out fishing is poor catch (see Table 8). These fishing craft mainly employ one type of fishing gear, the gillnet. The result is a low overall gross revenue of the same range as that of the MOT-KAT. The gross revenue of the latter, however, is sufficient to make its operation economically feasible, as its depreciation costs are much less than those of the FRP boats (see Table 7).

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The FRP boats, however, continue to operate, probably because the owners do not repay the full instalments due on their loans.

The gross revenues of the TEP-LONG and TEP-OBM are higher than those of the MOT-KAT, although in economic terms their performance is not as godd (as is shown by the **IRR figures and** B/C ratios of the respective fishing craft). This is mainly due to the higher investment costs of the *teppa* owners in hull and fishing gear (see Table 10).

Table 10 : **Investment costs on motorized traditional craft (in IRs)**

	MOT-KA T	*TEP-LONG*	*TEP-OBM*
Hull	8,000	18,000	18,000
Engine	16000	12,000	21,000
Fishing gear	9500	14,000	21,500
TOTAL	33,500	44,000	60,500

The number of fishing days of the TEP-LONG and TEP-OBM are in the same range. Whereas the TEP-LONG lost more fishing days due to bad weather, the TEP-OBM lost more days due to engine repair, although the latter did not lead to higher repair and maintenance costs (Rs. *2,975* for the TEP-LONG and only Rs. 624 for the TEP-OBM). Here again, fishermen were willing to make up the loss of fishing days due to engine repair by going out during bad weather. The fishermen reported that spare parts for the outboard motor are not readily available, often leading to loss of many fishing days. This factor, together with the relatively high investment costs of an outboard motor (see Table 10), leads to the conclusion that this type of engine is not suitable for operation in the area.

The TEP-SAIL operation in Pentakota is economically more profitable in terms of IRR and B/C ratio than the operation of the motorized *teppa.* The net earnings are also twice to four times higher, although its gross revenue is lower than that of the other two fishing craft (see Table 7). It would seem that the high investment costs for motorization of the *teppa* as well as an increase in variable costs due to expenditure on diesel, kerosene, lubricating oil, repairs, and maintenance of the engine, ar-c not justified in economic terms. The fishermen may not fully realize this, since their criterion is the value of the catch, which is indeed higher than that of the non-motorized *teppa.*

From the resources point of view, motorization of traditional craft should be promoted since these fishing craft employ different fishing gear and capture different species in areas different to those fished by the non-motorized *teppa.*

If the TEP-LONG operation is compared with that of the BLC-WC, it can be concluded that, in terms' of IRR, the TEP-LONG scores higher whereas the B/C ratio and net earnings of the BLC-WC appear more promising.

The non-motorized *kattumaram* in Tummelapenta are family operated and, therefore, no crew share is 'officially' paid. The share system that prevails in other areas has been assumed in order to assess their economic performance.

With the present skills and attitude of the fishermen in Tummelapenta, the operation of the non-motorized *kattumaram* seems, from the economic point of view, to be more feasible than that of the BLC, since the former involves less investment and running costs. It is not advisable to continue the BLC operation here in its present form.

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The economic performance of the NM-KAT in Thirumullaivasal is outstanding, with its IRR of 100 per cent, though its net earnings are in the same range as those of the MOT-KAT. Both types of operation seem to be economically viable. Since motorization of traditional craft also implies the use of different types of fishing gear and exploitation of other resources, motorization can be promoted and supported in preference to FRP boat operations which run at a loss.

Overall, the non-motorized traditional craft count a larger number of fishing days than the motorized traditional craft and other introduced fishing craft. It should be considered that when the net earnings of different operations are in the same range, the fishing effort and earnings per time unit invested may differ widely.

9. DISTRIBUTION OF INCOME

This discusses the distribution of earnings between the fishing craft owner and the crew members. The question studied is to what extent an increase in the income of crew members has been achieved through the BLC operations compared to what they earned working with traditional and other introduced fishing craft. The actual shares of craft owners and crew have been calculated percentage-wise and on the basis of the share system in use for each type of fishing craft (see Appendix VI). They are presented in Table 11 together with the real percentages received by the respective partners.

Table 11: Distribution of Income (in I Rs)

PENTAJ(OTA	*CRAFT:*	*BLC-AC*	*BLC-WC*	*TEP-LONG*	*TEP-OBM*	*TEP-SAIL*
Cash flow before payment to crew and boat owner		45,89!	45,358	29,645	25,977	27,902
Earnings of crew		14,000	5,830	14,600	12,430	12,125
Percentage		30.5°Is	13%	49%	48%	43.5%
Percentage according to share system		50%	50%	62.5%	55.5%	71.5%
Gross cash to boat owner		31,891	39,528	15,045	13,547	15,777
Percentage		69.5%	87.1%	15.1%	52%	56.5%
Percentage according to share system		50%	50¾	37.5	44.5%	28.5%

TUMMELAPENTA	*CRAFT:*	*BLCI*	*BLC2*	*KAT-LI*	*KAT-L2*	*KAT-S*
Cash flow before payment to crew and boat owner		11,105	22,243	18,863	17,179	17,808.50
Earnings of crew		3,345	4,965	—	—	—
Percentage		30%	22%	—	—	—
Percentage according to share system		50%	50%	—	—	—
Gross cash to boat owner		7,760	17,278	18,863	17,179	17,808.50
Percentage		70%	78%	100%	100%	100¾
Percentage according to share system		50%	50¾	—	—	—

THIRUMULLAIVASAL	*CRAFT:*	*BLC*	*FRPI*	*FRP2*	*MOT-KAT*	*NM-KAT*
Cash flow before payment to crew and boat owner		1,19,891	16,248	37,209	36,449	20,738
Earnings of crew		52,439	6,190	13,602	20,266	12,21!
Percentage		44%	38%	36.5%	55.5%	59%
Percentage according to share system		50%	33%	33%	60¾	60%
Gross cash to boat owner		67,452	10,058	23,606	16,182	8,527
Percentage		56%	62%	63.5%	44.5%	41¾
Percentage according to share system		50%	67%	67%	40¾	40%

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The percentages of payment to crew and boat owner in Thirumullaivasal are very close to the percentages payable according to the customary share system. The small difference between the actual and the due percentage could be explained by the fact that the share system changes slightly according to the type of fishing gear operated, and tor number of crew members operating the fishing craft (see Appendix VI).

In Pentakota, the actual share received by the crew of the TEP-LONG, TEP-OBM, and TEP-SAIL is less than the percentage payable according to the share system. The explanation is that the fishing craft owners in that village receive one crew share even if they do not go out fishing themselves. If this factor is included in the calculations, the percentage received by the crew would be less and, therefore, the figures given in Table 11 might be correct according to the share system.

It should also be taken into account that the owner of the TEP-LONG goes out fishing full-time in his fishing craft, while the owner of the TEP-SAIL joins his crew only during about 60 per cent of the fishing trips, thereby receiving a full crew share, which is included in Table 11 under gross cash flow to the boat owner.

The percentage actually paid to the crew of the BLC-AC and BLC-WC is far below the percentage payable. Although boat-owners do not go out fishing themselves, they have one or more close relatives (usually brothers) going out fishing with the crew. It is possible that their earnings have been added to the earnings of the boat-owners and that only the payments made to crew members outside the family have been recorded. Besides, the boat-owners of the BLC receive a crew share even if they do not go out fishing themselves.

In Tummelapenta, the crew shares of the BLC1 and BLC2 are very low. Here, too, payments made to family crew members are not included in crew larnings. Further, in this village, the share system is not applied and the crew work for a fixed wage of approximately 20 Rs/fishing trip for each crew member. The crew themselves insisted on this arrangement to secure an assured level of income. The wages paid in the agricultural sector probably served as a guideline (see Section *5).*

No crew earnings are recorded for the traditional fishing craft in Tummelapenta, as these fishing craft are owned and operated by family members.

A BLC and its crew in Tummelapenta

To make a comparative analysis of crew member earnings receivable, calculations have been made on the basis of the share system for each type of fishing craft (see Table 12).

Table 12 : Payment per crew member and fishing craft-owner on the basis of share system (in I Rs)

PENTAKOTA	CRAFT :	BLC-AC	BLC- WC	TEP-LONG	TEP-OBM	TEP-SAIL
	Cash before payment to crew and boat owner	45,891	45,358	29,645	25,977	27,902
	Percentage to be paid to crew	50%	50%	62.5%	55.5%	71.5%
	Actual payment to crew	22,946	22,619	18,528	14,417	19,950
	No. of crew members	5	5	5	5	4
	Yearly earnings per crew member*	4,589	4,536	3.706	2,883	4,988
	Monthly earnings per crew member	417	412	337	262	453
	Percentage to be paid to owner	50%	50%	37.5%	44.5%	**28.5%**
	Payment to boat-owner	22,946	22,619	11.117	11,560	1,952
	Costs of repairs and maintenance	6,925	155	2,727	572	585
	Yearly net income of boat-owner*	16,021	22,524	8,390	10,988	7,367
	Monthly net income of boat-owner	1,456	2,048	763	**999**	670
	Depreciation (monthly)	1,717	1,751	688	**1,087**	651
	Income after depreciation	(261)' *	297	75	(88)* *	**19**

TUMMELAPENTA	CRAFT:	BLCI	BLC2	KAT-L1	KA T-L2	KA T-S
	Cash before payment to crew and boat-owner	11,105	22,243	18,863	17,179	17,808.50
	Percentage to be paid to crew	50%	50%	–	–	
	Actual payment to crew	5,553 ***	11,122	–	–	–
	No. of crew members	5	5	–	–	–
	Yearly earnings per crew member	1,111	2,224	–	–	–
	Monthly **earnings per crew member**	139	185	–	–	–
	Percentage to be paid to owner	50%	50%	100%	100%	100%
	Payment to boat-owner	5,552	11,121	18,863	17,179	17,808.50
	Costs of repairs and maintenance	–	–	–	–	–
	Yearly net income of boat-owner	5,552	11,121	18,863	17,179	17,808.50
	Monthly net income boat-owner	694	927	1,572	1,432	1,484
	Depreciation (monthly)	1,935	1,935	343	343	343
	Income afterdepreciation	**(1,241) *** **	**(1,008) *** **	**1,229**	**1,089**	**1,141**

THIRUMULLAIVASAL	CRAFT :	BLC	FRP1	FRP2	MOT-KAT	NM-KAT
	Cash before payment to crew and boat-owner	119,891	16,248	37,209	36,449	20,738
	Percentage to be paid to crew	50%	33%	33%	60%	60%
	Actual payment to crew	59,945	5,361	12,279	21,869	12,443
	No. of crew members	4	3	3	3	3
	Yearly earnings per crew member	14,986	1,787	4,093	7,290	4,148
	Monthly earnings per crew members	1,248	149	**341**	**608**	**346**
	Percentage to be paid to owner	50%	67%	67%	40%	40%
	Payment to boat-owner	59,945	10,886	24,930	14,580	8,295
	Costs of repairs and maintenance	7,463	450	2,060	3,440	165
	Yearly net income of boat owner *	52,482	10,436	22,870	11,140	8,130
	Monthly net income of boat-owner	4,372	870	1,906	928	678
	Depreciation (monthly)	2,071	1,806	1,692	**122**	319
	Income after depreciation	2,302	(936)**	214		359

* For Pentakota the figures represent an income over 1 I months.

** Figures within brackets represent negative figures.

*** For BLC1 the figure represents an income over 8 months.

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The figures show that, on this basis, the earnings of a crew member and the boat-owner of the **BLC** in Thirumullaivasal are the highest. Motorization of traditional craft also benefits the crew members, as their income is almost double that of crew members working on non-motorized craft. But the income of the craft-owner, after deducting the costs of depreciation, becomes less than that of the owner of a non-motorized craft. This may explain why the crew receives only *55.5* per cent share instead of 60 per cent.

Table 13, which presents the actual average monthly earnings, indicates that while this results in a slight reduction in the income of crew members, it also results in three-fold higher earnings for the boat-owner, thereby raising his income slightly above the income level of his crew members and far above the income of owners of non-motorized fishing craft.

Table 13 : Actual monthly earnings of crew member and fishing craft-owner (in I Rs)

PENTAKOTA	*CRAFT:*	*BLC-AC*	*BLC-WC*	*TEP-LONG*	*TEP-OBM*	*TEP-SA1L*
	Monthly earnings per crew member	225	106	265	226	276
	Monthly earnings of boat-owner	2,899	3,593	1,368	1,232	1,434
	Depreciation (monthly>	1,717	1,751	688	1,087	651
	Monthly earnings of boat-owner after depreciation	1,182	1,842	680	145	783

TUMMELAPENTA	***CRAFT:***	*BLCI*	*BLC2*	*KAT-L2*	*KAT-L2*	*KAT-S*
	Monthly earnings per crew member	83.63	82.75	—	—	—
	Monthly earnings of boat-owner	970.00	1,440.00	1,572.00	1,432.00	1,484.00
	Depreciation (monthly)	1,935.00	1,935.00	343.00	343.00	343.00
	Monthly earnings of boat-owner after depreciation	*(965.00)**	(495,00)*	1,229.00	1,089.00	1,141.00

THIRUMULLA!VASAL	*CRAFT:*	*BLC*	*FRP1*	*FRP2*	*MOT-KAT*	*NM-KAT*
	Monthly earnings per crew member	1,092	72	378	563	339
	Monthly earnings of boat-owner	5,502	838	1,967	1,349	711
	Depreciation (Monthly)	2,071	1,806	1,692	722	319
	Monthly earnings of boat-owner after depreciation	3,431	(968)*	275	627	392

* Figures within brackets represent negative figures

The performance of the FRP1 has been extremely poor and is, therefore, not included in the discussion here. The earnings of the crew members of the FRP2 are less than those of the earnings of their counterparts working in a motorized *kattumaram.* This also applies to the earnings of the boat-owner when depreciation is taken into account, his earnings falling even below those of the owner of the non-motorized *kattumaram* (see Table 12). This situation probably results in a bad repayment rate by FRP boat-owners.

In Pentakota, motorization of traditional craft does not result in higher earnings for crew members or, necessarily, for craft-owners compared to the non-motorized *teppa* according to the share system (see Table 12). Even taking into account the actual payments to crew and boat-owners, the income of both parties is less for the motorized *teppa* than for the non-motorized *teppa* (see Table 13).

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In the case of the BLC-AC and BLC-WC the earnings of the crew members are equal to those of the crew of the TEP-SAIL. The earnings of the craft-owners is higher after depreciation (see Table 12). With the share system at present in use, however, the crew of the BLC-WC earn less than the crew of all other fishing craft.

Even if it is assumed that only two or three crew members are paid and that the remainder are family members, the crew is poorly paid (see Table 14).

Table 14: Alternative calculations of **BLC** crew member's earnings, Pentakota (in I Rs.)

	BLC-AC		*BLC-WC*	
No of crew members	*on basis of share system*	*on basis of actual payment*	*on basis of share system*	*on basis of actual payment*
2	—	—	1030	265
3	695	424	687	176
4	521	291	—	—

It can be concluded that the owner of the BLC-WC does not pay the correct share to his crew members. His own monthly earnings are far above the level of those of other fishing craft-owners.

In Pentakota, it can be said that the income of the fishing craft-owner after depreciation would be less than that of his crew members. This might explain the difference between the amount payable and the actual payment.

In Tummelapenta, the earnings of the crew as well as those of the owners of the BLC are extremely poor (see Table 15). In fact, the earnings are negative for the owners, after depreciation.

Table 15: Alternative monthly crew payment calculations for the **BLC** in Tummelapenta (based on three paid crew members) (In I Rs)

Crew earnings based on share system		*Crew earnings based on actual payment*	
BLCJ	***BLC2***	***BLCI***	***RLC2***
213	309	139	138

The calculations presented in Tables 11 and 12 are based on five paid crew members. Even if two of the crew are family members and do not share in the crew payment, the crew earnings remain low. The *kattumaram* in Tummelapenta are owner-operated. The KAT-LI and KAT-L2 require three crew members and the KAT-S two crew members.

The net income of a crew member of KAT-L1, KAT-L2 and KAT-S works out to Rs. 410, 363 and 571 respectively.

The kattumaram *of Tummelapenta*

10. *SOME FACTORS AFFECTING BLC OPERATIONS*

Successful operation of the BLC depends on the following factors

- **The performance of the engine installed in the fishing craft.** The air-cooled diesel engine of the BLC operating from Pentakota as well as the water-cooled diesel engine of the BLC in Thirumullaivasal were subject to many operational problems. The air-cooled engine tends to overheat quickly, resulting in frequent breakdowns. The fishermen have the choice of travelling only short distances, without using the full potential of the fishing craft, or of attending to frequent repairs, resulting in loss of fishing days. This loss can be partially offset by going out fishing on days when catches do not seem too promising. It seems that the technical problems with regard to the water pump on the BLC-WC have been overcome, and a better economic performance of the BLC operating from Thirumullaivasal can therefore be expected.

- **Diversification of** its **fishing gear in order to fish further offshore.** If BLCs do this, larger fish and other species can be caught. Otherwise, the returns will be low, as in the case of the BLCI and BLC2 operating from Tummelapenta. A question requiring answer is whether there are adequate fish resources in this area, since the gross revenue of the KAT-Ll, KAT-L2 and KAT-S are also lower than those of non-motorized traditional craft in the other two locations. It must be mentioned that, due to the cyclone of November 1989, no fishing was undertaken until January, but even so the number of fishing days is in the same range as that of craft operating from the other two locations, indicating a lower catch value per fishing trip. Trials for assessing the potential for BLC operations in this area are necessary.

- **The availability of skills among the** fishermen. In Pentakota, fishermen are familiar with the idea of fishing further offshore due to the *nava* operations in the area and the use of different types of fishing gear. Traditional craft have also been motorized. In Thirumullaivasal, where the skills necessary for a proper operation have been transferred to local fishermen by BOBP and the Directorate of Fisheries, Tamil Nadu, the results are promising. The fishermen there are also familiar with motorization of traditional craft and with FRP boats and trawlers. In Tummelapenta, however, no motorization had taken place before the introduction of the BLC. More attention should, therefore, be given here to improvement of fishing skills by training.

Apart from these factors, the following points should be noted

Provision of a subsidy by itself is no guarantee of successful economic operation of the BLC, as demonstrated in Tummelapenta. Even with a 50 per cent subsidy element these operations do not show a positive result (see Table 7). It is advisable to assess the potential of the BLC operations there, taking all aspects into account, before continuing the scheme in this area.

Apart from the BLC operations in Thirumullaivasal, which should be considered a special case, for reasons mentioned earlier in this report, the BLC operations studied in the other two villages do not generate higher earnings for the crew members, considering the actual crew share paid or the crew share which should be paid when the share system is applied correctly. This can be achieved only by an increase in gross revenue.

The total time invested in fishing should also be taken into consideration. A better basis for comparision might be the returns per man-hour labour. Whereas the BLC go on longer fishing trips, the non-motorized traditional craft spend fewer hours per fishing trip but count more fishing days (see Table 8). The returns per man-hour labour have not been calculated in this study nor has a quantification been made of the opportunity cost of labour. This might be appropriate for Tummelapenta, where fishermen not only derive earnings from fishing but also from agriculture. Fishermen may continue fishing operations which do not seem to be too profitable in economic terms when the opportunity cost of capital is low. For example, the affluent fishermen

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from Pentakota, who formerly invested relatively large amounts of money in the purchase of agricultural land in Andhra Pradesh, might prefer to invest in fisheries instead, as the price per **acre increases.**

The relationship between fisheries and agriculture in the respective areas should be investigated in greater depth to obtain a clearer indication of the criteria which determine the decision-making pattern of the fisherfolk.

10.1 The use of the BLC as a beachianding craft

Questions which remain to be answered are

- To what extent is the **BLC really used** a beach landing craft?

AND

- **How** far is the more expensive hull and pivoting engine system justified?

For this purpose, information was gathered on the number of times the different fishing craft were landed on the beach, left at anchor beyond the surf or returned immediately for fishing. In Thirumullaivasal, the option to anchor the fishing craft in the lagoon is also seasonally available **(see Table 16).**

Table 16 : Location of craft after fishing

PENTAKOTA	*CRAFT:*	*BLC-AC*	*BLC-WC*	*TEP-LONG*	*TEP-OBM*	*rEP-SAIL*
	Landed on the beach	24	18	111	101	149
	Anchored beyond the surf	68	92	—	—	—
	Immediately returned for fishing	1	—	—	—	—
	Anchored in the lagoon	—	—	—	—	—
	No. of fishing days	89	110	111	101	149
	No. of fishing days done	240	219	218	228	180
	Total no. of days	329	329	329	329	329

TUMMELAPENTA	CRAFT:	BLC1	BLC2	KAT-LI	KAT-L2	KAT-S
	Landed on the beach	6	46	287	287	287
	Anchored beyond the surf	222	241	—	—	—
	Immediately returned for fishing	—	—	—	—	—
	Anchored in the lagoon	—	—	—	—	—
	No. of fishing days	71	95	151	148	141
	No. of fishing days done	157	270	214	217	224
	Total no. of days	228	365	365	365	365

THIRUMULLAIVASAL	CRAFT:	BLC	FRP1	FRP2	MOT-KAT	NM-KAT
	Landed on the beach	9	12	12	120	213
	Anchored beyond the surf	49	26	22	—	—
	Immediately returned for fishing	22	7	12	—	—
	Anchored in the lagoon	114	47	71	—	—
	No. of fishing days	194	92	117	120	213
	No. of fishing days done	171	273	248	245	152
	Total no. of days	365	365	365	365	365

The location of the fishing craft after each fishing trip was recorded in Pentakota and Thirumullaivasal. Records were kept only when fishing was carried out. In Tummelapenta, the location of the fishing craft was also noted on days the fishing craft did not go out fishing, except during November, December and March 1-17 when data were not collected due to cyclonic and bad weather conditions. Hence the discrepancy in figures for this village.

Motorized and non-motorized traditional fishing craft are carried on to the beach after each fishing trip. These fishing craft are too vulnerable to be anchored beyond the surf. They also need to be dried on the beach after each fishing trip to retain their buoyancy.

The BLC is anchored in the lagoon in Thirumullaivasal in 58 per cent of the cases. In the case of the FRP boats here, the percentage is 56 per cent. The lagoon is not accessible to the FRP boats for long periods, as a sand bar builds up at its entrance. During such periods, the FRP boats cannot take shelter in the lagoon. The BLC, however, can do so during bad weather, and can also be easily drawn up on the beach. The high frequency of anchoring the BLC in the lagoon indicates that it can easily cross shallow water.

The option of anchoring the BLC in a lagoon is not available in Pentakota and Tummelapenta. The fishermen have a choice of landing the craft on the beach or anchoring them beyond the surf after fishing. The first option is resorted to in 22 per cent of the cases in Pentakota, and in 10 per cent of the cases in Tummelapenta. Discussions with the fishermen reveal that the craft are carried up to the beach only when repair or maintenance work is necessary or when bad weather is expected. Usually fishing craft come up to the waterline in front of the surf after fishing. There the catch is unloaded, after which the craft is turned round, crosses the surf and is anchored beyond. Before each fishing trip, a crew member swims to the craft or paddles to it in a traditional craft, and brings it to the beach where it is loaded with fuel, food and fishing gear just before it starts its trip. The fishermen are quite content with this arrangement, which is only possible because of the BLCs pivoting engine system.

The higher hull and engine installation costs of the BLC (Rs.12,500 : – hull = Rs. 10,000 and engine plus installation = Rs. *2,500),* compared to those of the FRP boat, is justified, as it enables the fishing craft to be easily beached, something that cannot be done with the FRP boat. This is an important factor in areas where fishing craft cannot be sheltered in lagoons or rivermouths and in areas where cyclones and storms are regular occurrences.

The BLC is carried on to the beach by lashing two poles across the fishing craft and having about 24 men lift it vertically and then slowly move forward. It is easy to form a group like this in Pentakota. For beaches where the slope is steep, as in Thirumullaivasal, BOBP has designed hauling devices (a manual capstan and engine driven winch). These hauling devices, however, are used only in places where BOBP trials are carried out, such as Thirumullaivasal.

11. *CONCLUSIONS*

Coastal fish resources along the east coast of India are heavily exploited. This has also been noticed by the fishermen who,in general, complain about a drop in catch rates over the last ten years. They are using more fishing gear than before to compensate.

Since fisherfolk derive most of their income from fisheries, and as production can be expected to increase steadily in future, the increasing pressure on the inshore resources is a matter of great concern.

These factors justify the development of small fishing craft, like the BLC, suitable for fishing further offshore and capable of exploiting resources different from those fished at present by traditional local fishing craft. These fishing craft involve increased investment. Meeting these costs by small-scale fisherfolk depends on the returns from the operations of these craft.

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11.1 *Techno-economic and socio-cultural factors resulting in adoption or rejection of the BLC*

The initial response of fishermen to the introduction of the BLC was one of hesitancy. Their major concern was the high investment and the unknown returns from fishing operatiOns different to what they were accustomed. Supporting the introduction of this fishing craft by a subsidy scheme, which decreased the economic risks for the purchasers, was, therefore, a good initiative.

This fishing craft soon became popular in Pentakota, where the BLC operations have been shown to be profitable from the owner's point of view. It has been mainly the more affluent fishermen who acquired the BLC here. This was, because, in the first place, the fishing craft distributed under the NCDC subsidy scheme were channelled through cooperative societies in which the economically better-off fishermen influence decision-making. Since only five fishing craft (BLC IND-25) were distributed through the Pentakota cooperative society, fishermen of this village made use of the schemes implemented in their 'home villages' in Andhra Pradesh, where they had maintained membership in the local cooperative societies. BLC were purchased in their own name and, subsequently, operated from Pentakota in Orissa.

Secondly, the illegal system of transfer of BLC on an 'internal hire basis' could be resorted to only by the richer fishermen, as a lump sum ranging from Rs. 15,000 to Rs. 20,000 had to be paid to the person who obtained the BLC under the subsidy scheme.

Thirdly, only the more affluent fishermen were able to mobilize the funds needed for outright purchase of BLC from the government boatyards in Kakinanda or from private boatyards in Bhubaneshwar and Pentakota itself.

It is the availability of BLC for purchase, access to funds by a certain group in the community, together with the proven economic feasibility of the fishing operations from the point of view of the owner, that led to such a large concentration of BLC in Pentakota.

The relatively large supply of BLC to this community is mainly due to the dynamic lifestyle of the fishermen – first, their migratory pattern, which enables them to maintain close links with their home communities in Andhra Pradesh and gives them a chance to benefit from schemes implemented there, and, second, the initiative by local businessmen to start production of BLC.

The timing of the introduction of the BLC was also important. It came at a time when investments in agriculture in Andhra Pradesh were becoming more costly, while catch rates from artisanal fishing operations had already been decreasing for some time. Motorization of traditional craft was not generally successful due to the poor performance of the longtail diesel engine and outboard motors and the lack of proper support and repair services.

The low opportunity cost of capital and labour in Pentakota as well as in the 'home villages' also seems to have induced fishermen to invest in BLC operations, even when profit margins were low.

On the other hand, the introduction of the BLC in Tummelapenta has more or less been a failure. Fishermen were not really interested in this craft from the beginning and the manager of the AFCOF had to personally promote its introduction under the subsidy scheme. Even then, it was not the local fishermen but businessmen with interests and activities outside the village who were willing to try it out.

The high investment cost of the craft was the main reason for this resistance, as the fishermen, who only operate non-motorized traditional craft, did not feel that the returns would be sufficient to repay the costs. This opinion has been reinforced by the poor economic performance of the BLC in the village. None of the fishermen is interested at present in the purchase of a BLC. Instead, they have requested the AFCOF to make more funds available for distribution of *kattumaram* under subsidy schemes.

But *kattumaram* fishing is not very rewarding. The fishermen therefore look to diversification of activities to spread their economic risk, a strategy often adopted by communities dependent on

a subsistence economy. In each household at least one member gets an income from agriculture through ownership and/or cultivation of land or work as an agricultural labourer. Spreading of investment in terms of labour, time and money in different sectors inhibits the investment of large sums of money in fisheries. The community will only make such investments when the profitability of a new technology has been proved.

The BLC-20 was first introduced in Tamil Nadu in Thirumullaivasal, when a demonstration was undertaken by the Directorate of Fisheries, Tamil Nadu, in cooperation with BOBP. The **BLC** IND-25, however, had been earlier introduced in Tamil Nadu under a subsidy scheme, but the fishermen in Thirumullaivasal had not been aware of this introduction.

The BLC demonstration started in February 1989 and the time has been too short to analyze all the factors which can lead to acceptance or resistance. But some issues can be discussed here.

Fishermen forming the crew of the BLC were willing to try out fishing operations offshore, taking the financial risk themselves by operating the fishing craft on a share basis. The fishermen who showed interest were those who already had experience of a motorized traditional craft – **FRP** gillnetter or a trawler. The earnings of the fishermen from the BLC operation were more than those of fishermen working on other types of fishing craft, and the crew members were, therefore, content. They, however, had to justify their input to the community, who judged the BLC on its visible technical performance. The problems resulting from the water pump and its installation left the fishing craft idle for many days on the beach during the initial months, while the *kattumaram* **went** fishing. Only when these technical problems were solved did the attitude of the community as a whole become positive towards the BLC.

The fishermen are now willing to sell their motorized *kattumaram* to generate the funds required to make deposits on BLC, provided the banks and the Directorate of Fisheries, Tamil Nadu, formulate a credit scheme.

Further, in this community, where fisheries constitute the major, if not the sole, source of income, the more affluent fishermen look for opportunities to invest their savings in fishing.

In summary, it can be said that factors like dependence on fisheries, availability of cash in a community, low opportunity cost of capital and labour, and access to BLC determine the acceptance of, or resistance to, these fishing craft. Economic and technical performance of the craft in a specific area are also major influencing factors.

11.2 *Competition between BLC and traditional fishing craft*

There is no direct competition between the BLC operations and those of traditional craft as the fishing times, fishing gear used and species caught differ. The issue of interaction of the operations in relation to the fish resources has, however, not been examined. It is only in Thirumullaivasal that the BLC is used to fish further offshore. The main reasons for the reluctance in the other two villages to fish further offshore seem to be the lack of experience on the part of fishermen,uncertainty about catch and earnings,and lack of capital to diversify fishing gear. Interference of trawlers, causing loss or damage to fishing gear by entanglement, may be another reason.

11.3 *Economic feasibility of commercial BLC operations*

Economic feasibility depends on the returns, which, in turn, depend on the availability of adequate fish resources, use of diversified fishing gear and fishing skills.

Apart from these, the technical performance of the craft, which is mainly related to engine efficiency and the availability of spare parts and prompt repair services, is of great importance to avoid loss of fishing days.

In the BLC demonstration in Thirumullaivasal, where all these conditions were fulfilled, the best economic performance was achieved despite the technical problems initially faced.

11.4 *Economic performance of the BLC compared to that of other types of fishing craft*

In terms of IRR and B/C ratio, non-motorized traditional craft show a better overall economic performance than the BLC. The economic performance of the BLC and motorized traditional craft are similar at each location in the absence of major technical problems with the engines. The BLC in Tummelapenta show a very poor performance, recording a very low gross revenue that is only a little more than that of the other motorized traditional fishing craft. On the other hand, the gross revenue of the BLC in the other two locations far exceeds that of the other motorized and non-motorized fishing craft.

11.5 *Distribution of income between fishing craft-owner and crew*

BLC generate higher earnings for their owners compared to the earnings of owners of other fishing craft when depreciation costs are not taken into account. When the latter are deducted, their earnings drop considerably and can even become negative. This may be the reason why a proper share system is not applied and the crew receive less than their entitlement. This results in their earnings dropping below those of their counterparts working on other fishing craft (except in Thirumullaivasal) and leaves considerably higher earnings for the fishing craft-owner, even when depreciation costs are taken into account.

11.6 *The use of the BLC as a beachlanding craft*

The usefulness of the pivoting engine installation, enabling the BLC to be beachlanded, has been proven by the ease with which the fishing craft can be beached when repairs are needed or bad weather is reported. Recent development trials and demonstration of a new, cheaper water-cooled diesel engine propulsion system, featuring a rubber bellows, eliminates the use of the engine box and other accessories (gear box).

The introduction of the BLC in any new location should be preceded by

- **A** brief socio-economic study of the community;
- Trials of BLC operations to gauge the manner in which the fishing craft can be best utilized and to assess the economic feasibility of its operations in the specific area;
- The development, prior to start of the trials, of a credit scheme to finance the purchase of BLC by small-scale fishermen. Banks should be committed to extend credit to small fishermen if the economic feasibility of the BLC operations in a specific area has been proven by demonstration. Credit should be sufficient to cover the costs of fishing craft/engine and a wide variety of fishing gear. The design of the credit scheme should be ready beforehand, to ensure a quick follow-up on successful demonstration/trial activities. If the operation is economically feasible, there is no need for a subsidy element; and
- Encouragement to the private sector to establish a servicing facility that provides engine spare parts and has a repair workshop.

The objectives of the BLC operation within the local fisheries should be fully discussed with the community in order to reach a consensus. Emphasis should be placed on offshore fishing being complementary to the existing local traditional fisheries.

The respective Directorates of Fisheries should act as catalysts, identifying communities interested in BLC operations and initiating and organizing the process of introduction.

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APPENDICES

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APPENDIX I

Background information on selected villages

PENTAKOTA (Orissa)

Pentakota fishing village

Pentakota is a major fishing centre in Pun District, south Orissa. The village is *3.5* km east ot Pun town.

The village was founded in 1958 by migrants from Pentakota in the Vishakhapatnam District, Andhra Pradesh, and from 20 to 30 other villages in different districts in northern Andhra Pradesh. The reasons for the migration were the seasonal low catch rate in Andhra Pradesh and the discovery by the fishermen of abundant fisheries resources in the waters near Pun. These resources were not fully tapped by the local fishermen who were using, and still use, the smaller type of *kattumaram.* The migrant fishermen use the larger, boat-type *nava.*

Fishermen in the main neighbouring fishing villages are also originally from Andhra Pradesh. Chandrabhaga, 35 km east of Pentakota, is a smaller settlement but is similar to Pentakota. The households of these two villages are, in many cases, related in one way or another. The fishermen of Moto-Arakhakud (40 km west of Pentakota) are also originally from Andhra Pradesh, having migrated and settled here three or four generations ago. This village is located further from the beach and is towards Chilika Lake which is also fished with small *vallam.*

A household in Pentakota generally comprises of a nuclear family. Parents might live together with one of their married children. At present there are 9124 fisherfolk distributed among 1274 households. They include 2631 males (of whom 2374 are full-time fishermen), 2431 females and 4152 children.

The local government does not want the number of inhabitants to exceed 10,000, since the village is already considered to be a hindrance to the development of tourism in nearby Pun, which is a place of pilgrimage and famed for its beach. The distribution of licences to new settlers has,

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therefore, been restricted. The local government also tries to restrict seasonal migration, but without much success. Every year 250-300 *teppa* and 100-200 *nava* arrive from Andhra Pradesh for the fishing season (October to February), resulting in a seasonal influx of 3000-4000 persons.

Besides the fisherfolk, an additional 4000 persons of Oriya origin live in the northern part of the village. Their main source of income is trade, services and small enterprises.

Though Pentakota is less than 4 km from Pun, the villagers do not maintain much contact with the town. Although the migrants arrived 30 years ago, the second generation in Pentakota is still Telugu-speaking, thus isolating the village culturally and socially. Fishing is the main source of income in the village. Other activities include fish drying, which is undertaken by women. Large quantities of ribbon fish are dried in December. During the rest of the year, smaller varieties of fish are dried. There are about 40-50 dried fish traders in the village, although this trade is said to have been more lucrative in the past. Many women earn some income by carrying the fish from the beach to the traders, godowns (packing places) etc.

Women carrying fish, Pentakota

The village comprises of the following types of households:

- Small businessmen of Oriya origin, permanently settled in the village. They run the tiashops, vegetable stalls, tailoring shops etc.
- Crew members owning neither fishing craft nor fishing gear. Some have been owners in the past, but have been unable to replace their fishing craft after its lifespan. Generally, these households have permanently settled in the village and no longer maintain links with, or own any property in, Andhra Pradesh. Their houses are built for more permanent residence, with those who can afford it having mud walls and proper cadjan roofs. They work for a specific craft-owner with whom they come to an agreement at the beginning of each fishing season in return for a loan which has to be repaid before they can work for another craft-owner. This system of bonded labour obliges them to work in a specific craft even if earnings are low. Loans taken are quite substantial (Rs. 2000 to Rs. 3000) and cannot be repaid at short notice.

Most women who carry the fish from the beach to the godowns belong to households in which the husband works as a crew member on traditional craft. This group, together with the group comprising of women-headed households, belongs to the poorest section of the community.

- A small group of fishermen who moved from active fishing to a land-based activity, *e.g.* fish trade, cycle-rickshaw driving to service the many tourists visiting Pun or transporting fish. They considered fisheries not profitable and, therefore, sold their fishing craft and invested the money in another activity.

- A large group of households owning one or more *teppa* and fishing gear. Some of them have settled permanently in Pentakota and no longer maintain any links with Andhra Pradesh. Others migrate yearly between the two states and usually have near relatives permanently resident in their home village.

- A small group of fishermen owning houses and land in Andhra Pradesh but who mostly live in Orissa, earning a good income from fishing with their motorized and/or non-motorized *teppa* and BLC. During the offseason (May to August) they move their motorized fishing craft to Andhra Pradesh where catches are better at this time of the year. There they fish and make arrangements to lease their land for the coming year.

- A group of 15 big fish traders and several small fish traders. The big fish traders comprise the more affluent part of the population.

- A group of migrant *nava* fishermen who come from Andhra Pradesh to Pun only during the fishing season (December to February). The crew members camp on the beach or stay with relatives. They do not own houses in Pentakota.

It can be concluded that a large part of the population still consider their home village to be in Andhra Pradesh. This is especially so in the case of those who own assets there. Part of the family moves between the two states, while some members remain permanently in Andhra Pradesh. When moving from Pentakota (Orissa) to Andhra Pradesh, a few members stay behind in Orissa to look after house and fishing craft left behind.

That many people consider Pentakota only as a place for fishing is reflected by the fact that little money is spent on housing in the village. Huts are built of cadjan. Only the more affluent fishermen or the families who live there permanently have homes with mud walls. This is in marked contrast to some of the houses in Andhra Pradesh which are made of brick, have tiled roofs and spacious rooms and are provided with electricity.

It seems that most of the earnings are invested in housing, land, buffaloes, cycles and even motor-cycles in Andhra Pradesh.

Access to land in Pentakota (Orissa) is nil. The beach on which the village is located is owned by the government.

The fisheries infrastructure in the environs of Pentakota is quite good. Though the village might be culturally and socially isolated, this isolation is not evident in the trade channels to the wholesale fish markets or to the metropolitan centres. From Pun railway station, two trains run daily to Bhubaneshwar from where fish can be transported further. There is even a daily direct connection to Madras. There are two ice factories in Pentakota, and four in Pun.

TUMMELAPENTA (Andhra Pradesh)

Tummelapenta fishing village

Tummelapenta is in Nellore District, south Andhra Pradesh, 10 km east of Kavali town to which it is connected by a road which is, generally, in poor condition. The village consists of three sections. Tummelapenta Pattapopalem, Tummelapenta Pallipalem and a third hamlet where farmers and businessmen live. Tummelapenta Pattapopalem, on which this study focusses, was formerly to the east of the Buckingham Canal. But after damage by storms' and a severe cyclone in 1979, the government advised the villagers to move their homes inland, west of the Canal.

Of the *350* households in the village, 146 are fisherfolk households. Most households consist of nuclear families, as the joint family system is not common.

Most of the villagers came from Tamil Nadu and settled in southern Andhra Pradesh about 100 years ago. The population of many other villages along the coast of southern Andhra Pradesh also originated in Tamil Nadu. The reasons for migration are unknown. In contrast to Pentakota (Orissa), the villagers no longer maintain links with their places of origin; many do not even know their exact place of origin in Tamil Nadu. Their language is a mixture of Tamil and Telugu. The style of houses and type of fishing operations do not differ from what is found in Telugu villages.

Fishing is the main, but not the sole, source of income of the fisherfolk households. Women are engaged in fish drying and fish marketing, but also spend a good deal of their time in agriculture. Some households own a piece of land, usually in extent 30-100 cents (100 cents = 1 acre). Others lease land against an annual payment of 100-300 Rs/100 cents and cultivate millet, their staple, on it. Groundnuts, vegetables, tobacco and chillies are also grown in rotation, and sold in the local market. There is only one harvest a year, as the soil is sandy and unsuitable for paddy cultivation. No irrigation system is available.

Others, women as well as men, work as agricultural labourers on land belonging to their fellow-villagers or on land belonging to people outside the village. The men are mainly involved in ploughing and seeding, for which they receive 20 Rs/day, whereas the women look after weeding for 5 Rs/day and water the fields for 8 Rs/day.

It is estimated that, on the average, the men work one month a year in agriculture. The time spent on agriculture depends on the returns from fishing. The agricultural season is from September to January/February and therefore complementary to the fishing season which starts in January and goes on, with intervals, depending on weather conditions, until October.

The forefathers of these villagers were, however, engaged solely in fishing. The present practice have contrasts with developments in some of the surrounding villages, where men who were formerly engaged in agriculture and fishing now earn their income solely from fishing (e.g. in Alagayapakem, where only the women work as agricultural labourers).

Besides fishing and agriculture, fish processing (mostly drying of fish for the traders) and fish marketing are sources of income. In each household, some of the women are engaged in selling fish and earn approximately 10-20 Rs/day. Another source of income is the collection of shells for lime processing.

The inhabitants of Tummelapenta can be broadly divided into four groups :

- Businessmen who have activities outside the village, such as ownership and management of inland fish tanks;
- *Kattumaram* fishermen who own a piece of land in addition to one or more *karttumaram;*
- Fishermen who *own a kattumaram,* but no land; and
- Non-owners who work *as crew* members *on* one of the *kattumaram,* usually for a family member, and/or as agricultural labourers.

In addition, there is a small group of shrimp agents/collectors who work in return for a fixed wage for one of the fish traders in Kavali.

The Andhra Pradesh State Cooperative Fishermen's Federation Limited, which has its office in Kavali, covers 22 villages in southern Andhra Pradesh. It is also active in Tummelapenta, which is one of the locations selected for implementation of its development programme which includes the distribution of subsidized traditional craft and BLC, supply of fishing gear materials and spare parts for BLC, implementation of a housing scheme, and construction of auction halls, roads and bridges over the Buckingham Canal.

The fisheries/marketing infrastructure in Tummelapenta is limited. Though the distance to Kavali railway station is only 10 km, access is difficult due to the bad road and irregular traffic. Most fish traders live in Kavali, where the nearest ice plant is also sited,

Drying fish in Tummelapenta

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THIRUMULLAIVASAL (Tamil Nadu)

Thirumullaivasal fishing village

Thirumallalvsal is in Thanjavur District, Tamil Nadu, 13 km east of Sirka.zhi, to which it is connected by a tarred road on which there is a bus service to town every half an hour.

Thirumullaivasal comprises of a town area, where mainly businessmen live, and the adjoining fishing village, on the shore and along the lagoon. There is little contact between the fisherfolk and the town people. Whereas the whole fisherfolk community belongs to the Pattinavar Chetty caste and is Hindu, the greater part of the town population is Muslim. The fisherfolk have more contact with the fisherfolk of neighbouring villages.

There are 1700 people in the fishing village. Of the 470 male adults, 350 are active fishermen, while 25 men fish part-time. Of the latter group, some are owners of a trawler or FRP boat. There are *475* women and 755 children.

Migration in or out of the village does not seem to be common, though many wives come from other fishing communities in the area.

Fishing is the main source of income in the village. Men are mainly involved in capture fishing. Women undertake fish-related activities, such as fish drying and fish selling. They also transport fish from the shore to the trader's storage place by headload. Except for some seasonal labour in agriculture, no alternative income generating activities are available for women or men.

About ten fishermen own some land, but the income from agriculture is very low as the soil is suitable only for groundnut cultivation and produces only one crop a year. Most fishermen lease out their land. Other landowners are mainly merchants.

The households can be broadly divided into four different categories:

- Those mainly dependent on income from fishing as crew members who do not own fishing craft;
- Those in which the income is derived from fishing by own fishing craft;
- Those headed by widowed females who are fish vendors; and
- Those deriving an income from fish trade.

A large number of households are dependent on the income of adult males working as crew members on one of the many non-motorized *kattumaram.* These persons do not work for the same fishing craft-owner all the year round, as in Pentakota, but switch from fishing craft to fishing craft, sometimes even daily. The crew members are usually not related to the fishing craft-owners for whom they work, as is the casó in Tummelapenta, and none of their close relatives own any fishing craft.

A peculiar feature is that close relatives of FRP boat crew members are usually fishing craft owners. Distant relatives of crew members of motorized *kattumaram* own fishing craft. None of the relatives of the crew members of non-motorized *kattumaram* seem to own any fishing craft.

It is estimated that about a third of the households own some type of fishing craft. Joint ownership is relevant in the case of trawlers or FRP boats. In these cases the joint owners operate the fishing craft themselves.

Widowed fish vendors, usually young women who have lost their husbands and now have to support young children, constitute the most vulnerable group. Their incomes are very low and irregular, depending entirely on the amount and species of fish landed. They market the fish in nearby towns. Twenty women are engaged in fishing vending on a full-time basis, earning a maximum of 300 Rs/month. Forty women undertake fish vending on a part-time basis, earning 50-100 Rs/month; this is generally a secondary income of the household.

The fish traders in the village also act as moneylenders, providing short-term credit for consumption and long-term credit for the purchase of fishing craft and gear. The latter form of credit obliges the fisherman to sell his catch to the landing trader.

The fisheries infrastructure is satisfactory. Road connections with Sirkazhi, where there is a railway station, are good. From there, fish can be transported to Madras, Bangalore and Kerala.

One of the two ice plants in the village is operating. It has a capacity of about two tonnes/day. This is sufficient during much of the year, but when there are good catches, shortages are experienced. Ice has to be purchased from Chidambaram, approximately 40 km away.

Flyingfish targetted by the BLC in Thirumullaivasal are brought ashore in a kattumaram.

APPENDIX H

Specifications of Fishing Gear

PENTAKOTA

large mesh drift gillnet

Netting material	P.E.
Twine size	2mm
Stretched mesh size	140-160 mm
Depth	60-70 meshes

Large mesh drift gilinet

Netting material	PA multifilament
Twine sizes	210d/9 21 Od/ 12 210d/15
Stretched mesh size	80-120 mm
Depth	80-100 meshes

Bottom drift gilluet

Netting material	PA multifilament
Twine size	210d/2
Stretched mesh size	60mm
Depth	120 meshes

Trammelnet

Netting material	PA multifilament
Twine size	210d/2-210d/6
Stretched mesh size	Inner wall 40-44 mm Outer wall 260 mm
Depth	Inner wall 60-80 meshes Outer wall 10-12 meshes

Surface drift gilinet

Netting material	PA multifilament
Twine size	210d/2
Stretched mesh size	26-30 mm
Depth	600-700 meshes

Kattumaram seine

Netting material	Cotton/PE
Twine size	Cotton 8 mm dia
Stretched mesh sizes	20 mm in codend 60 mm in mouth of belly 120 mm in wings

Hook-and-Line

Material	
Sizes	1-8mm
Number of hooks	800-1000

(Source. Fisheries Extension Officer, Pun 1989)

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TUMMELAPENTA

Large mesh gilinet

Netting material	**PA** multifilament
Twine size	210d/9/12/15
Stretched mesh size	90-120 mm
Depth	90-150 meshes

Trammelne

Netting material	PA multifilament
Twine size	210d/2 - 210d/6
Stretched mesh size	Inner wall 42-46 mm Outer wall 260 mm
Depth	Inner wall 65-75 meshes Outer wall 10 meshes

Skate bottom set giHnet

Netting material	PA multifilament
Twine size	210d/24/45/54
Stretched mesh size	280mm
Depth	10-12 meshes

Monofilament gilinet

Netting material	PA monofilament
Twine size	0.2mm
Stretched mesh size	50mm
Depth	125-150 metres

(Source: **AFCOF,** Kavali 1989)

APPENDIX III

Frequency of depth of fishing operations

THIRUMULLAIVASAL

(February 1989 - January 1990)

Depth in metres	*BLC*	*FRPI*	*FRP2*	*MOT-KA T*	*NM-KA T*
0-10	2	—		1	8
11-20	5	S	12	10	23
21-30	4	11	7	34	51
31-SO	7	24	25	31	2!
51-100	57	39	40	18	—
101-200	22	10	9	11	—
200	97	3	13	IS	—
Total no. of Oshing trips	194	92	117	120	213

PENTAKOTA

Depth in metres	*BLC-AC*	*BLC-WC*	*TEP-LONG*	*TEP-OBM*	*TEP-SAIL*
0-20	47	75	64	50	130
21-30	—	—	2!	19	19
31-50	16	23	24	30	—
51-100	3	1	2	2	-
101-200					
200					
Total no. of fishing trips	66	99	111	101	149

TUMMELAPENTA

(March 18, 1989- March 7, 1990)

Depth in metres	*BLCI*	*BLC2*	*KAT-Li*	*KA T-L2*	*KAT-S*
0-10	—	—	108	102	91
11-20	2	22	33	36	40
21-50	24	4	10	0	0
51-100	-	5	-	-	-
101-200	-	-		—	-
200					
Total no. of fishing trips	26	31	151	148	141

BLC I and BLC 2 operating from PAKAL and KRISHNAPATNAM

(July 1989-October 1989 and February 1990)

Depth in metres	*BLC1*	*BLC2*
0-10	—	
11-20	—	—
21-50	45	46
51-100	—	17
101-200	-	-
200		
Total no. of fishing trips	45	63

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APPENDIX IV

Weight, value and average price of fish, specieswise, for each fishing craft (December 1988-October 1989)

PENTAKOTA

BLC-AC

Species	Value / Rs	Weight kg	Average price per kg
Seaperch	6960,00	840	8.29
Hilsa	800.00	85	9.4!
Billfish	235.00	33	7.12
Trevally	1285.00	117	10.98
Pomfres	1070.00	132	8.1!
Seerfish	31800.00	3125	10.18
Catfish	2970.00	456	6.51
Tuna	1540.00	219	7.03
Shark	5310.00	834	6.37
Ribbonfish			
Sciaenids	860.00	115	7.48
Shrimp			
Silverbelly			
Eel			
Anchovy			
Indian mackerel			
Total	52830.00	5956	

BLC-WC

Species	Value / Rs	Weight kg	Aserage price per kg
Seaperch	8685.00	1Q13	8.57
Hilsa			
Billfish	95.00	20	4.75
Trevally	6320.00	870	7.26
Pomfret	180.00	25	7.20
Seerfish	31605.00	3208	9.85
Catfish	2035.00	324	6.28
Tuna			
Shark	4050.00	700	5.79
Ribbonfish	70.00	10	7,00
Sciaenids	1060.00	45	7.31
Shrimp	180.00	2	90.00
Silverbelly			
Eel	150.00	20	7.50
Anchovy			
Indian mackerel			
Total	54430.00	6337	

TEP-LONG

Species	Value / Rs	Weight kg	Average price per kg
Seaperch	11825.00	1480	7.99
Hilsa			
Billfish	270.00	40	6.75
Trevally	2735.00	525	5.2!
Pomfret			
Seerfish	100.00	10	10.00
Catfish	7910.00	2881	6.22
Tuna			
Shark	670.00	121	5.54
Ribbonfish	1490.00	258	5.78
Sciaenids	3625.00	540	6.7!
Shrimp	690.00	4.6	150.00
Silverbelly			
Eel			
Anchovy	1000.00	400	2.50
Indian mackerel			
Total	40315.00	6250.6	

TEP-OBM

Species	Value / Rs	Weight kg	A cerage price per kg
Seaperch	11965.00	502	7.97
Hilsa			
Billfish	240.00	40	6.00
Trevally	4275.00	758	5.64
Pomfret	40.00	6	6.67
Seerfish	80.00	20	9.00
Catfish	13810.00	2408	5.74
Tuna			
Shark	7205.00	400	5.15
Ribbonfish			
Sciaenids	475.00	85	5.59
Shrimp	705.00	4.7	150.00
Silverbelly	400.00	300	1.33
Eel			
Anchovy	450.00	180	2.50
Indian mackerel			
Total	39745.00	6703.7	

TEP-SAIL

Species	Value / Ru	Weight kg	Average price per kg
Seaperch			
Hilsa			
Billfish	2235.00	348	6.42
Trevally	4570.00	877	5.21
Pomfret	450.00	66	6.82
Seerfish	210.00	35	6.00
Catfish	150.00	25	6(X)
Tuna	517.00	142	3.64
Shark	220.00	45	4.89
Ribbonfish	8945.00	2892	3.09
Sciaenids	7265.00	1157	6.28
Shrimp	750.00	16	47.32
Silverbelly	30.00	10	3.00
Eel			
Anchovy	3515.00	850	4.14
Indian mackerel	20.00	5	4.00
Total	28877.00	6468	

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TUMMELAPENTA

Craft		BLCI *	
Species	Value / Rs	Weight kg	Average price per kg
Seaperch	770.00	81	9.50
Trevally	588.00	173	3.40
Seerfish	5650.00	565	10.00
Catfish	1053.00	336	3.13
Tuna	53.00	16	3.31
Shark	1738.00	510	3.41
Ray	627.00	312	2.01
Pomfret	300.00	130	0.00
Indian mackerel	129.00	42	3.07
Anchovy			
Late			
Shrimp	2830.00	53	53.60
Eel			
Ribbonfish			
Silverbelly			
Sardine			
Others	3.00	3	.00
Total	4741.00	2221	

Craft		BLC 2	
Species	Value / Rs.	Weight kg	Average price per kg
Seaperch	790.00	86	9.29
Trevally	1128.00	221	5.10
Seerfish	4820.00	482	10.00
Catfish	2936.00	982	2.99
Tuna	1132.00	362	3.13
Shark	4679.00	1180	3.97
Ray	520.00	26!	1.99
Pomfret	910.00	91	10.00
Indian mackerel	57.00	19	3.00
Anchovy			
Late	120.00	12	10.00
Shrimp	8535.00	171	50.00
Eel	1215.00	241	5.04
Ribbonfish			
Silverbelly			
Sardine			
Others	22.00	12	1.83
Total	26864.00	4120	

Craft		KAT-LI	
Species	Value / Rs.	Weight kg	Average price per kg
Seaperch	783.00	205	3.81
Trevally			
Seerfish			
Catfish			
Tuna			
Shark			
Ray			
Pomfret	10.00	I	10.00
Indian mackerel	1548.00	475	3.27
Anchovy	8870.00	1841	4.82
Late			
Shrimp	6242.00	108	58.00
Eel			
Ribbonfish	288.00	72	4.00
Silverbelly	549.00	151	3.64
Sardine	225.00	45	5.00
Others	303.50	132	2.30
Total	18818.50	3030	

Craft		KAT L2	
Species	Value / Rs.	Weight kg	Average price per kg
Seaperch			
Trevally	724.00	90	3.81
Seerfish			
Catfish			
Tuna			
Shark			
Ray			
Pomfret			
Indian mackerel	059.00	353	3.00
Anchovy	7137.00	1746	409.00
Late			
Shrimp	6653.00	110	60.48
Eel			
Ribbonfish	360.00	80	4.50
Silverbelly	565.00	143	3.95
Sardine	322.00	68	4.74
Others	369.00	149	2.41
Total	17189.00	2839	

Craft		KA T-S	
Species	Value Ru.	Weight kg	Average price per kg
Seaperch			
Trevally	684.00	180	3.80
Seerlish			
Catfish			
Tuna			
Shark			
Ray			
Pomfret			
Indian mackerel	914.00	302	3.03
Anchovy	8793.00	1340	6.56
Late			
Shrimp	5785.00	102	56.88
Eel			
Ribbonfish	348.00	87	4.00
Silverbelly	616.00	155	3.97
Sardine	410.00	82	5.00
Others	258.00	103	2.51
Total	17808.00	2351	

* The figures for BLCI represent the amount caught during the period March 18, 1989 — October 1989. Craft was destroyed during cyclone in November 1989.

THIRUMULLAIVASAL

Craft		BLCI :	
Species	Value / Ru	Weight kg	Average price per kg
Seerfish	19822.00	062	18.66
Tuna	30769.00	7489	4.10
Shark	48018.00	6121	7.85
Indian mackerel			
Sardine			
Billfish	2650.00	787	3.37
Flyingfish	3396600	8949	3.79
Queenfish			
Shrimp			
Catfish			
Pomfret			
Others	5116.00	279	4.00
Total	140341.00	25687	

Craft		FRP1	
Species	Value / Rs.	Weight kg	Average price per kg
Seerfish	8362.00	451	18.54
Tuna	7490.00	2280	3.29
Shark	720.00	86	8.37
Indian mackerel	930.00	310	3.00
Sardine			
Billfish			
Flyingfish	500.00	120	4.17
Queenfish			
Shrimp			
Catfish	50.00	9	16.67
Pomfret			
Others	5163.00	1065	4.85
Total	23315.00	4321	

Craft		FRP2	
Species	Value 1 Rs.	Weight kg	A rerage price per kg
Seerfish	30546.00	667	18.32
Tuna	4814.00	1315	3.66
Shark	015.00	128	7.93
Indian mackerel			
Sardine			
Billfish	50.00	10	5.00
Flyingfish	7335.00	1935	3.79
Queenfish			
Shrimp			
Catfish			
Pomfret	30.00	3	10.00
Others	2350.00	415	5.66
Total	46140.00	5473	

Craft		MOT-KAT	
Species	Value / Rs.	Weight kg.	Average price per kg
Seerfish			
Tuna			
Shark	4100.00	530	7.74
Indian mackerel	14356.00	2550	5.63
Sardine	3750.00	900	4.17
Billfish			
Flyingfish	16435.00	5465	3.01
Queenfish			
Shrimp	245.00	7	35.00
Catfish			
Pomfret			
Others	3225.00	888	3.63
Total	42111.00	10340	

Craft		NM-KA T	
Species	Value / Ru,	Weigh! kg	A verage price per kg
Seerfish	200.00	23	8.70
Tuna	100.00	28	3.57
Shark			
Indian mackerel	8923.00	1241	7.19
Sardine	8095.00	2455	3.30
Billfish			
Flyingfish			
Queenfish			
Shrimp	965.00	26.5	36.42
Catfish			
Pomfret			
Others	4990.00	1344	3.71
Total	23273.00	5117.5	

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APPENDIX V

Cost and earnings **for each fishing craft**

PENTAKOTA

Craft	BLC-AC	BLC-WC	TEP-LONG	TEP-OBM	TEP-SAIL
I. GROSS CATCH VALUE	57,633	59,378	43,980	43,358	31,502
2. INVESTMENT	64,500	163,100	46,000	62,500	40,800
I-lull	80,000	80,000	18,000	18,000	9,500
Engine	42,500	49,500	12,000	21000	21,300
Gear	40,000	31,600	14,000	21,500	8,000
Sail	2,000	2,000	2,000	2,000	2,000
3. VARIABLE COSTS	30,398	16,525	30,542	29,204	14,929
Diesel	4,075	5,667	4,898	—	—
Kerosene				6,791	
Luboil	1.069	1,229	813	2,116	—
Food	2,377	2,942	1,244	813	1,064
Bait	49	158	4,685	5,005	—
Ice	—	—	—	—	—
Trawifish	—	—	—	273	—
Repairs and maintenance	7,555	169	2,975	624	638
Crew share	15.273	6,360	15,927	13,560	13,227
Other costs	—	—	—	22	—
4. FIXED COSTS	26,225	25,125	9,335	12,410	8,482
Insnrance	3,000	3,000	35	35	—
Depreciation	23,225	22,125	9,300	12,375	8,482
5. TOTAL COSTS (3 + 4)	56,623	41,650	39,877	41,614	23,411
6. NET EARNINGS (1 - 5)	1,010	17,728	4,103	1,744	8,091

TUMMELAPENTA

Craft	BLC1	BLC2	KATLI	KATL2	KATS
I. GROSS CATCH VALUE	23,586	26,863	18,864	17,179	7,809
2. INVESTMENT	164,500	164,500	13,700	13,700	13,700
Hull	80,000	80,000	8,500	8,500	8,500
Engine	42,500	42,500			
Gear	40,000	40,000	5,000	5,000	5,000
Sail	2,000	2,000	200	200	200
3. VARIABLE COSTS	11,170	9,965			
Diesel	2,170	1,682	—	—	—
Kerosene	784	675	—	—	—
Lahoil	558	434	—	—	—
Food	2,306	1,829	—	—	—
Bait	—	—	—	—	—
Ice	—	—	—	—	—
Trawlfish					
Repairs and maintenance					
Crew share	5,362	4,965	—	—	—
Other costs	—	—	—	—	—
4. FIXED COSTS	26,225	26,225	4,117	4,117	4,117
Insurance	3,000	3,000	—	—	—
Depreciation	23,225	23,225	4,117	4,117	4,117
5. TOTAL COSTS (3 + 4)	37,395	26,225	4,117	4,117	4,117
6. NET EARNINGS (1 - 5)	(I3.809)	(8,947)*	14,747	13,062	13,692

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THIRUMULLAIVASAL

Craft	BLC	FRPI	FRP2	MOT-KAT	NM-KAT
I. GROSS CATCH VALUE	140,341	23,315	46,140	42,111	23,273
2. INVESTMENT	178,000	140,000	140,000	34,500	15,500
Hull	72,000	70,000	70,000	8,000	5,000
Engine	44,000	40,000	40,000	16,500	—
Gear	60,500	30,000	30,000	9,500	10,000
Sail	2,000	—	—	500	500
3, VARIABLE COSTS	80,350	13,707	24,593	29,368	14,911
Diesel	7,634	3,024	3,853	255	—
Kerosene	164	—	15	2,549	30
Luboil	1,648	323	423	142	—
Food	7,720	3,720	4,640	2,576	2,121
Bait	1,362	—	—	40	234
Ice	1,355	—	—	—	—
Trawlfish	—	—	—	—	—
Repairs and maintenance	7,463	450	2,060	3,440	165
Crew share	52,439	6,190	13,602	20,266	12,211
Other costs	565	—	—	100	150
4. FIXED COSTS	28,088	23,833	23,833	8,333	3,833
Insurance	3,238	2,500	2,500	-	—
Depreciation	24,850	21,333	21,333	8,333	3,833
5. TOTAL COSTS (3 + 4)	108,438	37,540	48,426	37,701	18,744
6. NET EARNINGS (I – 5)	31,903	(14,225)'	(2,286)'	4,410*	4,529

* Figures between brackets represent negative amounts

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APPENDIX VI

Share systems by type **of fishing craft**

PENTAKOTA

BLC-AC and BLC-WC

Net earnings
50% for the boat owner
50% for the crew members

TEPPA-LONG

Net earnings to be divided into 8 shares
Boat + engine + sail 3 shares
Crew members : 5 shares

TEPPA-OBM

Net earnings to be divided into 9 shares
Boat + engine + net : 4 shares
Crew members 5 shares

TEPPA-SAIL

Net earnings to be divided into 7 shares
Boat + sail + nets 2 shares
Crew members 5 shares

TUMMELAPENTA

BLC1 and BLC2

Crew members work for a fixed wage of Rs. 20/- per fishing trip.

KAT-Li, KAT-L2 and KAT-S

Units are family operated, no crew share is paid.

THIRUMULLAIVASAL

BLC

Gilinetting

Net earnings divided into 3 shares
Crew members I share
Boat + gear 2 shares

Other gear

Net earnings divided into 2 shares
Crew members 1 share
Boat + gear 1 share

FRP1 and FRP2

Net earnings to be divided into 3 shares
Crew members : 1 share
Boat + gear : 2 shares

MOT-KAT

Net earnings to be divided into 5 shares
when there are 3 or more crew members
Crew members 3 shares
Boat + gear 2 shares

Net earnings to be divided into 4 shares
when there are 2 crew members
Crew members : 2 shares
Boat + gear : 2 shares

NM-KAT

Net earnings divided into 5 shares
Crew members : 3 shares
Boat + gear : 2 shares

In the situation where there are only 2 crew members the net earnings are divided into 4 shares
Crew members 2 shares
Boat + gear 2 shares

Note : In Pentakota, the craft-owner automatically receives a crew share on top of the boat share, irrespective of whether he goes out fishing or not.

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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 BOBP 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 *(Bay of Bengal News)* which are issued quarterly and which contain illustrated articles and features in non-technical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

A list of publications from 1986 onwards is given below. A complete list of publications is available on request.

Reports (BOBP/REP/...)

23. *Summary Report of BOBP Fishing Trials and Demersal Resources Studies in Sri Lanka.* (Madras, March 1986.)
24. *Fisherwomen'sActivities in Bangladesh: A Participatory Approach to Development.* P. Natpracha. (Madras, May 1986.)
25. ***Attempts** to Stimulate Development Activities in Fishing Communities in Adirampattinam, India.* P. Natpracha, V. L. C. Pietersz. (Madras, May 1986.)
26. *Report of the Tenth Meeting of the Advisory Committee.* Male, Maldives. 17-18 February 1986. (Madras, April 1986.)
27. *Activating Fisherwomen for Development through Trained Link Workers in TamilNadu, India.* E. Drewes. (Madras, May 1986.)
28. *Small-scale Aquaculture Development Project in South Thailand: Results and impact.* E. Drewes. (Madras, May 1986.)
29. *Towards Shared Learning: An Approach to Non-formal Adult Education for Marine Fisherfolk of Tamil Nadu, India.* **L.** S. Saraswathi and P. Natpracha. (Madras, July 1986.)
30. *Summary Report of Fishing Trials with Large-mesh Dr,ftnets in Bangladesh.* (Madras, May 1986.)
31. *In-service Training Programme for Marine Fisheries Extension Officers in Orissa, India.* U. Tietze. (Madras, August 1986.)
32. *Bank Credit for Artisanal Marine Fisherfolk of Orissa, India.* U. Tietze. (Madras, May 1987.)
33. *Non-formal Primary Education for Children of Marine Fisherfolk in Orissa, india.* U. Tietze, Namita Ray. (Madras, December 1987.)
34. ***The Coastal Set Bagnet Fishery of Bangladesh** — Fishing Trials and Investigations. S.* E. Akerman. (Madras, November 1986.)
35. *Brackish water Shrimp Culture* ***Demonstration in Bangladesh.*** M. Karim. (Madras, December 1986.)
36. *Hilsa Investigations in Bangladesh.* (Colombo, June 1987.)
37. *High-Opening Bottom Trawling in TamilNadu, Gujarat and Orissa, India: A Summary of Effort and impact.* (Madras, February 1987.)
38. *Report of the Eleventh Meeting of the Advisory Committee.* Bangkok, Thailand, March 26-28, 1987. (Madras, June 1987.)
39. *investigations on the Mackerel and Scad Resources of the Malacca Straits.* (Colombo, December 1987.)
40. *Tuna in the Andaman Sea.* (Colombo, December 1987.)
41. ***Studies of the Tuna Resource in the EEZs of Sri Lanka and Maldives.*** (Colombo, May 1988.)
42. ***Report of the Th'elfth Meeting of the Advisory Committee.*** Bhubaneswar, India, 12-15 January 1988. (Madras, April 1988.)
43. ***Report of the Thirteenth Meeting of the Advisory Committee.*** Penang, Malaysia, 26-28 January, 1989. (Madras, March 1989.)
44. *Report of the Fourteenth Meeting of the Advisory Committee.* Medan, Indonesia, 22-25 January, 1990. (Madras, April 1990.)
45. *Report of the Seminar on Gracilaria Production and Utilization in the Bay of Bengal Region.* (Madras, November 1990.)
46. *Exploratory Fishing for Large Pelagic Species in the Maldives.* R.C. Anderson and A. Waheed. (Madras, December 1990.)
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