

Bay of Bengal Programme

Fisheries Resources

KATTUMARAM FISHERIES AND FISHERFOLK

BOBP/WP/70

- A Study in Kothapatnam-Pallipalem, Andhra Pradesh, India



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— A study in Kothapatnam-Pallipalem, Andhra Pradesh, India

K. Sivasubramaniam
Sr. Fishery Biologist
BOBP

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This working paper describes the attempt made to conduct an integrated study of the biological, economic and sociological aspects of the fisheries and fisherfolk that use one of the most traditional and popular fishing craft of the east coast of India — *kattumaram*. The benefits of the results from such an approach are also presented in this report.

The paper discusses the significance of using one or more types of fishing gear with such a traditional craft, correlation between income from fishing and income from other sources and consequent diversity in income categories, relative performance by other types of craft, interactive fishing problems, exploitation of resources, underutilized resources, motorization of traditional craft, marketing practices and improvements and opportunities for additional/alternative income generation. Periodic exchanges of information between the study-group and fisherfolk, in the course of this study, opened the doors to communication with fisherfolk on issues concerning resources and management and culminated in the preparation of a series of extension material in this field.

This project was carried out in cooperation with the Department of Fisheries, Andhra Pradesh State, India, and was sponsored by a Bay of Bengal Programme (BOBP) project, 'Small-Scale Fisherfolk Communities in the Bay of Bengal' (GCP/RAS/118/MUL). The post-harvest technological investigations were conducted under the direction and supervision of Mr. David Walker, Adviser, ODA. The socio-economic investigations were conducted by Ms. Christina Lundquist, Socio-economist (APO) of the Bay of Bengal Programme. And Messrs P.R. Prathap Kumar and I. Ramaswamy were responsible for painstakingly collecting most of the data included in this report.

The BOBP is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal — Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The programme plays a catalytic and consultative role : it develops, demonstrates and promotes new techniques, technologies or ideas to help improve 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 UNFPA (United Nations Population Fund), 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).

This document has not been cleared either by the FAO or the Governments concerned.

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The kattumaram...

of Kothapatnam-Pallipalem





A large kattumaram on the beach at Kothapatnam-Pallipalem

1. INTRODUCTION

The *kattumaram*, a raft made of logs tied together, is one of the traditional fishing craft of India and Sri Lanka. But because of its structure and its limitations in size, carrying capacity, endurance and suitability for versatile fishing, fishing activity with this craft remains at a low level of efficiency compared even with other types of traditional craft.

With the introduction of modern fishing craft and methods, the performance of the *kattumaram* has been falling behind not only because more efficient systems are tapping the resources traditionally exploited by *kattumaram*, but also due to increasing fishing pressure, competition and interactive fishing in all types of coastal fisheries. Consequently, the income of a significantly large component of the fishing population engaged in *kattumaram* fisheries is reported to be very low.

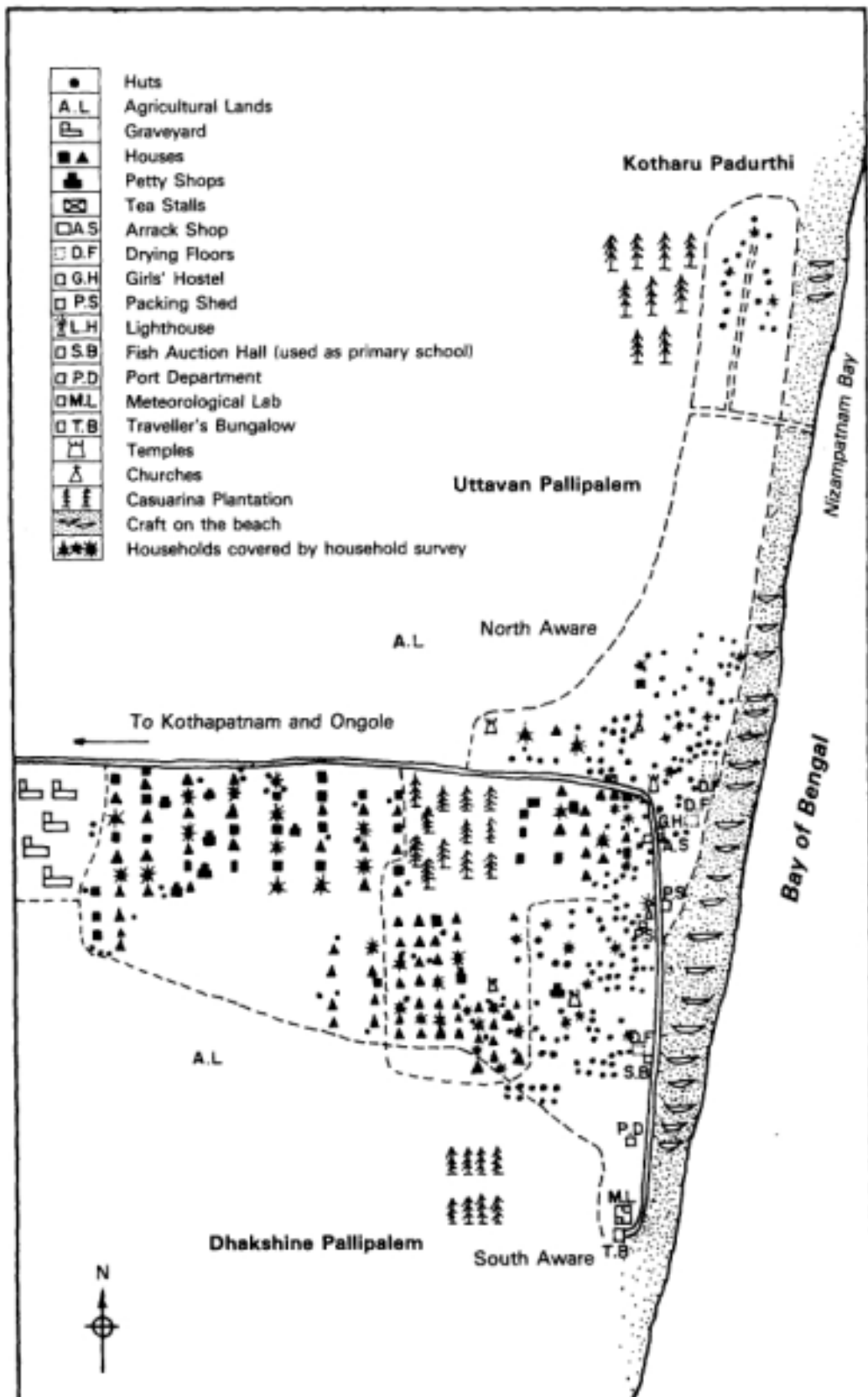
With the craft's design considered perfect, in its own way, for beaching on a surf-beaten coast and as no further improvements are possible without diverting from the *kattumaram* concept, the need has been realised for other means to improve the earning capacity of *kattumaram* fisherfolk. Consequently, it was felt that an assessment should be made through an integrated survey programme of the fishing methods used in a typical village, the resources exploited, the resources available, the fish handling, processing and marketing methods and the socio-economic conditions in the village. Such a survey, it was felt, could help to identify the potential avenues of improving the livelihood of the *kattumaram* fisherfolk. Data and information on these aspects were collected regularly from August 1988 to February 1990 by two specially trained field officers who were based in the village for the duration of the survey.

The archetypal village chosen for the survey was Kothapatnam-Pallipalem in the Prakasam District of Andhra Pradesh, South India. Kothapatnam is the main village and Pallipalem is its neighbouring coastal hamlet where the fisherfolk live and work. In the study, of this village, an attempt was made to integrate the bio-economic and socio-economic aspects of *kattumaram* fisheries and fisherfolk in order to understand better the inter-related issues and problems, by understanding better the inter-related issues and problems, assess the income from fishing and other activities, to establish a better stratified income structure of the *kattumaram* fisherfolk in relation to fisherfolk using other types of fishing craft and, thus, identify the component of the fishing community below the poverty line and the specific factors contributing to their situation.

The study has, consequently, contributed to an understanding of the relationship between income from fishing and income from other activities/sources by identifying

- areas in fishing and the handling/processing and marketing of fish that need improvement in order to increase income from fishing, and

Fig. 1 Map of Kothapatnam —Pallipalem



- opportunities for additional income generating activities particularly for the relatively poor fisherfolk.

2. SURVEY *METHODOLOGY*

To achieve an integration of the bio-economic and socio-economic parameters, the same stratification for the random sampling procedures was applied in the survey of the fisheries and the fisherfolk households. Though *kattumaram* fishing and fisherfolk were the objectives of this study, the report also discusses other types of craft in the village, their fisheries and income and households involved. Thk has enabled a better understanding of the resources exploited by this community, the interactions, influences and inter-relationships among the various fisheries in the area and the consequent differences in income from all these fisheries and in social factors in the village.

2.1 *Resources*

The information on fish resources was obtained by analyzing results and data records published by the Fisheries Survey of India (FSI) and the Central Marine Fisheries Research Institute (CMFRI) of India, mainly between 1980 and 1988. These were primarily bottom trawl surveys, but there were some pelagic surveys too.

2.2 *Fishing activities and income*

Based on a frame survey of the craft, gear, fishing operations, and landings in the village, a stratified random sampling survey, covering every type of craft and gear combination in operation, was conducted from August 1988 to December 1989, to estimate

- monthly catch rates,
- species composition,
- production,
- operational costs,
- price of fish,
- revenue,
- share system,
- income to owner and crew members, etc.

Thus, better estimation of monthly costs and earnings and production was possible. This was useful in determining clear differences in the income from many kinds of gear used by not only *kattumaram*, but also other types of craft.

2.3 *Socio-economic survey of the households and income from other sources*

A village profile and a frame survey were conducted to identify the general characteristics of the village and the types of households in it. Based on visual separation by roadways, wasteland, differences in size/type of houses (material of construction), size of land around houses, the village was geographically divided into five strata (Figure 1).

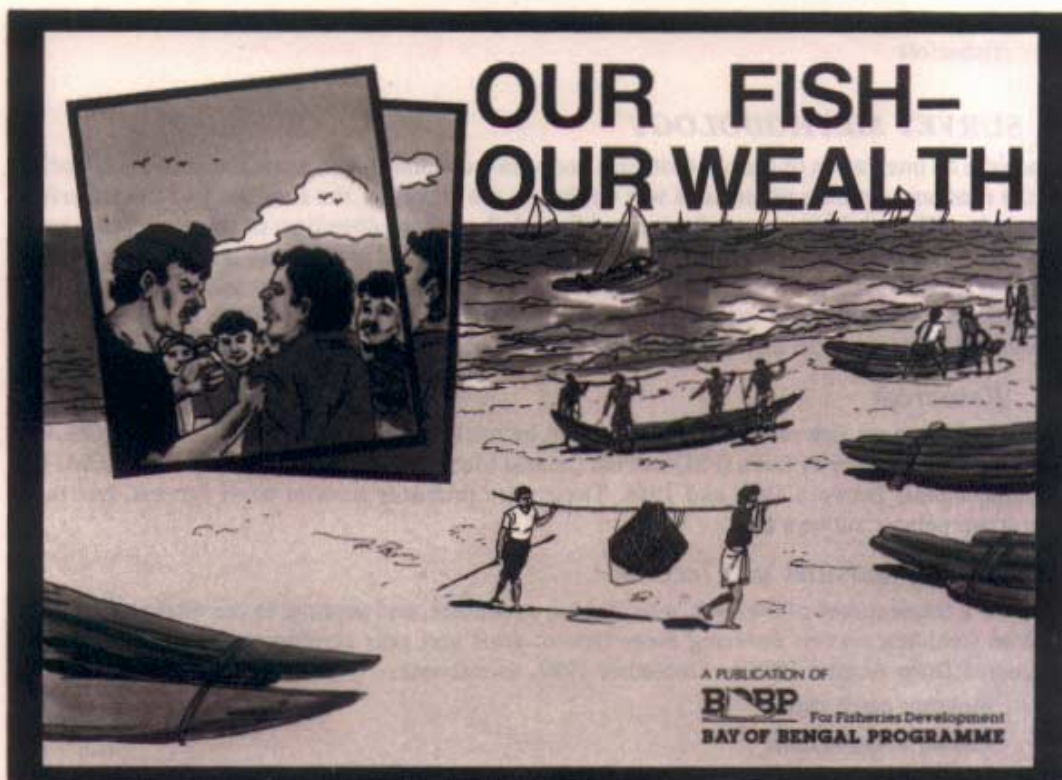
A basic socio-economic survey was conducted by sampling 20 per cent of the households in each stratum. Based on the results of the survey the households in the village were stratified according to

- ownership of specific types of craft and gear,
- fishing labour,
- fishing with specific types of craft and gear combinations, and
- non-fishing households.

These again were stratified into fishing and non-fishing households engaged in,

- fish processing,
- fish marketing,
- fishing transport,
- agriculture on own land/leased land,
- agriculture-labourer, and
- other kinds of activities.

A household could have two or more of these income generating activities.



The Kothaparnam-Pailipalem experience led to BOBP developing a comic book (its front cover, above) in Tamil and Telugu to communicate with the fisherfolk.



A page from the comic book: The hero, Raghu, a fisherman's son who went to the fisheries institute, explains resource management to the fisherfolk of his village. (Pictures used here are from the English prototype.)

To study seasonal changes in non-fishing activities, which may be influenced by fishing seasons, bad weather conditions for fishing etc, 10 per cent of the households were selected out of the 20 per cent sampled earlier, for systematic survey of seasonal changes in income from non-fishery related activities in the village. Though this information was collected through interviews, the survey being carried out during seasonal changes, provided an opportunity for getting the information when the changes were actually happening.

2.4 Fish marketing survey

Fish landings were sampled on the beach each day, to collect information on catch rates, species composition, price at first sale etc. One of the two field officers would often follow a subsample of these landings, from the beach to the household, to determine the fate of the catch. He also checked on the handling, processing, transportation and the second sale value of the fresh and processed fish marketed in the village, the nearest town (Ongole) and, occasionally, even followed the fish to destinations further on.

2.5 Exchange of information

The results from the monthly analysis of data collected were periodically presented to the fisherfolk (men, women and even children) through group discussions, meetings and a 'field day'. Discussions that followed resulted in an exchange of information, views and better understanding and cooperation. This increased the participation of the community in various aspects of the investigation and helped the learning process. This interaction culminated in some fishing trials for under-utilized resources being conducted through the joint efforts of the fisherfolk and the project staff.

This attempt at communicating resources and management information to the fisherfolk gave birth to the idea of developing a comic book (see facing page) to explain these concepts. The comic book approach is now being tested and has been well received by instructors in non-formal education.

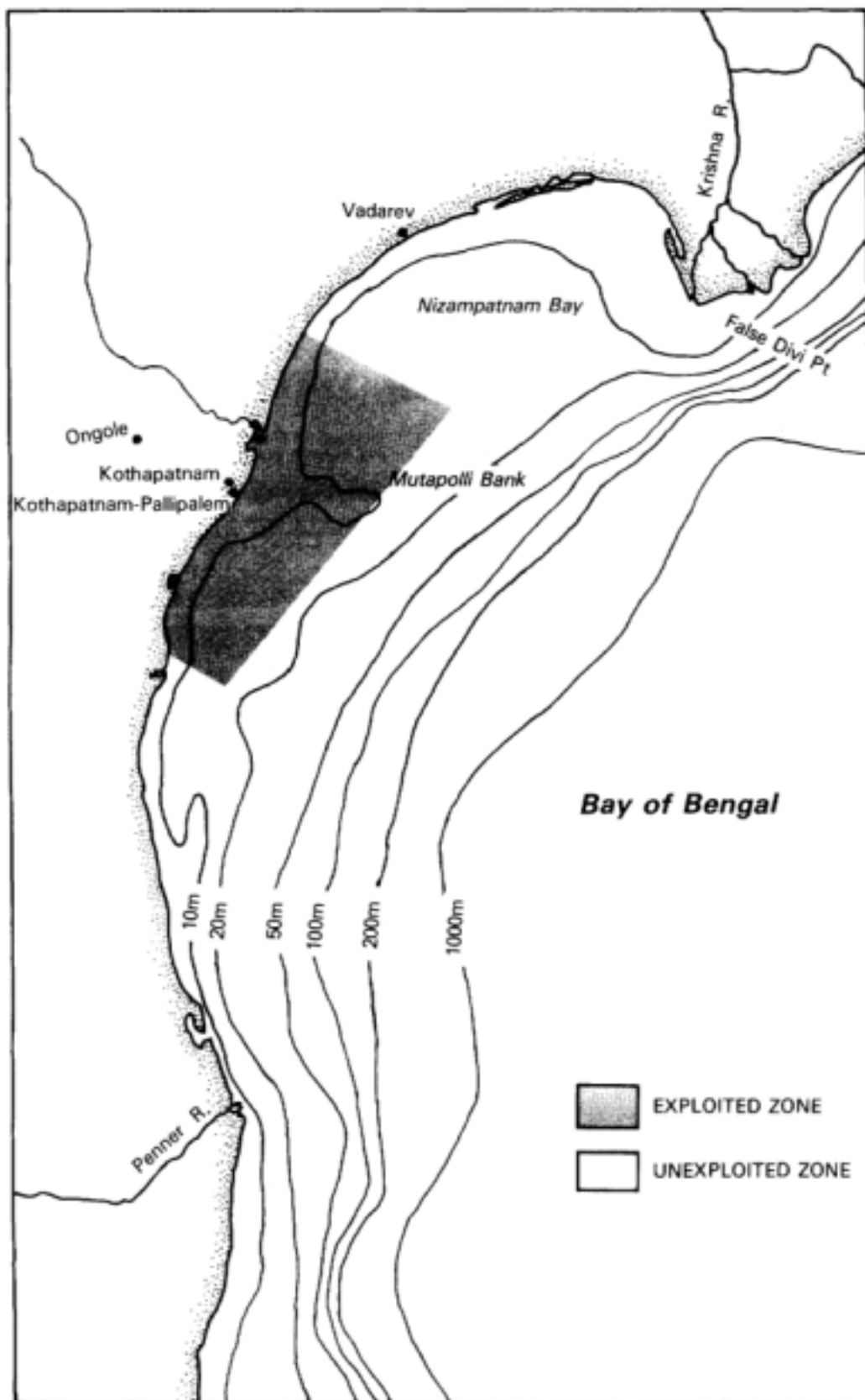
3. VILLAGE PROFILE AND CLASSIFICATION OF HOUSEHOLDS

Kothapatnam-Pallipalem is a coastal village in Prakasam District, Andhra Pradesh. Primarily a *kattumaram* fishing village, it is about 20 km from Ongole, the nearest town with which it is connected by bus. There is a bank, post and telegraph office, hospital and panchayat office in Kothapatnam, which is 2 km from the fishing village, on the road to Ongole. The composition of the households in the fishing village, according to their employment or income sources, as described in the survey methodology, is presented in Table 1.

Table 1
Composition of households according to income-generating activities in Kothapatnam

| Activity | Categories | Households (No.) | Households (% of total) |
|----------------|--|------------------|-------------------------|
| | Total number of households | 740 | 100 |
| Fishing | Engaged in fishing | 584 | 79 |
| | Owning craft and gear | 202 | 27 |
| | Owning only gear | 48 | 6 |
| | Engaged in contractual labour (taking advance from owner) | 204 | 27 |
| | Engaged in casual labour | 130 | 17 |
| | Without any craft or gear | 490 | 66 |
| | Not involved in any fishing activities | 156 | 21 |
| Fish marketing | Engaged in fish marketing | 300 | 40 |
| | Number of households with craft-gear and engaged in fish marketing | 150 | 20 |
| | Fishing labourers engaged in fish marketing | 60 | 8 |
| | Non-fishing but engaged in fish marketing | 90 | 12 |
| Agriculture | Engaged in agriculture | 700 | 95 |
| | Engaged in agriculture and fisheries | 560 | 75 |
| | Engaged in agriculture, own craft and gear | 244 | 33 |
| | Engaged in agriculture and fishing labour | 316 | 43 |
| | Own or own and rent agricultural land | 300 | 40 |
| | Only renting agricultural land | 330 | 44 |
| | Only engaged in agricultural labour | 70 | 9 |
| Others | Engaged in other kinds of income activities | 236 | 32 |
| | Engaged only in other income activities | 26 | 3 |

Fig. 2 Chart of depth contours in the coastal waters of Kothapatnam —Pallipalem



It is evident from the table that many of the fishing households are engaged in at least one other income generating activity as well. Though fisheries is considered to be the primary activity in this village, the greater percentage of the households is involved in agricultural activities (40 per cent). Only 3.5 per cent are dependent on any other sources of income.

The fishing village is divided into Dhakshine, or South, Pallipalem and Uttaran or North, Pallipalem, which are separated by the main road from Kothapatnam. This road ends at the beach.

There are 740 households (Figure 1) in Pallipalem and the population is estimated at 4000. There are 1650 dependent children under 16 years of age and 270 are dependent old people. However, some of these children are engaged in fishing, agriculture, livestock caring etc. The average age of the men in the village is 29.

The fisherfolk in north Pallipalem are reported to be of Agrikulakshatriya, or Palli, caste, while those in the South Pallipalem are a mixture of Palli and Voda Balegas. The large majority are Hindus, but there are some Muslims and Christians, as well.

A primary school is to be constructed, but till then, classes are being conducted in the fish auction hall built by the Fisheries Corporation of Andhra Pradesh. The school has classes up to Grade V and four teachers tutor about 250 children in these classes. A hostel for 50 girls has been established in the village.

The future school building will also be a cyclone shelter, as this village is prone to frequent damage by cyclones.

About 350 (51 per cent) households in the village have members with schooling/education. The number of years of schooling varied from 1 to 13, but the number of households falling into each of these categories by extent of formal education were even and around 30-50 in most cases. Average years of attendance at school for crew was two, that for non-fishing households was 3.7 and for craft owners 5.4. School-educated youth generally did not find any employment other than fishing, but the village has two University graduates, one of whom is a typist in the fisheries office and the other a security officer in Ongole.

There are two fishermen's cooperative societies, one in North Pallipalem and the other in South Pallipalem, with a total membership of 668. Many, mainly crew, are not members of the societies because they lack understanding and faith in the benefits of such societies.

There are good bus connections from Kothapatnam to other villages along the coast and to Ongole. But there is a bus service only twice a day from Pallipalem to Kothapatnam.

Fuel, ice and repair mechanics are available only at Ongole. Fishing gear materials can be obtained from Kawali (150 km to the south) or Madras (360 km south). Whenever such purchases have to be made, several fishing days are lost.

The nearest fishing villages are about 30 km north and south of Kothapatnam—Pallipalem.

4. COASTAL SEA CONDITIONS

The Pallipalem coast is an open, surf-beaten shore with moderate surf. The beach is sandy and narrow. The Krishna river is the closest major river and is about 85 km north of Pallipalem village. The coastal belt is prone to cyclones, particularly during the Northeast Monsoon. There is a creek about 10 km north of the village, which is used as a shelter for some of the craft during stormy weather. This stretch of coast is the southern end of the coastline of Nizampatnam Bay which has the Krishna river delta at the northern end.

The bottom configuration here indicates a small gradient, resulting in a distant edge of the continental shelf (Figure 2). A projection of 0-6 m deep bank exists directly opposite the village and results in the 6 m depth extending upto little over 15 km from shoreline, reaching close to the 20 m depth contour — the Mutapalli bank.

The bottom sediment is sandy, muddy sand and then muddy, upto about 25 m depth. It is then rocky upto about 50 m.

Fig 3a. Average catch rates while bottom trawling at different depths

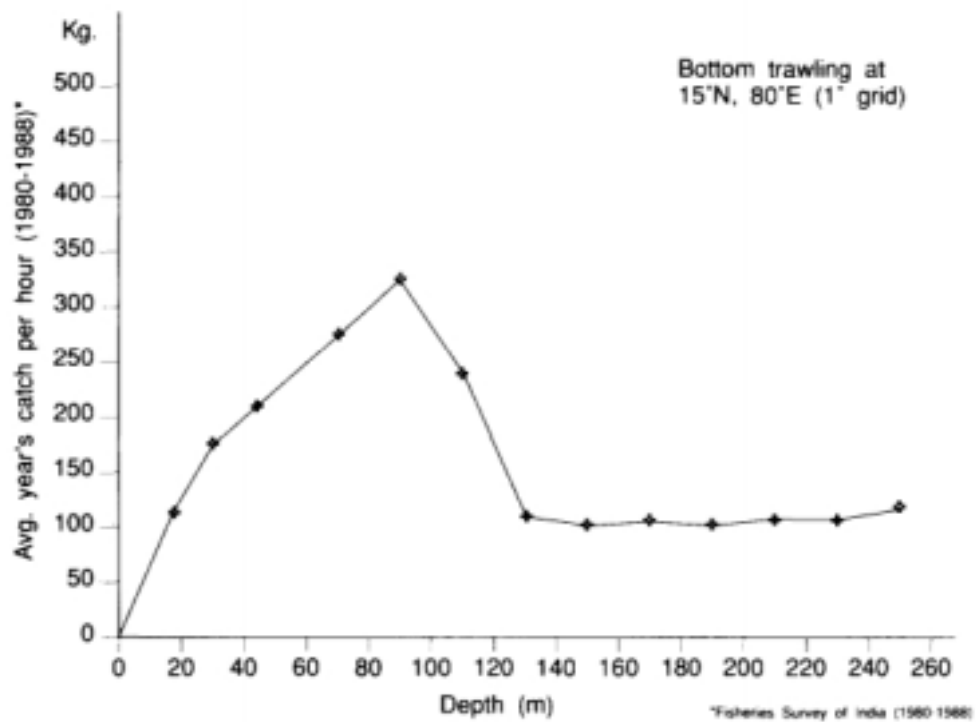
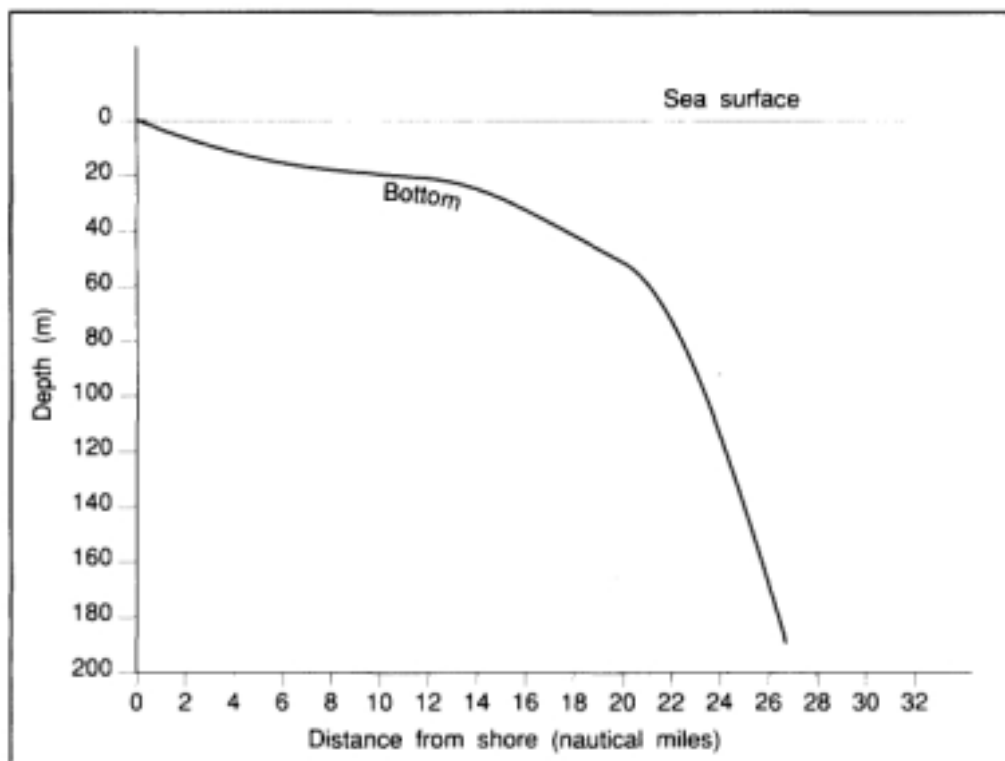


Fig 3b. Bottom configuration opposite Kothapatnam-Pallipalem



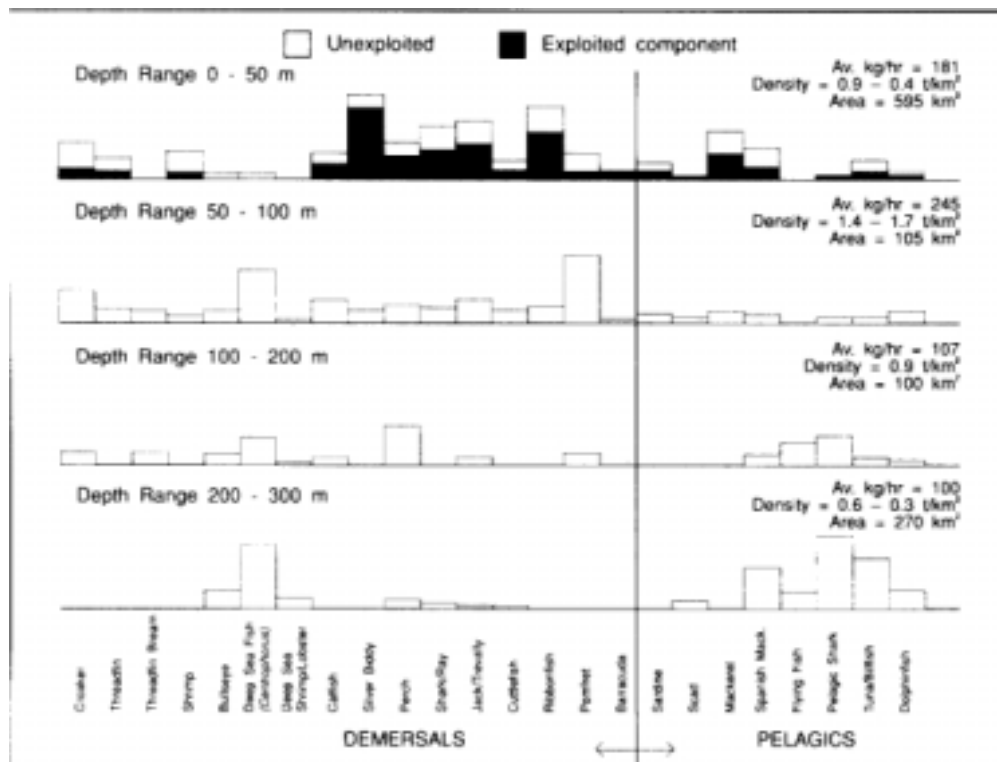
5. FISHERIES AND FISHERY RESOURCES

5.1 Fishery resources in the area

Fish resources in the inshore waters are primarily demersal fin fish, shrimp and some small pelagics. Trawl surveys conducted by the Fishery Survey of India (FSI) between 1980 and 1988, in the grid $14^{\circ} - 15^{\circ}\text{N}$, 81°E and covering a depth range of 10- 260 m, showed, on the basis of catch rate (kg/hr), a sharp increase in fish density from 20 m to a maximum of 90 m, a sharp decline to 110 m and then a levelling off beyond that depth (Figures 3a and 3b, facing page).

Relative indices of abundance of primary demersal varieties of fish and shell fish in different depth ranges are shown in Figure 4. Indices of abundance were estimated by determining the biomass in the sea area in front of the village, using the catch rates in different depth zones, estimated surface area of the depth zones, area swept by trawls of known specifications, and towing speeds. The exploitable component of the biomass was then estimated for various varieties by applying the percentage species composition to the biomass and probable natural mortality rate values for the respective species groups.

Fig. 4. Abundance of fish at different depth ranges



In the case of pelagic species, the purse-seine and tuna longline fishing trials and school counts conducted by FSI were used. Purse seine operations yielded, on an average, 175kg/set (120 - 400 kg range) with 80 kg of tuna, 60 kg of sardine, 10 kg of smaller tuna and 25 kg of other varieties, including pomfret and anchovy, in the grid 15°N , 80°E . Tuna longline trials just outside 50 km from the village gave an average hooked rate of 2.40 fish/100 hooks (1.06 per cent yellowfin and bigeye tuna, 0.13 per cent billfish and 0.73 of shark). Peak catch rates for pelagics were during the winter months.

Seasonal schools of sardine, frigate tuna, skipjack tuna, king mackerel, flying fish and dolphinfish were also recorded during the survey conducted by FSI. More schools were sighted

during March to May, August and September. The potential yield is difficult to estimate because of the migratory nature of these pelagic species, in and out of the fishing grounds opposite Kothapatnam.

5.2 Fishing craft in the village

There were about 250 raft type *kattumaram*, 19 *nava*, and 8 beachlanding craft, at the beginning of 1990. In 1969, there were about 100 *kattumaram* and 6 *nava*; the BLCs were introduced only in 1988. Details of all types of craft, their costs, average life, crew size and replacement costs are presented in Table 2.

Table 2
Fishing craft used at Kothapatnam-Pallipalem, Andhra Pradesh

| Craft Code | Craft type | Length (m) | Non | Crew | life rs | Original cost (Rs) | Replacement cost (Rs) |
|------------|-----------------------------|------------|-----|------|---------|--------------------|-----------------------|
| 1C1 | Raft type <i>kattumaram</i> | 5-6 | 100 | 3 | 10 | 2000 | 4000 |
| 1C2 | Raft type <i>kattumaram</i> | 6-8 | 150 | 4 | 15 | 5000 | 8000 |
| 2C3 | <i>Nava</i> | >8+ | 18 | 6 | 15 | 30,000 | 4000 |
| 3C3 | Beach landing craft (IBE) | 8 | 10 | 5 | 10 | 125,000 | 130,000 |
| 4C2 | Boat type <i>kattumaram</i> | 6-8 | 4 | 4 | 4 | 8000 | 10,000 |
| 4C3 | Boat type <i>kattumaram</i> | >8+ | 4 | 4 | 4 | 000 | 12,000 |

The 3 - 4 logs *kattumaram* are generally rowed to and from the fishing ground and are considered to be the small *kattumaram*. Only the large *kattumaram* use sail. The beachlanding craft are modern FRP boats with inboard engines. About 1 1/2 years ago, shrimp trawlers from other east coast areas invaded the 20 - 30 m depth zone outside this village and have been a presence there since. About ten boat-type *kattumaram* (*teppa*) from areas north of the village migrate into this village fishing ground between December and March every year to conduct bottom longline fishing.

Though fishermen claim that *kattumaram* have a life of 10-15 years, conditions of those over half that period appeared to be poor. Average age and size of the *kattumaram* population in the village are presented in Table 3. Considering the condition of the *kattumaram*, only about 20 - 25 Large *kattumaram* in the village are worthy of being motorized, if any are to be motorized. Even the *nava* are too old to be motorized.

Table 3
Kattumaram in Kothapatnam-Pallipalem, according to age and size

| Age of craft | Small <i>kattumaram</i> | | Large <i>kattumaram</i> | | Total |
|--------------|-------------------------|--------|-------------------------|--------|-------|
| | 3 logs | 4 logs | 5 logs | 6 logs | |
| 1 year | — | — | — | 10 | 10 |
| 1.2 years | — | — | 4 | 15 | 19 |
| 2 years | 7 | 90 | 69 | 55 | 221 |
| Total | 7 | 90 | 73 | 80 | 250 |

In April 1989, the entire lot of larger *kattumaram* changed the arrangement for fixing the mast for the sail, by fitting a lee-board and mobile mast-step as well as by increasing the surface area of the sail by 30 per cent. This gives higher speed with better mobility and makes it possible to go further. It is suspected that this innovation was prompted by the observation of such a system in the second-hand *kattumaram* purchased from fishermen in the southern part of Tamil Nadu.

5.3 Fishing gear

Various kinds of fishing gear, their basic characteristics, average life and cost are presented in Table 4. There are basically about seven kinds of gear but there are a number of variations. Net variations are based on the mesh sizes of gillnets made with different numbers of panels of monofilament and multifilament webbings and variations in longlines are based on differences in hook size and number of hooks per set. In all, about 16 different forms of gear are listed. Three of them — shadenet/liftnet, dragnets and boat-seine — are active gear, the rest are passive.

Raft type *kattumaram* operate all types of gear except large mesh drift/bottom set gillnets, (Code D,F and O), very large mesh gillnets or skate nets (Code E) and longline (Code L and P). These exceptions are operated only by the *nava* and BLCs. However, both *kattumaram* and BLCs operate trammelnets. Gear types listed under Code I and K are being replaced steadily by types C and O respectively. Hand-operated gear are used very occasionally.

Table 4
Fishing gear used at Kothapatnam-Pallipalem, Andhra Pradesh

| Gear code | Gear Ope | Local name | No. of hooks or No. of panels/set | Hook size/ Mesh size (cm) | Avg. life (yrs.) | Original cost (Rs.) | Replace. ment cost (Rn) |
|-----------|------------------------|----------------------------|-----------------------------------|---------------------------|------------------|---------------------|-------------------------|
| A | Trammelnet | Appavalai | 3 | 27x5x27 | 2 | 2000 | 3000 |
| B | Dragnet | Kontivalai | | 1 | 1 | 1000 | 1000 |
| C | Mono. filament Gillnet | Chaapal Naapu | 1 or 2 | 5 & 2.5 | 1 | 500 | 2000 |
| D | Gillnet | Chinna Naapu | 50-60 panels | 10 | 8 | 48,000 | 60,000 |
| E | Gillnet | Tekuvalai | 11 panels/set | 45 | 10 | 19,000 | 20,000 |
| F | Gillnet | Pedda Naapu | 30 panels | 18 & 24 | 8 | 50,000 | 55,000 |
| G | Boat-seine | Iragavalai | | 1-2 | 10 | 2000 | 2200 |
| H | Shadenet/ Liftnet | Neelavalai | | 0.5-3.6 | 10 | 12,000 | 18,000 |
| I | Gillnet | Sanduvalvalai (Pomfretnet) | | 5 | 2 | 1000 | 1200 |
| | Hand-operated net | | | 2.5 | 10 | 800 | 1000 |
| K | Gillnet | Naapuvalai | | 12.25 & 14.7 | 10 | 25,000 | 30,000 |
| L | Longlines | Galam Thaadu | 350/set | No. 6 | 2 | 1200 | 2000 |
| M | Longlines | Galam Thaadu | 500/set | No. 6 | 2 | 1800 | 2000 |
| N | Hand-operated net | | | No. 5 | 10 | 100 | 120 |
| O | Gillnet | Navamvalai | 16 & 6 | 10 & 14 | 10 | 25,000 | 30,000 |
| P | Longline | Galam Thaadu | 1000/set | No. 8 | 2 | 2500 | 3000 |

NOTE:

Gear B or G are operated using two *kattumaram*, Gear H is operated with five *kattumaram*, all others require only single craft for operation. Gear G and J are made of cotton, Gear G, H and N may be of nylon, all other nets are of PA or nylon.

5.4 Fishing grounds and fishing operations

Small *kattumaram* operate generally in areas where the sea depth is within 5 m while larger ones cover areas of depths upto 10m. The BLCs and *nava* operate in the areas with depths up to about 30m while trawlers operate in areas with 15 - 25m depth. *Teppa* operate even in areas with depths up to 40m.

Fishing trips by small and large *kattumaram* last between 3 and 14 hours, and average five hours. The duration of trips undertaken by BLCs range between 12 and 14 hours, round the year. Migrant *teppa* exhibited 0.4-0.8 days/trip; this was only during the winter months. *Nava* trip durations range between 10 hours to 6.5 days, the average increasing from 12 hours in January to 3.2 days in May and declining to an average of 19 hours in November/December.

In general, *kattumaram* commence their fishing trip, close to sunrise and return to shore not later than 2 p.m. If they happen to sail northwards or southwards, towards other villages, during the shrimp fishing season, they return around 4 to 5 p.m. BLC's leave in the afternoon or evening and return by the following morning. *Nava* leave around 10a.m. and return by the following morning or several days later. When they are out for days they carry salt for preserving their catch.

5.5 Craft and gear combinations

There are 13 major combinations generally used, of the 4 types of craft and 10 types of gear operated in the village. Based on the monthly random sampling, the frequency of usage of various combinations was established (Table 5).

Among the *kattumaram*, the most commonly used combination for operation is the large *kattumaram* and small mesh monofilament gillnets (43 per cent) followed by boat-seine operated jointly by one large and one small *kattumaram* (29 per cent) and large *kattumaram* and trammelnets (15 per cent). The remaining 13 per cent of the effort is through other combinations.

All popular combinations are generally operated throughout the year, evenly for the most popular combinations but with seasonal variations in the intensity of usage of other gear. Besides boat-seine, a dragnet requires two *kattumaram* to operate the gear and a liftnet/shadenet operation requires five small *kattumaram*.



Gear and kattumaram on the beach at Kothapatnam-Palhpalem after a day's fishing

Table S

Frequency (%) of operation of craft/gear combinations, and average number of fishing days of craft, by month, based on observation/interviews on sampling days

| Combination | Months (1989) | | | | | | | | | | | | (1990) | | ANNUAL TOTAL |
|---|---------------|-------|-------|------|------|-------|-------|-------|------|------|-------|-------|--------|-------|-----------------|
| | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. | |
| Small kattumararn + trammel | 0.0 | 4.5 | 2.0 | 4.0 | 7.2 | 4.6 | 0.0 | 0.6 | 0.0 | 1.0 | 2.5 | 0.0 | 1.9 | 0.0 | 2.0 |
| Small kattumaram + small mesh gillnet (monofilament) | 11.9 | 12.1 | 16.0 | 5.6 | 11.0 | 2.7 | 5.3 | 2.6 | 3.3 | 5.3 | 12.8 | 3.3 | 1.9 | 4.9 | 7.0 |
| Large kattumaram + trammel | 5.5 | 19.0 | 9.0 | 17.8 | 24.5 | 21.3 | 10.1 | 26.0 | 10.0 | 12.7 | 2.5 | 0.0 | 26.8 | 19.7 | 15.00 |
| Large kattumaram + small mesh gillnet (mono) | 44.0 | 36.3 | 50.0 | 37.4 | 28.2 | 27.7 | 38.3 | 20.6 | 55.4 | 43.6 | 70.5 | 63.7 | 26.9 | 71.6 | 43.0 |
| Large + small kattumaram dragnet | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 10.2 | 10.6 | 4.6 | 4.1 | 6.4 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| Large + small kattumaram + boat-seine | 38.0 | 26.0 | 23.0 | 35.0 | 27.2 | 33.3 | 34.0 | 45.3 | 26.4 | 27.6 | 7.7 | 31.8 | 26.9 | 1.2 | 29.0 |
| Small katinmaram x 5 + liftnet | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| Nava + large mesh gillnet (11 panels) | 0.0 | 8.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 60.0 | 0.0 | 0.0 | 0.0 | 21.0 | 0.0 | 3.0 |
| Nava + large mesh gillnet (30 panels) | 100.0 | 92.0 | 94.0 | 00.0 | 00.0 | 100.0 | 100.0 | 100.0 | 40.0 | 0.0 | 100.0 | 100.0 | 79.0 | 100.0 | 97.0 |
| BLC trammel | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 0.0 | 26.0 | 10.0 | 50.0 | 0.0 | 0.0 | 52.0 | 71.0 | 12.0 |
| BLC + large mesh gillnet (50 panels) | 50.0 | 14.0 | 30.0 | 69.0 | 75.0 | 50.0 | 26.0 | 52.0 | 59.0 | 50.0 | 67.0 | 53.0 | 24.0 | 29.0 | 45.0 |
| BLC + large mesh gillnet (22 panels) | 50.0 | 66.0 | 70.0 | 31.0 | 25.0 | 40.0 | 74.0 | 22.0 | 31.0 | 0.0 | 33.0 | 47.0 | 24.0 | 0.0 | 43.0 |
| Teppa + Bottom longline | 0.0 | 100.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 100.0 | 100.0 | |
| Average no. of fishing days | | | | | | | | | | | | | | | |
| Kattumaram | 29 | 28 | 24 | 23 | 19 | 19 | 17 | 22 | 24 | 26 | 23 | 26 | | | |
| — Nava/ BLC | 20 | 20 | 17 | 20 | 18 | 18 | 20 | 10 | 6 | 0 | 12 | 13 | | | |

5.6 Species composition

The species/species groups or varieties caught by various combinations of craft and gear and their individual catch rates (kg/fishing day), to indicate the relative proportions in the catches, are presented in Table 6. Small and large *kattumaram* catch about 34 out of 62 varieties landed in Kothapatnam while *nava* and BLCs landed lesser number of varieties but of relatively much larger size and quantities. Indian mackerel, carangids, ribbonfish and small croaker contribute to the seasonal peaks in the catches of small and large *kattumaram*. Larger shrimp also contribute to their seasonal peaks in income, because of their high value. The *navcz* and BLCs primarily land the large sized croaker, skate, ray, seerfish and shark. Migrant *teppa* target on croaker, catfish, shark and ray. Croaker, pomfret, ribbonfish, catfish and penaeid shrimp are varieties taken by all types of craft at different stages in the lives of these animals.

There is considerable interaction between different types of craft, as far as shrimp and demersal finfish are concerned. Large pelagics, such as seer, small tuna and pelagic shark are at present exploited only by *nava* and BLCs, while the small pelagics, such as sardine, mullet, anchovy and small carangids and the non-penaeid shrimp, are exploited only by *kattumaram* fisheries.

Table 6
Species/species groups or varieties caught and the catch rates for craft/gear combinations

| SPECIES NAME | 1C1 | 1C1 | 1C1 | 1C2 | 1C2 | 2C3 | 3C3 | 3C3 | 1C1 | 2C3 | 3C3 | 3C3 | 4C1 | 5 x | 1C3 | 1C3 | 1C3 | 2C4 | 2C4 |
|--|------|------|------|------|------|------|------|------|------|-----|------|------|------|-----|------|-----|------|-----|-----|
| | | | 1C2 | | | | | | 1C1 | | | | | | 1C1 | | | | |
| | A | C | B | A | C | F | DO | | B | E | A | P | P | H | C | Q | A | SC | |
| Albula/Bonefish | | | | | | | | | | | | | | | | | | | |
| Anadontostoma | | | | | | | | | | | | | | | | | | | |
| chacunda/Shad | | | | | | | | | | | | | | | | | | | |
| Anchovy | — | — | — | — | 0.06 | | | | | | | | | | | | | | |
| Black pomfret | — | — | 0.01 | — | 0.04 | 0.18 | 0.39 | 0.24 | | | | | | | 3.71 | — | — | — | |
| Carangids/Caranx | 0.13 | 1.77 | 0.28 | 0.03 | 3.42 | 7.24 | 0.64 | 2.27 | — | — | — | — | 3.45 | | | | | | |
| Catfish | | | | | | | | 1.35 | | | | | | | | | | | |
| Coilia Dusu- micra/Anchovy | — | — | — | — | 0.12 | — | — | — | 0.15 | — | | | | | | | | | |
| Crab | 0.17 | 0.02 | 0.07 | 0.06 | 0.03 | | | | | | | | | | | | | | |
| Cynoglossus | | | | | | | | | | | | | | | | | | | |
| spp/Tongue sole | — | — | 0.04 | 0.07 | | | | | | | | | | | | | | | |
| Drepane spp/Sicklefish | | | | | | 0.03 | — | — | — | — | | | | | | | | | |
| Ethynnus affinis/ Littletuna | | | | | | 0.04 | 0.64 | | | | | | | | | | | | |
| Flatfish/Flounder | | | | | | | | | | | | | | | | | | | |
| Flyingfish | | | | | | | | | | | | | | | | | | | |
| Gerret spp/ Silverbiddy | 0.01 | 0.01 | | | | | | | | | | | | | | | | | |
| Goatfish | — | — | — | — | 0.02 | | | | | | | | | | | | | | |
| Grouper | | | | | | 0.03 | — | 0.14 | | | | | | | | | | | |
| Harpadon/ Bombay duck | — | — | 0.01 | — | 0.08 | | | | | | | | | | | | | | |
| Hemiramphus spp/ Halfbeak | | | | | | | | | 3.56 | — | | | | | | | | | |
| Hilsa spp | 0.02 | 0.90 | — | 0.01 | 0.94 | | | | | | | | | | | | | | |
| Lactarius lactarius/ False trevally | | | | | | | | | | | | | | | | | | | |
| Lates calcarifer/ Seaperch | | | | | | 1.11 | — | — | — | — | | | | | | | | | |
| Leiognathus/Silver belly | — | — | 0.03 | 0.05 | 0.14 | | | | | | | 0.60 | | | | | | | |
| Metapenaeus spp/ Shrimp (Brown) | 0.15 | 0.01 | 0.15 | 0.16 | 0.01 | — | — | — | 0.02 | — | 0.06 | | | | | | | | |
| Miscellaneous/ Mixed species | 1.10 | 3.10 | 4.17 | 2.10 | 4.57 | — | 0.11 | 0.02 | 3.35 | | 4.47 | 5.0 | | — | 0.71 | — | 5.26 | | |
| Mullet | 0.21 | — | — | 0.07 | | | | | | | | | | | — | — | — | — | |
| Non-penaeid prawn | — | — | 3.99 | | | | | | | | | | | | — | — | — | — | |

| SPECIES NAME | IC1 A | IC1 C | IC1 IC2 B | IC1 A | IC2 C | 2C3 F | 3C3 D | 3C3 O | IC1 IC1 B | 2C3 E | 3C3 A | 3C3 P | 4C1 P | 5 x IC1 H | IC3 C | IC3 Q | IC3 A | 2C4 S | 2C4 C |
|--|----------|----------|-----------------|----------|----------|----------|----------|----------|-----------------|----------|----------|----------|----------|-----------------|----------|----------|----------|----------|----------|
| Opisthopterus spp/Sardine | — | 0.42 | 0.03 | — | 0.88 | | | | | | | | | | | | 0.51 | — | — |
| P. Indicus/ White shrimp | 0.24 | — | 0.01 | 0.58 | 0.01 | — | — | — | 0.15 | — | 7.42 | | — | — | — | — | 0.84 | — | — |
| P. Monodon/ Tigerthrimp | | | | | | | | | | | | | | | | | | | |
| Parrotfish | | | | | | | | | | | | | | | | | | | |
| Penaeid (large) | 0.23 | — | 0.06 | 0.15 | 0.28 | | | | | | | | | | | | | | |
| Penaeid shrimp (small) | — | — | 5.96 | 0.05 | 0.01 | — | — | — | 10.63 | 0.17 | | | | | | | | | |
| Piatycephalus spp/ Flat head | | | | | | | | | | | | | | | | | | | |
| Plotosus spp/Cat fish | | | | | | | | | | | | | | | | | | | |
| Polynemus spp/ Threadfin | 0.01 | — | — | 0.10 | 0.08 | 6.66 | 1.57 | 0.14 | | | | | | | | | 0.26 | — | 38.40 |
| Psettodes spp/Flatfish | | | | | | | | 0.05 | | | | | | | | | | | |
| Pufferfish | | | | | | | | | | | | | | | | | | | |
| R. Kanagurta./Indian Mackerel | 0.02 | 3.06 | — | 0.01 | 13.89 | — | 0.93 | — | — | — | — | | | | | | | | |
| Rachycentron spp/ Cobia | | | | | | | | | | | | | | | | | | | |
| Rattail Anchovy | 0.05 | — | 0.24 | 0.02 | 0.01 | | | | | | | | | | | | | | |
| Ray | | | | | | 6.16 | — | 0.14 | — | 979.5 | — | 57.0 | 3.43 | | 3.14 | — | — | — | — |
| Ribbonfish | 0.22 | 0.53 | 14.8 | 0.02 | 2.17 | | | | | | | | | | | | | | |
| Sailfish | | | | | | | 0.14 | | | | | | 0.86 | | | | | | |
| Sardine/Lesser sardine/Clupeid | 0.14 | 0.62 | 0.56 | 0.01 | 2.26 | — | 0.05 | | | | | | | 228.8 | — | 0.77 | — | — | 42.00 |
| Sciaenidae/Croaker | 0.70 | 0.31 | 0.83 | 0.41 | 0.52 | 91.85 | 4.76 | 8.19 | 0.15 | — | 0.10 | — | 60.71 | — | 0.50 | — | 2.77 | — | 3.60 |
| Seerfish/5. Commerson | — | — | 0.02 | — | 0.06 | 9.93 | 17.97 | 19.49 | — | 0.29 | 2.00 | — | — | — | 0.25 | — | — | — | — |
| Shark | — | 0.06 | — | — | 0.03 | 11.73 | 20.12 | 14.92 | — | 12.50 | — | 25.0 | 4.43 | — | 1.14 | 14.0 | — | 1400.0 | — |
| Shovelnoseshark | | | | | | 0.60 | | | | | | | | | | | | | |
| Sillagosp/Whiting | | | | | | | | | | | | | | | | | | | |
| Silver Pomfret/Pomfret/ Baby Pomfret | — | 0.02 | 0.08 | — | 0.16 | — | 16.73 | 1.73 | | | | | | | 2.0 | — | 0.14 | | |
| Skate | | | | | | | | | | 15.0 | | | | | | | | | |
| Sole | 0.04 | — | — | 0.01 | | | | | | | | | | | | | | | |
| Sphyræna spp/ Barracuda | — | — | 0.18 | 0.01 | 0.02 | — | 2.29 | 2.28 | | | | | | | | | 0.29 | — | — |
| Squid | | | | | | | | | | | | | | | | | | | |
| Squilla | | | | | | | | | | | | | | | | | | | |
| Stolephorus spp/ Anchovy | | | | | | | | | | | | | | | | | | | |
| Swimbladder of croaker | — | — | — | — | 7.38 | 0.02 | — | — | — | | | | | | | | | | |
| Synodus indicus/ Lizardfish | | | | | | | | | | | | | | | | | — | — | — |
| Tachysurus spp/Catfish | — | 0.05 | — | — | 0.07 | 0.54 | 0.71 | | | | | | | 240.0 | | | — | — | — |
| Therapon spp | — | 0.01 | — | — | | | | | | | | | | | | | — | — | — |
| Thryssa spp/Anchovy | 0.01 | 0.16 | 0.01 | — | 0.21 | | | | | | | | | | | | — | — | — |
| Redsnapper | | | | | | | | 0.13 | | | | | | | | | — | — | — |
| Tuna | | | | | | 2.85 | 1.25 | 4.76 | — | — | — | — | | | | | | — | — |
| Total | 3.51 | 11.18 | 31.60 | 3.91 | 30.34 | 146.34 | 66.42 | 55.87 | 18.06 | 1007.3 | 12.81 | 87.0 | 72.86 | 462.0 | 11.50 | 16.0 | 10.84 | 1400.0 | 96.0 |

5.7 Catch rates

5.7.1 IN RELATION TO CRAFT-GEAR COMBINATION

Table 7 exhibits the overall average catch rates (kg/day) for each craft-gear combination and the revenue (Rs/day) realized for the period August 1988 to December 1989. Significant differences in catch rates are evident for various gear used by each type of craft. Even the liftnet operated by the *kattumaram* gives a reasonably good catch rate, but this operation is possible only when large shoals of fish are sighted and not on a regular basis. The large *kattumaram* operations are generally twice or more as efficient as the small *kattumaram* operations.

Table 7
Annual average catch rates (kg/day) and gross revenue (Rs/day)
for craft/gear combinations used in Kothapatnam-Pallipalem

| Code | Craft | Gear (code) | Kg/day | Rs/day | Rel. fishing efficiency | Main species |
|---------|---------------------------------|--|---------|---------|-------------------------|--|
| — | No craft | Hand operated dragnet (J) | 35.00 | 101.00 | — | Non-penaeid |
| | | Hand operated dragnet (N) | 105.00 | 15.00 | — | Mullet |
| 1C1 | Small <i>kattumaram</i> | Trainmelnet (A)* | 3.50 | 46.45 | 1.0*** | Croaker, Misc. |
| | | Small mesh monofilament gillnet (C) | 11.20 | 25.55 | 3.2 | Indian mackerel, Carangids |
| 1C1+1C2 | Small+large <i>kattumaram</i> | Dragnet (B) | 18.00 | 114.27 | 5.1 | Halfbeak Penaeid |
| | | Boat-seine (G) | 31.60 | 115.68 | 9.0 | Non-penaeid, Penaeid, Ribbonfish |
| 1C2 | Large <i>kattumaram</i> | Trammelnet (A) | 3.90 | 61.87 | 1.1 | Penaeid, Misc. |
| | | Small mesh monofilament gillnet (C) | 30.30 | 75.80 | 8.6 | md. Mackerel, Ray, Carangids |
| | | Large mesh gillnet (O) | 12.00 | 88.00 | — | — |
| 1C3 | Large <i>kauumaram</i> with OBM | Trammelnet (A)** | 10.80 | 67.71 | — | Penaeid, Croaker |
| | | Small mesh monofilament gillnet (C) | 11.50 | 59.14 | — | Ray, Shark |
| | | Longline BOBP (Q)** | 16.00 | 118.00 | — | Seer, Shark |
| 2C3 | Nova non-mechanized | Skatenet (E)* | 1007.00 | 1466.75 | — | Ray, Shark, Skate |
| | | V. Large mesh gillnet (F)* | 146.00 | 1657.65 | 41.7 | Carangids, Catfish, Ray, Croaker, Seer |
| | | Longline 500 hooks (M) | 30.00 | 410.00 | — | Seer |
| | | Longline BOBP 300 hooks (Q) | 24.00 | 300.00 | — | Seer |
| 2C4 | Nova mechanized | Small mesh monofilament*** gillnet (C) | 96.00 | 115.00 | — | Seer, Croaker, Polynemus |
| | | Shark longline new design (5) | 1400.00 | 3200.00 | — | Shark |
| 3C3 | Beach Landing Craft | Trammelnet (A) | 12.80 | 605.70 | — | <i>P. Indicus</i> |
| | | Large mesh gillnet (D)* | 66.40 | 470.50 | 18.9 | Croaker, Seer, Skate, Pomfret |
| | | Liftnet (H) | 108.00 | 733.00 | — | Shark, Grouper, Carangids |
| | | Large mesh gillnet (O)* | 55.80 | 365.10 | 15.9 | Croaker, Seer, Shark, Pomfret, Tuna |
| | | Longline 1000 hooks, size 8(P) | 87.00 | 202.00 | — | Shark |
| | | Longline BOBP (Q)** | 33.70 | 217.00 | — | Shark |
| | | Skatenet BOBP (R)** | 20.00 | 80.00 | — | Snapper, Carangids |
| | | Shark longline BOBP (S)** | 21.30 | 91.70 | — | Shark |
| 4C1 | <i>Teppa</i> small | Longline 1000 BOBP (P)*** | 72.86 | 402.70 | — | Croaker |
| 4C2 | <i>Teppo</i> medium | Longline 1000 BOBP (P)*** | 43.50 | 241.10 | — | Croaker |
| 4C3 | <i>Teppa</i> large | Longline 1000 BOBP (P)*** | 46.80 | 298.60 | — | Croaker, Shark |
| 1C1 | Small <i>kattumaram</i> x 5 | Liftnet (H) | 468.00 | 564.50 | — | Sardine, Catfish |

Major commercial combinations

*** Migrant craft and gear combinations

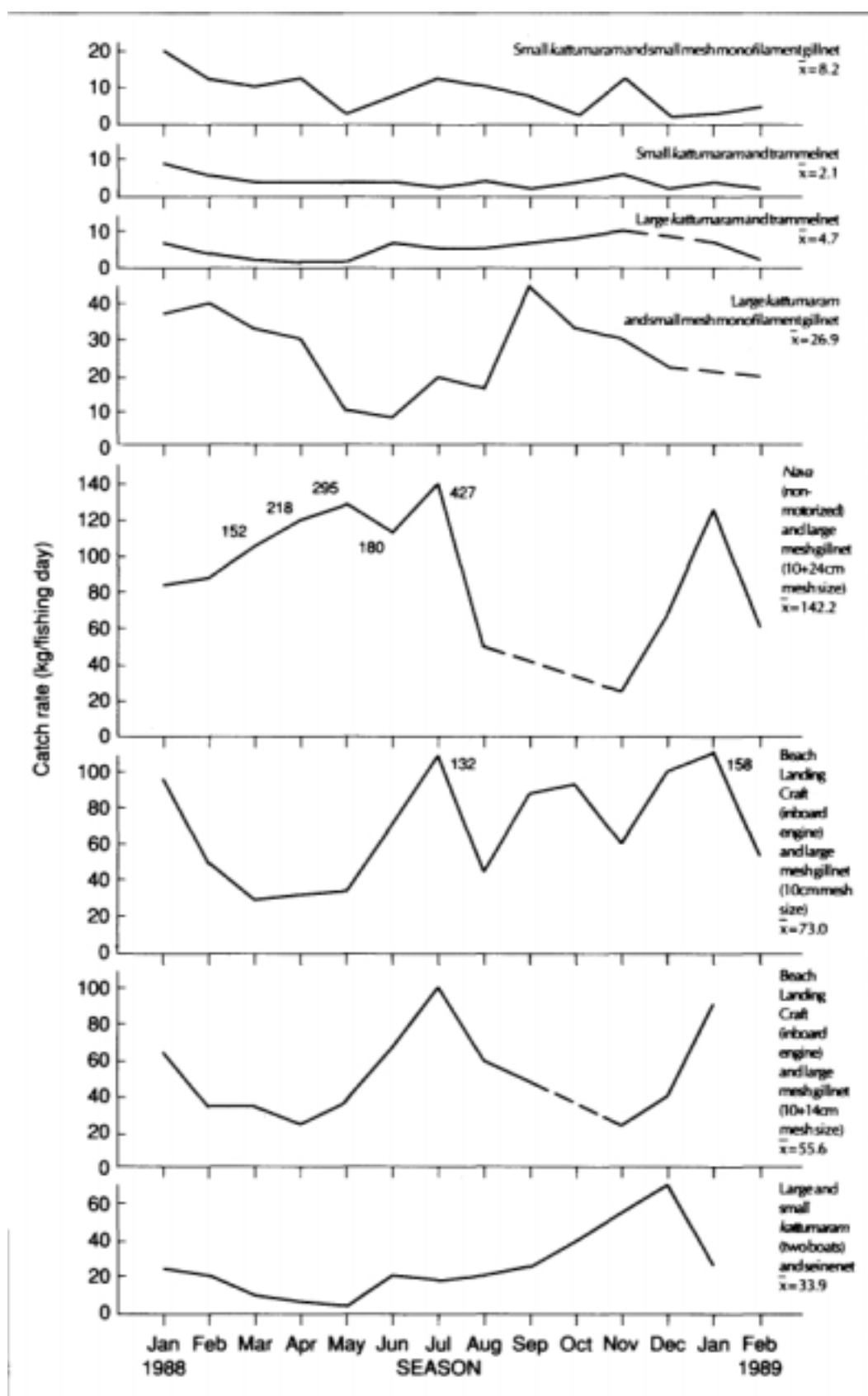
** Experimental combinations

** Base level for relative fishing efficiency

5.7.2 SEASONAL VARIATION

Seasonality in the catch rates of various combinations operated are illustrated in Figure 5. *Kattumaram* operations show that those who have many types of gear can seasonally change the

Fig. 5 Seasonal variations in the catch rates of major combinations of craft and gear in Kothapatnam-Pallipalem



operational gear to maximize their catch rates and revenue. This is because of the limited area of coverage, endurance of the craft and dependency on seasonal movement of various species into the area accessible to the craft. On the other hand, BLC and *nava* have greater endurance, carrying capacity and manoeuvrability, which permits them to seek the same species with the same gear, most of the time. Migrants with *teppa* operating in the area during the winter month average much higher catch rates than *kattumaram*.

5.7.3 PRODUCTION AND EARNING CAPACITIES

It is estimated that the annual landings in this village are about 800 t (Table 8). Thirtysix per cent of the production was contributed by *kattumaram* fisheries, while the balance was provided by the *nava* and BLCs and migrant *teppa*. The production capacity of each type and size of craft differs significantly with the gear operated.

Table 8
Monthly production (kg) by major craft/gear combinations

| Combi- natio.s | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total prod. | No. of boats | Prod. capacity per boat | Rank |
|-------------------|-------|--------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|----------------|--------------------|-------------------------------|------|
| 1C1 A | 0 | 490 | 170 | 90 | 80 | 110 | 0 | 50 | 0 | 70 | 80 | 0 | 1140 | 67 | 17.01 | 7 |
| 1C2A | 650 | 1060 | 300 | 300 | 170 | 600 | 320 | 860 | 400 | 1300 | 300 | 0 | 6260 | 13 | 481.54 | 2 |
| 1C1 C | 4800 | 2300 | 1900 | 630 | 170 | 150 | 670 | 210 | 330 | 130 | 600 | 60 | 11950 | 38 | 314.47 | 3 |
| 1C2 C | 31300 | 20800 | 19000 | 10600 | 1100 | 1700 | 8800 | 4100 | 28300 | 16000 | 8700 | 9700 | 160100 | 202 | 792.57 | 1 |
| 1C1 & 1C2 B | 0 | 0 | 0 | 0 | 260 | 850 | 2000 | 400 | 540 | 750 | 0 | 0 | 4800 | 17 | 282.35 | 6 |
| 1C1 & 1C2 G | 12600 | 8100 | 3600 | 3100 | 540 | 2600 | 6900 | 3400 | 4500 | 6800 | 1000 | 2800 | 55940 | 163 | 343.19 | 4 |
| 1C1 x 5 H | 0 | 3600 | 0 | 0 | 0 | 0 | 1440 | 850 | 0 | 0 | 0 | 0 | 5890 | 15 | 392.67 | 5 |
| 2C3E | 0 | 45200 | 31300 | 0 | 0 | 0 | 0 | 0 | 48000 | 0 | 0 | 0 | 124500 | 11 | 11318.18 | 1 |
| 2C3 F | 18500 | 26000 | 31800 | 72300 | 10800 | 59100 | 94200 | 11600 | 0 | 0 | 2800 | 7400 | 334500 | 159 | 2103.70 | 2 |
| 3C3 D | 5700 | 2000 | 1100 | 2100 | 3100 | 4600 | 5800 | 1600 | 3300 | 7400 | 2700 | 4600 | 44000 | 35 | 1257.10 | 2 |
| 3C3 O | 4000 | 2400 | 1900 | 1300 | 1900 | 1600 | 11600 | 3800 | 4900 | 0 | 1080 | 1600 | 36080 | 31 | 1163.80 | 3 |
| 3C3 A | 0 | 0 | 0 | 0 | 0 | 132 | 0 | 420 | 160 | 1000 | 0 | 0 | 1712 | 7 | 244.60 | 4 |
| 4C2 P | 0 | 4100 | 2700 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6800 | 4 | 1700.00 | 1 |
| 4C3 P | 0 | 8000 | 5900 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1800 | 15700 | 14 | 1121.43 | 2 |
| Total (tonnes) | 77.55 | 124.05 | 99.67 | 90.42 | 18.12 | 71.44 | 131.73 | 27.29 | 90.43 | 33.45 | 17.26 | 27.96 | 809.37 | — | — | — |

See Tables 2 and 4 for details of craft and gear codes.

Among the *kattumaram*, large ones operating small mesh monofilament gillnets showed the highest production capacity of about 800 kg/annum, while other gear combinations with *kattumaram* exhibited 60 per cent of this value or less. *Nava* operating skatenet very seasonally showed extremely high capacity — nearly 11 t/annum. *Nava* operating large mesh gillnets achieved higher productivity (2.1 t/annum) than BLC operating similar gear (1.3 t/annum). BLCs are new introductions and fishermen appear to lack familiarity and experience with this modern type of craft.

When the earning capacities are examined, small and large *kattumaram* operating trammelnets had the lowest catch rates, but their revenue per day was relatively high compared to other *kattumaram* fisheries, because of the high value shrimp in the catches.

Nava operating skatenets realize the highest productivity, but these nets are less popular than large mesh gillnets. The latter have lower productivity, but provide better revenue than the former. Similarly, BLCs operating large mesh gillnets show five times higher catch rates than when operating trammelnets, but the revenue from the latter is about 30 per cent higher than that of the former (Table 6). The fishermen here prefer to operate craft gear combination which have higher earning capacity than production capacity. The only fishermen who do not follow this principle are those who do not own the appropriate craft and gear combinations to maximize their earnings by changing the combinations to suit seasonal changes in the availability of higher value shrimp and finfish.

5.7.4 STATE OF EXPLOITED RESOURCES

The level of production for each species/species group or variety is shown in Figure 4, against the abundance of these species or species groups, thus illustrating the degree of exploitation in the range (0-30m) exploited at present. Active gear, such as dragnet, boat-seine, and liftnet, have bags or cod-ends of 0.5 -2.0 cm mesh sizes and are operated in very shallow waters. This results in the catching of very small size fish, mainly juveniles of such species as croaker, pomfret, ribbonfish, catfish, carangids and penaeid shrimp. The degree of exploitation of juveniles in the shallow water (<5m) could be detrimental to many of the important species, particularly if this practice extends all along the coastline. Use of such active fishing gear should be discouraged in the area covered by *kattumaram*.

Fishermen using small *kattumaram* have to shift into one of the better systems of small-scale fisheries or, at least, into large *kattumaram* fisheries. In this way, the reduction in the exploitation of juveniles would help to improve catch rates of adults by craft fishing further away from shore and improve the earnings of the larger *kattumaram* operators and others.

The resources surveys, and the depthwise fish density pattern in the present areas of operation of *kattumaram* as well as the production level of each species group, indicate that there are pockets of underutilized resources of particularly large sized shrimp, catfish and croaker in the 20 - 60 m depth range, unutilized species — such as large shark and skate — at the bottom, and Spanish mackerel, small tuna and pelagic shark in the pelagic zones beyond the 100 m depth line.

A limited number of test fishing operations were conducted by fixing an outboard motor to large *kattumaram* and using monofilament gillnet, trammelnet and bottom longline and also by using a motorized *nava* hired in Kakinada, to try out bottom longline for very large sized shark. Though some of the results were positive, further trials are necessary to establish economic feasibility (Annexure I).

Motorized *kattumaram* should be considered only on the basis of such resource identification and trials for establishing viability, on an area by area basis.

5.7.5 ECONOMICS IN THE OPERATION OF VARIOUS CRAFT-GEAR COMBINATIONS

The system of sharing earnings, with the crew, varies with the type of fishery. Boat-seining with small and large *kattumaram* allocate four-fifth of the gross revenue to crew and a fifth to owners. Migrant *teppa* operating longlines, provide two-thirds to crew and a third to the owner. All other combinations operate on a 50-50 basis, after deducting food, fuel, bait and other variable costs.

The costs and earnings calculated on a monthly basis, for major combination of craft and gear, are detailed in (Figures 6 a-i, on the following pages) . The small and large *kattumaram* appear generally profitable during some months, taking the fixed costs also into account. However, the small *kattumaram* tends to incur losses during the third quarter due to poor catch rates and monsoonal weather. The loss is borne by the owner because the crew share is paid after deducting the variable costs only. But even during the profitable months, the actual earnings of these fishermen are relatively low and are insufficient to meet the basic requirements for living. This strengthens the argument for suspending small *kattumaram* operation.

In the case of large *kattumaram*, the operation of three or more types of fishing gear may provide an evenly moderate income throughout the year. This may not be possible with the small *kattumaram* because it will have to operate gear which are destructive to the resource, to obtain a meagre income year round.

Nava undertaking multiday trips, salting their catch and salt-curing swimbladder or gasbladder of croaker, get a very high income during the first half of the year and very low or no income during some months in the second half. BLCs, being a relatively new introduction, are not operating at maximum efficiency and do not venture out as far and as long as the *nava* do. Besides, with the capital investments in them and their fuel costs the nett earnings are very much less than that of *nava*. Consequently, losses are incurred by the owners operating large mesh gillnets (Gear Code 'D'; 10m x 50- 60 panels) during March-May. Those operating gillnets with about half the number of panels (Gear Code 'O'; 10 cm x 16 panels + 14 cm x 6 panels) seem to be more often in the red (Figures 6 h+i).

The Internal Rate of Return and Net Present Value (NPV) were estimated for a few of the popular combinations of craft and gear used in Kothapatnam. The results are summarized below

| <i>Craft</i> | <i>Gear</i> | <i>Capital investment</i> (Rs.) | <i>Gross income</i> (Rs.) | <i>IRR</i> (5 yrs) | <i>NPV</i> |
|-----------------------------|---------------------------------|------------------------------------|------------------------------|-----------------------|------------|
| Small <i>kattumaram</i> | Small mesh monofilament gillnet | 6,000 | 6,371 | Neg. | — |
| Small <i>kattumaram</i> | Trammelnet | 7,000 | 11,887 | 44.8 | 5,822 |
| Large <i>kattumaram</i> | Small mesh monofilament gillnet | 10,000 | 20,640 | 70.0 | 19,977 |
| Large <i>kattumaram</i> | Trammelnet | 11,000 | 22,375 | 70.0 | 25,097 |
| <i>Nova</i> (non-motorized) | Large mesh gillnet | 95,000 | 519,876 | 70.0 | 654,403 |

The IRR for small *kattumaram* showed a negative result when it operated gillnets, irrespective of whether the life span of the craft was taken as three years or five years. However, it shows a good return value if it operates trammelnets and if the craft has a life span of five years or more. On the other hand, large *kattumaram* and *nava* both exhibit much better economic performances. The cost and earnings analysis, however, showed that the earnings of the owners and crew members of small *kattumaram* were insufficient to lift them above the poverty line. Those of large *kattumaram* were only slightly better. But those for *nava* were very high.

It must, however, be noted that, quite often, the IRR value has been used in isolation, as the economic performance index, without relating it to the actual earnings from small-scale fishing craft, traditional and non-traditional. This is followed in some developing countries and may be misleading, as can be seen in the case of the *kattumaram* in Kothapatnam.

(Over to page 24)

Fig 6a. Costs & earnings of *kattumaram*
1C1 - A (Jan 1989- Dec 1989)
Small *kattumaram* and trammelnet

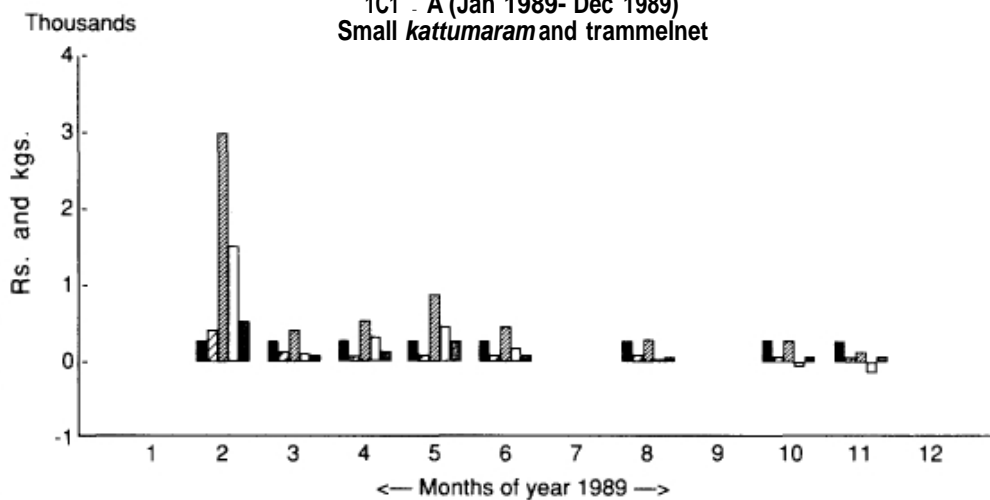


Fig 6b. Costs & earnings of *kattumaram*
1C2 - A (Jan 1989- Dec 1989)
Large *kattumaram* and trammelnet

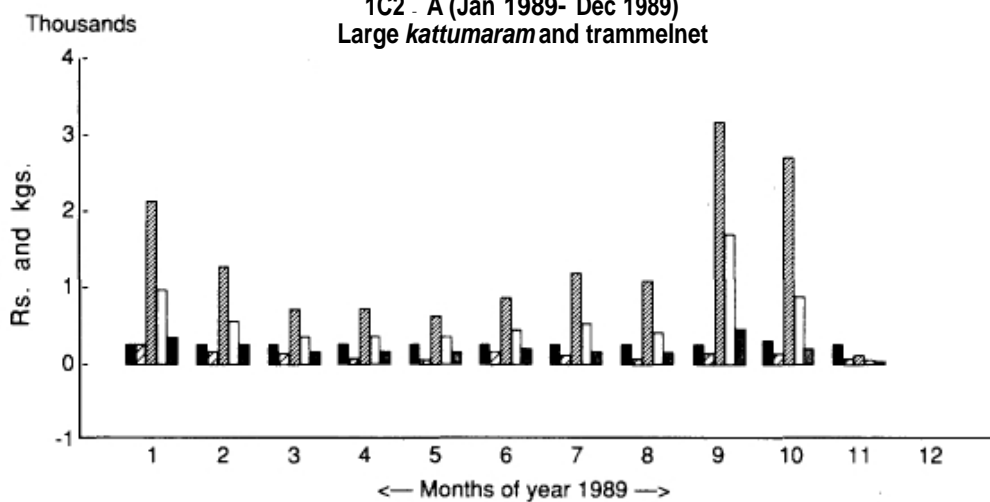


Fig 6c. Costs & earnings of *kattumaram*
1C1&2- B (Jan 1989- Dec 1989)
Small and large *kattumaram* and dragnet

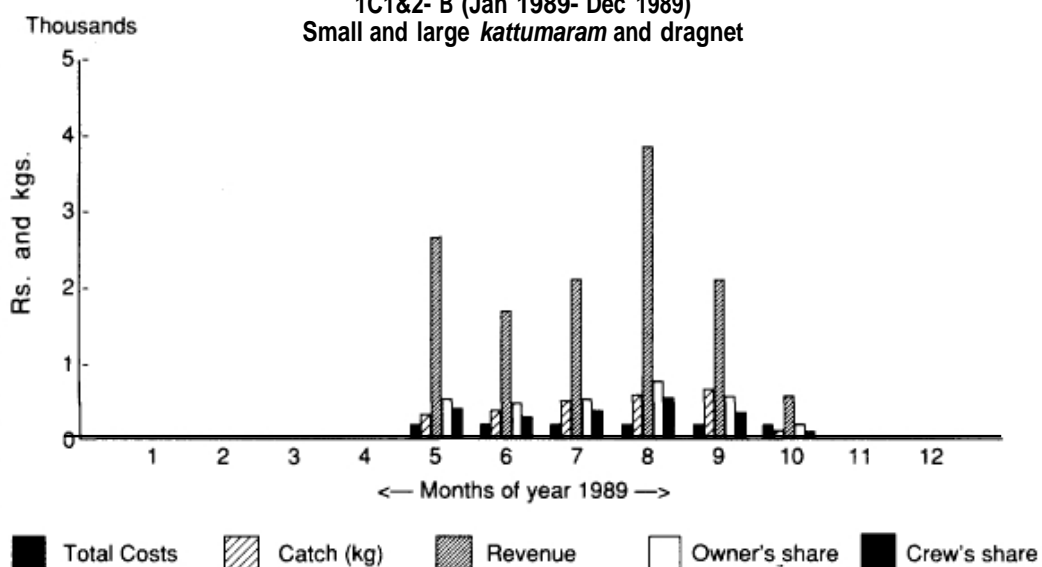


Fig 6d. Costs & earnings of *kattumaram*
1C1&2 - G (Jan 1989- Dec 1989)
Small & large *kattumaram* and boat-seine

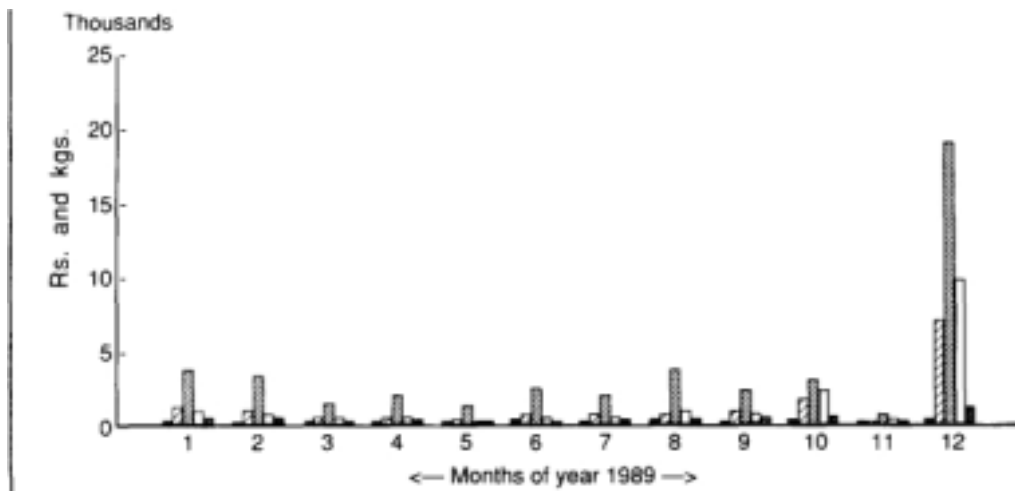


Fig 6e. Costs & earnings of *kattumaram*
1C1 - C (Jan 1989- Dec 1989)
Small *kattumaram* and monofilament gillnet (small mesh)

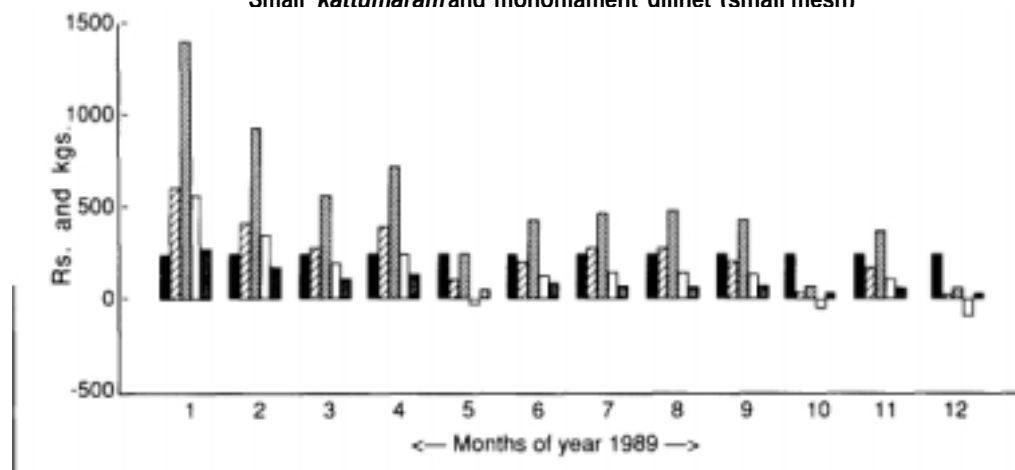


Fig 6f. Costs & earnings of *kattumaram*
1C2 - G (Jan 1989- Dec 1989)

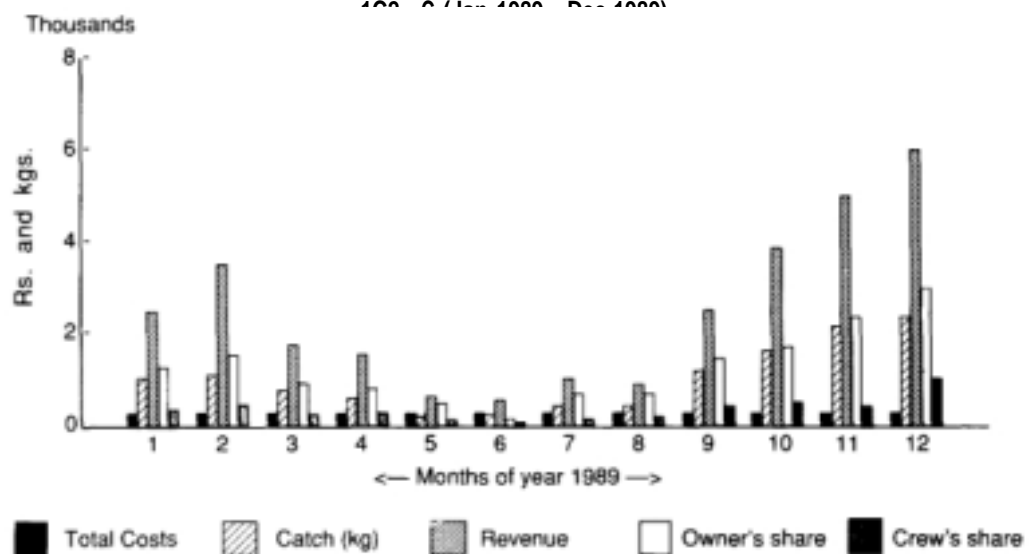


Fig 6g. Costs & earnings of *nava*
2C3 - F (Jan 1989- Dec 1989)
Nava and large mesh gillnet (10cm mesh size)

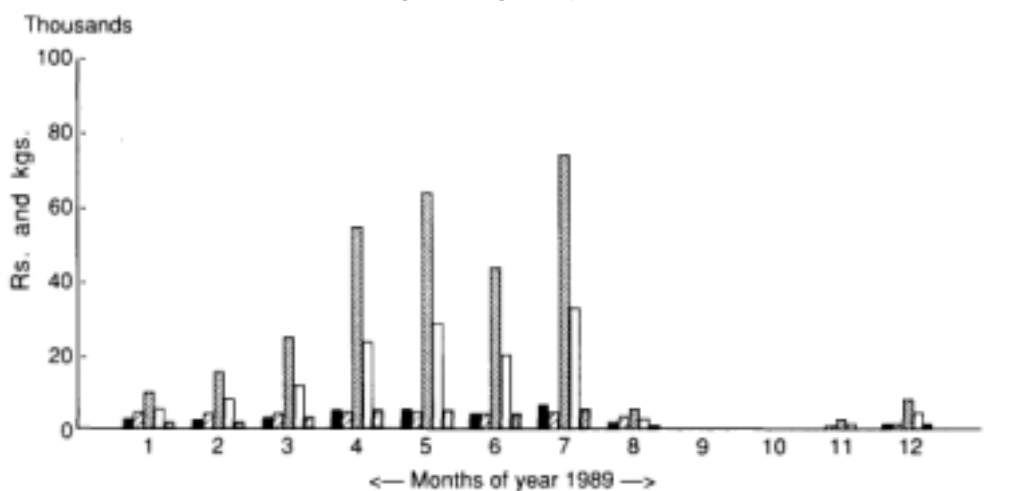


Fig 6h. Costs & earnings of BLC
3C3 - D (Jan 1989 - Dec 1989)
BLC and large mesh gillnet (10 cm x 50-60 panels)

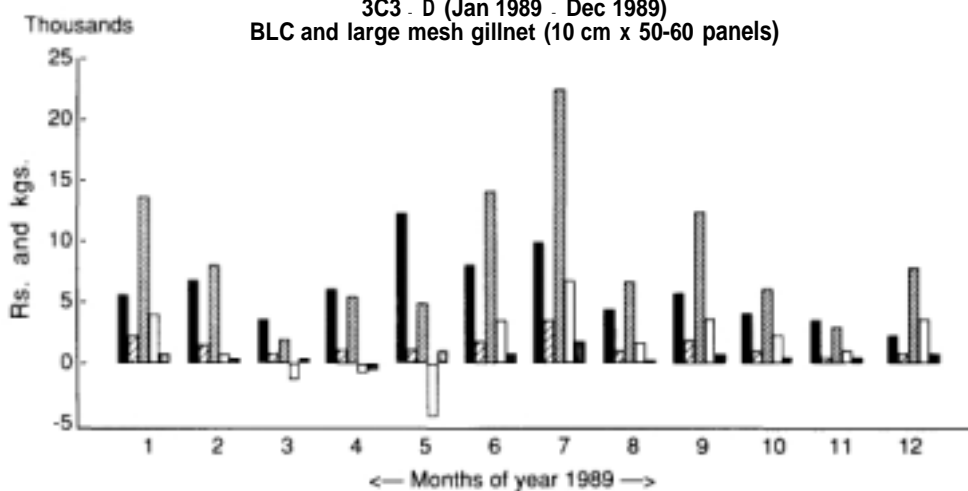
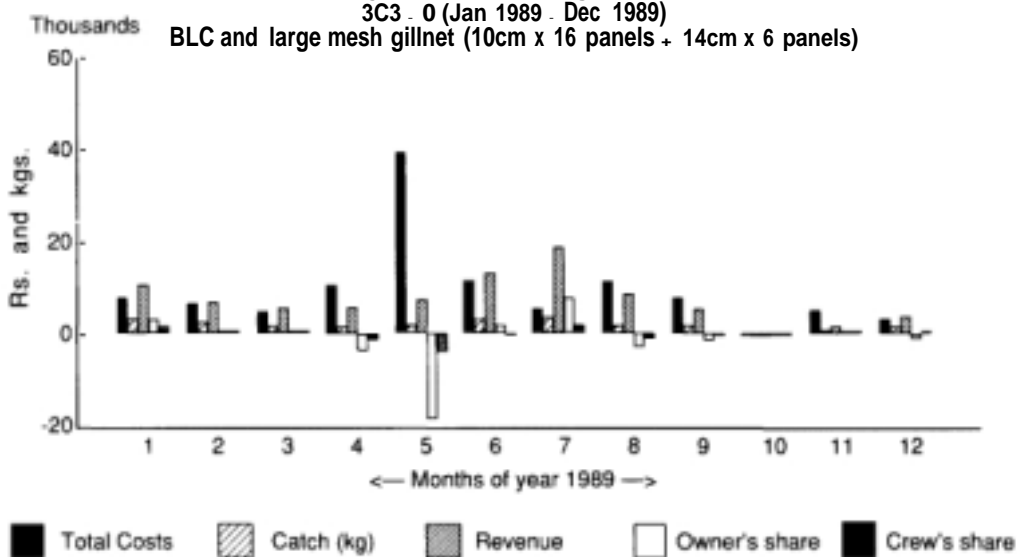


Fig 6i. Costs & earnings of BLC
3C3 - O (Jan 1989 - Dec 1989)
BLC and large mesh gillnet (10cm x 16 panels + 14cm x 6 panels)



In order to assess the general pattern of behaviour of IRR and cost-benefit ratio values, estimates for Kothapatnam and values available for other areas along the east coast of India (El Gendy 1990; Anonymous 1987) were examined (Figure 7, facing page). These indices tend to decrease with increasing level of investment in the fishing craft. They also exhibit a high degree of variability influenced by the abundance/density of fish resource, the level of exploitation of the resource by other fisheries in the area, the commercial value of the fish, and the skill of the fishermen. The economic performance of a craft and gear combination may not only vary with geographical area of fishing but also in the same area if the status of the resource changes due to changes in fishing effort on the resource or in the environmental conditions, with time. Therefore, any feasibility and economic performance analysis established for a craft and gear would be valid only for specific combinations of factors mentioned. Further, IRR values should be discussed in conjunction with estimates such as actual income to fishermen, the NPV, technological qualities of the craft and gear for fishing efficiency and any destructive effects on the resource.

The *nava* is the most outstanding traditional craft, having the best IRR, the highest NPV, and the highest income to owners and crew members. Introduction of modern fishing craft, such as the BLC, should be tied to a programme of trial fishing in the area, effective training and demonstration, before determining their economic performance. Further, introduction of small *kattumaram* should not be encouraged. At least along the southern coast of Andhra Pradesh.

6. HANDLING, MARKETING AND PROCESSING OF FISH FROM KOTHAPATNAM

6.1 Handling and preservation at sea

Kattumaram fisheries generally involve only a few hours at sea and hence no attempts are made to adopt any fish preservation techniques. In fact, due to the limited time at sea, *kattumaram* catches have to be removed from the nets at sea if the gear is to be reset. If gear is not planned on being reset, there is no fish handling at sea and removal and sorting of fish are done ashore.

Beach Landing Craft are generally at sea for about 12 hours. Hence, they too do not carry ice or salt but, they remove the fish from the net, stack the catch, cover it with gunny bags, canvas etc and keep it wet by frequently splashing sea-water over it. Further, as much of this fishing is done at night, the craft returning to base by morning, the fish escape the heat of the day. In rare instances, ice is provided by merchants to preserve shrimp. Only the *nava*, during the croaker fishing season, carry salt for preservation of the catch. During this season, trips are of two or more days and, hence, the gutted croaker are salted and the swimbladder dried.

6.2 Fish handling ashore

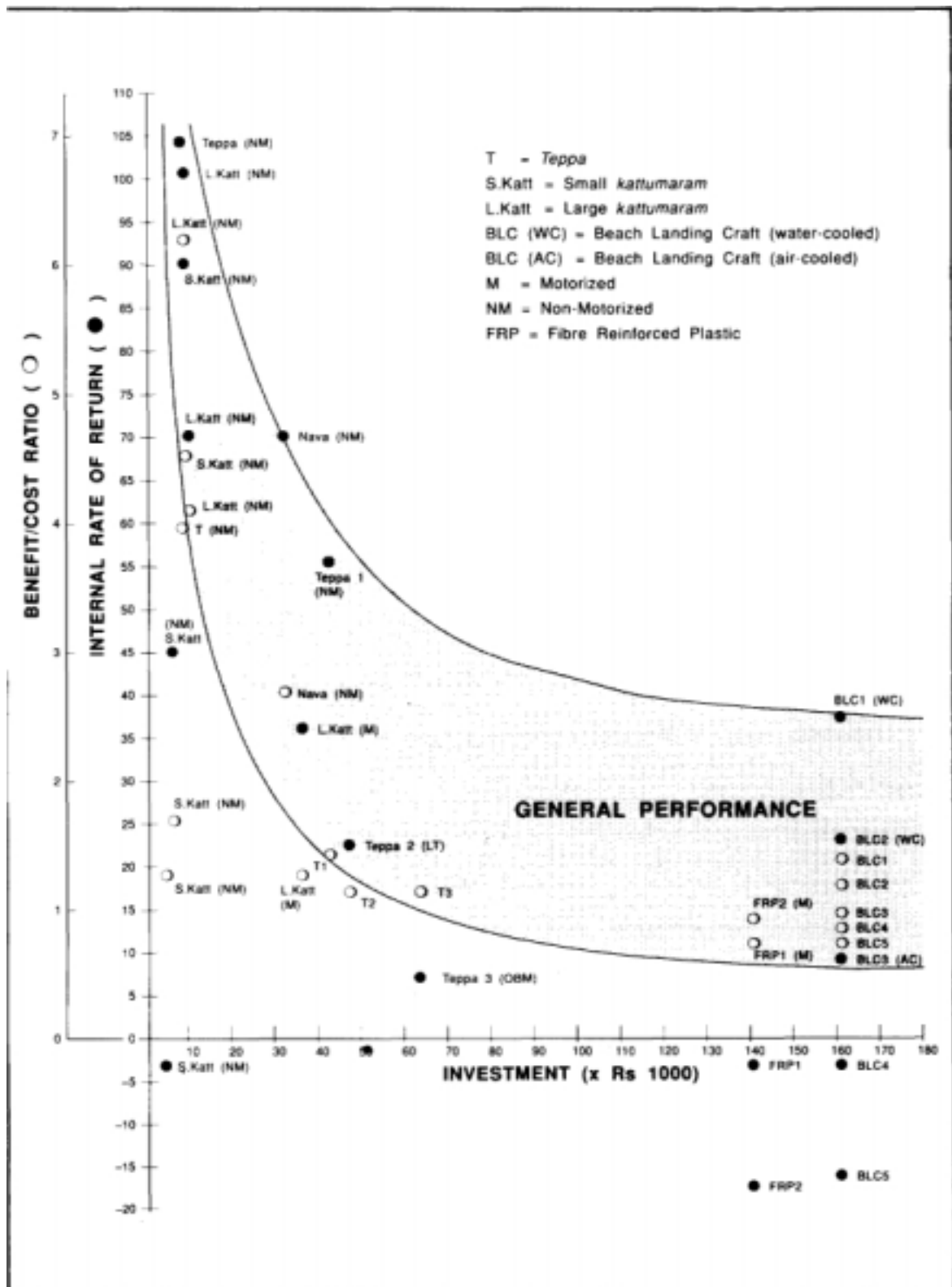
The hail constructed for fish auctions is being used for a primary school. Catch are therefore generally taken directly to the owner's house, unless the quantities are too large. The household generally carry out the sorting, weighing and preparing of shrimp for the merchants who collect them and pay for them on the spot.

Handling standards are very low. It may be possible to show improved financial returns with better handling of fish, such as croaker and pomfret. The use of more fish drying platforms and better construction of salt-curing tanks, improved supply of ice, a more hygienic process of de-heading shrimp and proper storage facilities for dry fish are some areas of improvements necessary. At present, only the merchants who come from distant places use ice on the fish while the fisherfolk on the other hand, use salt, gunny-bags, rice-husk, palm leaves etc as insulation material.

6.3 First sale

There is no system of auctioning the landings in the village. Bulk landings are sold to merchants from Ongole. When quantities are small, which is common, the owners of the craft and gear organize marketing and processing. A survey showed that at the first sale, the price in most cases (62 per cent)

Fig 7. Variation pattern in the economic performance indices, in relation to investment in small-scale fishing craft on the east coast of India



were fixed for such varieties as ribbonfish, sardine, anchovy and non-penaeid shrimp which are caught by *kattumaram* fishermen. It is credit linked in about 25 per cent of the cases, involving mainly shark, croaker, seerfish and large sized shrimp, most of which are caught by BLCs and *nava*. Shrimp alone is caught by BLCs and *kattumaram*. About 12 per cent of the catch, generally comprising of miscellaneous fish, crab, smaller quantities of anchovy and small penaeid shrimp are shared by owners and crew. The crew share is often bought by the owners, for processing or directly marketing. A very small percentage (1 per cent) of the landings, consisting of ray, skate, pomfret and small penaeid shrimp are freely sold. Price categories for the first sale of major varieties are indicated in Table 9.

Table 9
Frequency (%) distribution of price range categories for each variety marketed

| Species | 1 | 2 | 3 | 4 | 5' |
|-----------------------|----|----|----|----|-----|
| Shark | 2 | 11 | 80 | 7 | — |
| Skate/Ray | 95 | 5 | — | — | — |
| Wolf herring | 18 | 79 | 3 | — | — |
| Hilsa | 52 | 44 | 4 | — | — |
| Lesser sardine | 59 | 39 | 2 | — | — |
| Sardine | 54 | 44 | 2 | — | — |
| Rat-tailed anchovy | 91 | 9 | — | — | — |
| Anchovy | 59 | 39 | 2 | — | — |
| Caranx | 43 | 38 | 19 | — | — |
| Croaker | 44 | 17 | 7 | 21 | 11 |
| Swimbladder (Croaker) | — | — | — | — | 100 |
| Threadfin | 12 | 32 | — | 9 | 48 |
| Indian mackerel | 26 | 63 | 11 | — | — |
| Seer | 5 | 8 | — | 84 | 3 |
| Ribbonfish | 58 | 42 | — | — | — |
| Pomfret | 11 | 20 | — | 65 | 3 |
| Miscellaneous fish | 76 | 23 | — | — | — |
| Crab | 85 | 15 | — | — | — |
| Non-penaeid shrimp | 98 | — | — | — | 2 |
| Metapenaeid shrimp | 1 | — | — | — | 98 |
| White shrimp | — | — | — | 3 | 95 |
| Large penaeid shrimp | — | — | — | 3 | — |
| Small penaeid shrimp | — | — | — | 83 | 17 |

* CATEGORIES: 1. Up to Rs 2/-; 2. Rs 2 to Rs 3/-; 3. Rs 3 to Rs 5/-; 4. Rs 5 to Rs 10/-; 5. >Rs. 10/-

An analysis of the price structure for various types of fish, according to craft-gear combinations used, showed that prices of black and silver pomfret, jack/trevally, threadfin, croaker, shark and sole caught by *nava* and BLCs realized a unit price 100 per cent or more, than that for the same varieties caught by *kattumaram*. Hilsa, metapenaeus and penaeus species of shrimp, anchovy, ribbonfish realized more or less similar prices for all craft-gear combinations. On the other hand, seer, barracuda and tuna fetched equally high prices for BLCs and *nava*.

Higher unit prices for catches by BLC and *nava* were mainly due to the larger sizes caught and merchants buying them for out-of-state markets. The smaller sized fish landed mainly by *kattumaram* are for local markets or drying. The swimbladder from croaker landed by BLCs and *nava* are for export and hence add value to the croaker landings. This is also the case of large penaeid shrimp caught by *kattumaram*.

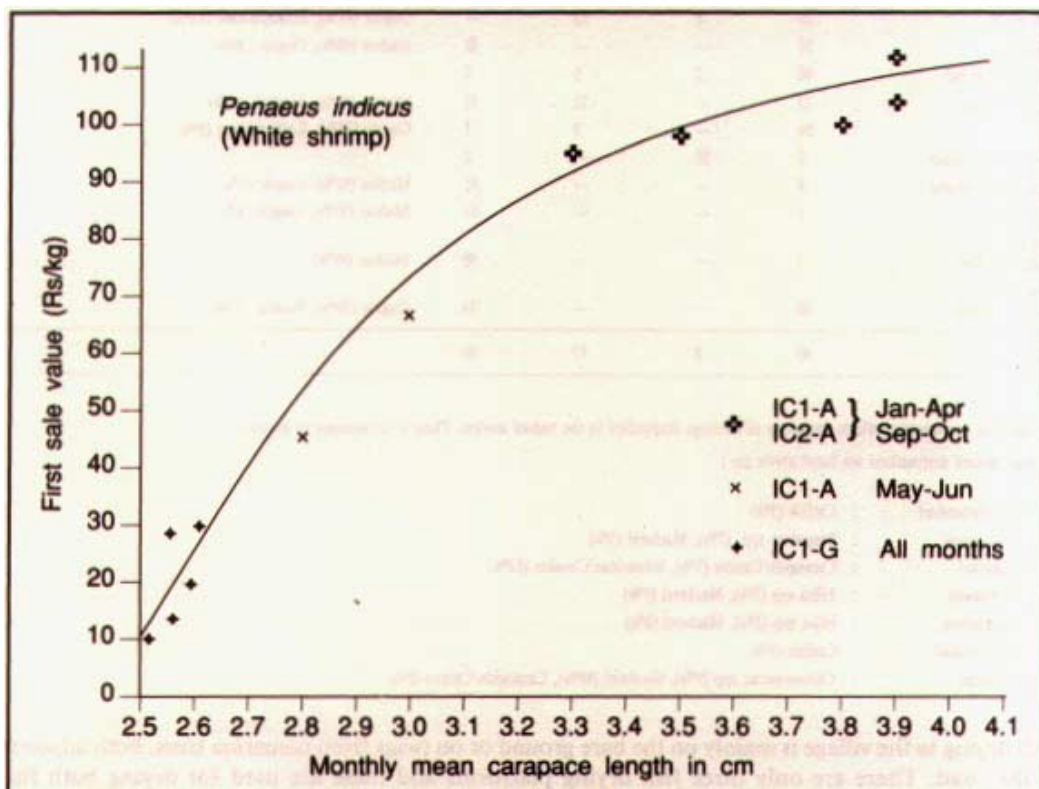
The price paid by merchants for large penaeid shrimp is related to the size. And the size caught depends on the gear used and the season. The largest size (4 cm carapace length) caught, fetches around 110 Rs/kg, medium size (3 cm carapace length) 70 Rs/kg and small (2.5 cm) 10 Rs/kg. The small sizes are for domestic markets, while medium and large for export (Figure 8, facing page).

Indian mackerel caught were more or less of the same mean length in all seasons in the area fished. Ribbonfish and pomfret, however showed higher mean sizes in the winter months when they also realised higher prices.



A typical mixed haul offish and shrimp, seen on the beach at Kothapatnam-Pallupalem.

Fig 8. Price variation with size of shrimp landed at Kothapatnam



6.4 Fish processing

The processing of each variety varies, depending on seasonal weather conditions, quantities landed, sizes of fish and quality of landings. Frequency distribution of the application of various types of processing on each of the major varieties, is shown in Table 10. It was also noted that some of the smaller varieties, such as the silver biddy, ponyfish and crab, are dried or consumed by the fishermen during the lean season, but are discarded during the good fishing season. During the peak season for Indian mackerel, the catches are gutted and salt cured in makeshift tanks on the ground, with large quantities of the viscera from the fish being dumped in the intertidal zone. Most of the shrimp are de-headed by women in their homes, before sale to merchants and the heads are discarded. The peak season for non-penaeid shrimp generally coincides with the rainy season. As these shrimp are always sold in dried form, large quantities are discarded.

Table 10
Frequency distribution (%) of the types of processing and market destinations for each variety — based on the landings sampled over the whole year

| Species | Fresh | Sundried | Salt cultured | iced | Market destinations offresh and iced fish |
|------------------------|-------|----------|---------------|------|---|
| Shark | 14 | — | 20 | 66 | Madras (64%), Renigunta (8%) |
| Skate/Ray | 2 | 2 | 94 | 2 | Renigunta (81%), Tirupathi (12%) |
| Wolf herring | 86 | — | — | 12 | Ongole (73%), Kothapatnam (12%) |
| Hilsa | 64 | — | 4 | 32 | Ongole (43%), Kothapatnani-Pallipalem (22%) |
| Lesser sardine | 86 | 3 | 10 | 1 | Ongole (44%), Kothapatnam (18%) |
| Sardine | 76 | 10 | 9 | 4 | Ongole (48%), Kothapatnam (17%) |
| Retailed Anchovy | 46 | 41 | 13 | — | |
| Anchovy | 86 | 4 | 10 | — | Ongole (43%), Kothapatnam (16%) |
| Carangids/Caranx | 59 | 7 | 21 | 12 | Ongole (37%), Kothapatnani (11%) |
| Sciaenidae/Croaker | 35 | 14 | 30 | 20 | Ongole (20%), Madras (16%) |
| Swimbladder | — | — | 100 | — | Santhol (37%), Thenali (12%) |
| Threadfin | 38 | — | 9 | 53 | Madras (52%), Ongole (23%) |
| Catfish | 71 | — | 2 | 26 | Ongole (53%), Kothapatnam (11%) |
| Seerfish | 14 | — | 16 | 69 | Madras (67%), Santhol (12%) |
| Ribbonfish | 59 | 8 | 32 | — | Ongole (46%), Kothapatnam (12%) |
| Pomfret | 52 | — | — | 48 | Madras (48%), Ongole (36%) |
| Miscellaneous fish | 90 | 2 | 5 | 2 | |
| <i>Tachysurus</i> spp | 23 | — | 22 | 55 | Madras (45%), Santhol (16%) |
| Crab | 94 | — | 3 | 3 | Ongole (29%), Kothapatnam (9%) |
| Non-penaeid shrimp | 2 | 95 | — | 2 | |
| Metapenaeid shrimp | 8 | — | — | 91 | Madras (92%), Ongole (6%) |
| White shrimp | 3 | — | — | 97 | Madras (92%), Ongole (6%) |
| Penaeid shrimp — large | 1 | — | — | 99 | Madras (99%) |
| Penaeid shrimp — small | 66 | — | — | 34 | Ongole (39%), Madras (32%) |
| Overall | 45 | 8 | 17 | 30 | |

1. Figures in parentheses indicate frequency of landings despatched to the named market. There is no measure of volume.

2. Other distant destinations not listed above are

| | |
|--------------|--|
| Secunderabad | Catfish (3%) |
| Bangalore | Bangalore spp. (7%), Mackerel (5%) |
| Santhol | Carangids/Caranx (7%), Sciaenidae/Croaker (12%) |
| Tirupathi | Hilsa spp (3%), Mackerel (3%) |
| Renigunta | Hilsa spp (2%), Mackerel (2%) |
| Hyderabad | Catfish (3%) |
| Madras | <i>Chironcentrus</i> spp (9%), Mackerel (49%), Carangids/Caranx (8%) |

Fish drying in the village is mainly on the bare ground or on twigs from casuarina trees, both adjacent to the road. There are only three fish drying platforms and these are used for drying both fish and agricultural produce.



Fisherwoman spreading ribbonfish on an old piece of fishing net on the ground to dry



Fish spread on casuarina twigs to dry in the middle of the village

6.5 Marketing and second sale

The bulk landings of such valuable varieties as Indian mackerel, croaker, catfish, shark, seer etc are sold to traders who seasonally come to the village in vans or lorries with ice, take the fish to Ongole and pack them there for transport to distant destinations. Advance arrangements are made for such supplies and advances paid in these cases. Smaller landings, except in the case of shrimp, are either dried and sold to merchants who come to the village periodically or sold fresh in the market at Kothapatnam or Ongole by the womenfolk of the village. The large shrimp are collected by traders who come to the village on bicycles which are loaded with aluminium containers stocked with ice. The irregularity in landing times and quantities landed, discourage regular visits by outside traders.

Those *kattumaram* fishermen who are not indebted to the traders, prefer to take their catch to Ongole market where they can obtain better prices. The infrequent bus service, which is the only available means of fish transport from the village, is, however, a major constraint. Organizing their own transport system for the fish may give the fisherfolk a substantial financial advantage.

Based on the survey of the market destinations of the catch, the frequency distribution of destinations for various varieties of fish was arrived at and this too is shown in Table 10. Most of the fish landed in Kothapatnam are disposed of locally in Ongole or Kothapatnam. Madras is the main market for shark, threadfin, seerfish, catfish and large shrimp. Hence the use of ice in these cases.

The destinations for different types of fish seem to be stable, indicating that the marketing system is well established. The second sale prices tend to be more consistent and it may be concluded that the role of middlemen, or wholesale merchants, is lucrative, particularly in the case of purchases, from *kattumaram* fishermen. From occasional case studies, the following observations were made on price margins:

| <i>Species group</i> | <i>State of preservation</i> | <i>% of consumer price received by fishermen</i> | <i>Market location</i> |
|----------------------|------------------------------|--|---------------------------|
| Small penaeid shrimp | Fresh | 65 | Ongole |
| Mackerel | Fresh | 83 | Ongole |
| Croaker | Salted | 24 | Guntur |
| Croaker | Salted | 27 | Thenali |
| Croaker | Salted | 41 | Reepalli |
| Ray | Salted | 28 | Renigunta Nagar/Tiruthani |
| Shark | Salted | 37 | Renigunta Nagar/Tiruthani |
| Seer | Iced | 22 | Madras |
| Shark | Fresh | 31 | Madras |

A return of 20 to 30 paise for iced fish, at distant markets, would be considered reasonable in many other countries, but the same return for salted (i.e.durable) fish is not reasonable.

7. INCOME

7.1 Income from fishing

Among the 584 fishing households in the village, about 105 are owners of small *kattumaram*, fifty own small and large *kattumaram*, twenty own only large *kattumaram*, ten own *kattumaram* and *nava*, three own only *nava* and 14 own BLC (two owned by individual households, one owned by two households, one by five and two by five households). The rest, 382 households, are crew members (Tables 1 and 11).



*Fish is **often** transported using cycles such as **this one**, **on** the road to Kothapatnam. Better transport **methods** need to be explored.*



*Kauumaram **aplenty**, **but nava** are **few**; and **one of those few** is being attended to, top right In the picture.*

They all own varying combinations of gear. It is estimated that 18 combinations of craft and gear are owned by households in the village. The number of households owning these combinations are shown in Table 11. The total numbers of craft and gear in the villages by category as estimated from the sample survey, deviated significantly from the numbers estimated by direct count and interview by the Masterfisherman (Table 11).

The discrepancy in the count of small and large *kattumaram*, may have been due to confusion in the understanding during the interview of what are small and what are large categories, but the total of small and large *kattumaram* obtained by both methods does not show significant differences.

Regarding the monofilament gillnet numbers, it is noted that these are recent introductions which are replacing multifilament nets of the same mesh size. Quite a large number of the latter are still in the village. Though unused now the liftnets were popular when introduced some years back at a time when large shoals of fish were frequently sighted near the shore in this area. Such shoals have declined in recent years and many of these nets are lying idle in the village because there are no takers for them in the district.

For each household having two or more kinds of craft and/or gear, it was assumed that they use the craft and gear combinations that would give the best results during a particular season. The income for each such combination was, therefore considered for income derivation.

In the case of crew members, the actual share paid according to the combination they work with was used. This does not however, include the fixed cost. On the other hand, share to the owner of the craft and/or gear is calculated after including the depreciation on these items. Generally owners also participate in the fishing process, and, hence, they are also allocated a crew share. There were very few cases of non-participation.

The monthly income of households with various combinations of craft and gear ownership and crew engaged in the fishing operation with the respective owner households are presented in Table 13. Incomes from BLC operations were assumed to be below normal in view of the recent introduction of the craft, insufficient training and lack of experience in the village.

Over 1000 crew members would be required to keep the village's entire fleet at sea. Considering households with ownership-cum-operations of craft, the balance crew would have to come from 340 households. This means two or more persons from each household. However, the average number of craft operating/day (Table 4) and the average number of fishing days/month (Table 12) show that the entire fleet was never out at sea all together at any time.



Poorfisherfolks houses in Kothapatnan

Table 11

Estimated number of households owning various combinations of craft and gear, based on sample survey

| Sl. No. of combination/ categories | Estimated No. of households | Percentage of owner households | CRAFT | | | | | GEAR | | | | | | | | | | |
|---|-----------------------------|--------------------------------|---------------|---------------|--------|-----|-----|------|-----|----|---|----|-----|----|---|---|---|---|
| | | | S. kattumaram | L. kattumaram | Nava | BLC | A | B | C | D | E | F | O | H | I | J | K | O |
| | 10 | 4.9 | 2 each | — | — | — | — | — | — | — | — | — | 10 | — | — | — | — | — |
| 2 | 10 | 4.9 | 1 each | 2 each | — | — | 10 | 10 | 10 | — | — | — | 10 | 10 | — | — | — | — |
| 3 | 6 | 2.9 | 2 each | — | 1 each | — | 6 | — | — | — | — | 6 | 6 | — | — | — | — | — |
| 4 | 1 | 0.5 | — | — | 1 each | — | — | — | — | — | 1 | — | — | — | — | — | — | — |
| 5 | 10 | 4.9 | 1 each | 1 each | — | — | 10 | — | 10 | — | — | — | — | — | — | — | — | — |
| 6 | 10 | 4.9 | — | 1 each | — | — | — | — | — | 10 | — | — | 10 | — | — | — | — | — |
| 7 | 7 | 3.4 | 1 each | — | 1 each | — | — | — | — | — | — | 7 | 7 | — | — | — | — | — |
| 8 | 2 | 1.0 | — | — | 1 each | — | — | — | — | — | — | 2 | — | — | — | — | — | — |
| 9 | 40 | 19.9 | 1 each | — | — | — | 40 | — | 40 | — | — | — | — | — | — | — | — | — |
| 10 | 10 | 4.9 | 1 each | 1 each | — | — | 10 | 10 | — | — | — | — | 10 | — | — | — | — | — |
| 11 | 20 | 9.9 | 1 each | — | — | — | — | — | — | — | — | — | 20 | — | — | — | — | — |
| 12 | 10 | 4.9 | 1 each | — | — | — | 10 | 10 | — | — | — | — | — | — | — | — | — | — |
| 13 | 2 | 1.0 | 1 each | — | 1 each | — | 1 | — | — | — | — | 2 | — | — | 1 | 1 | — | — |
| 14 | 10 | 4.9 | — | 1 each | — | — | 10 | — | — | — | — | — | 10 | 10 | — | — | — | — |
| 15 | 10 | 4.9 | 1 each | 1 each | — | — | — | — | — | — | — | — | 10 | 10 | — | — | — | — |
| 16 | 20 | 9.9 | 1 each | — | — | — | — | — | 20 | — | — | — | — | — | — | — | — | — |
| 17 | 10 | 4.9 | 2 each | — | — | — | 10 | — | — | — | — | — | 10 | — | — | — | 1 | — |
| 18 | 14 | 7.0 | — | — | — | 6* | 6 | — | — | 6 | — | — | — | — | — | — | — | 6 |
| | 202 | 99.6 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| Total based on sampling survey: | | | 191 | 70 | 18 | 6 | 113 | 30 | 80 | 16 | 1 | 17 | 103 | 30 | 1 | 1 | 1 | 6 |
| Total (based on observations and interviews by Masterfisherman) | | | 97 | 153 | 17 | — | 100 | 35 | 150 | 19 | — | 19 | 90 | 10 | — | — | — | — |

(*Joint owners) (See Table 4 for detailed description of gear codes A - O)

Table 12
Average number of units operating each day of the month

| Month | S. kattumaram + trammel | S. kattumaram + small mesh gillnet | L. kattumaram + trammel | L. kattumaram + small mesh gillnet | Small+large kattumaram + boat-seine | S. kattumaram (x5) + liftnet | SUBTOTAL All kattumaram + with all gear | NAVA | | SUBTOTAL | Large mesh gillnet | BLC Large mesh gillnet | Trammel- net | SUBTOTAL |
|-------|----------------------------|--|----------------------------|--|---|---------------------------------|--|---------|---------|----------|-----------------------|------------------------------|-----------------|----------|
| | | | | | | | | Gillnet | Gillnet | | | | | |
| 1 | — | 8 | 4 | 28 | 25 | — | 65 | — | 18 | 18 | 3 | 2 | — | 5 |
| 2 | 2 | 6 | 10 | 18 | 13 | 1 | 50 | 1 | 17 | 18 | 2 | 3 | — | 5 |
| 3 | 2 | 8 | 4 | 25 | 11 | — | 50 | 2 | 16 | 18 | 2 | 3 | — | 5 |
| 4 | 2 | 2 | 7 | 15 | 14 | — | 40 | 18 | — | 18 | 3 | 2 | 1 | 6 |
| 5 | 2 | 2 | 4 | 6 | 6 | — | 20 | 18 | — | 18 | 4 | 1 | 1 | 6 |
| 6 | 2 | 1 | 7 | 10 | 14 | — | 34 | 18 | — | 18 | 3 | 1 | 1 | 5 |
| 7 | 1 | 3 | 6 | 23 | 26 | 1 | 60 | 14 | — | 14 | 2 | 5 | — | 7 |
| 8 | 1 | 1 | 14 | 11 | 27 | — | 54 | 10 | — | 10 | 2 | 3 | 2 | 7 |
| 9 | — | 2 | 4 | 25 | 14 | 1 | 46 | 2 | — | 2 | 2 | 4 | 1 | 7 |
| 10 | 1 | 2 | 6 | 19 | 16 | — | 44 | — | — | — | 4 | — | 3 | 7 |
| 11 | 1 | 1 | 2 | 11 | 1 | — | 15 | 4 | — | 4 | 4 | 3 | — | 7 |
| 12 | — | 2 | — | 16 | 7 | — | 25 | 11 | — | 11 | 4 | 3 | — | 7 |

7.2 Income from agriculture

The categorization of households by income is shown in (Table 13). Sixty per cent of craft and gear owners own, or own as well as rent land, while 22 per cent rent land. Thirty per cent of the non-owners of craft and gear own, or own as well as rent land, while 57 per cent rent land. None of the craft and gear owners work as agricultural workers, except on their own or rented land.

Table 13
Classification of households according to the type of involvement in agriculture

| Category | No. of households |
|--|-------------------|
| 1 Owning craft and/or gear and agricultural land | 40 |
| 2 Not owning craft and/or gear but owning agricultural land | 40 |
| 3 Owning craft and/or gear and renting agricultural land | 10 |
| 4 Not owning craft and/or gear but renting agricultural land | 30 |
| 5 Owning craft and/or gear and owning and renting agricultural land | 30 |
| 6 Not owning craft and/or gear but owning and renting agricultural land | 10 |
| 7 Owning craft and/or gear and owning land and working as agricultural labourer (on own land) | 60 |
| 8 Not owning craft and/or gear but owning land and working as agricultural labourer | 50 |
| 9 Owning craft and/or gear and renting land and working as agricultural labourer (on own land) | 50 |
| 10 Not owning craft and/or gear but renting land and working as agricultural labourer | 240 |
| 11 Owning craft and/or gear and owning and renting land and working as agricultural labourer (on own land) | 30 |
| 12 Not owning craft and/or gear but owning and renting land and working as agricultural labourer | 40 |
| 13 Owning craft and/or gear and working as agricultural labourer | 70 |
| 14 Not owning craft and/or gear but working as agricultural labourer | 70 |
| | 700 |

The soil in and around the village is loose sand and, hence, groundnut, *ragi* (a millet), chillies and, sometimes, onions are cultivated. Water for irrigation is collected in pots from shallow ponds dug in the fields. Only a couple of households in the village have water pumps and sprinkler systems. Men generally work on their own land, or, collectively, in one another's plots, without involving cash payments.

Women generally work as paid labour and agriculture is considered a women's activity, irrespective of whether they come from a craft and gear owner's household or a crew member's household. The monsoon (N.E.) season is an active cultivation season, but rough sea conditions make it a poor fishing one.

Discussions with the International Institute for Crop Research in Semi-Arid Tropical Areas (ICRISAT), in Hyderabad, the capital of Andhra Pradesh, revealed that some high yielding strains of groundnut and other crops have been developed for better results in the coastal sandy soil.

Income from agriculture = Revenue - expenditure on fertilizer, seed, rent + labour costs. Paid labour is 6 Rs/day (10 a.m. - 6 p.m.) and generally works 10 days/month for 3 - 6 months; the rest of the time, it works on its own land. This gives an income of approximately 360 Rs/annum/worker. Households without land can work 20-25 days/month for six months, but women complain that there is not enough work for them. On the basis that three out of the average of five members of a household could, at the maximum, participate in this activity, the household's maximum income would be 2700 Rs/annum.

In the year of the present survey, two groundnut harvests (4 bags/0.5 acre plot) were very poor and resulted in a loss to the producers. A normal harvest would yield 10 bags at 150-250 Rs/bag, giving the cultivator an average income of Rs. 2000. *Ragi* is cultivated mainly for the land owner's own consumption and, hence, costs and expenditure are not calculated.



Fisherwoman watering a patch of ground in Kothapatnam-Pallipalem. Fishing nets drying and the palmyrah trunks seen in the background are a common sight in most fishing villages on this coast.



Fish marketing is another activity in the village to provide additional income

There are two crops of groundnut in a year – July/August to October/November, and December/January to March/April. *Ragi* is planted only once, in February. Onion is cultivated from November to March and chillies yield every ten days for five months during the same period. April to July are the non-cultivating season and no income from agriculture is derived during that period.

The agricultural income based on the revenue of a normal year is presented in Tables 14 & 15. A comparison of the income from fishing with income from agriculture, for the 18 combinations of craft and gear owners, shows a positive correlation, though it is not statistically significant. It is evident that agriculture is not the primary activity for income; households with higher incomes from fishing tend to have higher incomes from agriculture also. For example, *nava* owners have the highest incomes from fishing as well as from agriculture. Agricultural labour income for fishing crew members is considered to be a single average value, in view of the similarity in time input, labour rate etc (Table 14). Even for crew members, the income from agricultural labour is less than from fishing in about half of the categories of craft-gear combinations.

7.3 *Income from fish marketing*

About 300 households belonging to the following categories are involved in fish marketing.

| | |
|---|-----|
| Owning craft and gear, and involved in marketing | 150 |
| Owning craft and gear, and involved in marketing, but not actively fishing | 20 |
| Owning craft, gear and 0.2 acres of agricultural land, and also doing dry fish marketing | 50 |
| Owning craft, gear and 1-3 acres of agricultural land, and doing dry and wet fish marketing | 20 |
| Owning craft and gear, and with womenfolk involved in fish marketing | 10 |

Several craft and gear owners participate in dry and/or fresh fish marketing (Table 14). By and large, owners of small *katrumaram* with trammelnet and monofilament gillnet combinations are most actively engaged in fish marketing. This is particularly so of those who are not indebted to merchants. On the other hand, *nava* owners with very high incomes, take the largest amounts as advance from merchants and are the least involved in marketing because they have to sell the catch to the merchants. Fish sold by women is generally small in quantity and is sometimes rejected by merchants because it is small in quantity, is of low value, poor quality or is too late for their distribution. None of the crew takes advances from the traders. But the merchants are interested in giving advances to fishermen during these seasons when the catch of valuable species is heavy.

Household surveys indicated that the average earning by fishing households in the village from marketing was 10 Rs/day. Certain households undertook this activity on an average for ten days/month, while others spent only five days/month on it, depending on circumstances mentioned above. The approximate annual incomes earned by various categories of households are shown in Table 15. Marketing by non-fishing households is very sporadic and, hence, difficult to indicate on an annual basis, it is estimated to be 300-400 Rs/annum, at the most.

7.4 *Income from any other sources*

Two hundred and thirty-six households out of the 740 households are involved in some other activities other than the three major ones. Eighty of these are fishing craft-gear owning households, sixty are crew members, about seventy are households engaged in agricultural and fish marketing activities and the remaining 26 are households solely dependent on other income sources for their livelihood, such as the following:

| Activity | Income/annum (Rs) |
|---|-------------------|
| Ploughing fields | 1800 |
| Clerk/Security officers | 12,000 |
| Shops | 4500 |
| Rearing buffaloes | 1000 |
| Fry collection (10 Rs/day x 10 days) | 100 |
| Salt pans/construction sites (8 Rs/day x 15 days/month) | 300 |
| Leasing out land (for Rs.100 per 0.2 acre plot) | 1500 |

High income activities, such as shop owning, leasing land or employment in salaried jobs, are held by some *nava*-owning households. Rearing buffaloes and marketing fry collections are taken up

Table 14
Income of fishing households from all activities, stratified according
to the categories of ownership of craft and gear combinations

| Serial Nos. of categories | Fishing income owners (Rs) | Agri- cultural income owners (Rs) | FISH MARKETING INCOME | | No. of house- holds (esti- mated from sample) | Fishing income (labou- rers) | Agri- cultural income (labou- rers) | Total | No. of house- holds (esti- mated from sample) |
|------------------------------|-------------------------------------|---|-----------------------|-----------|---|---------------------------------------|---|-------|--|
| | | | Type | Rs Total | | | | | |
| | 6015 | 1760 | D+F | 600 | 8375 | 10 | 3210 | 2700 | 5910 |
| 2 | 22,325 | 4940 | D+F | 600 | 27,865 | 10 | 5770 | 2700 | 8470 |
| 3* | 166,985 | 4940 | D+F | 1200 | 173,125 | 6 | 24,480 | 2700 | 27,180 |
| 4 - | 62,510 | 6230 + | - | (Dealers) | 69,950 | 1 | 8930 | 2700 | 11,630 |
| | 13,840 | | | not known | | | | | |
| | (Paddy cult.) | | | | | | | | |
| 5 | 17,845 | 2450 | D+F | - | 21,495 | 10 | 3590 | 2700 | 6290 |
| 6 | 11,655 | 715 | F | - | 13,570 | 10 | 2530 | 2700 | 5230 |
| 7 * | 166,985 | 13,840 | D | - | 182,025 | 7 | 24,500 | 2700 | 27,200 |
| 8 * | 165,390 | - | - | - | 165,390 | 2 | 23,630 | 2700 | 26,330 |
| 9 | 5515 | 2450 | D+F | 1200 | 9165 | 40 | 1380 | 2700 | 4080 |
| 10 | 13,860 | 6230 | F | 1200 | 21,290 | 10 | 3470 | 2700 | 6170 |
| 11 | 8255 | 2450 | - | - | 10,705 | 20 | 3360 | 2700 | 6060 |
| 12 | 6270 | - | - | - | 6270 | 10 | 2280 | 2700 | 4980 |
| 13* | 165,955 | 6230 | - | - | 172,185 | 2 | 23,930 | 2700 | 26,630 |
| 14 | 11,270 | 6230 | - | - | 17500 | 10 | 2530 | 2700 | 5230 |
| 15 | 11,965 | 715 | D+F | 1200 | 13,880 | 10 | 4550 | 2700 | 7250 |
| 16 | 2650 | 6230 | D+F | 1200 | 10,080 | 20 | 660 | 2700 | 3360 |
| 17 | 8250 | 2450 | - | - | 10,700 | 10 | 3360 | 2700 | 6060 |
| 18** | 28,810 | 2450 | - | - | 31,260 | 14 | 9400 | 2700 | 12,100 |
| Total households | - | - | - | - | - | 202 | - | - | 382 |

(See Tables II and 4 for details of craft and gear combination categories I - 18)

D = Dry fish

F = Freshfish

* Nava owner

** BLC owner

Table 15
Frequency distribution of income levels of households in Kothapatnam-Pallipalem
according to the income generating activities of the households

| income levels | Households owning craft and gear, and with income only from fishing | Households with fishing crew and their income from fishing only | CUMULATIVE INCOME FROM COMBINED ACTIVITIES | | |
|-----------------|---|---|--|--|---|
| | | | Craft and gear owners and income from fishing, agriculture, marketing and other activities | Households with fishing crew mem- bers and income from fishing, agri- culture, marketing and other activities | Non- fishing households with non- fishing activities |
| Rs. | | | | | |
| <5000 | 20 | 270 | - | 80 | 153 |
| 5001-10,000 | 90 | 56 | 60 | 211 | - |
| 10,001-15,000 | 40 | - | 70 | 34 | 3 |
| 15,001-20,000 | 10 | - | 10 | - | - |
| 20,001-30,000 | 24 | 56 | 30 | 57 | - |
| 30,001-40,000 | | | 14 | | |
| 40,001-50,000 | | | | | |
| 50,001-60,000 | | | | | |
| 60,001-70,000** | 1 | | | | |
| 70,001-80,000 | | | | | |
| 80,001-90,000 | | | | | |
| 90001-100,000 | | | | | |
| >100,001** | 17 | | 17 | - | |
| Total | 202 | 382 | 202 | 382 | 156 |

* BLC owners and large kattumaram owners with trammelnet, monofilament gillnet and boat-seine

** Nava owners — 17 with 'F' gear, 1 with 'E' gear

mainly by fishing labour households. Manual labour at the salt pans or at construction sites is occasionally undertaken, mainly by households dependent on other income generating activities. Three households earn income from cycle rickshaws.

Rearing buffaloes for owners from outside the fishing village is on a fixed term basis. Only a few households in the village own buffaloes for their own benefit, but practically all households keep poultry, the eggs and meat meant for their own benefit. According to the Animal Husbandry Division of the Department of Agriculture, there are schemes for buying buffalo calves, rearing them and selling them at good profit as well as for introducing high-yielding hybrid varieties of poultry, that could be fed with rich fish-meal made in the village from the discarded fish, heads of shrimp and the viscera of mackerel. The Department of Forest Conservation revealed that there were Social Forestry Schemes that encouraged the planting of trees to provide shelter in the village and food for goats and buffaloes.

The womenfolk can, for about six months (March-July) every year, undertake other income-generating activities, agricultural activity being minimal during this period.

8. ASSETS, CREDIT FACILITIES AND SAVINGS

8.1 Ownership of assets

Table 16 presents the distribution pattern of assets and their value among the households in the village. It also shows income activities according to the assets owned.

Table 16

Frequency distribution of households in Kothapatnam, according to ranges in the value assets (primary income activities and types of assets indicated)

| <i>Investment level range (Rs)</i> | <i>Number of households</i> | <i>Primary asset items</i> | <i>Primary income activities of households</i> |
|--|---------------------------------|---|--|
| 100 - 2500 | 172 | House | Mainly fishing labour households and few other-income activity households — Fishing categories 6,9,12, 14 & 16 |
| 2501-5000 | 332 | House, land and livestock | Fishing labour and marketing and other income households — Fishing categories 1,5,10,11,15 & 17 |
| 5001-10,000 | 81 | (1) Craft+gear owners, House (2) House | (1) Fishing craft-gear owners+ fishermen and a small investment in livestock — (Fishing categories 12,16,17, 11&1). (2) Fishing labour categories 2+ 14 |
| 10,001-20,000 | 60 | Craft, gear, house, land and livestock | Fishing, agriculture Fishing, categories 6,9,&1t |
| 20,001-30,000 | 23 | House and livestock | Fishing, labour on <i>nava</i> + BLC Fishing categories 3,7,8,13&18 |
| 30,001-40,000 | 20 | Craft, gear, house and land | Fishing and agriculture (groundnut) Fishing categories 5,14&4 |
| 40,001-50,000 | - | - | |
| 50,001-60,000 | - | - | |
| 60,001-70,000 | 10 | Craft, gear, house, land, livestock | Fishing, agriculture, livestock — fishing category 2 |
| 70,001-80,000** | 6 | Craft, gear, house, land | <i>Nava</i> fishing & agriculture — fishing category 3 |
| 80,001-90,000** | 7 | Craft, gear, house, land | <i>Nava</i> fishing & agriculture — fishing category 7 |
| 90,001-100,000 | - | - | |
| 100,001-150,000** | 14 | Craft, gear, house, land, livestock | <i>Nava</i> fishing, agriculture — fishing categories 8,13 &15 |
| 150,001-200,000' | 14 | Craft, gear, land, livestock | BLC fishing, agriculture, livestock — fishing category 18 |
| 200,001' | | Land, craft, gear, house, and livestock | Rice cultivation, <i>nava</i> fishing and livestock — fishing category 4 |
| Total | 740 | | |

* Owners of BLC with joint ownership

** Owners of *nava*

NOTE Fishing categories as in Table 11



A view of the shore in Kothapatnam-Pallipalem, showing a large number of kattumaram on the beach. The sheds on the left are the fish collection points of merchants.



There is a large variety of fishing gear available. But fewer and better selected gear is the need.

Crew members of small *kattumaram* and many of the non-fishing households have the lowest value for their assets; they also belong to the lowest ranks among the income groups. Relatively speaking, *nava* owners have assets with the highest value; they are also in the highest income group category. This being the introductory phase for BLCs, the status of the owners of this craft shows a very high asset value because of the high cost of the modern craft, but their income level, particularly from fishing, is not in keeping with the overall pattern of income and asset values. Sixty-nine per cent of the households have assets valued at less than Rs. 5000. Only about 6 per cent of the households have assets valued at more than Rs. 60,000. The one case of a person having assets valued in excess of Rs. 200,000 is due to his owning paddy land valued at Rs. 155,000.

The large *kattumaram* owners showed an interest in buying BLCs, but *nava* owners were more interested in investing their money in properties ashore.

8.2 Credit facilities

There are many sources of credit for the majority of the households, but advances from craft owners are generally only to contracted fishing crew members and average Rs. 900 per crew. The majority of the craft owners take advances from traders, as already mentioned. The advances tend to decline with the fishing income level of the households — from Rs. 25,000 to Rs. 4,000 in the cases of *nava* and BLC owners, the advance taken declines to Rs. 6000-Rs. 3,000 in the cases of large *kattumaram* owners and Rs. 3,000-0 in the case of small *kattumaram* owners. Loans generally varied between Rs. 7,000 and Rs. 1,000. Loans are most often taken from traders, followed by local people. Banks, moneylenders (who charge 3 per cent interest/month), relatives and other villagers are the least common source. About 370 householders are desirous of taking new loans for craft and gear (2 per cent), agriculture (13 per cent) and marriage (5 per cent). Loans sought for housing, marketing, livestock etc are even small percentages (1-2 per cent each).

Though many would like to borrow from banks, their assets are insufficient collateral. The bank in Kothapatnam claims that there have been in the past, instances of bad repayment of loans taken by people from this fishing village. There is a lack of communication between the fisherfolk and the bank and so it has not been possible to clear the air and re-establish a good relationship. Better education on the bank's loan schemes and the functioning of the bank may help to rectify this position in the village.

8.3 Savings

Only fifty households have savings in the bank, while thirty have invested in a chit fund. One hundred and seventy have their savings at home, for repayment of loans (8 per cent), for a lean season (5 per cent), marriage (2 per cent) and for other purposes, such as repairs to craft/gear/house, sickness, children's education etc., all of which are evenly low (one per cent each). Investment in fishing and agriculture and children's education were reported only by *nava* owners. Non-owners of craft and gear saved for lean seasons or bad weather periods.

9. OVERALL INCOME STRUCTURE

The frequency distribution of income of fishing craft-and-gear owning households, fishing crew households, the cumulative incomes from all sources for the households of fishing craft-and-gear owners and operators, and those of non-fishing households are summarized in Table 15.

Fifty per cent of the fishing households in the village have an income of less than 5000 Rs./annum, earning an average of 250 Rs./month from fishing activities. A large part of these (46 per cent) are fishing households without craft and gear. Considering income from all types of activities, only 31 per cent of all households in the village fall into the lowest income class and are below the poverty line (but 20 per cent are from non-fishing households, 11 per cent are from fishing households without craft and gear, and none from households with craft and gear).

Considering income only from fishing, those with less than 5,000 Rs./annum are from households with one small *kattumaram*, or crew members of small *kattumaram*. Those with incomes of Rs. 5,000 - 10,000 Rs./annum are those having small and large *kattumaram* with good combinations

of one or two gear and having crew members. Those having incomes of 15,000-20,000 Rs/annum own one or more large *kattumaram* with two or more types of gear. Fisherfolk who are crew members of BLC and *nava* earn 20,000 - 30,000 Rs/annum while those above 60,000 Rs class are those owning *nava* and *kattumaram*.

As already indicated under each activity, the assets of the household, their borrowings and income from all activities other than fishing show some degree of relationship to their income from fishing activity. Serious concern of income is for those owning solely small *kattumaram*, almost all the crew members of small *kattumaram* and non-fishing households in the village.

10. **CONCLUSIONS AND RECOMMENDATIONS**

1. There is clear evidence of interaction among the fisheries of all types of craft in the village, as well as with the shrimp trawlers from outside, operating in the area.
2. Operation of certain active gear, like the boat-seine and dragnet with fine mesh, is resulting in the capture of large quantities of juvenile shrimp and finfish in the shallow water.
3. Small *kattumaram* fishermen (owners and crew) get a very poor income. They are the only group of fishermen in the village, apart from some of the non-fishing households, with incomes below the poverty line. Use of such active gear and small *kattumaram* should be discouraged in order to get better catch-rates of larger sized penaeid shrimp and finfish using other gear with large *kattumaram*. Small *kattumaram* may be replaced by other types of traditional craft or, at least, by large *kattumaram*.
4. Limited accessibility to resources by the large *kattumaram* requires that such craft operate at least three different kinds of gear, depending on the kinds of resources available, to obtain an even income round the year.
5. An Economic Performance Index, such as the Internal Rate of Return (IRR) or Cost-Benefit Ratio, should not be used in isolation to make recommendations for investment in small-scale fisheries. It should be considered along with Net Present Value (NPV), actual income accruing to the fishermen, technological assessment of the craft-gear combination and its influence on the resources.
6. Underutilized resources or components of resources exist beyond the range exploited at present by the non-motorized *kattumaram*. The technical feasibility of accessing these resources with motorized large *kattumaram* seems to exist, but the economic feasibility of motorized large *kattumaram* sailing further out and obtaining catch rates with existing gear, such as trammelnets for shrimp, gillnets for small pelagics and bottom longlines and handlines for demersals must be established before investments are made. This must also be assessed on a case by case basis.
7. Training and demonstration of diversified fisheries in the offshore area is required for the BLC which are being issued under various credit schemes, as well as for the *nava*. Such training alone will enable them to economically tap underutilized large pelagic resources and operate bottom longlining for large shark which cannot be done with *kattumaram*. This will enable the motorized large *kattumaram* to utilize the resources at present exploited by the former.
8. In order to encourage exploitation by motorized *kattumaram*, of demersal finfish and shellfish beyond 10 m depth, shrimp trawlers exploiting these resources in the 20-60 m depth range should be prevented from operating inside the 50 m depth line opposite the village.
9. The shrimp resource in the area is a small localized stock. Extensive shrimp seed collection from the adjacent estuary could affect the recruitment to the trammelnet fishery by large *kattumaram* and should therefore be discouraged.

10. The highest earning capacity is demonstrated by the *nava* fishermen, followed by those with BLC. The large *kaltumarain* fishermen earn marginally above the poverty line, while small *kattumaram* owners and crew members have the lowest income which tends to be at or below the poverty line. *Teppa* (boat-type *kattuinararn*) provide higher incomes than the large *kattumaram*.
11. *Nava* owners tend to make investments in land and properties ashore while large *kattuinararn* owners tend to invest in BLC.
12. Because of the absence of fishing gear suppliers near the village, considerable time and money are lost in travelling far to purchase these materials. Organizing supplies of fishing gear material and, perhaps, ice/salt and fuel also, through the Fishermen's Cooperatives in the village, may reduce cost and ensure more fishing time.
13. Improved handling and preservation methods such as using ice to preserve high-valued shrimp catches, salt-curing mackerel and croaker in more hygienic cement troughs, providing drying platforms for better quality dry fish, deheading shrimp under more hygienic conditions, better storage facilities for dry fish in the village etc., would improve the value of the products.
14. There is considerable wastage of fish for various reasons. Developing cheap drying methods to be used during the rainy season for non-penaeid shrimp will reduce discarding and increase the production and earnings from this resource. Utilizing small fish discarded during the good fishing season, fish damaged by crabs, shrimp heads and offal of mackerel, to make fish meal in the village could enhance poultry-keeping.
15. Organizing collective transport of fish to the town either by groups of fishermen teaming together or through their cooperative societies, may significantly increase the first sale value of fish.
16. Improving livestock rearing — poultry and buffalo, through introduction of better quality egg-layers and a scheme to rear their own buffalo calves and sell them for a better return than the fixed amount received for the practice of rearing calves owned by others, could also improve the earning capacity of the households in the village.
17. The use of high-yielding, dry zone varieties of seed for groundnuts and other agricultural crops should be demonstrated to help improve the income from agricultural activities. Similarly, the available social-forestry schemes should be made use of to grow arid zone trees which could provide as fodder for the goat and buffalo.
18. Fishing is the primary source of income in this village of *kattumarain* fisherfolk. income from all other sources and the value of the assets of households in the village tend to be higher for those with higher incomes from fishing. Consequently, the diversity in income that is already evident in the income from fishing becomes much greater in the village when the total income from all sources is considered.
19. In the process of small-scale fisheries development, in developing countries such as those in the Bay of Bengal region, there is a 'residual' population of fisherfolk like the small *kattuinararn* fishermen and some non-fishing households in such villages who fail to progress as much as other fishermen or, sometimes, even not at all. This could be for various reasons such as lack of skill, motivation, innovativeness, assets or collateral for obtaining credit for investments, luck, etc. These people tend to stagnate below the poverty line and are in the lowest income group. Such fishermen, due to their limited mobility and the lack of alternate employment, will utilize whatever resources are available without concern for any damage to these resources. Additional/alternative income generating activities have to be identified and necessary rehabilitation programmes must be provided if they are to be got out of this situation.

Annexure I

TEST FISHING AND DEMONSTRATION

Based on the results discussed in the preceding sections, some fishing trials were conducted to test the validity of the findings.

Test fishing activity was conducted by fixing outboard engine to different *kattumaram* in the village and allowing different groups of people to become familiar with the motor and its operation. Demonstration of *kattumaram* fishing in waters deeper than those normally covered was a source of encouragement to the *kattumaram* fishermen in the village who have applied for outboard motors.

a. Motorized (OBM - 11 H.P) large *kattumaram* and monofilament gillnet fishing

Test fishing with this combination did not reveal any significant results. Trials were too few and were limited to three months (Oct - Dec 1989) (Tables 7 + 17). Trials must be continued in deeper waters and covering other seasons also.

b. Motorized large *kattumaram* and trammelnet fishing

Only eleven test fishing operations were conducted. These were in October, January and February and the catch rates were generally higher than those for non-motorized craft using trammelnets. In February, the catch rate (average of three trials) of the motorized *kattumaram* was very high and the average income/day was Rs. 1857 (Tables 7 + 17). More trials are required to quantify the benefits of motorization.

c. Motorized *kattumaram* and bottom longlining

Very few trials; two operations averaged 16 kg and 118 Rs./day. The limitation of the craft size prevents operation for larger shark. Longlining for other demersal fish is possible with *kattumaram*, but viability has to be established with further trials (Tables 7 + 17).

d. Motorized *nava* and bottom longlining

Two operations realized significantly high catch rates of very large predatory shark and very good revenue (Tables 7 + 17). Further trials are necessary to establish the economic feasibility.

e. Demonstrations of the use of trolling lines, while sailing to and from fishing grounds, were also carried out and accepted enthusiastically by fishermen.

f. The availability of resources that can provide better catch rates and revenue for *kattumaram* in ranges beyond those covered at present was also demonstrated qualitatively. The existence of resources for exploitation in unexploited depths, accessible to *kattumaram*, and the chances of better catch rates and earnings were generally indicated. More extensive trials must be conducted to establish viability and to organize extension programmes.

Table 17
Results of the test fishing conducted and comparisons with results of commercial operations

| <i>Period</i> | <i>Craft</i> | <i>Gear</i> | <i>No. of operations</i> | <i>Kg/day</i> | <i>Revenue' (Rs.) day</i> | <i>Major species</i> |
|---------------|----------------------------------|-----------------------------|--------------------------|---------------|---------------------------|----------------------|
| Oct. '89 | <i>L. kattumaram</i> | Monofilament gillnet | 41 | 32.4 | 79.94 | md. mack. + sardine |
| Oct. '89 | <i>L. kattumaram</i> (motorized) | Monofilament gillnet | 3 | 8.34 | 65.0 | Pomfret, shark |
| Nov. '89 | <i>L. kattumaram</i> | Monofilament gillnet | 55 | 30.89 | 73.38 | Ind, mackerel |
| Nov. '89 | <i>L. kattumaram</i> (motorized) | Monofilament gillnet | 3 | 18.17 | 72.33 | Carangids |
| Jan '90 | <i>L. kattumaram</i> | Monofilament gillnet | 36 | 13.94 | 31.63 | Miscellaneous |
| Jan. '90 | <i>L. kattumaram</i> (motorized) | Monofilament gillnet | 1 | 12.00 | 30.00 | Miscellaneous |
| Feb. '90 | <i>L. kattumaram</i> | Monofilament gillnet | 58 | 19.34 | 48.18 | Carangids |
| Feb. '90 | <i>L. kattumaram</i> (motorized) | Monofilament gillnet | — | | | |
| Oct. '89 | <i>L. kattumaram</i> | Trammelnet | 12 | 8.29 | 124.85 | <i>P. indicus</i> |
| Oct. '89 | <i>L. kattumaram</i> (motorized) | Trammelnet | 6 | 12.48 | 78.84 | <i>P. indicus</i> |
| Jan. '90 | <i>L. kattumaram</i> | Trammelnet | 14 | 7.15 | 92.92 | <i>P. indicus</i> |
| Jan. '90 | <i>L. kattumaram</i> (motorized) | Trammelnet | 8 | 11.17 | 124.14 | <i>P. indicus</i> |
| Feb. '90 | <i>L. kattumaram</i> | Trammelnet | 6 | 3.00 | 77.84 | <i>P. indicus</i> |
| Feb. '90 | <i>L. kattumaram</i> (motorized) | Trammelnet | 3 | 32.44 | 1857.67 | <i>P. indicus</i> |
| Dec. '90 | <i>L. kattumaram</i> (motorized) | Shark longline | 2 | 16.00 | 118.00 | Shark |
| Jan. '90 | <i>L. kattumaram</i> (motorized) | Shark longline + Troll line | 5 | 7.50 | 52.00 | Seer |
| Feb. '90 | Nava | Shark longline | 2 | 3000 | 410.00 | Shark |
| Feb. '90 | Nava (motorized) | Shark longline | 2 | 1400.00 | 3200.00 | Shark (large) |

Annexure II

REFERENCES CITED

1. Anonymous (1987), *Techno-socio-economic survey offisheries in Tamil Nadu*. Institute of Techno-economic Study, India. (Report presented to the Director of Fisheries, Tamil Nadu, India). (Manuscript).
2. Anonymous (1984). *Report of the investigations to improve the kattumarams of India's East Coast*. FAO Bay of Bengal Programme (RAS/040/SWE), BOBP/REP/17.
3. Anonymous (1981-1991). *Annual reports of the Fisheries Survey of India*. Ministry of Food Processing Industries, Bombay.
4. Gardien El Gendy (1990). *A comparative study on the economic performance of the beachlanding craft in Thirumullaivasal (TN), Penthakota (OR), and Tummelapenta (AP), along the east coast of India*. Bay of Bengal Programme FAO/BOBP (RAS/I 18/MUL), Madras (Manuscript).
5. Hinriksson T. (1984). *Survey of pelagic resources of the lower east coast of India and training of officers and crew of the Danish aided vessel "Matsya Dharshini"*. Tech. Rept., Fisheries Survey of India, Vishakhapatnam.
6. Joseph K.M. (1980). *Comparative study of the demersal fisheries resources of the Indian waters as assessed by the 17.5 m trawlers*. Fisheries Survey of India Bull. No. 10, Ministry of Agriculture, Bombay.
7. Kamal Kumar Dutta, Dan S.S. and Amal Kumar Dutta (1989). *Economics of different craft-gear combinations of Orissa Coast*. Sea Food Export Journal, May 1989.
8. Sivaprakasam T.E., Parameswaran P.S., Premchand S.A., Rajakumar and Nagarajan G. (1991). *Marine resources off the lower east coast of India*. Fisheries Survey of India Bull. No. 21. Ministry of Food Processing Industries, Bombay.
9. Sudarsan D and Sanvanshi V.S. (1988). *Fishery resources of the Indian Exclusive Economic Zone with special reference to upper east coast*. Fisheries Survey of India Bull. No. 16, Ministry of Food Processing Industries, Bombay.
10. Sudarsan D., Sivaprakasam T.E., Sanvanshi V.S., John M.E., Nair K.N.V. and Joseph A., (1988). *An appraisal of the marine fishery resources of the Indian Exclusive Economic Zone*. Fisheries Survey of India Bull. No. 18. Ministry of Food Processing Industries, Bombay.
11. Swaminath S., Mohammed M., Resha Aklar, Nair M.K.K., Joseph J.A. and Varghese S., (1979). *Trawl gears operated by E FP*. Fisheries Survey of India, Ministry of Agriculture, Bombay.

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36. *Hilsa Investigations in Bangladesh.* (Colombo, June 1987.)
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39. *Investigations on the Mackerel and Scad Resources of the Ma'acca Straits.* (Colombo, December 1987.)
40. *Tuna in the Andaman Sea.* (Colombo, December 1987.)
41. *Studies of the Tuna Resource in the EEZ5 of Sri Lanka and Maldives.* (Colombo, May 1988.)
42. *Report of the Twelfth 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.)
47. *Exploratory Fishing for Large Pelagic Species in Sri Lanka.* R. Maldeniya & S.L. Suraweera. (Madras, April 1991.)
48. *Report of the Fifteenth Meeting of the Advisory Committee.* Colombo, Sri Lanka, 28-30 January, 1991. (Madras, April 1991.)

Working Papers (BOBP/WP/...)

27. *Reducing the Fuel Costs of Small Fishing Boats.* O. Gulbrandsen. (Madras, July 1986.)
38. *Credit for Fisherfolk: The Experience in Adirampattinam, Tamil Nadu, India.* R. S. Anbarasan and O Fernandez. (Madras, March 1986.)
42. *Fish Trap Trials in Sri Lanka.* (Based on a report by T. Hammerman). (Madras, January 1986.)
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61. *Development of Outrigger Canoes in Sri Lanka.* O Gulbrandsen, (Madras, November 1990.)
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64. *Reef Fish Resources Survey in the Maldives.* M. Van Der Knaap, Z. Waheed, H. Shareef, M. Rasheed (Madras, April 1991.)
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68. *The By-catch from Indian Shrimp Trawlers in the Bay of Bengal.- The potential for its improved utilization.* Ann Gordon. (Madras, August 1991.)
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70. *The Kattumaram of Kothapatnam-Pallipalem, Andhra Pradesh, India — A Survey of the Fisheries and Fisherfolk.* Dr. K. Sivasubramaniam. (Madras, December 1991.)
72. *Giant Clams in the Maldives — A stock assessment and study of their potential for culture.* Dr. J.R. Barker. (Madras, December 1991.)
73. *Small-scale culture of the flat oyster (Ostrea folium) in Putau Langkawi, Kedah, Malaysia,* Devakie Nair and Bjorn Lindeblad. (Madras, November 1991.)
76. *A View from the Beach — Understanding the status and needs of fisherfolk in the Meemu, Vaavu and Faafu Atolls of the Republic of Maldives* The Extension and Projects Section of the Ministry of Fisheries and Agriculture, The Republic of Maldives. (Madras, June 1991.)
78. *The Fisheries and Fisherfolk of Nias Island, Indonesia. A description of the fisheries and a socio-economic appraisal of the fisherfolk* Based on reports by G Pajot and P. Townsley. (Madras, December 1991.)

Manuals and Guides (BOBP/MAG/...)

1. *Towards Shared Learning : Non-formal Adult Education for Marine Fisherfolk.* Trainers' Manual. (Madras, June 198
2. *Towards Shared Learning: Non-formal Adult Education for Marine Fisherfolk.* Animators' Guide. (Madras, June 198
3. *Fishery Statistics on the Microcomputer : A BASIC Version of Hasseblad's NORMSEP Program.* D. Pauly, N. Day J. Hertel-Wuiff. (Colombo, June 1986.)
4. *Separating Mixtures of Normal Distributions: Basic programs for Bhattacharja's Method and Their Application for Fish Population Analysis.* H. Goonetilleke, K. Sivasubramaniam. (Madras, November 1987.)
5. *Bay of Bengal Fisheries Information System (BOBFINS) : User's Manual.* (Colombo, September 1987.)
10. *Our Fish, Our Wealth.* A guide to fisherfolk — in 'comic book' style (English/Tamil/Telugu) on resources management Kamala Chandrakant with K. Sivasubramaniam and Rathin Roy. (Madras, December 1991.)

Information Documents (BOBP/INF/...)

9. *Food and Nutrition Status of Small-Scale Fisherfolk in India's East Coast States : A Desk Review and Resource Investigation.* V. Bhavani. (Madras, April 1986.)
10. *Bibliography on Gracilaria — Production and Utilization in the Bay of Bengal.* (Madras, August 1990.)
11. *Marine Small-Scale Fisheries of West Bengal: An Introduction.* (Madras, November 1990.)
12. *The Fisherfolk of Puttalam, Chilaw, Galle and Matara — A study of the economic status of the fisherfolk of the fisheries districts in Sri Lanka.* (Madras, December 1991.)

Newsletters (Bay of Bengal News)

Quarterly

Other Publications

Artisanal Marine Fisherfolk of Orissa . Study of their Technology, Economic Status. Social Organization and Cognitive Patterns. U Tietze. (Madras)

Studies on Mesh Selectivity and Performance : The New Fish-cum-Prawn Trawl at Pesalai, Sri Lanka. BOBP/MIS/3. M.S.M. Siddeek. (Madras, September 1986.)

Motorization of Dinghy Boats in Kasafal, Orissa. BOBP/MIS/4. S. Johansen and O Gulbrandsen. (Madras, November 1986.)

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

For further information contact:

The Bay of Bengal Programme, Post Bag No. 1054, Madras 600 018, India.

Cable : BAYFISH Telex : 41-8311 BOBP Fax 044-836102,

Telephone 836294, 836096, 836188.