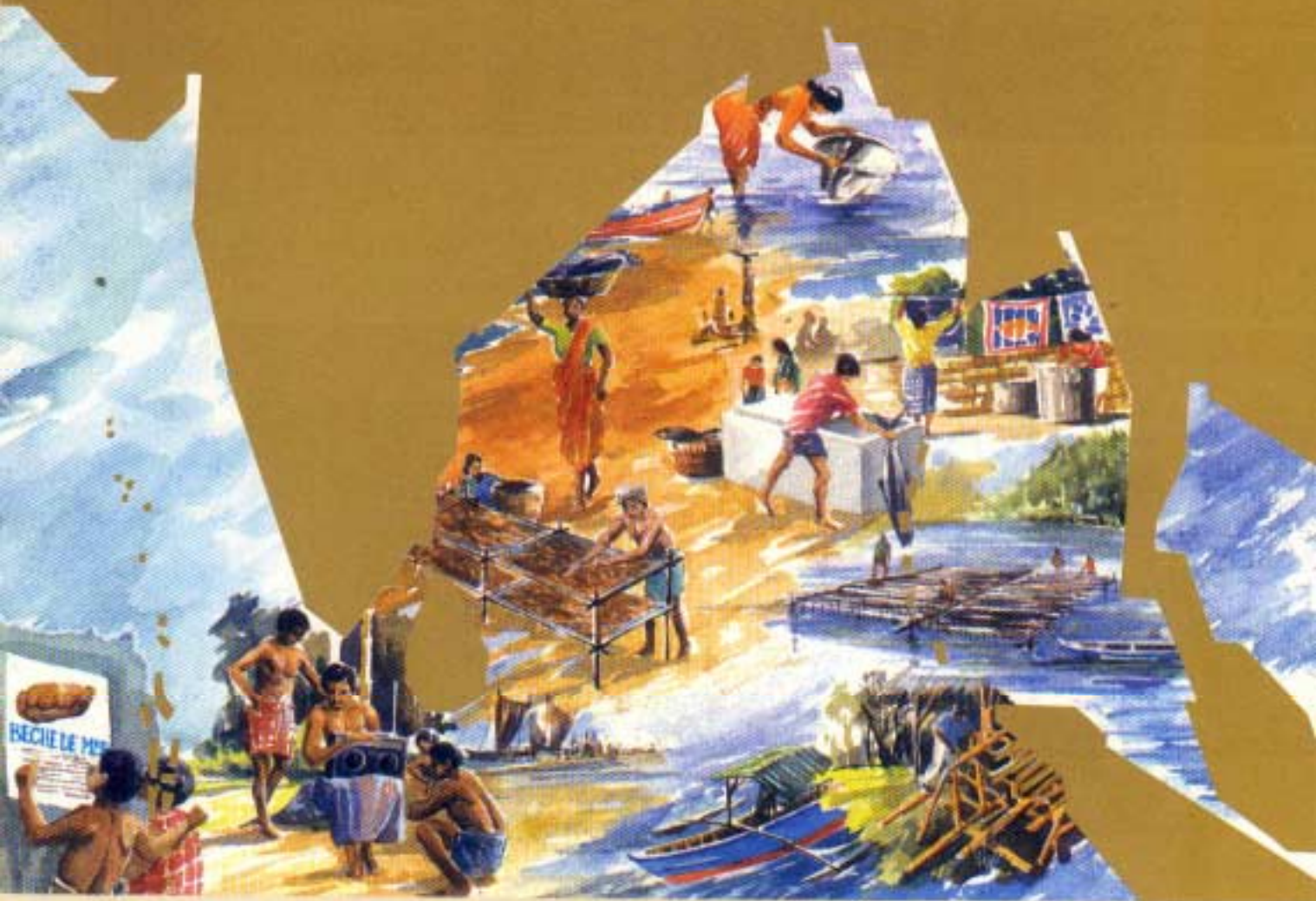


Flyingfish Fishing on the Coromandel Coast



BAY OF BENGAL PROGRAMME
Small-Scale Fisherfolk Communities

BOBP/WP/84
GCP/RAS/1 18/MUL

Pinyingfish Fishing on the Coromandel Coast, 1988-1991

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BAY OF BENGAL PROGRAMME
Madras, India
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There are at least ten species of Flyingfish in the Bay of Bengal but they have not been intensively fished. In order to demonstrate new income-generating activities for small-scale fisherfolk, systematic fishing trials for Flyingfish were initiated by the Bay of Bengal Programme (BOBP) in connection with the demonstration of a beachlanding craft being conducted in Thirumullaivasal, Tamil Nadu, India. The trials, between 1989 and 1991, introduced gillnetting, with or without lures and combined gear arrangements for Flyingfish capture to the local fishermen every year in the March-July Flyingfish seasons during this period.

In order to study the economic feasibility of continuing Flyingfish operations in the fishing villages of Tamil Nadu, a marketing survey was conducted in 1990 by the Bay of Bengal's Post-Harvest Fisheries Project, funded by the Overseas Development Administration (ODA), U.K.

This working paper details the trials and indicates that the daily earnings of the fishermen working on the beachlanding craft in this fishery compared favourably with the average earnings of fishermen employed in other fisheries during the same period. The marketing study revealed that there is a market for the fresh varieties of Flyingfish as well as for the dried fish.

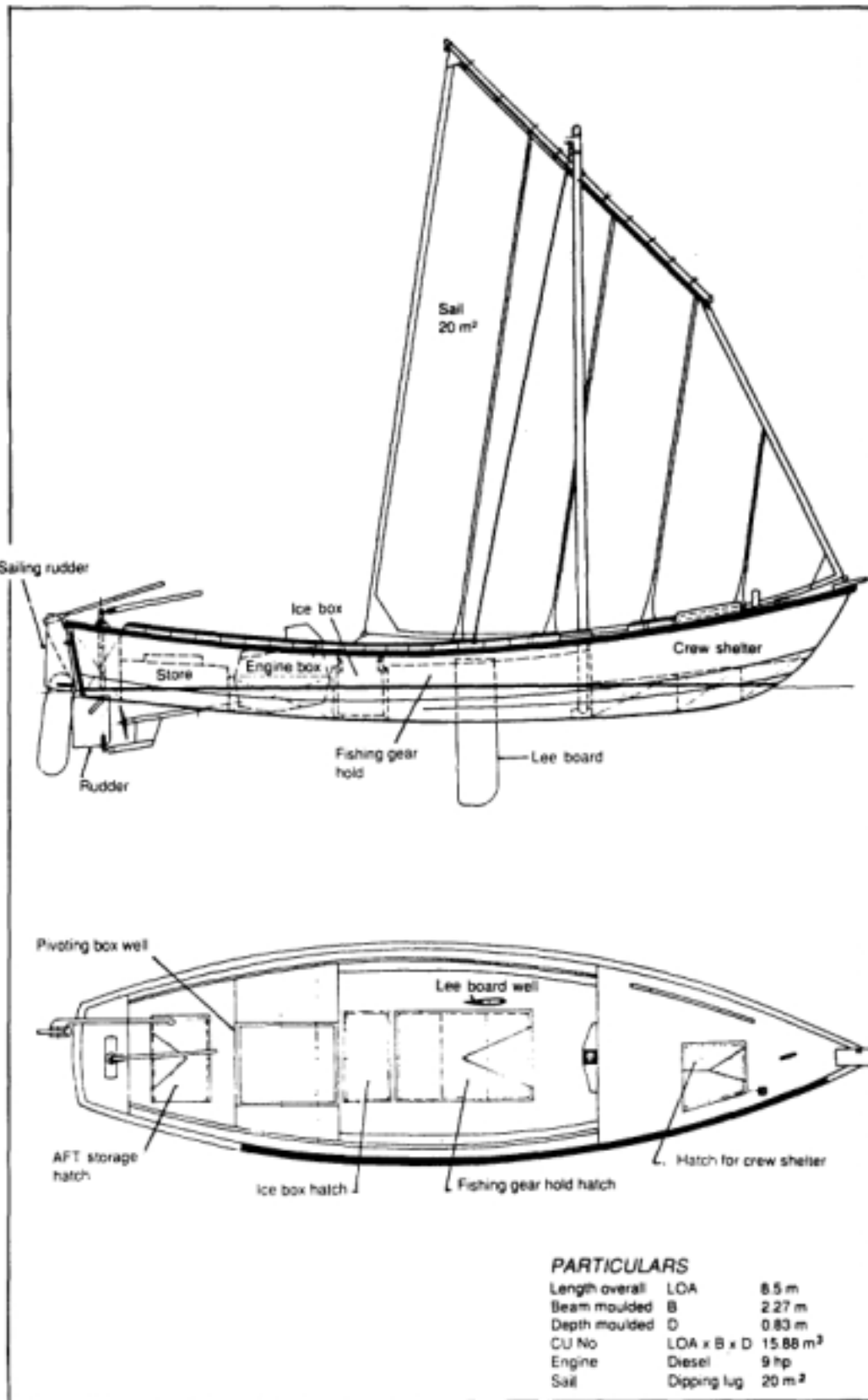
The Bay of Bengal Programme (BOBP) is a multi-agency regional fisheries programme which covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka and Thailand. The Programme plays a catalytic and consultative role : it develops, demonstrates and promotes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

This document is a working paper and has not been cleared by the Governments concerned or the FAO.

January 1993

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Fig. 1. The FRP beaching craft IND-20 with box drive



1. INTRODUCTION

On the Coromandel Coast of Tamil Nadu, South India, Flyingfish have been fished for decades by traditional fishermen using large sailing *kattumaram* and large scoopnets or, to a lesser extent, small mesh gillnets in conjunction with brushpile as luring devices. The Flyingfish caught, mainly small Flyingfish species, are landed in commercial quantities during June and July at various fishing centres along the coast. But good catches can be obtained only for about three to four weeks in the year.

In March/April 1988, in connection with trials of a new diesel engine for a beachlanding craft the Bay of Bengal Programme (BOBP) had developed, gillnetting for large species of Flyingfish was carried out off Besant Nagar, near Madras. Commercial quantities of non-spawners of different larger species were landed using a new type of gillnet. In all, 1,970 kg, valued at Rs 11,300, were landed during nine fishing trips which, from an economic point of view, was very encouraging. The species caught had only occasionally been caught before in this area and then with the use of baited hooks-and-lines.

The results of the fishing trials suggested that March-July was the fishing season for the large species of Flyingfish. If it were so, fishermen could extend the Flyingfish season by using this relatively low-cost fishing gear and, thereby, have an additional source of income.

Given the familiarity of the fishermen with small mesh gillnets, it was felt that, should fishing for large species of Flyingfish prove to be rewarding, they would easily adapt to this new fishing method, using their traditional sailing or motorized *kattumaram* or introduced motorized fishing craft.

The yearly production of all small varieties of Flyingfish in India is estimated at 4,000 t, with Tamil Nadu and Pondicherry contributing 76 per cent and 22 per cent respectively to this total. The most frequently landed of the species is a small coastal variety known as Coromandel Flyingfish, which has been landed here for decades.

Almost all other species are larger and oceanic in habitat. This includes the two varieties which predominate in the hooks-and-lines catch, namely Sutton's Flyingfish and Indian Spotted Flyingfish. These large varieties are generally scattered beyond the continental shelf in the southwestern part of the Bay of Bengal. The production of these varieties has so far been negligible. Considering the scatteredness and only seasonal availability of non-spawners, it is obvious that there is considerable scope for exploitation of these species without endangering the stocks.

In order to demonstrate new income-generating activities for small-scale fisherfolk, systematic fishing trials were planned by BOBP for one year in the first instance. The purpose was to assess the feasibility of gillnetting for large Flyingfish species using beachlanding craft operating from a selected fishing centre. In the event that commercial viability was achieved and that the fishing operations were acceptable to the fishermen, it was planned to extend the demonstrations to the other fishing centres.

It was decided to carry out the trials in Thirumullaivasal, Thanjavur District*, which had already been selected for demonstration of the beachlanding craft (BLC) IND-20 (See Figure 1, facing, and BOBP/WP/75).

A market survey was also conducted in June-July 1990 by the BOBP's Post-Harvest Fisheries Project, during the Flyingfish season, to assess the potential for increased marketing of Sutton's Flyingfish in select centres of South India. The two main elements of the survey were

- A four-week field study of landing, processing and marketing in Thirumullaivasal and of trading and consumption patterns in nearby towns in Thanjavur District and Pondicherry as well as in Madras and Bangalore. The study aimed at getting information on the Flyingfish marketing network, prices and consumer preferences.
- A trial marketing exercise of large Flyingfish (Sutton's species) obtained in Thirumullaivasal and sold fresh in Madras.

* Now Quaid-e-Millath District

2. TRADITIONAL FLYINGFISH FISHERIES

At least ten species of Flyingfish have been recorded in the Bay of Bengal. Six of them have been identified close to the continental shelf of the Coromandel Coast of Tamil Nadu. They are

Large Flyingfish species (LFF)

Sutton's Flyingfish	:	<i>Cypselurus suttoni</i>
Indian Spotted Flyingfish	:	<i>Cypselurus poecilopoterus</i>
Large-scale Flyingfish		<i>Cypselurus oligolepis</i> <i>Cypselurus opisthopus</i>
Tropical Two-winged Flyingfish		<i>Exocoetus volitans</i>

Small Species (SFF)

Coromandel Flyingfish	:	<i>Hirundichthys coromandelensis</i>
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The LFF exhibit a size range of 23-35 cm length, while the SFF have a length range of 18-24 cm.

The SFF spawn on the water surface near the continental shelf. But the LFF that come close to the continental shelf are non-spawners.

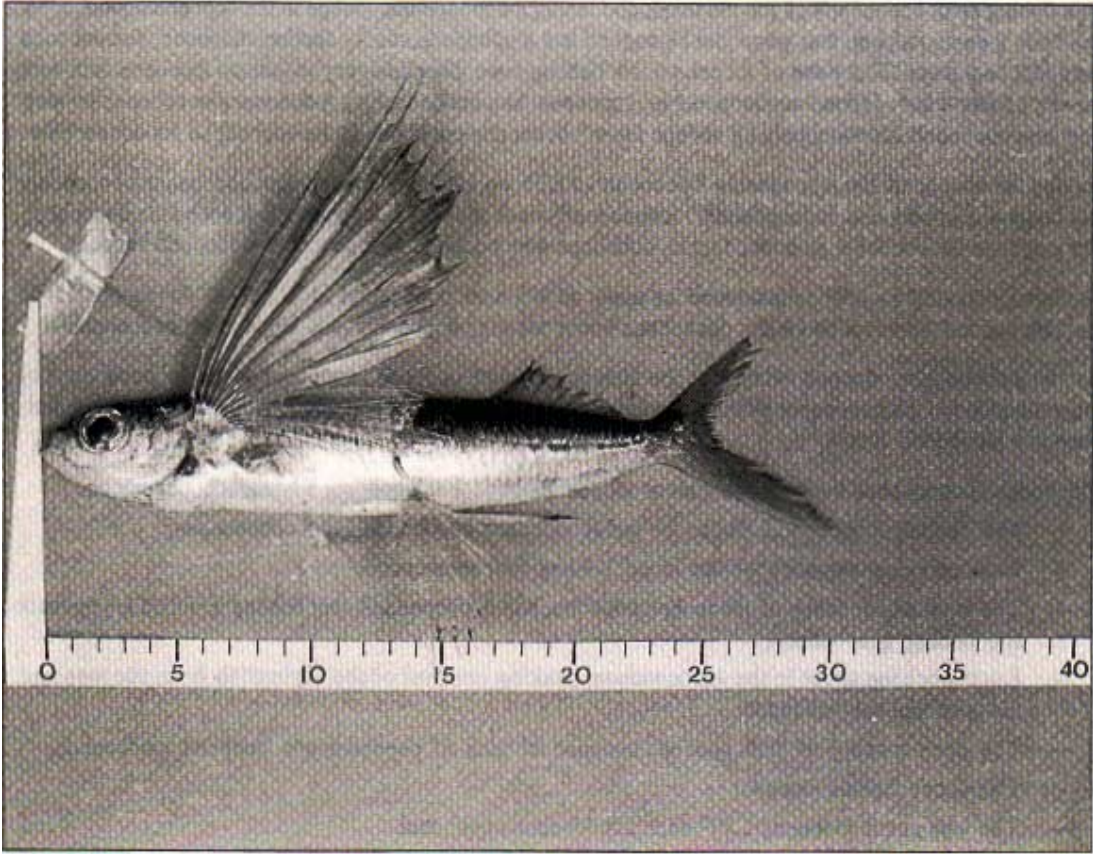
The fishing season is usually less than two months, June and July, when they spawn. They are not available in commercial quantities during the other ten months when, it is believed, they migrate to more offshore areas or are very scattered.

Flyingfish fishing is conducted all along the Coromandel Coast, especially in the southern part of the South Arcot District and Thanjavur District.

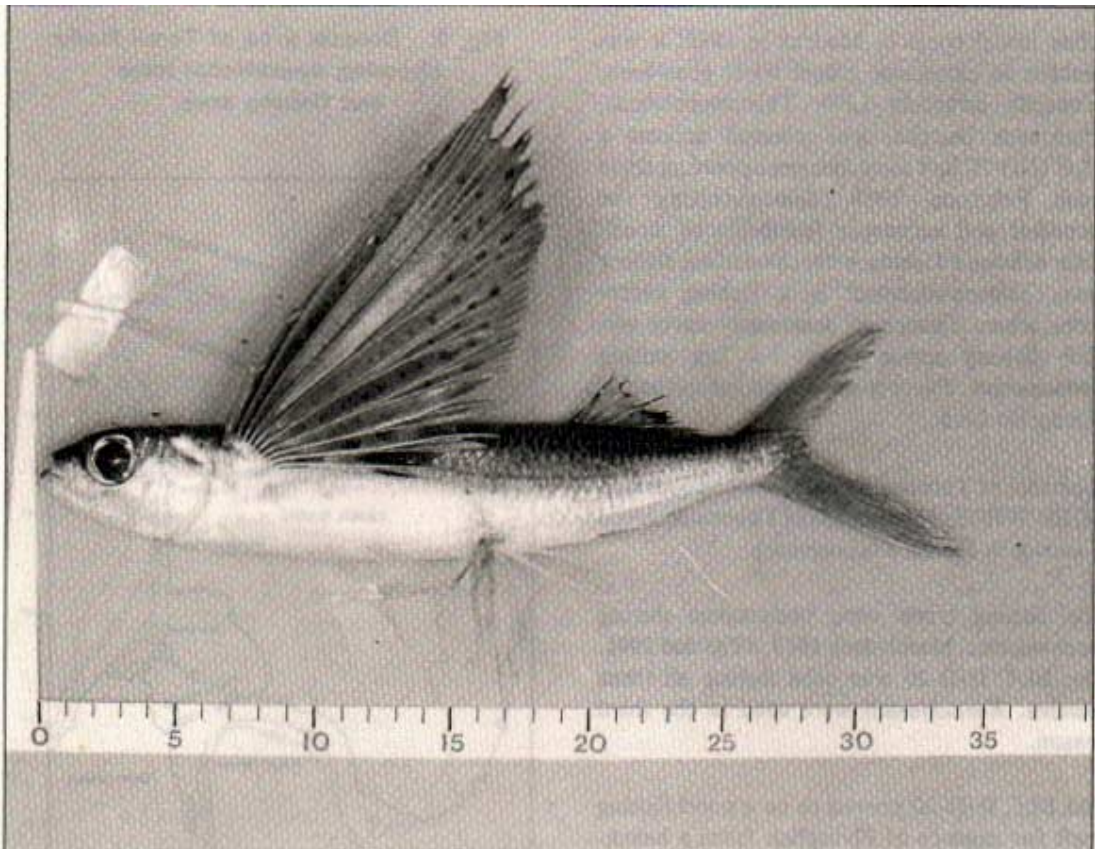
Large (8 m) 5-7 log sailing *kattumaram* called *kolamaram* are generally used for catching Flyingfish. It is estimated that about 5 per cent of the total number of *kattumaram* on the Coromandel Coast are seasonally used for this fishery. Very few motorized *kattumaram* or new types of fishing craft are used in the fishery, unlike in Shri Lanka.



A large kattumaram in Thirumullaivasal, one of the few with an engine (a longtailed diesel engine)



SFF: Coromandel Flyingfish (Hirundichthys coromandelensis)



LFF: Sutton's Flyingfish (Cypselurus suttoni)

The fishing craft leave early in the morning and return to the fishing village in the late afternoon, after less than a day's fishing. But when the Flyingfish are available in plenty further offshore, fishing trips may last two days. The time of return to the fishing base depends very much on the direction and power of the wind. Often, unfavourable combinations make sailing *kattumaram* return the next day or even reach another fishing village from which the craft has to be carried to its home base.

Taking advantage of the aggregating behaviour of SFF around floating objects, the fishermen mainly use large scoopnets and, occasionally, short small mesh gillnets in conjunction with shrubs as lure. For capture of the LFF species, hooks-and-lines are occasionally used with limited success.

Flyingfish fishing usually commences as early as 4-5 a.m. and stops at 1-2 p.m. Areas preferred for fishing are those with clear, dark blue water where, it is believed, Flyingfish are plentiful.

As the *kattumaram* do not carry ice, the fish are landed in fresh form and often in poor quality only suitable for processing as dried fish after salting. If the quality of the fish is good when landed, they are marketed fresh.

The main factors that limit development of the present *kattumaram* Flyingfish fishery are

- The fishing area is too far to be easily reached by the sailing *kattumaram*,
- Low carrying capacity of the large 5-7-log *kattumaram*;
- The lack of mobility of these *kattumaram* when they reach the fishing ground to operate the fishing gear easily;
- Little working space in the *kattumaram*, making removal of the Flyingfish from the nets and reuse of the nets difficult;
- The poor quality of fish landed, because of lack of preservation facilities on board;
- The short fishing season;
- The low production of LFF with hooks-and-lines; and
- High running costs, if motorized with OBM.

3. FEATURES OF FISHING TRIALS

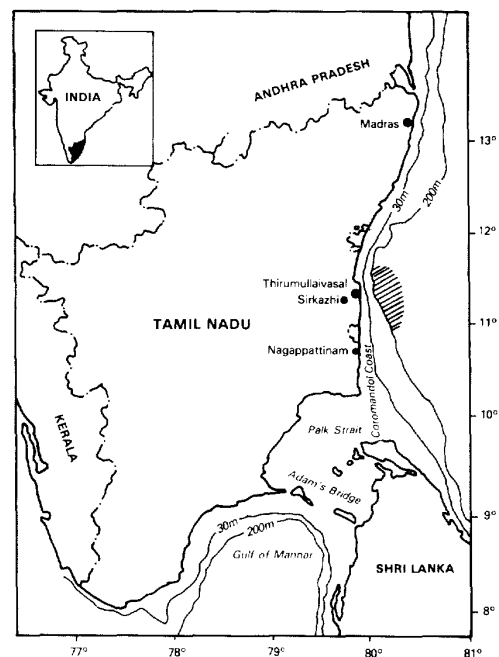
After initial trials in Madras in 1988, it was decided to carry out gillnet trials elsewhere, primarily targeting LFF. Thirumullaivasal, Thanjavur District, was selected because a BLC IND-20 had already been operating there from February 1989, demonstrating the technical and economic feasibility of small-scale offshore fishing with diversified fishing gear. Thirumullaivasal is a fishing centre from where fishermen seasonally carry out SFF fishing using large 5-7 log sailing *kattumaram*. There is also a market outlet for Flyingfish here.

A profile of Thirumullaivasal may be found in BOBP/WP/75. The location of Thirumullaivasal is shown in Figure 2 (alongside).

The fishing trials were undertaken during three seasons, March-July 1989, 1990 and 1991. The BLC IND-20 was used during all three seasons. *Kattumaram* were used in the third season.

The BLC IND-20 proved to be a good fishing craft for capture of Flyingfish from a beach-based fishing village. Besides its surf-crossing,

Fig. 2. Coastal area of Tamil Nadu showing operational base and fishing area.





The BLC IND-20 with Box Drive used in Madras and Thirumullaivasal.



The modified BLC IND-20 with new BOB Drive in Thirumullaivasal.

beaching and safety features, the BLC IND-20 has both the mobility and carrying capacity required for this fishery. It has

- the speed to reach offshore fishing areas and return in time the same day for disposal of the catch in the market,
- a fishing gear hold large enough to carry as many as 35 LFF gillnets (2500 m),
- a built-in insulated ice box large enough to preserve a good catch in ice and, thereby, maximize fishing time and value of catch, and
- a deck layout and space adequate for easy handling of the fishing gear and removal of Flyingfish from the nets on board.

On the other hand, the log type *kattumaram*, whether used with sail or motor, are, because of their constraints, better suited for traditional SFF fishing with scoopnets or with gillnets using shrub lure.

The experience of previous trials in Sri Lanka suggested that expansion of the Flyingfish fishery would be possible only with a motorized fishing craft. The fishing trials in Thirumullaivasal with the beachlanding craft IND-20 were the first step in the right direction.

The trials were carried out with local fishermen, with whom different sharing agreements had been worked out, for operation of gillnets with the BLC IND-20 and for operation of gillnets using their own fishing craft. Training in operation of the BLC IND-20 and engines and in the use of gillnets and combined fishing gear was given by Project staff. The crew were also instructed on making the observations necessary for monitoring. (Project staff on shore monitored expenditure and earnings of each fishing craft.) A second year of fishing trials was carried out to consolidate the earlier results with the BLC and, during the third year, the trials were extended to other fishing craft.

3.1 Fishing gear

The following types of fishing gear and luring techniques were used:

- Gillnets for LFF species
- Gillnets for SFF species
- Scoopnet for SFF species

Gillnets and the scoopnet were used for SFF species in conjunction with artificial lures.

Trolling lines were used as a complementary fishing gear to and from the fishing ground, targeting Seerfish and small Tuna species.

The details of fishing gear used for Flyingfish fishing are given in Table 1 and shown in Figures 2, 3 and 4 (facing and in the pages following).

Table 1 Fishing gear used during the Flyingfish trials

<i>Fishing craft and gear</i>	<i>Length (meshes)</i>	<i>Depth (meshes)</i>	<i>Stretched mesh size (mm)</i>	<i>Twine size</i>	<i>Material</i>	<i>Quantity</i>	<i>Cost (IRs)</i>
<i>Beachlanding craft IND. 20 -</i>							
1. Gillnet for large Flyingfish	2000	45-50	50-54	0.20mm	PA Monofilament	25	15000
2. Gillnet for small Flyingfish	2800	200	32-34	0.20 mm	PA Monofilament	5	3500
3. Scoopnet			20	210 d/6	PA Multifilament	1	300
- 8.5 m length with 1.9 m beam and 0.30 m draft, using 9 hp VST watercooled diesel engine and costing IRs 120,000. Used for trials in April-July 1989, April-July 1990 and March-July 1991.							
<i>5log motorized kattumaram*</i>							
1. Gillnet for large Flyingfish	2000	50	50	0.20mm	PA Monofilament	15	9000
2. Gillnet for small Flyingfish	2800	200	32-34	0.20 mm	PA Monofilament	5	3500
3. Scoopnet			20	210 d/6	PA Multifilament		300
- 7 m length, costing IRs 15,000, using Evinrude (OBM) engine, costing IRs 17,000. Used for trials in March-July 1991.							
<i>74log motorized kattumaram -</i>							
1. Gillnet for large Flyingfish	200	50	50	0.20mm	PA Monofilament	15	9000
2. Gillnet for small Flyingfish	2800	200	32-34	0.20 mm	PA Monofilament	5	3500
3. Scoopnet			20	210 d/6	PA Multifilament		300
- 8 m length, costing IRs 20,000, using 5.5 hp Lombardini (longtail) diesel engine, costing IRs 18,000. Used for trials in March-July 1991.							

**Us \$ = IRs. 17/- appx. (1989)

IRs. 18/- appx. (1991)

Fig. 3 Gillnet (for large flying fish)

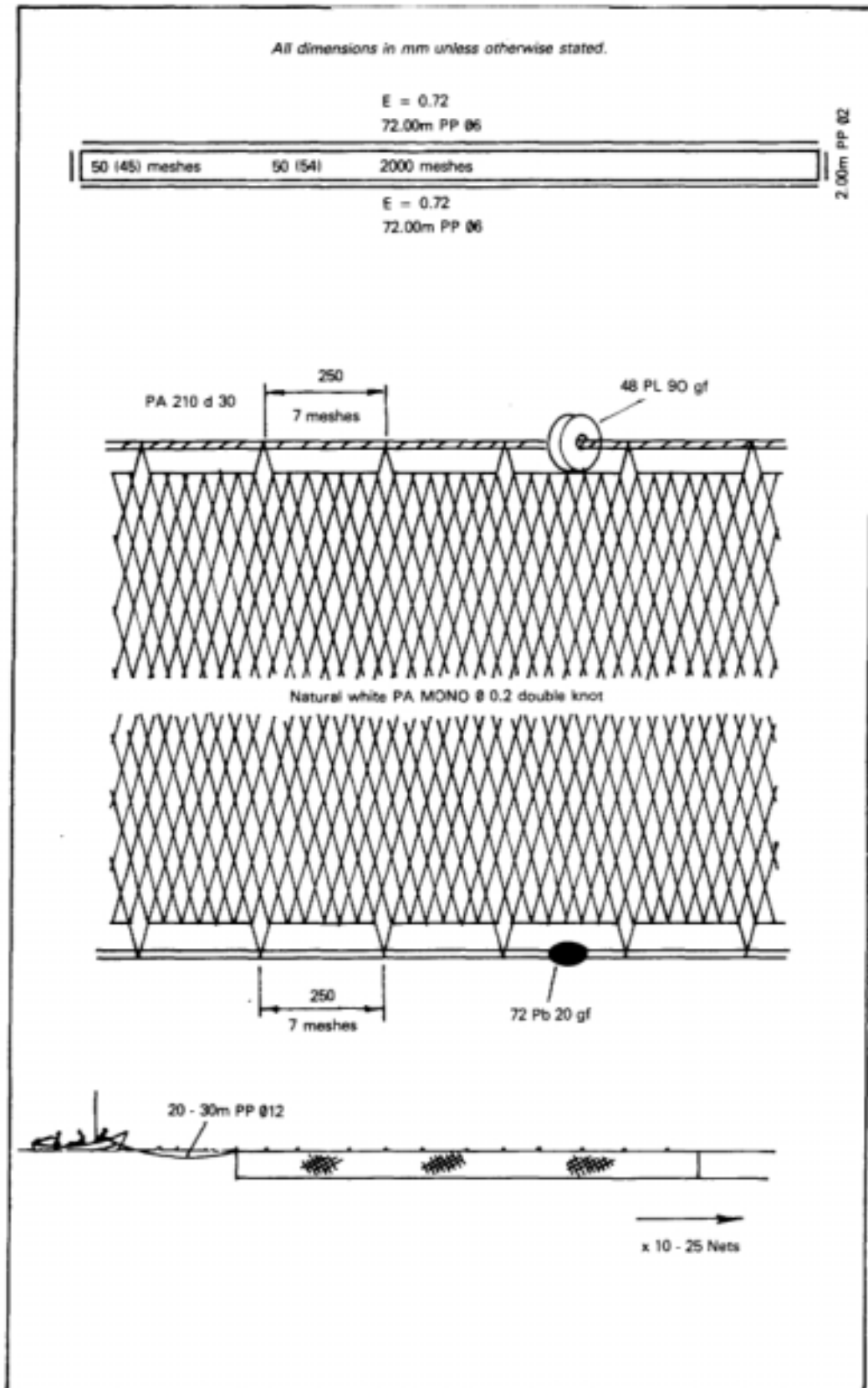


Fig. 4 Gillnet (for small flying fish)

All dimensions in mm unless otherwise stated.

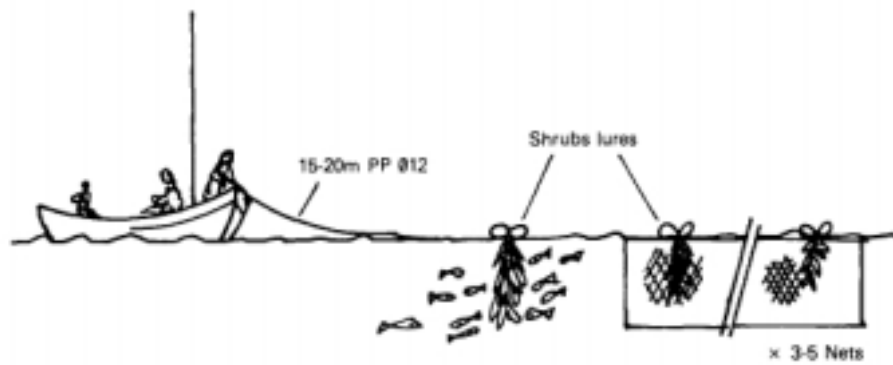
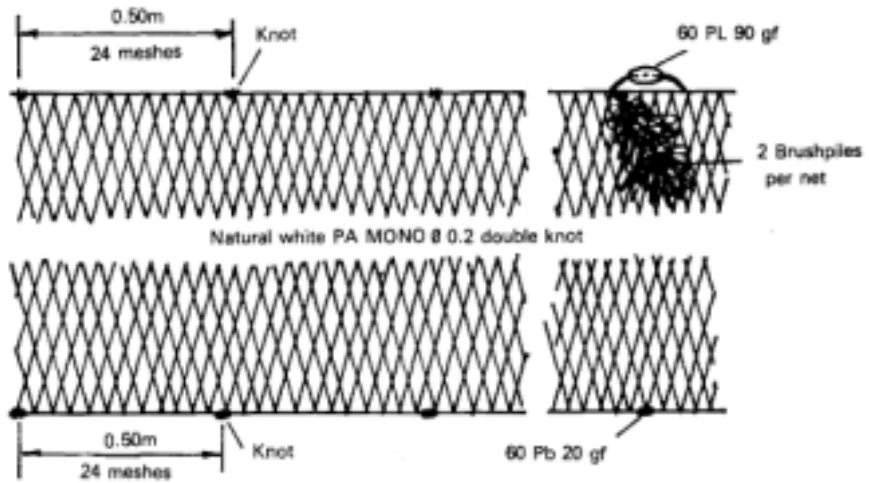
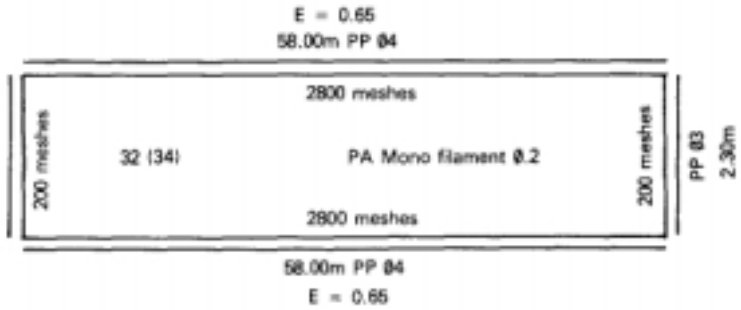
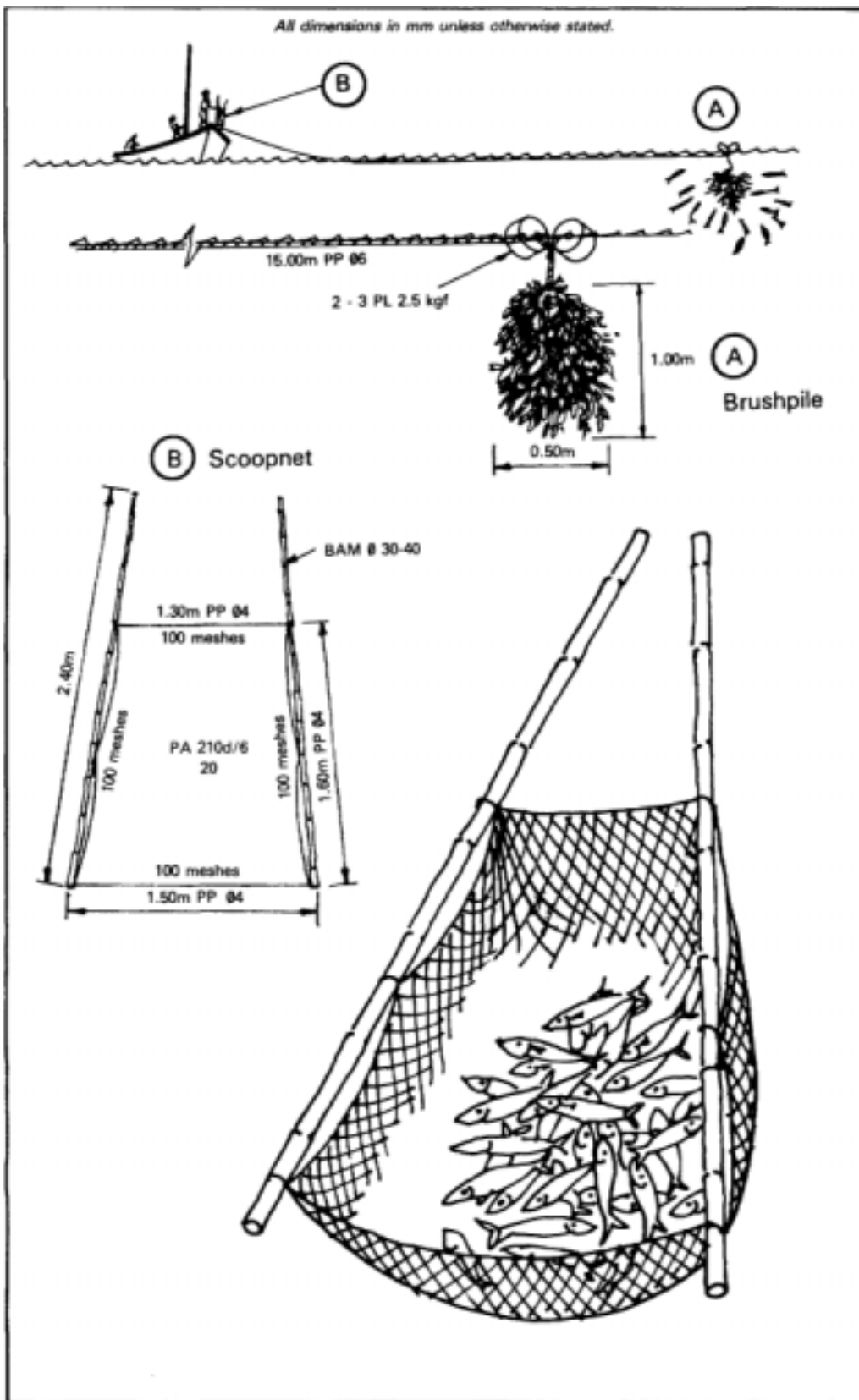


Fig.5 Scoopnet (for small flying fish)



3.2 Fishing operations

Fishing operations were carried out 10-20 n miles from shore, using a variety of fishing gear. The operations with these fishing gear are described below. Operations with trolling lines were carried out to and from the fishing ground.

GILLNETTING FOR LFF

The gillnets are attached one to another to form a long wall of net floating on the surface and hanging vertically about 2 m in the water for the Flyingfish to gill. After laying the gillnets, the tail end of the fishing gear is attached to the fishing craft and the nets drift with it. The soaking time varies from 1 to 2 hours depending on the fishing conditions. Hauling operations then commence in a reverse direction. As the nets are hauled on board the fishing craft, the fish are removed from them before the nets are restacked, ready for shooting. Sometimes, when conditions permit, the nets are reshot even while hauling. The same fishing operation is repeated up to three times before the boat returns to the village to dispose of the catch.

GILLNETTING FOR SFF WITH LURES

Three to five small mesh gillnets are attached one to another to form a short wall of net hanging vertically about 5 m from the surface. Two pieces of shrub are attached to each piece of net as lure to aggregate the Flyingfish. After laying the gillnets, the fishing craft is attached to the tail end of the net and allowed to drift. The soaking time is about one hour, or even less when gilling of fish is good. When enough fish are gilled, the nets are hauled on board for removal of the catch. This operation is repeated as long as the fish gill in commercial quantities.

SCOOPNETTING WITH LURES

In areas where small Flyingfish are believed to be available, fishermen drop the shrub lures attached to 10-15 m long rope and hold them in a half-submerged position with floats. The fishing craft to which the lure rope is attached is then kept drifting for one or two hours or till enough Flyingfish aggregate around the lures to shed their eggs. The fishermen then slowly draw in the ropes, called *kambi*, and, when the lures are close to the fishing craft, swiftly scoop out the fish with a large scoopnet. The same operation is repeated as long as Flyingfish aggregate around the shrub lure.

COMBINED FISHING OPERATIONS

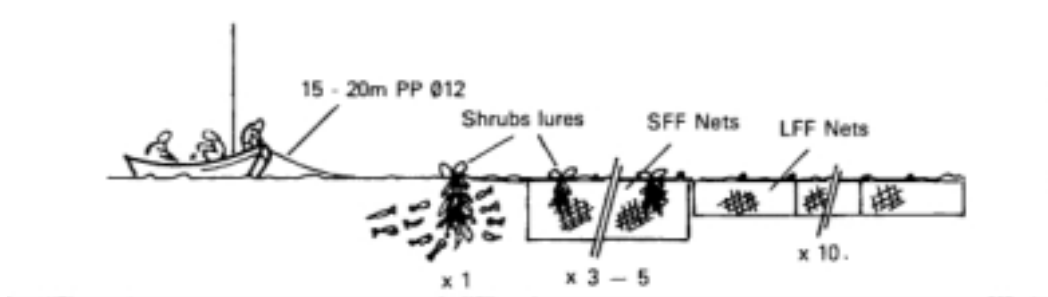
A combination of the three methods is used

- Gillnetting for non-spawner LFF;
- Gillnetting for spawner SFF with artificial lures; and
- Scoopnetting for spawner SFF with artificial lures.

When the three fishing methods are used together, a reduced fleet of large Flyingfish gillnets (10 pieces) is shot first, then the small Flyingfish gillnets (3-5 pieces), after being attached to the former, and, finally, attached to the tail end of the small Flyingfish gillnet a few metres of rope with shrub lures for scoopnetting. The rope, of about 15 m, is attached to the boat, which is then allowed to drift.

This fishing gear arrangement (see Figure 6) was occasionally made for the beachlanding craft in order to intensify the fishing operations when large non-spawners and spawners of the small Flyingfish species were available at the same time in the same fishing area.

Fig. 6 Arrangement of fishing gear for combined flyiftg fish fishing operations.





Hauling gillnets in, aboard the BLC IND-20 off Thirumullaivasal.



The Flyingfch caught by the gillnets are freed from the nets aboard the BLC IND-20.



Flyingfish being removed from ice-hold of a BLC IND-20 (left) and being landed (below) in Thirumullaivasal



4. RESULTS

4.1 Fishing effort

The fishing effort (days) of each fishing craft during the Flyingfish fishing season is given below.

The year-by-year increase in fishing effort by the BLC is partly attributable to the growing interest of the fishermen in carrying out Flyingfish operations. The fishermen also became aware of advantages of motorization of the fishing craft for such fisheries.

In 1991 the *kattumaram* effort was less (Table 2) because they were engaged in this fishery only during the peak fishing season. Because of the high running cost of an **OBM**, and other fishing opportunities closer the shore, the motorized *kattumaram* fishermen preferred to fish inshore and lost fishery days offshore. The *kattumaram*, it would appear, are being used to their full potential and, given their inherent shortcomings, it is very unlikely their performance can be much improved.

The BLC targeted only Flyingfish, because of prior agreement. Because of the exploratory nature of the Flyingfish fishing trials, they used Flyingfish gillnets as their main fishing gear. The gearwise fishing effort by the BLC during the three seasons is given in Table 3. Scoopnets with shrub lure were used by the BLC only occasionally, when small Flyingfish aggregated in large quantities on the lures used within the gillnets.

SFF gillnets (3-5 pieces) with attached shrub lures were used more extensively by the BLC in 1989 and 1991 than in 1990. Given the carrying capacity of the BLC, as many as ten nets could have been used, but only 3-5, a fishing effort more suitable for smaller craft such as *kattumaram*, were used.

The quantity of LFF gillnets used varied. When gillnetting only for LFF, 25 pieces were used, but when gillnetting for LFF and SFF species simultaneously, only ten LFF nets and 3-5 SFF nets with attached lures were used. Because the fishermen were more interested in the capture of SFF, the LFF gillnets were used alone only during 1990. At no time was the full fleet of gillnets (35 pieces) used, the BLC's capacity, thus, being underutilized.

Table 2 : Fishing effort by type of fishing craft (in days)

Fishing craft	1989	1990	1991
BLC		63	89
Motorized Kal. (OBM)			28
Motorized Kat. (DLE)			23

Table 3: Fishing effort by type of fishing gear used by BLC (in days)

	Drift gillnets	Drift longlines	Drift gillnets/ Drift longlines	Gillnet (Flyingfish)	Total
1989					
March	14	3	6	—	23
April	3	1	3	6	13
Ma	—	—	—	25	25
June	—	—	—	7	7
Jul	10	—	—	8	18
Subtotal	27	4	9	46	86
1990					
March	14	—	—	—	14
April	3	—	—	10	13
May	—	—	—	19	19
June	—	—	—	24	24
July	8	—	8	10	26
Subtotal	25	0	8	63	96
1991					
March	—	—	—	11	11
April	—	—	—	22	22
May	—	—	—	20	20
June	—	—	—	19	19
July	—	—	—	17	17
Subtotal	0	0	0	89	89
Total					
1989.1991	52	4	17	198	271

The combined use of gillnets between March and July by motorized fishing craft, such as the **BLC**, would increase the Flyingfish catch. This is indicated by Table 4 which gives the monthly catch rate of Flyingfish for combined use of gillnets by the BLC over the three years.

There appears to be a well-defined seasonal pattern for LFF as well as SFF fisheries spreading from April to July.

Because SFF are spawners and not so scattered, there is a noticeable peak fishing season lasting for a couple of weeks in June-July. Using more small mesh gillnets (10 pieces) with shrub lures will result in increased catch during this period. A peak fishing season for LFF is, on the other hand, less noticeable because they are non-spawners and more scattered. The length of the fishing seasons for LFF will depend very much on the number of nets used. With the use of more fishing nets (35 pieces) and a motorized fishing craft such as the BLC, LFF fishing could last up to four months (April-July). Because of limited carrying capacity (15 pieces of net) by motorized and non-motorized *kattumaram*, the LFF fishing season for them is much more limited.

Table 4 : Monthly catch rate of Flyingfish each year using combined gillnets (kg/day)

YEAR	MARCH	APRIL	MAY	JUNE	JULY	AUG
1989	NO.	18	217	188	316	NO.
1990*	NO.	132		134	24	NO.
1991	42	39	21	108	149	NO.

In 1990, gillnets for large Flyingfish contributed 98 per cent of the total catch
NO. = No operation

Table 5 : Catch record of LFF and SFF species by BLC in 1990 and 1991

1990						
Month	No. of trips	LFF		SFF		Total (kg)
		Wt. (Kg)	% comp.	Wt/Kg	% comp.	
March						
April	10	1322	19.80			1322
May	19	1903	28.50			1903
June	24	3138	47.00	75	1.12	3213
July	10	165	2.47	74	1.11	239
TOTAL	63			149	2.23	6677
		4528	97.77			
1991						
Month	No. of trips	LFF		SFF		Total (kg)
		Wt. (Kg)	% comp.	Wt. 1Kg	% comp.	
March	11	666	8.01			666
April	22	867	10.42			867
May	20	416	5.00			416
June	19	215	2.59	3625	43.59	3840
July	17	288	3.46	2240	26.93	2528
TOTAL	89	2452	29.48	5865	70.52	8317

In 1990, the LFF species were dominant and represented 98 per cent of the total catch. In 1991, this was reduced to 29 per cent. This variation in catch is attributed to the type of gillnets used and the fishing area. During 1991, SFF gillnets and scoopnets in conjunction with lures were used more in areas closer to the shore.

4.2 The fishing gear

The new gillnets performed well for capture of non-spawner LFF species as well as for SFF species.

The PA monofilament netting used for the LFF gillnets is transparent in water and has the softness and strength needed to hold its target fish. Damage to netting is limited and mainly caused by large predators feeding on gilled Flyingfish. Given the limited duration of the fishing season and the nature of the fishery, the service life of the nets is estimated at four years.

The 50-54 mm size stretched mesh worked well, with drop-off of LFF species from the nets negligible. A standard mesh size of 52 mm stretched mesh may be adequate. The hanging ratio of 0.72 (length of framing line / length of stretched netting) provided the correct mesh opening for gilling. The depth of the nets in the water, estimated at 2-2.20 m, is appropriate. Most of the Flyingfish gilled in the upper part (1 m) of the nets.

Because of these reasons, the LFF gillnets are very selective and the catch of other small pelagic fish is negligible. There are also very few small pelagics to catch in offshore waters.

Given the positive experience with the new type of nets, no further refinement is considered necessary. But it is of interest to note that Indian Mackerel gillnets, traditionally used by *kattumaram*, could also be adapted easily for this fishery. In doing so, the *kattumaram* fishermen do not have to invest extra money in LFF gillnets.

As LFF are non-spawners and, therefore, found scattered over large offshore areas, a large fleet of nets is required to yield an acceptable catch rate during the short season. The maximum length of the fleet of nets to be used with fishing craft like the BLC IND-20 is about 2.5 km (35 nets). Use of shorter fleets of nets, as during the trials, will result in significant reduction of catch and duration of fishing season.

In the case of the SFF fishery, the small mesh gillnets with attached shrub lures aggregated the SFF spawners well. They provide larger areas of floating objects for the spawners to shed their eggs on and then gill.

In a combined fishing operation with LFF and SFF gillnets, a maximum of five nets (200 m) were used with the *kattumaram* and the BLC. For a commercial fishing operation with a BLC type craft, as many as ten nets (600 m) could be used.

Though the combined fishing operation worked well and showed it was feasible with the BLC, it is not recommended for future use. Gillnetting for LFF and SFF species, independently done at different times, may yield better results.

The fishermen engaged for the trials were initially reluctant to use gillnets. But the higher earnings soon stimulated interest and fishermen and owners of motorized fishing craft in several nearby fishing villages also began to show interest in LFF and SFF gillnetting. During a subsequent field visit it was noted that gillnetting for LFF was seasonally being carried out with various types of fishing craft in more than twenty fishing villages. Some fishermen were using gillnets of the new design, others had adapted their Indian Mackerel gillnets for this fishery.

5. *ECONOMIC FEASIBILITY*

Data on production, costs and earnings and cashflow of BLC and *kattumaram* in Flyingfish fisheries during 1989, 1990 and 1991 in Thirumullaivasal are given in Table 6 (overleaf).

The much higher catch by the BLC is attributed to the quantity of fishing gear as well as many more fishing days over a much longer fishing season. While the annual total catch of the BLC did not fluctuate much during the three years, the total value varied a lot. The higher catch value of LFF species in 1990 and 1991 is attributed to a much higher average selling price of Flyingfish in 1990 (7.50 Rs/kg) and in 1991 (6.20 Rs/kg) compared to 1989 (3.86 Rs/kg).

The BLC catch per trip in 1991 was much lower than the average catch per *kattumaram* trip. This is because, unlike the BLC, the *kattumaram* carried out Flyingfish fishing only during the peak fishing season. For the same reason, the average earnings of *kattumaram* per trip was higher than of the BLC in 1991.

The average operating cost of the BLC is of the order of Rs. 100 per day trip, Given the potential of this fishing craft, it is very low; it is about the same as the *kattumaram* propelled by a diesel longtail engine (IRs 106) and is much lower than a *kattumaram* propelled by outboard motor (IRs 183), which has less potential for Flyingfish fisheries.

The daily earnings of fishermen working on BLC compared favourably with the average earnings of fishermen employed in other fisheries during the same period. The net boat share generated by each fishing craft during the Flyingfish season has been good for all the fishing craft and all years.

Continued good financial return with Flyingfish gillnetting has been an incentive to owners of small non-motorized or motorized fishing craft to get involved in this fishery. The investment required for the necessary fishing gear is not excessive (Table 7).

Given the earnings generated in Flyingfish fisheries, these investments and depreciation are comparatively low (Table 7). From the data gathered during the trials it appears that the depreciation cost of fishing gear would be of the order of 150 Rs/fishing day. In the case of the BLC, the total cost per day would be about Rs 350 — which is about 50 per cent of the earnings.

Table 6 : Data on production, costs and earnings and cashflow of fishing craft

		1989 (April-July)		1990 (April-July)		1991 (March-July)
		BLC	BLC	BLC	MOT KAT I (OBM*)	MOT KAT II (DLE)
Fishing trips	(No.)	46	63	89	28	23
Fish caught	(kg)	8949	6677	8317	4578	3197
Value of fish caught	(IRs)	33966 ^o	50076 ^{***}	51745 ^{***}	20766	13718
Fish caught/trip	(kg)	195	106	93	163	139
Value of fish caught/trip	(IRs)	738	795	581	742	596
Total operational cost	(IRs)	4268	7300	9533	5120	2434
Average operational Cost/Trip	(IRs)	93	116	107	183	106
Cashflow before payment to crew and owner	(IRs)	29698	42776	42212	15646	11284
Crew share	(IRs)	14849	21388	21106	7823	5642
Crew	(No.)	4	4	4	4	4
Mandays	(No.)	184	252	356	112	92
Earnings/mandays	(IRs)	81	85	59	69	62
Boat-ownershare	(IRs)	14849	21388	21106	7813	5642

- OBM : Kerosene Outboard Motor

-- DLE : Diesel Longtail Engine

Not including value of fish caught by trolling from and to the fishing ground

Table 7 Investment and depreciation of fishing gear

Fishing craft	Fishing gear		Investment (IRs)	Depreciation (Years)	Depreciation (IRs/Yr)
BLC	LFF gillnets	(25 pcs)	15,000	4	3,750
	SFF gillnets	(5 pcs)	3,500	2	1,750
	Scoopnets	(1 pc)	500	1	300
	TOTAL		18,800		5,800
<i>Kattumaram</i>	LFF gillnets	(15 pcs)	9,000	4	2,250
	SFF gillnets	(5 pcs)	3,500	2	1,750
	Scoopnets	(1 pc)	300	1	300
	Total		12,800		4,300

APPENDIX



*Flyingfish landed on the beach
at Thirumullaivasal(left)
is auctioned right away (below)*



APPENDIX I

Marketing of Flyingfish

All the Flyingfish landed, fresh or iced, was auctioned on the beach. Table 8 gives the price range of fish sold at Thirumullaivasal in 1989-1991.

The selling prices of large and small species of Flyingfish varied very much on a day-to-day basis and according to the landing of Flyingfish and other species.

Table 8 : Price range of large and small Flyingfish species (IRs/kg)*

	1989		1990		1991	
	LEE	SFF	LFF	SEE	LFE	SFF
Min.	3.50	3.50	7.00	6.00	7.50	4.00
Max.	7.50	6.00	7.50	5.00	10.00	6.00

The low selling price of LFF species in 1989 improved as

landings increased, and became more regular, in Thirumullaivasal. The Sardine catch also contributed to the lower prices of Flyingfish.

The LFF species fetched a much better selling price than the SFF species in the last two years of the trials. This is reflected in the market survey which indicated as much as 50 per cent higher retail selling prices of the LFF species compared to the SFF species in consumer centres in Thanjavur District in 1990.

The Flyingfish market study reached the following conclusions

- Low and middle-income families are the main consumers of Flyingfish. The middle-income groups go for fresh Flyingfish, the low-income groups buy dried Flyingfish.
- Some 1,600 t of Flyingfish are marketed in the area surveyed, of which about 50 per cent are sold fresh to urban consumers and 20 per cent to the rural market. The remaining 30 per cent of the Flyingfish are marketed dry, mostly through *shandies* (weekly markets) in Mayavaram and Villupuram, which, during the peak season, regularly handle up to 25t/week. Table 9 (alongside) indicates the estimated quantities of fresh Flyingfish currently being marketed in the region on a seasonal basis.
- While the fresh fish is sold within Tamil Nadu, the dried product is distributed widely and reaches the North and the Northeast.
- The mid-May-mid-July capture pattern of Flyingfish has led to consumer demand during these months for the “bird fish” or the “fish with feathers”. Flyingfish curry, made with coconut milk, is popular in many places. In Thanjavur, Tiruchchirappalli and Salem, Flyingfish is considered tasty and is a preferred fish during the season. In Pondicherry it is mostly a substitute for varieties that are not available. In Bangalore, Flyingfish is sold without the characteristic pectoral fins, which are cut off, It is bought as a “last substitute” by low-income groups sensitive to prices.
- LFF (Sutton’s species) appear periodically in Tamil Nadu markets in small quantities. Traders confirm that its better taste and bigger size, as compared to the traditional SFF (Coromandel variety), ensure it both a higher price in the market and readier consumer acceptance. In general, LFF (Sutton’s species) command a price 30-50 per cent higher than SFF (Coromandel variety).

Table 9 : Estimated quantities of fresh Flyingfish consumed by centres in the region

Consumption centre	Quantity (t/year)
Thanjas ur	190
Tiruchi	130
Salem	100
Pudakottai	20
Coimbatore	50
Vell ore	16
Bangalore	6
Cuddalore'	90
Nagapastteam'	70
Pondicherry'	140
Total	812

Notes:

Estimates are based on market information collected during the survey from traders on supplies of Flyingfish per day to she markers and calculated at an usage of 60 effective supply day's per season (Mac-July).

Estimates include LFF species.

Production-cam-distribution centres — figures indicate consumption of the fish in the centres.

- Thanjavur, Tiruchchirappalli, Pudukkottai and Salem are considered markets that can absorb increased quantities of LFF. In Thanjavur, the LFF species sells at up to 12 Rs/kg, as compared to SFF, whose highest price is 8 Rs/kg.
- Two consignments of LFF were sent from Thirumullaivasal to Madras on different dates. The fish sold in the Chintadripet market at an average price of 6.60 Rs/kg. Buyers were not prepared to pay more. There seems to be little market potential for this fish in Madras.

Price structure

Table 10 (below) gives market price data for several fish species, including both Flyingfish varieties, at the time of the survey.

Table 10 : Comparative prices of fish in the region (IRs/Kg)

Fish	Landing centre	Urban consumption centre
Flyingfish		
SFF (Fresh)	4-6	6-8
LFF (Fresh)	6-8	8-12
SFF (Dried)	4-5	6-7
(Rs. 150 per 1000 Nos) — (Mayiladuthurai price)		
Prime#		
Seer	15-20	25-30
Black Pomfret	18-25	22-25
Other fish		
Mackerel	6-8	9-12
Sardine	3-4	22-25
Silverbelly	5	6-7
<i>Nenuplerus</i>	7-8	10
Shark	8.10	12-15
Snapper	—	10
Tuna	3	4-5

The survey was carried out in 1990, when the traditional fishery was abnormally poor. The data and the conclusions should be substantiated by a survey under more normal supply conditions. Further, caution should be exercised in promoting the marketing of LFF, to prevent an adverse impact on the sales of the SFF variety.

The problem of quality deterioration (histamine toxicity) leading to a burning sensation in the tongue (a form of food poisoning) and the resultant negative implications on consumption of this fish should also be examined, and improved post-harvest techniques introduced, through an extension programme, to prevent this.

PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

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

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

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

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

Other publications which include books and other miscellaneous reports.

A list of publications in print follows. A complete list of publications is available on request.

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23. *Summary Report of BOBP Fishing Trials and Demersal Resources Studies in Shri Lanka.* (Madras, March 1986.)
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