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Cover photo: Purse seine operation at Mangalore

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# THE PURSE SEINE FISHERY OF MANGALORE (KARNATAKA)*

## Introduction

Karnataka State, with about 300 km of coastal line extending from Majali in the north to Talapady in the south contributes about 8.3% to the total marine fishery catch of the country. The average annual catch of this state for the five-year period 1970- 74 amounted to 96,217 tonnes which increased to 0.12 million t during the period of next five years (1975-79). The increase during the latter years was mainly attributed to the augmented fleet strength of trawlers and to the introduction of purse seiners from 1975 onwards. Undoubtedly, the rapid increase in the strength of purse seine fleet gave the necessary fillip to the marine fisheries, especially for the exploitation of hitherto underexploited resources like anchovies, horse-mackerel, cat fish etc., in addition to the other traditional pelagic fisheries viz., oil sardine and mackerel. The introduction of purse seine, though initially resented by the artisanal fishermen, neverthless, was rather smooth. As a result of this, once active landing centres of Dakshina Kannada for the indigenous gear have to bear the brunt of the change over in the age old traditional fishing method and wears the deserted look within a short time.

The famous shore-seine, *rampani* has become ineffective and obsolete, of late. To the rescue of fishermen who were wholly dependent on this gear, the schedule banks have come forward to extend credit facilities both on individual and co-operative basis for acquiring purse seine units.

The activities of purse seiners are restricted to Mangalore, Malpe, and Gangoli in Dakshina Kannada mainly due to the availability of some infrastructural facilities viz., berthing, transport of fish, ice plants, cold storages, oil, fresh water etc. An appraisal of the purse seine fishery at Mangalore has been made in this account based on the fish landings from 1979 to 1981.

## Operation

The purse-seiners at Mangalore are of wooden hulls, by and large are of 43' in length, and a few of 38' also. A few of them have fibreglass hulls.

The net is of synthetic fibre and usually knotless. This is about 600 m in length with a height of 50 m, with a mesh size of 14-18 mm. About 40 brass rings are used for pursing the net.

Normally the purse seiners set out for fishing by the break of dawn. The strength of crew of a purse seiner varies from 20 to 25. This excludes crew (2-3) of a carrier boat which each purse seine unit employs for 2-3 months during the peak fishing season to cope up with the transport of fish from the fishing ground to the landing place. Incidentally, this peak period happens to be a lean one for trawlers which are then converted as carrier boats. Nearly 100 purse seiners operate from Mangalore.

Time taken to complete a haul varies from 1-3 hours depending upon the catch. As there is a severe competition amongst fishermen, at least 1-2 hauls are made to send fish catch in the morning by carrier boats as quickly as possible for better financial returns. On an average 3-4 hauls are made daily.

Depending upon the availability of fish, the boats return home usually by 6 pm, by the time the carrier boats having made 2-3 trips to unload the catch. It is not uncommon to see the fishing activities extending upto 10 pm in the Mangalore waters.

Many a time handling of large catches, particularly of cat fish, poses a problem. As a custom, purse seiners operating in the vicinity of a boat which has pursed such a catch, come to their aid. The cat fish, though fetches better returns, neverthless, damage the net to a great extent.

The operational area of purse seiners of Mangalore extends in the region between Kaup in the north (45 km) and Kasargod in the south (40 km), but are mostly active in the southern area because of a severe competition offered by the purse seine units operating from Malpe.

During September-January these units restrict their activities around 20 m deep waters since this period coincides with the abundance of shoaling fishes. However, from February onwards with thinning of shoals extend their activities beyond 30-40 m depth.

Fishermen are forbidden by the local authorities to go out for fishing from 1st June to 30th September since this period happens to be the active spawning period for commercially impor-

*Prepared by M. H. Dhulkhed, C. Muthiah, G. Syda Rao and N. S. Radhakrishnan.

tant fishes like oil sardine, mackerel, etc. On a few occasions, infringement of this restriction was made by some units and considerable quantities of oil sardine and mackerel in spawning condition were caught causing much concern to the conservationists of marine resources.

### Fishery resources

By and large, oil sardine and mackerel constitute the major catches of purse seine (Photographs). The new resources exploited fairly on a large scale were cat fishes, anchovies and carangids (Fig. 1).

The estimated catch of important fishes for the years are given in Table 1. It may be seen that the catch in 1979 amounted to 27,197 t, showed a marginal increase in 1980 and the catches in 1981 increased by 35.6% over 1979. This was mainly due to the increase in effort and catch of oil sardine.

It is seen from Fig. 2, that during the post-monsoon period, expending about 55% of the annual effort, 80% of the annual catch is realised, in contrast to the premonsoon period (January -June) when about 45% of the effort was put to realise only about 20% of the annual catch.

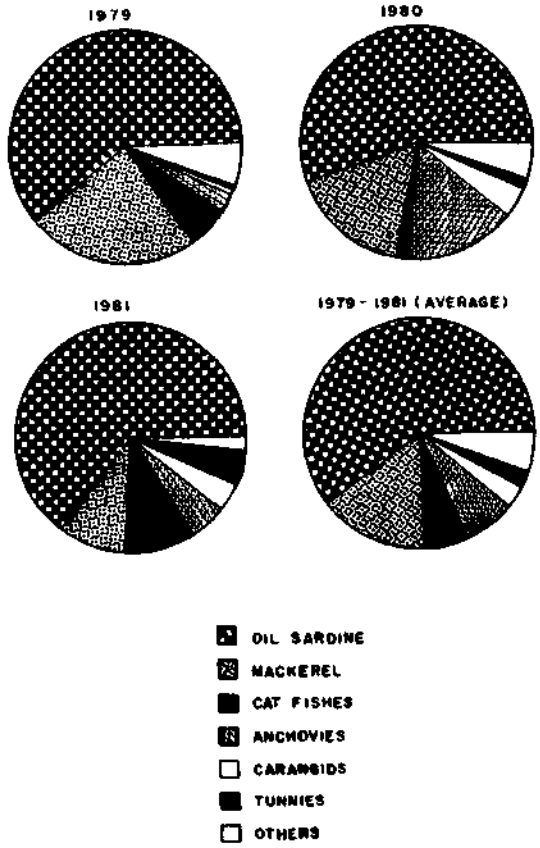



Fig. 1. Catch Composition of fish landed by purse seiners at Mangalore.

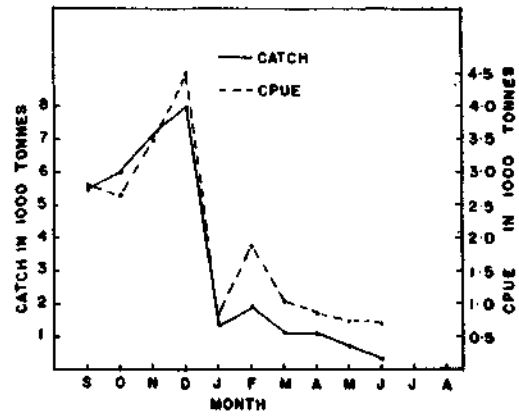



Fig. 2. Average catch and catch per unit effort in tonnes of purse seiners at Mangalore.

### Oil sardine

The oil sardine formed the major pelagic fish component of purse seine landings. It is seen from Table 1 that the catch was around 16,000 t in 1979 as well as in 1980 with more or less equal effort expended in both the years, whereas it rose to 27,000 t in 1981, of course, with an increase in effort also. Generally, October-December forms the most productive quarter, with highest catch rate being recorded in December. About 79% of the oil sardine landings were made, during the post-monsoon season. Oil sardine constituted 61%, 55% and 64% of the total catch in 1979, 1980 and 1981 respectively. Since there are no facilities for canning, most of the catch, that could not be marketed in fresh condition, was utilized for oil extraction and manure.

### Mackerel

This resource ranks second next to oil sardine in respect of yield. The success or failure of the purse seine fishery in this part of the coast largely depends upon the success or failure of this fishery. The average annual catch of mackerel in Karnataka for the five-year period 1975- 79 was 30,385 t. The Mangalore purse-seines contributed 16.7% to the total mackerel catch of the state in 1979.

During 1979, the catch of this fish amounted to 6,691 t, however, showed a decline of 27% in 1980. The 1981 season was no better since the catch decreased to as low as 3,960 t. It is interesting to note that the beginning of the fishing season, particularly September month recorded better catches of mackerel.

Table 1. *Fish landings of Purse-seines at Bunder, Mangalore (in tonnes)* 1979-81.

| Month | Oil sardine | Mackerel | Catfishes | Anchovies | Carangids | Tunnies | Other clupeoids | Leiognathus | Prawns | Others | Total | C.p.u.e.* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1979** | | | | | | | | | | | | |
| January | 487 | 375 | — | 88 | — | — | 113 | — | — | 30 | 1,093 | 0.80 |
| February | 1,211 | 310 | — | 7 | — | — | 37 | — | — | — | 1,565 | 1.53 |
| March | 1,058 | 433 | 3 | 81 | 1 | — | 60 | — | — | — | 1,636 | 1.55 |
| April | 1,319 | 298 | — | 2 | 6 | — | 90 | 7 | — | — | 1,722 | 1.61 |
| May | 51 | 161 | — | 3 | 27 | 7 | 164 | 22 | — | — | 435 | 0.73 |
| June | 353 | 399 | — | — | 5 | 32 | 6 | 6 | — | — | 801 | 2.47 |
| July | No fishing | | | | | | | | | | | |
| August | " " | | | | | | | | | | | |
| September | 766 | 2,845 | 143 | — | 25 | 3 | 85 | 95 | — | 84 | 4,046 | 2.16 |
| October | 3,855 | 1,249 | 115 | 157 | 188 | 7 | 27 | 216 | — | 68 | 5,682 | 2.45 |
| November | 4,621 | 621 | 258 | 333 | — | — | 81 | — | — | — | 5,914 | 2.92 |
| December | 2,876 | — | 1,023 | 60 | 6 | 63 | 45 | — | — | 30 | 4,103 | 3.08 |
| Total | 16,597 | 6,691 | 1,542 | 731 | 258 | 112 | 708 | 346 | — | 212 | 27,197 | 2.08 |
| **1980** | | | | | | | | | | | | |
| January | 1,285 | 124 | 20 | 14 | 6 | 59 | 18 | 2 | 11 | 16 | 1,555 | 1.21 |
| February | 2,646 | 61 | 23 | 38 | 1 | 5 | 57 | — | — | — | 2,831 | 3.15 |
| March | 376 | 7 | 74 | 40 | 17 | 239 | 36 | — | — | — | 789 | 1.55 |
| April | 15 | 6 | — | — | 77 | 6 | 384 | 83 | — | — | 571 | 0.80 |
| May | 673 | — | — | — | — | 77 | 201 | — | — | — | 951 | 1.28 |
| June | No fishing | | | | | | | | | | | |
| July | " " | | | | | | | | | | | |
| August | " " | | | | | | | | | | | |
| September | 3,583 | 3,123 | 50 | 2 | 98 | 27 | 83 | 16 | 395 | 96 | 7,473 | 3.19 |
| October | 779 | 861 | 193 | 2,255 | 110 | — | 58 | 96 | — | 60 | 4,412 | 1.84 |
| November | 2,857 | 49 | 41 | 2,071 | 878 | 10 | 21 | 18 | — | 20 | 5,965 | 2.69 |
| December | 4,021 | 646 | — | 151 | 8 | — | 7 | — | — | — | 4,833 | 2.60 |
| Total | 16,235 | 4,877 | 401 | 4,571 | 1,196 | 423 | 865 | 215 | 406 | 192 | 29,380 | 2.27 |
| **1981** | | | | | | | | | | | | |
| January | 1,133 | 260 | 12 | 3 | 18 | 26 | — | — | — | 3 | 1,455 | 0.65 |
| February | 1,237 | 14 | — | 12 | 9 | 3 | — | — | 4 | 10 | 1,289 | 1.22 |
| March | 223 | 377 | 159 | 50 | 9 | 163 | — | 2 | — | 4 | 987 | 0.58 |
| April | 588 | 132 | 69 | 26 | 70 | 45 | 7 | 5 | 28 | 55 | 1,025 | 0.49 |
| May | 17 | 4 | — | — | 1 | — | — | — | — | 17 | 39 | 0.03 |
| June | 55 | 201 | — | — | 3 | — | — | — | — | — | 259 | 0.87 |
| July | No fishing | | | | | | | | | | | |
| August | " " | | | | | | | | | | | |
| September | 1,621 | 1,700 | — | 745 | 550 | 177 | — | — | — | — | 4,793 | 3.00 |
| October | 2,244 | 1,130 | 2,551 | 99 | 655 | 1,142 | — | — | — | 6 | 7,827 | 3.88 |
| November | 7,770 | 142 | — | 950 | 297 | 368 | — | — | — | — | 9,527 | 5.18 |
| December | 12,327 | — | 1,199 | 437 | 23 | 37 | 125 | — | — | 920 | 15,068 | 6.50 |
| Total | 27,215 | 3,960 | 3,990 | 2,322 | 1,635 | 1,961 | 132 | 7 | 32 | 1,015 | 42,269 | 2.53 |

*C.p.u.e. = Catch per unit effort

Apart from local consumption in fresh condition, when the landings are heavy they are iced in trucks and sent to Bombay, Bangalore and interior places of Karnataka and Kerala.

## Cat fishes

With the advent of purse-seines, this resource which remained underexploited by the indigenous gear, has assumed a significant importance. The dominant species which constitute the fishery are *Ariusdussumieri, A. thalassinus, A. serratus* and *A. tenuispinis*. The average annual cat fish catch in Karnataka for the period 1975-79 was 5,083 t, forming 4.5% of the total fish catch. However, the purse seines at Mangalore alone contributed 15.5% to the total cat fish catch in the state during 1979. The estimated catch of this species during 1979 amounted to 1,542 t, which showed a decrease of 74% in the subsequent year. Neverthless, the catches in 1981 was 3,990 t registering an increase of 159% over 1979. Incidentally during all the three years of observation, October was the month in which heavy landings were made.

It may be pointed out here that this resource

which holds promise for future, is indiscriminately exploited from the nursery grounds as was witnessed from the large scale fishing of *A. tenuispinis* with eggs in various stages of development in their mouth during September and October 1979 (*Mar. Fish. Infor. Serv. T & E Ser.*, No. 24, 1-9, 1980) causing incalculable loss, which could be gauged from the destruction of eggs estimated at weighing as much as 16 t. Similar indiscriminate fishing was repeated in 1981 also. It is feared that resorting to such destructive fishing may cause deleterious effect on this resource in the coming years.

As there is very limited market for consumption in fresh condition locally, cat fishes are sent in iced as well as sun-dried form to interior parts of Karnataka and also to Kerala and Tamil Nadu.

### Anchovies

This resource, though detected earlier, remained elusive so far to the indigenous gears and has now come within the reach of purse seines. Locally known as Kollataru , the anchovies or white baits, represented by *Stolephorus devisi*, *S. buccaneeri* and *S. bataviensis* rank third in the catches. The average annual catch of this resource in the state for the five-year period 1975-79 was 480 t constituting a mere 0.4% in the total catch. However, this picture changed for better from 1979 onwards. During 1979 the seiners at Mangalore landed 731 t. In 1980 the catch reached an incredible figure of 4,571 t. On the contrary the catches in 1981 almost dropped by 50%.

Anchovies are consumed in dried condition. Huge catches of anchovies have generated employment opportunities among the village folk in sun drying process.

### Tuna

This resources which remained so far beyond the reach of the indigenous gear, has come now within the operational ambit of purse seiners. The little tunny *Euthynnus affinis*, the frigate tuna, *Auxis thazard*, and the bullet tuna, *A. rochei* are occasionally caught in considerable numbers, particularly in October. The catch of tunas at Mangalore in 1979 which was just 112 t forming 0.4% of the total catch showed a four-fold increase (423 t) in 1980 and reached a spectacular figure of 1,961 t in 1981. This clearly indicates the vast potential of this resource in our waters, which could be exploited for meeting the demands of our country.

Generally tunas are not relished by the local people. *E. affinis* and *A. thazard* are packed in ice and are sent particularly to Kerala where there is great demand for these fishes. Since *A. rochei* gets spoiled even before reaching the landing place they are utilized for making fish manure.

### Carangids

This group is represented by the horse-mackerel, *Megalaspis cordyla* and also by *Caranx kalla* and *Decapterus* spp. More often the former species in small schools are caught with tuna shoals whereas the latter species are hauled up along with silver bellies, anchovies etc. The average catch of these species for 1979-81 amounted to 1,029 t, forming 3.1% of the total catch. October-December quarter appears to be more productive when about 70.2% of the catches were landed.

As there is no local market, particularly *M. cordyla*, they are sent to Tamil Nadu in iced condition from where they could fetch better financial returns.

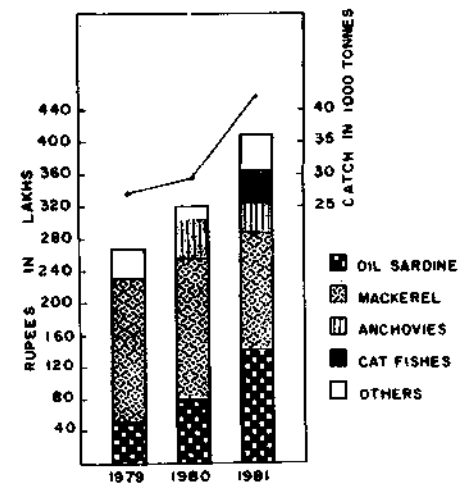
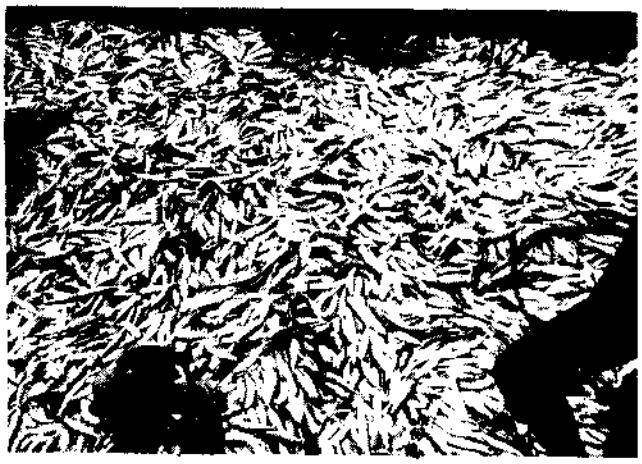



Fig. 3. Value of major groups of fishes and total fish catch landed by purse seiners at Mangalore.

### Silver bellies

*Leiognathus splendens*, *L. bindus* and *Secutor insidiator* form incidental catches. The average annual landings for 1979-81 amounted to 190 t forming 0.6% of the purse seine catch. In 1979, the catch was as high as 346 t, however, dropping to 215 t in 1980 and in the subsequent year as low as 7 t. October appears to be the peak period when more than half (55%) of the annual catches were realised. Silver bellies in fresh condition do not find ready market and as such the catches are invariably used for sun-drying.



1. Oil sardine catch

2. Carrier boat filled with mackeret

3. Carrier boat with frigate tuna, *Auxis thazard*

4. Little tunny *Euthynnus affinis* and other catches

5. Cat fish catch at the landing centre

6. Black pomfret *Parastromateus niger*

### Other clupeoids

This group comprises *Sardinella albella, S. fimbriata* and *S. gibbosa* and also *Kowala coval, Thryssa* spp. and the gizzard shad *Anadontostoma chacunda*. Their estimated catch in 1979 was 708 t. Landings in 1980 registered an increase of 18% over the previous year and witnessed a fall in the subsequent year. However, the average catch for 1979-81 was 570 t, contributing 2.3% to the purse seine catch. April-May appears to be the most productive period for this resource. Considerable portion of these catches are channelled for sun-drying.

### Prawns

Prawns form one of the incidental catches of purse-seines particularly soon after the commencement of the fishing season in September. The species represented were *Metapenaeus dobsoni, Parapenaeopsis stylifera, M. monoceros, M. affinis* and *Penaeus indicus* in the order of abundance. During September 1980 their catch amounted to 406 t, but, fell precipitously to a mere 32 t during the next year.

### Pomfrets

Occasionally, the black pomfret *Parastromateus niger* was landed during 1979 amounting to 36 t whereas in the subsequent two years their catches remained rather insignificant.

### Miscellaneous fishes

This group consists of fishes which are incidentally caught when the net is paid out for shoaling species. Common species are the Sciaenid *(Otolithus ruber), Dussumieria* sp. *Belone, Chorinemus* sp. *Therapon* sp., sharks, rays and cephalopods. The last quarter appears to register better catches of miscellaneous fishes. The average annual catch for the three year period was 544 t, forming 1.6% of the purse seine catch.

7. Cat fish eggs being disposed

### Economics

Based on the auction rates prevalent at the landing centre, the total value of fish landed works out to an average of Rs 3.48 crores an year, ranging from Rs 2.7 to 4.1 crores during the 3 years 1979 to 1981. The average return per boat per operating day is estimated at Rs 2,440. Mackerel fetched the highest value, the annual average for the years under consideration being Rs 1.7 crores. This formed about 48% of the annual total income. Cat fishes earned Rs 0.63 crores in 1979. An all time record earnings of Rs 44.6 lakhs by anchovies was recorded in 1980 as against 7.0 and 38.6 lakhs realised in 1979 and 1981 respectively. The sales proceeds of carangids varied from Rs 1.8 to 1.5 lakhs. The earning of tuna showed a gradual increase from Rs 1.6 lakhs in 1979 to 16.3 lakhs in 1981. The year 1980 was most productive for prawns when their sales touched Rs 28.4 lakhs as compared to just Rs 3 lakhs in the previous year.

8. Truck load of cat fish for transportation

As mentioned earlier, September-November forms a lean period for trawlers and as such they are used as carrier boats. They are hired on contract basis either daily or monthly. In the former case it is about Rs 300/- excluding food and fuel, and in the latter Rs 6,000 per month.

### Earnings of crew

The expenditure on the requirement of daily food of the crew is met from the common fund of a purse seine unit. As yet there is no practice of engaging crew members on fixed wages either

daily or monthly basis. However, as a sort of incentive to the crew, a system has been evolved wherein 25% of the day's income would be equally shared by all. During the season, a fisherman earns approximately Rs 4,000 to 9,000.

As most boats are financed by banks, they have to repay the capital as well as interest accrued thereon which works out about Rs 12,000 per month, irrespective of catch or monsoon when the boats are idle.

An analysis of the annual income and expenditure based on the average catch per boat is given below:

| | | |
|---|---|---|
| 1. | Annual return based on average catch per boat | Rs 5,61,200 |
| 2. | Expenditure | |
| | a) Food @ Rs 150 × 230 days | Rs 34,500 |
| | b) Diesel 230 days × 200 litres | Rs 1,48,120 |
| | c) Wages - 25% of annual income | Rs 1,40,300 |
| | d) Carrier boat hiring charges | Rs 30,000 |
| | e) Repayment of loan | Rs 1,44,000 |
| | f) Incidental expenditure (Repairs, spare parts etc.) | Rs 10,000 |
| | Total | Rs 5,06,920 |

Thus, the minimum amount that a purse seine unit has to earn works out to about Rs 5 lakhs per year as the break-even point.

**General remarks**

In view of the increasing operations of purse seiners and consequent additional exploitation of the various resources from limited areas, a close monitoring the situation is very essential in order to manage the fishery properly and attain stability of production and economic returns. In this connection one of the important points for consideration is avoiding heavy pressure on critical stages such as juveniles, spawning stocks etc. of some of the resources like oil sardines, mackerels, horse mackerel and cat fishes. More often it is noticed that indiscriminate fishing using the purse seines results in wasteful utilisation of the resources and in some cases even destruction of future resources. The particular method of fishery being in the initial stages it would be advisable that the authorities concerned view the matters relating to the purse seine fishery with the proper management perspective.

# DRIFT GILL NET FISHERY OF THE DAKSHINA KANNADA COAST*

## Introduction

With the advent of purse seine in 1975 in the Dakshina Kannada (Karnataka) the indigeneous gears particularly *rampani, pattabale* and *chalabale* used for shoaling fishes have almost become non functional. However, the drift gill net (*odubale*), which is employed for fishing bigger fishes, of late have assumed greater importance because of its economic viability. In fact in recent years a trend is set for fixing out-board and inboard engines to the existing canoes for harvesting fishes by employing gill nets. Perhaps this would be the forerunner for the development to take place particularly in the Dakshina Kannada and other areas. The drift net catches from Dakshina Kannada constituted about 3% of marine pelagic catches of Karnataka during 1979.

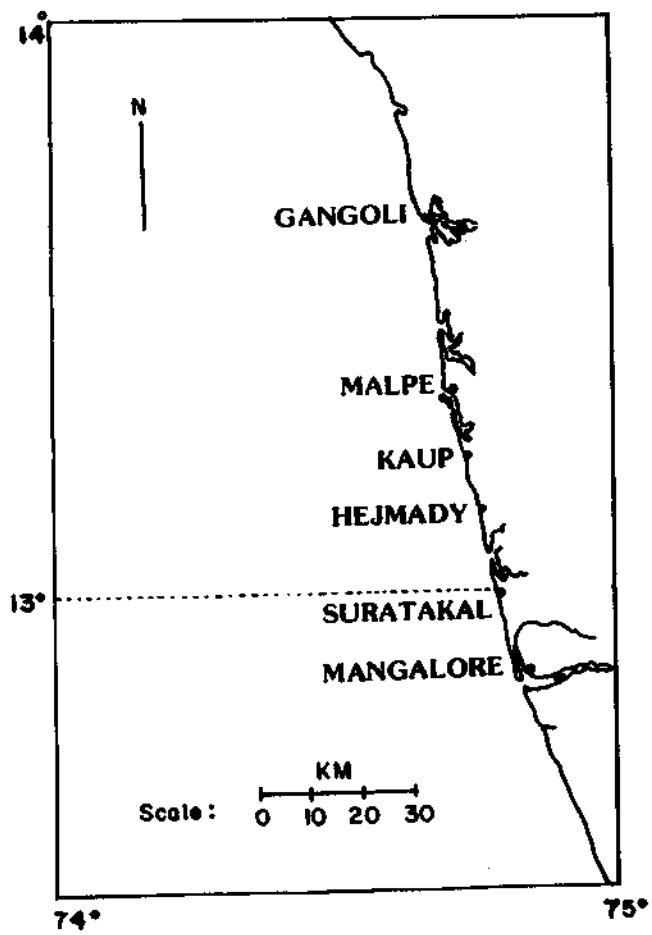



Fig. 1. Map showing drift gill net landing centres in South Kanara.

However, the interesting fact is that once the Dakshina Kannada fishermen could boast of their *odubale* catches. But with the gradual augmentation of trawler and purse seine fleets the local fishermen of this area no longer pursue fishing with this gear. With the result in recent years the fishermen of Kanyakumari and Vizhinjam (Trivandrum) area have made inroads to this region gradually by employing this gear off Dakshina Kannada area. Usually their arrivals commence in the Mangalore area (Mangalore, Suratkal, Hejmadi, Kaupu, Malpe and Gangoli) (Fig. 1) with the close of the south west monsoon. These fishermen, who are experts and very hardy, extend their fishing activities till March/April. The strength of these immigrant fishermen varies from 1,200 to 1,300.

## Craft and gear

Usually they hire, on contractual basis, the dug-out canoes (Thoni or Vallum) of 5-6 m length along with the drift gill nets from local fishermen. Besides, they also bring along with them a good number of mechanised vessels of 9.7 m length which afford them greater mobility in quest of better catches.

Generally the fishermen use a dull pink coloured nylon net with mesh size varying from 65 to 135 mm. The length of the net varies from 450 m to 700 m and height 6 to 7 m. However, the mechanised boats employ comparatively longer nets. The fishing operations are confined to 20-60 m depth zone. The concentration of gill nets are more at Kaup than at other centres probably because of better market demand and other facilities. At the close of the season these fishermen return the canoes to the local owners and shift their mechanised boats back to Kanyakumari-Vizhinjam. However, a few enterprising fishermen have permanently brought in their own canoes.

## Fishery

Though the fishery is supported by several species the important groups among them are seer fish, elasmobranchs (especially sharks), cat fishes, tunas and bill fishes, mackerel and pomfrets (Fig. 2). Not uncommon are *Chirocentrus*

*Prepared by C. Muthiah

spp., black king-fish (*Rachycentron canadus*) and carangids.

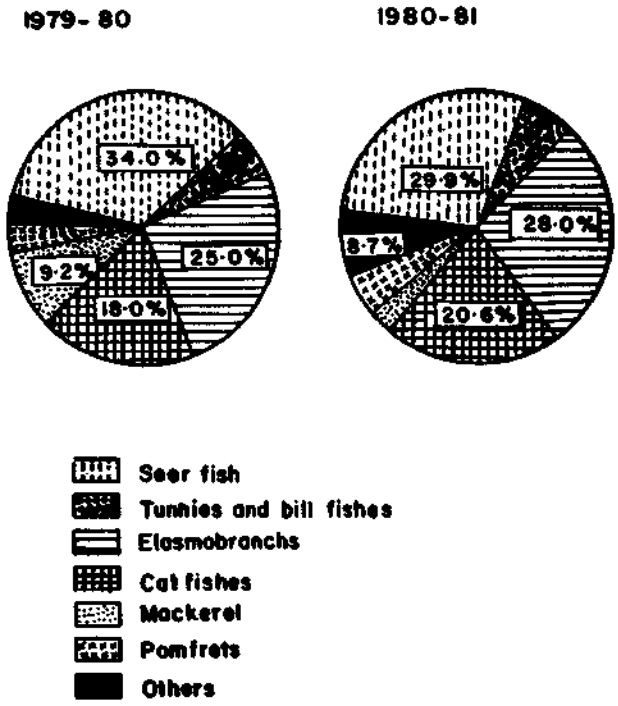



Fig. 2. Catch composition of fish landed by drift gill nets in South Kanara during 1979-80 and 1980-81.

The estimated monthly fish landings for the years 1979-80 and 1980-81 are given in Table 1 and the effort in Fig. 3. It is seen from the table that in the former year the catch amounted to about 2,072 tonnes, showing an increase of 38% during the next year. To certain extent it could be attributed to the extended fishing season by a month. However, the annual catch per unit effort of 90.4 kg in 1979-80 decreased to 80.4 kg in the next year (Fig. 4). The data presented on the Catch Per Unit effort (Fig. 4) and on the species composition (Table 2) of the mechanised and non-mechanised drift gill net units for the period of study show that there is little difference in the catch rates as well as in the relative abundance of different species in the catches by these two types of units.

## Catch composition

### Seer fish

The catches comprised of king seer, *Scomberomorus commerson*, spotted seer *S. guttatus* and streaked seer *S. lineolatus*. The first two species occurred in all months whereas the last one occurred in few numbers during December-April. *S. commerson* dominated the catches usually from September to December, of which the earlier months being more productive. This species alone formed about 69% of seer fish catches in both years whereas its contribution to the total

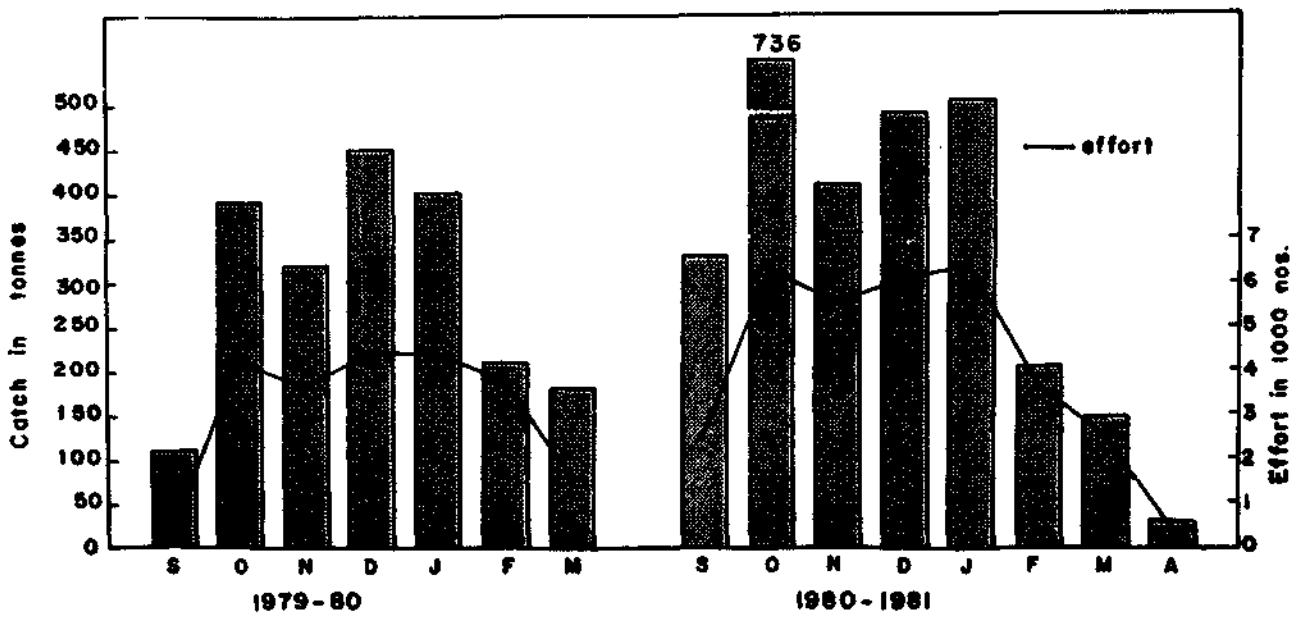



Fig. 3. Month-wise total catch and effort expended during 1979-80 and 1980-81.

**Table 1.** *Estimated month-wise fish landings (in tonnes) by drift gill nets in Dakshina Kannada during 1979-80 & 1980-81.*

| | Species | September | | October | | November | | December | | January | | February | | March | | April | | Total | | Grand |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1979-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | 79-80 | 80-81 | Total |
| 1. | Seer fish | 9.8 | 90.0 | 71.3 | 327.4 | 207.1 | 140.0 | 174.0 | 148.7 | 143.8 | 126.7 | 55.9 | 11.5 | 41.7 | 6.7 | | 4.5 | 703.6 | 855.5 | 1,559.1 |
| 2. | Tunnies | 24.1 | 54.5 | 20.6 | 32.1 | 20.7 | 1.1 | 16.2 | 10.1 | 6.8 | - | 0.3 | 0.1 | - | - | | - | 88.7 | 97.9 | 186.6 |
| 3. | Bill fish | - | 10.0 | 4.5 | 6.4 | 16.3 | 18.0 | 4.9 | 1.6 | 2.3 | - | - | - | - | 0.5 | | 0.1 | 28.0 | 36.6 | 64.6 |
| 4. | Elasmobranchs | 29.3 | 97.8 | 88.7 | 160.1 | 28.2 | 109.1 | 183.6 | 65.6 | 67.8 | 126.9 | 47.7 | 127.5 | 74.1 | 107.9 | | 7.2 | 519.4 | 802.1 | 1,321.5 |
| 5. | Cat fishes | 24.4 | 58.6 | 149.7 | 96.5 | 25.1 | 52.4 | 26.9 | 129.7 | 74.8 | 188.8 | 36.0 | 39.9 | 41.3 | 18.1 | - | 4.9 | 378.2 | 588.9 | 967.1 |
| 6. | Pomfrets | - | 4.9 | 48.6 | 41.0 | 4.4 | 29.6 | 5.2 | 42.8 | 7.8 | 13.0 | 4.0 | 12.7 | 0.7 | 3.4 | | 0.3 | 70.7 | 147.7 | 218.4 |
| 7. | Mackerel | 25.0 | 0.4 | 4.5 | 7.8 | 11.7 | 0.7 | 18.3 | 42.8 | 65.5 | 13.9 | 45.6 | 0.1 | 19.5 | 5.4 | | 11.8 | 190.1 | 82.9 | 273.0 |
| 8. | Carangids | - | 2.8 | - | 11.2 | - | 10.2 | 4.1 | 4.1 | - | 0.9 | 0.7 | 0.4 | - | 0.3 | | - | 4.8 | 29.9 | 34.7 |
| 9. | Chorinemus | - | 0.4 | - | 8.9 | - | 4.1 | 0.3 | 1.2 | 20.7 | 5.0 | - | - | - | - | | 0.1 | 21.0 | 19.7 | 40.7 |
| 10. | Wolf herring | - | 3.9 | - | 2.9 | - | 28.7 | 7.4 | 31.4 | 2.1 | 18.3 | 2.7 | 1.4 | 0.1 | 0.7 | | 0.1 | 12.3 | 87.4 | 99.7 |
| 11. | Oil sardine | - | 2.9 | - | 0.2 | - | - | - | - | - | - | - | - | - | - | | - | - | 3.1 | 3.1 |
| 12. | Black King-fish | - | 4.8 | 2.2 | 32.0 | - | 6.4 | 0.9 | 0.2 | 0.4 | 1.3 | 9.3 | 1.0 | - | 0.1 | | - | 12.8 | 45.8 | 58.6 |
| 13. | Perches | - | - | 0.3 | 2.0 | - | - | .. | 0.4 | 1.3 | 1.6 | 5.8 | 2.9 | 0.3 | 0.5 | | - | 7.7 | 7.4 | 15.1 |
| 14. | Miscelleneous | - | 1.9 | 0.5 | 7.4 | - | 8.7 | 8.1 | 7.9 | 7.3 | 5.5 | 2.9 | 5.5 | 2.7 | 3.8 | | 1.8 | 21.5 | 42.5 | 64.0 |
| 15. | Mammals | - | - | 3.0 | - | 7.3 | 0.2 | - | 2.0 | - | 2.5 | - | 1.5 | - | - | | - | 10.3 | 6.2 | 16.5 |
| 16. | Turtles | - | 0.8 | - | 0.2 | - | - | 2.9 | 1.3 | - | 1.4 | - | 2.2 | - | - | | - | 2.9 | 5.9 | 8.8 |
| 17. | Crabs | - | - | - | - | - | - | - | - | - | - | - | 0.8 | - | 1.4 | | 0.1 | - | 2.3 | 2.3 |
| | Total | 112.6 | 333.7 | 393.9 | 736.1 | 320.8 | 409.2 | 452.8 | 489.8 | 400.6 | 505.8 | 210.9 | 207.5 | 180.4 | 148.8 | - | 30.9 | 2,072.0 | 2,861.8 | 4,933.8 |

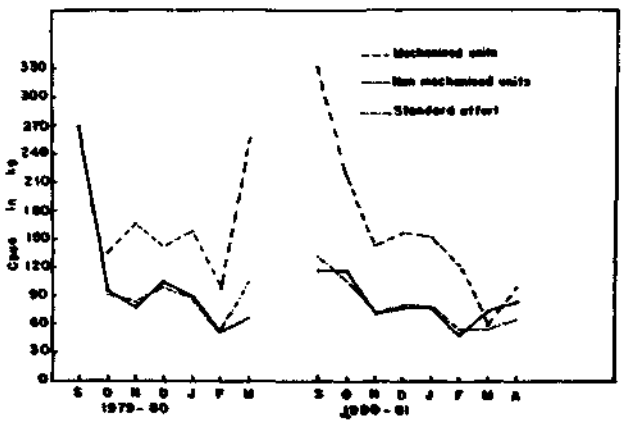


Fig. 4. Month-wise catch per unit effort by drift gill nets during 1979-80 and 1980-81.

gill net catches amounted to 23.4% and 20.5% during 1979-80 and 1980-81 respectively.

In case of spotted seer *S. guttatus* the productive months were October-December and its contribution in seer fish landings amounted to 10% and 9.3% during 1979-80 and 1980-81 respectively. Though the streaked seer *S. lineolatus* was observed in the catches its contribution to the fishery could be considered to be of little significance in view of its meagre catches.

**Tunnies**

This group formed a fair proportion in the gill net catches. The little tunny *Euthynnus affinis*, the northern bluefin *Thunnus tonggol*, frigate tuna *Auxis thazard*, the bullet tuna *Auxis rochei* together with the oriental bonito *Sarda orientalis* constituted about 4.3% and 3.4% of the total catch of fishes in 1979-80 and 1980-81 respectively. *E. affinis* usually starts appearing in the catches from September and becomes rarer by January. This fish contributed to the tuna catch as high as 92.5% in 1980-81, an increase of about 15.2% over the previous year. The occurrences of *T. tonggol* were rather erratic in nature and its contribution on an average for both years was about 9.4%. An interesting feature of the gill net fishery was the landings of frigate tuna, bullet tuna and oriental bonito, hitherto remained unexploited in the Dakshina Kannada. They collectively formed about 11.7% of the tuna catches in 1979-80, however, declining to 0.4% in the subsequent year.

**Bill fishes**

So far the potentiality of this resource remained unexploited because of lack of venture of fishermen to deeper waters. The sail fish *Istiophorus platypterus* and the black marlin *Makaira indica* each accounted about 31 tonnes. The catch of the

**Table 2.** *Species composition of non-mechanised and mechanised gill net catch (in tonnes) in Dakshina Kannada for the years 1979-80 & 1980-81 (pooled)*

| | Species | Non-mechanised units | % | Mechanised units | % | Total | % |
|---|---|---|---|---|---|---|---|
| 1. | Seer fish | 1,051.5 | 33.31 | 507.6 | 28.56 | 1,559.1 | 31.60 |
| 2. | Tunnies | 133.4 | 4.22 | 53.2 | 3.00 | 186.6 | 3.78 |
| 3. | Bill fish | 50.9 | 1.61 | 13.7 | 0.77 | 64.6 | 1.31 |
| 4. | Elasmobranchs | 736.1 | 23.32 | 585.4 | 32.93 | 1,321.5 | 26.78 |
| 5. | Cat fishes | 584.8 | 18.53 | 382.3 | 21.51 | 967.1 | 19.60 |
| 6. | Pomfrets | 147.3 | 4.67 | 71.1 | 4.00 | 218.4 | 4.43 |
| 7. | Mackerel | 224.3 | 7.11 | 48.7 | 2.74 | 273.0 | 5.53 |
| 8. | Carangids | 26.5 | 0.84 | 8.2 | 0.46 | 34.7 | 0.70 |
| 9. | Chorinemus | 20.1 | 0.64 | 20.6 | 1.16 | 40.7 | 0.83 |
| 10. | Wolf herring | 69.7 | 2.21 | 30.0 | 1.69 | 99.7 | 2.02 |
| 11. | Oil sardine | 3.0 | 0.10 | 0.1 | 0.01 | 3.1 | 0.06 |
| 12. | Black King-fish | 37.1 | 1.18 | 21.5 | 1.21 | 58.6 | 1.19 |
| 13. | Perches | 5.1 | 0.16 | 10.0 | 0.56 | 15.1 | 0.31 |
| 14. | Miscellaneous | 46.7 | 1.48 | 17.3 | 0.97 | 64.0 | 1.30 |
| 15. | Mammals | 14.0 | 0.44 | 2.5 | 0.14 | 16.5 | 0.33 |
| 16. | Turtles | 4.1 | 0.13 | 4.7 | 0.26 | 8.8 | 0.18 |
| 17. | Crabs | 1.7 | 0.05 | 0.6 | 0.03 | 2.3 | 0.05 |
| | Total | 3,156.3 | 100.00 | 1,777.5 | 100.00 | 4,933.8 | 100.00 |
| | No. of units | 36,234 | | 11,270 | | 47,504 | |

latter species which amounted to 10.2 tonnes in 1979-80 showed almost a two fold increase during the subsequent year. Though these fishes occurred during the September-December period it could be said that November formed the most productive month for both species.

**Elasmobranchs**

The gill net catches invariably were dominated by *Scoliodon sorrakowa, Carcharinus limbatus* and *Sphyrna blochii*. Their total catch was as high as 802 tonnes in 1980-81, 35% over the previous year. Their importance could be gauged from the contribution of this group to the total catch which varied from 25% to 28% during the years of observation. Their share to elasmobranch catch was as high as 94% in 1979-80 and maintained the same tempo during the next season also. It is seen from Table 1 that the catches extended from October to March, the most productive month being December.

**Cat fishes**

This group was represented by *Arius thalassinus, A. dussumieri, A. serratus* and *A. tenuispinis*. The catch of about 378 tonnes in 1979-80 sharply increased by 29.2% during the subsequent year. They were caught almost throughout the season, however, the middle part of the season accounts for bulk of the catches.

**Mackerel**

It has to be said that gill net of mesh size 65-135 mm is not definitely meant for small species like mackerel. However, large sized mackerel were often caught and their landings amounted to 190 tonnes in 1979-80 which was almost 1/10 of the total catch of all fish (Table 1). However, the catch decreased by 50% during the next year. They were obtained mainly during December-February period.

**Pomfrets**

The most sought after fish both for financial returns and gourmet needs are the pomfrets. The catches consisted of the white pomfret, *Pampus argenteus* and black pomfret *Parastromateus niger*, totalling about 71 tonnes in 1979-80 and showing a two-fold rise during the succeeding year. Usually the black pomfrets are caught in good numbers during December-January whereas *P. argenteus* in October.

**Carangids**

Amongst the carangids the important species are the horse mackerel, *Megalaspis cordyla* and *Carangoides chrysophrys*. Less important were *Chorinemus lysan, C. tol* and *Alectis indicus*. Their percentage contribution to the total catch varied from 1.3 to 1.7 during 1979-80 and 1980-81 respectively.

**Wolf herring**

*Chirocentrus dorab* and *C. nudus* were observed in the catches. Their catches amounted to 8.7 tonnes during 1979-80, showing an increase of 91% during the next year (Table 1). In both seasons high catches were recorded in December.

**Oil sardine**

Like mackerel, large-sized oil sardines were also occasionally caught. Their catch was 0.5 tonnes in 1979-80, increasing to 3·1 tonnes in 1980-81.

**Black king-fish**

Not infrequent was the occurrence of black king-fish (*Rachycentron canadus*). Its estimated catch amounted to about 13 tonnes during the first year, going up by 35% in the next year. In both seasons October appeared to be the productive month for this species.

**Sciaenids**

This group was represented by *Pseudosciaena diacanthus, Otolithes ruber* and *Johnius* spp. The first species dominated the catches in both years. The catch of 1.4 tonnes during 1979-80 increased to 12.5 tonnes in the next year.

**Perches**

A variety of species constituted this group, the most important in order of abundance being *Lutianus* spp., *Pomadasys hasta, Serranus* spp., *Pristipoma typhus, Nemipterus japonicus* and *Therapon theraps*. Their contribution however, to the total catch during both years never exceeded more than 1%. These are available in good numbers during the months of January-February.

**Miscellaneous fishes**

Fishes like Belones, *Sphyraena* spp., *Trichiurus* spp., *Coryphaena* spp., *Megalops cyprinoides, Muraenesox talabonoides, Lates calcarifer, Lobotes surinamensis, Polynemids, Platycephalus* spp., *Echeneis naucrates, Saurida tumbil* and *Chanos chanos* collectively amounted to about 20 tonnes and 27 tonnes in the two years respectively. The first five categories of fish were found to be dominant and they were best obtained during November to January.

### Dolphins and porpoises

These are mammals accidently caught when moving in herds. Neverthless their catches amounted to 10.3 and 6 tonnes during 1979-80 and 1980-81 respectively.

### Turtles

The peak season for turtle appears to be December. A total of 2.9 tonnes were landed during 1979-80 and in the subsequent year the figure was 5.9 tonnes.

### Crabs

About 2.3 tonnes of crabs comprising *Scylla serrata* were caught during January-April period of 1980-81 season.

### Marketing and disposal

The fish catches are usually auctioned at the landing centre. For purposes of this study, the information was gathered at the landing centres during the auction time. During 1979-80 the price realised through the sales was Rs 4.5 million whereas in the next year it amounted to Rs 6.7 million (Fig. 5). During the first year seer fishes fetched Rs 1.67 million and it increased to Rs 2.04 million in the following year. Sharks and rays netted Rs 1.41 and 2.13 million in 1979-80 and 1980-81 respectively. Pomfrets fetched Rs 0.07 million in 1980-81 season.

While at Gangoli, Hejmady and Suratkal the fishes are auctioned, at Kaup (Plate 1), the wholesale merchants and fishermen offer mutual discussion through a commission agent agreed upon to fix prices for quality of fish. The prices fluctuate depending upon the quantum and quality of fish available. There is a severe competition among the traders to corner the catches. As such they lure the needy fishermen by making advance payments.

However, at Mangalore a different pattern is followed. To avoid the monopoly of few merchants cornering all the catches at the landing centre (Bunder), a new method has been devised. The catches are removed to the wholesale market in the city which helps the fishermen to get better returns for their hard labour.

Kaup is the biggest fish landing centre in the Dakshina Kannada as far as gill net catches are concerned. Naturally this has generated a lot of employment opportunities among the rural folks. As the landing place at Kaup is rather away from approach road the catches have to be transported by head-load for which purpose invariably women folks are engaged in view of their low wages. Nor-

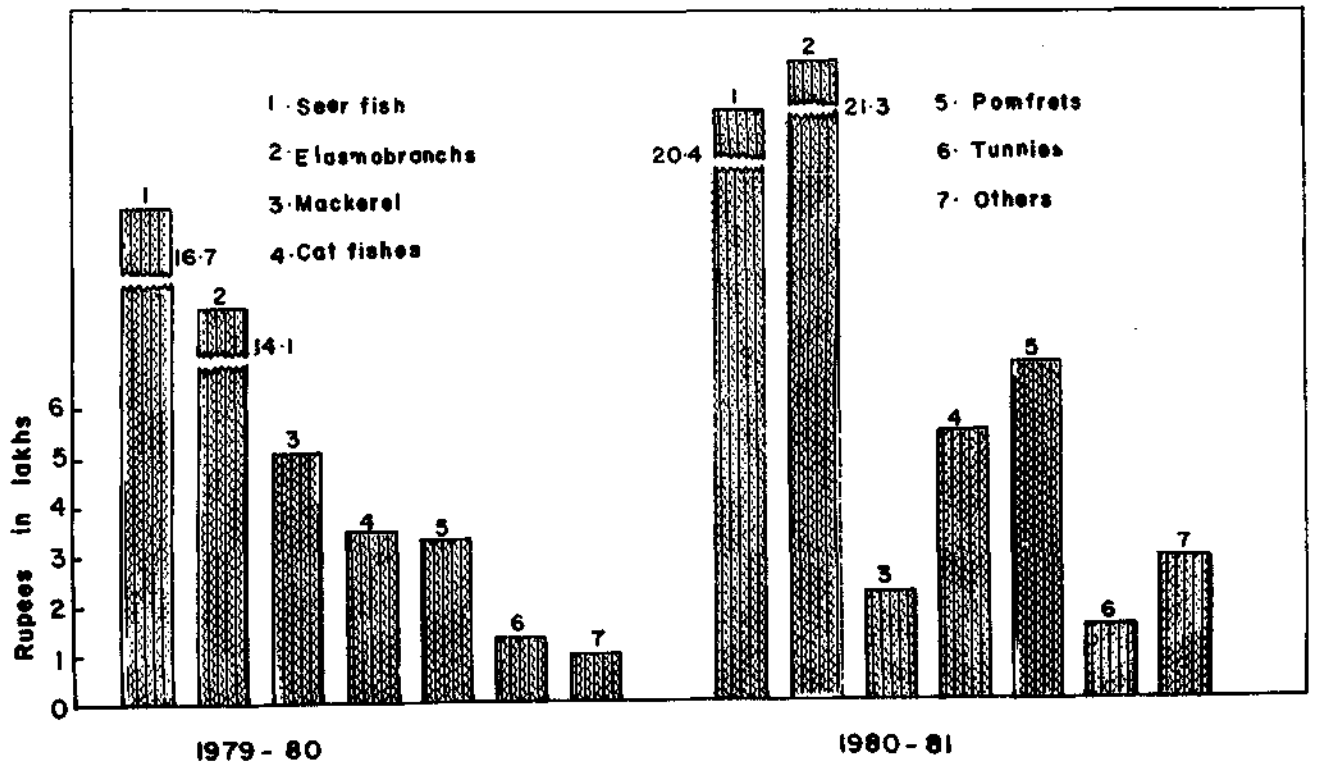
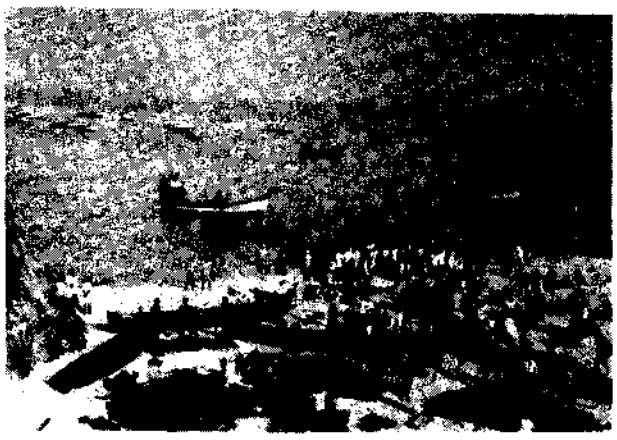



Fig. 5. Value of various fish landed during 1979-80 and 1980-81.



**Photographs (Plate I) showing handling of different categories of fishes from the gill net landing centres in South Kanara.**

mally half a rupee is paid for each trip for carrying the fish. It is estimated that on an average a women labourer earns about Rs 6–10 per day.

Usually cat fishes, sharks and bill fishes are salt cured. The quality fishes like seer, pomfret and black king-fish are packed in deal wood boxes with ice and transported by lorries to far off places like Bangalore and Madras. Tunas have no local market and as such they are sent to Kerala where there are ready markets for this fish. In spite of the escalation of freight rates by road, merchants churn out handsome profits. In other words, it amply proves how the middle men deprive the fisherfolk of their legitimate financial return for their catch. Hence to safe guard the interest of the toiling fishermen there is an imperative need of setting up of organised marketing agencies either by the Government or co-operative societies or fishermen unions.

**General remarks**

It is evident from the foregoing account that gill nets in Dakshina Kannada region are playing a major role in the small scale fisheries sector even after the introduction of purse seines. Unlike purse seines the gill nets are presently operated during night, and often for larger and higher value species and hence there exists no competition between these two gears for exploiting the pelagic resources. Considering the present trend of fish catches and financial returns by gill nets it is felt that this class of artisanal fishingoperations could be encouraged to substitute the presently idle indigeneous gears (rampani, shore seine, boat seine etc.). It is encouraging to note that action in this directon has been already taken by some local fishermen by deploying dugout canoes fitted with out-board engines in Dakshina Kannada for going out for drift gill netting. In view of these facts it may safely be stated that there exists a tremendous potential in coastal Karnataka for augumenting the gill net fishing for exploiting under exploited marine resources, thereby increasing fish yields and financial benefits to a large number of people engaged in the artisanal fishery.

# NEWS - INDIA AND OVERSEAS

**Fisheries development schemes in Kerala State**

Several major schemes at an estimated cost of Rs. 700 million with the object of developing fisheries, boosting exports and improving living and working conditions of fishermen in Kerala State, India are being launched by the Kerala Fishermen's Welfare Corporation. The schemes, to be implemented over three years will cover some 265 coastal villages and envisage mechanisation of fishing craft, replacement of wooden boats by fibre glass ones and diversification of fishing techniques for fuller exploitation of marine resources. Boats, nets and other fishing equipments, subsidised by the Corporation, will be supplied to the fishermen. Effective steps will also be taken to avoid exploitation of fishermen by middlemen and all the development assistance will be channelled through fishermen's Co-operative Societies. Construction of 15,000 houses in addition to the 10,000 houses now under construction for fishermen forms part of the schemes. Long term loans to fishermen at nominal rates of interest are also envisaged.

**Electromagnetic aid for lobster research**

A young Australian scientist has devised a tiny electromagnetic "bug" for studying the behaviour and movement of the spiny lobster on the west coast of Victoria. The device is carried in a saddle attached to the back of the lobster.

Ultrasonic devices with which experiments have been conducted to study the animals in their open habitats have been proved not very useful as they transmit their signals only in straight lines. So the idea of using electromagnetic devices came up and this has been developed. The signals from the device can penetrate

sea water, rocks and most other substances except steel. A saddle carrying the device has been designed and this sits firmly on the hard back of the carapace of the lobster. The saddle contains the electromagnetic tag, which is a tiny pellet of diameter 46 mm and 10 mm thick, weighing 8 g when in sea water. It contains a tiny battery-powered device which transmits a low-frequency, electromagnetic pulse.

Signals from the pellet are received by an observer in a boat using a miniature receiver, which accepts signals via either a small antenna or via submersible copper wire loops. Since each electromagnetic tag is on a different pulse rate it is possible to identify each individual lobster. However, there are practical difficulties encountered in the field experiments conducted with this device. One of the problems is the life time of the battery and the second is that lobsters, as in the case of other crustaceans, shed their hard shells periodically.

*FNI 19 (12) : December 1980*

**Wave-powered boat**

A series of successful tests carried out by Norwegian researchers in the experimental model tanks in Trondheim are showing bright prospects of boats upto 50 m length being propelled by wave energy.

Briefly, the system comprises a movable foil (a water wing) placed horizontally on an axis beneath the boat. This moves up and down in step with the movements of the boat in the waves. It is in fact more effective against wave direction than with it. These conceptual vessels could, if proved eventually, have considerable significance for some sections of the fishing industry.

*FNI 20 (1) : January 1981*

**Seadog or fish hotdog developed**

Canadian researchers have developed "the seadog" otherwise known as the fish frankfurter or fish hotdog. This is reported to be a cheaper, less fattening, more nutritious and easier to digest compared to the red meat hotdog.

The seadog is made of cod, squid, non-fat dry milk, corn oil, seasoning and preservative, moulded into hotdog form, steamed for 7 minutes and then cooled. A team of taste-testers have scrutinised and certified the product for colour, chewiness, elasticity, after taste and particle size. The cost would be about 1.40 dollars compared to 1.89 to 2.19 dollars for hotdogs. This is the first time a fish hotdog has been developed, although Japan and the Soviet Union have seafood sausages. The product is higher in protein content than the hotdog, has Vitamin A, which hotdogs do not have and contains about 80 calories a seadog as against 134 calories for a redmeat hotdog.

*FNI 20 (1) : January 1981*

**Potential resources of lantern fish**

Canada's International Development Research Centre (IDRC) reports about the existence of large resources of lantern fish in the western part of the Arabian Sea. This has been brought to light by the cruises of a Norwegian research vessel in an expedition sponsored by the United Nations.

As small as a sardine, but resembling a trout, the glow-in-the dark lantern fish is a deep water bottom fish. The protein value of the fish was ignored by the fishing industry till the results of the expedition came in. Since the same fish inhabits all the major oceans of the world, scientists speculate that annual harvests of this fish could substantially increase the current world fish production.

Much remains to be learned about the best way to use lantern fish as a food source. However, the United Nations is supporting exploration for the fish in the Indian Ocean, off the Atlantic coast of Africa and in the South China Sea.

*International Exchange News 25 (2) : 1981*

**Built-in compass for migrating fishes**

One of the theories about animal migration is that internal magnets may be synthesised to assist accurate navigating over long distances. Migratory birds have revealed an ability to use the geomagnetic field of the earth to guide their travel. But there was no known biological mechanism through which migratory animals might detect and use earth's geomagnetic field. However, recently a number of animals have been found to possess microscopic iron-rich particles. These tiny particles, which react like simple compass needless to the earth's magnetic field, may be the sensory mechanism responsible for the incredible migratory behaviour of some animals.

Studies conducted at the Honolulu Laboratory of the U. S. National Marine Fisheries Service on tunas and green turtles is showing promising leads in this direction. Numerous magnetic crystals have been located in the heads of these animals, enough to provide them with an extremely accurate magnetic "map" sense. The magnetic crystals in the yellow fin, skipjack and other species of tunas were located in or upon the frontal bone of the skull. Experiments have also revealed an unconditioned magnetic response in yellow fin tuna.

*FNI 20 (1) : January 1981*

# BOOKS

*Oceanography from space*: Ed by J. F. R. Grower, Plenum Press, New York, pp 978, 1981.

This is the thirteenth volume of the series Marine Science. The volume is based on the proceedings of the COSPAR/SCOR/IUCRM Symposium on the same topic held in May 1980 in Venice. The papers give the variety of measurement techniques available or possible, and many of the types of studies in which they can be used. Papers are arranged in a general section and six specialized sections viz. satellite sea surface temperature measurements, water colour measurements, radar studies of the sea surface, passive microwave observations, remote sensing of ice and satellite altimetry. Each section starts with a brief introduction summarising important results. The capabilities of space sensors demonstrated by satellites like SEASAT and Nimbus-7 led many authors to plan enthusiastically for use of National Ocean Satellite System (U.S.) data which has ocean microwave sensors.

*Marine Algae from Karachi*: By Pyare Lal Anand, Sushma Publications, Dehra Dun, India, pp 128, 1981.

This book is divided into two parts dealing with Green Algae, *Chlorophyceae* and Red Algae *Rhodophyceae*. The author has studied the marine plants from the Karachi coast both from taxonimic and ecological points of view. Although the author has collected the material from various localities such as the rocky ledge at Manora, the buoys, piers and wharves near Manora and the Kemari harbour, sea beaches at Sandpit and Baba Island and the water channels in the adjoining salt marshes, he has limited the studies to the rocky ledge stressing more detailed ecological aspects with a view to obtain more knowledge of the vegetation and of the conditions influencing its distribution. The book is well illustrated.

*Aerial photography*: By G. S. Kumar, Sudarshan Publishers, Hyderabad, India, pp 293, 1981.

This is the first book on Aerial photography by an Indian author. Aerial photography is a modern science with wide applications in various fields of development. It is being increasingly used all over the world for mapping and making inventories of earths resources. It is an established fact that the use of aerial photographs, results not only in the saving of finances and time but also improves efficiency. In spite of the advantages of satellite imagery for repetetive and extensive coverage, aerial photography, being on a large scale with greater details will continue to provide useful information about the earth and its resources, essential for various types of intensive planning and developmental activities. This is an useful book for students, teachers and professionals associated with aerial photography.

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Compiled and prepared by M. J. George and G. Subbaraju.
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