



# MARINE FISHERIES INFORMATION SERVICE



*Technical and Extension Series*

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

No. 8

APRIL 1979

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

**THE MARINE FISHERIES INFORMATION SERVICE:** Technical and Extension Series envisages the rapid dissemination of information on marine and brackish water fishery resources and allied data available with the Fishery Data Centre and the Research Divisions of the Institute, results of proven researches for transfer of technology to the fish farmers and industry and of other relevant information needed for Research and Development efforts in the marine fisheries sector.

Abbreviation - *Mar. Fish. Infor. Serv. T & E Ser., No. 8: 1979*

## **CONTENTS**

1. **The Indian Mackerel in 1978**
2. **News — India and Overseas**
3. **Books**

**Cover photo: The Indian mackerel**

# THE INDIAN MACKEREL IN 1978\*

## INTRODUCTION

The Indian mackerel, *Rastrelliger kanagurta* (Cuvier) constitutes a fishery of great commercial importance in the country. It occurs all along the coast but over 90% are caught from the west coast off Quilon-Ratnagiri region. The season for the mackerel starts by August and lasts till April. But high catches usually occur in October-December.

The annual average catch of the mackerel during 1950-78 period was around 70,000 tonnes and it formed about 8% of the marine fish catch. The landings, nevertheless, showed considerable fluctuations from year to year as it ranged from 16,431 tonnes of 1956 to 204,575 tonnes of 1971. The percentage of mackerel to the total marine fish catch varied from 2 to 20 in 1956 and 1951 respectively.

The fishery is supported largely by the commercial sizes ranging between 160 mm and 229 mm believed to be one-year old and belonging to the maturing stage. Population studies showed a survival of only 6%. On the basis of the estimates of potential stock the production may be further augmented by expanding with caution the area of exploitation and judiciously extending the fishing to the existing off-season also.

The mackerel is still being exploited mostly by indigenous crafts and gears employing traditional methods. But mechanised fishing by purse seine is slowly getting popular these days. With the introduction of purse seining, the future trends of this fishery in space and time have to be rather closely watched and this report for 1978 hence becomes quite timely and appropriate.

### All-India landings (Fig. 1)

The mackerel landings in India in 1978 was provisionally estimated to be 82,645 tonnes against 62,136 tonnes of 1977. The annual landings from 1974 onwards, as shown in Fig. 1 reveal an increasing trend in this fishery.

In 1978, 94.4% of the country's mackerel catch came from the west coast. The contribution from the east coast was only 5.6% against 11.9% of 1977.

### Statewise landings (Fig. 1)

#### West Bengal

No mackerel was landed here in 1978.

#### Orissa

The catch in the state was 173 tonnes in 1978. It was slightly less than that of 1977 landings of 195 tonnes. The state's percentage in the all-India total mackerel landing was only 0.21 in 1978 against 0.31 of last year. No mackerel occurred in Balasore district in the north. High catches (36%) occurred in Puri and northern parts of Ganjam districts while the southern areas of Ganjam accounted 44% of the state's mackerel landings.

#### Andhra Pradesh

The catch in this state in 1978 was 2,520 tonnes against 1,040 tonnes of last year. The percentage contribution by Andhra Pradesh towards all-India catch was 3.05% in 1978 against 1.67% in 1977. There were no mackerel landings along the coast of Srikakulam district, the northernmost part of the state. Mackerel in the state actually occurred in 2 clusters of places, the first one along the coasts of Visakhapatnam and Godavari districts and the second along the districts of Guntur, Prakasam and Nellore. There were no mackerel in Krishna and Nellore south areas. The landings from East Godavari alone formed 46% of the state's catch and the catch of Guntur-Prakasam zone contributed to another 46%.

#### Tamil Nadu and Pondicherry

The landings in this part of the country reduced to 1,868 tonnes forming only 2.26% in 1978 from 6,072 tonnes forming 9.77% in 1977. Forty seven per cent

Prepared by A. Noble in association with the staff of Fishery Resources Assessment Division. Biological data from centres other than Cochin were provided by M. Vasudeva Pai - Karwar, N. S. Radhakrishnan - Mangalore, T. M. Yohannan - Calicut, K. Rajasekharan Nair - Vizhinjam and G. Mohanraj - Mandapam.

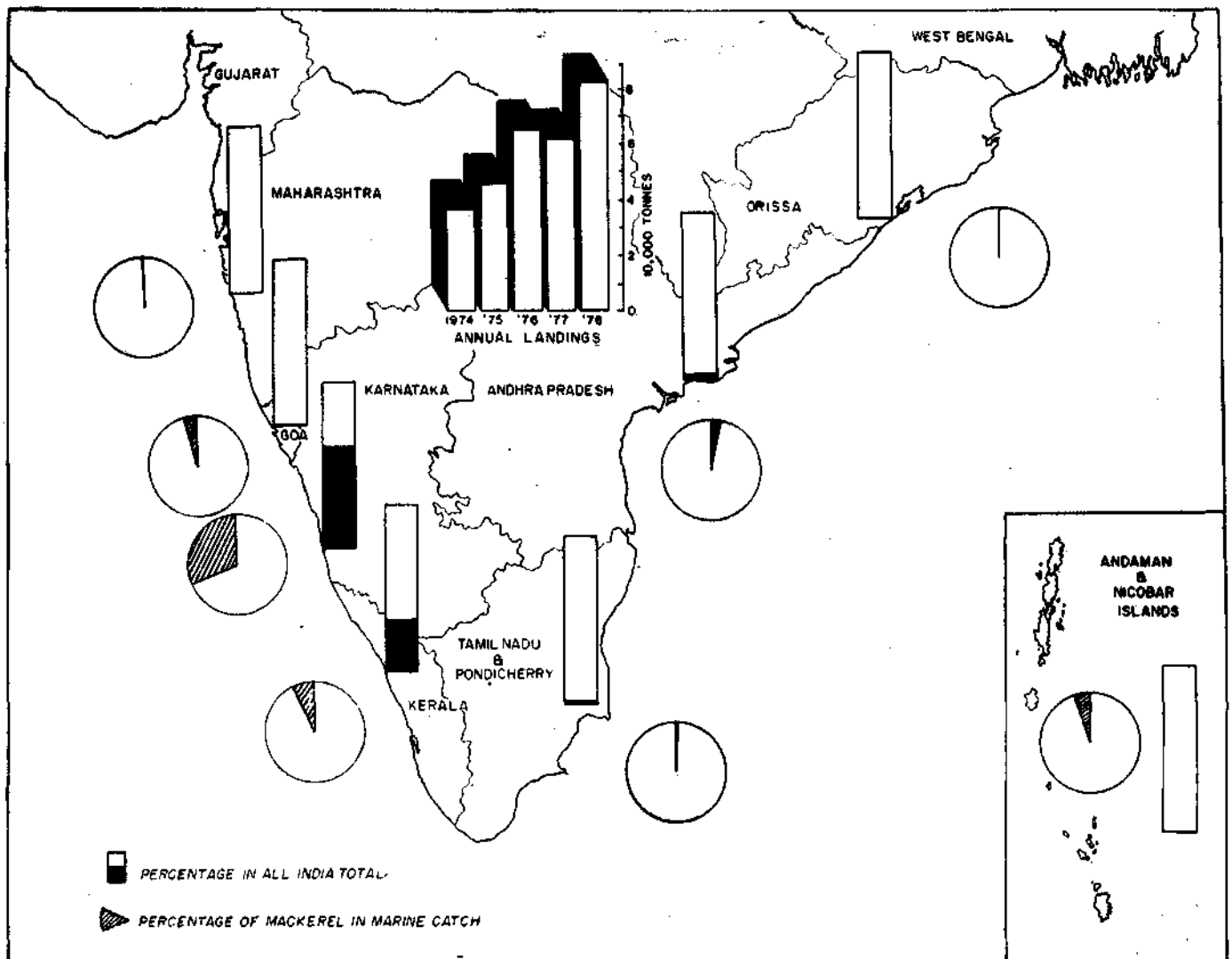


Fig. 1. Annual landings of mackerel during the years 1974 to 1978 and statewise percentage compositions. (States' percentage in all-India mackerel landings and the percentages of mackerel in total catch).

of the mackerel landings occurred along the coasts of South Arcot, Pondicherry, Karaikkal and Thanjavur. Next area of good mackerel landings was from south end of Ramanathapuram, Thirunelveli and Kanyakumari districts contributing to 42%.

#### Kerala

The catch in Kerala in 1978 was 25,917 tonnes. In 1977, it was 19,968 tonnes showing some marginal increase. The Kerala landings formed 31.36% and 32.13% respectively in the country's total catch in 1978 and 1977. Within the state, the mackerel formed only a poor fishery (4%) along the coast of Trivandrum district. Along the coasts of Ernakulam district and portions of the contiguous districts of Alleppey in the

south and Trichur in the north, 16% of the state's catch was obtained. Mackerel, however, was abundant along the Malabar coast from Ponnani to Cannanore where 62% were landed.

#### Karnataka

Major landings in the country in 1978 came from this state. It was 50,704 tonnes, forming 61.35% of the all-India catch. In 1977, the landings were around half that of 1978 and formed only 42.19%. The catches in the South Kanara coast up to Coondapur accounted to 80% of the state's annual landings. From Ganguli to Sasithal the catches, however, were poor. In the North Kanara coast, north of Sasithal the catches formed 17% of the state's total.

## Goa

The mackerel landings in Goa was poor in 1978 as it was only 658 tonnes against 7,661 tonnes of 1977. In 1977, the state's catch formed 12.3% in the total landings of the country, whereas in 1978 it has crumbled to a mere 0.8%. The bulk of the state's catch came from its northern part.

## Maharashtra

The landings in Maharashtra showed a slight decline to 699 tonnes in 1978 from 875 tonnes in 1977. The state's share in the all-India landings in 1977 was 1.4% and in 1978 it reduced to 0.9%. The coast up to Dandi

in Ratnagiri district adjacent to the Union Territory of Goa had 29% of the State's mackerel landings. In Ratnagiri district north of Dandi there was no mackerel. In Thana district up to Arnala the catches formed only 6%. The arrivals of mackerel in the Sasoan Dock, Bombay accounted for 65% of the state's landings.

## Gujarat

No mackerel landings were recorded in this state in 1978.

## Lakshadweep

No mackerel occurred here.

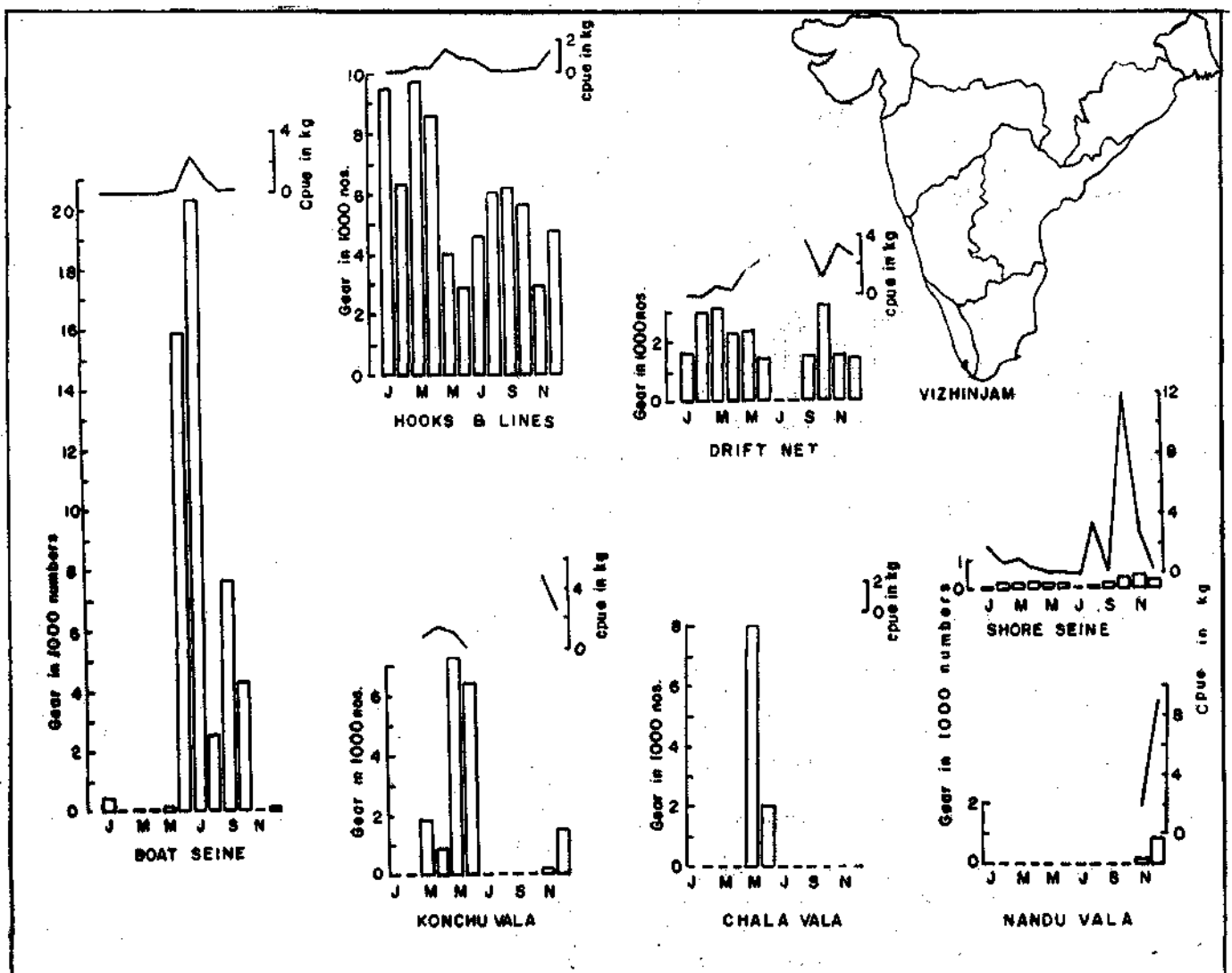


Fig. 2 (a) Gear (numbers of units in operation) and catch per net at Vizhinjam

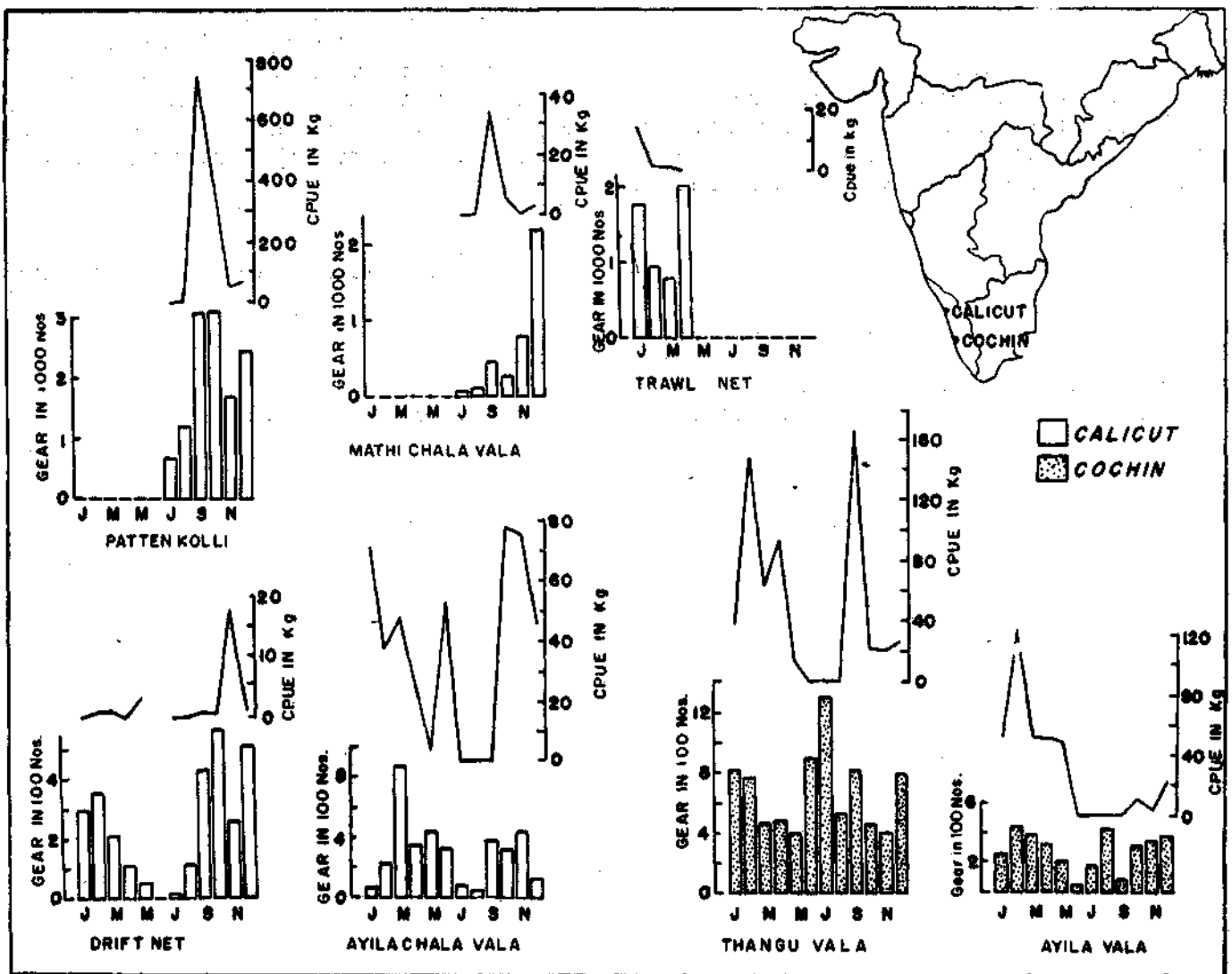


Fig. 2 (b) Gear (numbers of units in operation) and catch per net at Cochin and Calicut.

#### Andaman and Nicobar Islands

The catch in 1978 was 106 tonnes as against 111 tonnes recorded in 1977. Its percentage to the country's total landings was 0.13 in 1978 and 0.17 in 1977. The catch here includes the species *R. brachysoma* also.

#### Catch in relation to total marine fish landings (Fig. 1)

The total marine fish catches in the country in 1978 was provisionally estimated to be 13,85,660 tonnes of which 6.0% was mackerel. In 1977, it was only 4.9%. In 1976, 1975 and 1974 the percentages were respectively 4.8, 3.2 and 3.2. As in the case of the total landings of the mackerel, its percentage in the marine fish

landings of the country also showed an increasing trend in the past 5 years.

Statewise, the mackerel in Orissa formed only 0.6% of the local marine fish landings in 1978 against 1.3% of 1977. The percentage of mackerel in the marine fish catch in Andhra Pradesh increased in 1978 to 3.1 from 1.0 of 1977. In Tamil Nadu - Pondicherry Coast, on the other hand, it was just the reverse, the same falling to 0.7% in 1978 from 2.9% of 1977. In Kerala, the percentage of mackerel in the marine fish landings increased to 7.0 from 5.8 of last year while in Karnataka it increased to 33.2 in 1978 from 27.0 of 1977. Mackerel formed the major marine fishery in Goa in 1977 contributing to 31.0% in the state's total catch. But in 1978,

it accounted only 4.9%. The percentage of mackerel in the marine fish landings of Maharashtra State remained stationary in 1978 and 1977 at 0.3. In Andaman and Nicobar Islands it formed 6.9% in 1978 and 7.2% in 1977.

**Gear and catch per net (Fig. 2 a-d)**

Observations on the gear and catch per net were made at a few selected important centres in the country. The bulk of the landings (41.66%) at Vizhinjam was made by the boat seine, the catch per net being only 1.10 kg (Fig. 2a) in 1978 against 2.94 kg of last year. The drift net and hooks and lines respectively exploiting 20.10% and 15.70% of the local mackerel resource had a catch of 1.28 kg and 0.30 kg only per net. The konchu

vala landing 11.65% of the local catch had a turnover of 0.90 kg per net, whereas the nandu vala netting only 5.64% catch had the highest catch per net of 7.39 kg. The shore seine contributing to 4.78% of the total catch had a catch rate of 2.63 kg per net. The shore seine and the hooks and lines were used throughout the year. The boat seine though operated all the year round except November was predominant during June-October. Drift nets were used throughout the year excepting July and August. Konchu vala was in use in March-June and November-December period and nandu vala in November-December period only. Besides these, there were some chala vala also in operation in May and June, netting a few kilograms of mackerel. Compared to last year, there was an overall increase in 1978 in the number of operations of all types of gears at Vizhinjam.

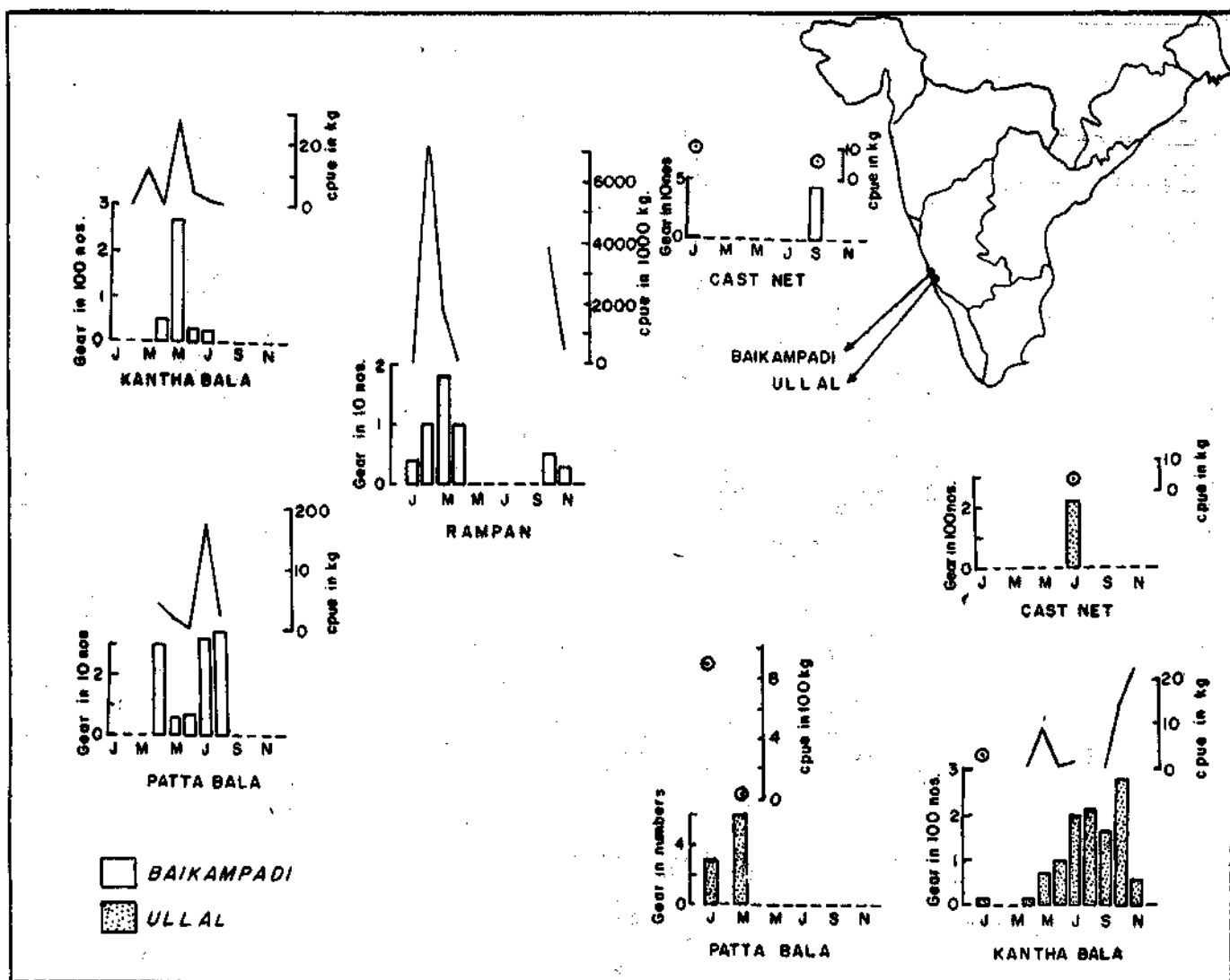


Fig. 2 (c) Gear (numbers of units in operation) and catch per net at Ullal and Baikampadi.



Three-fourth of the mackerel landings at Cochin were made by the boat seine, thangu vala. There was an increase in the number of operations of this gear in 1978, and the catch per net was 48.79 kg against 38.53 kg of last year (Fig. 2b). The number and catch per net of gill net ayila vala, however, decreased in 1978.

Patten kolli (boat seine) was the major gear accounting for about 95.06% of the total catch of 1978 season at Calicut at a catch rate of 310.95 kg per net (Fig. 2b). Drift net, mathi chala vala, ayila chala vala and trawl net were other gears used for catching mackerel here. At Quilandy, north of Calicut there were no mackerel landings by the boat seine during January-July. During August-December, 9,717 patten kolli vala with 209.69

kg per net landed a total of 2,038 tonnes of mackerel. The ayila chala vala landed 230 tonnes of mackerel at a catch rate of 30.94 kg per net. There were some mackerel in the trawl nets also.

At Ullal the patta bala (gill net) landed only 34.20% of the mackerel, the rest having been netted by the shore seine (kantha bala). Nevertheless, the catch per net of patta bala was 316.70 kg against 4.8 kg of the kantha bala (Fig. 2 c). There were a few cast nets also in July landing 86 kg of mackerel at a catch rate of 0.4 kg per net. The rampan net accounted for 88.94% of the mackerel landings at Baikampady and the catch per net was 2,463.3 kg (Fig. 2 c).

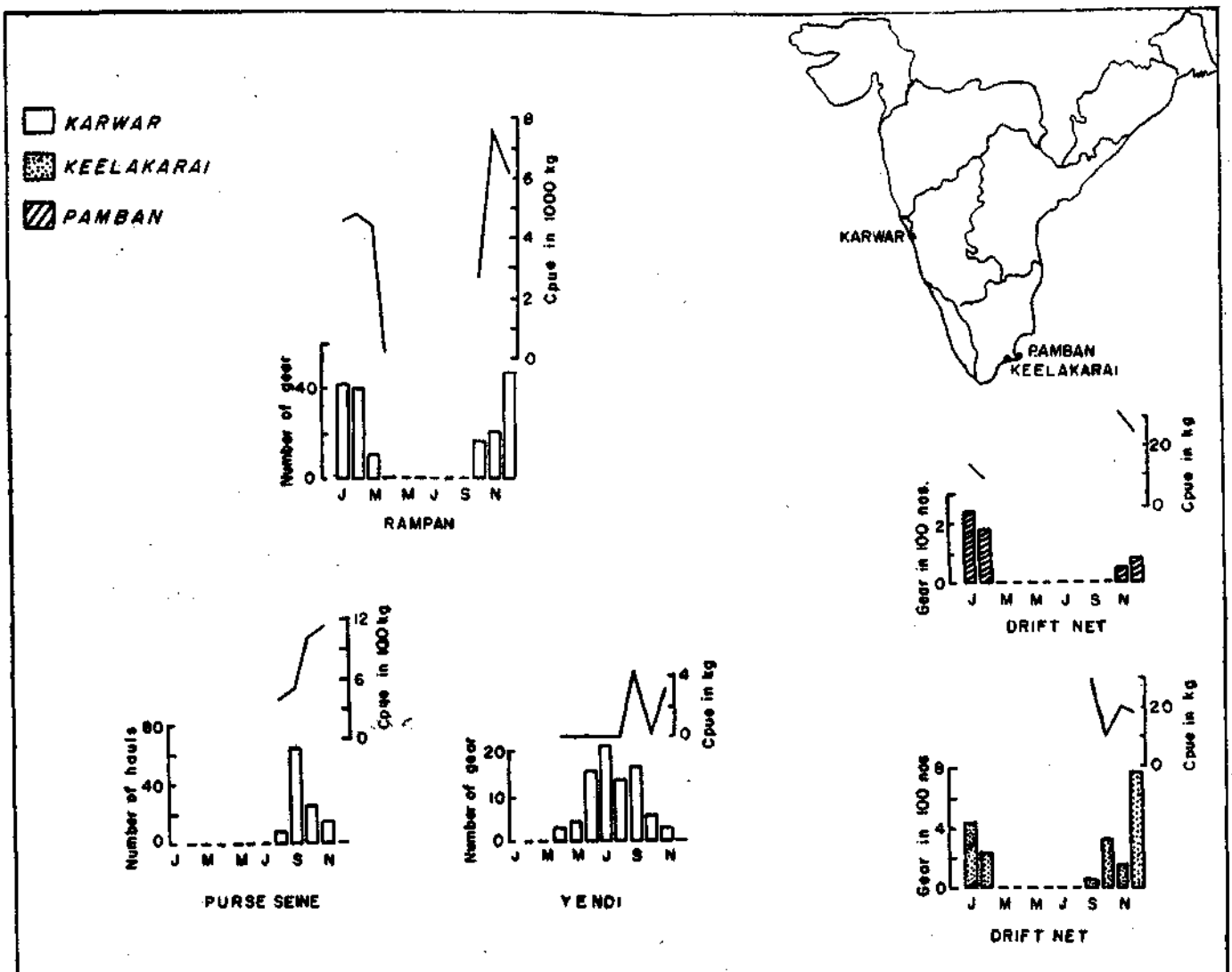


Fig. 2 (d) Gear (numbers of units in operation) and catch per net at Karwar, Pamban and Keelakarai.

Ninety two per cent of the mackerel landings at Karwar were made by the rampan net which had a high catch rate (Fig. 2 d). The contribution by yendi, a small shore seine, was just nominal (0.8%). The remaining catch at Karwar was landed by the purse seine nets.

Table 1. Purse seine landings in Karnataka State in 1978 in tonnes

Months	Mangalore	Padubidri	Malpe	Ganguli	Bhat-Karwar
January	524	35	277	2	—
February	390	30	144	114	—
March	—	16	57	386	—
April	—	—	58	27	—
May	—	—	—	7	—
June	—	—	—	—	—
July	—	—	—	—	—
August	—	—	—	—	3
September	3,219	146	2,222	2,010	—
October	4,544	62	1,541	6,347	—
November	508	—	1,269	2,570	358
December	92	—	12	1,083	180

Mackerel landings by purse seines in the South Kanara coast in January–May 1978 was 2,067 tonnes (Table 1). The purse seine was not operated during June–August period due to rough sea and inclement weather. During September–December the landings rose to 25,625 tonnes. The total landings in the South Kanara in 1978 was 27,692 tonnes and the number of units along this coast spread over at Mangalore, Padubidri, Malpe and Ganguli were 112. There were 12 purse seiners in the North Kanara Coast, 4 of them stationed at Bhatkal and 8 at Karwar. The number of hauls made by the purse seiners at Karwar in 1978 was 123 (Table 2) and at a catch rate of 677 kg per haul, landed 83,254 tonnes of mackerel. As given in Table 2 the catch per haul in 1977 was only 177 kg and in 1976 it was 849 kg. The corresponding catch per rampan net showed an inverse relation.

The purse seine landings from Mangalore to Bhatkal in 1978 was estimated to be 28,230 tonnes. The number of purse seiners in this area was 116 and the catch per purse seine was 243,362 tonnes for the year. As at Karwar, the catch per haul for purse seine is not available in this region; but is necessary for comparable appraisal of abundance and understanding the consequences of mechanisation on the traditional fishery.

Table 2. Purse seine and rampan landings at Karwar, effort and cpue

Unit	Year	Effort No. of operations	Catch in kg	cpue in kg
Rampan	1978	185	9,72,645	5,258
...	1977	206	21,96,467	10,662
...	1976	190	6,79,378	3,576
Purse seine	1978	123	83,254	677
...	1977	16	2,834	177
...	1976	2	1,697	849

The trawlers at Calicut and Quilandy have landed 30.122 tonnes and 10.247 tonnes of mackerel at a catch rate of 5.46 kg and 10.69 kg in 1978 (Fig. 2 b).

The important gear that landed mackerel at Keelakarai and Pamban was the drift net and its catch rate was 14.75 kg and 16.15 kg respectively (Fig. 2 d).

#### Seasonal distribution (Fig. 3)

The 1977 season lasted till April of this year and the commercial fishery of 1978 started in September in the country. The catch was the highest in September and October (peak month). The period May to August was off season for the mackerel fishery. The season along the west coast was the same as the above trend while along the east coast highest catches occurred in February and March.

In Orissa, the catch was high in February–March period, and also in November. Along Visakhapatnam–Godavari coast in Andhra Pradesh, the bulk landings occurred in March. There was good yield in February also. Along Guntur–Prakasam–Nellore area the catches were the highest in February.

Along the coasts of South Arcot, Pondicherry, Karaikkal and Thanjavur the catch was the highest in June. It was good in February–March and also October. The season here on the whole was a protracted one, and the coast probably is having an intermediate status between the west coast and the east coast. A protracted fishery was noticed along Andamans coast also. Along Thirunelveli and Kanyakumari districts of Tamil Nadu the mackerel season occurring during December–April was almost west coast-like but for the difference that the landings were poor in December and abundant in April.

Along the coasts of Ernakulam district and some areas of the neighbouring districts in Kerala, the fishery

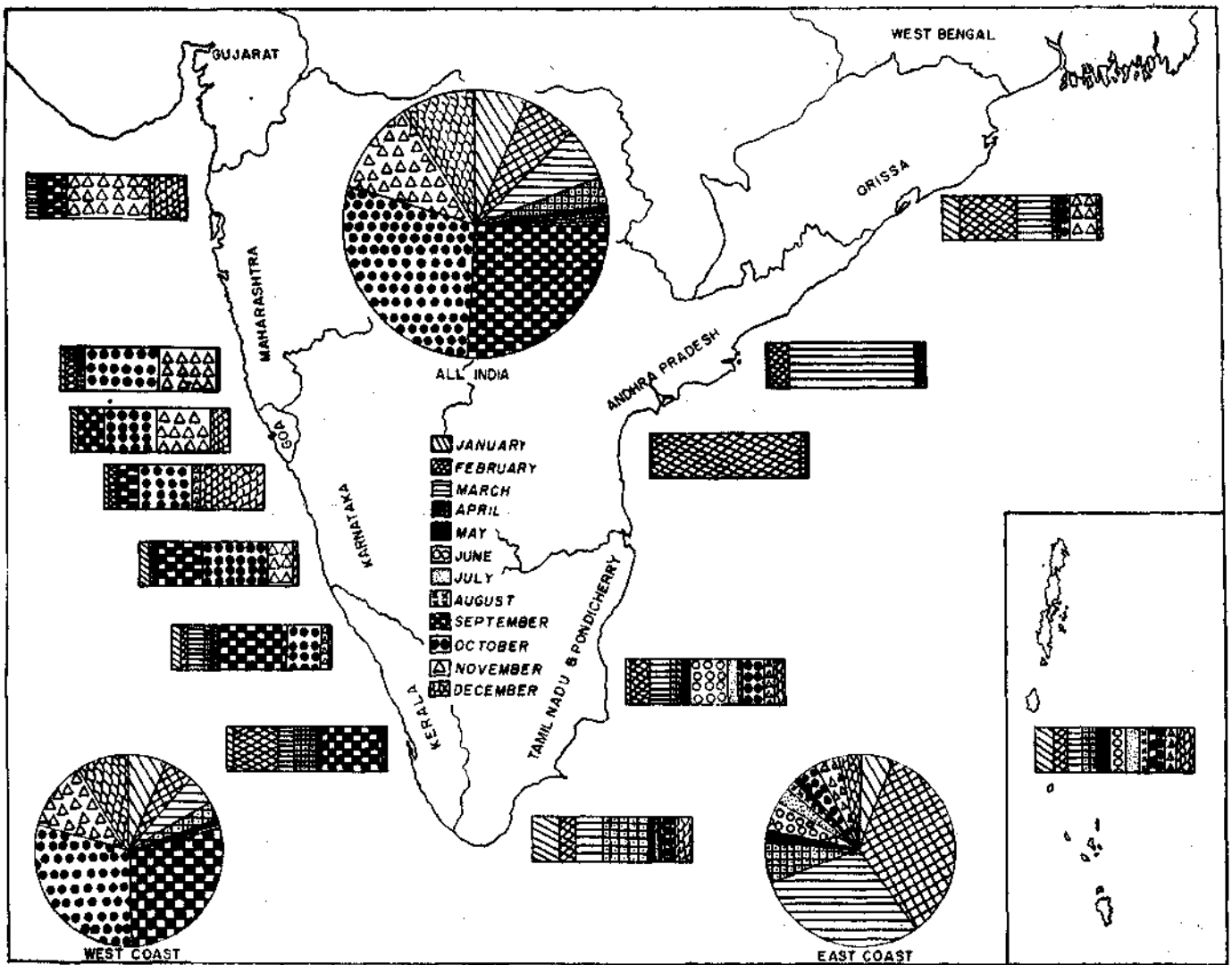


Fig. 3 The seasonal distribution of mackerel in 1978.

was excellent in September and good in February-April. Along the coast of Malapuram-Kozhikode-Cannanore districts, the season of 1978 started in September with high catches and it was good in October also. The landings in January-March period here were only moderate.

In Karnataka State, along the South Kanara Coast up to Coondapur the 1978 season was good during September-November with peak landings in October. In the North Kanara coast the season started in September with good landings and became better in October. In November the catch dwindled but recovered in December with excellent catches.

The mackerel fishery in Goa is highly seasonal and

good catches were recorded during September-December period.

In the Ratnagiri coast of Maharashtra State the fishery commenced in October with high catches. In November also it was good. Along Bombay coast the arrivals of mackerel were in moderate quantities in September but were heavy in November and December.

On the whole the fishery in the southern region of the west coast commenced in September with high landings along Kerala. In Karnataka and Goa though the season commenced in September its intensity was more in October. In Ratnagiri area, on the other hand, the season started only in October and in Bombay region the peak occurred in November. To sum up, the fishery

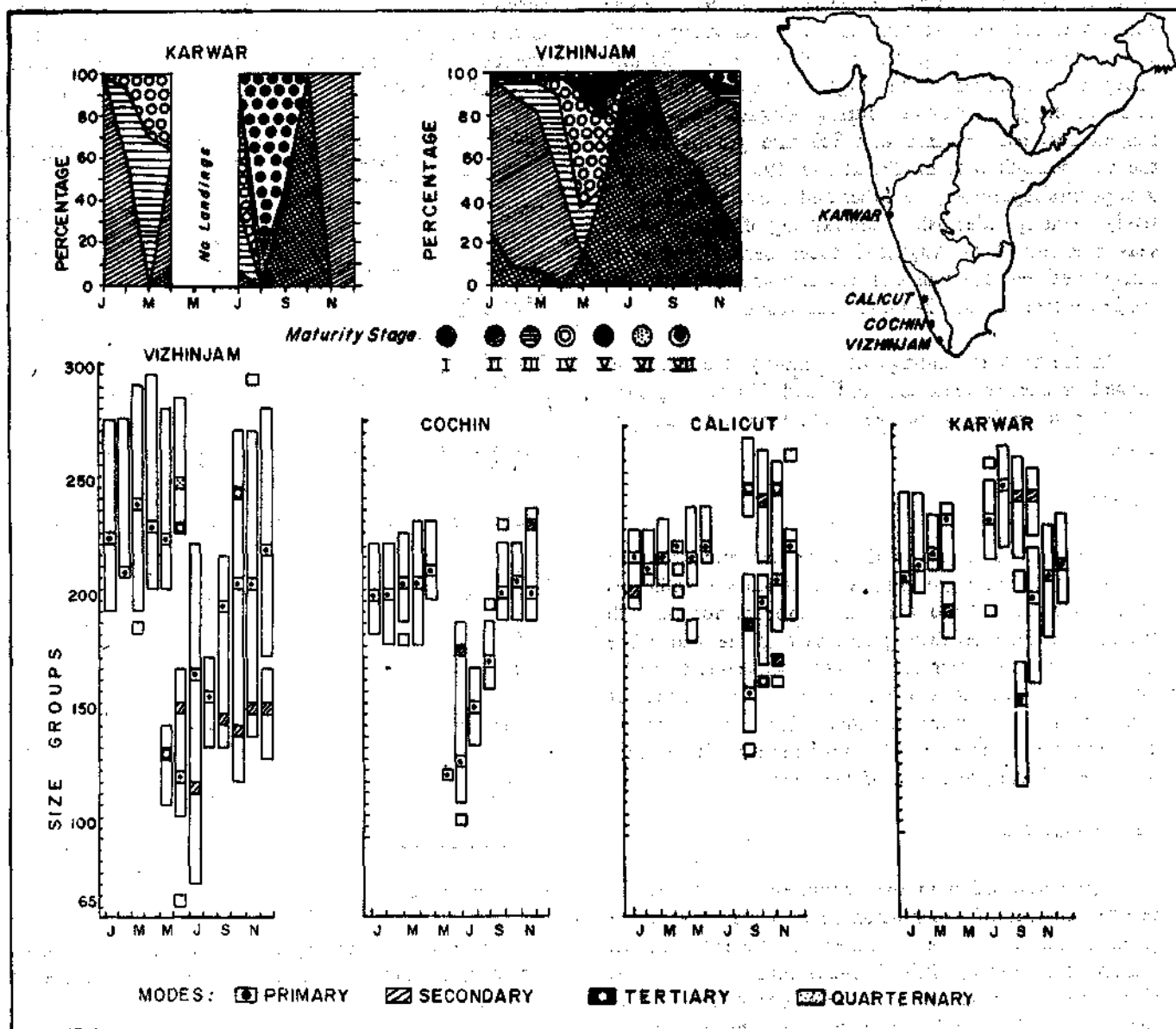


Fig. 4 Length distribution and maturity of mackerel in 1978.

in 1978 started early in the south and late in the north, the peaks occurring earlier in the south than in the north.

**Length distribution (Fig. 4)**

The size as observed in a few selected centres in the west coast ranged between 65 mm and 295mm groups and it was the widest at Vizhinjam. In the east coast as observed at Mandapam the range was between 200 mm and 285 mm.

Till June 1978, the fishery at Vizhinjam was supported by older fish of the 1977 season. Concurrently small size groups also started occurring in May

and they became dominant in June and July. The recruitment seems to have started at Cochin in July. At Calicut there was a gap in the data in July and August. However, at Quilandy a centre very near to it, the recruitment commenced in August. At Karwar in the north, it commenced in September. Older fish of 1977 season continued in the fishery in small numbers till the end of 1978 at Calicut. At Karwar it lasted up to October and at Vizhinjam up to November.

The length of fish in the purse seine catches at Mangalore ranged between 175 mm and 245 mm groups in January-March with the modes falling between 200

mm and 215 mm groups. In the season of 1978 the size range was between 125 mm and 260 mm groups with the mode at 175 mm group in September to 200 mm group in November. The length of fish in the purse seine landings at Karwar during August - November ranged between 130 mm and 220 mm groups among the new recruits with modes at 150, 190 and 210 mm groups in September, October and November respectively. Among older fish in the last leg of the previous season extended to August-October period, the sizes ranged between 215 mm and 260 mm groups with the mode centred around 240-245 mm groups.

In the trawler landings at Quilandy, the mackerel ranged in size between 200 mm and 230 mm groups with the mode falling between 210 mm and 220 mm groups.

### Growth

The shifting of size from mode 205 mm group in January to 230 mm group in April at Karwar indicates 25 mm growth in 4 months and it appears normal with the commercial sizes during that part of the year. The growth in the new recruits of 1978 also seems to be 85 mm in 6 months at Cochin, 80 mm in 5 months at Quilandy and 60 mm in 4 months at Karwar; indicating on the whole an increase of 15 mm a month, also normal with them during this part of the year.

### Age composition

Age composition in the commercial catches at selected centres of observation in important gears are given in Table 3. The commercial fishery consists mainly of 1-year old fish (160-229 mm) at all centres along the west coast except at Vizhinjam where the 0-year olds (<159 mm) dominated. In the east coast, as observed at Keelakarai the 0-year olds were absent and the 1-year olds dominated with a good number of 2-year olds (230-269 mm) also occurring. The 0-year olds in the west coast was absent in the northern sector where comparatively more 2-year olds appeared.

### Mortality

From the occurrence of different age groups in the current season and the last season (Table 3), the instantaneous total mortality coefficient of the mackerel was calculated to be  $1.00162$  at Cochin and  $1.00107$  at Karwar which indicate that 99.83% and 99.89% of fish respectively at these places perished due to various causes. At Vizhinjam, the instantaneous total mortality coefficient was calculated to be  $1.34699$  indicating a

survival of 29.787% probably resulting in improvement in the current landings. Likewise, at Calicut the instantaneous total mortality was  $1.20703$  which means a survival of 18.868% also showing better landings.

Table 3. Catch, in number of fish per net, in different year classes in important gears at selected centres of observation among new recruits during June-December period

Place (Net)	year	0-year < 159 mm	1-year 160-229 mm	2-year 239-269 mm	3-year > 270 mm
Keelakarai (Drift net)	1978	0	99	57	0
Vizhinjam (Boat seine)	1978	18	14	0	0
-do-	1977	47	14	0	0
Cochin (Boat seine)	1978	2	506	1	0
-do-	1977	58	591	0	0
Calicut (Boat seine)	1978	48	1,002	290	0
-do-	1977	25	1,537	120	0
Quilandy (Boat seine)	1978	57	3,424	15	0
Ullal (Patta bala)	1978	0	0	0	0
-do-	1977	0	3,184	0	0
Baikampady (Rampan)	1978	0	29,418	0	0
-do-	1977	0	54,021	0	0
Karwar (Rampan)	1978	0	59,231	135	0
-do-	1977	0	1,26,065	251	0

### Sex composition

There was no segregation of sexes and its distribution in the landings on the whole was almost equal in proportion.

### Maturity and spawning (Fig. 4)

The fish were mostly in early stages of sexual maturity in the beginning of the year. From the advancement of maturity as well as from the occurrence of the spent and spent recovering fishes in the catches, the spawning seems to have occurred at Vizhinjam around May and at Cochin after May. At Karwar it appears to have taken place in August. At Calicut there are indications of the beginning of spawning in July.

### Feeding

The feeding of the mackerel in 1978 as observed at Cochin appeared to be moderate, the average monthly

displacement volume of the stomach contents varying in the year between 0.222 ml and 0.517 ml.

since 1974, except for a minor decline in 1977, is probably heading for higher catches in or about the year 1980-81.

**Forecast**

The fishery continuously showing improvements



## NEWS — INDIA & OVERSEAS

### Mercury content analysers

The analytical chemistry division of the Bhabha Atomic Research Centre (BARC) of the Indian Atomic Energy Commission at Trombay near Bombay has for the first time developed and fabricated mercury analysers. The equipment was developed at the insistence of certain importer-countries of Indian marine products that BARC should certify the mercury content of these products.

### Fisheries development projects in Orissa

In the coastal state of Orissa two schemes for developing fisheries in and around Chilka Lake, the largest of its kind in the country, are being given top priority. They will be carried out by the Chilka Lake Development Authority set up by the state government.

One of the projects will develop fisheries in brackish water. The other aims at exploiting the offshore and deep sea fishing potential in the coastal area adjoining the lake. The construction of a fishing harbour near the lake is also included. These projects would improve living conditions of nearly 60,000 fishermen in 114 villages in the lake area.

### Shrimp aquaculture experiments in U. S. A.

A Massachusetts-based firm, Groton Bio-Industries Development Co. is engaged in investigations on commercial shrimp aquaculture with \$ 29,900 grant from National Oceanic and Atmospheric Administration's (NOAA) Sea Grant Office and matching funds from the firm in association with Maricultura, SA, a Costa

Rican aquaculture Company. Aquaculture scientists will spend a year at a shrimp farm in Central America, gathering biological data from "growout" ponds—small earth bottomed enclosures used for raising shrimp from the early larval stage to market size. These growout habitats are by design similar to natural shrimp habitats. Advocates of extensive aquaculture believe that shrimps will grow under artificial conditions, if enough of the natural conditions are duplicated.

One of the problems vexing shrimp farmers is the wide variations in productivity between neighbouring growout ponds, even when the species of shrimp, feed, sunlight and other factors are apparently identical. The researchers hope to use their findings to create an ecological model of a pond to determine how to increase productivity most economically.

World Fishing 26 (11): November 1977

### Pacific oyster culture trials in the Mediterranean

Oyster growth trials are being carried out at a Marine Station of the University of Malta at Fort San Lucian to study the feasibility of launching oyster culture on a commercial scale in Malta. For the trials the marine station has chosen the Pacific oyster *Crassostrea gigas*, a fast grower in warm waters. This is the first time that this oyster has been tried in the Mediterranean and it is proving superior in performance to the European flat oyster *Ostrea edulis* in terms of rate of growth, overall mortality and meat condition.

World Fishing 26 (12): December 1977

### Intensified studies on thermal effluents in Japan

With the growing recognition of the need to maintain balanced eco-systems, recently in Japan research on the effects of thermal effluents discharged from thermal power stations on marine life has been given more emphasis. The Technical Laboratory of the Shikoku Electric Power Co., Ltd is using phyto and zoo plankton, which play important roles in the food chain, as eco-indices.

Researchers are studying the varieties, densities and growth activity of plankton in specific areas with special reference to effects of thermal effluents. The laboratory has developed a new type of plankton sampling device, consisting of plankton nets, buckets, a self-priming pump, valves and sinkers. The sampler is easy to handle and can sample plankton at any depths with considerable saving in time and labour.

World Fishing 26 (10): October 1977

### Russian theory for growth in fish stocks

Studies conducted over the past ten years by Russian research ships *Mikhail Lomonosov* and *Akademik Kurchatov* off the West African coast show that change in the circulation of air masses is one of the main causes of the growth of fish stocks, in particular sardines. Prolonged observations of the ocean and atmosphere in that area have convinced scientists that the change in the air streams bring about an intensification of the trade wind current and a rise of depth waters in the shelf area.

As a result of these changes there has been a big improvement in the environment of such commercially valuable fish as horse mackerel, sardines and sea snipe. Stocks of sardines have trebled there as compared to 1972. It was noticed that the rise of depth waters brings about an increase in the density of plankton, the staple food of these fishes. Similar rise of depth waters was also observed by scientists near American coasts.

World Fishing 26 (11): November 1977





## BOOKS

*Reproduction of Marine Invertebrates. Vol. 4. Molluscs: Gastropods and Cephalopods.* Edited by A. C. Giese and J. S. Pearse. Academic Press, New York, pp 369, 1977.

This volume covers the reproductive aspects of two major classes of molluscs, namely gastropods and cephalopods, divided among six chapters dealing with the three major groups of each

class. Gastropods display a wide range of structural complexity which is reflected in their diverse modes of reproduction, while cephalopods are often looked at as one of the apices of invertebrate evolution and have intricate courtship and developmental patterns. Some aspects of reproduction have been studied more thoroughly in some groups than in others, and these are emphasised in the different chapters while the same topics are covered to the extent feasible for each group.

*Fate and effects of petroleum hydrocarbons in marine organisms and ecosystems.* Edited by D. A. Wolfe. Pergamon Press, Oxford, pp 478, 1977.

This volume includes most of the papers which were presented at an international symposium during November 10-12, 1976 held at Seattle, Washington, sponsored by the National Oceanic and Atmospheric Administration and the Environmental Protection Agency. It is divided into three parts, of which part I includes contributions from the invited scientists on the topics: (a) inputs and physical transport processes influencing the distribution and composition of petroleum hydrocarbons in marine systems, (b) bioaccumulation and metabolism of hydrocarbons by marine organisms and (c) biological and ecological effects of petroleum exposure in marine systems. Part II consists of those contributed papers which were accepted for publication and part III is the transcript of the panel discussion.

*Dynamics of marine vehicles.* By R. Bhattacharya, John Wiley & Sons, New York, pp 498, 1978.

This book is based on lecture notes prepared for students of naval architecture, marine engineering and ocean engineering at different universities over a period of ten years. It is a self instructional treatise on the dynamics of marine vehicles and seakeeping. The chapters in the book have been arranged in a way that provides a sequence of the physical phenomenon necessary for a complete understanding of marine vehicle dynamics and each chapter can be easily assimilated with the knowledge from the preceding one. This is an ideal reference book for beginners as well as for the experienced practitioners in the field.

*Marine Ecology. Volume IV. Dynamics.* Edited by Otto Kinne. John Wiley & Sons, New York, pp 746, 1978.

This is the fourth volume in the series Marine Ecology. The present volume deals with the ecological dynamics in the oceans and coastal waters, predominantly in situ research. It deals with dynamic aspects of life in oceans and coastal waters, concentrating on the fundamental processes of production, transformation and decomposition of organic matter and culminating in general concepts and considerations of population dynamics and food links. This is the contribution from the leading experts in the subject from North America and USSR, countries which command the largest research ship capacities and expedition experience.

*Selected works on fishing gear. Vol. I Commercial fishing techniques* By F. I. Baranov. Translated from Russian by E. Vilim and edited by P. Greenberg. Israel programme of scientific translations, Jerusalem, pp 631, 1976.

Taking into account the technical features of the different gears, they are divided into five main groups, namely, gill nets, gears of the seine type, trawls, fixed trap nets and baited hooks and lines. The commercial fishing techniques are described in 22 chapters dealing with the fundamentals of the construction and operation of different types of nets, the theory and techniques of gill net fishing, seining and trawling, design and calculation of stationary gear, drag seines and other fishing gear, net materials, external forces acting on the gear, methods of modelling, method of simulation and new fishing methods.

