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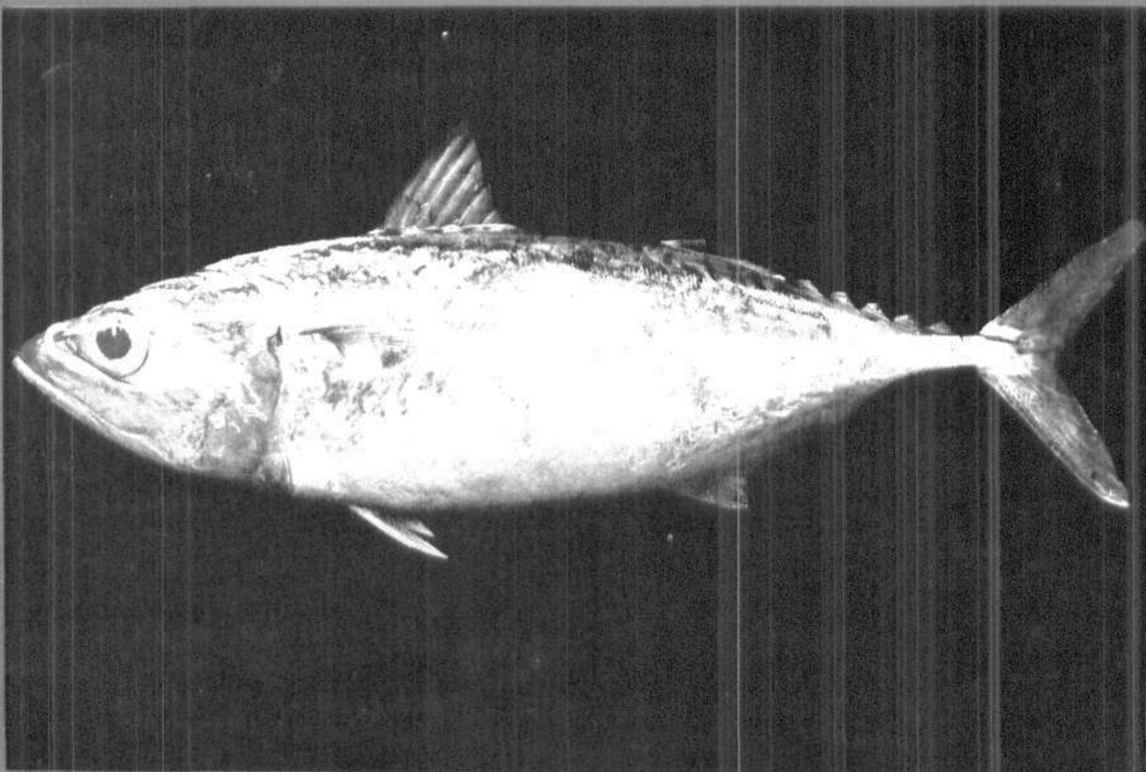

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INDIAN COUNCIL OF AGRICULTURAL RESEARCH

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 National Marine Living Resources Data Centre (NMLRDC) 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. 63: 1985

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Front cover photo: The Indian mackerel *Rastrelliger kanagurtta*
Back cover photo: A bumper catch of mackerel landed in Cochin

THE MACKEREL FISHERY – A SHORT REVIEW

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Trends in production

Estimated landings of mackerel in India is available from 1950 to 1982 in published accounts (CMFRI, 1969, 1980, 1982, and 1983). The data for 1983 is taken from the reports and records of Fishery Resources Assessment Division of the Central Marine Fisheries Research Institute. Ranging between 16,431 tonnes of 1956 and 2,04,575 tonnes of 1971 (Fig. 1), the landings fluctuated widely from year to year.

Though the fish is available all along the Indian coasts, it forms a commercial fishery in the west from Quilon in Kerala to Ratnagiri in Maharashtra only. In 1965–'83 (full complements of statewise landings including that of the Union Territory of Goa being available from 1965 onwards only), the catches in Kerala ranged between 3,600 tonnes of 1968 and 95,164 tonnes

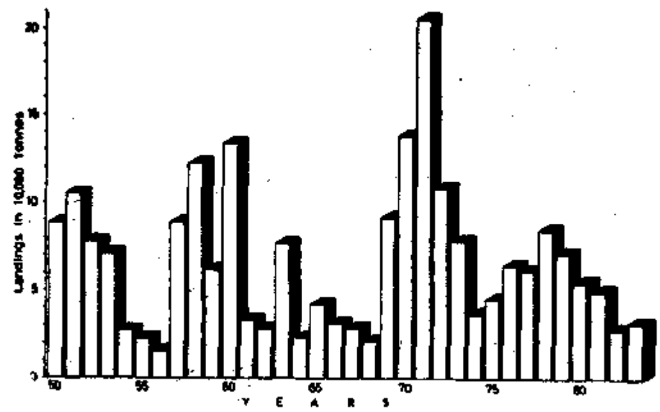

Fig. 1. Annual mackerel landings in India.

of 1971 (Fig. 2). The catches, nevertheless were mostly between 10,000 and 20,000 tonnes. In Karnataka, in 19 years, the catches fluctuated from 2,182 tonnes of 1983 to 64,047 tonnes in 1971. The landings here were erratic during 1965 to 1969. Subsequently it increased to almost above 20,000 tonnes per year, except 1974 and 1975, and 1982 and 1983 (Fig. 2).

Goa is the next important place of mackerel production in the country. The catches here varied between 220 tonnes of 1983 and 35,258 tonnes of 1971 (Fig. 2). In fact, the catch here was never as low as it occurred in 1983. Prior to it, the lowest was 2,446 tonnes of 1980; and production from 3,500 to 8,000 tonnes per annum was most common. In Maharashtra (Fig. 2), the catches oscillated widely between four tonnes of 1967 and 20,683 tonnes of 1969. The catches here, however, were mostly below 25,00 tonnes only. The annual mackerel landings swung between 0 and 112 tonnes in Gujarat, 13 and 2,015 tonnes in Orissa, 1,040 and 6,525 tonnes in Andhra Pradesh, 521 and 12,086 tonnes in Tamil Nadu–Pondicherry, and 12 and 348 tonnes in Andaman & Nicobar Islands (Fig. 2). However, the catches were generally confined to 2,000 to 5,000 tonnes in Tamil Nadu–Pondicherry and it varied between 1,000 and 3,000 tonnes in Andhra Pradesh. In Orissa, the catch touched four digits in 1983 after 12 years of such an occurrence in 1970.

The all-India average annual landing of the mackerel in 34 years of 1950–'83 period was 66,584 tonnes. The catches during 1950–'53, 1957–'60 (except 1959), 1963, 1969–'73 and 1978–'79 (Fig. 3) were higher than this and lower for the rest. The average all-India annual value computed for 19-year period of 1965–'83 when statewise landings in full are available, is 67,419 tonnes. Average annual production of mackerel during 1965–'83 period was 8,542 tonnes along the east coast and 58,877 tonnes on the west coast. The 19-year averages in the states were; Karnataka 23,478 tonnes, Kerala 23,094 tonnes, Goa 9,001 tonnes, Tamil Nadu–Pondicherry 5,321 tonnes, Maharashtra 3,293 tonnes, Andhra Pradesh 2,688 tonnes, Orissa 436 tonnes, Andaman & Nicobar Islands 97 tonnes, and Gujarat just 11 tonnes.

For the first time in the history of mackerel fishery, seven tonnes of it is reported to have occurred in the fish landings of Bengal in 1983. The mackerel landings in east coast in the year exceeded the landings of west

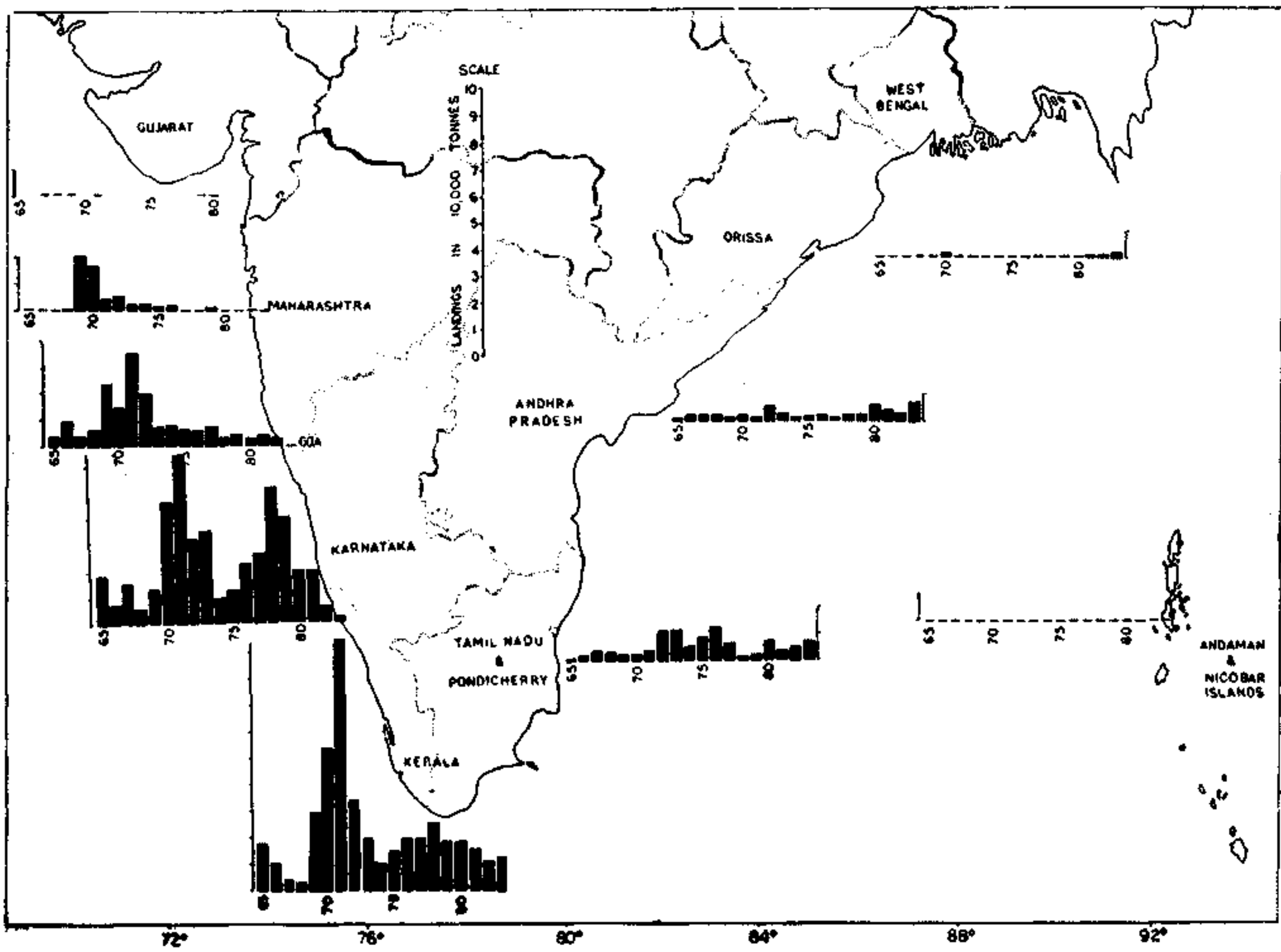

Fig. 2. Statewise mackerel landings during 1965–'83.

coast, also for the first time, with 15,680 and 15,503 tonnes (Fig. 4) forming 50.3 and 49.7% respectively. The percentage contribution from east coast in the previous year also was as high as 31.8. The mackerel production in east coast in 19 years (Fig. 4) shows the

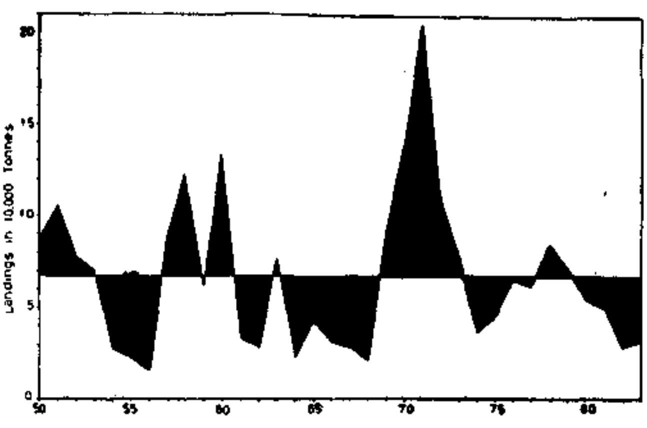

Fig. 3. Fluctuation of all-India annual mackerel production from average landing during 1950–'83.

catches to vary between 2,233 tonnes of 1965 and 16,700 tonnes of 1972. In 1972 when the landing was the highest here in quantity, it formed only 15.3% in the all-India catch. Along the west coast, the catches varied between 15,503 tonnes of 1983 and 1,99,120 tonnes of 1971. The contribution from west coast, however, was 97.3% in 1971 forming the highest percentage in record. Another year of low production in west coast was 1968 with 16,123 tonnes. But it formed 74.3% in country's catch of the year.

During 1965–'83, Karnataka tops with 34.82% (Fig. 5) of the total mackerel production in the country. Kerala closely elbows it with 34.25%. The contribution of Goa in all-India production is 13.35%. States next in order of importance are Tamil Nadu-Pondicherry, Maharashtra, Andhra, Orissa, Andaman & Nicobar Islands and Gujarat; contributing to 7.89%, 4.89% 3.99%, 0.65%, 0.14% and 0.02% of the total catches respectively.

Contribution of mackerel in marine fish production in the country from year to year is given in Fig. 6, and the production of mackerel is not in proportionate pace with the increase in marine fish production. The average annual production of marine fish during 1950–'83 was 958,178 tonnes and mackerel in it formed 66,584 tonnes.

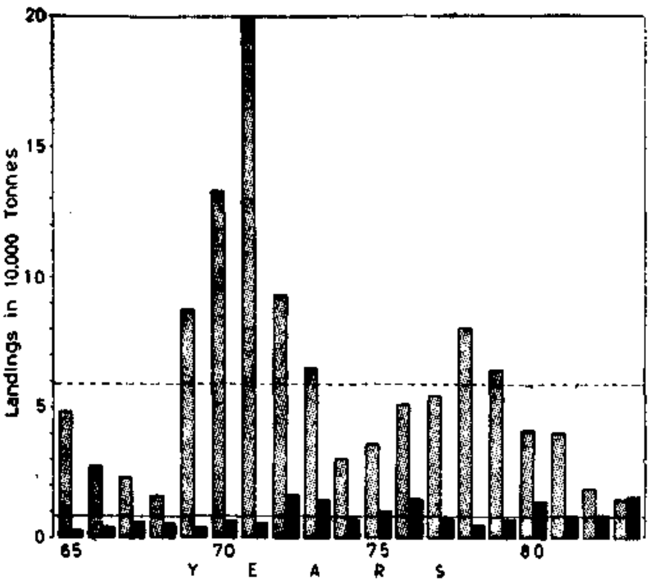

Fig. 4. Annual landings of mackerel in east coast (black bars) and west coast (stippled). The continuous line shows 19-year average in east coast and broken line depicts it in the west coast.

The mackerel contributed to a percentage as high as 19.65 in the total marine fish production in the country in 1951. However, in 1971 when the mackerel catch was the highest, it formed only 17.61% in the year's marine fish landings. During the 10-year period commencing with 1973, the percentage of mackerel in the marine fish catches was low (Fig. 7). Earlier for 8 years starting from 1961 (except 1963) and 3 years beginning with 1954, the percentage of mackerel in the marine fish catches was low. The lowest ever recorded percentage of 1.97 occurred in 1982. The percentage, in fact was 2.29 in 1956 when the catch was the lowest.

The percentage of mackerel in the marine fish catches during 1950–'83 as a whole was 6.95. But on account of persistent low values in recent past, as detailed above, the average percentage in 1965–'83 reduced to 5.69 (Fig. 8).

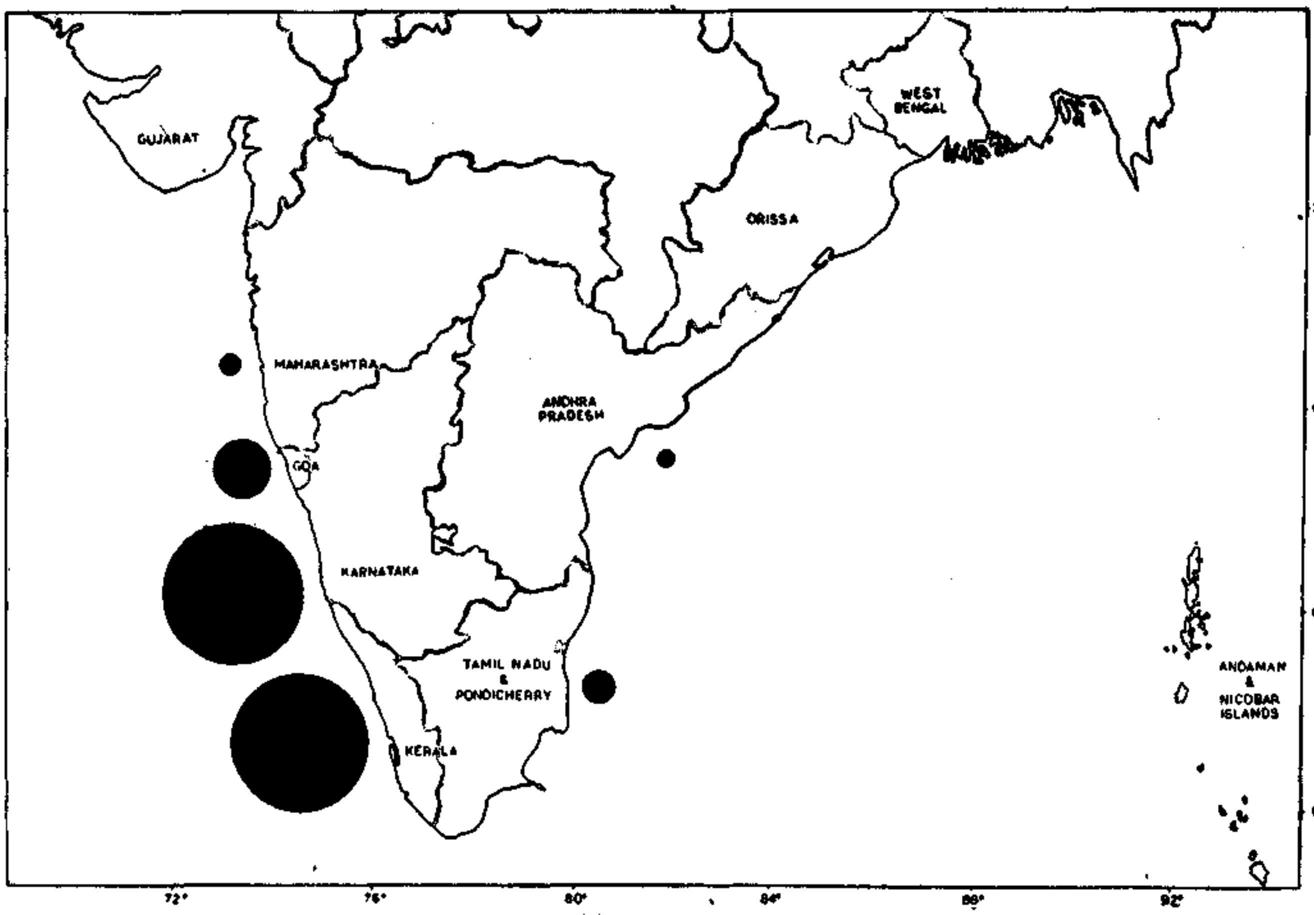

Fig. 5. Percentage of mackerel production by states in the all-India total catch.

The importance of mackerel in the economy of Goa is high as it forms 34.38% in the marine fish catches there during 1965–'83 (Fig. 8). The contribution of mackerel to the total marine fish catches in Karnataka is 23.21%. Mackerel is the only fish that can be claimed as proprietary item of these states in the country.

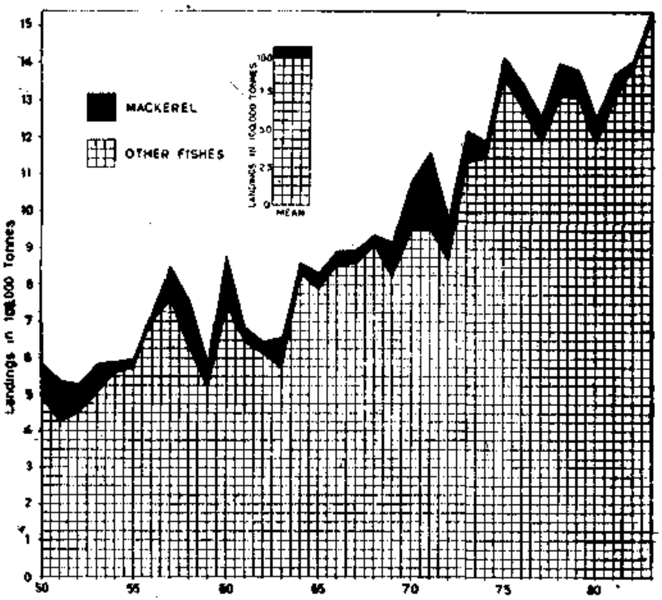

Fig. 6. Mackerel in annual all-India marine fish catches.

In spite of high catches, mackerel in Kerala forms only 6.49% in its marine fish landings (Fig. 8). Huge catches of oil sardine here cause such a situation. In Andaman and Nicobar Islands, the catch of mackerel, though very little in quantity, is worth mentioning as it forms 7.68% (Fig. 8) in the marine fish catch. In other maritime states of the mainland the percentage of mackerel in their marine fish landings is 2.68, 2.62, 1.51, 1.13, and 0.01 respectively in Tamil Nadu-Pondicherry, Andhra Pradesh, Maharashtra, Orissa, and Gujarat.

The mackerel season in the country falls during September–April period (Noble, 1982 a). As the bulk of the landings occurs along the west coast the seasonal distribution on all-India level is only a reflection of what is happening in the west. The fishery, here commences first in the south and late in the north (Noble, 1979). It often peaks in Kerala in September itself. In Karnataka and Goa, though the season commences in September, intense landings occur in October. In Maharashtra, on the other hand, the season commences in October but peaks in November. The peak landing also thus occurs earlier in the south than in the north (Noble, 1979). In the east coast of the mainland, nevertheless the maximum occurs in March–April. But in Andaman & Nicobar Islands, the season is a protracted one the mackerel occurring almost equally in all the months of the year (Noble, 1982 a).

Rastrelliger kanagurta is the species that commercially contribute to the fishery in the country. *R. brachysoma* and *R. faughni* also occur in our waters. The mackerel landed in 1981 and 1982, for instance in Tamil Nadu-Pondicherry consisted of respectively 0.57% and 0.14% species other than *R. kanagurta* (CMFRI, 1982 and 1983).

Mackerels were once caught only in boat seines, shore seines and gill nets operated from indigenous fishing crafts. Of late, mechanised units like purse seines, drift nets and trawls also exploit this resource especially along the west coast. In fact, the purse seine has virtually replaced the indigenous gear in Karnataka and Goa where 78.7% and 90.6% respectively (Fig. 9) of the catch in 1981 were landed by mechanised units (CMFRI, 1982). In Kerala, 75.0% of the catches in the year was still made by indigenous fishing units only. Exploitation of mackerel by mechanised units increased here also in the subsequent year (CMFRI, 1983).

Research high-lights

Advent of mechanised fishing and resultant expansion of fishing grounds, however, have not concurrently improved the landings in the country as a whole and Karnataka in particular. In 1956, when the mackerel catch was the lowest the catch in Karnataka with *Rampani* as principal gear in vogue was 3,177 tonnes (CMFRI, 1969). But with about 400 purse seiners working along Karnataka coast at present, the mackerel catch crumbled to just a low value of 2,182 tonnes in 1983. The highest catch since 1950 in Karnataka was 81,882 tonnes of 1960. In 1957 and 1958 also, when

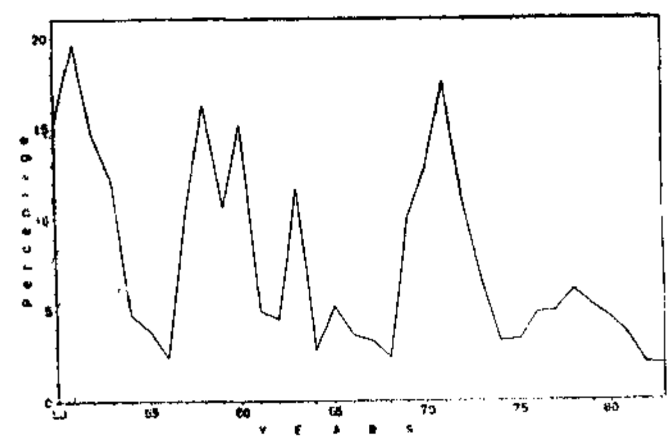

Fig. 7. Percentage of mackerel in annual marine fish production.

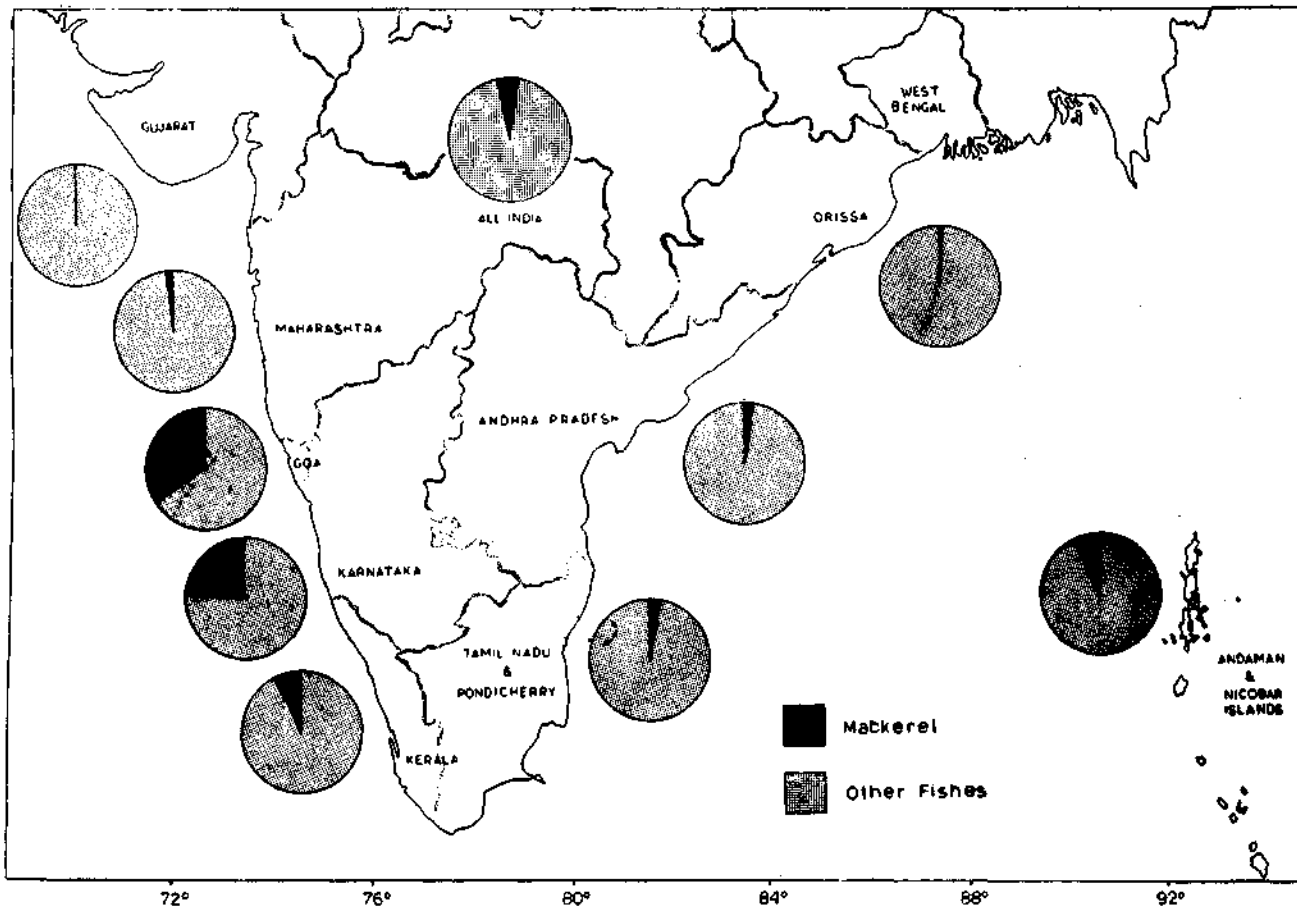

Fig. 8. Percentage of mackerel in marine fish landings of different states, and country as a whole during 1965–'83.

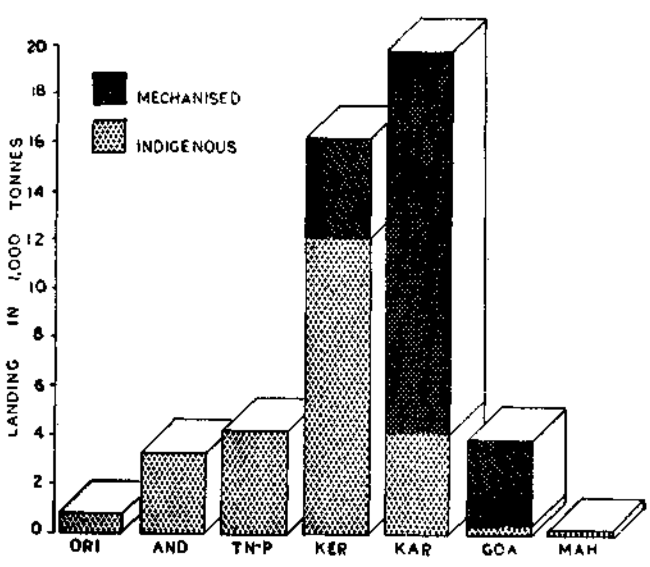

Fig. 9. Statewise landing of mackerel by mechanised and non-mechanised gear in 1981.

Rampani was the gear in command, the catches were as high as 55,754 and 63,365 tonnes respectively (CMFRI, 1969). Since introduction of purse seine in late nineteen seventies, the highest annual catch was only 50,704 tonnes of 1979. The story in Kerala and Goa is also in no way different. The fishery in its 10-year cycle of long term fluctuations (Noble, 1980) presently is on a low ebb, and to crown it, mature fish and spawners seem to be disturbed by the mechanised fishing fleet (Noble, 1982 b).

As already stated, the mackerel fishery in its long term fluctuations shows a 10-year cycle with ups and downs (Noble, 1980), and the current trend, notwithstanding is not encouraging. Whether it is caused by human interference and intrusion into their nurseries or due to fishery independent environmental factors is a matter of much concern. Suspension of fishing by purse seine during June–August, coinciding the supposed spawning period of the fish, however, is a great relief.

The annual stock of mackerel as estimated by Sekharan (1974) is 1,30,000 tonnes. The average production in ninteen seventies being 92,000 tonnes indicated an exploitation around 70% of the stock. The total mortality declaring the death of 94% of stock, in these years was 2.877 (Noble, MS). The fishing mortality (total mortality less natural mortality of 0.9 by Sekharan 1974) is 1.977 and the rate of exploitation becomes 68.7%. Banerji (1973) also computes a rate of 68.3% exploitation for earlier years.

Investigations on the age composition of the commercial catches through length frequency studies reveal the fishery to sustain mainly on a single year class recruited afresh every year. The commercial fishery depends chiefly on fish of sizes 16 to 23 cm in total length. For want of non-selective specific gear a reliable index of its abundance in the sea is, however, lacking; rendering estimates on mortality, stock assessment and exploitation rates a little difficult.

Prospects

Monitoring resource characteristics on the mackerel at present is being carried out when they are already recruited and commercially being exploited. By and large, it imparts some data on the resource and availability of spawners. It is imperative at this juncture to conduct fecundity studies, spawning surveys, eggs and larval studies, young fish surveys, and recruitment studies; involving sophisticated acoustic and aerial devices and remote sensing through satellites. The erstwhile Pelagic Fishery Project at Cochin had done some work on this line for a few years (PFP, 1974) along the southwest coast bringing out quantitative appraisal of the resource ready for recruitment shortly after. Besides, such a study imparts also advance information on the movement of stock and their direction indicating when and where they hit the coast. Fixing up a national target of production is then a feasible proposition, accordingly aiding regulation of annual exploitation avoiding over-fishing and depletion of stock.

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MARINE FISHERY OF WEST BENGAL COAST*

Introduction

West Bengal has a coastline of 120 km spread over the districts of Midnapur and 24 Parganas lying on either side of the mouth of river Hooghly. Marine fisheries here up to fifties were confined to the operation of a few bag nets, shore seines, stake nets and some seine nets. The fishing activities continued for three months in a year from mid-October to middle of January. Fishermen from erstwhile East Pakistan settled in Musidabad and Naidia districts introduced monofilament drift nets in the sixties, and revolutionised the fishing industry. Consequently the fishing season extended from July to March and fishermen belonging to Hooghly and Howrah also started fishing in sea. Mechanisation of countrycrafts with bag nets, drift nets and seine nets followed in seventies and boosted the catch, and people of many other community also came into the fray. Trawling is not yet in vogue, although trawlers based at Vishakhapatnam regularly fish in this coast.

*Prepared by S.S. Dan, Field centre of CMFRI, Contai, W.Bengal.

Fishing bases and landing centres

There are only a few marine fishing villages along West Bengal coast. Fishermen from interior villages, however, come down during season time to coastal areas and establish temporary fishing bases. About eight such bases namely Disha, Jadha, Kharpai and Junput in Midnapur District, and Frazergunj, Bakkhali, Jamboo and Handi Bhanga in 24 Parganas District are usually formed. Normally landings take place in these bases. Apart from them, landings occur at Fatta, Diamond Harbour, Kakdwip and Nambhana in 24 Parganas District. Catches from fishing grounds are transported by mechanised carrier boats and landed.

Fishing crafts

Clinker built boat called *Patia* or *Paukhia* without deck are used for operating shore seine and drift nets and carved built boats called *Salti* with deck made of bamboo splits are used in the operation of bag nets, and *Chot* with deck made of wooden planks and often mechanised with engines varying from 7.5 to 120 h.p. according to sizes are used in the operation of drift nets and seine nets.

Fishing gear

1. *Bag net*

(a) *Behundi jal:* There are different types of tackles under this group. They are operated against current to catch fish through filteration. Nets meant for bottom and surface differ in their design and mode of operation. When some are used for fishing throughout the year, others are restricted to seasons. There are types earmarked for fishing according to lunar phases.

The fishes caught in *Behundi jals* are sciaenids, anchovies, *Thrissocles, Setipinna, Coila, Harpodon nehereus, Parapenaeopsis* sp., *Metapenaeus* spp., *Acetes* sp., and squids.

(b) *Panch kati cool jal:* This is also a conical net fixed against the current with the help of five bamboo poles and hence the name. Presently this is found only at Junput and it is used for fishing in spring tide throughout the year. Catches are similar to that of *Behundi jals.*

2. *Drift net*

Locally known as *bhasani* or *chandi jal* are now in extensive use at Digha, Saula, Junput, Bakkhali and Frazergunj. Decron is used for making the net at all places except Digha where tyrecord forms the raw material. Drift nets operate for about 10 days a month from June to September and 20 days a month from October to March depending on weather conditions. Catch by the drift nets constitute mainly of *Hilsa ilisha, Scomberomorus guttatus, Stromateus argentius, Arius* spp. and *Osteogeniosus militaris.* There are about 150 non-mechanised and 380 mechanised units with decron nets and about 70 mechanised units with tyrecord nets in this coast.

3. *Seine nets* ('Kachal')

Six country crafts with the net and a mechanised boat make one unit. The boat tows the country crafts to the grounds searching for *Hilsa.* When shoals are sighted, they are soon encircled by the net, and the foot rope is pulled up and made into a bag with the fish in. Soon after hauling, the fish is taken to Diamond Harbour or Calcutta. Apart from *Hilsa,* cat fish, pomfret and seer fish are also caught in this net. The operation of this net is restricted to October–February period. There are about 40 units based along the coast of Midnapur. The average annual catch per unit is 20 tonnes.

4. *Shore seine* ('Sarini')

The shore seines are used only at Digha and Chandpur area. There are about 44 units and the average annual catch per net is 20 tonnes. The fish caught are mainly sciaenids, *Thrissocles, Setipinna, Coilia,* juvenile pomfrets, *Leiognathus*, polynemids and cat fishes. Sometimes the cat fish are caught in shoals.

Constriants in fishing activities

Bulk of the catch in the coast come through mechanised sector. But lack of berthing and mooring facilities stand in the way of expansion of fishing fleets. Boats are anchored in the open waters and catches transferred to canoes and ferried to the shore especially at Digha, Junput and Frazergunj. Same difficulty is faced to take provisions, fishing implements etc. to the boat. In none of the landing centres there is adequate jetty facility. Construction of jetties is therefore an immediate need.

A number of boats anchored in the sea are lost every year during rough weather that suddenly bursts. Canals in the area are silted and not suited for navigation. If bar mouths of the canals are periodically dredged and kept good for passage, most of them can form safe bases for fishing vessels and more people will venture forward to invest in fishing. Landmarks with signal lights in the bases are lacking now and their installation will assist navigation particularly at night.

Jadha, the largest fishing base of the coast is not connected by road. There is no cold storage or ice factory near about. As a result the catch is sun dried on beach when scarcity for fresh fish is acute in the nearby Calcutta market. At present there are only three small ice factories with a total installed capacity of 37 tonnes and it is too meagre to meet the needs of the area. An ice plant with cold storage facility in a central place like Balisai will boost the industry. Proper approach roads are also lacking. Drying fish on bamboo mats or on cement platforms will improve the quality of the products. Facilities for this now not available should also be developed without fail.

Frazergunj and Bakkhali, where 242 mechanised boats operate do not have a workshop near about. The vessels are to be taken to Calcutta for even small repairs at the expense of many fishing days and money. Establishment of a full-fledged workshop will step up fishing days and increase production.

A couple of years ago, a few 9.6 m Tamil Nadu trawlers were supplied to different co-operative societies by the Government of West Bengal. But from the beginning they have been used either as gill netters or carriers. Trawling is never tried here by the fishermen. It would be helpful if Government train up local fishermen in it and encourage trawling.

THE *DISCO VALAI**

The *dico vali* (disco net) is an adaptation of the triple-walled entangling net, the trammel net, which, in India, has hitherto been confined to reservoir and estuarine fisheries. Recently (July, 1984) it has been introduced in the sea in Tamil Nadu, especially, in very large numbers, in Kanyakumari District, very successfully to entangle prawn. Never before in recent years were the fishermen of Kanyakumari district so fascinated with a particular type of net as with *disco valai* (or dance valai, as they sometimes call it). That thousands of these nets have been sold within a period of a month in the district is unprecedented, and stands proof to the impressive performance of the gear so far. This net has become a threat here to the existence of the prawn gill nets *(ral valai)* which had dominated the small-scale prawn fishing scene till now, for the prawn gill nets are being hastily transformed into *disco valai* by executing the essential changes in them. As this report is being prepared in August, 1984, the net has spread to the southern tip of Kerala coast (Trivandrum district) also in good numbers. Information on the net for this report was collected from fishing villages in Kanyakumari district.

*Prepared by Jacob Jerold Joel, Vizhinjam Research Centre of CMFRI, Vizhinjam and I. P. Ebenezer, Field Centre of CMFRI, Kanyakumari.

Disco valai is tri-walled and designed to be set at the bottom. It has a fine net of smaller meshes hung loosely between vertical walls of coarser net of much larger meshes so that fish passing through the outer wall carry some part of the finer net through the wall of the other side and are entangled in the pocket thus formed. Though mainly operated for prawn, this net also pockets other crustaceans, molluscs and fishes that move near the bottom of the sea. Gilling of larger fishes in the outer walls has also been reported.

The inner wall which has 4,500 horizontal and 72 vertical meshes of 20 mm bar is made of nylon twine (No. 1/2). The outer walls made of No. 2 nylon twines have 583 horizontal and eight vertical meshes of 135 mm bar. The webbing in both are rhomboidal. Polyethylene ropes (4 mm diameter) constitute the float line, the sinker line, the buoy rope, the pull rope and the mounting lines which form an integral part of the net. The head rope proper 100 m in length is formed of two ropes, the float line and the mounting line. Likewise, the foot rope, 100 m in length, is also comprised of two ropes, the sinker line and the mounting line. The floats numbering 168 in all are synthetic and round (50 mm diameter and 10 mm thick). The sinkers (500 numbers) are lead and barrel-shaped (20 mm long, 15 mm and 10 mm thick at the centre and sides respectively), each weighing 20 g.

The inner netting is hung from the mounting line of the head rope whereas the outer walls are tied at their upper and lower extremities to the inner wall two to four meshes away from the mounting lines. The floats are passed through the float line. The mounting and the float lines are rigged by rigging twines at intervals of 20 cm and 40 cm alternately, with one float in each 20 cm interval. Similarly the sinkers have been fixed on the sinker line by rigging the mounting and the sinker lines at regularly repeated intervals of 2 cm and 18 cm with one sinker in each 2 cm interval. Two granite stones, each weighing 1/2 kg are tied to each end of the foot rope to anchor the net in position. A marker buoy (alkathene jerry-can of 10 litre capacity) is attached to the buoy rope (40-45 m in length) which is the continuation of the head rope. This is used to locate the position of the gear in operation. The proximal ends of the head and the foot ropes are continued 3 m from each side, united at ends and prolonged further as the pull rope of 40-45 m length.

The proportion of the mesh size of the inner wall of the net to the outer is 1:6.75. The horizontal hanging coefficient of the inner wall is 0.55 and the outer 0.63. The required slackness of the inner wall to facilitate entanglement of the fish is effected by the relatively shorter distance between the upper and lower lines of attachment of the outer walls.

A net with 100 m-long head and foot ropes normally has a depth of 2.5 to 3 m. The length of a net is usually mentioned in the fishing villages in terms of the number of sinkers it has, say, a net with 500 sinkers, one with 750 sinkers and so on. While a net with 500 sinkers is common, those with sinkers up to 900 are also in use. The spacing in between floats and in between sinkers is uniform in different nets, but the length and depth vary, the latter being seldom more than 3.5 m.

The net at present is operated from catamaran of any length by one or two persons at depths up to 35 m.

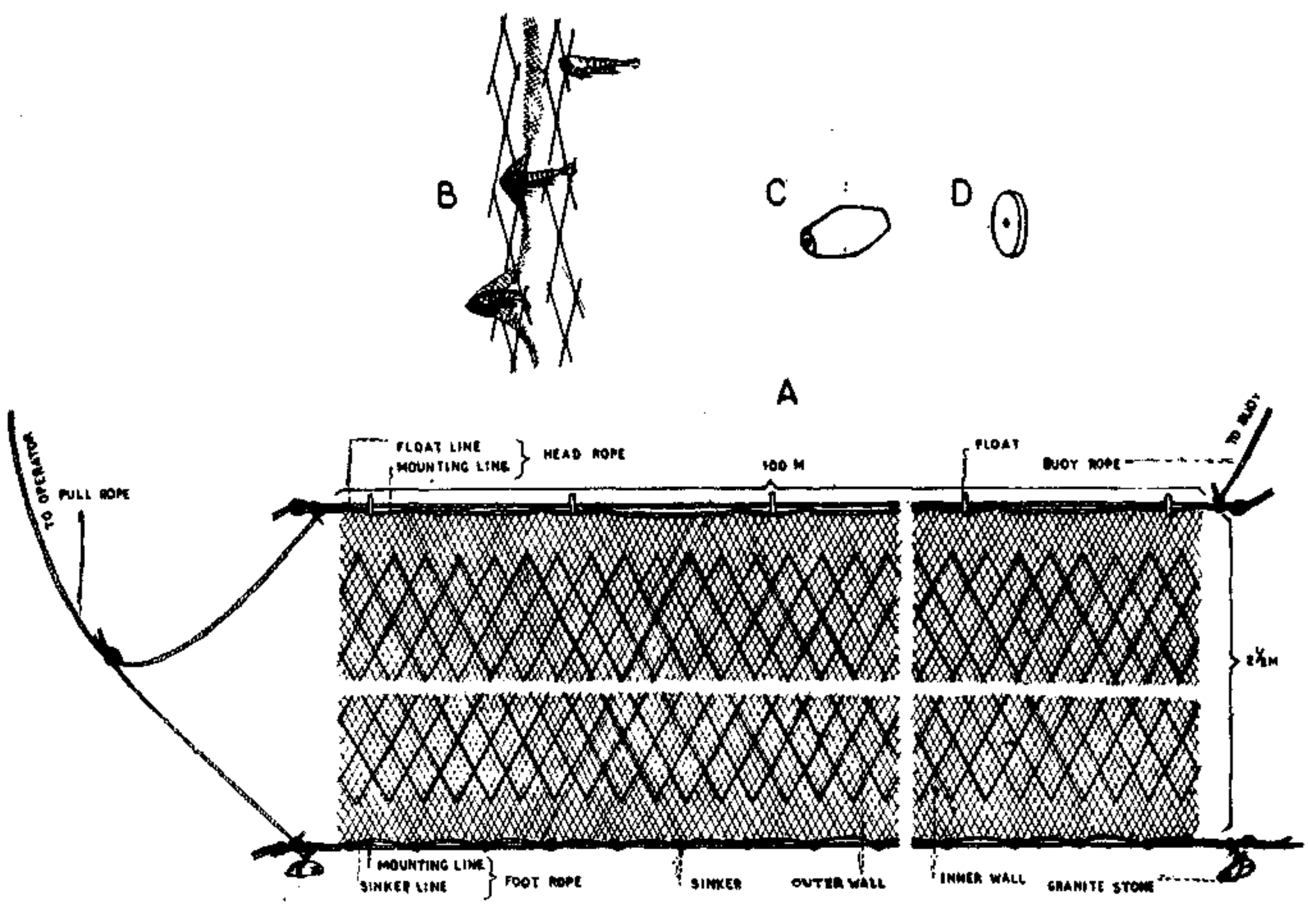

Fig. 1. (A) Design of a *disco valai*, (B) Mode of entanglement of prawn, (C) Sinker, and (D) Float.

The mode of operation is like that of any other bottom-set net.

At the time the net was introduced in Kanyakumari District during July 1984, a net with 500 sinkers cost about Rs. 1,355/- the approximate price details being:

5 kg polyethylene rope (4 mm dia.) @ Rs. 30/- per kg — Rs. 150.00
2.5 kg webbed (20 mm bar mesh) nylon twine code No. 1/2 @ Rs. 170/- per kg — Rs. 425.00
1 kg webbed (135 mm bar mesh) nylon twine code No. 2 @ Rs. 140/- per kg — Rs. 140.00
10 kg lead sinkers (20 g each) @ Rs. 25/- per kg — Rs. 250.00
170 synthetic floats (50 mm dia., 10 mm thick) @ Rs. 0.40 per piece — Rs. 68.00
1 alkathene jerry can (10 litre capacity) — Rs. 22.00
Labour charges — Rs. 300.00

But as the demand for the net is increasing day by day, the price of all components of the net has hiked up to 15% by August 1984, the net now costing Rs. 150/- to Rs. 200/- more than a month ago, especially, as fishermen from neighbouring Kerala State, who are unfamiliar with the know-how of its making, rush to Kanyakumari District to procure this net. The increase in price, however, does not seem to deter anyone from buying it since the intended catch is the highly priced foreign exchange earner, the prawn.

BIOACTIVITY IN ECHINODERMS*

Man in his pursuit for knowledge of newer and better drugs for eradicating diseases to which he is prone to has turned to the sea, which is a more potential treasure house of drugs due to its vast and diverse range of marine life. Many marine organisms exhibit toxicity as well as bioactivity. Some are toxic and lethal to terrestrial animals as well as to the man. These contain hitherto unknown chemical compounds which are pharmacologically active either against cancer, bacteria, virus, worms, ulcer, fertility, pains, cough and spasms, high and low blood pressure or promoting or inhibiting growth. In the recent years marine organisms are being screened for these activities and the causative chemical compounds isolated and studied in detail.

The Phylum Echinodermata consists of sea cucumbers (holothurians), star fishes and sea urchins. These are known for their toxicity. Primitive man used bits of some species of holothurians to stupefy fish from rocky pools and catch them. Some species of sea cucumbers are known to produce nausea to man when eaten. Baughinan (1951) had reported that crude star fish meal contained factors which inhibited growth of chicken. Hippocrates (Halstead, 1956) stated that ingestion of sea urchin may produce diarrhoea. Fürth (1903) quotes an old record that dogs and cats died from eating cooked starfish. The pedicellariae of sea urchin *Tripneustes gratilla* have been reported to produce swellings of the lips or mouth in Japan and that the ovaries of this urchin also produce the same reaction if they are not sufficiently washed before consuming (Yoshiro, 1979). It is also reported that dried starfish meal has long been used for extermination of harmful insects and fly maggots in Hokkaido and they have found that this meal inhibits ecdysis of fly maggots. The ovaries of the sea urchin, *Paracentrotus lividus* during their reproductive period are as lethal as puffer poison and the ovaries of the white sea urchin, *Tripneustes ventricosus* produce severe allergic symptoms when eaten.

The toxicity in a few holothurians to fishes has recently been studied by Bakus (1974) and by Bakus and Green (1974). They have found that the toxicity is inversely related to latitude. James (1980) has tried the toxin of *H. atra* to eradicate undesirable organisms from fish farms successfully at Mandapam.

This report deals with the results of the screening of 10 species of echinoderms collected from Gulf of Mannar area for biotoxicity to fishes and mice and also

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for hemolytic activity. Of the 10 echinoderms, five were holothurians, viz. *Holothuria atra, H. scabra, H. spinifera, Bahadschia marmorata* and *Actiuocucumis typicus;* three star fishes, *Pentoceraster regulus, Astropecten indicus* and *Goniodiscaster scaber;* one sea feather, *Tropiometra carinata,* and one sea urchin, *Stomopneustes variolaris.*

The specimens were collected, and the bioassays for toxicity and hemolytic activity were started within one hour of collection. For each bioassay, 2 g of the part of the animal to be tested were extracted within boiling ethanol, solvent removed and the residue was dissolved in either sea water or distilled water or phosphate-buffered saline at pH7 depending on the type of assay involved such as fish toxicity, mice toxicity or hemolytic activity respectively. The parts of the animal used were body wall, viscera and cuverian tubules according to availability. In some cases, where weight of a part was not sufficient, the part available was used and the weights taken were naturally less for each bioassay. For fish toxicity, *Chanos* (average size 96.5 mm and average weight 6 g) and *Tilapia* fingerlings (average size 40 mm and average weight 0.9 g), were used. In the case of holothurians, the washings obtained, by cleaning the animal with sea water, was tested for biotoxicity for fish namely *Chanos, Tilapia* and cuttle fish (*Sepia* sp., average size 10 mm).

In the case of bioassays for toxicity on mice, 1 ml solution of the ethanolic extract residue dissolved in 10 ml of distilled water was injected intra-peritoneally into white (albino) mice of average weight 20 g. Hemolytic activity was studied with rabbit blood erythrocytes in phosphate-buffered saline at pH7 at 37°C using colorimetry. In all cases of bioassays, controls and blanks were maintained simultaneously with each experiment.

The results showed that all the parts of *Holothuria atra H. spinifera* and *Behadschia marmorata* exhibited a high degree of toxicity to fish fingerlings and mice and also destructive action on erythrocyte cells. The cuverian tubules of *B. marmorata* seemed to be highly toxic to *Chanos* and *Tilapia* fingerlings. These also showed strongest action on erythrocyte cells.

All organs of *H. atra* and *B. marmorata* were highly lethal and toxic to *Chanos* fingerlings while those of *H. scabra* and *H. spinifera* were less toxic. It was found that the toxin from the echinoderms *Actinocumis typicus, Pentoceraster regulus, Tropiometra carinata* and *Astropecten indicus* were only mildly toxic and were not lethal whereas *Goniodiscaster scaber* and *Stomopneustes variolaris* did not contain any substance toxic to *Chanos.* The action of the echinoderm extract on *Tilapia* fingerlings was more or less the same as for *Chanos.* Here also *H. atra,* and *B. marmorta* were highly toxic and *H. scabra* and *H. spinfera* were less toxic. The only change noticed was that for all other species of echinoderms tested, *Tilapia* continued to show normal behaviour. This may be due to the fact that *Tilapia* is more sturdy and resistant to changes in environments (except temperature) than is *Chanos.*

It was found that the toxins were water soluble from the fact that the aqueous washings showed similar toxicity to fishes. An interesting feature noted was that whereas the alcoholic extract of *A. typicus* did not show any lethality to *Chanos,* its aqueous washings showed clearly that this echinoderm contains water soluble and alcohol insoluble toxin which is concentrated in the body wall. Another interesting phenomenon noticed was that even the non-toxic and weakly toxic echinoderms (to *Chanos* and *Tilapia* fingerlings) were toxic and lethal to *Sepia* fingerlings except the star fish *Stomopneustes variolaris. Sepia,* thus seemed to be the most sensitive of all test fishes used.

The mice bioassay, showed that only two species of echinoderms, viz. *H.atra* and *B.marmorata* were toxic and lethal to mice.

All the echinoderms exhibited hemolytic activity thereby giving the true index of toxicity as the action is on the primary cellular level. The gradation of toxicity is brought out clearly by this assay. The gradation from strongest to weakest toxic species is *H. atra* (body wall and viscera), *B. marmorata* (body wall and cuverian tubules), *H. spinifera* (body wall and viscera), *H. scabra* (body wall), *P. regulus,* (body wall), *A. typicus* (body wall), *A. indicus, H. scabra* (viscera), *P. regulus* (viscera), *S. variolaris* (viscera), *G. scaber, T. carinata* and *A. typicus* (viscera).

Further detailed chemical investigations aimed at isolation and characterisation of the bio-active compounds present in these species are in progress.

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FISH FOOD POISONING AT BALLY, HOWRAH*

On 17-6-1984, in the morning, a trader brought a basket of puffer fish *(Tetradon* sp.) to Ghoshpara, Bally, about 10 km from Howrah railway station and offered the fish for sale at the rate of Rs. 4/- per kg. The fish was quite new to the place. After the heavy rains and floods in the area from the end of first week of June there was a sudden hike in the price of fish in the market and the poor and middle class families were starved of fish. Therefore there was great demand for the puffer fish offered at a low price. Quite unaware of the death trap, about 49 families in the surrounding areas bought the fish. According to the information collected from the victims, some of the fish contained matured eggs. The fish were cooked after peeling off the skin. The eggs as well as abdominal fat were fried-in some cases with powdered gram ('basan'). The fish being cheap, each person consumed 75-100 g of flesh with their mid-day meals.

From 2 P.M. onwards fish food poisoning victims from all castes, age groups and from both the sexes started pouring in at Uttarpura General Hospital, about 2 km from Bally (Tables 1 & 2). Altogether 101 victims arrived in the same day, out of which, two were declared dead on arrival. The rush of the victims was so heavy that the doctors could not cope up with recording symptoms of individual cases.

The general symptoms were uneasiness, giddiness and loss of general senses. According to the symptoms, effect of the poison was neurotoxic acting on central nervous system. Vomiting was reported in a few cases, and those who vomitted suffered less and did not die. Those who were more affected appeared to have eaten more or eaten on empty stomach. On the following day, i.e. 18-6-1984 another 23 pessons were also admitted to the hospital. The admissions on the second day were more out of fear among people after the spread of fish food poisoning news. All were released from the hospital on 19-6-1984. It appeared that almost all the people who ate the fish turned upto the hospital. Majority of the victims were within 20 years of age. An age-wise analysis of the victims was: upto 20 years (68); between 21 & 50 years (49); and between 50 & 80 years (7).

There was acute convulsion in one case, and an unusal high dose of four calmpose injections within 15 minutes were administered to save the patient. The following treatment was prescribed in all the cases.

1. Dextrose 5% I.V.
2. Atropine
3. Decadron
4. Coramine
5. Calmpose

Besides the two brought dead to the hospital on 17th June, five others died in the hospital on the same day after receiving treatment for a short period as indicated in the table. Out of the seven persons dead, four were from the same family at Coomillapara and the other three were from two families at Ghoshpara. The dead persons were of different ages, from four year old child to 50 year old man. In a family of eight persons, seven survived after treatment but a child succumbed.

* Prepared by S. S. Dan, Field Centre of CMFRI, Contai, W. Bengal.

Table 1. *Number of families and victims in different localities of Bally, affected by eating puffer fish*

Locality	No. of families	No. of victims	Males	Females	Children within 12 years	No. dead	Remarks
Nischinta colony	2	5	3	2	3	—	—
Coomillapara	7	21	12	9	8	4	four dead from same family
Shyamaprasadpally	2	6	4	2	2		—
Ghoshpara	20	55	33	22	17	3	three dead from same family
Santinagar	2	8	4	4	4	—	—
Ma Saradapally	4	8	3	5	3	—	—
Ramachandrapur	2	4	2	2	1	—	—
Shrinagar colony	1	1	—	1	—	—	—
Sapripara	2	2	—	2	1	—	—
Anandanagar	2	2	—	2	—	—	—
Motinagar colony	5	12	8	4	3	—	—
TOTAL	49	124	69	55	42	7	

Table 2. *Particulars of victims who died after eating puffer fish*

Name of victim	Locality	Age	Sex	Date & time of hospitalisation	Date & time of of expiry	Remarks
Dulal Das	Coomillapara	20	M	17-6-1984 1455 hrs	17-6-1984 2040 hrs	Fell sick in hospital, giddiness, pulse subnormal, pupil reacting to light. No loss of consciouness.
Jiban Das	-do-	50	M	17-6-1984 1500 hrs	17-6-1984 1600 hrs	Symptoms not recorded.
Kachi Das	-do-	18	F	17-6-1984 1500 hrs	17-6-1984 17 hrs	-do-
Sambhu Das	-do-	22	M	—	—	Brought dead to hospital.
Prabir Bose	Ghoshpara	17	M	17-6-1984 1430 hrs	17-6-1984 1525 hrs	Symptoms not recorded.
Geeta Bose	-do-	35	F	—	—	Brought dead to hospital
Bapi Sarkar	-do-	4	M	17-6-1984 1915 hrs	17-6-1984 1925 hrs	Brought unconscious.

Shri Dulal Das of Coomillapara aged 20 brought all the other four members of his family to hospital who had developed poisoning symptoms. But after arriving in the hospital he suffered from dry tongue, chocked voice, subnormal pulse and pupil reacting to light but without loss of consciousness. He expired after 5 hrs 45 mts of hospitalisation after receiving treatment as mentioned above. Three other members died in the same family.

All the victims contacted, reported that the fish was not at all tasty. There was burning sensation as the fish passed through oesophagus. One Shri Bipul Bose was served with fish eggs and body fat fried in oil with his meal. As he felt the burning in the throat while swallowing and no taste for the fish, he did not take a second gulp of the egg and far or the flesh. He did not die, but had to be hospitalised along with other members of his family where his wife and a son succumbed. This showed that not only the flesh but eggs and oil of puffer fish were equally poisonous.

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