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Government of India
Central Institute of Fisheries
Nautical & Engineering Training
Dewan's Road,
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THE POTENTIAL MARINE FISHERIES RESOURCES AND POSSIBILITIES OF EXPLIOTING THE SAME TO INCREASE MARINE FISH PRODUCTION

By

P. S. B. R. JAMES *

INTRODUCTION :

Marine fish production from the presently exploited fishing grounds remained somewhat stagnant, the average annual production for the past five years (1980-85) being 1.46 million tonnes. Therefore, it is imperative that additional production should come only by extending the fishing effort beyond the presently exploited zone and from under-exploited resources.

The EEZ of India has an estimated area of 2.02 million sq. km. Extensive surveys and studies in the past decade or so indicated the existence of several untapped as well as under-exploited resources. Efforts are now needed to harvest these resources on an economic basis to increase fish production in the country.

THE POTENTIAL RESOURCES :

The present fishing operations are mostly confined up to a depth of about 50 m. Within this area, some of the under exploited resources can yield additional catches. Areas beyond the 50 m depth, over the outer continental shelf, the continental slope and the oceanic regions are known to harbour marine resources, which if judiciously exploited, can yield very high catches. Thus, the annual potential yield of pelagic, demersal, crustacean, cephalapod, oceanic and other resources (Figs. 1 and 2) from the EEZ have been estimated at about 4.5 million tonnes (George *et al.*, 1977).

Pelagic resources: The oil sardine and mackerel are heavily exploited in the inshore area but it is known that only a fraction of these resources are traditionally exploited since the total stock does not enter the fishing area (Anon, 1976 and Balan *et al.*, 1979). Besides these resources, there are a number of other groups of fishes like the anchovies, ribbon fish and carangids which promise very high yields (Fig. 3) outside the present fishing zone at depths varying between 20 and 75 m (Anon, 1976, Devidas Menon and George, 1975 and Narayana Rao *et al.*, 1977). While the anchovies are concentrated along the south west and south-east coasts between 20 and 50 m depth, the others are found almost throughout the east coast. Of the estimated potential pelagic resources, 66% is expected to come from west coast and 34% from the east coast.

Demersal resources : The demersal fisheries resources are estimated to yield about 1,095 million tonnes (Fig. 2). Pomfret, catfishes, perches and sciaenids constitute the most important groups (Fig. 3). Of the estimated potential of 310,000 t of catfishes, about 65% of the catches are expected to come from west coast and 35% from the east coast. South west coast is expected to yield better catches than other areas. Perches are estimated to yield 250,000 t, of which 65% would come from the west coast and 35% from the east coast. The sciaenids have a potential of 210,000 t, mostly from north-west and north-east coasts. On the whole, of the total demersal resources, about 55% is expected from the west coast and 45% from the east coast. The depth zone 0-50 m has a slightly higher potential (56%) than 50-200 m zone (44%).

Crustacean resources : The increased catches of shrimp in future are expected to come mainly from the north-eastern region and from depths beyond 50 m depth. The increases from non-penaeids, crabs and lobsters would be limited.

* Director, Central Marine Fisheries Research Institute, Cochin-682 031.

The deep water prawn and lobsters offer some scope for increasing production but their commercial concentrations on the west and east coasts of India are yet to be assessed. Information on the deep-sea crustacean resources along Indian coasts beyond the littoral zone was meagre till planned deepwater suveys were organised by the Central Marine Fisheries Research Institute and the Indo-Norwegian Project (now the Integrated Fisheries Project) since the middle of sixtees. The exploratory fishing carried out by the vessels R. V. VARUNA, M. V. KLAUS SUNNANA, M. V. TUNA and M. V, VELAMEEN on the 'Shelf edge' and upper continental slope (100-500 m depth) along the southwest and southeast coasts between 1965 and 1979 have indicated immense potentialities for prawns and lobsters which could be exploited on commercial scale (Silas, 1969; Mohamed and Suseelan, 1973; Suseelan, 1974; Oommen, 1980, 1985). As a result of these surveys an area of about 5000 sq. km extending from Ponnani to Quilon on the west coast and 725 sq. km in the Gulf of Mannar on the east coast are found to be suitable for trawling and productive for the crustaceans especially at depths between 250 and 400 m in the former and 180 and 360 m in the latter regions. Of this, the area lying between Quilon and Alleppey, which is generally referred to as "Quilon Bank", is the widest Bathymetrically (3300 sq. km) and harbours maximum concentration of the crustacean resources. In the Gulf of Mannar, the deep-sea trawling ground is a narrow belt lying between 25 and 40 km away from the coast line. The potential of the deep-sea resources from the upper continental slope off the southwest coast of India is shown in Table 1.

The deep-sea prawn resource of the southwest coast, estimated to be about 5300 t (Mohamed and Suseelan, 1973), is chiefly constituted by *Heterocarpus woodmasoni, H. gibbosus, Parapandalus spinipes, Aristeus semidentatus, Penaeopsis rectacuta and Solenocera hextii* (Plate I). Among these, *A. semidentatus, S. hextii* and *H. gibbosus* are fairly large in size (140-185mm total length) and together contribute an average of about 18% of the total shrimp catch. The other species are smaller varieties (55-135mm), of which *H. woodmasoni* is the most dominant. Maximum abundance of prawns along the coast is observed in the "Quilon Bank" and off Ponnani between 300 and 400m depth (Fig. 4). The catch so far realised, potential resources and productive grounds of important species are shown in Table 1. On the southeast coast, no significant resources of deep-sea prawns have been encountered during the exploratory survey.

The lobster resource from the deeper waters (Table 2) is exclusively constituted by a single species, namely *Puerulus sewelli* (Plate I), which grows to a maximum size of about 190 mm total length. Although this species occurs throughout the southwest and southeast coasts, commercial concentration has been located in the "Quilon Bank", off Ponnani and Colachel and off, Mandapam in the Gulf of Mannar (Fig. 5). The maximum density is noticed between 180 and 270 m depth on both the coasts. Oommen (1980, 1985) estimated a potential resource of 12, 941 t from the southwest coast and 1860 t from the Gulf of Mannar for this species.

Cephalopod resources: The cephalopods are at present exploited only as by-catches from trawlers. Oceanic squids offer high potential for exploitation. Investigations so far carried out indicate that the oceanic squids constitute one of the major resources of EEZ (Fig. 3).

Oceanic fish resources: Only a fringe of this resource is at present exploited. While tunas constitute the major resource, pelagic sharks, dolphin fish, bill fish, wahoo, lancet fishes form the by-catches in the tuna fishing (Silas *et al.*, 1982) The total oceanic fish potential in the EEZ is estimated to be about 500,000 t (Fig. 3).

Deep sea fish resources: The deep-sea fishes form the major portion of the demersal catches from the upper continental slope off the southwest coast (Plates II & III). They are found in maximum abundance at 300-450m depth in the "Quilon Bank". The common species contributing to the catch are *Chlorophthalmus agassizi, Cubiceps natalensis* and *Epinnula orientalis*. From the estimates made by Silas (1969) the potential resource of the bathypelagic fishes for the region between lat. 7°N and 15°N works out to 35,891 t at 180-450m depth. The sustainable yield at 60% level is estimated to be about 21, 575 t (Table-3).

Other resources: Several non-conventional resources offer scope for development. The mesopelagic myctophids, balistids and bathy pelagic macrurids, stromateoids and granadiers are known to be abundant in the EEZ (Tholasilingam *et al*,. 1964 and Somavanshi and Joseph, 1983). The bull-eye and the Indian drift fish offer great potential, especially off the east coast upto 500m depth (Somavanshi and Joseph, 1983).

EXPLOITATION OF POTENTIAL RESOURCES:

The pelagic resources can further be exploited by encouraging motorisation of the traditional crafts. The traditional driftnet fishery with country craft which was very effective, dwindled due to progressive mechanisation. The heavy catches for fishes like seer, pomfret carangids, wolf-herring, sharks, hammerheads, etc, should be brought back in suitable areas through necessary incentives and encouragement The purse-seine fishery should operate beyond the 20 m depth off Kerala and Karnataka coasts and should be effectively regulated for judicious exploitation of the pelagic resource. Operation of purse seines beyond 50 m is expected to be effective for pelagic stocks including tunas. The immediately available resources of white bait should be exploited off the southwest and southeast coasts. Indiscriminate capture of spawners and young fish should be controlled through mesh regulations and restriction of fishing seasons'. This is essential in the long range programme of conservations and further development of the resources.

Production of the demersal fisheries resources' could be increased by introduction of medium size trawlers to operate in depths ranging between 20 and 50 m, especially for resources like perches, catfish and sciaenids. Similarly, large trawlers can profitably operate in the outer shelf and the Wadge bank areas. The destruction of young fish by shrimp trawlers, dol nets and purse seiners and wastage of fin fish from large shrimp trawlers should be avoided and utilized properly for increasing production. Capture of breeding stocks like those of catfish should be regulated.

While the inshore shrimp catches should be stabilized and managed, the deep sea crustaceans should be exploited by large shrimp trawlers.

The cephalopod resources are at present not exploited by direct methods meant for them. Introduction of appropriate methods in the depth zone upto 50 m is expected to yield about 50,000 t of this under exploited resource. A vast potential of about 130,000 t cephalopods in the outer continental shelf (50-200m) awaits exploitation by modern methods specially designed for them. Considerable potential for oceanic squids has been identified in the open ocean.

Exploitation of known tuna resources by purse-seines in suitable areas is expected to increase the catches of coastal species immediately. Use of fish aggregating devices in oceanic island areas is likely to augment tuna catches. Improvements to pole and line fishing method, intensification of long-lining and purse-seining are called for to extend tuna fishing into the open sea. These methods also go a long way to harvest by-catches which include pelagic sharks, dolphin fishes, bill fishes, etc.

CONCLUSIONS :

Although marine fish production from the presently exploited zone has been stagnant for more than a decade now, a marginal increase is still possible from this area from the under - exploited resources like anchovies, ribbon fishes, catfishes, sciaenids, perches and threadfin breams.

Since no substantial increases are expected from the prawn fishery of the inshore area, better management is called for, for conservation of these resources. The purse-seine fishery off the west coast needs control and diversification for the twin purpose of increasing fish production through exploitation of offshore resources like tunas and related fishes and for economic returns by avoiding glut situations created due to heavy pressure on inshore and coastal resources.

Yet another method of increasing fish production on a long term programme is through ban on capture of juveniles and young fishes which are now indiscriminately destroyed by direct methods such as *'nonnavu'* fishery along the southern Kerala coast and by indirect methods when they are caught in shrimp trawlers and dol nets in inshore region and large trawlers in offshore region which discard them at sea for want of free board space and economic returns.

At present the fish catches are obtained from the inner continental shelf. The middle and outer shelf, continental slope and the oceanic region beyond remain virtually unexploited. Fish production, hopefully, can be increased by exploiting the resources of these areas.

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Table-1 Resources of Important Species of Deep-Sea Prawns along the Southwest Coast of India (100 – 450 m depth)

Important species	Quantity fished by exploratory vessels till 1979 (tonnes)	Estimated potential resources (tonnes)	Productive areas
Heterocarpus woodmasoni	31.8	2120	Lat. 8°40'N–9°20'N Long. 75°35'E–76°00'E 300–400 m depth
H. gibbosus	5.3	339	Lat. 8°50'N–10°50'N Long. 75°00'E-75°50'E 300–400 m depth
Parapandalus spinipes	15.4	985	Lat. 8°40'N–9°10'N Long. 75°35'E–76°00'E 250 – 400 m depth
Aristeus semidentatus	7.4	477	Lat. 8°40'N–10°50'N Long. 75°00'E-75°50'E 350 - 450 m depth
Penaeopsis rectacuta	8.2	525	Lat. 8°40'N-12°10'N Long. 74°10'E-76°00'E 250 – 300 m depth
Solenocera hextii	3.4	217	Lat. 9°00'N-9°20'N Long. 75°35'E-75°50'E 350 - 450m depth

Table – 2 Resources of the Deep-Sea Spiny Lobster Puerulus sewelli along the Southwest and Southeast Coast of India. (Figures in Parenthesis Indicate Estimated Sustainable Yield at 60% Level).

	Quantity fished by exploratory vessels till 1979 (tonnes)	Estimated standing stock (tonnes) *	Productive areas
Southwest coast	338.7	12,941 (7,765)	Lat. 8°30'N-9°00'N Long. 75°50'E–76°05'E 180-270 m depth
Southeast coast	27.8	1,860 (1,116)	Lat. 8°45'N–9°00'N Long. 79°15'E–79°35'E 180–270 m depth

* Estimates of Oommen (1980, 1985)

Table-3 Potentials (Tonnes) of the Deep-Sea Resources of the Southwest Coast of India *

S. No.	Resource	Potentials (in tonnes) Standing stock	Yield (at 60% level)	Maximum abundance Season	Depth (m)
1.	Deep sea lobster	12,941	7,765	February-June	180-270
2.	Deep sea prawns	5,300	3,180	October-January	300-400
3.	Deep sea fishes	35,891	21,535	July-January	300-450
	Total	54,132	32,480	—	—

* Reconstructed from Silas (1969), Mohamed & Suseelan (1973) and Oomen (1985)

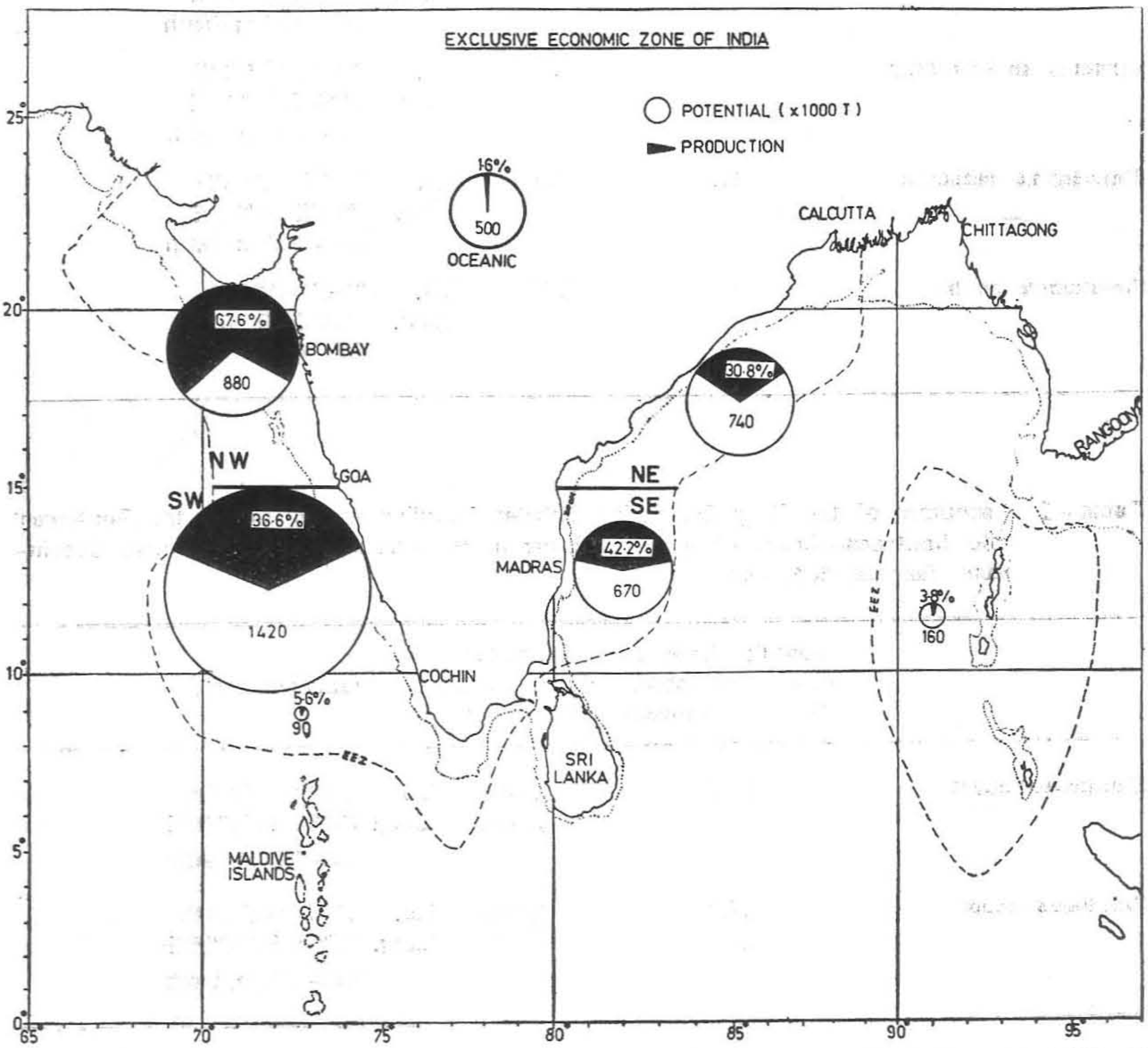

Fig. 1 Potential resources (in 1000 tonnes) and their present production from the Exclusive Economic Zone of India

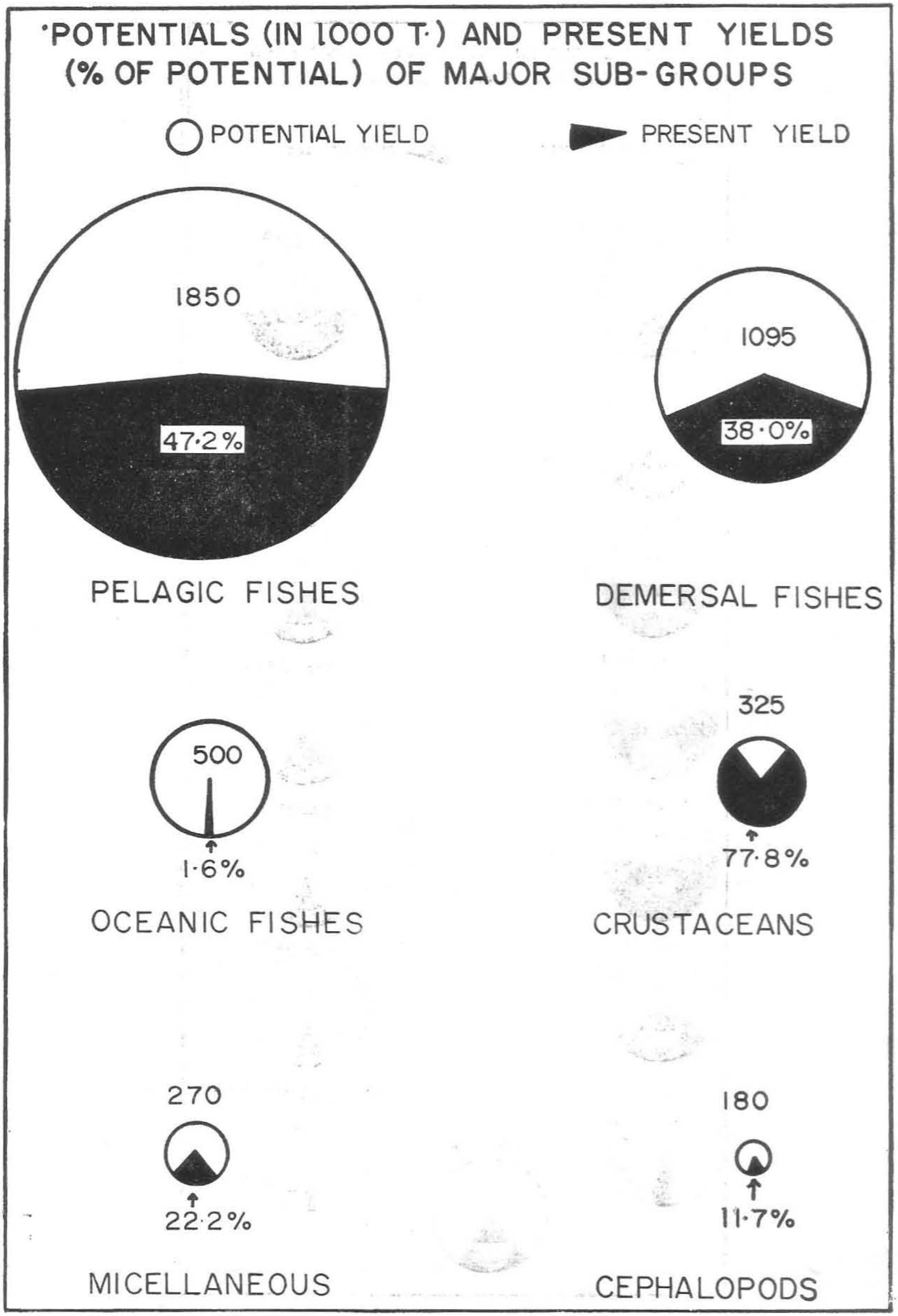

Fig. 2. Potentials and present yields (in 1000 tonnes) of major sub groups in the Exclusive Economic Zone of India.

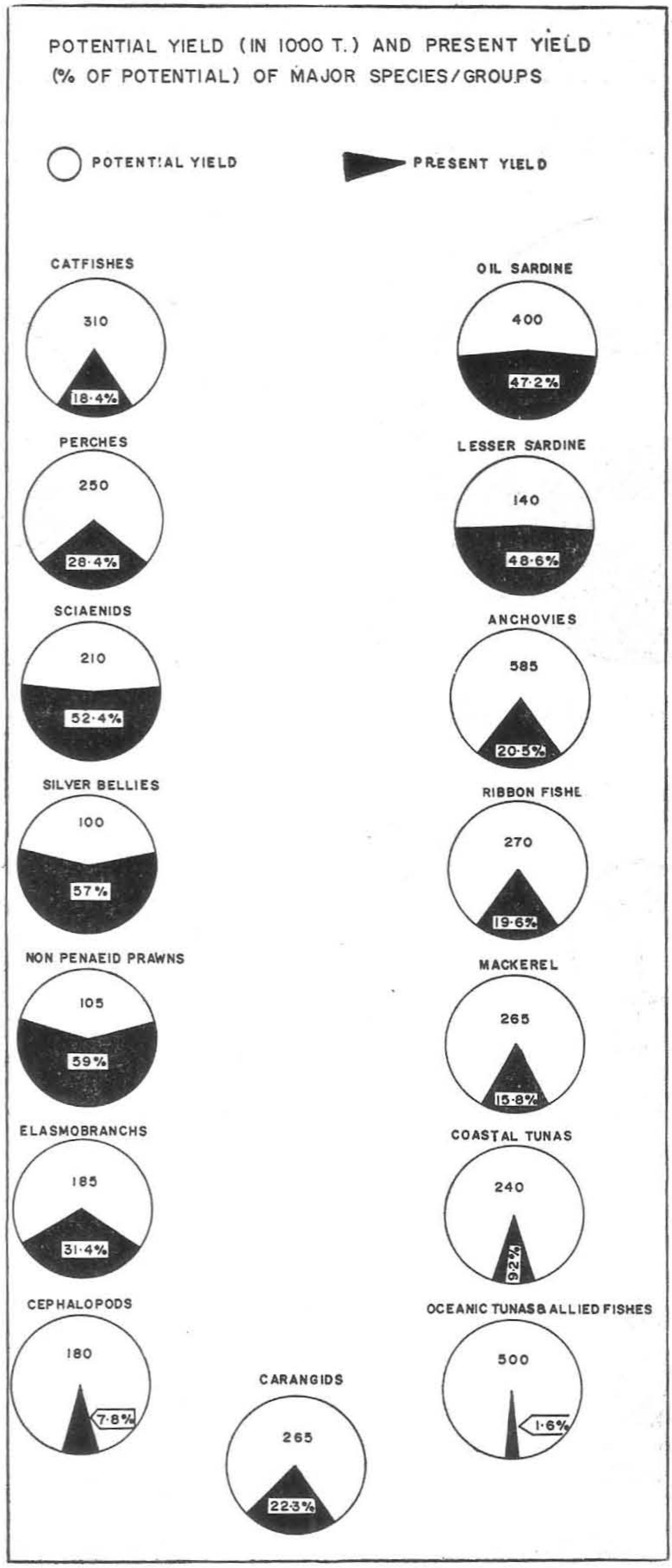

Fig. 3. Potential yield and present yield (in 1000 tonnes) of Major species/variety.

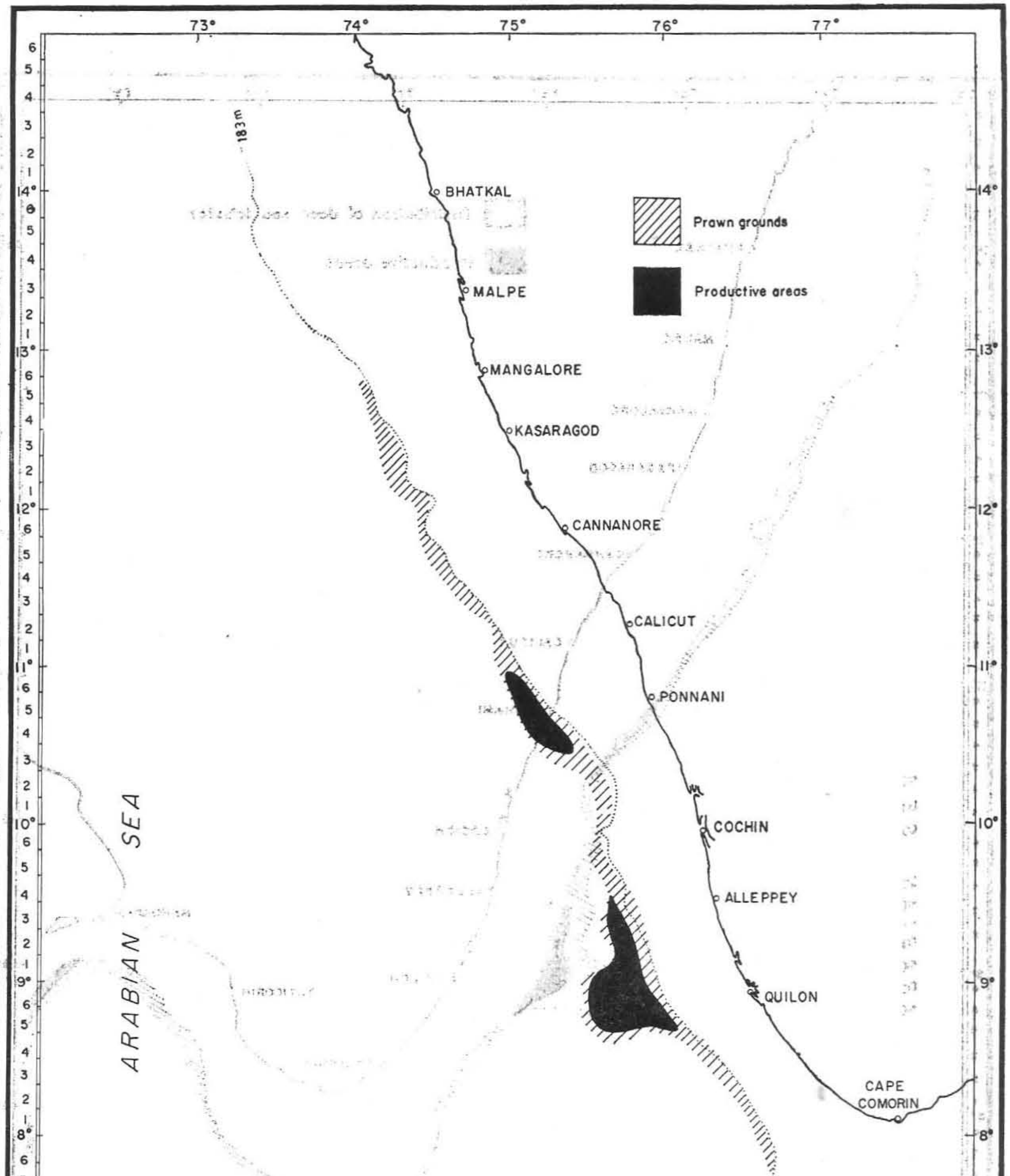

Fig. 4. Distribution and productive areas of deep-sea prawns along the southwest coast of India.

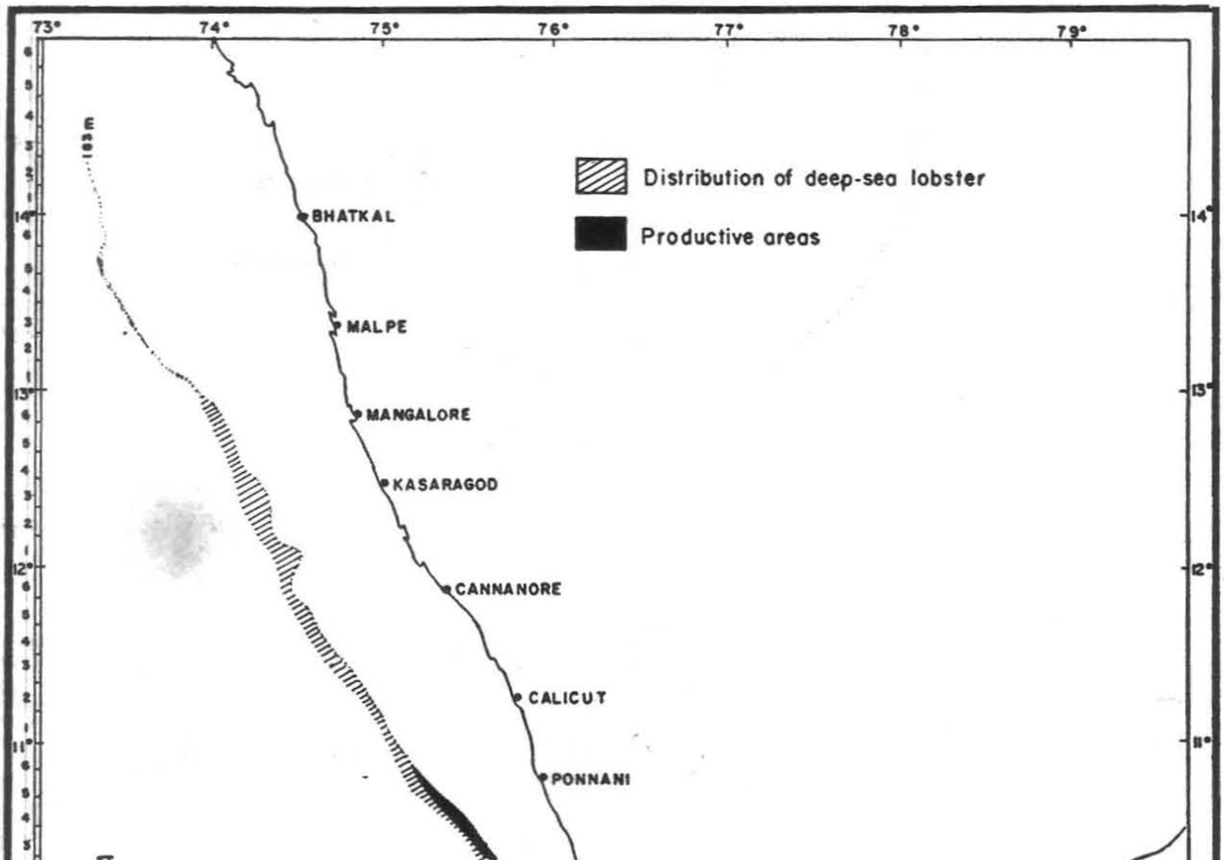

Fig. 5. Distribution and productive areas of the deep-sea lobster ***PUERULUS SEWELLI*** along the southwest coast and Gulf of Mannar.

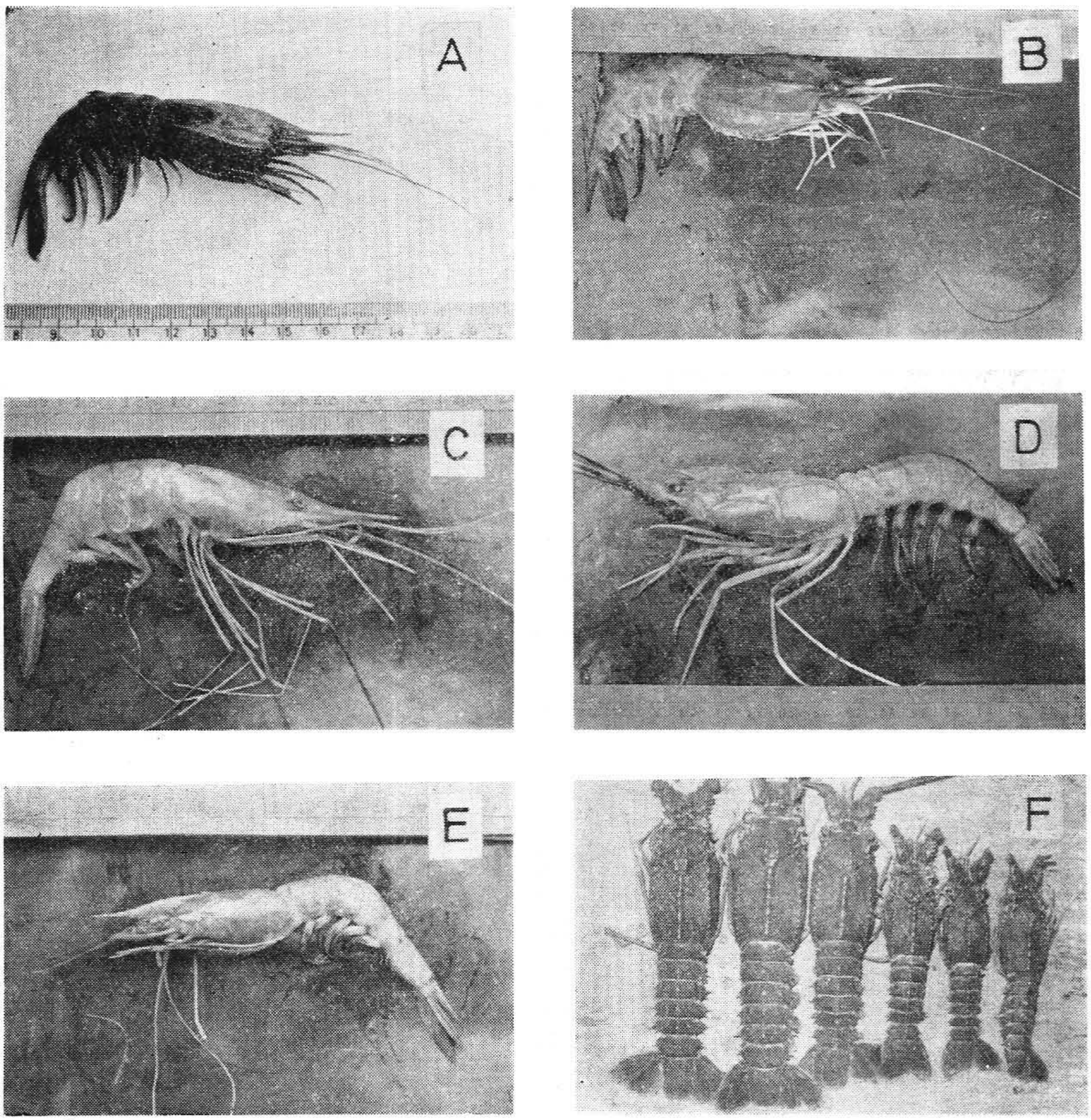

Plate I DEEP-SEA CRUSTACEANS.

A. *Heterocarpus woodmasoni*

H. gibbosus B.

C. *Parapandalus spinipes*

Solenocera hextii D.

E. *Penaeopsis rectacuta*

Puerulus sewelli F.

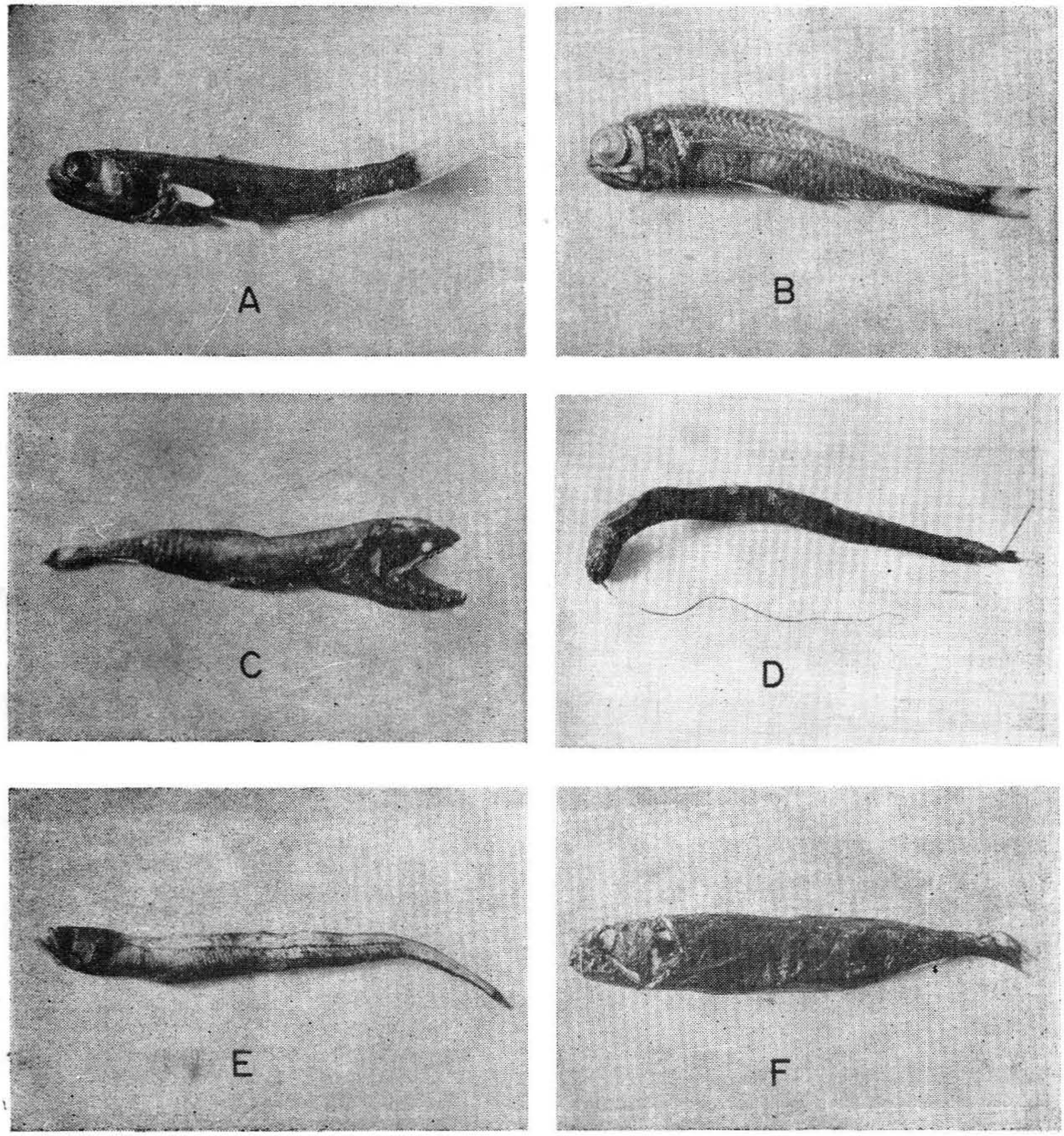

Plate II MESOPELAGIC FISHES.

A. *Diaphus elucens* — *Myctophum pristilepis* B.

C. *Photichthys sp.* — *Eustomia filiferum* D.

E. *Diplophos taenia* — *Astronesthes sp.* F.

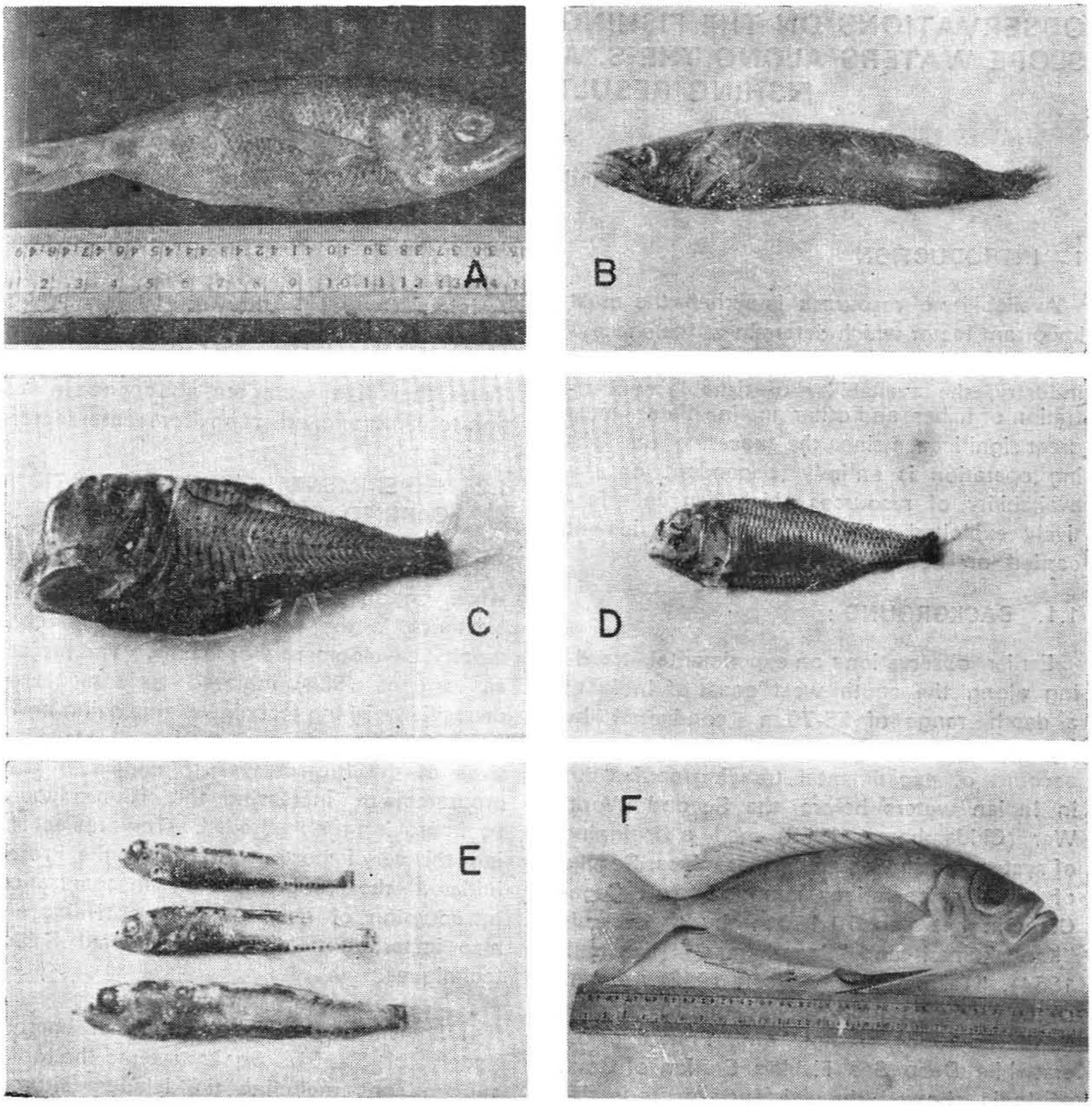

Plate III DEEP-SEA FISHES.

A. *Cubiceps natalensis* — *Epinnula orientalis* B.

C. *Argyropelicus hemigymnus* — *Polyipnus sp.* D.

E. *Vinciguerria spp.* — *Priacanthus hamrur* F·