

**DISTRIBUTION PATTERN OF THE ECONOMICALLY
IMPORTANT SPINY LOBSTERS OF THE GENUS *PANULIRUS*
WHITE, IN THE INDIAN OCEAN***

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ABSTRACT

The spiny lobsters are distinguished from the true lobsters by the absence of large crushing claws characteristic of the latter animals as well as the presence of flexible tail fan. These lobsters gained considerable importance in recent years due to the demands of frozen lobsters for export. The distribution patterns of the species contributing the Indian Lobster Fishery have been studied in detail based on earlier records as well as the material available in the collections of the Zoological Survey of India examined by the authors. An attempt is made to explain the distribution patterns of these species taking into consideration, the prevailing ocean currents influencing the dispersal of the free swimming and fragile-bodied larvae, prior to settling in a favourable substrata, particularly in areas especially near the coast where rocks or reefs offer retreats for them, though the adults also may migrate from place to place to a certain extent. Further studies on the distribution of the larvae of these lobsters in relation to ocean currents are necessary for elucidating several problems connected with the distribution patterns of these decapod crustaceans.

INTRODUCTION

THE SPINY LOBSTERS are characterised by a large inflated and often spiny carapace or head shield covering the forward part of the body, a pair of stiff thorny antennae or feelers extending from the head region, five pairs of walking legs, and a powerful abdomen or tail terminating in a flexible and somewhat leathery tail fan. They are distinguished from the true lobsters by the absence of large crushing claws characteristic of the latter animals as well as the presence of the flexible tail fan. They are distributed throughout the tropical and subtropical seas of the world as well as in certain temperate regions

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SPECIES OCCURRING IN THE INDIAN OCEAN

A detailed examination of the material present in the Zoological Survey of India and a perusal of literature reveal that in the Indian Ocean 8 valid species of the genus *Panulirus* White, 1847 have been recorded so far.

These are *P. japonicus* (Von Siebold), *P. longipes* (A. Milne Edwards), *P. Penicillatus* (Olivier), *P. cygnus* (George), *P. homarus* (Linnaeus) [= *P. dasypus* (Milne)]

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Edwards) and *P. burgeri* (De Haan)], *P. versicolor* (Latreille), *P. ornatus* (Fabricius) and *P. polyphagus* (Herbst).

COMMERCIAL SPECIES OF DIFFERENT REGIONS

Of the eight species recorded from Indian Ocean, only 4 species i. e., *P. homarus*, *P. ornatus*, *P. polyphagus* and *P. versicolor* occurring from shallow waters down to a depth of 30–40 metres have formed the basis for much of the commercial exploitation in the Indian region. Recently another palinurid *Puerulus sewelli* Ramdan occurring in the deeper waters off Kerala in commercially exploitable quantities is also considered as important.

In East Africa, *P. ornatus* and in Saudi Arabia, *P. homarus* contribute to the commercial species. Along the Australian Coast, *P. cygnus* is the dominant and commercially important spiny lobster and *P. versicolor* together with *P. ornatus* also enter the commercial fishery in this region.

Although *P. penicillatus* forms an important constituent of the lobster fishery of east Pacific offshore islands, it is not of commercial significance in the Indian Ocean. However, its occurrence off Minicoy Islands, Maldives and Sri Lanka has definitely been established.

Thus the genus *Panulirus* includes five species of commercial value in the Indian Ocean of which *P. cygnus* is known from western Australia between 21° 45'S and 32°30'S (George and Holthuis, 1965).

SPECIES IDENTIFICATION

Two keys for the identification and separation of the commercially important Indian Ocean species are given. In the first key, morphological characters have been used while the second is based exclusively on characters provided by the colour pattern of the animals and can be used both for fresh material and those preserved in spirit or neutral formalin.

KEY BASED ON MORPHOLOGICAL FEATURES

1. Each abdominal somite with a transverse groove.....2
- Abdominal somites without transverse grooves.....3
2. Anterior margin of abdominal transverse grooves crenulate.....*P. homarus*
- Anterior margin of abdominal transverse grooves not crenulate.....4
3. Flagellum of exopod of second maxilliped well developed, multiarticulate.....*P. polyphagus*
- Flagellum of exopod of second maxilliped small or absent.....5
4. Antennular plate with 4 equal principal spines, which are fused at the base.....*P. penicillatus*
- Antennular plate with 2 principal spines; second abdominal somite with a transverse band of pubescence behind the transverse groove.....*P. cygnus*
5. Groove before posterior margin of the carapace narrower than the marginal ridge behind it, of about the same width throughout Abdomen smooth and naked without narrow transverse pale bands*P. ornatus*

- Groove before posterior margin of the carapace atleast as wide as marginal ridge, widened in middle. Abdomen without sunken pubescent areas with conspicuous narrow transverse pale bands.....*P. versicolor*

KEY BASED ON COLOUR MARKINGS

1. Abdominal segments with narrow transverse pale bands.....2
 - Abdominal segments without narrow transverse pale bands.....3
2. Legs striped, colour greenish, carapace marbled with confluent black spots and blotches edged with white. Transverse band either pale, yellow or white bounded by bluish black on either side.....*P. versicolor*
 - Legs not striped; merus of pereiopod blotched or spotted; carapace muddy brown with row of white spots on each of the laterals.....*P. polyphagus*
3. Dorsal surface of abdomen, apart from a white spot behind each of the articulation of somites, unspotted or with a few very small and indistinct spots on anterior somites only. General impression of abdomen of uniform greenish colour with patches of blue and yellow. Pereopods with transverse coloured rings or with large irregular spots.....*P. ornatus*
 - Dorsal surface of all abdominal somites with distinct spots.....4
4. Abdomen with a moderate number of moderate spots on dorsal surface; carapace uniformly pink or dark brownish with a distinct white lateral streak.....*P. cygnus*
 - Abdomen with very many fine spots on dorsal surface.....5
5. Legs spotted or blotched.....*P. homarus*
 - Legs striped; outer surface of merus of pereiopods with 3 or more pale lines, outer surface of propodus with 2 lines. Abdominal pleura uniformly spotted, without white line. No conspicuous large pale spot behind the articulation of the abdominal somites*P. penicillatus*

DISTRIBUTION OF COMMERCIAL SPECIES OF INDIAN REGION

The various species of spiny lobsters are found throughout the tropical and subtropical areas of the world as far as 35°C, especially along the coastal zones wherever food is available and rocks and reefs are present as suitable retreats. Although the adult lobsters may migrate from place to place to a certain extent, their widespread distribution is already accounted for by the dispersal of pelagic larvae "phyllosoma stage" by oceanic currents (Chace and Dumont, 1949; Prasad and Tampi, 1969). There is little reliable information on the age of these species at marketable size. It is probable that females reach sexual maturity at a total length of 25 or 30 mm and at age of about 3 years, while males become sexually matured at 22 or 23 mm total length and that the marketable specimens are upwards of 5 years age.

The distribution patterns of the four species contributing to the Indian lobster fishery have been studied in detail based on the earlier records as well as the material examined by us.

P. homarus: The records of this species in Indian waters have been under the names *P. dasypus* and *P. burgeri*, although Gordon (1953) synonymised these 2 species under *P. homarus*.

It constitutes a good fishery in several localities in east and west coasts of India, and in the Andaman and Nicobar group of Islands, especially where rocks and corals and coral conglomerates are present in depths upto 30 m. We have examined extensive material of this species from several localities in India and from few other localities in the Indian and Pacific Oceans, i.e., Port Okha, Veraval, Gulf of Cambay, Bombay, Ratnagiri, Mangalore, Calicut, Cochin, Trivandrum, Cape Comerin, Tiruchendur, Gulf of Mannar, Tuticorin, Mandapam Camp, Palk Strait, Point Calimere, Madras, Kakinada, Visakhapatnam, Puri, Balasore, Calcutta, Port Blair, Car Nicobar, Great Nicobar and also from Karachi, Sri Lanka and Hongkong. From the data on the dates of collection of the material examined it appears that this species occurs in shallow waters throughout the year.

In the south west coast of India, the lobster fishery is mostly contributed by this species during December to April. It is captured rarely in the north west coast of India from Port Okha to Ratnagiri during October to March.

P. polyphagus: This species has been frequently referred to as *P. fasciatus* (Fabr.) which is a junior synonym of *P. polyphagus*. Material from Port Okha, Veraval, Bombay, Ratnagiri, Cochin on the west coast of India and Sunderbans and Calcutta on the east coast of India, and Penang and Karachi in the Indian Ocean have been examined by us. This is the prevalent species along the north west coast of India, and according to Chhapgar and Deshmukh (1961) and Deshmukh (1966) constitute 99% of the total spiny lobster population around Bombay. On the east coast it is *P. polyphagus* which is the common species (Chopra, 1939) and appears to be the only one of commercial importance in the Calcutta area. This species has also been recorded from Natal, Mauritius, Gulf of Aden, Baluchistan, Sri Lanka, Maldives, Malacca Strait and Singapore. From the data on the dates of collection of material examined, it appears that this species prefers mud banks, on the north west coast and the mouths of river systems on the east coast, where there is considerable silting and turbidity of the waters.

P. ornatus: Material from Calcutta, Madras, Mandapam Camp and Andamans has been examined by us. This species appears to occur in abundance in the south east coast of India and forms a lucrative fishery from December to April. The previous records by Rai (1932) of *P. ornatus* var. *decoratus* along the Bombay-Sind coast and that of Chopra (1939) as *P. ornatus* from Bombay are, really records of *P. versicolor* as pointed out by Chhapgar and Deshmukh (1961). Prasad and Thampi (1969) show the records of this lobster from several localities on west coast of India. It is not clear whether their records refer to *P. ornatus* based on literature or on actual material. This species is also known from several other localities in the Indian Ocean.

P. versicolor: This species described originally by Latreille (1804) under the genus *Palinurus* includes *Palinurus fasciatus* of De Haan (1841) and *Panulirus ornatus taeniatus* of Gruvel (1911). De Man (1916) working on the Decapoda of Siboga

Expedition recorded this species under *Panulirus versicolor* which has been followed by subsequent authors.

We have examined material from Port Okha, Veraval, Gulf of Cambay, Bombay, Ratnagiri, Gulf of Mannar, Andamans and Nicobars.

This is the rarest commercial species along the Indian Coast. According to Chhapgar and Deshmukh (1961) also, it is the rarest lobster species along the Bombay coast, although both Rai (1933) and Chopra (1939) have mentioned otherwise.

The distribution pattern of this species in the Indian Ocean is having a disjunct distribution which can be mainly correlated with coral reefs and conglomerates.

From the data on the dates of collection (capture) of this species, it appears that it is captured from October to February along the west coast of India and during February to April from Andaman and Nicobars.

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