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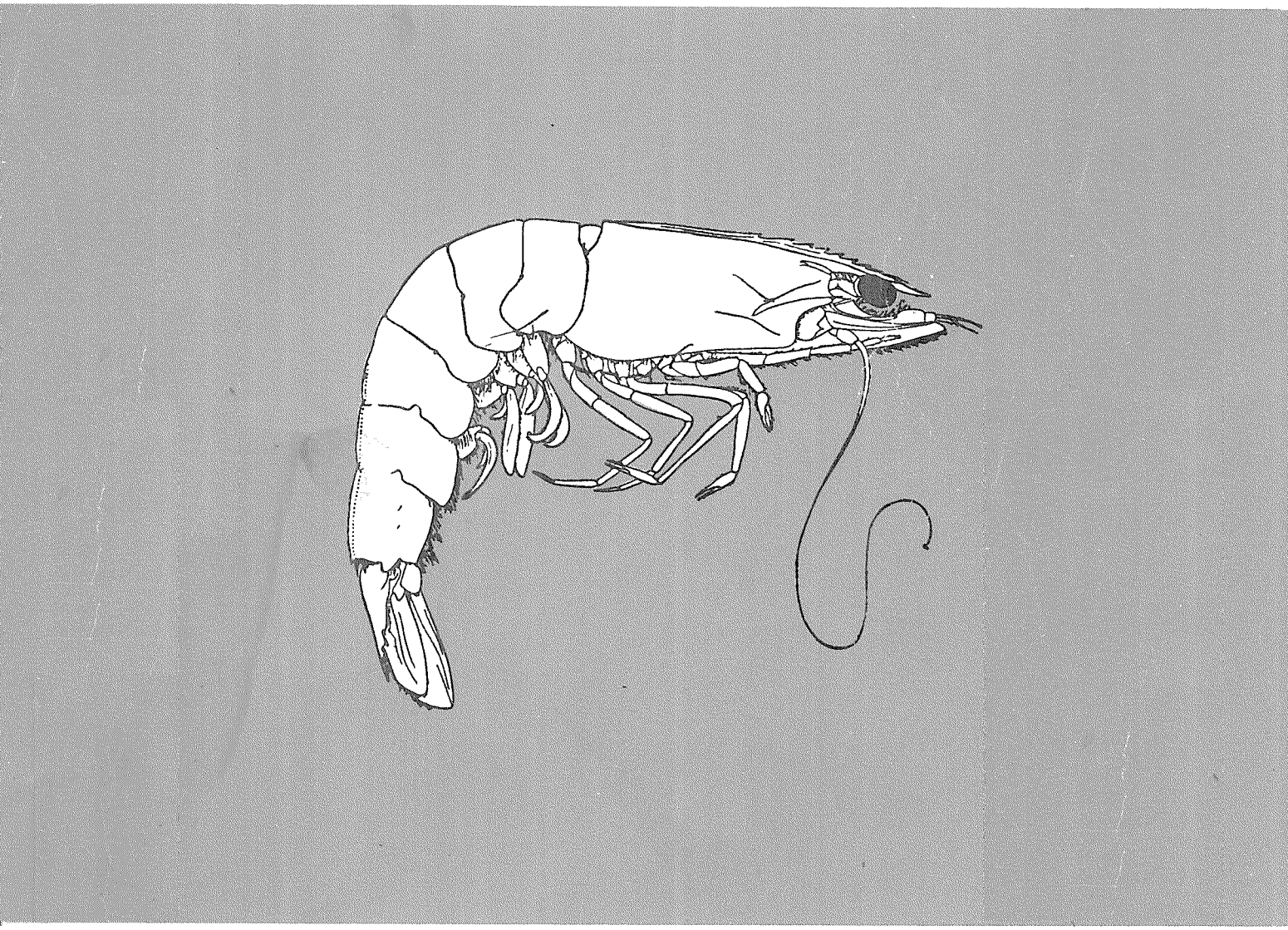

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SYNOPSIS OF BIOLOGICAL DATA ON THE PENAEID PRAWN *Metapenaeus brevicornis* (H. Milne Edwards, 1837)

Exposé synoptique sur la biologie de *Metapenaeus brevicornis* (H. Milne Edwards, 1837)

Sinopsis sobre la biología del *Metapenaeus brevicornis* (H. Milne Edwards, 1837)

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CONTENTS[1/]

1/ This synopsis has been prepared according to Outline Version No. 1 (H. Rosa Jr., FAO Fish Synops., (1) Rev.1, 1965).

* As no information was available to the author, these items have been omitted from the text.

1 IDENTITY

1.1 Taxonomy

1.1.1 Definition

Phylum Arthropoda
Class Crustacea
Subclass Malacostraca
Series Eumalacostraca
Superorder Eucarida
Order Decapoda
Suborder Natantia
Section Penaeidea
Family Penaeidae
Subfamily Penaeinae
Genus Metapenaeus Wood-Mason, 1891
Species Metapenaeus brevioornis (H. Milne Edwards, 1837)

1.1.2 Description

Generic

Genus Metapenaeus Wood-Mason, in Wood-Mason and Alcock, 1891, Ann.Mag.nat.Hist. (6)8:271. Type species by original designation: Penaeus affinis H. Milne Edwards, 1837. Gender: masculine.

A detailed description of the genus is given in the Species Synopsis on Metapenaeus affinis by George (1970). The following characters distinguish it from other genera of the Penaeinae:

Rostrum with dorsal teeth only. Carapace without longitudinal or transverse sutures or lateral keels. Dorsal keel on 4th -6th abdominal segments; lateral keels on 6th segment discontinuous and inconspicuous. Telson grooved, not trifid. No exopod on 3rd maxilliped or 5th pereiopod.

Specific

Species Metapenaeus brevicornis (H. Milne Edwards, 1837)

The species is illustrated in Fig. 1.

The type material, if still extant, is probably in the collection of the Museum National d'Histoire Naturelle, Paris.

Type locality: "Les côtes de l'Inde".

Body not, or very little, tomentose. Rostrum curved and rarely reaching middle of 2nd joint of antennular peduncle, sometimes only just surpassing eyes, bearing dorsal crest of 7 teeth. Postrostral crest very indistinct, only just reaches posterior third of carapace. Postantennular (antennal) spine weak; hepatic spine very small. Postantennular groove shallow; subhepatic groove (anterior part of cervical groove) shallow, does not meet hepatic spine. Indistinct ridge defining branchial region superiorly, present only on posterior part of carapace.

Median carination on abdominal terga hardly perceptible on 3rd somite, distinct on posterior two-thirds of 4th and on 5th and 6th somites; 5th somite about two-thirds length of 6th, 6th as long as telson. Telson shorter than endopod of uropod; without marginal spines (Kubo, 1949) or with pair of clearly perceptible distal spine and series of minute spinules (Racek and Dall, 1965).

Outer antennular flagellum nearly as long as the peduncle.

Third maxilliped barely reaches middle of antennal scale; dactylus slender, setose, tapering about four-fifths length of propodus, not modified in male.

Strong antrorse spine on basis of all 3 pairs of chelipeds; ischial spine on 1st pereiopod. Last pair of pereiopods reach more than a dactylus length beyond tip of antennal scale; adult male with notch in posterior border of proximal end of merus, small tooth at end of notch but no other denticles; no subterminal lobe on border of ischium.

Petasma symmetrical, the 2 halves lightly folded, interlocked anteriorly, closely apposed posteriorly to form a compressed tube. Tube ends distally in a pair of simple spouts, each bearing a longish filament near middle (Fig. 2)

Thelycum (Fig. 3) concave; median lobe shaped like figure eight, anterior portion between processes of antepenultimate thoracic sternum, posterior portion between flat crescent-shaped lateral lobes.

Flesh coloured with sparsely distributed brown dots on dorsal side of body; more such dots on tail fin according to Ahmad (1957).

1.2 Nomenclature

A key to the species of Metapenaeus is given by George (1970), in the Species Synopsis on M. monoceros, and also by Racek and Dall (1965:56-68).

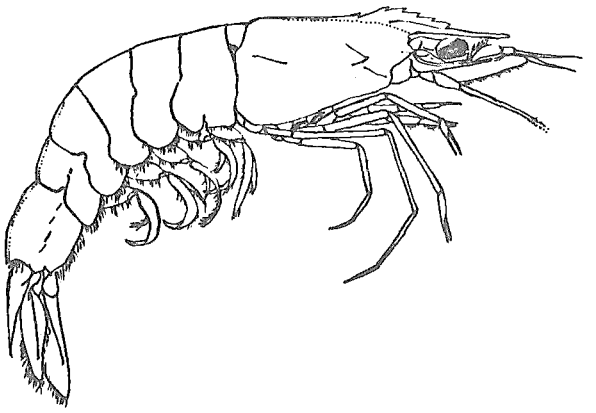
1.2.1 Valid scientific names

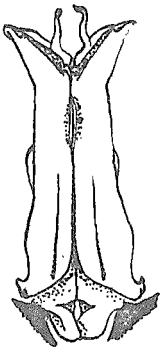
Metapenaeus brevicornis (H. Milne Edwards, 1837).

1.2.2 Synonyms

Objective synonymy

Penaeus brevicornis H. Milne Edwards, 1837, Hist. nat. Crust., 2:417





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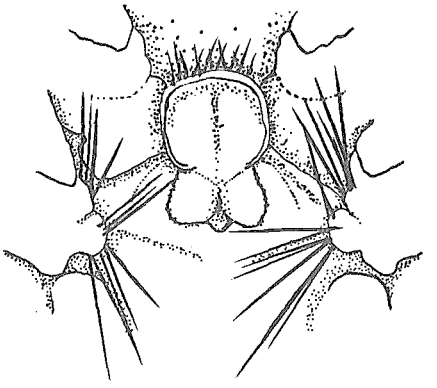

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Fig. 1 Metapenaeus breviocornis, lateral view.

Fig. 2 Petasma of adult male.

Fig. 3 Thelycum of adult female.

(from Hall, 1962)

Penaeopsis brevicornis (H. Milne Edwards, 1837) De Man, 1911, Siboga Exped., 39a:3

Metapenaeus brevicornis (H. Milne Edwards, 1837) Burkenroad, 1934, Bull. Bingham oceanogr. Coll., 4(7):33.

Subjective synonymy

Penaeus avirostris Dana, 1852, Crust. U.S. Explor. Exped.:603

1.2.3 Standard common names, vernacular names

In India in the Gangetic delta area and in the Calcutta markets it is called 'Dhanbone ohingdi', 'Honyi', 'Koraney', 'Kuoho' and 'Saga ohingdi'.

In Indonesia, the species is known as 'udang kuning' (yellow prawn).

1.3 General variability

1.3.1 Subspecific fragmentation

No subspecies or varieties of M. brevicornis are known.

2 DISTRIBUTION

2.1 Delimitation of the total area of distribution and ecological characterization of this area

The species is distributed from West Pakistan through Indian, Malaysian, Thai and Indonesian waters to about East Borneo. Under the FAO distribution code (Holthuis and Rosa, 1965), the species occupies land areas: 421, 423, 424, 425, 431, 432, 433 and 434, and water areas: ISW, ISEW.

In Indian waters M. brevicornis has a more northerly distribution than M. monoceros and M. affinis, and does not occur in the southern area; it contributes to a good fishery in the northern region, both on the west and east coasts. It is well represented in estuaries and inshore waters, especially on the east coast of India. In the Gulf of Kutch area, the species is distributed mostly in sandy areas (Ramamurthy, 1963). It occurs in the Singapore pond fishery and in the sea around Malaysia (Hall, 1962).

2.2 Differential distribution

2.2.1 Areas occupied by eggs, larvae and other junior stages: annual variations in these patterns, and seasonal variations for stages persisting over two or more seasons

There are no reports on the occurrence of eggs and larvae of this species.

Juveniles (0-year group), of modal total lengths 24.5 and 26.5 mm, occur throughout the year in the upper and middle reaches of the Hooghly estuarine system, where they are common from July to October or November (Rajyalakshmi, 1961), and juveniles and young adults also occur throughout the year in inshore waters near Bombay (Shaikhmahmud and Tembe, 1960). Juveniles of this species contribute up to 19 percent of the prawn catches from Singapore ponds in October (Hall, 1962); adults of M. brevicornis do not occur in these ponds.

2.2.2 Areas occupied by adult stages: seasonal and annual variations of these

Mature adults are found in the lower reaches of the Hooghly estuary (Rajyalakshmi, 1961) and in the sea in Malaysian waters (Hall, 1962). No seasonal or annual variations are reported.

3 BIONOMICS AND LIFE HISTORY

3.1 Reproduction

3.1.1 Sexuality (hermaphroditism, heterosexuality, intersexuality)

As is the case with other penaeids, the species is heterosexual. Externally visible genitalia and secondary sex characters are present (see section 1.1.2).

3.1.2 Maturity (age and size)

Based on the rapid decline and recovery in the condition factor with the attainment of sexual maturity, Rajyalakshmi (1961) concluded that the species attains maturity at a length of about 100 mm. Bhimachar (1965) gave the age at maturity as 2 yr, corresponding to a length of 75.0 mm.

Hall (1962) reported that the petasmal endopodites fuse together completely when the young attain a carapace length of 11.2 mm.

3.1.4 Fertilization (internal, external)

As in other penaeids, fertilization is external.

3.1.6 Spawning

Spawning seasons (beginning, end, peak)

In the Hooghly estuarine system, on the east coast of India, the species is reported to have 2 spawning seasons, one in the early summer, March and April, and the other in the monsoon months, July and August (Rajyalakshmi, 1961). Hall (1962) recorded 2 peak breeding seasons for the species in Malaysian waters, namely May to July and October to December.

3.1.7 Spawning grounds

Shaikhmahmud and Tembe (1960) noted the presence of females with conjugal pads, but no mature specimens in the exploited inshore waters of Bombay. They suggested that mating takes place in shallow water, after which the females migrate to deeper water for spawning. In the Hooghly estuarine system, according to Rajyalakshmi (1961), the species spawns in the marine zone of the estuary, i.e. the lower reaches or the inshore areas. In the Malaysian waters the species breeds very close inshore (Hall, 1962).

3.2 Larval history

3.2.1 Account of embryonic and juvenile life (prelarva, larva, postlarva, juvenile)

No information is available on the larval development of the species. An account of the biology of juveniles in the fishery of the Hooghly estuarine system is given by Rajyalakshmi (1961), and in the Singapore pond fishery by Hall (1962).

3.3 Adult history

3.3.1 Longevity

Rajyalakshmi (1961) recorded 0, 1, 2 and 3-year groups from the Hoogly estuarine system, indicating a life span of more than 3 yr.

3.3.2 Hardiness

The species is tolerant to wide variations in salinity, but can withstand only a minimum of handling.

3.3.3 Competitors

In the Singapore pond fishery, where the species occurs, there is no evidence of competition for food among the important species (Hall, 1962).

3.3.4 Predators

No large scale predation has been reported.

3.3.6 Greatest size

According to Alcock (1906), the species very rarely attains a length of 5 in (127 mm). Menon (1956) and Bhimachar (1965) recorded the maximum size for the species as 5 in (127 mm) and 125 mm, respectively. However, according to Chopra (1939) it grows to only about 4 in (101 mm) near Bombay. The largest specimen recorded from the Hooghly estuary by Rajyalakshmi (1961) was 120.0 mm.

3.4 Nutrition and growth

3.4.1 Feeding (time, place, manner, season)

Hall (1962) analyzed the stomach contents of 40 specimens, of which 23 were from daylight fishing operations in Malacca Strait and 17 from night fishing from a Singapore prawn pond. More of the stomachs of specimens from the night fishing operation in the pond were empty than the stomachs of specimens obtained in the daylight fishing operations, thereby indicating more feeding activity during daytime.

3.4.2 Food (type, volume)

The items of food found by Hall (1962), in their order of abundance, were: vegetable matter, mainly consisting of angiosperm tissue and filamentous algae; small crustacea, mostly the calanoid copepod Pseudodiaptomus hickmani and a few other copepods; echiurid setae; large crustacea, mainly appendages and other remains of penaeids; remains of fishes, particularly scales, and polychaeta. Sand grains were also present.

3.4.3 Relative and absolute growth patterns and rates

In the Singapore prawn pond studied by Hall (1962), this species did not show any appreciable growth.

Rajyalakshmi (1961) estimated the growth pattern of the species in the Hooghly estuarine systems by the probability plot analysis of length-frequency distributions. According to her, males and females attain lengths of 45.8 mm and 47.4 mm, respectively, at the end of the 1st year of life, and 80.5 mm and 89.0 mm, respectively, by the end of the 2nd year of life. Thus the females show a faster growth rate than males, particularly during the 2nd year. The growth rate curves for males and females given by her show that, after the postlarval phase, the prawn grows at a rate of approximately 3 mm per month. Specific growth rate was observed to be highest in the young, declining with age.

Based on 70 observations, Hall (1962) estimated the relationship between carapace length and weight as

$$W = 0.8630\ C^{2.650}.$$

Rajyalakshmi (1961) worked out the length-weight relationship on the basis of 1,968 individuals, ranging in total length from 23 mm to 120 mm, caught in the Hooghly estuary. She found a linear relationship between log length and log weight, but the relationship for the 0-year group (a) differs from that for older individuals (b). The relationships for the 2 groups were found to be:

(a) $\text{Log } W = -5.0083 + 2.9810 \text{ Log } L$

(b) $\text{Log } W = -4.5407 + 2.6976 \text{ Log } L$

She also studied the relative condition factor $Kn(W/\overline{W})$. Seasonal fluctuations and other variations in the condition factor for different size groups were attributed to weight increases subsequent to moulting.

3.4.4 Relation of growth to feeding, to other activities, and to environmental factors

The seasonal growth pattern of the species in the Hooghly estuary has been worked out by Rajyalakshmi (1961). She found that in females the growth rate is fastest in summer, when the water temperature and salinity in the estuary are high (temperature ranging from 30.45 to 30.82°C and salinity from 4.3 to 29.1°/oo). The growth rate is less in the rainy season, which is characterized by fairly high temperatures and low salinities (temperature, 30.08 to 30.80°C and salinity from a trace to 9.47°/oo) and lowest during the winter when the temperature is low (21.85 to 23.70°C) and the salinity is relatively high (1.62 to 19.78°/oo).

3.5 Behaviour

3.5.1 Migration and local movements

The typical movement of juveniles from brackish-water ponds to offshore breeding grounds has been recorded by Hall (1962). In the Hooghly estuarine system, Rajyalakshmi (1961) observed that the species spawns in the marine zone of the estuary or in inshore areas, and the young migrate up the estuary, either by active swimming or by tidal action. They live in the upper reaches of the estuary until the attainment of maturity, then the adults appear to migrate back to the lower reaches, where they mature and spawn.

In Bombay waters, Shaikhmahmud and Tembe (1960) suggested that females may migrate away from the inshore areas towards the deeper zone to spawn.

Subramanyam (1965) studied immigration and emigration of the species in the Godavary estuary. According to him emigration from the estuary commenced sparsely in January, reaching its peak in May. Emigration took place mostly by day; immigration was at a maximum at dawn. The number of migrants was found by him to be greater at new moon than at full moon and the size range of the migrating prawns was observed to be between 21 and 105 mm.

The percentage ratio of migrating M. brevicornis at changing tides in Gautami estuary (Subramanyam, 1965) is shown below.

Low tide (day)	...	32.88
High tide (dusk)	...	18.27
Low tide (night)	...	21.92
High tide (dawn)	...	26.93
% remaining in the sea (difference between low and high tides)	...	9.60

4 POPULATION (STOCK)

4.1 Structure

4.1.1 Sex ratio

In Bombay waters, Shaikhmahmud and Tembe (1960) recorded slightly fewer females than males in January (49 percent females), similar numbers of each sex in February, and more females in all other months, with a maximum of 67 percent in April. In the Hooghly estuary, Rajyalakshmi (1961) found more females than males in all months, with the highest percentage in January (61.4 percent) and the lowest in July (51.5 percent). Hall (1962) recorded slightly more females than males (52.1 percent females) in the catches from Singapore prawn ponds.

4.1.2 Age composition

According to Rajyalakshmi (1961) in the lower reaches of the upper zone and the upper reaches of the middle zone of the Hooghly estuary, 1 and 2 year groups form the fishery, the 1-year class forming the dominant group during all months except August to October. In the lower-middle and the lower zones of the Hooghly, 2 additional age groups, 0 and 3, also contribute to the fishery; the 0-year group appearing only between July and December.

In the inshore waters of Bombay and in the Singapore prawn ponds, only immature specimens of M. brevicornis are taken in the fishery (Shaikhmahmud and Tembe, 1960; Hall, 1962).

4.1.3 Size composition

In the Hooghly estuary, the catches, according to Rajyalakshmi (1961), ranged in length between 15 mm and 115 mm. She gave length frequency histograms for females and males for the years 1959 and 1960. Sizes of males and females of 1 and 2 years, which occur in the upper and middle zones of the estuary, are given in section 3.4.3. Three year old prawns of 90 mm or more also contribute to the fishery in the lower reaches.

Size-frequency histograms for males and females of the species in the Singapore prawn pond fishery for 1954 to 1955 were given by Hall (1962). Carapace lengths ranged from 7 to 20 mm.

In the inshore fishery for the species in Bombay waters, Shaikhmahmud and Tembe (1960) recorded a range in total length of 40 to 110 mm.

5 EXPLOITATION

5.1 Fishing equipment

5.1.1 Fishing gear

In the Hooghly estuarine system, bag nets (bhinjal and thorjal) form the main type of gear and account for nearly 90 percent of the total catches. Small drag nets and dip nets account for the rest of the landings. The species is also caught in barrier nets (kalpata jal) (Rajyalakshmi, 1961). The 'behundi jal' mentioned by Chopra (1939) is another bag net or conical purse net, in which the species is caught in Bengal. In Bombay coast, the 'dol net' or bag net and its variant, the 'bokshi', are the main gear used for catching this species along with other prawns and fish (Shaikhmahmud and Tembe, 1960; Setna, 1949).

The method of fishing and the net used in the Singapore pond fishery, in which this species is caught along with others, are described by Hall (1962).

The fishing gear employed in the shrimp and prawn fisheries in the Kroya District in Indonesia are described by Djajadiredja and Sachlan (1956), and these include the skimming net, push net, cast net, fixed lever net and the various traps and fykes, such as the common trap, filter trap, filter fyke and bamboo screen trap.

5.1.2 Fishing boats

The species is generally fished without the help of boats.

5.2 Fishing areas

5.2.1 General geographic distribution

The species is fished in most of the areas from which it has been recorded (see sections 2.1 and 2.2).

5.2.2 Geographic ranges (latitudes, distances from coast, etc.)

The fishery is generally confined to inshore areas, estuaries and ponds.

5.2.3 Depth ranges

In Bombay waters these prawns are caught in inshore waters varying in depth from 4 to 7 fm (7 to 13 m)(Shaikhmahmud and Tembe, 1960). The fishery in the Hooghly estuarine system is in shallow waters (Rajyalakshmi, 1961).

The Singapore prawn pond studied by Hall (1962) had a high tide mean depth of 4 ft (1.3 m).

5.3 Fishing seasons

5.3.1 General pattern of fishing season

Taking the entire coast of India, the season is generally towards the latter half of the year, except in the Godavary estuary where it is mainly in the earlier half. In the Singapore pond fishery also the season for this species falls in the latter half of the year.

5.3.3 Dates of beginning, peak and end of seasons

July to February is the main season for the species in the Gulf of Kutch area; its contribution to the fishery in different centres varies from 13.7 to 27.4 percent (Ramamurthy, 1963). Slightly south of this area, along the Bombay coast, the species is available throughout the year and the peak season is from January to March. Here in 1952 to 1954 the species averaged 12.8 percent of the prawn catch (Shaikhmahmud and Tembe, 1960). In the Hooghly estuarine system the species is fished almost throughout the year. In the lower zone of the Hooghly and the lower Sunderbans, the bulk of the landings is during the winter months, November to February. In the Matlah estuary, the fishery commences in August and continues until March (Rajyalakshmi, 1961). According to Subramanyam (1965), the season for the species in the Godavary estuary, on the east coast of India, is from March to June.

In the Singapore pond fishery, although the species is always present in the samples, it forms an important fraction of the catch (namely, 19.0 percent) in October only. It is fairly common from May to October (Hall, 1962).

5.3.5 Factors affecting fishing season

Rajyalakshmi (1961), studying the trend of occurrence of the species in the Hooghly estuarine system, observed that the bigger size groups are largely confined to areas of higher salinity, where they occur in the winter months. It is probable that salinity plays an important part in the seasonal distributions of these larger prawns as they congregate before spawning. In the upper and middle reaches of the estuary the peak fishing season is in the latter half of the year and is dependent on the migration of juveniles from waters of higher salinity.

5.4 Fishing operations and results

5.4.2 Selectivity

None of the fishery, as it exists at present, is very selective.

5.4.3 Catches

There appear to be no figures for any area giving the commercial catch of M. brevicornis separately from that of other prawns. If catches from the prawn pond studied by Tham Ah Kow (1955) and Hall (1962) are typical for the Singapore area, then the weight of M. brevicornis passing through Singapore markets probably amounts to about 1,000 kg in October and less in other months.

Pantulu (1965) estimated the total prawn production from the Hooghly estuarine system as 900 tons. According to Rajyalakshmi (1961) 30% of the total prawn catches of this estuary is contributed by M. brevicornis. So the total catches of this species from this region may be estimated as 270 tons in a year.

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