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**SYSTEMATICS OF THE COMMERCIALY IMPORTANT PRAWNS
(CRUSTACEA, DECAPODA, SUBFAMILY PENAEINAE) FROM GOA¹**

M. J. George²

SYSTEMATICS OF THE COMMERCIALY IMPORTANT PRAWNS (CRUSTACEA, DECAPODA, SUBFAMILY PENAEINAE) FROM GOA¹

M. J. GEORGE²

The taxonomy of the economically important prawns of the subfamily Penaeinae occurring in the waters of Goa is described. Species belonging to 5 genera, namely, *Penaeus* (4 species), *Metapenaeopsis* (1 species), *Metapenaeus* (6 species), *Trachypenaeus* (1 species) and *Parapenaeopsis* (5 species) are recorded. 10 out of the 17 species included are reported for the first time from these waters.

INTRODUCTION

The demands from an export oriented industry increasing day by day, the estuarine and marine penaeid prawn fishery of the country has improved substantially over the past two decades. As a result, all maritime states are making efforts to exploit the fishery to the maximum possible extent. Along with this development, researches indicate depletionary tendencies as a result of over exploitation of a limited resource in certain areas of the Indian coast like, for instance, the Kerala coast (Menon & Abraham 1971). At the same time, there is increasing exploitation of new prawn resources along certain areas on the east coast. It is necessary that research be continued to find out new prawn resources and to keep existing fisheries at maximum sustainable levels. As in other maritime states, along the Goa coast also, the marine penaeid prawn fishery is developing very fast. However, apart from the recent studies on the fishery biology (Anonymous 1975) and the distribution of their

larvae in the inshore waters and the estuary (George & Goswami 1976; Achuthankutty *et al.* 1976), no published account is available concerning the systematics of the prawns, which is a necessary prerequisite to determine the exploitable resources in a multi-species fishery. Hence, the opportunity to examine some of the catches of prawns from both inshore, as well as, brackish estuarine waters of Goa was used to report on their taxonomy.

LIST OF SPECIES

1. *Penaeus mondon* Fabricius
2. *Penaeus semisulcatus* de Haan
3. *Penaeus indicus* Milne Edwards
4. *Penaeus merguensis* de Man
5. *Metapenaeopsis mogiensis* (Rathbun)
6. *Metapenaeus brevicornis* (Milne-Edwards)
7. *Metapenaeus dobsoni* (Miers)
8. *Metapenaeus monoceros* (Fabricius)
9. *Metapenaeus alcocki* George and Rao
10. *Metapenaeus affinis* (Milne-Edwards)
11. *Metapenaeus burkenroadi* Kubo
12. *Trachypenaeus curvirostris* (Stimpson)
13. *Parapenaeopsis stylifera* (Milne-Edwards)
14. *Parapenaeopsis cornuta* (Kishinouye)
15. *Parapenaeopsis hardwickii* (Miers)
16. *Parapenaeopsis sculptilis* (Heller)
17. *Parapenaeopsis acclivirostris* (Alcock)

Family PENAEIDAE Aafinesque, 1815
Sub-family PENAEINAE Rafinesque, 1815

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²National Institute of Oceanography, Dona Paula-403004, Goa, India. Present address: Central Marine Institute, Cochin-682 018.

Penaeus monodon Fabricius, 1798

Penaeus monodon Mohamed, 1970a : 1258 (with synonymy); 1973 : 551; Muthu 1971 : 154; Racek and Yaldwyn 1971 : 209; Starobogatov 1972 : 387; Ivanov and Hassan 1976a : 246; Kurien and Sebastian 1976 : 100.

Material: Several specimens from the estuary as well as from inshore and off shore catches.

Remarks: The species utilises, to a limited extent, the estuary as a nursery ground only. As a result, the quantity of younger specimens, found in the catches of the estuary is very limited. The large adults are obtained in the mechanised fishery from offshore waters. In the estuary, the species is found mostly in April-May.

Penaeus semisulcatus de Haan, 1850

Penaeus semisulcatus George, 1969 : 23 (with synonymy); Muthu 1971 : 154; Starobogatov 1972 : 368; Mohamed 1973 : 551; Ivanov and Hassan 1976a : 246; Kurien and Sebastian 1976 : 100.

Material: Few specimens from the estuary and the sea.

Remarks: The species is found along with the catches of *P. monodon*, but is rare.

Penaeus indicus H. Milne-Edwards, 1837

Penaeus indicus Mohamed, 1970b : 1274 (with synonymy); 1973 : 551; Muthu 1971 : 154; Starobogatov 1972 : 368; Ivanov and Hassan 1976a : 246; Kurien and Sebastian 1976 : 99.

Material: Specimens from the estuary as well as the sea.

Remarks: All specimens examined show the typical features of the species described in previous literature. The adrostral sulci extend upto the epigastric tooth as described by Alcock (1906), although Racek & Dall (1965) found these sulci slightly exceeding the epigastric tooth. The gastro-orbital carina is well defined. The length of the 3rd pereopod is quite variable as pointed out by Hall (1956). The species occurs in small numbers in both sea and estuary catches.

Penaeus merguensis deMan, 1888

Penaeus merguensis George 1969 : 24 (with synonymy); Tirmizi 1969 : 757; Muthu 1971 : 154; Racek and Yaldwyn 1971 : 210; Starobogatov 1972 : 368; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 100.

Material: Numerous specimens from the estuarine and marine catches.

Remarks: This is commercially the most important species of the genus present in these waters. It forms an important constituent of the catches from both inside and outside waters. Dall (1957) and Racek & Dall (1965) drew attention to the absence of gastro-orbital carina in the specimens from Australia and New Guinea while the carina is present in specimens from Karachi, Malaysia, Indonesia and the Philippines. The material on hand from Goa waters also shows the presence of this carina occupying middle 1/3 portion between the hepatic spine and area between the hepatic spine and post orbital margin of carapace. Distinction of the species from *P. indicus*, especially in the juvenile stages is very difficult. Muthu & Rao (1973) have described some useful characters for distinguishing the juveniles of these two species.

Genus *Metapenaeopsis* Bouvier, 1905

Metapenaeopsis mogiensis (Rathbun), 1902

Metapenaeopsis mogiensis George, 1969 : 25 (with synonymy); Muthu 1971 : 149; Starobogatov 1972 : 376; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 96.

Material: 3 specimens from the estuary, Ribander area. 42 - 58 mm total length.

Remarks: Considering the differences between Australian and Indian specimens of this species recorded in previous literature, Racek & Dall (1965) remarked that *M. mogiensis* auctorum might consist of more than one species. This has since been proved to be correct and with the material available from Sri Lanka,

De Bruin (1965) separated *P. hilarulus* of de Man (1911) and Barnard (1950) and *M. mogiensis* of Hall (1962) to include them in *Metapenaeopsis hilarulus* (de Man), a view accepted by Muthu (1971) also. Starobogatov (1972) is of the opinion that the specimens of Racek & Dall (1965) are closer to *M. hilarulus*. The present material shows that the specimens belong to *M. mogiensis* auct.

Genus *Metapenaeus* Wood Mason and Alcock, 1891

Metapenaeus brevicornis (H. Milne-Edwards), 1837

Metapenaeus brevicornis George, 1970d : 1564 (with synonymy); Muthu 1971 : 154; Starobogatov 1972 : 389; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 96.

Material: Few specimens from the Zuari estuary and from the sea.

Remarks: This is the first time that the species is recorded south of Bombay on the west coast. The ischial spine is present on the 1st pereopod. Although Kubo (1949) described the telson as devoid of lateral spines, Racek & Dall (1965) observed a pair of clearly perceptible spines near the tip in addition to minute spinules in 24 out of 29 specimens in their collection, a condition described by de Man (1924) and Burkenroad (1934). The specimens in the present collection also show variation in the character, 2 or 3 specimens devoid of the pair of lateral spines on telson while others possessed these spines.

Metapenaeus dobsoni (Miers), 1878

Metapenaeus dobsoni George, 1970a : 1342 (with synonymy); Muthu 1971 : 154; Racek and Yaldwyn 1971 : 212; Starobogatov 1972 : 393; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 97.

Material: Innumerable specimens from the estuary and the sea.

Remarks: This is one of the most important commercial species of the area with reference

to quantity of landings. The numerous specimens examined agree with the previous descriptions. The free filament of the petasma distomedian projection about which attention was drawn by Racek and Dall (1965) is clearly seen in the adult petasma examined. This is one of the species belonging to the group with conjoined white pads on the thelycum in impregnated females.

Metapenaeus monoceros (Fabricius), 1798

Metapenaeus monoceros George, 1970b : 1547 (with synonymy); Muthu 1971 : 154; Racek and Yaldwyn 1971 : 212; Starobogatov 1972 : 389; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 97.

Material: Numerous specimens from the estuary and from the sea.

Remarks: One of the common species in the catches of the estuary, though not very common in the catches from the inshore waters, probably because of the adults occurring in deeper waters than other species as has been reported from the south west coast of India. Trawl nets operated in shallower areas, therefore fail, to trap them.

Metapenaeus alcocki George and Rao, 1966

Metapenaeus alcocki George and Rao, 1966 : 146; George 1969 : 31; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 96.

Material: Few specimens from the estuary.

Remarks: The species is reported for the first time from outside the type locality, the Gulf of Kutch. In the length of the 5th pereopods and mid-dorsal carination of the abdominal somites, slight differences were noticed from the type material. Traces of carination are noticed in the anterior abdominal segments also and the 5th pereopods reach slightly beyond the middle of the scaphocerite.

Metapenaeus affinis (H. Milne-Edwards), 1837

Metapenaeus affinis George, 1970c : 1366 (with synonymy); Muthu 1971 : 154; Racek and Yaldwyn

1971 : 211; Starobogotov 1972 : 368; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 96.

Material: Several specimens from the in-shore catches. Only very seldom seen in catches from the mouth of the estuary.

Remarks: The confusion created by Hall's (1962) re-examination of the type material of the species and his comments has since been cleared (Ref: Racek & Dull, 1965, p. 54): Still, there is considerable difference of opinion on the taxonomic status of this species (Mistakidis 1968). Pending a final decision, the two new species of Hall (1962) *Metapenaeus necopinans* and *M. mutatus* are treated as synonyms of *M. affinis*.

Metapenaeus burkenroadi Kubo, 1954

Metapenaeus burkenroadi George, 1969 : 32 (with synonymy); Starobogotov 1972 : 393; Muthu and Manickam 1973 : 214; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 96.

Material: Several specimens from the estuary and rarely from inshore catch.

Remarks: This is the first report of the species from the northern half of the west coast of India, extending its distribution in Indian waters. The species is represented in the fishery of the lower reaches of the estuary and plenty of specimens with mature gonads are seen in the catches in January, February, indicating that the species breeds inside the estuary in these months. Mature specimens of the same species were reported from Pulicat lake by Muthu & Manickam (1973).

De Bruin (1965) recorded some variable features in Sri Lanka specimens. In the present material the dorsal pubescence is less in males than in females as in Sri Lanka specimens. In comparison with De Bruin's specimens the abdominal somites are more pubescent, especially the anterior somites.

Genus *Trachypenaeus* Alcock, 1901

Trachypenaeus curvirostris (Stimpson), 1860

Trachypenaeus curvirostris George, 1969 : 33 (with synonymy); Muthu 1971 : 154; Starobogotov 1972 : 370; Mohamed 1973 : 551; Kurien and Sebastian 1976 : 101; Ivanov and Hassan 1976b : 1300.

Material: Few specimens from the sea.

Remarks: In Sri Lanka specimens, De Bruin (1965) found that the rostrum is straight and not curved as illustrated by Dall (1957). Large numbers of specimens examined from the south west coast of India as well as the present material show much variation in this character as noticed by Hall (1961) also. Based on features like straight rostrum and other differences in thelycum and petasma, Ivanov & Hassan (1976b) described 4 specimens from the western Indian Ocean as a new species, *Trachypenaeus starobogotovi*.

Genus *Parapenaeopsis* Alcock, 1901

Parapenaeopsis stylifera (H. Milne-Edwards), 1837

Parapenaeopsis stylifera Rao, 1970 : 1580; Starobogotov 1972 : 393; Mohamed 1973 : 551; George 1973 : 421 (with synonymy); Kurien and Sebastian 1976 : 98.

Material: Numerous specimens from the sea and a few from the mouth of the estuary.

Remarks: Although the species does not penetrate into the estuary, large numbers are found in the catches from the region of the mouth of the estuary. George (1973) has given the complete synonymy of the species, relegating as synonyms, the two sub-species, namely, *P. stylifera stylifera* and *P. stylifera coromandelica* suggested by Racek & Dall (1965).

Parapenaeopsis cornuta (Kishinouye), 1900

Penaeus cornutus Kishinouye, 1900 : 23.

Parapenaeopsis cornuta de Man, 1911 : 93; Muthu 1971 : 147; Starobogotov 1972 : 397; Mohamed 1973 : 551.

Parapenaeopsis cornutus Kubo, 1949 : 374; Dall 1957 : 215; Cheung 1960 : 67 (key); Kunju 1967 : 1384.

Parapeneopsis cornuta Racek, 1959 : 10; De Bruin 1965 : 95.

Parapenaeopsis cornuta cornuta Racek and Dall, 1965: 98.

Material: 1 female—48 mm total length from the inshore catch.

Remarks: This is the first record of the species along the west coast of India south of Bombay. Although Hall (1961) suggested that Alcock's *P. maxillipedo* might be considered as geographical variety of *P. cornuta* (Kishinouye), De Bruin (1965) felt that the two are distinct species, based on comparison of the features in Sri Lanka specimens. Racek & Dall (1965) considered them as two subspecies, *P. cornuta cornuta* (Kishinouye) and *P. cornuta maxillipedo* (Alcock). A critical examination of specimens from the south west coast of India and of the present specimen shows that De Bruin's view was correct.

As in De Bruin's (1965) specimens, the 3rd pereopod does not possess basal spine. 2 or 3 pairs of minute spines are present on distolateral margins of the telson. A median tuft of setae is also not present behind the posterior thelycal plate.

***Parapenaeopsis hardwickii* (Miers), 1878**

Parapenaeopsis hardwickii George, 1969: 36 (with synonymy); Muthu 1971: 154; Starobogatov 1972: 370; Mohamed 1973: 551; Kurien and Sebastian 1976: 98.

Material: Several specimens from the estuary and from the sea.

Remarks: The species is recorded for the first time from the west coast south of Bombay. It is also interesting to note that most of the specimens come from the estuary, contributing to the fishery of the estuary to a certain extent in some areas.

The first two abdominal segments are without median carination. The telson is armed with 3 pairs of small lateral spines. The cultrate rostrum of the adult males is a feature shared by both *P. hardwickii* and *P. sculptilis*.

***Parapenaeopsis sculptilis* (Heller), 1862**

Parapenaeopsis sculptilis George, 1969 (with synonymy); Muthu 1971: 154; Starobogatov 1972: 370; Mohamed 1973: 551; Kurien and Sebastian 1976: 98.

Material: A few specimens from the estuary.

Remarks: This species also is reported for the first time from the west coast of India south of Bombay. Occurs in association with *P. hardwickii* which is more common. The specimens of *P. sculptilis* can be separated by the presence of dorso medial carinae on 1st and 2nd abdominal somites, absence of lateral spines on telson and the features of thelycum and petasma as described by earlier authors.

***Parapenaeopsis acclivirostris* (Alcock), 1905**

Parapenaeopsis acclivirostris George, 1969: 37 (with synonymy); Muthu 1971: 154; Starobogatov 1972: 397; Mohamed 1973: 551; Kurien and Sebastian 1976: 97; Ivanov and Hassan 1976b: 1299.

Material: Few specimens from the catches of the sea.

Remarks: Racek & Dall (1965) suggested that the vicinity of Palk Strait on the east coast of India could be considered the zoogeographic boundary separating the eastern species *P. tenella* from its western congener *P. acclivirostris*. Alcock's (1906) record of *P. acclivirostris* from Madras and Visakhapatnam on the east coast of India as well as the recent record of *P. tenella* from East African waters by Ivanov & Hassan (1976b) makes it difficult to accept this suggestion.

KEY FOR THE IDENTIFICATION OF PRAWNS OF THE SUBFAMILY PENAELINAE IN THE WATERS OF GOA

1. Rostrum without ventral teeth 2
- Rostrum with ventral teeth 5
- 2(1) A distal fixed pair of spines on the telson and 1-3 pairs of mobile spines; petasma asymmetrical; 3rd maxilliped with basal spine *Metapenaeopsis*
- Stridulating organ absent; hepatic sulcus absent or not reaching to ventral edge of branchiostegite; a pair of tooth-like plate

- lets immediately posterior to thelycal plate; distinct groove present on 3rd abdominal carina; anterior edge of anterior sternal plate between 5th pair of legs in female with 4 rounded teeth, 2 median ones being incurved; distomedian lobule of petasma small *Metapenaeopsis mogiensis* (Rathbun)
- Distal fixed pair of spines on the telson may or may not be present; petasma symmetrical; 3rd maxilliped without basal spine 3
- 3(2) No exopod on 5th pereopod; pleurobranch on 7th thoracic somite present.....
Metapenaeus..... 8
- Exopod on 5th pereopod present; pleurobranch on 7th thoracic somite absent.....4
- 4(3) 3rd pereopod with epipodite.....
Trachypenaeus
 Epipodites present on 1st and 2nd pereopods; anterior plate of thelycum may have a raised anterior margin but laterally the margins not raised; an excavation present between the anterior plate and the transverse sternal ridge..... *Trachypenaeus curvirostris* (Stimpson)
 3rd pereopod without epipodite.....
Parapenaeopsis....13
- 5(1) Hepatic carina present 6
 Hepatic carina absent 7
- 6(5) Hepatic carina horizontally straight; 5th pereopod without exopodite
Penaeus monodon Fabricius
 Hepatic carina inclined at an angle of 20° antero ventrally; 5th pereopod with small exopodite *Penaeus semisulcatus* de Haan
- 7(5) Gastro-orbital carina occupying the posterior 2/3 distance between hepatic spine and orbital angle; rostral crest may be elevated but not triangular in profile.....
*Penaeus indicus* H. Milne-Edwards
 Gastro-orbital carina absent or not reaching hepatic spine and occupying the middle 1/3 distance between hepatic spine and orbital angle; rostral crest triangular in profile....
 *Penaeus merguiensis* de Man
- 8(3) Distomedian petasmas projection with fully developed or vestigial apical filament; thelycum of impregnated females usually with white conjoined pads 9
 Distomedian petasmas projection without apical filament; thelycum of impregnated females without conjoined pads.....10
- 9(8) Posterior part of rostrum with distinctly elevated crest; basal spine on male 3rd pereopod simple; apical petasmas filaments slender, slightly converging; thelycum with a large anterior and small lateral plates....
*Metapenaeus brevicornis* (H. Milne-Edwards)
 Posterior part of rostrum without distinctly elevated crest; basal spine on male 3rd pereopod long and barbed; apical petasmas filaments not readily visible; anterior thelycal plate tongue-like
 *Metapenaeus dobsoni* (Miers)
- 10(8) Ischial spine on 1st pereopod distinct
11
 Ischial spine on 1st pereopod small or absent 12
- 11(10) Lateral thelycal plates with salient and parallel ear-shaped lateral ridges; distomedian petasmas projections hood-like.....
 *Metapenaeus monoceros* (Fabricius)
 Lateral thelycal plates without lateral raised ridges; distomedian petasmas projections not hood-like but overlying lateral projections and distally trilobed; posterior extension of the anterior median thelycal plate bound laterally by an oval flat plate on each side*Metapenaeus alcocki* George and Rao
- 12(10) Branchio cardiac carina distinct, extending from posterior margin of carapace almost to hepatic spine; anterior thelycal plate longitudinally grooved, wider posteriorly than anteriorly; distomedian petasmas projections crescent shaped *Metapenaeus affinis* (Milne-Edwards)
 Branchio cardiac carina feeble or ill-defined, anterior end not exceeding posterior 1/3 of carapace; distal margin of anterior thelycal plate convex to indistinctly triangular; petasma with laminose and strongly diverging distomedian projections
 *Metapenaeus burkenroadi* Kubo
- 13(4) Epipodites present on 1st and 2nd pereopods; rostrum inclined upwards at an angle to carapace for whole of its length.....

SYSTEMATICS OF THE COMMERCIALY IMPORTANT PRAWNS OF GOA

-*Parapenaeopsis acclivirostris* (Alcock)
Epipodites absent on 1st and 2nd pereopods 14
- 14(13) Telson with a pair of fixed sub apical spines; at least distal $\frac{1}{4}$ free portion of rostrum unarmed
Parapenaeopsis stylifera (Milne-Edwards)
Telson without fixed sub apical spines, with or without lateral movable spines; $\frac{1}{3}$ or less free portion of rostrum unarmed.... 15
- 15(14) Petasma with a pair of long slender caliper-like distolateral projections directed forwards; 3rd pereopod of female without basal spine *Parapenaeopsis cornuta* (Kishinouye)
Petasma with a pair of distolateral projections directed laterally or distolaterally, short and spout-like 16
- 16(15) Antennular flagella 0.5-0.6 length of carapace; movable lateral spines absent on telson; thelycum with median tuft of setae on posterior plate
..... *Parapenaeopsis sculptilis* (Heller)
Antennular flagella 0.7 length of carapace or longer; movable lateral spines present on telson; thelycum without median tuft of setae on posterior plate
..... *Parapenaeopsis hardwickii* (Miers)

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