

NOTES ON A COLLECTION OF PENAEID PRAWNS FROM THE ANDAMANS

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ABSTRACT

There is little information on the penaeid prawns of the inshore waters, backwater creeks and mangrove swamp areas of the Andaman Islands. This report records the occurrence of 16 species of penaeid prawns collected mainly during a survey conducted by one of the authors (E.G.S.) from the Middle Andamans. Thirteen out of 16 species collected, are new records for the Andaman-Nicobar Islands. The clinal differences observed in some of the species such as *Metapenaeus dobsoni* and *Parapenaeopsis cornuta* are discussed.

INTRODUCTION

Our knowledge of the penaeid prawn fauna of the Andaman Islands is limited to the early works of Alcock (1901, 1906) who mainly studied the deep sea species collected by the 'Investigator'. Very little is known about the littoral species. The following species of penaeid prawns were recorded from Andaman waters by Alcock (1901, 1906). The littoral species are marked by an asterisk; the rest are all deep sea forms.

1. *Aristaeus virilis* (Bate)
2. *Hemipenaeus crassipes* (Wood-Mason)
3. *Plesiopenaeus edwardsianus* (Johnson)
4. *Plesiopenaeus coruscans* (Wood-Mason)
5. *Aristaeomorpha rostridentatus* (Bate)
6. *Benthescymus investigatoris* (Alcock and Anderson)
7. *Solenocera annectans* (Wood-Mason)
8. *Hymenopenaeus aequalis* (Bate)
9. *Haliporus microps* (Smith)
10. **Penaeus monodon* Fabricius
11. **Penaeus japonicus* Bate
12. **Metapenaeus intermedius* (Kishinouye)
13. *Metapenaeopsis coniger* (Wood-Mason)
14. *Metapenaeopsis andamanensis* (Wood-Mason)
15. **Metapenaeopsis stridulans* (Alcock)
16. **Metapenaeopsis mogiensis* (Rathbun)
17. *Penaeopsis rectacuta* (Bate)
18. *Parapenaeus fissurus* (Bate)
19. *Parapenaeus investigatoris* Alcock and Anderson
20. **Trachypenaeus asper* Alcock

Collections made by one of us (E.G.S.) from the shallow coastal waters in places around Port Blair, Andamans contained 16 species of penaeid prawns, of which 13 are new distributional records for Andaman waters and one was described recently a new species (Silas and Muthu, 1976). A taxonomic study of these species revealed some very interesting speciation trends which are discussed in this paper.

The collection site, date of collection, sex, size and range in millimeter are given in this order under the heading 'Material'.

We are thankful to Shri D. B. James for sending us some additional collections of prawns from Chauldari and Dighlipur.

***Penaeus merguensis* De Man, 1888**

Penaeus merguensis De Man, 1888, pp. 287-90; 1911, pp. 104-105. Kubo, 1949, pp. 308-11. Racek, 1955, pp. 221-22; 1959, pp. 10-12. Hall, 1956, pp. 74-75; 1962, p. 15. Dall, 1957, pp. 160-62. Cheung, 1960, 17.67. Racek & Dall, 1965, p. 16-17. De Bruin, 1965, p. 76. Tirmizi, 1967, p. 8. George, 1969, p. 24. Racek & Yaldwyn, 1971, p. 210.

Penaeus indicus Bate, 1888, p. 248.

Penaeus merguensis Schmitt, 1926, pp. 360-61. Boone, 1935, pp. 96-107.

Penaeus indicus var. *mergulensis* De Man, 1892, p. 511.

Penaeus indicus var. *mergulensis* Block, 1906, p. 13.

Material : Sippighat, 14-8-68, 2 females 87, 113 ; one male 93 ; Lal Palar, 21-12-67, 2 females 71, 88 ; Marine Bay, 13-11-63, one female 163 ; Corbyn's Cove, 10-8-67, one male 136 ; Sippighat, 17-2-76, one male 98 ; Corbyn's Bay, 18-2-76, 2 males, 120, 120 ; Corbyn's Cove, 18-2-76, 2 females 132, 133, 2 males 117, 120 ; Wright Mayo, 10-5-76, 75 females 91-175, 97 males 91-160 ; Wright Mayo, 12-7-76, 28 females 81-145, 36 males 81-135 ; Chauldari, 20-7-76, 37 females 91-135, 89 males 81-135 ; Dighlipur, 19-12-76, 54 females 66-120, 97 males 81-120.

Remarks : This is the most important commercial species of penaeid prawn in the Andamans and is the object of a stake-net fishery at Wright Mayo, Chauldari and Dighlipur.

This species is closely related to *Penaeus indicus* the common Indian white prawn which it replaces in the Andamans.

***Penaeus monodon* Fabricius, 1798**

Penaeus monodon Fabricius, 1798, p. 408. Haswell, 1882, p. 199. Kishinouye, 1900, p. 7. Stebbing, 1910, p. 380. Holthuis, 1949, pp. 1051-57. Kubo, 1949, p. 291 (part Synonymy only). Barnard, 1950, p. 584. Dall, 1957, pp. 152-54. Racek & Dall, 1965, pp. 10-11. De Bruin, 1965, p. 76. Jombert, 1965, p. 22-24. Tirmizi, 1967, p. 7. George, 1969, p. 22-23. Racek & Yaldwyn, 1971, p. 209.

Penaeus carinatus Dana, 1852, p. 602. De Man, 1911, p. 101. Kemp, 1915, p. 317. Burkenroad, 1934 a, p. 74. Anderson & Lindner, 1943, p. 305. Racek, 1955, pp. 215-17; 1959, pp. 10-11.

Penaeus semisulcatus Alcock, 1906, pp. 10-11 (nec D: Haan).

Penaeus caeruleus Stebbing, 1905, p. 77. Burkenroad, 1934 a, p. 74. Racek, 1955, p. 217-18; 1959, p. 10-11.

Peneus carinatus Schmitt, 1926, pp. 359, 363.

Penaeus bubulus Kubo, 1949, pp. 296-301.

Material : Marine Bay, 24-11-65, one female 164 ; Port Blair, 1-12-67, one female 141 ; Chauldari, 20-7-76, one female 86.

Remarks : The specimens agree in all respects with the earlier descriptions of the species.

***Penaeus semisulcatus* De Haan, 1850**

Penaeus semisulcatus De Haan, 1850, p. 191. De Man, 1911, pp. 97-100. Barnard, 1950, p. 588. Racek, 1955, pp. 218-19 ; 1959, p. 10. Dall, 1957, pp. 154-57. Racek & Dall, 1965, p. 11. De Bruin, 1965, p. 76. Joubert, 1965, p. 20-22. Tirmizi, 1967, p. 7. George, 1969, p. 23.

Penaeus monodo : Bate, 1838, p. 250. Kubo, 1949 (part Synonymy only), pp. 291-96.

Peneus monodon Alcock, 1906, p. 8.

Penaeus semisulcatus Schmitt, 1926, pp. 360, 364.

Material : Corbyn's Cove, 18-2-76, one female 157 ; Wright Mayo, 10-5-76, 3 males 62,80,92 ; 2 females 68,87 ; Wright Mayo, 12-7-76, 2 females 72,74 ; 2 males 66, 83.

Remarks : This is the first record of the species from the Andamans and the specimens agree with the earlier descriptions of the species.

***Penaeus canaliculatus* Oliver, 1911**

Penaeus canaliculatus Oliver, 1911, p. 660. H. Milne Edwards, 1837, p. 414. Bate, 1881, p. 174 ; 1888, p. 243. Nobili, 1906, p. 9. De Bruin, 1965, p. 75. Joubert, 1965, p. 18-20. George, 1969, p. 21. Farfante, 1976, p. 23-37.

Material : Junglighat, 23-12-67, male 83 ; Corbyn's Cove 18-2-76, female 107.

Remarks : This is the first record of the species from the Andamans. The telson is without lateral spines and the median plate of the thelycum is long and roughly triangular in outline.

***Penaeus latisulcatus* Kishinouye, 1900**

Penaeus latisulcatus Kishinouye, 1900, p. 12. De Man, 1911, pp. 108-11. Kubo, 1949, pp. 278-82. Racek, 1955, pp. 222-23 ; 1959, pp. 10-11. Hall, 1956, p. 72 ; 1962, pp. 14-15. Dall, 1957, pp. 149-151. Racek & Dall, 1965, 12-13. De Bruin, 1965, p. 74-75. Joubert, 1965, p. 17-18. George, 1969, p. 22.

Peneus latisulcatus Schmitt, 1926, pp. 365-7 (except 0-7 E 3157).

'*Penaeus canaliculatus* Oliv. var.' Lanchester, 1901, p. 571.

Penaeus canaliculatus var. *australensis* De Man, 1902, p. 905.

Material : Corbyn's Cove, 18-2-76, one female 90.

Remarks : This is the first record of the species from the Andamans. Telson has 3 pairs of movable lateral spines. The median plate of thelycum has a prominent pair of antero-ventrally directed horns.

***Metapenaeus dobsoni* (Miers, 1878)**

Penaeus dobsoni Miers, 1878, p. 302.

Metapenaeus dobsoni Nobili, 1903, p. 3. Menon, 1952, pp. 80-93. Dall, 1957, p. 183 (Key) Hall, 1962, p. 25. Racek & Dall, 1963, p. 80-81. De Bruin, 1965, p. 80. George 1969, p. 29. Racek & Yaldwyn, 1971, p. 212.

Metapeneus dobsoni Alcock, 1906, pp. 21-22.

Penaeopsis sp. De Man, 1911, pp. 60-61.

Penaeopsis dobsoni Kemp, 1915, p. 322.

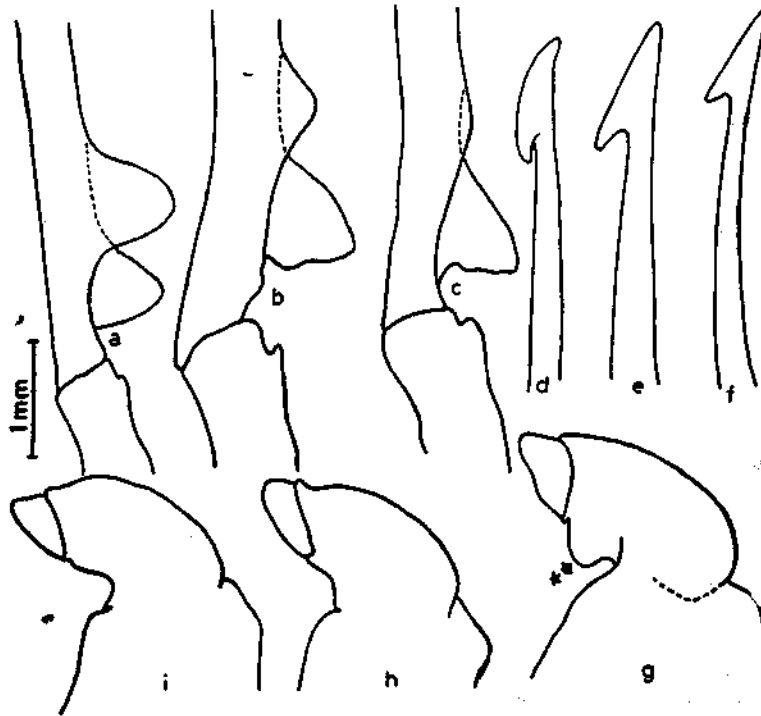


Fig. 1. *Metapenaeus dobsoni*—Meral spines on the 5th pereopod of male from : a. Cochin (15 mm c.l.), b. Madras (17 mm c.l) and c. Port Blair (16 mm c.l) ; Basial spine on 3rd pereopod of male from : d. Cochin (15 mm c.l), e. Madras (17 mm c.l) and f. Port Blair (16 mm c. l) ; vestigial 5th pereopod of female from : g. Cochin (18 mm c.l), h. Madras (18.5 mm c.l) and i. Port Blair (17.5 mm c.l).

Material : Wright Mayo, 10-5-76, 20 females 56-100, 25 males 51-80 ; Wright Mayo, 12-7-76, 7 females 66-85, 34 males 61-80 ; Chauldari 20-7-76, 2 females 83,98, 7 males 66-80 ; Dighlipur, 19-2-1976, 60 females 56-90, 31 males 51-80.

Remarks : Specimens of *M. dobsoni* from the Andaman show some interesting variations when compared with *M. dobsoni* from the mainland. When males of the same size are compared, the Andaman specimens, appear to have a more massive petasma than the specimens from the west coast of India. The rostrum also appears to be more slender in the Andaman specimens. The most important difference, however, is in the 5th pereopod of the male ; in *M. dobsoni* from the Kerala Coast there are two flat meral projections, the anterior one being larger than the posterior one (Fig. 1 a) whereas in the present material from the Andamans there is only one meral projection, the anterior projection being totally absent or highly reduced (Fig. 1 c). A very interesting point is that in *M. dobsoni* from the Madras Coast the meral spines on the 5th pereopod of the male show an intermediate condition (Fig. 1 b), there are two meral projections but the anterior one is smaller than the posterior one. This trend in the reduction of the anterior meral spine of the 5th leg of the male in the eastern populations of *M. dobsoni* is suggestive of a west-east cline in the Indo-Pacific for this species. The clinal trend is also noticed in the shape of the stumpy 5th pereopods of the adult females from the Kerala Coast, Madras Coast and the Andamans illustrated in Fig. 1 g, h and i respectively ; the small posterior lobe (marked '*' in the figure) which is present in the specimens from the Kerala Coast is absent in the specimens from Madras and the Andamans. The trend is also seen in the coxal projection of the 4th pereopod of the female, the finger like coxal projection is larger in specimens from the west coast than in the specimens from the Madras Coast and the Andamans. The shape of the basal spine of the 3rd pereopod of adult males is also different in the western and eastern populations (Fig. 1 d, e, f). In the light of the present findings it will be interesting to study the specimens of *M. dobsoni* from West Irian where commercial concentrations of this species have recently been reported (Racek and Yaldwyn, 1971).

This is the first record of the species from the Andamans. At Dighlipur it is caught in commercial abundance.

Metapenaeus baramensis Hall, 1962

Metapenaeus ensis var. *baramensis* Hall, 1962, pp. 22-23.

Material : Corbyn's Bay, 15-2-76, 3 females 71,76,89.

Remarks : The three juvenile females have the thelycum exactly similar to that of *Metapenaeus ensis* var. *baramensis* illustrated by Hall (1962). The median plate of the thelycum has two indentations on each side and the lateral plates are flat without elevated margins. As in Hall's variety, the first pereopods of the specimens on hand have a sharp well developed ischial spine while in *M. ensis* the ischial spine is very small and blunt. In the present material there are 11-12 rostral spines in addition to the epigastric whereas in *M. ensis* there are only 8-10 rostral spines besides the epigastric. Hall (1962) considered the single female to be an aberrant form of *M. ensis* but a study of the present material indicates that *M. ensis* var. *baramensis* of Hall could be raised to the status of a distinct species.

M. baramensis can be distinguished from *M. ensis* by (1) the presence of a sharp well developed ischial spine on the first pereopod, (2) the greater number of rostral teeth and (3) the distinctly different thelycum. The males are yet unknown.

Metapenaeus krishnatrii Silas and Muthu, 1976

Metapenaeus krishnatrii Silas and Muthu, 1976, pp. 645-648.

Metapenaeus monoceros Hall, 1956, pp. 77-79. (glabrous Form).

Material : Corbyn's Cove, 17-2-76, one female 96, 3 males 76,98,98.

Remarks : This species has been described elsewhere in great detail (Silas and Muthu, 1976). The 'glabrous form of *M. monoceros*' described by Hall (1956) appears to belong to this species. The petasma figured by him (Hall, 1956) resembles that of *M. krishnatrii* very closely.

Metapenaeus ensis (De Haan, 1850)

Penaeus monoceros ensis De Haan, 1850, p. 192.

Penaeus monoceros Haswell, 1882, p. 200.

Penaeus mastersii Haswell, 1879, p. 42; 1882, p. 203.

Penaeus incisipes Bate, 1888, pp. 257-58 (note female). Kishinouye, 1900, pp. 18-19. Blanco and Arriola, 1937, p. 223.

Penaeopsis monoceros De Man, 1911, pp. 55-57. Schmitt, 1926, pp. 325-29 (including part of *Penaeus mastersii*).

Metapenaeus incisipes Block, 1906, p. 51.

Metapenaeus monoceros Kubo, 1949, pp. 329-33 (part Synonymy only). Hall, 1956, pp. 77-78 (not including Fig. 11). Dall, 1957, pp. 184-87 (part Synonymy only).

Metapenaeus incisipes Racek, 1955, pp. 230-32; 1959, p. 10.

Metapenaeus ensis Hall, 1958, pp. 537-44; 1962, pp. 22-23. Cheung, 1960, pp. 66, 68. Muthu, 1965, pp. 465-68, Racek & Dall, 1965, pp. 50-61. De Bruin, 1965, p. 80. George, 1969, p. 29-30. Racek & Yaldwyn, 1971, p. 211-12.

Material : Sippighat, 17-2-76, one female 107, 2 males 103,93; Corbyn's Cove, 18-2-76, 6 females 92-113, 2 males 93,111; Wright Mayo, 12-7-76, 4 females 68-82, 3 males 62-73; Chauldari, 20-7-76, 2 females 79,81, 3 males 76-79; Dighlipur, 19-12-76, one female 81, one male 78.

Remarks : This is the first record of the species from the Andamans. It appears to replace the closely allied species *M. monoceros* in the Andamans. On the mainland, *M. ensis* has been recorded only from the east coast (Muthu, 1965) where it occurs along with *M. monoceros*. The share of *M. ensis* in the commercial catches of this closely related pair of species on the east coast increases northwards and in the catches from the head of the Bay of Bengal, opposite to the Hooghly River mouth, *M. ensis* is more common than *M. monoceros* (personal observations of M. S. M.). This trend appears to continue eastwards and *M. ensis* completely replaces *M. monoceros* in the Andamans and in the region east of the Malacca Strait.

Metapenaeus affinis (H. Milne Edwards, 1837)

Penaeus affinis H. Milne Edwards, 1837, p. 416.

Metapenaeus affinis Alcock, 1906, pp. 20-21 (part Synonymy only).

Penaeopsis affinis Kemp, 1915, p. 321. De Man, 1924, pp. 4-5 (non 1911).

Metapenaeus affinis Burkenroad, 1934, pp. 29-32. Kubo, 1954, pp. 82-92 (non 1949). Dall, 1957, p. 183 (key). George, 1969, p. 31-32. Tirmizi, 1967, p. 11. Cheung, 1960, p. 66 (key). Racek & Dall, 1965, pp. 68-69. Racek & Yaldwyn, 1971, p. 211.

Penaeus mutatus Lanchester, 1901, pp. 572-73.

Metapenaeus necopinans Hall, 1956, pp. 83-84.

Metapenaeus muratus Hall, 1961, p. 85 ; 1962, p. 86-87. De Bruin, 1965, p. 76-78.

Material : Corbyn's Cove, 18-2-76, 3 females 97,98,98 ; Sippighat, 17-2-76, 2 males 94,97 ; Wright Mayo, 10-5-76, one female 83 ; Wright Mayo 12-7-76, one female 66.

Remarks : This is the first record of the species from the Andamans. The present specimens are all juveniles. It may be interesting to study the adult forms from Andaman waters to see whether they differ from the mainland specimens of *M. affinis*.

Metapenaeus burkenroadi Kubo, 1954

Metapenaeus burkenroadi Kubo, 1954, pp. 92-93. Dall, 1957, p. 183 (key). Racek, 1957, pp. 6-7. Cheung, 1960, pp. 66-68. Racek & Dall, 1965, pp. 72-73. De Bruin, 1965, pp. 78-79. George, 1969, p. 32.

Penaeus affinis Kishinouye, 1900, pp. 16-18.

Penaeopsis affinis Balss, 1914, p. 7 ; 1924, p. 44 (non de Man, 1911).

Parapenaeus affinis Rathbun, 1902, p. 38.

Metapenaeus affinis Kubo, 1949, pp. 340-44 (part Synonymy only).

Metapenaeus mastersii Hall, 1962, pp. 23-24 (non Racek, 1955, 1957, 1959 ; Dall, 1957, 1958).

Material : Chauldari, 20-7-76, one female 65.

Remarks : This is the first record of the species from the Andamans. The specimen agrees in all respects with the earlier descriptions of the species.

Metapenaeus elegans De Man, 1907

Metapeneus elegans De Man, 1907, p. 130.

Penaeopsis elegans de Man, 1911, p. 58-60.

Penaeopsis monoceros De Man, 1924 (Fig. 1, 1a).

Metapenaeus singaporensis Hall, 1956, pp. 84-86.

Metapenaeus elegans, Hall, 1962, p. 25. Racek & Dall, 1965, p. 57 (key). De Bruin, 1965, p. 80-81.

Material : Chauldari, 20-7-76, one female 106.

Remarks : West of the Malaysian region this species has been reported only from Ceylon (De Bruin, 1965). This is the first record of the species from the Andamans.

The present specimen agrees in all respects with the description and illustration given by Hall (1956, 1962) except for the fact that the ischial spine on the 1st pereopod is sharp and distinct, being $\frac{1}{4}$ size of the basal spine. The ischial spine according

to Hall (1956) is 'most minute'. The dorsal spine on the basal segment of the eye-stalk is present. The median plate of the thelycum has a deep median sulcus along its length and its broad anterior border is deeply emarginate; there is a bulbous structure between each lateral plate and the median plate.

Metapenaeus brevicornis (H. Milne Edwards, 1837)

Penaeus brevicornis H. Milne Edwards, 1837, p. 417. Bate, 1881, Lanchester, 1901, p. 571.

Metapenaeus brevicornis Alcock, 1906, pp. 22-23.

Penaeopsis brevicornis Kemp, 1918, pp. 294-95.

Metapenaeus brevicornis Burkenroad, 1934b, pp. 33-36. Kubo, 1949, pp. 351-55. Hall, 1956, p. 81; 1962, pp. 24-25. Dall, 1957, p. 184 (key). Racek & Dall, 1965, p. 81-82. George, 1969, p. 28.

Penaeopsis avirostris Balss, 1914, p. 10.

Penaeus sp. Lanchester, 1901, pp. 571-72.

Material : Chauldari, 20-7-76, one female 94, one male 65; Dighlipur, 19-12-76, 3 females 73-86.

Remarks : This is the first record of the species from the Andamans.

Metapenaeopsis stridulans (Alcock, 1905)

Metapeneus stridulans Alcock, 1905, p. 526. 1906, pp. 27-29 (not Synonymy, nor figure 14b, plate 5).

Metapenaeopsis stridulans Hall, 1962, p. 32. Racek & Dall, 1965, p. 32-34. De Bruin, 1965, p. 84-85. George & Muthu, 1968, p. 289-291. George, 1969, p. 25.

Material : Wright Mayo, 12-7-76, one female 50.

Remarks : The specimen is a juvenile and agrees with the earlier descriptions of the species.

Trachypenaeus fulvus Dall, 1957

Trachypenaeus Fulvus Dall, 1957, pp. 106-09. Racek & Dall, 1965, p. 93. Racek & Yaldwyn, 1971, p. 212-13.

Trachypenaeus asper Kubo, 1949, pp. 395-98. Cheung, 1960, p. 65 (key).

Trachypeneus fulvus Hall, 1962, pp. 29-30.

Trachypeneus unicus Hall, 1961, p. 102.

Trachypeneus (*Trachysalambria*) *curvirostris* Racek, 1955 (pl. 7, Fig. 4 only).

Material : Corbyn's Cove, 18-2-76, one female 56.

Remarks : This is the first record of the species west of the Malaya Peninsula. The anterior thelycal plate is semicircular in outline. The pereopods of the specimen are damaged and hence it could not be decided whether it belongs to the long-legged variety recognised by Racek and Dall (1965).

Parapeneopsis cornuta (Kishinouye, 1900)

Penaeus cornutus Kishinouye, 1900, p. 23.

Parapeneopsis cornuta De Man, 1911, p. 93.

Parapeneopsis cornutus Maki and Tsuchiya, 1923, pp. 43-44. Kubo, 1949, pp. 374-78. Dall, 1957, pp. 215-17.

Parapeneopsis cornutus Racek, 1959, p. 10.

? *Parapeneopsis maxillipedo* Alcock, 1905, pp. 40-41. Hall, 1961, pp. 89-90; 1962, p. 26. De Bruin, 1965, p. 95.

? *Parapeneopsis maxillipedo* Kubo, 1949, pp. 380-81.

Parapeneopsis cornuta cornuta Racek & Dall, 1965, pp. 98-99.

? *Parapeneopsis cornuta maxillipedo* Racek & Dall, 1965, p. 99. Racek & Yaldwyn, 1971, pp. 213-14.

Material: Corbyn's Bay, 18-2-76, 7 females 62-87, 11 males 57-85; Corbyn's Cove, 18-2-76, 10 females 62-112, 7 males 62-97.

Remarks: The Andaman specimens appear to be intermediate between *P. cornuta maxillipedo* (Alcock) and *P. cornuta cornuta* (Kishinouye). The females are practically devoid of a basal spine on the 3rd pereopod. Out of 16 females examined 14 are without this spine; in one specimen it is represented by a small and blunt prominence on one side and none on the other; and in the other specimen it is very small and blunt on both sides. Out of 17 males examined 8 have a well defined basal spine on the 3rd leg, 3 have a small blunt spine and 6 have no trace of basal spine on the 3rd leg. The carapace has 9 rostral spines in addition to the epigastric in most of the specimens. The postrostral carina is well defined and extends almost to the posterior end of the carapace but is not raised in the form of a crest behind the epigastric as in *P. cornuta maxillipedo* (Alcock) from the mainland.

The colouration of the Andaman specimens in fresh condition is exactly similar to that of *P. cornuta maxillipedo* from the mainland, with olive green transverse bands on the abdominal segments, dark green uropods and a brown oval patch on either side of the 6th abdominal segment.

Earlier workers treated *P. maxillipedo* Alcock and *P. cornuta* (Kishinouye) as two distinct species, although Alcock (1906) while describing the species felt that it may turn out to be a variety of *P. cornuta* (Kishinouye). The distinction was based mainly on the presence of the basal spine on the 3rd pereopod of females in the former and the absence of the spine in the latter. Hall (1962) while discussing his material from the Malaysian region said that they are intermediate between the two species since, in the females, the basal spine of the 3rd pereopods is rudimentary, although present, and the postrostral carina is less prominent than in *P. maxillipedo*. He also suggested that *P. maxillipedo* may be only a geographic variety of *P. cornuta*. Racek and Dall (1965) opined that, as the thelycum and petasma are identical in the two forms, they are conspecific and recognised two sub-species of *P. cornuta*, viz., *P. cornuta maxillipedo* (Alcock) with an equatorial spread and *P. cornuta cornuta* (Kishinouye) confined to Japanese and Australian waters. However, they were not satisfied with this arrangement and felt that 'further studies of this species complex are highly desirable'.

From a careful study of the earlier descriptions of *P. maxillipedo* (Alcock, 1906; Hall, 1962; De Bruin, 1965) and *P. cornuta* (Kishinouye, 1900; de Man, 1911;

Kubo, 1949 ; Dall, 1957) it appears that this species complex forms a clinal series in the Indo-Pacific with the *maxillipedo*-form at the western and the *cornuta*-form in the north-eastern and south-eastern ends of its distribution in the region. The *maxillipedo*-form which is typical of specimens from Indian waters is characterised by (a) the presence of well developed basal spine on the 3rd pereopod of females (b) 9-10 rostral teeth in addition to the epigastric and (c) a very prominent postrostral ridge which is almost elevated to a crest behind the epigastric tooth in large females. As we proceed eastwards along the cline there appears to be a reduction in (a) the size of the basal spine on the 3rd pereopod of the female (b) the number of rostral spines and (c) the prominence of the postrostral carina. This condition appears to be exemplified by the specimens from the Andamans (present observation) and the Malaysian region (Hall, 1962). In the extreme north-eastern (Japanese waters) and south-eastern (Australian waters) ends of the cline, the *cornuta*-form which is characterised by (a) the absence of basal spine on the 3rd pereopod (b) 6-7 rostral teeth besides the epigastric and (c) feeble postrostral carina in the posterior half of the carapace, is found.

A comprehensive study of specimens of this species complex from various points of its geographic range, in the light of these observations may throw more light on the problem.

DISCUSSION

The present study has shown that some species of prawns which are abundant in Indian waters, such as *Penaeus indicus* and *Metapenaeus monoceros*, are replaced (not totally but with regard to commercial abundance) by their closely related species viz., *P. merguensis* and *M. ensis* respectively, in the eastern Indo-Pacific Region east of the east coast of India.

Another interesting observation is that some widely distributed Indo-Pacific species such as *M. dobsoni* and *Parapenaeopsis cornuta* have evolved as a geocline stretching across the Indo-Pacific. The basic structure of the thelycum and petasma does not change throughout the cline but other morphological features such as the carination of the carapace and the spines on the appendages and the rostrum show decided reductional trends along the cline in the west-east direction. It is likely that similar clinal series may be present in many widely distributed penaeids such as *Parapenaeopsis stylifera*, *Metapenaeus affinis* and *Trachypenaeus curvirostris*. For example, *P. stylifera coromandelica* from the east coast of India, where the fixed spines on the telson are reduced in number, may represent such a clinal trend. In the light of these suggestions a comparative study of these species collected from various geographical areas in the Indo-Pacific region may be rewarding. The clinal concept may solve many tangled problems in penaeid taxonomy.

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