

# ASYMMETRY OF THE MANDIBLES IN THE LARVAE OF SOME PENAEINAE (PENAEIDAE, DECAPODA)

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Mandibles of the larval stages of 8 genera of penaeid prawns of the Indian Ocean are described and figured. An interesting phenomenon observed is the asymmetry of the mandibles in the larvae of the species of the genera, *Metapenaeus*, *Parapenaeopsis*, *Penaeopsis*, *Parapenaeus*, *Penaeus*, *Metapenaeopsis*, *Trachypenaeus* and *Atypopenaeus*. The asymmetry is noticed mostly in the number of denticular setae, the number varying with different stages and species and the nature of dentation of the molar process. Such an asymmetry in the mandibles of the larvae has not been described earlier. Its importance as a character for interstage, interspecific and intergeneric identification is discussed.

## INTRODUCTION

Though the larval development of a large number of species of penaeid prawns has been published (Menon, 1951; Heegaard, 1953; Pearson, 1939; Kirkegaard, 1969; Gurney, 1942; Rao, 1973; Paulinose, 1973; Raje and Ranade, 1972a and b; Hudinaga, 1942; Dobkin, 1961), the asymmetry of the mandibles in the larvae is not dealt with in detail in any of these. Menon (1951) mentioned that the mandibles are slightly asymmetrical in the number of denticular setae in the first mysis of *Metapenaeus dobsoni*. Bate (1888) reported this phenomenon in the adults of *Lucifer* Sp., Burkenroad (1936) and Gordon and Ingle (1956) in adults of the genus *Funchalia*. This has been noted in the larvae of some decapods (Sankolli, 1967; Shenoy, 1967) and also in certain Caridea (Pillai, 1973; Menon, 1938; Greenwood *et al.*, 1976). Large number of larvae of all stages of different species of penaeids available from the IIOE collections (1960-65) was utilized to make a complete study of the development of the mandibles, in an attempt to assess the importance of this feature as a character for identification of different genera and species in their larval stages.

## DESCRIPTION

Larval stages from protozoae to postlarvae of 8 genera have been closely examined. In the case of larvae, the asymmetry is found mainly in the number of denticular setae present in between the incisor and molar processes and in the dentation of the molar process and in the case of adults in the general shape of the mandibles (Fig. 1). In some of the species there is a progressive increase in the number of setae on the mandible, from one stage to the next, till certain stage, however, maintaining the asymmetry between the two sides. Hence, this feature may be useful for identification of larval stages.

The mandibles of the following genera namely *Metapenaeus*, *Parapenaeopsis*, *Metapenaeopsis*, *Penaeopsis*, *Trachypenaeus*, *Penaeus*, *Parapenaeus* and *Atypopenaeus* were examined and studied.

*Metapenaeus*: In all the three mysis stages the number of denticular setae was found not varying in number from the 1st stage to the next. There are 3

## Asymmetry in mandibles of Penaeid larvae

denticular setae on the right mandible and 7 on the left and the molar process of the right mandible is dentated with many teeth (Fig. 1). Although Menon (1951) noted the asymmetry of the mandibles in zoea I of *Metapenaeus dobsoni* he does not give any detail except showing 9 setae in stage I and 8 in stage III in the figures of the left mandibles.

*Parapenaeopsis*: Rao (1973) described the developmental stages of *Parapenaeopsis stylifera* but failed to mention about the asymmetry of the mandibles. The mysis stages examined showed some number of denticular setae on the mandibles as in *Metapenaeus*, 3 setae on the right mandible and 7 on the left (Fig. 1, 2).

*Penaeopsis*: The developmental stages of *P. rectacuta* have been observed by the author (1973) wherein he had overlooked the asymmetry of the mandibles. On further examination of the mysis and postlarval stages it was found that the mandibles are asymmetrical, in the number of denticular setae and in the dentation of the molar process. Unlike *Metapenaeus* and *Parapenaeopsis* where

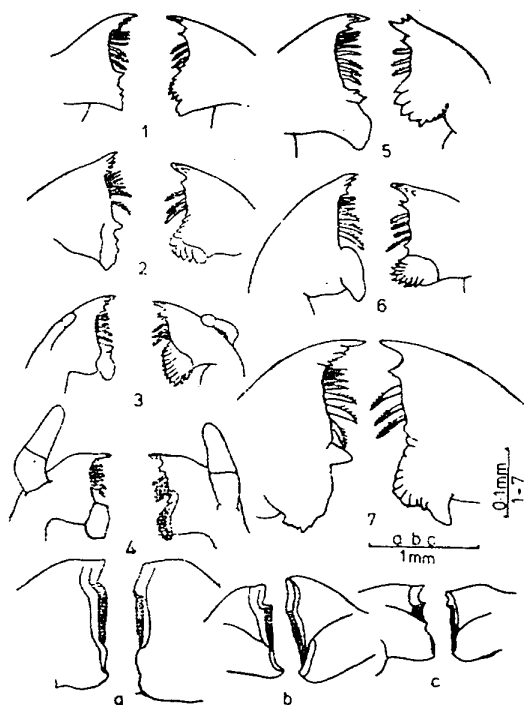


Fig. 1. Mandibles of different genera, showing the asymmetry in setae and molar process. 1 - *Metapenaeus* sp., Mysis III; 2 - *Parapenaeopsis stylifera*, Mysis III; 3 - *Metapenaeopsis mogiensis*, Mysis III; 4 - *M. barbata*, Postlarva; 5 - *Penaeopsis rectacuta*, Mysis II; 6 - *P. rectacuta*, Mysis III; 7 - *Atypopenaeus* sp., Mysis III; a - *Penaeus* sp., - adult; b - *Metapenaeopsis* sp., - adult; c - *Metapenaeus* sp., - adult

there is no change of denticular setae between the mysis stages, the number of setae is found slightly varying in *Penaeopsis*. Thus in 3rd protozoa there are 3 denticular setae on the right mandible and 6 on the left; in mysis I there are 3 on the right and 7 on the left; In mysis II 3 on the right and 7-8 on the left (Fig. 1, 5), and in mysis III 4 on the right and 7 on the left (Fig. 1, 6). These cases may be considered as only slight variations from the usual number. Finally, it remains 3 on the right mandible and 7 on the left in the postlarval stages.

*Parapenaeus*: Larvae of 3 species of *Parapenaeus* were examined. It was difficult to find any uniform arrangement in the number of denticular setae of the mandibles. In *P. investigatoris* there is an addition of one seta each on both mandibles from the 3rd protozoa to the 3rd mysis stage, i.e., 2 and 6 in protozoa III; 3 and 7 in mysis I; 4 and 8 in mysis II and 5 and 9 in mysis III. But in later stages it varied from 5 to 6 on the right mandible and 7 to 9 on the left mandible (mysis IV and postlarvae). The variation is greatest in *P. longipes*, in that a maximum of 8-9 setae are present on the right mandible and 19-20 on the left mandible in postlarva III. There are 4-5 setae on the right mandible and 11 on the left in mysis stage and 6 on right and 13 on the left in postlarva I. In *P. fissurus* there are 4 setae on the right mandible and 9 on the left mandible in mysis stages and 4-5 on the right and 8-9 on the left mandibles in early postlarvae. Thereafter, they decrease in number to 3 on the right mandible and 7 on the left mandible in late postlarvae. Thus the number of denticular setae in these 3 species forms a character of importance for the identification of larvae of one species from the other.

*Metapenaeopsis*: In *M. andamanensis* and *M. mogiensis* the number of denticular setae remains constant, 3 on the right mandible and 7 on the left mandible (Fig. 1, 3). But in *M. barbata* the number of setae is found varying with 4 on right and 8 on left mandible in mysis (Fig. 1, 4) and 5 on right and 9 on left in postlarvae. Hence, *M. barbata* can be identified from *M. andamanensis* and *M. mogiensis*. The number of denticular setae of the latter two species also tend to show that *M. mogiensis* and *M. andamanensis* are far more closely related than *M. barbata*.

*Trachypenaeus*: The larval stages of the genus were also examined. It was noted that there is one denticular seta on the right mandible and 5 on the left in 2nd protozoa. The number of setae increases by one in both mandibles in the next protozoa stage. But it remains constant, 3 and 7 on right and left mandibles respectively, in mysis stages and continues to be the same for postlarvae too.

*Atypopenaeus*: Mandibles of the larvae of *Atypopenaeus* showed a very similar pattern of development as that of *Trachypenaeus*. The number remained 3 and 7 on the right and left mandibles (Fig. 1, 7). It is seen that as the larvae advance towards juvenile stage there is a reduction in the number of setae on the mandibles.

*Penaeus*: Only few late postlarvae of *P. indicus* were available for the study which showed no denticular setae on the mandibles. However, the mandibles were found to be slightly asymmetrical in shape. Some of the juveniles and adults of the genera, *Penaeus*, *Metapenaeus* and *Metapenaeopsis* examined showed the mandibles are slightly asymmetrical (Fig. 1, a, b, c) in their shape.

#### DISCUSSION

The present observations point to the fact that asymmetry of mandibles is a common feature in penaeid larvae as in Caridea (Pillai, 1973 and Menon,

## Asymmetry in mandibles of Penaeid larvae

1938), and other decapods (Sankolli, 1967; Shenoy, 1967). It is felt that the asymmetry of the mandibles in combination with other characters could be used in identifying the larvae of at least some of the penaeids dealt with. Larvae of different species of the genera *Metapenaeus*, *Atypopenaeus*, *Trachypenaeus*, *Penaeopsis*, *Parapenaeopsis* and *Metapenaeopsis* have, in general left mandible with 7 setae and right with 3 setae, with minor variations between stages in some genera. But all the three species of the genus *Parapenaeus* show a much higher number of mandibular setae on both sides in all the larval stages. So the larvae of this genus can be easily separated from those of others by using this character.

Among the other genera, *Penaeopsis* and *Metapenaeopsis* show slight variations in the number of setae in early larval stages by which those larvae could be distinguished from those of *Metapenaeus*, *Atypopenaeus* and *Trachypenaeus* where the number of setae remains constant (3 on the right and 7 on the left mandible). In the genus *Metapenaeopsis* interspecific variations which would help in specific identifications are noticed. Thus in certain cases the mandibular asymmetry may be used as an identifying feature for the larvae.

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V. T. Paulinose

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DISCUSSION

- SANKOLLI : A review of decapod larvae reveals that what is referred as asymmetry is invariably seen as variation in armature, shape and size etc. from lower decapods to higher decapods, both in larvae and adults. I think this term should not be used.
- TIWARI : It appears to me not as asymmetry but as differences in structure of mandibles on both sides.
- PAULINOSE : The term asymmetry has already been used in the description of the mandibles in several crustaceans.