

ON THE DISTINCTION BETWEEN *PENAEUS INDICUS*
H. MILNE EDWARDS AND *PENAEUS MERGUIENSIS* DE MAN
(CRUSTACEA : PENAEIDAE) WITH SPECIAL REFERENCE
TO JUVENILES

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ABSTRACT

Clear-cut differences between the juveniles of *Penaeus indicus* and *Penaeus merguiensis* are pointed out in this paper. On the basis of the colour pattern of the antennal flagella, antennular flagella and the pleopods, and the disposition of the rostral teeth it is now possible to identify the juveniles of *P. indicus* and *P. merguiensis* with certainty.

INTRODUCTION

Penaeus merguiensis was first described as a species distinct from *P. indicus* H. Milne Edwards by de Man (1888). But de Man (1892) subsequently identified it with *P. indicus*. Alcock (1906) considered it as a variety of *P. indicus*. However, de Man (1911) again raised it to the level of a species. Later, Schmitt (1926), Kubo (1949), Barnard (1950), Racek (1955), Hall (1956 and 1962), Dall (1957), Racek and Dall (1965) and Kirkegaard, Tuma and Walker (1970) have treated *P. merguiensis* de Man as a distinct species. They have all stressed the close relationship of these two species and have pointed out the difficulty in distinguishing their juveniles.

In view of the importance of the fishery for these two co-existing species in Indian waters it was found necessary to evolve reliable criteria for separating the two in their juvenile stages also, especially since only small juveniles of both the species are found in the backwater catches of certain areas. In the course of analysis of the marine and backwater prawn catches of the Kakinada region, both *P. indicus* and *P. merguiensis* were found to occur together. This gave the present authors an opportunity to study comparative material of both the species.

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MATERIAL AND METHODS

One hundred and fifty-nine specimens of *P. indicus* ranging in size from 15 mm to 190 mm in total length and 153 specimens of *P. merguensis* ranging in size from 15 mm to 210 mm in total length, were studied. The juveniles were collected from the creeks leading into the Kakinada Bay and the adults from the trawlers operating off Kakinada.

Fresh specimens of the two species showed consistent colour differences especially in the colour pattern of the antennular and antennal flagella and the pleopods. The value of colour patterns in the diagnosis of penaeid species has been stressed by Racek (1955), Dall (1957) and Racek and Dall (1965). Hence the colour pattern of every specimen examined was noted down. The colour pattern persisted for one week after preservation in formalin. The colour was retained for a longer period if specimens were preserved in amber coloured bottles.

To identify long preserved specimens the relative position of the anteriormost dorsal tooth on the rostrum in relation to (1) the antennular peduncle (2) the penultimate dorsal tooth and (3) the ventral teeth, was noted down for each specimen. The number of dorsal teeth behind the anterior margin of the cornea was also noted. The frequency distribution of these characteristics was initially studied using 5 cm length intervals to gain an understanding of the change in the position of the anteriormost dorsal tooth with growth. But, for the purpose of presentation in this paper the specimens were grouped under two categories (1) juveniles 15–120 mm in length (2) sub-adults and adults above 120 mm in length. Usually the specimens above 120 mm move out of the estuaries into the marine environment. The shape of the mid-ventral conical prominence between the first two pairs of pleopods was also noted down for all the juveniles below 35 mm size since it was found to be of diagnostic value in such small specimens.

ADULT CHARACTERS

The present study showed that apart from the differences in the shape of the rostral crest, form and position of the gastro-orbital carina, shape of anterior median plate of the thelycum and the ratio of propodus: dactylus of the 3rd maxilliped in mature males, noted by the previous authors, the adults of *P. indicus* and *P. merguensis* could be distinguished on the basis of the following criteria as well.

Characters	<i>P. indicus</i>	<i>P. merguiensis</i>
1. Rostral tip	Length of rostrum anterior to the anterior most dorsal tooth distinctly longer than distance between penultimate dorsal tooth and the anterior most dorsal tooth	Length of rostrum anterior to the anterior most dorsal tooth as long as or shorter than distance between penultimate dorsal tooth and the anterior most dorsal tooth.
2. Post rostral carina	Well defined upto posterior $1/5$ or $1/6$ of carapace	Well defined only for a short distance behind epigastric tooth and then broadens out losing its identity.
3. Antennular flagella	Inner flagellum $\frac{3}{4}$ or more length of outer	Inner flagellum more or less $\frac{1}{2}$ length of outer.
4. Colour of antennal flagella	Distal $1/3$ white	Reddish throughout
5. Colour of antennular flagella	Both inner and outer flagella yellowish orange with reddish brown spots	Inner flagellum almost colourless with very faint minute dots; outer flagellum dull yellow with clear reddish brown spots.

JUVENILE CHARACTERS

Based on a careful study of the present data the diagnostic colour patterns and morphological features of the juveniles of both the species are described below.

Penaeus indicus: The general body colour is cream with numerous minute dark chromatophores on the body. The distal half of the antennal flagellum is white or yellowish. In specimens smaller than 50 mm the proximal $\frac{1}{4}$ of the antennal flagellum is faintly banded (white and reddish bands alternating). The inner antennular flagella are spotted with reddish brown upto the tip even at 15 mm total length while the distal half of the outer antennular flagella becomes spotted only in juveniles above 40 mm size. The exo- and endopodite of the pleopods assume a reddish tinge at a length of about 50-60 mm and are colourless in smaller juveniles. The basis of the pleopods lacks the conspicuous blue chromatophore.

The typical rostral formula is 8/7. There are six dorsal rostral teeth behind the anterior margin of the cornea (Table 1). In the great majority of the juveniles the anterior most dorsal tooth is situated posterior to the tip of the antennular peduncle (Table 2) and in juveniles longer than 50 mm this tooth is usually placed posterior to the third lower tooth (Table 3). The ratio, length of the dorsal unarmed portion of the rostrum/the distance between the anterior most dorsal tooth and the penultimate dorsal tooth, is well above 2.0 (Table 4). The disposition of the rostral teeth in juvenile *P. indicus* is shown in Fig. 1.

TABLE 1. *Frequency distribution of No. of dorsal teeth behind cornea*

Length groups	No. of teeth behind cornea			Total No. of specimens
	5	6	7	
15-119 mm				
<i>P. indicus</i>	27	114	...	141
<i>P. merguensis</i>	100	27	...	127
120-210 mm				
<i>P. indicus</i>	...	14	4	18
<i>P. merguensis</i>	1	24	1	26

TABLE 2. *Frequency distribution of position of anterior most dorsal rostral tooth in relation to the antennular peduncle*

Length groups	Above basal segment	Above middle segment	Above distal segment	Above tip of peduncle	Just ahead of peduncle tip	In advance of peduncle	Far in advance of peduncle tip	Total No. of Specimens
15-119 mm								
<i>P. indicus</i>	1	59	54	11	16	...	...	141
<i>P. merguensis</i>	...	...	3	1	9	60	54	127
120-210 mm								
<i>P. indicus</i>	3	9	5	1	...	...	...	18
<i>P. merguensis</i>	1	12	9	2	...	2	...	26

TABLE 3. Frequency distribution of position of anterior most dorsal tooth in relation to the ventral teeth

Length groups	Before 1	Above 1	Between 1 & 2	Above 2	Between 2 & 3	Above 3	Between 3 & 4	Above 4	Between 4 & 5	Above 5	Between 5 & 6	Above 6	Between 6 & 7	Total No. of specimens
15-49 mm														
<i>P. indicus</i>	...	...	...	...	1	2	15	4	32	7	21	3	...	85
<i>P. merguiensis</i>	...	...	7	1	29	3	38	2	6	...	...	...	...	86
50-119 mm														
<i>P. indicus</i>	...	...	...	...	4	...	19	5	15	3	9	1	...	56
<i>P. merguiensis</i>	2	2	18	4	14	...	1	...	...	...	...	...	...	41
120-210 mm														
<i>P. indicus</i>	...	...	...	...	5	...	7	2	3	1	...	...	...	18
<i>P. merguiensis</i>	7	2	13	2	1	...	...	...	1	...	...	...	...	26

TABLE 4. Frequency distribution of the ratio, length of rostrum beyond the anteriormost dorsal tooth/distance between penultimate and anteriormost tooth

Length groups	<0.5	0.5 to 0.9	1.0 to 1.4	1.5 to 1.9	2.0 to 2.4	2.5 to 2.9	3.0 to 3.4	3.5 to 3.9	4.0 to 4.4	4.5 to 4.9	5.0 to 5.4	>5.5	Total No. of Specimens
15-119 mm													
<i>P. indicus</i>	...	...	...	7	30	24	33	21	16	2	5	3	141
<i>P. merguiensis</i>	4	43	54	24	1	1	...	...	...	...	...	...	127
120-210 mm													
<i>P. indicus</i>	...	...	...	1	5	3	4	2	2	...	...	1	18
<i>P. merguiensis</i>	3	16	5	1	...	1	...	...	...	...	...	...	26

In juveniles smaller than 35 mm the mid-ventral conical prominences between the first two pairs of pleopods have a bluntly rounded apex, that on the first abdominal segment bearing a fringe of long hair-like setae longer than the height of the prominence (Fig. 2).

Penaeus merguiensis: The general body colour is more whitish with lesser number of larger chromatophores. The distal half of the antennal flagellum is red; in specimens smaller than 50 mm the proximal $\frac{1}{4}$ has white and red bands which are more conspicuous than in *P. indicus* of the same size. Only the proximal halves of the inner and outer antennular flagella have reddish brown spots, the distal halves being colourless, in juveniles smaller than 50 mm. The distal half of the inner flagellum becomes faintly banded with reddish brown only in specimens above 90 mm while the distal half of the outer flagellum becomes

banded at 50–55 mm size. The exo- and endopodites of the pleopods remain colourless upto a length of 85 mm and become tinged with red only above this size. In juveniles smaller than 100 mm the basis of the pleopods have a conspicuous blue chromatophore situated on the posterior aspect distally.

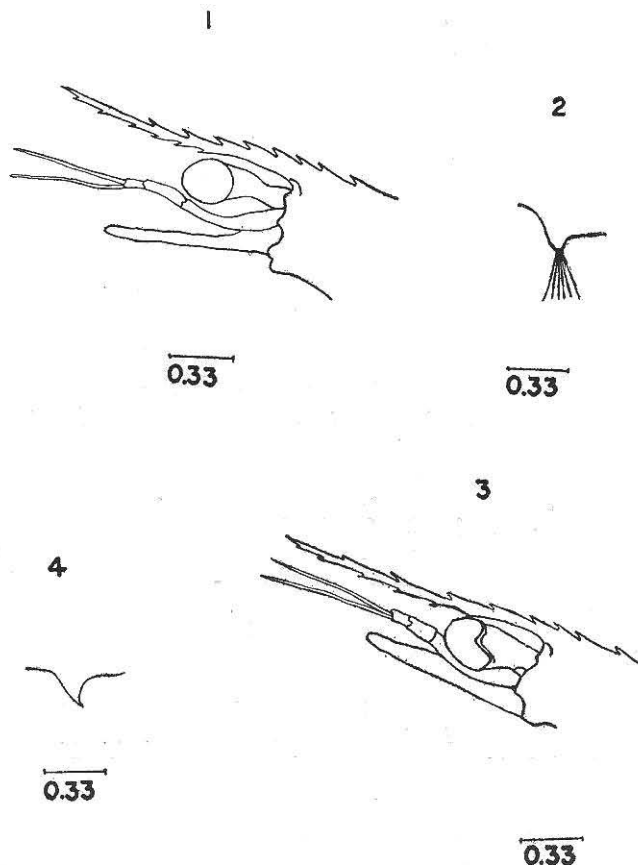


FIG. 1. Rostral region of *Penaeus indicus* 21 mm T. L. (4 mm C. L.)

FIG. 2. Mid-ventral prominence on 1st abdominal segment of *P. indicus* 21 mm in T. L.

FIG. 3. Rostral region of *Penaeus merguensis* 21.5 mm T. L. (4 mm C. L.)

FIG. 4. Mid-ventral prominence on 1st abdominal segment of *P. merguensis* 21.5 mm in T. L.
Scale in millimetres (0.33 mm)

The typical rostral formula is 8/6. In the majority of juveniles, especially below 50 mm length, there are five dorsal teeth behind the anterior margin of the cornea (Table 1). The anterior most dorsal tooth is placed well beyond the tip of the antennular peduncle, especially in juveniles smaller than 90 mm (Table 2). This tooth, in specimens larger than 50 mm is situated anterior to the third lower

tooth (Table 3). The ratio, length of the dorsal unarmed portion of the rostrum/the distance between the anterior most dorsal tooth and the penultimate dorsal tooth is less than 2.00 (Table 4). The disposition of the rostral teeth in juvenile *P. merguensis* is shown in Fig. 3.

In juveniles smaller than 35 mm the mid-ventral prominences between the first two pairs of pleopods are conspicuous and have a curved pointed apex; the prominence between the first pleopods may have short deciduous hair-like setae shorter than the height of the prominence; in many specimens examined the setae were absent (Fig. 4).

The distinguishing features of juvenile *P. indicus* and *P. merguensis* are compared in the table below. The size range within which some of the criteria were found useful is given in parenthesis.

Characters	<i>P. indicus</i>	<i>P. merguensis</i>
1. General body colour	Cream	Whitish
2. Antennular flagella	Inner flagellum spotted reddish brown along entire length even in specimens 15 mm in length; outer flagellum with reddish brown spots along entire length in specimens above 40 mm size	Distal half of inner flagellum remains colourless in juveniles upto 90 mm size; the outer flagellum with reddish brown bands distally in specimens above 50-55 mm.
3. Antennal flagella	White distally	Red throughout
4. Basis of pleopods	Without blue spot	With conspicuous blue spot distally on posterior aspect (15-100 mm)
5. The exo-and endopodites of the pleopods	Reddish in juveniles above 50-60 mm size	Reddish in juveniles above 85-90 mm size
6. No. of dorsal rostral teeth behind anterior margin of cornea	six (15-120 mm)	Five (15-50 mm)
7. Position of anterior most dorsal tooth in relation to the antennular peduncle	Posterior to tip of peduncle (15-190 mm)	Anterior to tip of peduncle (15-90 mm)

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|-----|--|--|---|
| 8. | Ratio, length of dorsal unarmed portion of rostrum/ distance between anteriormost dorsal tooth and the penultimate tooth | More than 2.0
(15-190 mm) | Less than 2.0
(15-210 mm) |
| 9. | Position of anteriormost dorsal tooth in relation to the lower teeth | Posterior to third lower tooth (15-120 mm) | Anterior to third lower tooth (50-210 mm) |
| 10. | Shape of mid-ventral prominences between the first two pairs of pleopods | With blunt apex (15-35 mm) | With a curved pointed apex (15-35 mm) |

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