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RECORDS

ZOOLOGICAL SURVEY OF PAKISTAN

VOLUME V. *Numbers* 1 *and* 2, *Karachi, March/September*, 1973.

CONTENTS

ON A NEW SPECIES OF MOLE-CRAB (*EMERITA KARACHIENSIS* sp. nov.) WITH A KEY TO COMMON INDO-PACIFIC SPECIES

By

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(Received on January 1970)

The taxonomical research on mole-crabs in Indo-Pak sub-continent, particularly on the West Coast, has not been done in detail except a preliminary work of M. K. Memon (1934) and a report by A. M. Patil (1951) on the occurrence of *Emerita emeritus* from the West coast of India while working on the marine fauna of Karwar coast and neighbouring islands. However, K. N. Sankolli (1965) of Marine Biological Research Station, Ratnagari (India); has added remarkable contribution to the taxonomy of mole-crab of Mirya, Ratnagari. He described a new species, *Emerita holthuisi* with a good note on *Emerita emeritus* (Linn.). Gravely (1924—1941) has recorded *Emerita emeritus* (Linn.) (=E. asciatica H. Milne-Edward) from the Krushidai Island in the Gulf of Manaar. K. H. Alikunbi (1944) has described zonal distribution of mole-crabs (E. emeritus) of the Madras coast.

In the revision of super-family Hippidea, E. J. Miers (1879) has described in short the taxonomical features of *E. emeritus* which has been detailed by K. N. Sankolli (1965).

W. L. Schmitt (1937) has described the African species *Emerita austro-africana* having close resemblance to the *Emerita emeritus*. Both the said species exhibit well-marked differentiating characters with that of ours, the *Emerita karachiensis*. However, *Emerita karachiensis* shows, to some extent, close resemblances to, but to a great extent, differences with that of *Emerita holthuisi*. As such, a comparative description of identifying characters of these two species are discussed in detail in this paper in addition to the specific features of the species under study.

The authors are grateful to the Director, Marine Biological Research Laboratory of Pakistan for the facilities rendered to carry out the research on the topic. They are also thankful to Marine Zoologist I, for suggesting and guiding the problem. Thanks are also due to the colleagues of Marine Biological Research Laboratory, for their sincere co-operation in field as well as laboratory work.

Mole-crabs inhabit on the sandy beach, at the place of wash by every wave. From our survey record, it is concluded that the specimens prefer to live gregariously at the upper-side of the loose sandy area in the inter-tidal zone, where they

can burrow easily. The animals burrow in the sand with such a rapid speed that it becomes very difficult to collect them if proper care and attention is not paid. While studying the ecology of the animals, we conducted many faunistic surveys at various localities having different soil conditions, *e.g.*, mix-soil, fine and compact sandy area. We did not get a single specimen from such localities. However, once we got a specimen from the depth of 10 fms., while we were conducting general deep-sea faunistic survey by dredge net. The specimens were abundantly collected when the tide tended to increase.

The species, *Emerita karachiensis*, is either equal to or less than the double of the breadth,*i.e.*, breadth ranges from 50% to 53% of the length of the crab. Body is oblong-oval and comparatively narrow. The lateral border of the carapace is decidedly serrulate. Serration on the anterior two third is distinct and well marked. Rest of the border is indistinctly serrulated and appears rather wavy and rough (Fig. 1.a). Frontal margin is tridentate. The middle one, the rostrum proper, is shorter than the lateral ones. The rostrum or the median lobe is less acute, blunt and triangulate separated on either side by a U-shaped sinus from the submedian pair of teeth (=lobe). The U-shaped sinus on each side is greater in width than the breadth of the rostrum at the base. The rostrum resembles a dwarf-isosceles triangle having vertical length lesser than the base.

There are well-marked post-rostral and post-gastric furrows, in between them two small but distinct crescentic pits are present. These crescentic pits are milky-white at fresh but turn blackish after preservation. The surface of the carapace is covered with transverse rugae which are well clear on the frontal area. Maximum length of carapace of the largest specimen is 25 mm.

The first segment of the abdomen seems to be fused with the carapace showing linear, narrow and subcrescentic shape whereas the second segment is nearly as wide as the carapace. The third segment is slightly wide than the median part of the second segment, but shorter and narrower. The successive segments of the abdomen (rest three) become narrower towards the posterior end of the body culminating at the keel shaped telson. The sixth segment of the abdomen and the telson is beneath the body. This segment is more or less thrice as long as that of the 5th one.

Telson is long, tapering, distinctly carinate, triangular with vertical sides densely ciliated, slightly convex and acute distally. The breadth of the telson is variable between the ranges of 40—45% of the length.

The matured male and female can easily be distinguished by their sizes. The male is much smaller than the female. The 2nd, 3rd and 4th pairs of pleopods are well developed and distinct in females. But the pleopods are so much reduced in the male as these appear to be absent or extinct externally. The telson of the adult female is more heavily ciliated along its lateral margin and is some what wider than that of the male.

We have studied 100 fresh specimens of varying sizes. Out of 100 specimens, we got 8 males, ranging in sizes from 9 to 12 mm. The ovigerous females were found to be ranging from 18 to 33 mm. While the non-ovigerous females from 14 to 26 mm.

The *Emerita holthuisi* is the only species which has some close resemblances with *Emerita karachiensis* sp. nov. For this purpose a comparative account of specific characters of *Emerita holthuisi* and *Emerita karachiensis* are being discussed here.

The body of *Emerita karachiensis*, as a whole, is conical, not barrel shaped as in *Emerita holthuisi* (Fig. 1. b.). The longer or the medium teeth of the second segment of antenna is comparatively less curved having the straight outer lateral border but in *Emerita holthuisi*, the same is markedly curved inward. The angle between the outer and medium teeth is more acute whereas in *Emerita holthuisi* it is less acute (Fig. 2. e.).

The outer anterolateral angle of the merus of the third maxilliped possesses a produced booth-like horny tip, which is sometimes broken or missing. The antero-internal lobe is blunt, rounded distally, having developed and raised triangle (not so much developed in *E. holthuisi*. The level position between the two lobes is not as straight as in *E. holthuisi* but raised. The merus, as a whole, is less broad, rather conical roughly. (Fig. 2. d.)

The dactylus of the first leg, in length, is either double or more than double of its breadth and usually terminates in a distal spine but sometimes in two or even three distal spines (Fig. 2. c). It bears 5 to 9 but usually 6 distinct spines on the lower margin only. The proximal position of the upper marging of the dactylus is comparatively straight and does not show gradual inwardly compression as in *E. holthuisi* and *E. emeritus* (Fig. 2, a and b).

Key to the Indo-Pacific Species of the genus Emerita

1. A=Distinct teeth on the outer as well as on the inner margin of the dactylus of first peraeopod.....2

   B=Distinct teeth only on the inner margin of the dactylus of the first peraeopod.....3

2. A=Teeth on the dactylus of first peraeopod occupying nearly the whole distal third of the lower margin.....*E. emeritus.*

   B=The teeth occupy more than one half to less than two third of the distal part of the lower margin.....*E. austroafricana.*

3. A=The merus of 3rd maxped is roughly barrel shaped and short. Its distal inner margin is round. The distal surface is uniformly serrulated. Dactylus of the first peraeopod bears generally four spines on the inner or lower margin.....*E. holthuisi.*

4. B=The merus of the 3rd maxped is roughly conical and long. Its distal inner margin is pointed. The distal surface is slightly raised in the middle or towards the inner margin. Dactylus of the first peraeopod bears generally six or more spines on the lower or inner margin.....*E. karachiensis.*

REFERENCES

Alikunhi, K.H. .. .. .. 1944 The zonal distribution of the mole-crab (Emerita asiatica) on the Madras coast. J. Bomb. Nat. Hist. Soc. 45(1) : 94—96.

Barnard, K.H. .. .. .. 1950 Descriptive catalogue of South African Decapod Crustacea (*Emerita austra-africana* Schmitt). Ann. South. Afr. Mus. 37 : 402—404, fig. 76 (a, b).

Benedict, J.E. .. .. .. 1901 The anomuran collections made by the Fish Hawk Expedition to Porto Rico. Bull. U.S., Fish Comm. 1900; 2 : 129—148; pls. 3—6. 3 text figs.

Gravely, F.H. .. .. .. 1927 The littoral fauna of Krusadai Island in the Gulf of manaar. Orders-Decopod (except Paguridea) and Stomatopoda. Bull. Madras Govt. Mus. (n. ser.) (Nat. Hist.) 1(1) : 135—155; text fig. 1, 2; pls. 19—26.

Gravely, F.H. .. .. .. 1941 Shellus and other animal remains found on the Madras beach. 1. Group other than snails etc. Bull. Madras Govt. Mus. 'n. ser. (Nat. Hist.) 5(1) : 75.

Mead, H.T. .. .. .. 1917 Notes on the natural history behaviour of Emerita analoga (Stimpson). Univ. Calif. Publ. Zool. 16, 431—448; text fig. 1.

Miers, E.J, ... 1879 Revision of the Hippidea. J. Linn. Soc. Lond. (zool.); 14 ; 312—336.

Patil, A.M. .. .. .. 1951 Study of the marine fauna of the Karwar coast and neighbouring islands Part I. J. Bombay Nat. Hist. Soc. 50(1) : 128—139; 1 map.

Sankolli, K.N. .. .. .. 1965 On a new spedies of *Emerita* from India, with a note of *E. emeritus* (Linn.). Crustaceana 8(1) : 48—54.

Schmitt, W.L. .. .. .. 1921 The Marine decapod crustacea of California (*Emerita analoga* (Stimpson). Univ. California Publ. Zool. 23 : 173-174.

Schmitt, W.L. .. .. .. 1937 A new species of *Emerita* from South Africa (*Emerita austro-africana*). Ann. South Afr. Mus. 32 (2) : 25—29; pl. 3.

EXPLANATION OF THE FIGURES

FIGURE 1

A=*Emerita Karachiensis* sp. nov., dorsal view.

B=Same lateral view.

FIGURE 2

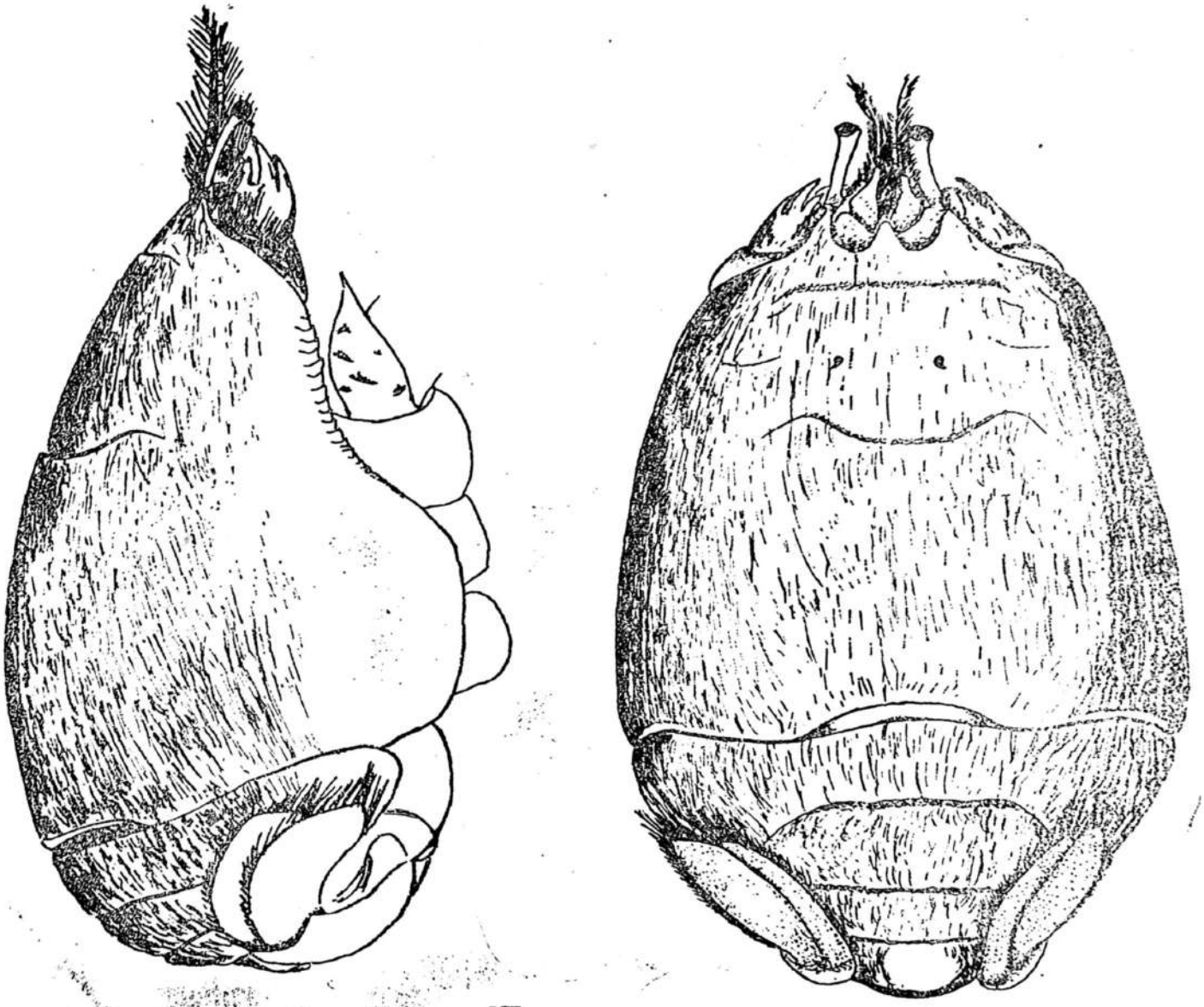
A=Dactylus of 1st peraeopod of *E. karachiensis* sp. nov.

B=Dactylus of 1st peraeopod of *E. karachiensis* sp. nov. with nine spines on the inner surface.

C=Distal end of dactylus of 1st peraeopod with a bunch of three spines.

D=Merus of 3rd maxped.

E=Second segment of antenna.



a

FIG. 1

b

FIG. 2

LERNAEENICUS HEMIRHAMPHI KIRTISINGHE (LERNAEIDAE : CALIGIDEA) A COPEPOD PARASITE ON HEMIRHAMPHUS XANTHOPTERUS (VAL.) FROM KARACHI COAST.

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INTRODUCTION

Copepod parasites of fishes constitute very interesting and important group. Keeping cirripedes apart, the parasitic copepods among crustacea show a great structural modifications and even vast differences in two sexes of the same species.

Much work has been done on parasitic copepods of Indo-pacific region by Bassett-Smith (1896-1899), Wilson (1903-1952), Raj and Aiyar (1921), Kirtisinghe (1932-1964), Shiino (1932-1960), Yamaguti (1936-1963), Heegaard (1940-1962), Gnanamuthu (1947-59), Shen (1948-1957), Kurian (1949-1961), Rangnekar, P.G. and Murti (1950-1959), Ramakrishna (1951-1959), Raio (1951), Rangnekar, M.P. (1953-1959), Tripathi (1959-1960) and Pillai (1961-1965).

No. attention has been paid so far to these important crustacean parasites of fishes in our region. Visualizing the devastating effect of these parasites on fishes, detailed study has been started on Copepod parasites at Marine Biological Research Laboratory, Karachi.

The present paper deals with *Lernaeenicus hemirhamphi*, a parasite on *Hemirhamphus xanthopterus*, which is being reported for the first time from Karachi coast.

MATERIALS

About 100 fishes were examined. Only 15 female parasites ranging between 35-42 mm were collected. No male was found.

DISTRIBUTION

Point Perdo, Ceylon, and off coral reef near Galle. in West Pakistan from Karachi coast.

COLOUR

The colour of the genital segment is light green and rest of the body light milky.

OCCURRENCE :

More than half of the body of the parasite including the head was found buried inside the body. Penetration is not fixed, it may occur at any fleshy region of the host

The penetration first occurs at right angle to the body of the host, covering a small distance it curves and ultimately becomes parallel to the long axis of the host body.

DESCRIPTION.

Females

The animal is long and tubular in shape. Head measurses slightly more in length than in breadth and is dorsoventrally flattened. Head turns at right angle to the neck. Anteriorly the head is round while it contains three chitinous horns on the opposite side; the middle one is longer and is perpendicular to the head, the other two lateral ones are shorter and are at right angles to the head, the middle one. In the mid. dorsal line of the head, a median eye is embedded near the anterior end.

Slender and wavy neck constitutes the major part of the body. It is uniformly wide and ends into the genital segment. The genital segment is three times wider than the neck. A ventral groove is present on the distal half of the segment. Abdomen arises from the genital segment and is less broad. The extremity of abdomen is rounded without any setae or ramii.

The head bears two pairs of antennae, both are three jointed. First antenna bears setae, while the second is chelate and bears no setae. Mouth is placed in a concavity on the ventral side of the head. It is provided with a pair of maxillae, the mandibles are not distinguished. Base of the neck is provided with four pairs of thoracic legs situated on the ventral side; base of each leg is darkly pigmented.

REFERENCES

Gnanamuthu, C.P (1953) — Three Lernaeid Copepods parasitic on south Indian fishes. J. Parasit. 39. (1), 14-21.

Heegaard, P. (1962) — Parasitic Copepods from Australian water. Rec. Aust. Mus. 25.9 P. 185

Kirtisinghe, P. (1933) — Two new parasitic copepods from Ceylon. Parasitology. 24(4) : 550-551.

Kirtisinghe, P. (1964) — A review of the parasitic copepods of fish recorded from Ceylon with description of additional forms. Bull, Fish, Res. Stn. Ceylon. Vol. 17(1) : 45.

Yamaguti, S. (1963) — Parasitic copepods and Brachiura of Fishes. Interscience Publishers, New York, London, Sydney.

EXPLANATION OF FIGURE

FIGURE 1 : *Lernaeenicus hemirhamphi Kirtisinghe*

(*a*)—Head, dossal view.
(*b*)—Same, lateral view.
(*c*)—Third leg.
(*d*)—Entire Animal.

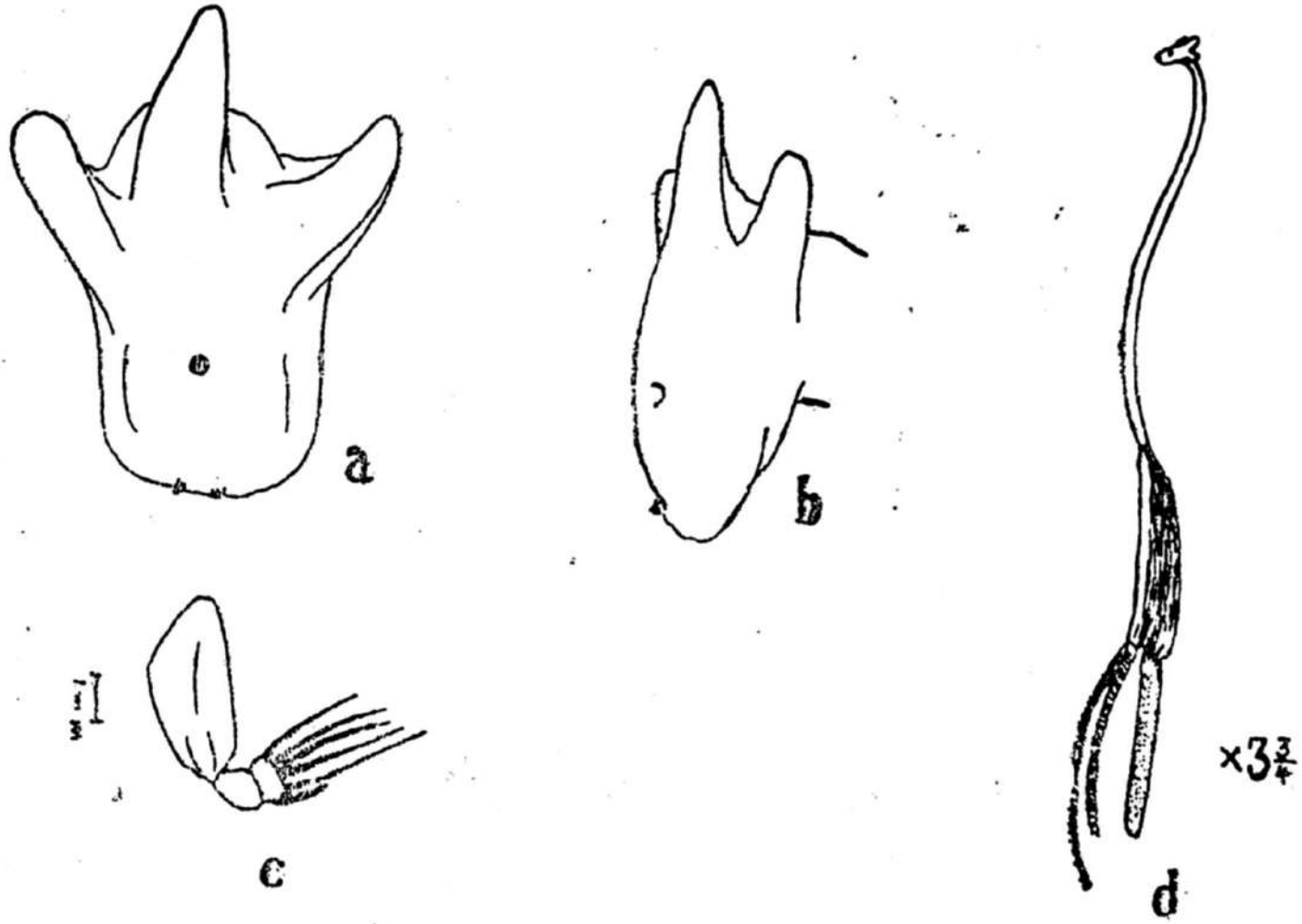

Fig. 1

NOTES ON THE BUTTERFLIES OF PAKISTAN IN THE COLLECTION OF ZOOLOGICAL SURVEY DEPARTMENT .

BY

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PART II

(Received on 1st March 1971)
(*Part I Published in Vol II*, 2)

Family : LYCAENIDAE

103. Castalius rosimon (Fabricius)

The Common Pierrot on the upper side is white having dark broad and black quadrate spots and streaks. in both the sexes. The bases or the wings have metallic blue scales in males and dark scales in females. The under side is white and have black spots and streaks. It is tailed. In female the black markings on both the sides are broader.

Foodplants : *Zizyphus rugosa* ; *Z. jujuba.* (Rhamnaceae)

5 specimens : Dry season form : 3 males; 2 females.

Location : East Pst Pakistan :—Dacca; Mymensingh ; Comilla

104. Tarucus theophrastsu Fabricius

The Pointed Pierrot on the upper side is violet blue and the markings of the underside are apparent through transparency. In the fore wing the termen is straighter towards the tornus. On the underside the ground colour is white in male and slightly yellowish in female. The bases of the wings in female are suffused with bluish scales.

Foodplants : *Zizyphus jujuba* (Rhamnaceae)

20 specimens : 12 males ; 8 females.

Location : Sind :—Karachi.

105. Tarucus extricatus Butler

The Rounded Pierrot is violet blue on the upper side. The spot at the end of the cell is prominent. The termen of the fore wing is evenly rounded. The female is larger in size.

Foodplants : *Zizyphus* spp.

41 specimens : 33 males ; 8 females.

Location : Sind : Karachi.

106. **Syntarucus plinius** Fabricius

On the upper side the male Zebra-Blue is slightly pale violet blue and the female is brown in colour. In female the bases of the wings are blue and the discal areas are white with dark spots. In both the sexes the ground colour is white with irregular alternate broad and narrow bands at right angles to the costa. On the hind wings the bands are broken into spots. It is tailed.

Foodplants : *Indigofera* spp. *Albizzia lebbex* ; *Sesbania aculeata*

(Leguminosae).

3 specimens : 1 male ; 2 females.

Location Sind : Karachi.

107. **Azanus ubaldus** (Cramer)

On the upper side the male Bright Babul is bright lilac blue with broad brown border, and prominent darker patch of specialised scales on the disc of the fore wings.

Foodplants : *Acacia arabica* ; *A. leucophloea* (Leguminosae) 1 specimen, male.

Location Sind : Karachi.

108. Everes **oarrhasius** Fabricius

The male Indian Cupid on the upper side is dark blue with brown border. The female is brown with pale blue discal area. On the upper side of both the sexes there are some black spots on the wings and the markings are slightly darker than the ground colour. It is tailed.

Foodplants : *Lotus corniculatus* (Leguminosae)

Location **Sind : Karachi.**

109. **Celastrina lavendularis** Moore

The female plain Hedge Blue on the upper side is light brownish blue having large white patch on the fore wing and a smaller one on the hind wing. The terminal border of the hind wing has small white lines. On the under side both the wings are white having minute brown lines.

2 specimens : females.

Location : East Pakistan :—Dacca, Mymensingh.

110. **Polyommatus astrarche** Bergstrasser

The upper side of the Brown Argus is dark brown with a silky sheen in certain light. On both the wings there are sub-terminal series of black spots, bordered outwardly by a series of orange spots.

1 specimen.

Location Sind :—Karachi.

111. **Polyommatus icarus** Rottenburg

On the upper side the male Violet Meadow Blue is bright lilac blue, with dark thread like border and the female is plain brown. On the under side, in both the sexes the discal spots, in the interspaces 4, 5, and 6 of the hind wing are in a curved line.

4 specimens : 2 males ; 2 females.

Location: N.W.F.P., Baluchistan :—Mastung Kaghan.

112. **Lycaenia fugitive** Butler

The male on the upper side is bright blue with a black marginal line. The underside is whity brown having bluish bases, black spots and a terminal series of orange spots on both the wings.

1 specimen : male.

Location Baluchistan : Quetta.

113. **Chilades laius** (Cramer)

The female Lime Blue on the upper side is dark brown having metallic bases.

Foodplants : *Limonia acidissima*, young shoots of Orange Lime etc. (Rutaceae)

1 specimen, female.

Location Sind : Karachi.

114. **Chrysophanus timeus** Cramer

On the upper side of the male both the wings are almost entirely suffused with dark brown scales. The fore wing has large black spots and orange speaks. The hind wing has orange coloured terminal border with black spots, on the outer edge. On the underside the fore wing is rich yellow with prominent dark spots and the hind wing is light brownish grey having indistinct spots.

3 specimens, males.

Location Punjab : Hasan Abdal, Murree.

115. **Chrysophanus stygianus** Butler

The male on the upper side has dark dull orange coloured fore wing with black spots and dull brown hind wing. The dull orange coloured band on the hind wing has black spots on both edges. The underside of both the wings are coloured and marked as in *C. timeus.*

4 specimens, males.

Location: Sind : Karachi. Punjab : Muree.

116. **Chrysophanus Kasyapa** Moore

On the upper side the fore wing is dark, dull copper red in colour with dark broad terminal band and dull large black spots. The basalt hirdof the wings is suffused with brown. The hind wing on the upper side is entirely suffused with blackish brown scales and have faint small black spots. On the underside the fore wing is bright orange in colour having blue green terminal band and large shining black spots and the hind wing is shining bluish green.

1 specimen, female, (Dry season form).

Location Punjab : Nathiagali.

117. **Zizeeria lysimon** Hubner

The male Dark Grass is deep blue with broad dark border. The female is plain brown with or without basal blue scaling.

Foodplants : *Zorina diphyla* (Leguminosae) ; *Amarantus virides*
28 specimens, 17 males, 11 females.

Location Sind :—Karachi.

118. **Euchrysops cnejus** (Fabricius)

The male grass blue is pale violet on the upper side with blue bases. The outer dark border is narrow and the hind wing has two tornal black spots. On the under side the discal band in the hind wing is broken into separate spots near the tornus and the last spot near the dorsum is quite apart from the next spot in the interspace ic. In female the tornal black spots are crowned with orange.

Foodplants : *Ougenia dalbergioides* ; *Phasiolus trilobus Cylista* ; *scariosa* ; *Butea frondosa* (Flame of the forest) ; *Acacia* pods of Peas ; Beans, Gram, etc. *Vigna catajang* (Leguminosae) 4 specimens : 3 males, 1 female.

Location Sind : Karachi.

119. **Euchrysops contracta** Butler

The male Small Cupid is violet blue on the upper side having narrow dark borders and a single tornal spot on the hind wing. On the under side of the hand wing the discal band is united to tornus and the last spot in the interspace lb is joined to the next spot.

Foodplant : Legumonosae

1 specimen, male.

Location Sind :—Karachi.

120. **Catochrysops strabo** Fabricius

The male Forget-Me-Not on the upper side is pale voilet having thread-like brown border. On the underside of the fore wing there is a spot on the costa midway between end of band and spot at the end of the cell. On the upper side of the hind wing there is a prominent tornal spot. The female on the upper side is bluish brown.

Foodplants : *Ougenia dabergiodes* ; *Cylistascariosa* (Leguminosae) *Schleichera trijuga* (Lace tree)

2 specimen : 1 male, 1 female.

Location Sind :—Karachi.

121. **Lampides boeticus** (Linnaeus)

The male pea Blue on the upper side is violet blue with two tornal black spots on the hind wing. The female is dark brown on the upper side with blue bases and obscure white marginal crescents on the hind wing. In 15 specimens there is an obscure outer discal band on the hind wing. Both the sexes are tailed and the under side is pale brown in colour with narrow brown bands and two black orange crowned tornal spots on the hind wing.

Foodplants : Flowers and seed of *Butea frondosa* ; *Crotalaria capensis* ; Meilotus, Peas, Bean, Gram and many other leguminous.

91 specimens : 63 Males ; 28 females.

Location Sind :—Karachi.

122. **Heliophorus sena** Kollar

The male Sorrel Sapphire on the upper side is dark shining voilet having dark border on the fore wing and red marginal band on the hind wing. The underside is greenish brown with prominent white line inside the red marginal

area and the hind wing has prominent costal and dorsal spots near the base. It is tailed.

Fooddplants : *Rumex hastatus* (Sorrel) (Polygonaceae).

2 species : males.

Location N.W.F.P. :—Haripur ; Punjab : Murree.

123. **Loxura** atymus Cramer

The Yamfly on the upper side is orange in colour and the broad border including the apex in the fore wing is black in colur. The hind wing is produced up to the tornus which ends in a long tail.

Foodplants : *Dioscora pentaphylla* (Dioscoraceae) ; *Smilex* (Liliaceae).

2 specimens.

Location East Pakistan :—*Dacca*, Mymensingh.

124. **Aphnaeus vulcanus** Fabricius

The male common Silverline on the upper side is dark brown having orange red transverse bands on the fore wing and an orange red patch on the anal area of the hind wing. The underside is white having silver lines in the middle. The anal yellow area of the hind wing has two black spots. It is tailed.

Foodplants : *Plectronia parviflora* (Canthium parviflorum) Rubiacea) ; *Zyzphus rugosa* ; Z. *jujuba* (Rhamnaceae) ; *Allophylus cobbe* ; *Clerodendron siphoranthes* (Verbenaceae).

1 specimen : male.

Location East Pakistan :—Dhanmondi (*Dacca*)

125. **Aphnaeus hypargyrus** Butler

The male on the upper side is orange red having greyish brown bands and the bases of both the wings are suffused with brownish grey. The under side is white having silvery bands lined with brown.

specimen.

Location Sind :—Daur.

126. **Pratapa icetas** (Hewitson)

The male Dark Blue Royal on the upper side is brilliant ultramarine blue having very broad black costa, apex and termen in both the wings. The underside is shinning grey with brown sinuous transverse lines.

1 specimen : male.

Location East Pakistan —Mohanganj (Mymensingh), Dacca.

127. **Charana mandarinus** (hewitson)

On the upper side the female Mandarin Blue is dark brown and the tornal area of the hind wing is white having 3 black spots. On the underside both the wings are yellow having chocolate brown discal broad band having lines and shades and the hind wings have two orange crowned black spots, one on the lobe and another on the interspace 2 and some zigzag lines above them. The outer margin is black. Tails present at veins 1b and vein 2 of the hind wing.

1 specimen : female.

Location East Pakistan : Sylhet, Dacca.

128. **Virachola isocrates** Fabricius

On the upper side the Common Guava Blue is dull violet in colour. The female is brown having darker cell and orange patches on the fore wing and an orange crowned black spot in the intrespace 2 of the hind wing. Both the sexes are tailed and have pale grey underside, with light brown markings. The females are larger in size.

Foodplants : Inside the fruits *Randia dumetorum Rubiaceae*) ;

Eriobotria japonica (Loquat) (Rosaceae) ; *Psidium guava* (Guava) (Myrtaceae) ; *Tamarindus indica* (Tarmarid) (Leguminosae), *Strychnos nux-vomica* (Logoniaceas) ; *Limonia acidissima* (Woodapple) (Rutaceae) *Punica gravatum* (Pomogranate) ; Lythraceae and others.

44 specimens : 21 males; 23 females.

Location Sind :—Karachi.

129. **Rapala schistaceae** Moore

The Slate Flash on the uppear side is dark slaty blue and shot brilliant deep blue on the hind wing and lower disc of the fore wing. The underside is slaty brown. The band on the fore wing is narrow and white edged outwardly. The discal band of the hind wing is generally curved and parallel to the termen.

Foodplants : Flowers of *Spiraea sorbifolia Zizyphus,* Acacia.

1 specimen.

Location East Pakistan :—Dacca.

130. Rapala melampus Cramer

The Indian Red Flash on the upper side is bright red. The costa, apex and termen of the fore wing are black. The hind wing is entirely red having black lobe with a few orange and metallic scales. The underside is slaty grey having orange crowned black spot in the inter-space 2 of the hind wing.

Foodplants : Flowers of *Ougenia dalbergioides* (Leguminosae) *Zizyphus* (Rhamnacae).

Location: Sind:—Karachi.

Family

HESPERIDAE

131. Spialia galba Fabricisu

On the upper side the male Indian Skipper is black with a slight olive tint and have white small spots on both the wings. The under side is grey having white spots on the fore wing and the hind wing has white abdominal fold and white bands. The female is larger and darker black than the male.

Foodplants : *Waltheria indica*; *Sida rhombifolia* (Hibiscus).

2 specimens : 1 male ; 1 female.

Location: Sind :—Karachi.

132. Gomalia albofasciata Moore

The female African Marbled Skipper is brownish olive grey on the upper side having white black bands and white spots on both the wings. The under side is pale brown with markings. The female is larger in size.

Foodplants : *Malvaceae*

3 specimens : 2 males; 1 female.

Location : Sind :—Karachi.

133. Carcharodus dravira Moore.

The tufted Marble Skipper on the upper side is grey, tinged with olive brown having dark bands and white spots. The under-side is paler having white spots.

4 specimens.

Location Baluchistan :—Mustang Road.

134. **Saustus subgrisea** Moore.

The male is olive brown on the upper side having white spots on the fore wing. On the underside of the hind wing there are dark brown spots.

3 specimens.

Location: Sind:—Karachi.

135. **Gangara thyrsis** (Fabricius)

The Giant Redeye on the upper side is dark chocolate brown in colour and the fore wing has large quadrate semi-transparent yellow spots across the cell and in the interspace 2 & 3 and smaller quadrate apical spots. On the under side of the hind wing the male has tuft along vein 1.

Foodplants : palms.

2 specimens : males.

Location: East Pakistan :—Dacca, Chittagong.

136. **Udaspes folus** (Cramer)

The Grass Demon on the upper side is black with large semi-transparent white spots. The fore wing has a spot across the cell and an irregularly disposed discal spot in each interspace from interspace 1b to 8. The hind wing has a large semitransparent central area from interspace 1c to 6.

Foodplants : *Curema decipiens* and other Scitomina. Also grasses according to Mackinnon.

1 specimen.

Location : East Pakistan :—Chittagong.

137. **Telicota augias** Linaeus

The Pale Palmdart on the upper side is golden ochreous having black costal and marginal lines and black spots and streaks. On the under-side the fore wing is brownish ochracious having black streaks and spots and the hind wing is deeper in colour with black spots.

3 specimens : males.

Location: East Pakistan :—Mymensingh, *Dacca.*

138. **Badamia exclamationis** (Fabricius)

The Brown Awl on the upper side is dark brown with paler bases. The fore wing is long and narrow having whitish elongated semi-transparent spots in the cell and in the interspace 2 & 3. In female the spots are larger and have additional spot in the interspace 1b against vein 1.

Foodplants : *Terminalia belerica*; *Cambretum ovalifolium*, *Combretaceae*; *Linociera purpurea* ; (Oleacea); Ficus.

3 specimens : 2 males, 1 female.

Location: Sind:—Karachi.

139. **Borbo bevani** Moore

The Bevani Swift is dark brown having white spots on the fore wing. On the under-side of the hind wing there are small white spots.

Foodplants : Grasses.

1 specimen.

Location : Sind:—Karachi.

140. **Pelopidas mathias** Fabricius

The Small Banded Swift is dark brown having small white spots on the fore wing. On the under-side of the hind wing there is a series of minute white spots.

2 specimens.

Location: Sind:—Karachi.

141. **Chappa midea** Swinhoe.

On the upper side the male is uniformly pale scandy brown having white pots on the fore wing. The female has larger spots. The underside in both the sexes is much paler than the upper side having a white dot in the cell.

27 specimens : 19 males; 8 females.

Location : Sind:—Karachi.

142. **Gegenes karsana** Moore.

The Dingy Swift is pale olive ochreous brown with three minute whitish sub-apical dots and series of discal white spots on the fore wing.

2 specimens : females.

Location : Sind:—Karachi.

The following list summarises the described butterflies collected from both wings of Pakistan :—

I. DANAIDAE :

1. *Danais limniace* Cramer
2. *Danais plexippus* (Linnaeus)
3. *Danais chrysippus* (Linnaeus)
4. *Danais dorippus* Klub
5. *Danais dorippus* Klug
   variety—*albinus* Lanz
6. *Euploea core* (Cramer)
7. *Euploea mulciber* (Cramer)
8. *Euploea deione* Westwood
9. *Euploea diocletiana* (Fabricius)

II. SATYRIDAE :

10. *Mycalesis perseus* (Fabricius)
11. *Lethe christophi* Leech
12. *Lethe europa* Fabricius
13. *Parage schakra* (Kollar)
14. *Maniola pulchella* (Felder)
15. *Eumenis parisatis* (Kollar)
16. *Eumenis thelephassa* Hubner
17. *Aulocera swaha* (Kollar)
18. *Erebia scanda* Kollar
19. *Erebia annada* Moore
20. *Erebia daksha* Moore
21. *Ypthima hubneri* Kirby
22. *Ypthima baldus* Fabricius
23. *Ypthima sakra* Moore
24. *Orsotrioena medus* (Fabricius)

25.	*Melanitis leda*	(Drury)
26.	*Elymnias hypermnestra* Race-*undularis*	Linnaeus Drury

III. AMATHUSIIDAE :

27.	*Discophora tullia*	(Cramer)

IV. NYMPHALIDAE :

28.	*Euthalia garuda*	(Moore)
29.	*Euthalia lubentina*	(Cramer)
30.	*Limenitis trivena*	Moore
31.	*Neptis hylas*	Moore
32.	*Neptis astola*	Moore
33.	*Hypolimnas bolina*	(Linnaeus)
34.	*Hypolimnas misippus*	(Linnaeus)
35.	*Hypolimnas misippus*	(Linnaeus)
	female form : *inaria*	Cramer
36.	*Precis hierta*	(Fabricius)
37.	*Precis orithyia*	(Linnaeus)
38.	*Precis lemonias*	(Linnaeus)
39.	*Precis almana*	(Linnaeus)
40.	*Precis atlites*	(Johanssen)
41.	*Precisiphita*	(Cramer)
42.	*Precis iphita*	Cramer
	form : *siccata*	Frushtorfer
43.	*Yanessa cardui*	(Linnaeus)
44.	*Yanessa indica*	(Herbst)
45.	*Yanessa rizana*	Moore
46.	*Yanessa canace*	(Johanssen)
47.	*vanessa xanthomelas*	(Denis & Schieffer= muller)
48.	*Argynnis hyperbius*	(Johanssen)

49. *Argynnis jainadeva* Moore
50. *Argynnis kamala* Moore
51. *Argynnis clara* Blanchard
52. *Argynnis lathonia* (Linnaeus)
53. *Atella phalantha* Drury
54. *Ergolis ariadne* (Johanssen)
55. *Ergolis msrione* (Cramer)

V. ACRAEIDAE :

56. *Telchinia violae* (Fabricius)

VI. ERYCINIDAE :

57. *Libythea lepita* Moore
58. *Zemoros flegyas* Cramer
59. *Dodona durga* Kollar

VII. PAPILIONIDAE :

60. *Polydorus hector* (Linnaeus)
61. *Polydorus aristolochiae* (Fabricius)
62. *Polydorus aristolochiae* (Fahricius)
    form : *diphilus* Esper
63. *Polydorus aristolochiae goniopeltis* (Rotschild)
64. *Chilasa clytia* (Linnaeus)
    form : *dissimilis* Linnaeus
65. *Papilio polyctor* Boisduval
66. *Papilio helenus* (linnaeus)
67. *Papilio polytes* (Linnaeus)
    female form : *cyrus* Fabricius
68. *Papilio polytes* Linnaeus
    female form : *romulus* Cramer
69. *Papilio polytes* Linnaeus
    female form : *stichius* Hubner

70. *Papilio polytes nickobarus* Felder

71. *Papilio demoleus* Linnaeus

VIII. PIERIDAE :

72. *Delias aglaia* (Linnaeus)

73. *Delias descombesi* (Boisduval)

74. *Delias eucharis* (Drury)

75. *Huphina nerissa* (Fabricius)

76. *Anaphaeis aurota* (Fabricius)

Race : *mesentina* Cramer

77. *Appias libythea* (Fabricius)

Race : *zelmira* Cramer

78. *Appias libythea* Fabricius

Form : *olferna* Swinhoe

79. *Appias lyncida* (Cramer)

80. *Pieris canidia* (Sparrman)

81. *Pieris brassicae* (Linnaeus)

82. *Pieris rapae* (Linnaeus)

83. *Pontia daplidice* (Linnaeus)

84. *Pontia glauconome* (Klug)

85. *Ixias marianne* (Cramer)

86. *Colotis calais* (Cramer)

87. *Colotis phisadia* (Godart)

88. *Colotis vestalis* (Butler)

89. *Colotis fausta* (Oliver)

Form : *faustina* (C & R Felder)

90. *Colotis etrida* (Boisduval)

91. *Colotis danae* (Fabricius)

92. *Parenonia ceylanica* (C & R Felder)

93. *Catopsilia crocaie* (Cramer)

94. *Catopsilia crocale* (Cramer)

female form : *jugartha* (Cramer)

95. *Catopsilia pomona* (Fabricius)

96. *Catopsilia pyranthe* (linnaeus)

97. *Catopsilia florella* (Fabricius)

98. *Gonepteryx rhamni* (Linnaeus)

99. *Eurema hecabe* (Esper)

100. *Colias erate* (Esper)

101. *Colias erate* (Esper)

female form : *pallida* Staudinger

102. *Colias electo* (Linnaeus)

IX. LYCAENIDAE :

103. *Castalius rosimon* (Fabricius)

104. *Tarucus theophrastus* Fabricius

105. *Tarucus extricatus* Butler

106. *Syntarucus plinius* Fabricius

107. *Azanus ubaldus* (Cramer)

108. *Everes parrhasius* Fabricius

109. *Celastrina lavendularis* Moore

110. *Polyommatus astrarche* Bergstrsser

111. *Polyommatus icarus* Rottenburg

112. *Lycaenia fugitive* Butler

113. *Chilades laius* (Cramer)

114. *Chrysophanus timeus* Cramer

115. *Chrysophanus stygianus* Butler

116. *Chrysophanus kasyapa* Moore

117. *Zizeria lysimon* Hubner

118. *Euchrysops cnejus* (Fabricius)

119.	*Euchrysops contracta*	Butler
120.	*Catochrysops strabo*	Fabricius
121.	*Lampides boeticus*	(Linnaeus)
122.	*Heliophorus, sena*	Kollar
123.	*Loxura, atymus*	Cramer
124.	*Aphnaeus vulcanus*	Fabricius
125.	*Aphnaeus hypargyrus*	Butler
126.	*Pratapa icetas*	(Hewitson)
127.	*Charana mandarinus*	(Hewitson)
128.	*Virachola isocrates*	Fabricius
129.	*Rapala schistaceae*	Moore
130.	*Rapala melampus*	Cramer

X. HESPERIDAE

131.	*Spialia galba*	Fabricius
132.	*Gomalia albofasciata*	Moore
133.	*Carcharodus dravira*	Moore
134.	*Saustus subgrisea*	Moore
135.	*Gangara thyrsis*	(Fabricius)
136.	*Uduspes folus*	(Cramer)
137.	*Telicota augias*	Linnaeus
138.	*Badamia exclamationis*	(Fabricius)
139.	*Borbo bevani*	Moore
140.	*Peloptdas mathias*	Fabricius
141.	*Chapra, midea*	Swinhoe
142.	*Gegenes karsana*	Moore

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REFERENCES

Bingham, C.T.	..	1905	The Fauna of British India, Including Ceylon and Burma, Butterflies, Vol. I; Taylor and Francis, Ltd.; XV-528 pp., X col. pls.; 94 figs.
————	..	1907	Op. cit. Butterflies. Vol. II ; Taylor and Francis, Ltd., VIII-480 pp., XX col. pls.; 104 figs.
Cantlis, Keith and Norman, T.	..	1959	Notes on the butterfly genus *Yepthima*. *J. Bombay nat. Hist. Soc.* 56 : 66—71, 12 figs.
Corbet, A. Steven	..	1941	Observations on certain of the Fabrician names of Indo-Australian. Rohopalocera (Lepid). *Proc Roy. Ent. Soc. London* (B) 10 : 98—106, 1 fig.
————	..	1945	The Linnaean names of the Indo-Australian Rhopalocera. Linnaean collection obtained by Peter Osbeck in 1751. op. cit. 14 : 91—94.
Crawford, W. M.	..	1930	Dwarf specimens of butterflies. J. *Bombay nat. Hist. Soc.* 34 : 261-262, 1 pl.
Dixey, Frederick A.	..	1902	Notes on some cases of seasonal dimorphism in butterflies, with an account of experiments by Mr. G. A. K. Marshall, F. Z. S, *Trans. Ent. Soc. Lond*, 1902 ; 189—218, 1 pl.
Evans, W. H	..	1927	The Identification of Indian Butterflies, 1st. ed., Bombay Natural History Society, Bombay, XI-302 pp. 32 pls.
————	..	1932	The Identification of Indian Butterflies, 2nd ed., rev. Bombay Natural History Society, Bombay, X-454 pp., 32 pls.
Fraser, F. C.	..	1911	Notes on *Colotis* in Sind. *J. Bombay nat. Hist. Soc.* 20 : 867—869,

Frushtorfer, H.	..	1912	Nymphalidae (pars). pp. 453—640. In A. Seitz; 1927, The Macrolepidoptera of the world. Vol. 9. The Indo-Australian. Rhopalocera. Alfred Kernen, Stuttgrat.
Ghalib, S.A. and Malik, J. M.	..	1971	Some Notes on the Butterflies of Karachi. Agriculture Pakistan, Vol. 22, No. 1.
Marshall, G.F.L. and de Niceville, L.	..	1882	The Butterflies of India, Burmah, and Ceylon. Vol.-1, Calcutta Central Press Co., Ltd.; Calcutta. VIII—XXVII pls.
Marshell, Guy A. K.	..	1901	Some experiments in seasonal dimorphism. *Ann. Mag. Nat. Hist.* 8 (7th ser.): 398—403.
Munshi, G. H.	..	1970	Host Plant Specificity of *Anaphaeis measentina* (Moore) Pan. *Pieridae Lepidoptera. Agri. Pak*, Vol. XXI No. 2 : 70 pp.
Niceville, Lione De	..	1886	The Butterflies of India, Burmah and Ceylon, Vol. 11, Calcutta Central Press Co., Ltd. ; Calcutta. VII-382, XXIV pls.
Rhe-Philipe, Grorge W.V. De		1917	The butterflies of Lahore. *J. Bombay nat. Hist. Sec.* 25 : 136-142.
Talbot, G.	..	(1939)	The Fauna of British India—Butterflies. Vol. 1, 2nd ed. Taylor and Francis, Ltd., xxix——600 pp., 3 col. pls.
————————	..	1947	op. cit. Butterflies. Vol. 2m 2nd ed. Taylor and Francis. Ltd., London xv ——506 pp., 2 col. pls. 1 map.
Woodhouse, L.G.C.	..	1949	The Butterfly Fauna of Ceylon. 2nd com. ed. The Colombo Apothecariea Co. Ltd., Colombo. xxxii—231 pp., LV pls. (xxxvI col. pls). 1 map.
Winter-Blyth, M. A.	..	1957	Butterflies of the Indian Region. Bombay Natural History Society, Bombay. xx—523 pp., 72 pls. (27 col.).

FURTHER DETAILS OF THE MORPHOLOGY OF ELAMENA SIDENSIS ALCOCK

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(Received on 22nd March 1971)

Introduction :

A great deal of work has been done on crabs of Indo-Pak sub-continent by Milne Edwards (1832), de Haan (1887), Henderson (1893), Alcock (1895—1900), Gravely (1827), Kemp (1915—1919), Chopra & Das (1930—1937) and Chhapgar (1957, 58, 61, 68). Besides them Kholi (1921-22) and Pillai (1951) have described the crab fauna of Karachi coast. Dr. Hashmi has also reported ninety-four (94) species from Karachi in his checklist in two parts (Agri. Pak. Vol. xiv No. 2 pp. 237—243 and Agri. Pak. Vol. xv No. 4 pp. 451—454, 1964) whereas Dr. (Mrs.) Nasima M. Tirmizi has also added one more crab to the list (Crustaceana Vol. 18 part 3, 1970).

This paper deals with *Elamena sidensis* Alcock (Hymenosomatidae). This species which was not reported previously by any of the above workers after Alcock from Karachi. It has however been reported from Bombay by Chhapgar [J. Bombay Nat. Hist. Soc. Vol. 55 (3) 1958].

Material and Methods :

Ten specimens of this species were collected from Buleji coast, Karachi. The specimens were preserved in 5% formalin. The identification is based upon the key of Alcock (1894), Borradaile (1900), Kemp (1917), Barnard (1950) and Chhapgar (1958).

Of the ten specimens seven are males and the rest females, ovigerated.

Average length and breadth

Male :

Length of carapace with rostrum	=	4.2 mm.
Breadth of carapace	=	3.6 mm.

Female :

Length of carapace with rostrum	=	5.6 mm.
Breath of carapace	=	5.0 mm.

The following features may be added to Alcock's description.

The anterolateral border of the carapace has two shallow bends. The rostrum converges gradually from the base to the apex. The 2nd pair of walking legs is placed slightly higher than the 3rd Dactylus is as usual triangulate. The sixth male abdominal segment is triangular and a little broader than its length. Proximally it is a little broader than the contracted distal end of the preceding portion. The first pleopod is corck screw like with five long finely divided plumose attached to the distal surface of the apex.

Locality : Manora Island.

Distribution : Persian Gulf and the Indian seas.

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REFERENCES

Alcock, A.	..	1900	Materials for a carcinological Fauna of India No. 6, The Brachyura, Catometopa or Grapsoidea. J. Asiat. Soc. Bengal, Vol. LXIX Part II, pp. 279—456.
Barnard, K. H.	..	1950	Descriptive Catalogue of South. African Decapod Crustacea (Crabs and shrimps). Ann. South Afric. Mus. Vol. XXXVIII.
Borradaile, L. A.	..	1903	Marine Crustaceans III. The Xanthidae and some other crabs. The fauna and geography of the Maldive and Laccadive Archipelago 1 : 237—271.
Chhapgar, B. F.	..	1957	On marine crabs (Decapoda Brachyura) of Bombay state-J. Bombay Nat. Hist. Soc. 54 : 503—549.
Chhapgar, B. F.	..	1958	More addition to the crab fauna of Bombay state J. Bombay Nat. Hist. Soc. Vol. 65 No. 3.
Chopra and R and Das, K. N.	..	1937	Further notes on crustacea Decapoda in the Indian Museum on the collection of crabs from Tavoy and Mergui Archipelago.

De Man, J. G. .. 1887 Report on the Podopthalmous crustacea of the Mergui Archipelago collected for the Trustees of the Indian Museum, Calcutta by Dr. John Anderson, F. R. S. superintendent of the Museum Parts i—v, J., Linn. Soc. London (zool), xxii, pp. 1—212 pls. i—xiv.

Gravely, F. H. .. 1927 Crustacea in the littoral fauna of Kursadai Island in the Gulf of Manaar. Bull. Madras. Govt. Mus. (U. S.) 1 : 135—155.

Hashmi, S. S. .. 1962 Carcinological fauna of Karachi. Agri. Pakistan, Vol. xiv No. 2, 237—243.

Hashmi S. .S. .. 1963 Carcinological fauna of Karachi. Agri. Pakistan, Vol. xiv No. 2, 237—243.

Hashmi S. S. .. 1964 Carcinological fauna of Karachi. Agri. Pakistan, Vol. xv. No. 4, 451—454.

Henderson, J. R. .. 1893 A contribution to India Carcinology. Trans. Linn. Soc. London. (zool.) 5 : 325—458.

Kemp, S. .. 1917 Notes on crustacea Decapoda in the Indian Museum Hymenosomatidae. Rec. Ind. Mus. Xiii, pl. 243—279, 29 text figs.

Pillai, N. K. .. 1951 Decapoda Brachyura from Travancore. Bull Res. Inst. Univ. Travancore, 2 ser. C : 1—46.

Sankarankutty, C. .. 1962 On Decapoda Brachyura from the Andaman and Nicobar Island 2 Family Xanthidae. J. Mar. Biol. Assoc. India, 41-2 : 121—150 figs.

EXPLANATION OF FIGURES

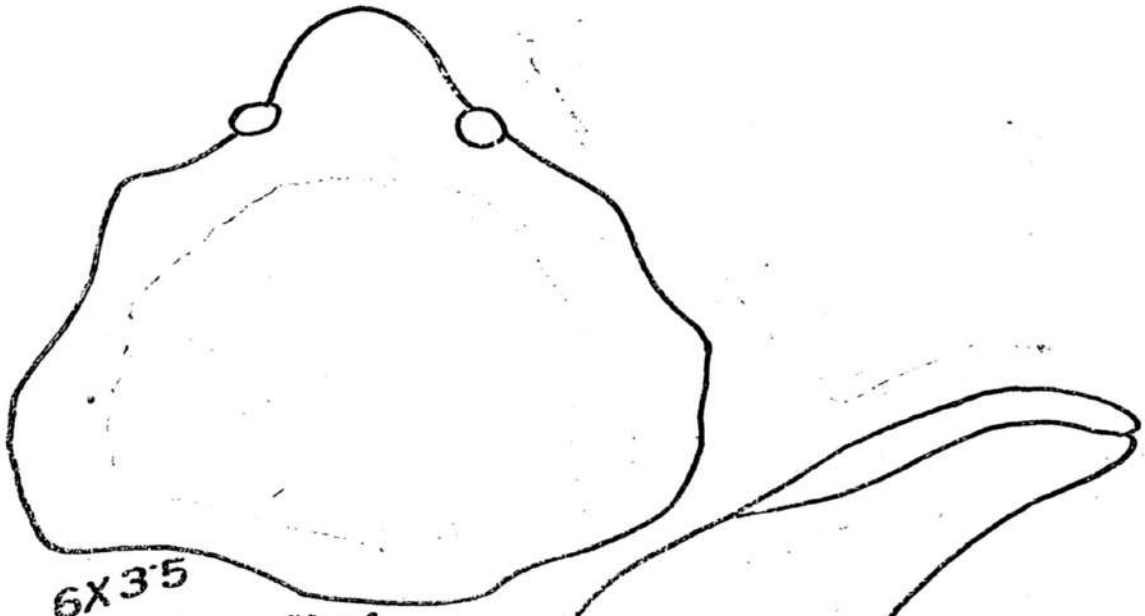
FIGURE 1. Dorsal view of carapace of *Elamena sidensis.*

FIGURE 2. Dorsal view of chela.

FIGURE 3. Tridenticulate dactyle of ambulatory leg.

FIGURE 4. Abdomen.

FIGURE 5. 1st pleopod.



6X3·5

fig.1

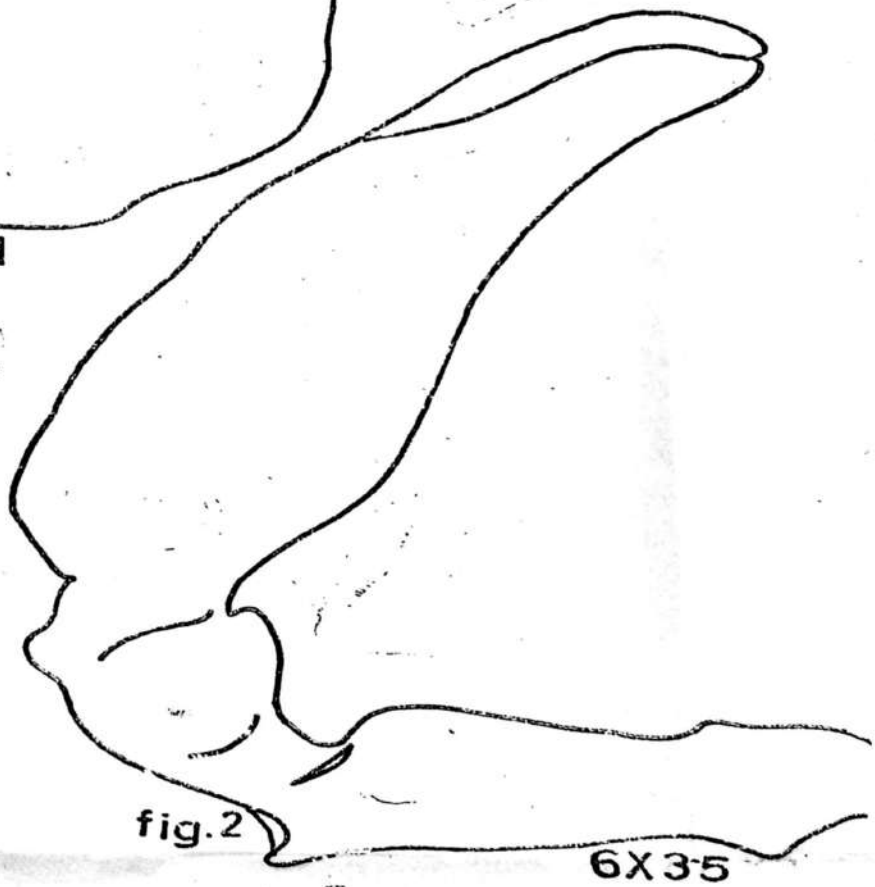


fig.2

6X3·5

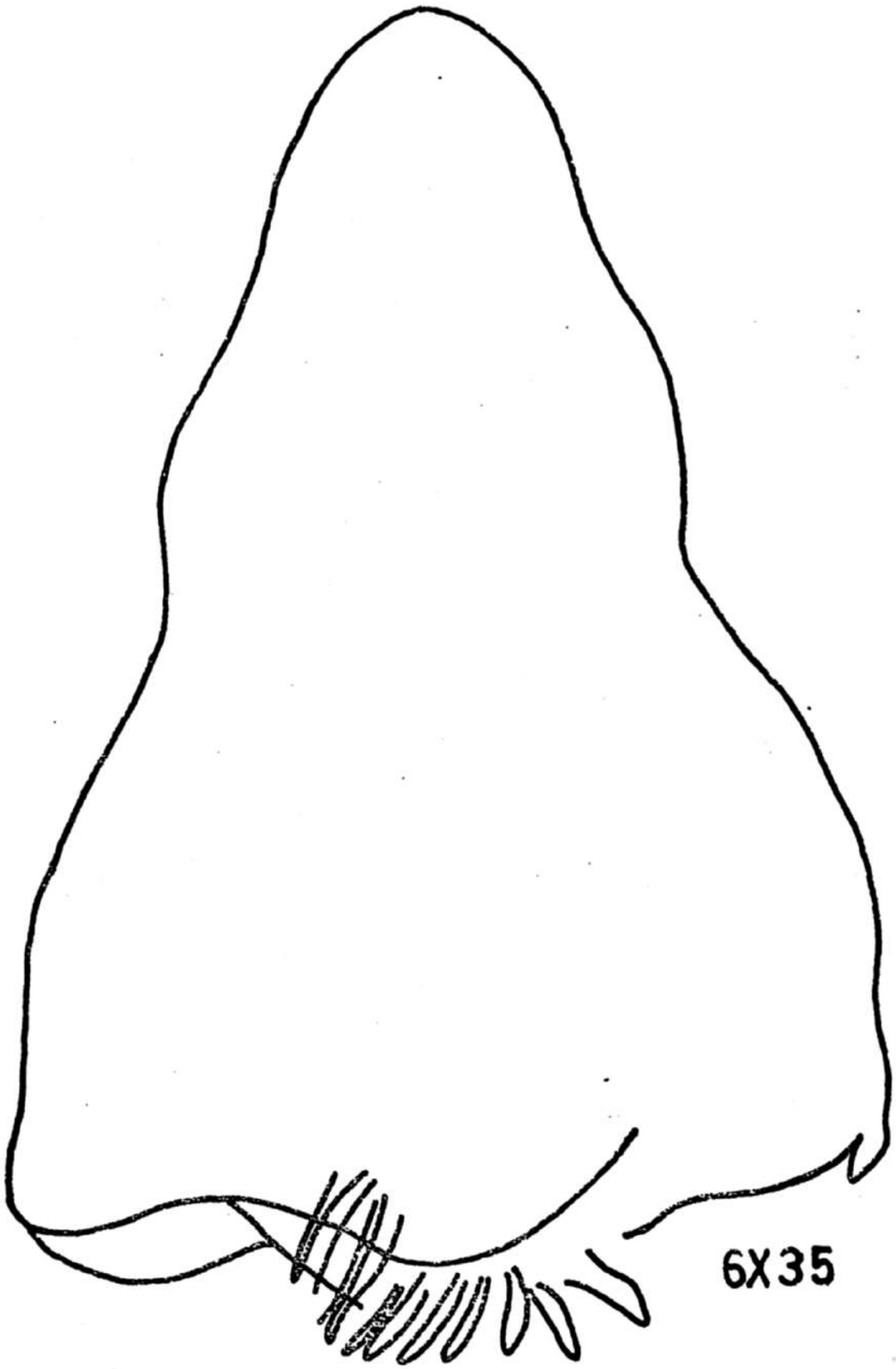


fig.4

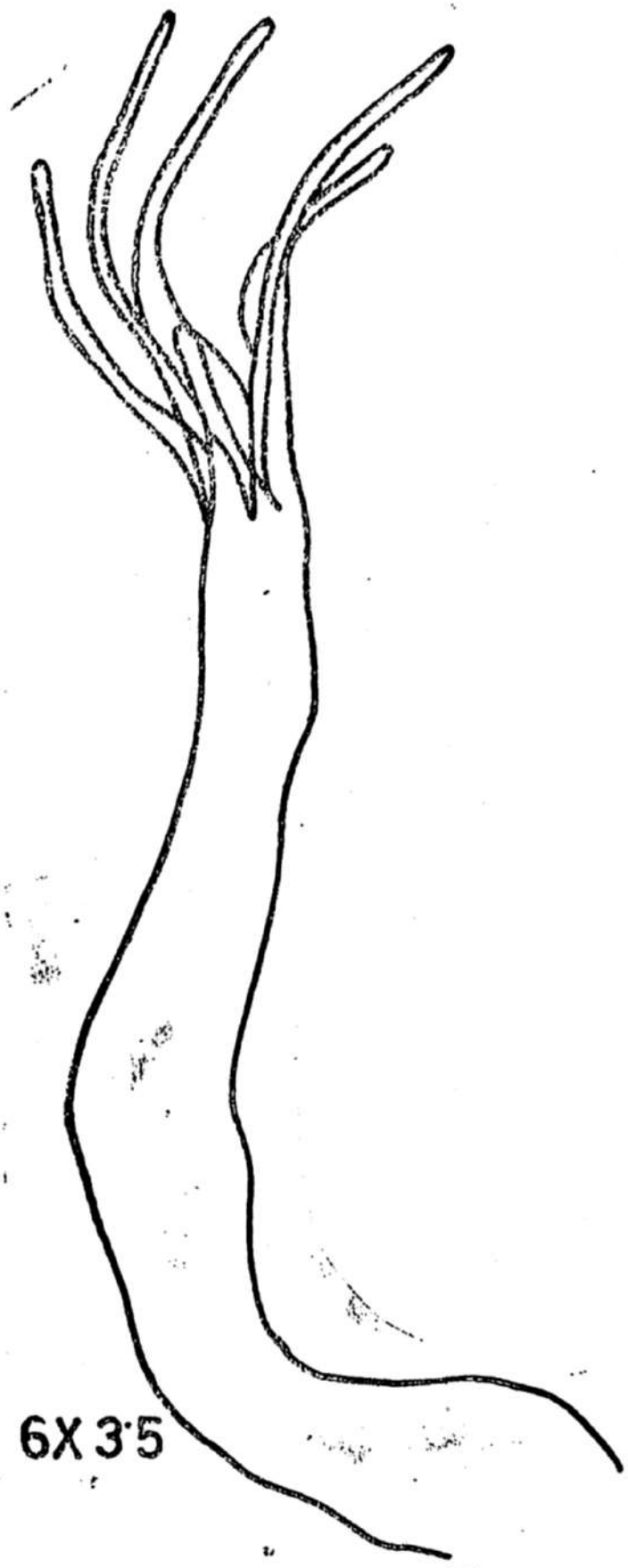


fig.5

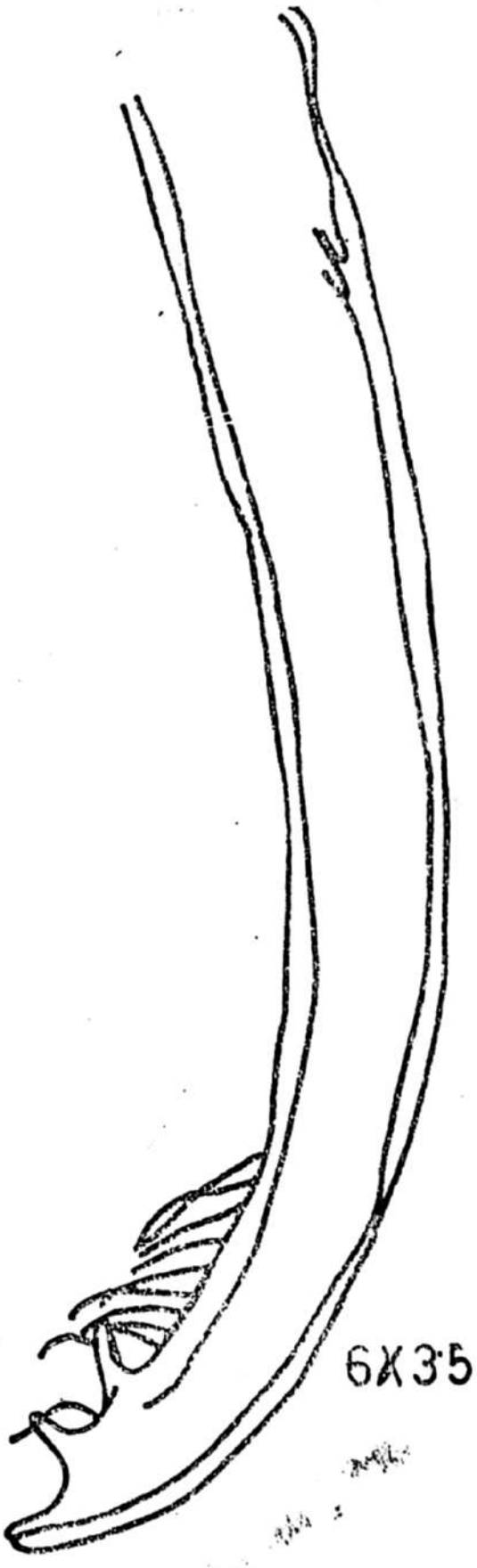


fig.3

AN ADDITION TO THE CRAB FAUNA OF PAKISTAN

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Taxonomy of crab fauna of Indo-Pak. subcontinent has been studied by Milne Edwards (1832), de Haan (1887), Henderson (1893), Alcock (1895—1900), Gravely (1827), Kemp (1915—1919), Chopra (1930—37) and Das (1930—37), Chhapgar (1957 58, 61, 68), Kholi (1921-22), Pillai (1951), Hashmi (1962 64) and Tirmizi (1970). Subsequent study of crabs of Karachi shores reveals that many species are yet to be reported. Here an attempt has been made to bring into account of such species.

Five species have been reported in this paper. The identification is based upon the study of pleopods. Alcock (1899) Barnard (1950), Chhapgar (1957, 58, 61, 68), Chopra (1930—35), Gordon miss (1930-35), Stephenson W. Campbell (1959) were followed for the identification of the species.

MATERIALS AND METHODS

The specimens were collected mainly from West Wharf Fish Harbour. They were washed properly and preserved in 5% formalin.

SPECIES WORKED OUT

1. **Tribe** ———— Brachygnatha.

   Family ———— Dorippidae.

   Genus ———— Dorippe.

   Species ———— Dorippe dorsippes (Linn.).

   (Figure Plate I fig. 1. 1st pleopod).

Synonymy Dorippe dorsippes (Linn.) 1878.

Hilgendrof. M.B. A.K. wiss. Berlin, p. 812 (quadredentata). 11896.

Alcock, J. Asiat. Soc. Bengal lxv., p. 277. 1903 Borradaile. F. Geogr.

Mald. Laccad. Archip., ip. 439, pl. 22 fig. 1. 1916 Ihle b. 1. pp. 148, 153, 156 figs., 41, 45, 51, 54, 58, 59, 61, 636, 1926.

Barnard. Trans. Roy. Soc. S. Afr. xiii p. 120.

(lanata lapscal) 1931. Shen. Hong-Kong. Natural, ii. p. 98 text figs. 5—7 pl. 5. fig. 1—2, 1945 Stephenson, Dan. Sci. Invest. Iran. pt. 4. p. 63 figs. 4A, B (plp I. 2 male).

Male :	Average length of male carapace	=	27.75 mm.
	Average breadth of male carapace	=	23.75 mm.
Female :	Average length of female carapace	=	34.5 mm.
	Average breadth of female carapace	=	36.5 mm.

Diagnostic characters :

The Length of the carapace is longer than that of its breadth. The body and appendages are covered with short hairs. Body regions are well defined forming a rather V-shaped band. Branchial region granular, lateral margin, behind the anterolateral spine, granular, supra ocular tooth rather hook-like in appearance with long hairs at the base. 1st pleopod is not like *D. astuta*. It is sharply tapering and bent at the apex making an angle of about 240 degrees and almost becoming like a fish hook. The dorsal surface of the pleopod is heavily marked with hairs (Fig. 1).

2. Tribe——————————————Brachygnatha.

S. Tribe——————————————Oxyrhyncha.

Family——————————————Blastidae.

Genus——————————————Doclea.

Species——————————————D. muricata Herbst.

(Figure Plate 1 fig 2 1st pleopod).

Synonymy :—

Doclea muricata, Herbst. 1920 stebbing Ann. S, Afr. Mus. xvii, p. 232.

A total of ten individuals are present in the collection of Marine Biological Research Laboratory. Of them five are male and the rest female.

Average length of male and female are given as follows :—

Male :

Average length of carapace	=	31	mm.
Average breadth of carapace	=	30	mm.
Average length of rostrum	=	5	mm.
Average length of last medio-dorsal spine	=	7	mm.

Female :

Average length of carapace	=	39.5 mm.
Average breadth of carapace	=	37.8 mm.
Average length of rostrum	=	6.8 mm.
Average length of last medio-dorsal spine	=	7.5 mm.

Diagnostic characters :

The carapace is subcircular and the rostrum is short triangular and bifid apically. The anterolateral border is armed with four spines, of which the last one, being situated near the posterolateral border, is the largest. There is a row of spine on the mediodorsal line starting from the base of the rostrum to the hind margin of carapace ; the spine on the hind margin being the largest. A denticulate flat tooth at the angle of the buccal cavity is present. The pterogostomial region is not longitudinally channelled. The carapace of female chelipeds, legs and abdomen are covered with very close velvety pile. 1st pleopod curved inward and sharply tapering towards the apex (fig. 2).

Locality———————— Dredged materials.

Distribution————————Indo-Pacific.

3. Tribe————————Brachygnatha.

Subtribe————————Brachyrhyncha.

Family————————Portunidae.

Genus————————Charybdis.

S. genus————————Goniohellenus.

Species————————Charybdis (goinohellenus) var. Vadorum.

(Figure Plate 1 fig. 3 and 3a 1st pleopod).

Synonymy :—

Charybdis (goniohellenus) Vadorum, Charybdis (goniohellenus) sinensis Gordon. J. Linn. Soc. London (Zool) xxxvii, pp. 534—536, 1931. Charybdis (Goniohellenus) hoplites. var. vadorum, Alcock, J. Asiat. Soc. Bengal LXVIII p. 67, 1899.

This species is represented in the collection by only two individuals———— a male and a female.

Length of carapace = 11.5 mm.

Breadth of carapace = 23 mm.

The carapace is tomentose and broader than that of its length. The regions are well defined and aerolated. A transverse granular ridge is present on each side of the brancinal region starting from the tip of the last anterolateral spine. There is another transverse granular ridge on the middle of the gastric region, followed by two more subregional convexities also ridge like. The frontal region of the carapace is divided into six lobes in addition to dentiform supra-orbital angles. The Median lobes are large, rounded and slightly projected beyond others. The next one is bluntly rounded and indistinctly separated from those of the median pair by deep wide gaps. The inner supra orbital angle is fairly large, broad tooth like and has a somewhat acutely pointed apex. The orbits have pronounced dorsal inclination. The upper border is firmly crenulate and the fissure near its outer end is somewhat obscure, Lower border also crenulate.....in the middle and its inner angle produced into a large bluntly rounded lobe. On the anterolateral border there are six posteriorly serrated spines of which the last one is fairly large and acutely directed. The posterior border of the carapace is straight, prominent and forms a dog's eared angle of junction with the posterolateral border. The chelipeds are little more than the length of carapace. There are two spines on the anterior border of the arm and one on the posterior border. There is a fairly large spine on the anterior border.

Locality——————————West Wharf & Korangi Creek fish harbour.

Distribution——————————Indo-Pacific, Bay of Bengal, Hong Kong.

4. Family ——————————Xanthidae.

Genus——————————Actaea (de Haan.).

Species——————————*A-tomentosa* (M. Ed.).

Figure——————————(Plate 2, fig. 4. 1st pleopod).

Synonymy :—

Actaea tomentosa, Milne Edwards 1834 Hist. Nat. Crust. 1. p. 385 (Zogymust) *Actaea tomentosa* (1878) Milne Edwards Hilgendrof M. B. A. K. wiss. Berlin. p. 788 Actaea tomentosa (1898) Milne Edwards odhner 1. c. p. 70.

This species is represented in the Laboratory by only one male individual collected from Buleji. It measures as follows :—

Length of carapace = 25 mm.

Breadth of carapace = 31 mm.

The carapace is shorter than that of its breadth, granular, aerolated and covered with short hairs. The aerolation is absent behind the cardiac region.

The anerolateral border is lobulated into four, of which the first one is the smallest. The Cheliped are bluntly pointed and spoon shaped. The fingers and thumbs are of dark colour which extend on the inner and lower surface of the palm. The legs are granulated and fringed with short hairs.

The first pleopod is arched with transparent horny tips (fig. 4). There are many recurved spinules and a few long hairs near the tips.

Locality ——————————Buleji.

Distribution ——————————Mauritius, East coast of Africa, Red Sea and Indo-Pacific.

5. Family——————————Xanthidae.

Sub-family——————————Pilumninae.

Genus——————————Pilumnus Leach.

Sp.-Pilumnus. vesperitilio (Fabricius).

Figure—(Plate 2, fig. 5 & 5a 1st pleopod).

Synonymy :—

Pilumnus Vespertilio Miers (1876) catalogue, Newzealand crustacea, p. 19 Haswell (1882) catalogue Austr. crust. P. 65 de Man (1887). J. Linn. Soc. London (Zool.) xxii, p. 58 walker (1890), J. Linn. Soc. London (Zool.) xx, p. 110. Henderson (1893) Trans Linn Soc. London (Zool.) v.p. 365, Alcock and Anderson (1894) J. As. Soc. Bengal 1xiii p. 201, Alcock (1898) J. As. Soc. Bengal 1xiii p. 192 Lanchester (1900) Proc. Zool. Soc. London, p. 743. Borradaile (1902), Fauna Geog. Malidiv. Laccadiv. Archipel (3) 1, p. 245 Laurie (1906), Ceylon Pearl Oyster Fish Report (5) p. 408. Borradaile (1950) Ann. S. Affr. Mus xxxviii p. 263 Savatti (1950) Department of Fisheries Bangkok, Thailand p. 167 Chhapgar (1957) on the crabs (Decapoda Brachyura) of Bombay state J. Bombay Nat. Hist. Soc. 54 : 399—439.

The average length and breadth measurements of the specimens in our collection are as follows :

Average length of carapace	15 mm.
Average breadth of carapace	20 mm.

The carapace, legs and chelipeds are covered with thick, dark shaggy coat of hairs of two kinds ——————longer and shorter. The carapace is transversely oval and nearly 3/4 as long as broad. It is flat posteriorly and has blotches of bright brick red colour ; legs stripped with the same colour and have blotches of bright brick red colour. The front is cut into two, anterolateral border cut into three spiniform teeth, besides which there is a subhepatic denticle behind and below the outer orbital angle. The chelipeds are unequal,

the inner angle of the wrist not spiniform, the upper and the outer surfaces of the wrist of the smaller hand, granular and lower outer corner of the large hand is also covered with clusters of granules, some of which on the smaller hand and also on the larger hand, are arranged in longitudinal series. Fingers are dark chocolate and spoon shaped. The 1st male abdominal appendages are bent upon themselves at the tip to form a hook and bear minute spinules in a patch at the end. Longer spinules occur along the borders.

Locality——————————Buleji.

Distribution——————————Andaman, Mergui & Palk strait. Indo-Pacific.

ACKNOWLEDGEMENT

I am thankful to Mr. M. S. U. Siddiqi, Director, Zoological Survey Department for providing me Research facilities.

REFERENCES

Alcock, A. .. 1894 An account of a recent collection of deep sea crustacea from the Bay of Bengal and Laccadive sea. J. As. Soc. Bengal xiii p. 201.

——————— 1898 Materials for carcinological fauna of India No. 3. The Brachyura cyclometopa. Part I. The family xanthidae. J. Asiat. Soc. Bengal. 67 : 67—233.

——————— 1899 Materials for carcinological fauna of India No. 4. The Brachyura cyclometopa. Part II. A revision of the cyclometopa with an account of the families Portunidea, canciridae and corystidae. J. Asiat. Soc. Bengal, 68(2) : 1—104.

Barnard, K. H. 1964

Chhapgar 1956-57 On the marine crabs (Decapoda Brachyura) of Bombay state Part I. J. Bombay Nat. Hist. Soc. Vol. 54 No. 2 & 3 pp. 399 and 441.

Chopra, B. .. 1933 Further notes on crustacea Decapoda in the Indian Museum VIII. On the Decapod crustacea collected by the Bengal Pilot service off the Mouth of the River Hoogly Brachygnatha (oxyrhyncha and Brachyura). Rec. 1 nd. Mus. xxxvii. p.477. fig. 4.

de Man, J. G.	..	1877	Report on the Podopthalmous crustacea of the Mergui Achipelag collected for the trustees of the Indian Museum, Calcutta by Dr. John Anderson, F.R.S., Superintendent of the Museum, Parts i—v, J. Linn. Soc. London (Zool). xxii, pp. 1—212, pls. i—xiv.
Gordon, Isabella		1930-32	Brachyura from the coast of China J. Linn. Soc. London (Zool.) 37, pp. 525-526.
Gravely F. H.	..	1927	Crustacea in the Littoral fauna of Krusadai Island in the gulf of Manaar. Bull, Madras Government Mus. (n.s. 7) : 135—155.
Hashmi, S. S.	..	1962	Crab Fishery in Pakistan Ag. Pak. Vol. xiv No. 1, pp. 93—99.
————		1964	Some addition to the checklist of crabs of Karachi and notes on habit and habitat of Podopthalmus, Vigil (Fabricius) And Macropthalmus Sp.
Henderson, J. R.	..	1938	A contribution to Indian carcinology Trans. Linn. Soc. London (2) Zool. v. pp.
Kemp, S.	..	1915	Fauna of chilka lake Mem. Ind. Mus. V. pp. 199—325 pl. xii. 20- text. figs.
————		1917	Notes on crustacea Decapoda in the Indian Museum ———— Hymenosomatidae. Rec. Ind. Mus. xiii, pl. 243—279, 29 text figs.
————	..	1918	Crustacea Decapoda of the Inle Lake basin. Rec. Ind. Mus. xvi pp. 383—394, pl. xxiv.
————	..	1919	Notes on crustacea Decapoda of the Indian Museum————scopimerinae. Rec.Ind.Mus. xvi., pp. 305—348. pls. xii-xiii, 21 text figs.

Kholi, Ganga Ram	..	1921-22	Brachyura of the Karachi coast. Proc. Lahore Phil. Soc. iii, pp. 81—85.
Laurie	..	1906	Ceylon Pearl Oyster fish report (5), p. 408.
Lanchester	..	1900	Proc. Zool. Soc. London, p. 743.
Walker	..	1890	J. Linn. Soc. London (Zool.), xx, p. 110.

ILLUSTRATIONS

Plate I

FIGURE 1.—1st pleopod of Dorippe dorsipes.

FIGURE 2.—1st pleopod of Doclea muricata.

FIGURE 3.—1st pleopod of charybdis (goniohellenus) Vadorum.

FIGURE 3a.—Same, tip enlarged. Plate II.

Plate II

FIGURE 4.—1st pleopod of Actaea tomentosa.

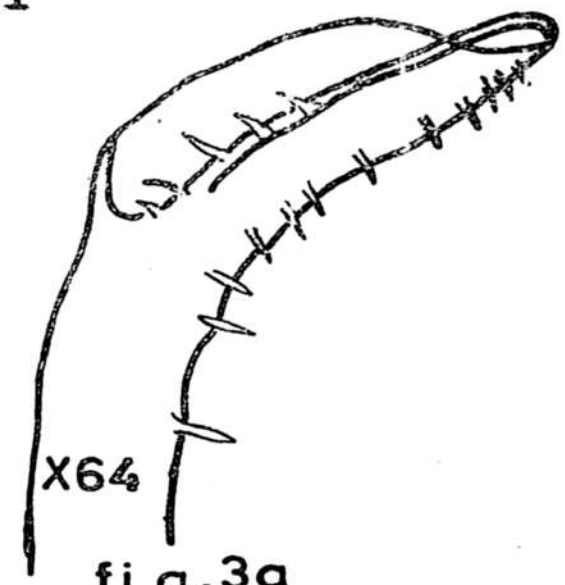
FIGURE 5.—1st pleopod of Pilumnus vespertilio.

FIGURE 5a.—Same, tip enlarged.

PLATE-1

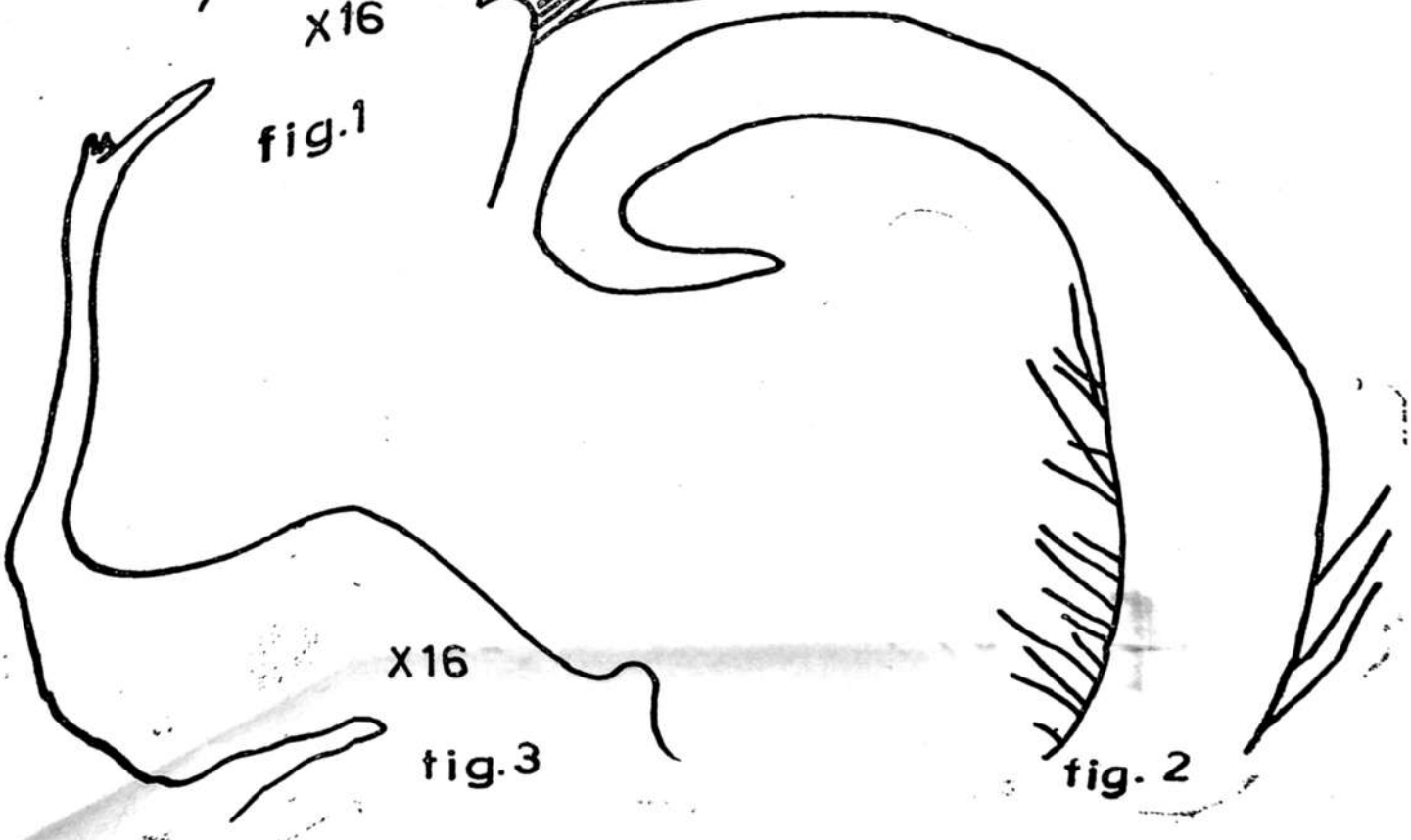
X16

fig.1



X64

fig.3a



X16

fig.3

fig. 2

PLATE-2

fig.5

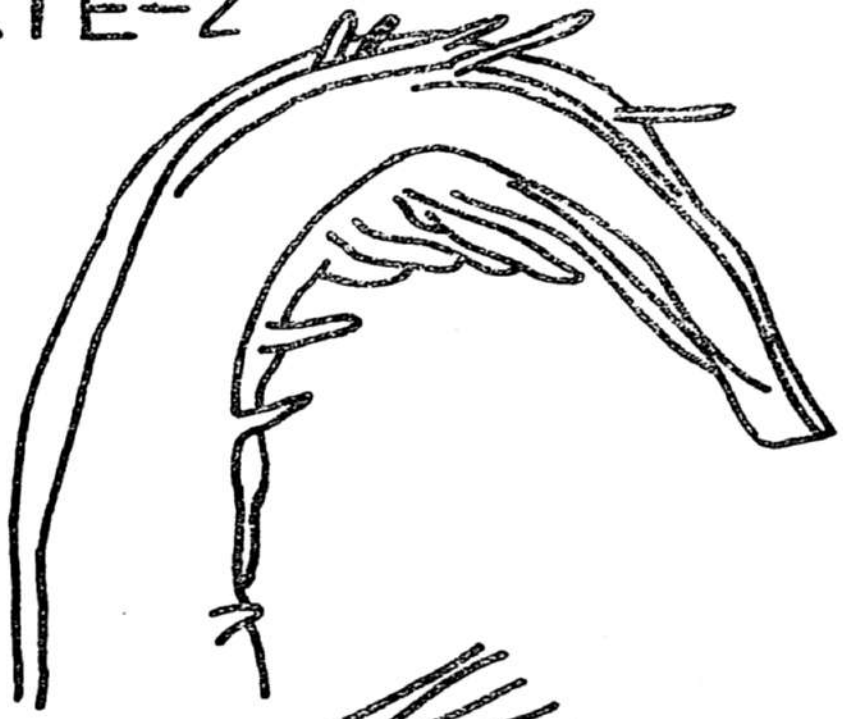


fig.5a

fig.4

ON A NEW SPECIES ALLOSTOMACHICOLA CHIROCENTRI OF THE GENUS ALLOSTOMACHICOLA SRIVASTAVA, 1939 (SUB FAMILY: STOMACHICOLINAE) FROM A MARINE FISH CHIROCENTRUS DORAB OF KARACHI COAST.

By

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Helniusthologist

AND

Mrs. Qamar Jahan Azam

Research Asstt.

(Received on 20th July 1971)

INTRODUCTION

The Genus Allostomachicola (Srivastava, 1939) till now comprises the only species, *Allostomachicola secundus*. The present species Allostomachicola chirocentri shows variability in the relative size and position of suckers, vesicula seminalis, pars prostatica and the Genital pore, oval shaped ovary and presence of receptaculum seminalis.

DESCRIPTION

Long, narrow, sub cylindrical and muscular body without spines, annulations and a distinct tail, measures 19.5—21.4 in length and 2.2—2.25 in breadth. Oral sucker sub terminal without pre-oral lobes measuring 0.56 × 0.52 —0.61 × 0.58 in diameter. Prepharynx lacking, Pharynx ovoid 0.16 × 0.201 —0.31 × 0.39 in size. Oesophagus inconspicuous, leading into the straight caeca without shoulder region, extending upto the posterior end of the body. Acetabulum less than the twice diameter of the oral sucker, measuring 0.68 × 0.62—0.74 × 0.81. The testes situated one behind the other in the post acetabular and pre-ovarian zone; the anterior testes measuring 0.46 × 0.48 and the posterior testes 0.76 × 0.31 in size, vesicula seminalis elongate, saccular and pre-acetabular having well developed bulbous pars-prostatica, surrounded by prestate cells, measuring 0.44 × 0.23, hermaphroditic duct small enclosed in oval muscular pouch continued into a musoular sac of genital atrium measuring 0.315 × 0.15 in size. Ovary somewhat spherical; post testicular, compact measuring 0.315 × 0.46 in diameter, receptaculum seminalis present measuring 0.12 × 0.11. Vitellaria seven winding tubes extending laterally over-lapping. The caeca reaching to the tail about 3/5th to 2/3rd of its length. Eggs numerous small measuring 0.0023 × 0.00203 to 0.0023 × 0.00145 in size.

DISCUSSION

The present specimen is much more similar in general topography to the previous specimen, *Allostomachicola secundus*, first described by Srivastava 1939, but differs in the position, size, ratio of the suckers, presence of conspicuous receptaculum seminalis and para prostatica, position of testes, unshouldered caeca absence of pre-pharynx and new host *i.e.*, *Chirocentrus dorab*. The above mentioned characters are quite enough for erection of a new species.

ACKNOWLEDGEMENT

We are grateful to Mr. M. S. U. Siddiqi, Director, Zoological Survey Department, Government of Pakistan, for the encouragement and facilities provided by him during our research work. We are also thankful to Mr. Mohammad Dawood Khan and Mr. M. S. Niazi of the same Department for giving useful suggestions during this work.

ABBREVIATIONS

O-Oral sucker, P-pharynx, G.A.-Genital atrium, H.P.-Hermaphroditic pouch, P.C.-Prostate cells, V.S.-Vesicula seminalis, V-Ventral sucker, T-testes, V.T.-Vitellaria, O.V.-Ovary, R.S.-Receptaculum seminalis, S.G.-Shell gland, I-Intestinal caeca, U-Uterus.

EXPLANATIONS OF THE FIGURES

A=Anterior region of the body; B=Uterine portion or middle portion; C=Posterior extremity.

REFERENCES

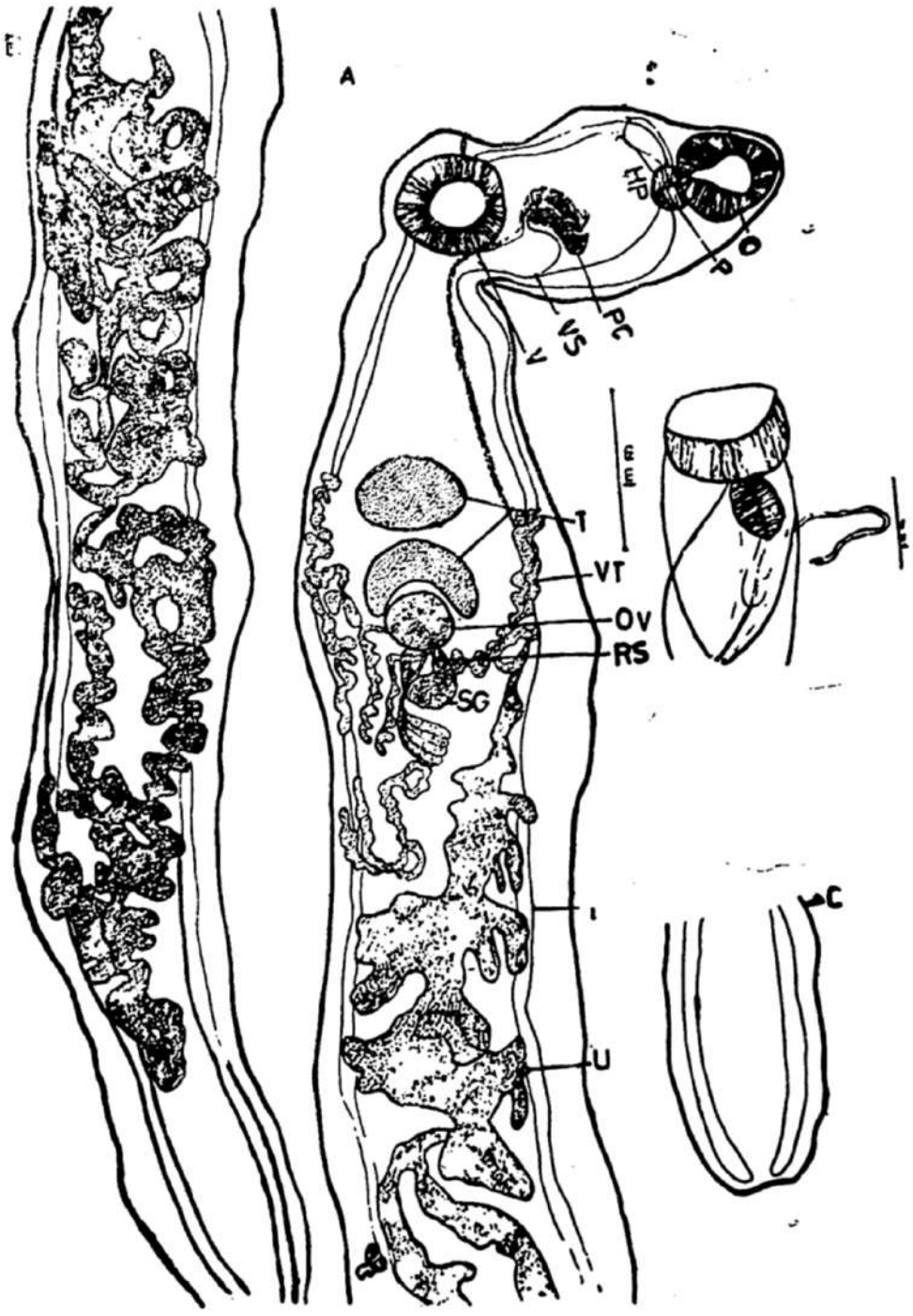
1. Linton, E. (1910) .. Helminth fauna of the dry tortugas, II. Trematodes. Carn. Inst. Wash. Publ. 133, 98 pp.

2. Srivastava, H.D. (1939) .. A New parasite Allostomachicola Secundus of the sub-family Dinurinae Locas, 1907. Ind. J. Vet. Sc. & Anim. Husb. 9(1), 77—79.

3. Yamaguti, S. (1934) .. Studies on the Helminth fauna of Japan Part 2, Trematodes of fishes, I. Jap. J. Zool. 5(3), 249—541.

Comparative Statement of the New Species and the described one

Name of the Organs	Allostomachicola dorab	Allostomachicola Secundus
1. Size of the Body ..	19.5—21.4×2.2—2.25 ..	23—35×2.5—3.4
2. Position of the oral sucker.	Sub-terminal ..	.. Cup-shaped, Sub-terminal.
3. Size of the oral sucker	0.56×0.52—0.61×0.58	0.72—0.95
4. Nature of the body ..	Long, narrow, sub-cylindrical and muscular body without spines annulations and a distinct tail.	Long muscular, sub-cylindrical, sharply constricted into two parts body proper and the tail.


A
HP
P
O
PC
VS
V
T
VT
OV
RS
SG
I
U
C

Name of the organs	Allostomachicola droab	Allostomachicola secondus
5. Pre-pharynx ..	Lacking	Extremely small.
6. Pharynx	Ovoid 0.16×0.21—0.31 ×0.39	Ovoid 0.46—0.52×0.38--0.5
7. Oesophagus ..	Inconspicuous ..	0.24×0.18
8. Caeca	Un-shouldered ..	Shouldered.
9. Acetabulum ..	Less than the twice diameter of the oral sucker.	Twice the oral sucker.
10. Size of the Acetabulum.	0.68×0.62—0.74×0.8	
11. Position of testes ..	One behind the other post acetabular and in pre-ovarian zone.	Asymmetrical intercaecal one on either side of the median line.
12. Size of the Testes ..	0.46×0.48—0.76×0.31	Left testis 0.76—1.5×0.54—1.0 Rt. 0.8×1
13. Vesicula seminalis ..	Elongate, saccular and pre-acetabular.	0.44×0.23 elongate, oval 0.8—1.45×0.4—0.6×0.2—0.3
14. Pars prostatica ..	Bulbous.	
15. Hermaphoroditic duct	Small 0.315×0.15	
16. Ovary	Spherical, post-testicular	Dome-shaped divided into 3 parts 0.8—0.9×0.88 — 1.2
17. Receptaculum seminalis.	0.315×0.46—0.12×0.11	Absent.
18. Size of the eggs ..	0.0023×0.00203 ..	0.015—0.023
19. Host	Chirocentrus dorab ..	Hemirhamphus limbatus.
20. Genital pore ..	Marginal below the pharynx.	Behind the pharynx.

A NEW SPECIES OF *HELICOMETRINA* (TREMATODA SUB FAMILY ALLOCREADIINA)

BY

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(Received December, 1971)

INTRODUCTION

During survey of Helminths parasites of Marine Food Fishes of Karachi coast, a new species of the genus *Helicometrina* found in the intestine of *Plectorhynchus sp* caught at Karachi fish harbour. The parasite from its detailed study found to be new. It differs from the previously described sp. in the position and sizes of different organs, No. of testes, position of genital pore, size ratio of the two suckers and the new host record.

DESCRIPTION

Helicometrina Plectorhynchii N.Sp.

Body plump, bluntly rounded at both extremities, moderate in size, aspinulate, 4.114 in length, widest across the ovarian region measuring 1.275. Oral sucker muscular, sub-terminal, 0.34 in diameter, Prepharynx lacking Pharynx globular, well developed 0.17 in length. Oesophagus moderately long, 0.85 in length. Caeca simple, straight, reaching near the posterior extremity. Acetabulum situated anteriorly, large, highly muscular, 0.561 in diameter. The size ratio of the oral sucker and ventral sucker is 2 : 3. Genital pore in the middle of the oesophagus near the pharynx. Excretory vesicle tubular extending up to the ovary. Excretory pore in the posterior end of the body. Cirrus sac moderately long and sinuous, extending from the middle of the oesophagus to the posterior margin of the acetabulum. It encloses a bipartite, uniformly broad vesicula seminalis, a small elongated bulb shaped parsprostatica surrounded by prostate gland cells, a small ductus ejaculatorious and knob-like cirrus. The genital atrium is a small shallow circular depression on the ventral surface in the middle of the oesophagus. The male and female ducts open separately in the genital atrium. Testes Neire in two rows four in each row and Ninth test is on the *mid line between* the two rows, spherical, equal in size, 0.187 in diameter. Ovary deeply four lobed just pretesticular. Shell gland and receptaculum seminis well developed. Vitellaria follicular extending from the level of the oesophagus up to the posterior extremity. Uterus with a few filamented eggs, winding between ovary and acetabulum. Eggs large 0.068 × 0.051 in size leaving the filament.

Host : Plectorhynchus.
Habitat : Intestine.
Locality : Karachi, Arabian Sea.
Holotype : Deposited in the Zoological Survey Department, Museum.

All measurements are in m.ms.

DISCUSSION

The genus Helicometrina first created by Linton, 1910 this genus comprises only eight species till now, *i.e.*, *H. ninria*, 1910 in *Neomoenis griseus, chrysurus, calanrus, Eupomacentrus leucostictus chrysuru*, *calaums, Eupomaceutrus leucostictus*; Florida, Additional hosts-Manter (1934,40,47). Also in Neomoeuis guttatus; Pacific coast of Mexico. *H.elongata*, Noble et Park 1937, *H. oientalis* Srivastava, 1936, *H.parva* Manter 1933, *H.septorchis* Srivastava 1936, *H.mirzai* n.sp. Siddiqi, A.H. and cable R.M., *H. trichinoti* from *trachinotus* and *H.quadrorchis* n.sp. Manter and pritchard 1960. The present species has close resemblance with *H.orientalis* in the general topography of the organs but variable in larger size of the body, and the oesophagus, in H. orientalis the size ratio is 1 : 2., Extension of vitellaria, all the testes are equal in size and shape. The sucker ratio in H. orientalis is 3 : 4 but in the present specimen it is 2 : 3 and the ovary is highly four lobed cirens pouch elongated and extended back of acetabulum. The above characters are quite sufficient for erection of a new species.

ACKNOWLEDGEMENT

My sincere thanks are due to Mr. M.S.U. Siddiqi for the continuous help and encouragement given during this work. I am also thankful to Mr. M. Farooq Ahmad, Zoologist, for the useful suggestions given during this work.

REFERENCES

1. Deelonau, J.J. (1960) .. "Studies on the genus Helicometrina Linton 1910 (Trematoda : Digenea: Allocreadiidae") Journal of Parasitology, 46 (5 sect 2), 13.

2. Linton, E. (1910) .. Helminth fauna of the Dry Tortugas II. Trematodes carn. Inst. Wash. Publ. No. 133, 98 Pp.

3. (A) Manter, H.W. (1933) The genus Helicometra and related trematodes from Tortugas, Florida. Pap. Tortugas Lab. 28 (11) 167—192.

4. (B) Manter, H.W. & Pritchard, M.H. (1960). "Some Digenetic Trematodes of Eels of Hawaii," J.Parasito (Vol. 46 No. 5) 651—658.

5. Noble, A.E. and Park, J.J. (1937). Helicometrina elongata n.sp. from the gobiesocid fish, canlarchusmeandiicus, with an emended diagnosis of the trematode genus Helicometrina. Trans. Amer. Micr. Soc. 56,344—347.

6. Siddiqi, A.H. & Cable, R.M., (1960). "Digenetic trematodes of Marine Fishes of Porto Rico", Scientific Survey of Porto Rico and the virgin islands, 17(3), 257—369.

7. Srivastava, H.D., (1936) .. New Allocreadiids from Indian Marine fishes. Part I. New parasites of the genus Helicometrina Linton, 1910, Proc. Nat.Acad.Sci.India. 7(3), 179—185.

8. Yamaguti, S. (1958) .. Systema Helminthem Vol. I. The Digenetic Trematodes of Vertebrates Pt. I & II, Interscience Publishers, Inc. New York.

ABBREVIATIONS

E—Excretory vesicle, G.A.—Genital atrium, M—Metraterm. O—Ovary, O.E.—Oesophagus, O.S.—Oral Sucker, P—Pharynx P.P.—Parasprostatica, R.S.—Receptaculum seminalis, S.G.—Shell gland, S.V.—Seminal vesicle, T—Testes. U—Uterus, V—Vitellaria, V.S.—Ventral sucker.

A NEW TREMATODE PARASITE *L.STRAIGHTUM* (n.sp.) FROM MARINE FOOD FISHES OF KARACHI COAST

By

MRS. ISHRAT JAHAN

Helminthologest

(Received on 23rd December, 1971)

Srivastava 1939 established the genus *Laruea* after its viable differentiation with *Haplosplanchnus* Looss, 1902. This has the only representative *L.caudatum* possessing a semi-spiral tail so characteristic of the genus. This new parasite *L.Straightum* recorded from *Rachycentron canadus Pseudosciaena diacanthus*, differs from the type species in the absence of prepharynx, position of gonads, size variations of different organs, terminal position of oral sucker and the very absence of semi-spiral tail. These distinctive differences are such which lead to justify the creation of a new species.

DESCRIPTION : (based on three specimens collected from two hosts).

L.Straightum n.sp.

Body more or less triangular, rather Y shaped; the arms of Y unequal, the larger containing a very long club shaped acetabulum. Posterior middle third of body abruptly narrowed. Body with broad off ends, semi-spiral tail absent. No power of contraction noticeable during lifetime. Length of body across oral extremity 2.227; body widest in the acetabular zone measuring 1.224. Oral sucker terminal located in the smaller arm 0.136 × 0.289. Pharynx muscular well developed and dome shaped 0.187 × 0.136. Oesophagus somewhat larger, indifferenciated, considerably wide and continued posteriorly into caecum and measures 0.187 × 0.085. Intestinal caecum single, tubular and ends blindly near the middle half along the right body margin measuring 1.241 × 0.153. Acetabulum more or less terminal club-shaped highly muscular measures 0.867 × 0.323 Testis single, near the caudal end measuring, 0.323 × 0.289. Ovary spherical medium lying obliquely in front of test is 0.136 × 0.136. Receptaculum seminis pre-testicular 0.136 × 0.119 with a narrow duct and opening into the genital pore vesicula seminalis Tubular. Vitellaria follicular lying between the blind end of a caecum and above the gonads. Uterus confined greatly to the space between the testis and acetabulum. Genital pore marginal closest to oral sucker. Eggs numerous, operculated with developing miracidia having well defined eye spots, measure 34 υ × 17 υ All the measurements are in mm.

Host	.. ..	*Pseudosciaena diacanthus Rachycentron Canadus.*
Habitat	.. ..	Intestine.
Locality	.. ..	Arabian Sea (Karachi).
Holotype	.. ..	Deposited in the Zoological Survey Department Museum, Regd., No. 4183.

DISCUSSION

The presence of a semi-spiral tail in *Laruea* is considered as an essential gene character. The three specimens recovered from the fish *Rachycentron sp* and *Ps dasciaena* sp. shows that a semi-spiral tail is altogether wanting. This, howev gives a contrary diagnostic generic feature. In. *L.straightum* the absence of p pharynx, position of gonads and the oral sucker and also the sizes of differ organs are such that it suggests for proposing this a new species.

ACKNOWLEDGEMENT

My thanks aie due to Mr. M.S.U. Siddiqi, Director, Zoological Sur Department, Government of Pakistan, Karachi, for the continuous help a encouragement given during this work. My thanks are also due to Mr. No uddin, Zoologist, for his kind and useful suggestions and help given during t work.

REFERENCES

Srivastava, H.D. (1939)

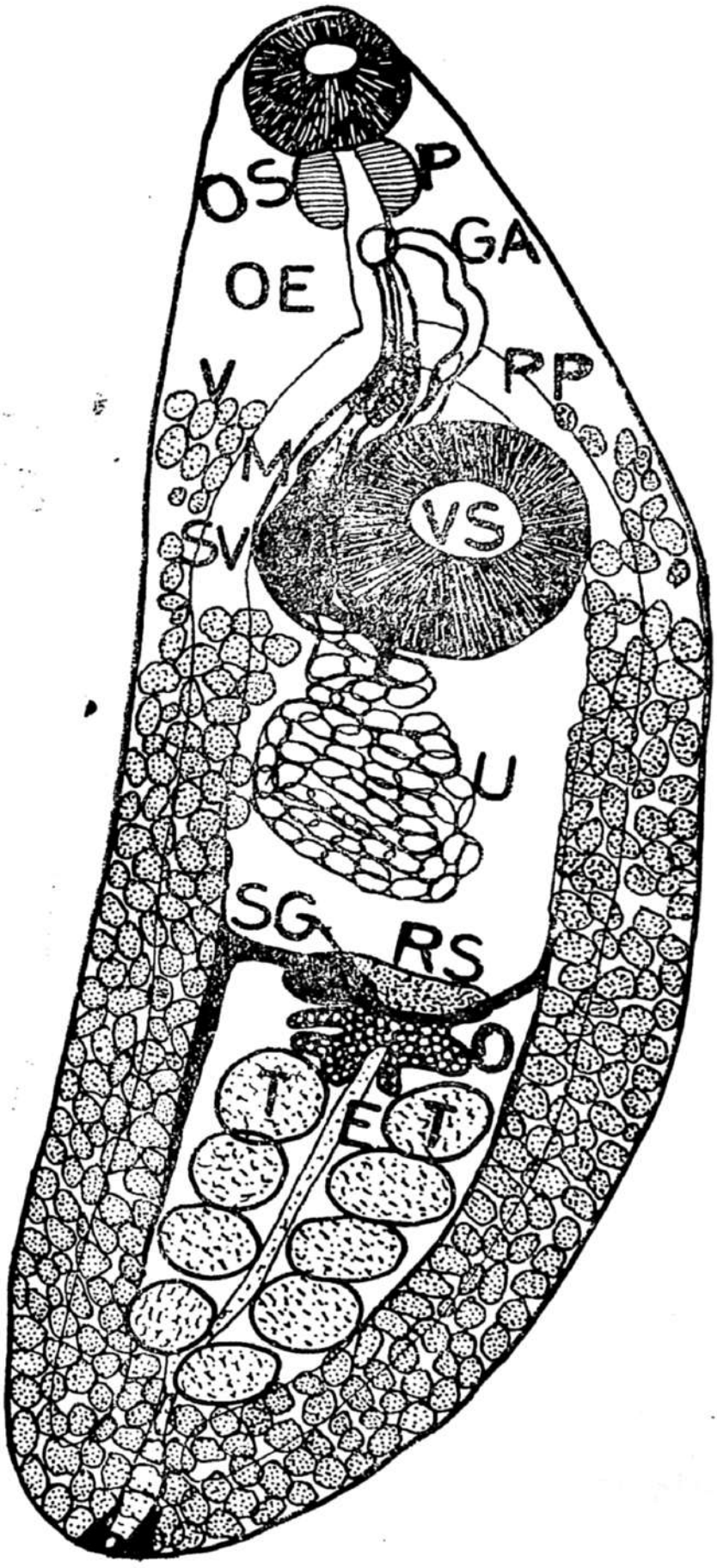
The morphology and systematic relationship of two New distomes of t family Hallosplanchnidae Poche, 1926, from Indian marine food fishes, Ind. Vet. Sc. and Anim. Husbandry, 9(1), 67-71.

Yamaguti, S. 1958

Systema Helminthum, Vol. 1, Part I and II, Interscience Publishers, In New York.

ABBREVIATIONS

E—Eggs, Oe—Oesophagus, G.P.—Genital pore, Ic—Intestinal caecu O—Ovary, Os—Oral scuker, P—Pars prostatica, Ph.—Pharynx, R.s—Recep culum seminis, T—Testis, U—Uterus, V—Vitellaria, V.S.—Ventral sucker.



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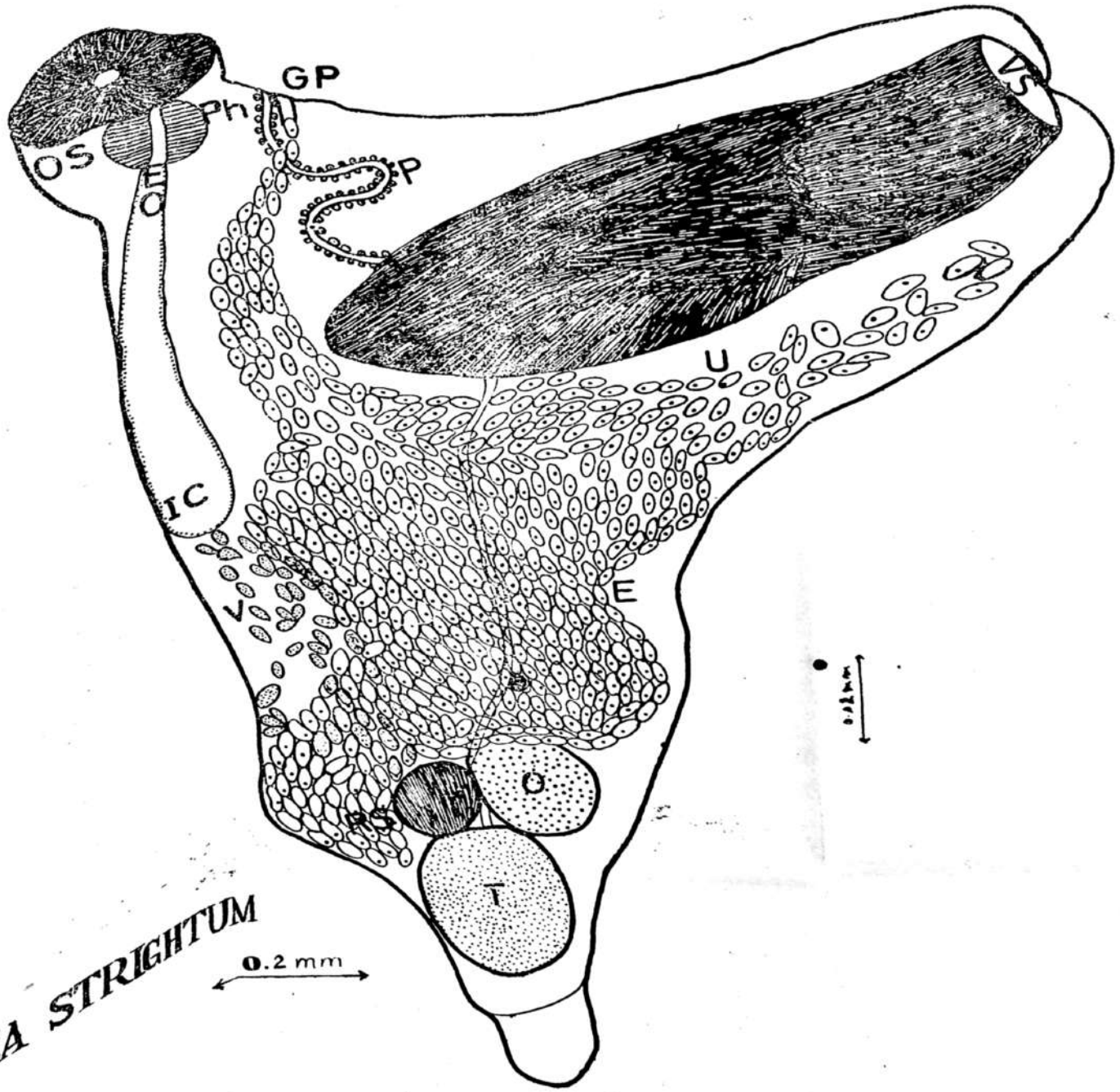

AUREA STRIGHTUM

ON SOME COPEPODS (CALANOIDS—1) FROM KORANGI CREEK, KARACHI

BY

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INTRODUCTION

In this paper I have given an account of marine copepods (Calanoids) from the plankton collection at Marine Biological Research Laboratory. The bulk of these collections has been made throughout the year of 1970 from the channel water of Korangi Creek. During the year round the survey, great fluctuation in the population of copepods, was observed.

Copepods, being the major constituents of the plankton consumed as food by the bigger animals, were not being paid much attention. These copepods, though without exception, are Microscopic and have some direct influence on the human-being. One will hardly think that these minute animals can be used as human food. Some calanoids like EUCHAETA not only serve the need of science but also provide delicious food. They can be served on toast in fried form. CALANUS also is served in making shrimp paste.

Remarkable works have been done from time to time by various scientists on the taxonomy of copepods of the different inshore and offshore waters of the world. Among the western authors DANA (1852—1949), CLARKE (1885—1934), GIESBRECHT (1888—96), BRADY (1878—89), THOMPSON(1900), CLEVE (1901-04), T. SCOTT (1901), G. O. SARS (1905), ESTERLY (1905), PEARSON (1905), WOLFENDEN (1908), VAN BREEMAN (1908), LYSHOLN & NORDGOARD (1921), MATHHEWS (1925), and FARRAN (1926—29) can prominently be referred to. Some authors from the Middle East O. PESTA (1912—13), R. GURNEY (1927), GRICE G.D. (1964) have also contributed much on the taxonomy of copepods. The taxonomical research on the copepod fauna of Indian water has commendably been carried out by a good number of workers. Among them SEWELL (1912—1934) has contributed much. His work is noteworthy, as he has described not only the copepods of different localities of India, but also discovered many new species in course of his research.

In view of established importance and an inadequate taxonomical work on the copepods of our waters the author was directed to take up the systematic studies on the calanoid collections of Korangi Creek, Karachi. This paper contains the description of nine identified species. Notable variations were observed

in the species of Korangi Creek as compared with the same species of other localities of the world. This might be due to environmental factors.

MATERIALS AND METHODS:

An out board engined boat, MOTI of MBRL was used for collection. The larger part of the collections was made from the surface waters. Sometimes a wt. of 2 lbs. was also used to keep the net submerged in water. The net used was of the usual type, having circular mouth of 1 foot in diameter comprising fine meshes; 60 meshes per linear inch, *i.e.*, 1 mesh is equal to .25 mm. The duration of every haul was 30 minutes. The hauls were taken from different stations in the channel. The catches were carefully preserved in 4% formalin.

Seventyfive specimens have been examined. Out of these, four families, six genera and nine species have been identified. The males and females of seven species are recorded from my collections. The females of only two species could not be traced out.

Visualizing the importance of length ratio of cephalothorax, urosome and antenna with the total length of respective species has been worked out very accurately and given in Table.

Family : CENTROPAGIDAE

SPECIES : *Isias tropica* (SEWELL)

MALE :

Animal is dorsoventrally flattened and fusiform. The head is round. The posterior region of the animal is also round.

Abdomen consists of 5 segments of unequal sizes. At the base of the 2nd segment is an elevation. The furcal rami have 5 long setae. The 2nd inner one is the longest.

1st antennae 22 segmented. The right one forms a grasping organ with segments 14—17, expanded and swollen. Segments 18 and 19 form a kneejoint. The outer wavy margin of the right antenna bears simple setae. Segments 15—17 bear three spines each. On the distal portion of the last joint are there short spines. The left 1st antenna is simple as usual.

The 5th pair of leg is asymmetrical. The exopod in each consists of two segments and the endopod is fused with the 2nd basal segment forming a projection. A rudimentary spine on the tip of the right endopod is observed. The endopod projection of the left side is longer than that of the right one. The first joint of the exopod has a single marginal spine, while the 2nd one has four marginal spines with the last one biggest. The spines are lamillate. The last segment of the left exopod is curved, hooklike and bilobed. The spines on this segment are long and comparatively thin without lamilae. The distal portion of the right exopod is more broader than that of the left one.

REMARKS :

The last segment of the right exopod (5th leg) has four thick, pointed stout spines with the last one longest. There are small and short spinelets arising from the proximal side of the base of 2nd, 3rd and 4th spines.

FEMALE :

Head rounded, body broader than that of male. The posterior margin of the cephalothorax is rounded.

The Abdomen consists of 3 segments possessing a pair of furcal rami. The margin of the 1st abdominal segment or genital segment is armed with 3 spines. The furcal rami are 3.5 times as long as broad and bear fine apical setae in which the 2nd one is the largest.

The 1st antennae reach up to the 2nd abdominal segments. No modification on the right 1st antenna. The 1st segment of it bears a long curved seta, while the remaining are clothed with small setae.

The 5th pair of legs is symmetrical, consists of left and right exopods. Endopods are rudimentary in each case and fused with the 2nd basal segment. The distal end of the endopod has a single blunt spine which is provided with setae at its outer margin. The exopod are 2 segmented. All the inner margins of the 1st segment of the exopods arise stout slightly curved spine which is serrated along both margins. Outer margin of the exopod bears two pointed spines. The 2nd segment of the exopods possesses single outer marginal spine in each case. The terminal margin of the exopod bears two marginal spines, and a distal one which is long serrated at both the ends. The inner border contains 4 setae.

REMARKS :

Besides two outer spines on the 1st segment, the exopods bear two rudimentary spines developing from the base of the spines. The spines of both the endopods possess setae on the inner side.

SPECIES : *Centropages dorsispinatus* (THOMPSON & SCOTT)

MALE :

Cephalothorax ovate, divided into 6 segments. Posterolateral margin of the last segment is pointed at both the ends and symmetrical. A remarkable curved beak-like hook situated on the median dorsal line of the posterior edge of the cephalic segment.

Abdomen 4 segmented. The furcal rami end into 5 unequal setae. Male right antenna 23 segmented with geniculation between 18th and 19th joints. The apex is provided with 3 or 4 setae. The rough wavy margins of the antennae bear a number of short setae.

The 5th leg of each side bears endopods and exopods. The chela of the right exopod is well developed. The thumb is a simple spine shorter than the finger and is pointed at its apex. Thumb is spineless but finger is provided with two short spines one on each inner and outer margin of it. From the outer proximal margin of 1st and 2nd segment of right exopod arise one short and pointed spine. A long seta is observed developing from the basal angle of the spine of the 2nd segment. The finger is clothed with short hairs on the outer side.

REMARKS :

The species is easily distinguished by the median dorsal cephalic hook and by t he clothing of finger of the left 5th leg.

FEMALE :

Cephalothorax 6 segmented, ovate, last segment having a round acute terminal projection. A remarkable curved beak like hook adorns the median dorsal line of the posterior edge of the cephalic segment.

Abdomen 4 jointed. The furcal rami terminate into 5 unequal seta. 1st antennae simple 24 segmented.

The 5th pair of leg is similar. Each half consists of an exopod and an endopod. The endopod of each side is 3 segmented. There are 6 lamillae on the 3rd segment, one on the right margin of the 2nd segment. The exopod is 3 segmented. The outer margin is provided with a single distal spine in segment 1 and 2 and the 3rd segment is provided with two short spines, 1 marginal and 1 distal. The finger is long, pointed and serrated externally. 4 lamillae arise from the inner margin of the 3rd segment. The thumb which originates from the 2nd segment is straight pointed at the tip.

SPECIES : *Centropages tenuiremis* (THOMPSON & SCOTT)

MALE :

Cephalothorax 6 segmented. Body as a whole is more or less angular, broad anteriorly, slightly tapered towards the last segment of the thorax. The posterior end terminates into a long outwardly extended lateral acute projection.

Abdomen 4 segmented, Furcal rami long about three times the width. The 1st right antenna 24 segmented. Joints 13 to 17 are swollen, geniculation occurs between the 18th and 19th segment.

The 5th leg of each side bears endopods and exopods. The thumb of the right exopod is less developed as compared with the finger of the same exopod. The thumb is a simple spine shorter than the finger ; and serrated to its inner margin of the curved portion. Finger is provided with two short spines one on each inner and outer margin of it. From the outer proximal margin of 1st and 2nd segment of the right exopod arise one short and pointed spine. A seta is also observed developing from the basal angle of the spine of the 2nd segment.

REMARKS :

A thumb of the right 5th leg is clothed with short hairs on its inner curved portion.

Family : TEMORIDAE

SPECIES : *Temora turbinata* (Dana)

MALE :

Body short and compact, 5 segmented. Broader anteriorly and posteriorly narrow. Posterior margin pointed on each side.

Urosome relatively shorter 5 jointed and more slender. Anal segment and caudal rami symmetrical. Stylets long having one lateral and 4 apical setae.

The terminal segment of left 5th exopod a little wider than the basal segment and somewhat enlarged and bluntly rounded distally, the 2 apical spines stout and subequal, endopod slender, slightly curved terminal segment of the right leg short, wide and curved inward, apical claw as long as the segment.

FEMALE :

Body more or less same as in male. Anal segment shorter than the first abdominal segment and somewhat asymmetrical. Caudal rami many times as long as wide, right one a little longer than the left.

The inner and outer marginal spines on the terminal segment of the 5th leg much shorter and weaker than the 2nd apical spines, of which the inner is considerably the longer.

SPECIES : *Temora dubia* (LUBBOCK)

MALE :

Cephalothorax robust, rounded in front, subtruncate behind. The posterolateral angles produced into long spinous process.

Abdomen consists of 6 segments with long slender stylets. Caudal stylet is about equal to the length of the abdomen.

Furcal rami bearing one log seta in the middle of the outer margin of the stylet and four equal apical setae.

Right 1st antenna is swollen in the middle and is 21 jointed. The joint before and behind the hinge being armed with finely serrated plates. Outer margin provided with long spines.

The 5th leg on the right side is broad, its first joint produced laterally into a long twisted immovable clawlike finger, the last joint blunt irregularly oval and bearing a few small marginal setae or spine.

The 5th leg on the left side is simple, slender and ends in a slender flexuous claw.

FEMALE :

Cephalothorax is very robust, 5 jointed, about half as broad as long, rounded in front and subtruncate behind. The posterolateral angles produced into long spinous process.

Abdomen is composed of 4 segments with a long and slender caudal stylet. Caudal stylet is about equal in length to the abdomen, terminating in 5 setae, the middle one being the longest.

Antennae 23 segmented and uniformely clothed with short slender setae.

The 5th pair of legs is simple, similar and three jointed. The last segment bears one outer marginal and three unequal distal spines, inner one being the longest

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Family : PONTELLIDAE

SPECIES : *Labidocera pectinata* (THOMPSON & SCOTT)

MALE :

The head is provided with two side hooks and is separated from the thorax by a segment. The segments 4 and 5 are fused together. The cephalothorax is three times longer than the abdomen. A pair of red eyes are very prominent from the dorsal side at the head region. The rostrum consists of a pair of spines. The posterior end of the cephalothorax is asymmetrical. On the right side is a lobe that terminates in three unequal spines, while on the left side the margin is provided with simple.

The abdomen is 4 segmented. The furcal rami are symmetrical and bear five setae. The 2nd one of each ramus is the longest. There is a short spine-like projection at the inner margin of each furcal rami.

The 1st antennae consist of 23 free joints. The left one is simple while the right one is modified to form a grasping organ with middle joints swollen. The knee joint is situated at 18th and 19th segment. The 19th, 20th and 21st segments bear delicate curved teeth plates that bear needle-like teeth on their proximal three joints.

The 5th pair of leg has no endopods. The right-leg is two segmented. The 2nd joint bears a swollen claw-like process. On the upper margin there is a single straight tooth, the upper half ends into two unequal setae. A spine is also found on its inner margin. The left leg ends in a segment so-called hand with a pointed thumb in the inner margin and finger on the opposite side. The finger is long and curved with a median long pointed spine and three smaller spines, two of which situated at the inner side.

REMARKS :

I could not view the distal spine on 1st left exopod segment which was sketched by Sewell. In may specimen a single spine on the inner middle region of the upper curved half of the claw of 2nd right exopod segment was observed, which Sewell (1929) described 2 spines.

FEMALE :

The head is separated from the thorax by a segment, provided with two sided hooks and a pair of spines. The postero-lateral margins of the thorax are pointed. The distal margin is asymmetrical as the left marginal spine is comparatively less developed, and directed inwardly. Cephalothorax is approximately three times longer than the abdomen. Three prominent segments are visible, segments 4 and 5 are fused together.

The abdomen is 3 segmented, the 2nd genital segment is swollen. The furcal rami bear 5 setae in which the inner 2nd is the longest. The last segment of the abdomen is provided with a straight spine on the distal right side.

The 1st antennae reach up to the 2nd segment of the abdomen. There are 23 segments of unequal sizes whose margins are provided with setae of variable sizes.

The 5th pair of legs are asymmetrical. In each the exopod and endopod consist of single segment. The right leg, as a whole, is larger than the left one. The right exopod bears two small spines on its outer margin while the apex is bifurcated into two large spines in which the inner one is the largest. Similar is the case with the left exopod ; however there is a small spinelet arising the angle of the apical spines, and stout spine on the inner middle margin of the exopod. Both the endopods are distally modified into many spines (8—12).

REMARKS :

An outgrowth in between the right-exopods and endopods of the 5th leg was seen, which is lacking both in ceylonese and Burmese species described by Thompson and Scott (1902). The apical spinelets of left exopod are also absent in the same species (viewed from the figure). The spinous system of left endopod shows some differences to that of Burmese species while the right one exhibits the same difference to that of Ceylonese.

SPECIES : *Pontella andersoni* (SEWELL)

MALE :

Body stout and cylindrical. Head terminates into two parallel backwardly curved pointed rostrum, having lateral side hooks. A pair of large eyes distinctly visible. Cephalothorax 4 segmented. The last segment slightly asymmetrical being more sharply jointed on the right side.

Abdomen is 5 segmented. The rami terminate into 5 setae.

The 1st antennae are as usual asymmetrical. In the right grasping antenna the middle joint bears on its upper margin a tooth plate somewhat longer than the joint.

The 5th pair of legs on the right side has two segments. The apical segment forms U-shaped structure. The 1st half of the apical segment bears paired setae and one spine to its outer margin, while there a seta to the distal anterior portion. In the left leg the terminal segment terminates into three spines. The inner margin is clothed with hairs. The second segment bears a short spine at its outer distal angle. The basal segments on each side of 5th leg bear one long seta.

FEMALE :

Head terminates into two parallel backwardly curved pointed rostrum and having with lateral hooks. A pair of large eyes distinctly visible. Body stout and cylindrical. Cephalothorax three times bigger than the urosome, 4 segmented.

The 4th segment is asymmetrical showing unequal postero-lateral spine-like projections. Abdomen is two segmented and asymmetrical. The rami end into 5 unequal setae. The middle seta is broader among all the setae in each ramus.

Antennae are 24 segmented and simple clothed with short setae in its rough margin.

5th legs are biramose, endopods short with two unequal apical spines inner one being the longer ; exopods elongate, acuminate, curved slightly inward with three outer and one inner marginal spines.

REMARKS :

This is the biggest specimen in my collections so far I observed. Sewell (1912) figured one prominent seta in each basal segment of 5th leg, but I could not view these in my specimen (female) but visible clearly in the 5th leg of male.

SPECIES : *Pontella investigatoris* (SEWELL)

MALE :

The cephalothorax is robust. Head is provided with side hooks and terminates anteriorly in a well-developed rostrum, well-marked rostral lenses, also a well-marked, well-developed ventral lens. 4th and 5th thoracic segments are separate, last segment slightly asymmetrical, being more pointed on the right side.

The abdomen is 5 segmented. Furcal rami are sightly asymmetrical.

1st antennae are as usual asymmetrical and the 10th and 11th segments are fused. The right grasping antenna bears on its upper margin in the middle a tooth-plate and bears a series of sharply pointed teeth. The distal segment bears two toothed plates with series of needle-like teeth.

The 5th pair of legs on the right-side has a pointed thumb. The distal segment is somewhat sharply curved about the middle of its length and bears on its proximal half two setae ; the inner margin of which is provided with two spine-like process. In the left leg the terminal segment is short and bears on its external border a short spine, one long and two shorter spines, of which one is ribbed. The inner surface is clothed with hair.

REMARKS :

Sewell showed a short spine at the distal external angle of the penultimate segment in the left 5th leg. No such spine is observed in the left 5th leg of this specimen.

Family : TORTANIDAE

SPECIES : *Tortanus* (*Tortanus*) *forcipatus* (GIESBRECHT)

MALE :

Body more cylindrical. The head and all the thoracic segments are separate. Cephalothorax 5 segmented with rounded posterior corners. Abdomen 5 segmented having symmetrical furcal rami, 4 furcal setae arise from the distal end of the ramus, the 2nd are being the largest. The seta arises from the lateral outer margin of the ramus is short.

The grasping antenna is of 16 segments with the rows of needle-like teeh on 17, 18 and 19—21 segments

The left 5th leg possesses a short spineless thumb, while the finger forms a curved hook-like structure having three short spines on its inner margin. The right 5th leg is three segmented. The apical one terminating into a sharp distal spine. This segment bears one inner and two outer spines.

REMARKS :

The lateral spines arise from each side of the ramal segment. The apical segment of the right 5th leg exhibits two outer marginal spines whereas the figure of Thompson and Scott (1903) shows only one.

FEMALE :

Body is comparatively less cylindrical than the male. Cephalothorax is five segmented, the 4th and 5th segments are fused together with posterolateral pointed process.

Abdomen three segmented, distinctly asymmetrical, genital one swollen slightly. Anal segment is fused with the caudal rami. The right ramus is broader than the left one. The ramus terminates into 4 unequal setae. 1st lateral seta of the left ramus arises far above the distal setae, while 1st seta of right ramus is situated not so far from the rest distal setae.

Antennae simple and 17 jointed.

The right and left 5th legs are two segmented. The left one is bigger than the right. The end segments of 5th legs are two or three times as long as penultimate segment, curved inward tapered to an acute point. The outer margin of the last segment of left 5th leg bears three short spines, while the right one two. Both the penultimate segments have one outer marginal seta each.

REMARKS:

Giesbrecht (1898) described the female, but Thompson and Scott (1903) did not. The later two described only the Male. The species is recognised by its typical asymmetry of the urosome in both the sexes.

TABLE

Proportionate Length of Species and their Parts showing Ratio of the Parts with the Total Length of respective species.

Sl. No.	Name of Species	Sex	Total Length of Animal	Length of Cephalotho-rax	Length of Urosome	Length of Antenna	Ratio of Cephalotho-rax to total Length	Ratio of Urosome to Total Length	Ratio of Antenna to Total Length
1.	*Isias tropica*	Male	2.04 mm	1.12 mm	0.92 mm	1.20 mm	1 : 1.82	1 : 2.22	1 : 1.61
2.	*Isias tropica*	Female	1.88 mm	1.00 mm	0.88 mm	0.94 mm	1 : 1.88	1 : 2.14	1 : 2.00
3.	*Centropages dorsispinatus*	Male	1.76 mm	0.90 mm	0.86 mm	1.30 mm	1 : 1.98	1 : 2.05	1 : 1.35
4.	*Centropages dorsispinatus*	Female	1.70 mm	1.00 mm	0.70 mm	1.56 mm	1 : 1.70	1 : 2.43	1 : 1.09
5.	*Centropages tenuiremis*	Male	1.66 mm	0.98 mm	0.68 mm	1.54 mm	1 : 1.69	1 : 2.44	1 : 1.08
6.	*Temora turbinata*	Male	1.12 mm	0.68 mm	0.44 mm	0.72 mm	1 : 1.64	1 : 2.5	1 : 1.55
7.	*Temora turbinata*	Female	1.00 mm	0.64 mm	0.36 mm	0.70 mm	1 : 1.56	1 : 2.77	1 : 1.42
8.	*Temora dubia*	Male	2.02 mm	1.08 mm	0.94 mm	1.48 mm	1 : 1.87	1 : 2.14	1 : 1.36
9.	*Temora dubia*	Female	1.88 mm	1.26 mm	0.62 mm		1 : 1.49	1 : 3.03	
10.	*Labidocera Pectinata*	Male	2.60 mm	1.42 mm	1.18 mm	1.38 mm	1 : 1.83	1 : 2.20	1 : 1.88
11.	*Labidocera Pectinata*	Female	2.72 mm	1.60 mm	1.12 mm	1.72 mm	1 : 1.70	1 : 2.43	1 : 1.58
12.	*Pontella andersoni*	Male	3.72 mm	2.18 mm	1.54 mm	2.12 mm	1 : 1.70	1 : 2.41	1 : 1.75
13.	*Pontella andersoni*	Female	4.06 mm	2.70 mm	1.36 mm	2.34 mm	1 : 1.50	1 : 2.99	1 : 1.73
14.	*Pontella Investigatoris*	Male	3.62 mm	2.12 mm	1.50 mm	2.26 mm	1 : 1.70	1 : 2.40	1 : 1.60
15.	*Tortanus forcipatus*	Male	1.48 mm	0.82 mm	0.68 mm	1.32 mm	1 : 1.85	1 : 2.18	1 : 1.12
16.	*Tortanus forcipatus*	Female	1.34 mm	0.78 mm	0.56 mm	1.06 mm	1 : 1.72	1 : 2.39	1 : 1.26

CAPTIONS

PLATE I

Magnification.

Isias tropica

FIG. a,	Male (dorsal view)	12.5 × 2.
FIG. b,	Male right antenna	12.5 × 4.
FIG. c,	Male 5th leg	8. × 10.
FIG. d,	Female (dorsal view)	8. × 4
FIG. e.	Female 5th leg.	8. × 10

PLATE II

Centropages dorsispinatus

FIG. a,	Male (dorsal view)	12. × 4
FIG. b,	Male right antenna	18. × 4
FIG. c,	Male right 5th leg	8. × 10.
FIG. d,	Female (Lateral view)	12.5 × 4.
FIG. e,	Female 5th leg	8. × 10.

PLATE III

Centropages tenuiremis

FIG. a,	Male (dorsal view)	12.5 × 4.
FIG. b,	Male right 5th leg	12. × 10.
FIG. c,	Male right antenna	12.5 × 4.

PLATE IV

Temora turbinata

FIG. a,	Male (dorsal view)	18. × 4
FIG. b,	Male 5th leg	12. × 10
FIG. c,	Male right antenna	12.5 × 10
FIG. d,	Female (dorsal view)	18. × 4.
FIG. e,	Female 5th leg	12. × 10.

PLATE V

Temora dubia

FIG. a,	Male (dorsal view)	18. × 2.
FIG. b,	Male right antenna.	8. × 10.
FIG. c,	Male 5th leg	8. × 10.
FIG. d,	Female (dorsal view)	8. × 2
FIG. e,	Female 5th leg	8. × 10

Plate VI

Labidocera pectinata

		Magnifications.
Fig. a.	Male (dorsal view)	12.5 × 2.
Fig. b.	Male right antenna	12.5 × 4.
Fig. c.	Male 5th leg	8 × 10.
Fig. d.	Female 5th leg	8 × 10.
Fig. e.	Female 5th leg	12.5 × 2.

Plate VII

Pontella andersoni

Fig. a.	Male (dorsal view)	12.5 × 2
Fig. b.	Male left 5th leg	8. × 10.
Fig. c.	Male right 5th leg	8. × 10.
Fig. d.	Male right antenna	18. × 2.

Plate VIII

Pontella andersoni

Fig. c.	Female (dorso-lateral view)	8. × 2.
Fig. d.	Female 5 th leg	12. × 10.

Plate IX

Pontella investigatoris

Fig. a.	Male (lateral view)	12.5 × 2.
Fig. b.	Male right 5th leg	8. × 8.
Fig. c.	Male left 5th leg	8. × 8.
Fig. d.	Male right antenna	18.2 × 2.

Plate X

Tortanus forcipatus

Fig. a.	Male (dorsal view)	8. × 8.
Fig. b.	Male right antenna	18. × 4.
Fig. c.	Male 5th leg	12.5 × 12.
Fig. d.	Female 5th leg	18. × 12.
Fig. e.	Female (dorsal view)	8. × 8.

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REFERENCES

1. Brady, G.S. .. .. 1878 A Monograph of British Copepoda, Vol. I, The Ray Soc., London.

2. ———— .. 1880 A Monograph of British Copepoda, Vol. II, The Ray Soc., London.

3. ———— .. 1880a A Monograph of British Copepoda, Vol. III, The Ray Soc., London.

4. ———— .. 1883 Report on the Copepoda. Report on the Scientific Results of the Voyage of H.M.S. " Challenger ". Zoology Vol. VIII, Pt. 23, London.

5. ———— .. 1889 " On the Marine Copepods of Newzealand " Trans. Zool. Soc. London, Vol. XV, Ptd. 2.

6. Farran, G.P. .. .. 1926 " Biscayan Plankton " of H.M.S. " Research " 1900, pt. XIV.

The copepoda Jour. Linn. Soc. Zoology, Vol. XXXVI, London.

7. Grice, G.D. .. .. 1962 " Calanoid Copepods from Equatorial Waters of the Pacific Ocean."

Woods Hole Oceanic Reprint. No. 1072.

" Calanoid Copepods of Pacific Ocean ".

8. Grice, G.D. .. .. 1964 Two new species of Galanoid copepods from the Galapagos Island with remarks on the identity of three other species. Crustaceana 6 : 225—264 ; 42 figs.

9. Jacob, P.K. & Memon, M.D. .. 1947 Copepoda of the West Hill Sea Proc. Ind. Acad. Sci. 26, Sec. B 177—194.

10. Johnson, M.W. .. .. On a new species of Pseudodiaptomus from the West Coast of Mexico, Costa Rica & Eucador (Copepoda) Crustaceana. 7 ; 33—41, 25 figs.

11. Mathews, L.H. .. 1925 "A new Antarctic Copepod, belonging to the Genus Eucalnus Ann. Mag. Nat. Hist. (9th series) Vol. XV, London.

12. Norman, A.M. .. .. "Copepoda calanoida, Chiefly Abyssal, From the Faro channel, etc. Jour. Linn. Soc. London, Zoology, Vol. XXIX.

13. Sars, G.O. .. .. 1903 "An Account of the Crustacea of Norway" Vol. 4, 169, pp.

14. Scott, A. .. .. 1909 The Copepoda of Siboga Expedition, 1 Siboga Expedite. Monograph XXIX Leiden.

15. Sewel, R.B.S. .. .. 1912 "Notes on the Surface living Copepoda of the Bay of Bengal". Rec. Ind. Mus. Vol. VII, p. 313, Calcutta.

16. ——— .. 1913 "Notes on Plankton from the Chilka Lake" Rec. Ind. Mus. Vol. IX Miscellanea. p. 338, Calcutta.

17. ———— .. 1914 "Notes on the surface copepoda of the Gulf of Mannar" Spolia Zeylanica" Vol. IX, Pt. XXXV, p. 191, Colombo.

18. Sewel, R.B.S. .. .. 1919 A preliminary note on some new species of Copepoda. "Rec. Ind. Mus., Vol. XVI, Pt. 1, No. 1, Calcutta.

19. ———— .. 1924 Fauna Chilka Lake. Mem. Ind. Mus., No. 12, 287.

20. ———— .. 1929 The Copepoda of Indian Seas Calaneidae 10 ; 30—71.

21. Thompson, I.C. .. 1888 "Copepoda of Maderia and the Island with the descriptions of New Genera and species" "Jour. Linn. Soc., Lond. Zool. Vol. XX, London.

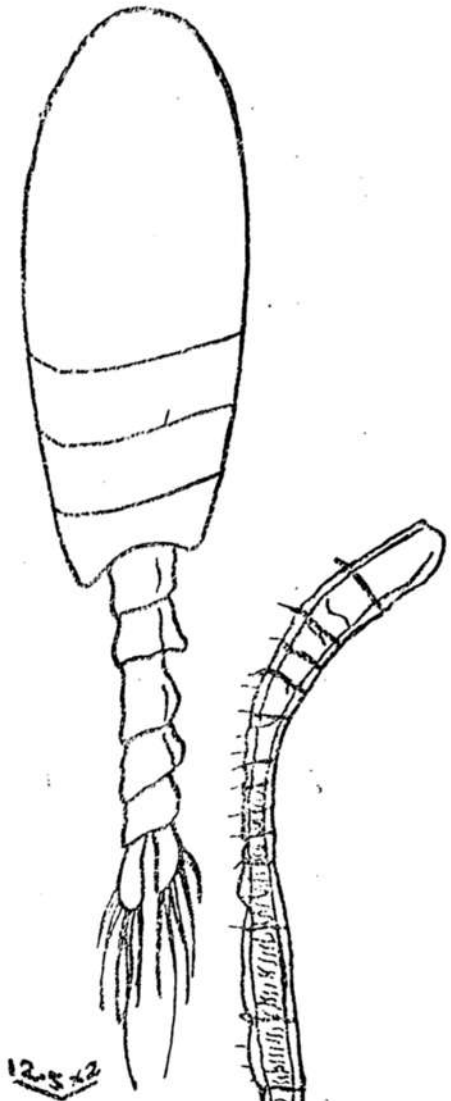
22. Thompson, I.C. .. 1903 "Report on the Copepoda obtained by Mr. George Murray, F.R.S. during the Cruise of the "Ocean" in 1898 Ann. Mag. Nat. Hist. (7th series) Vol. XII, No. 1, London.

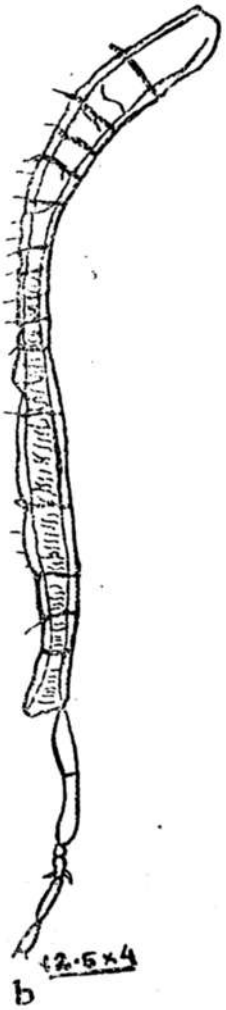
23. ———— .. 1903 "Report on the Copepoda" Ceylone Pearl Oyster Fisheries", supplementary reports, Pt. 1, No. VII, p. 227, Royal Soc., London.

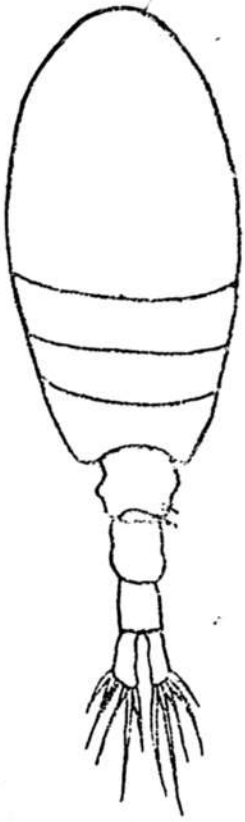
24. Wheeler, W.M. .. 1900 "The Free Swimming Copepods of the Woods Hole Region", U.S. Fish Commission Bulletin, 1899.

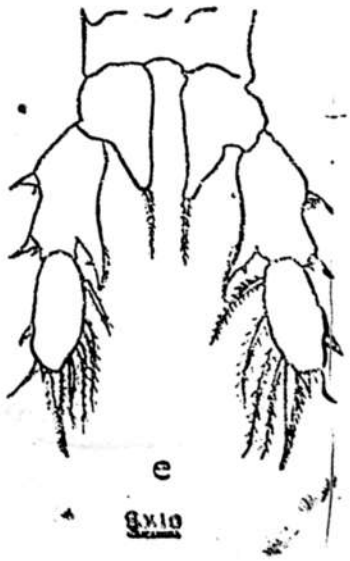
25. Wilson, B.C. .. .. 1932 The Copepods of the Woods Hole Region, Massachusetts, Smith Sonion Institution, U.S. Nat. Mus. Bul. No. 158.

PLATE I









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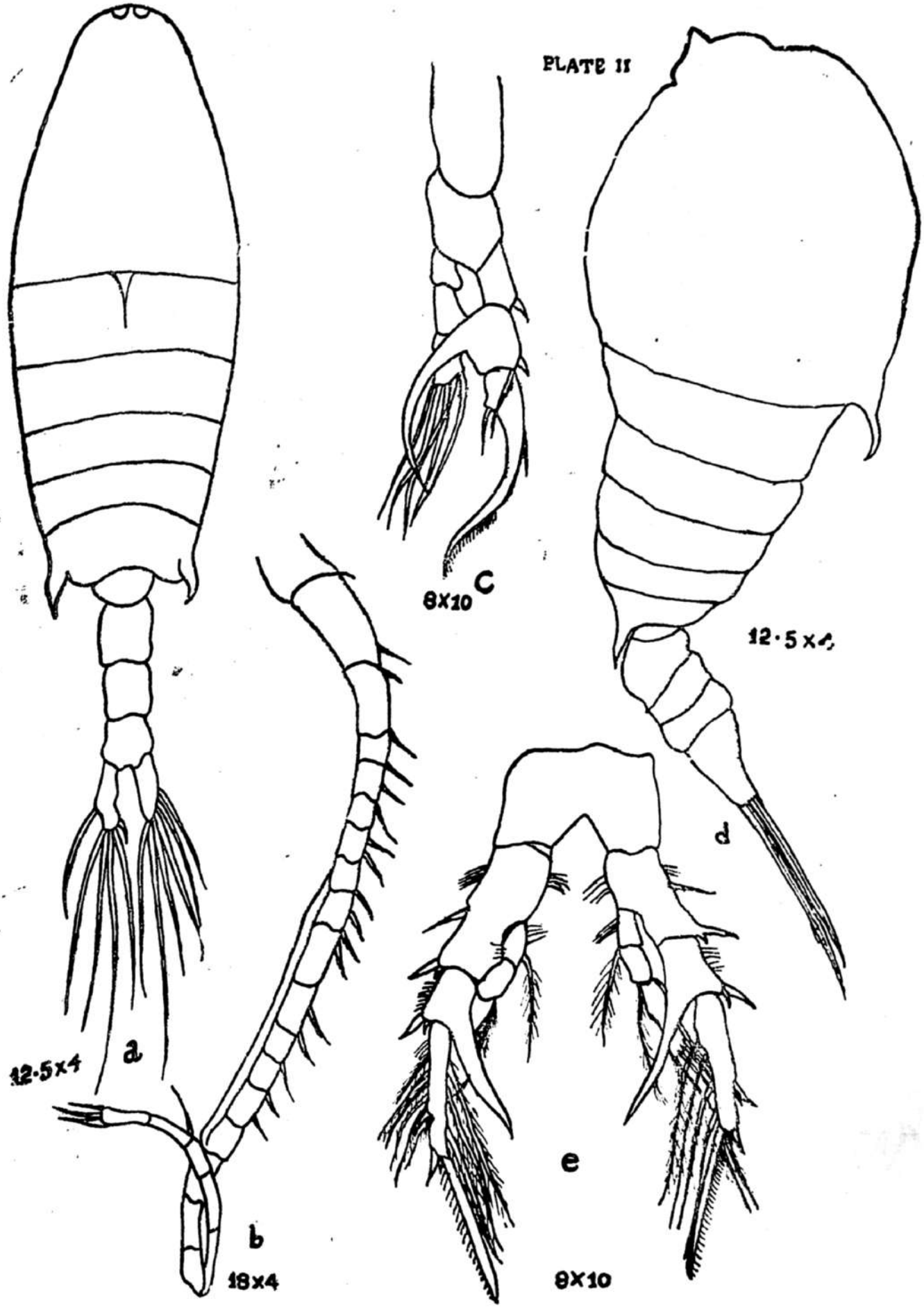

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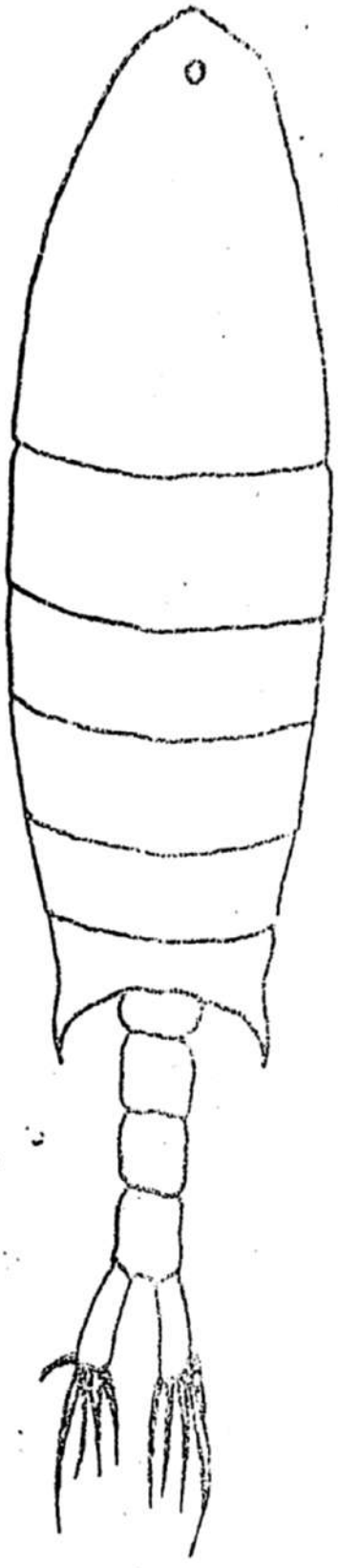

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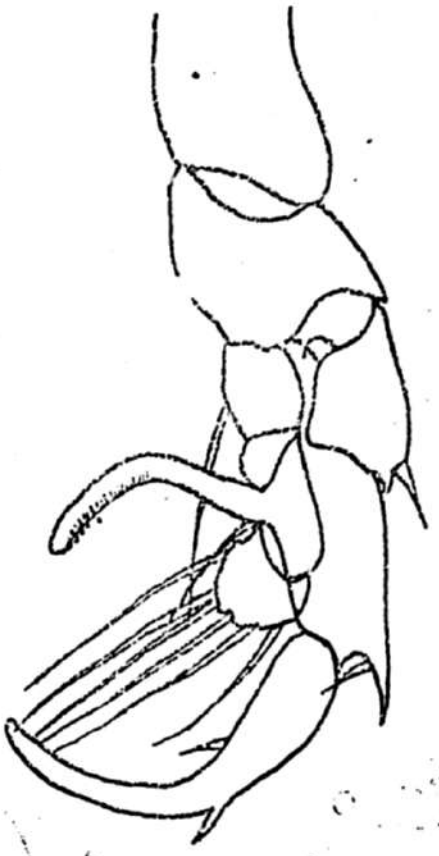

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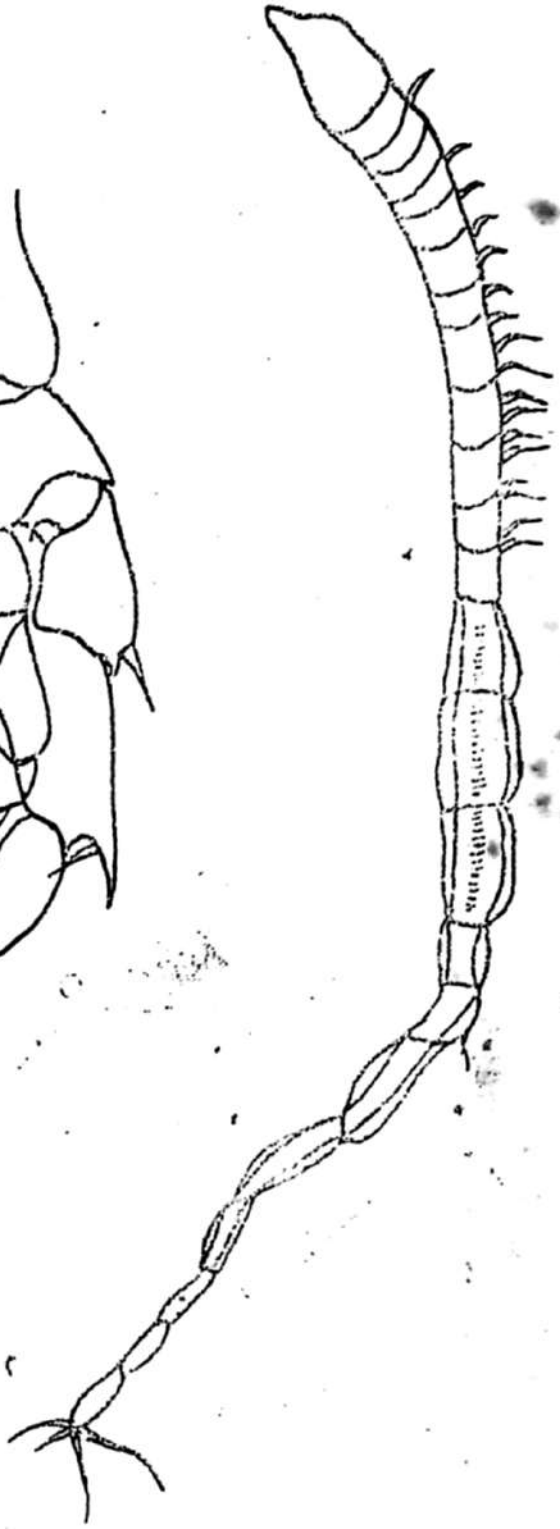

c
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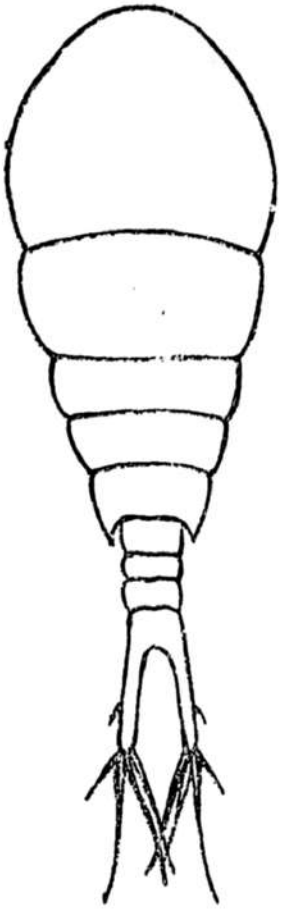

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c
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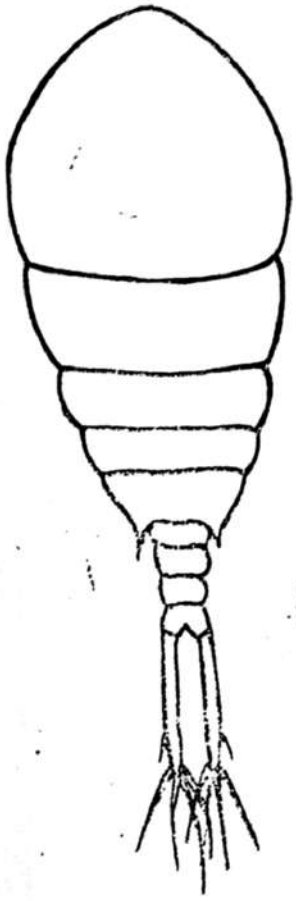

d
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b
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e
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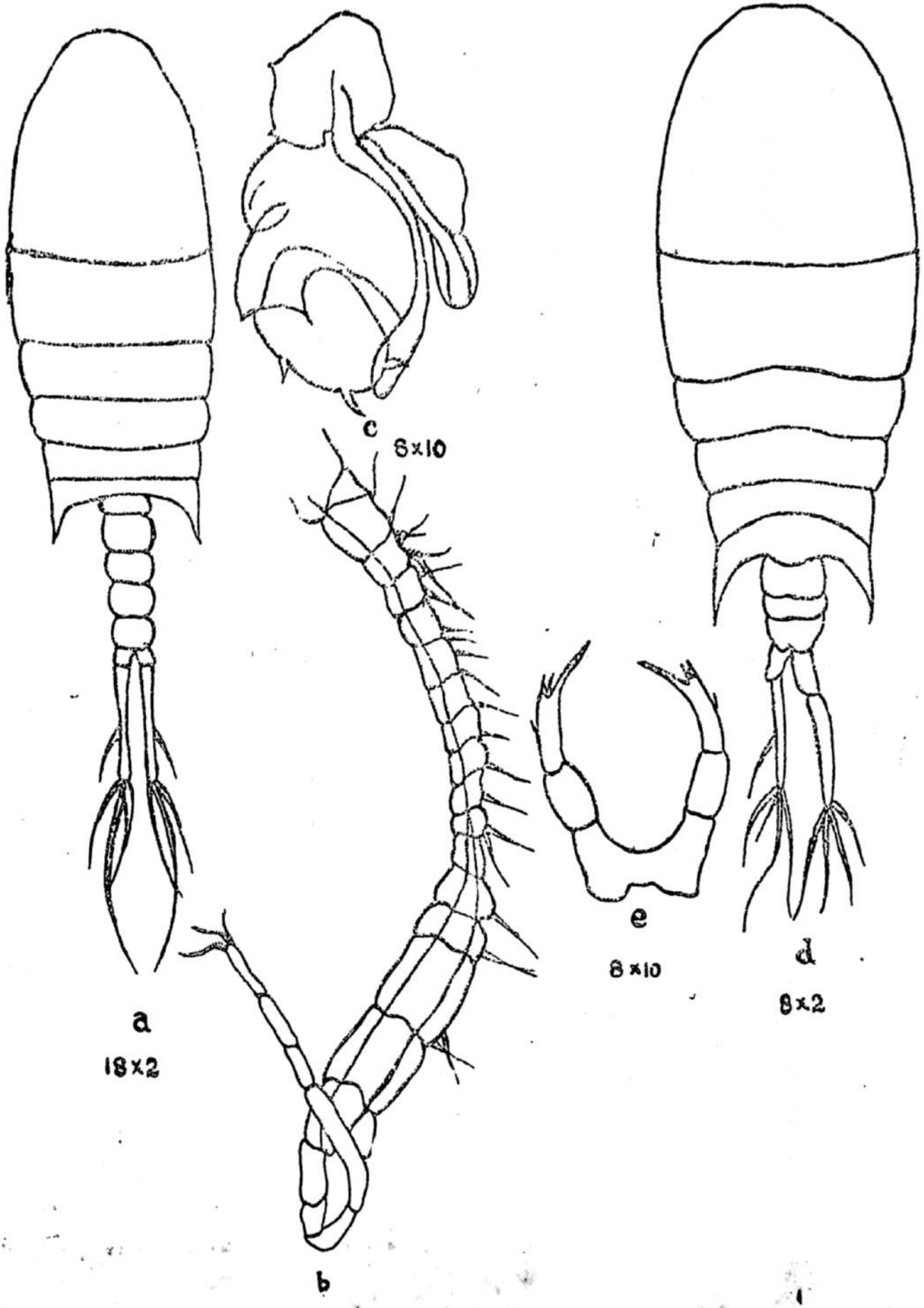
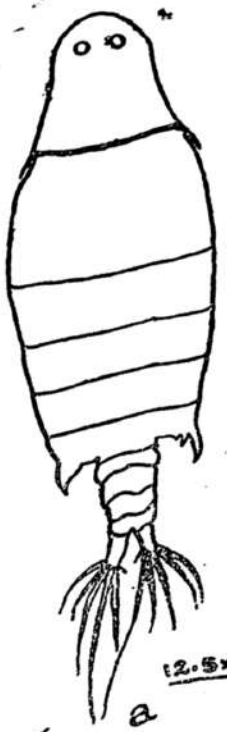
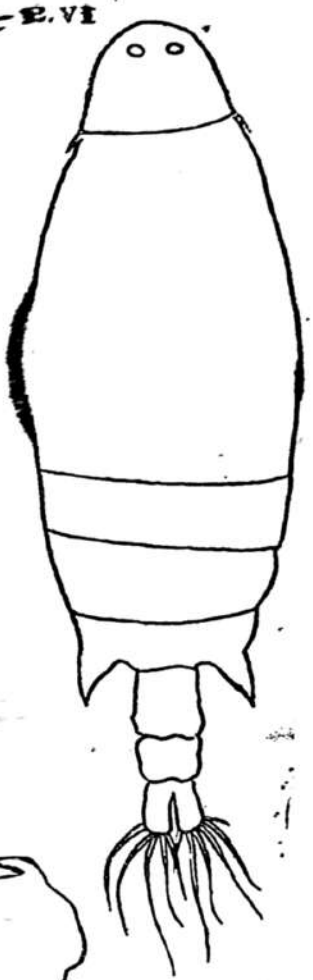

c
8×10
a
18×2
b
e
8×10
d
8×2

PLATE VI



a 12.5×2

d 8×10



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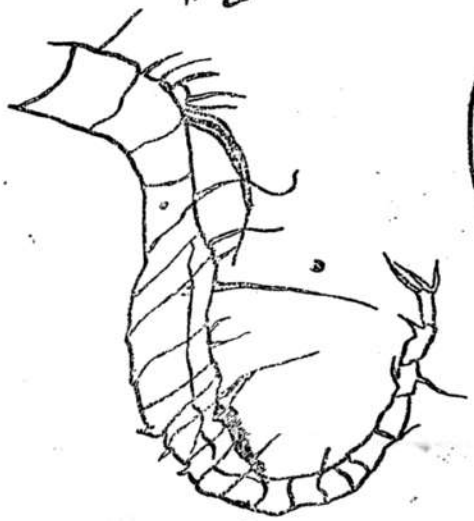

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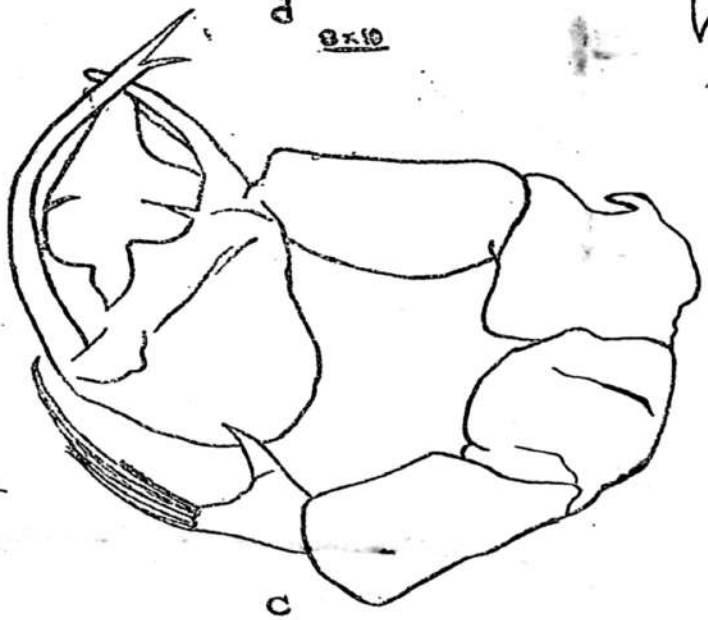
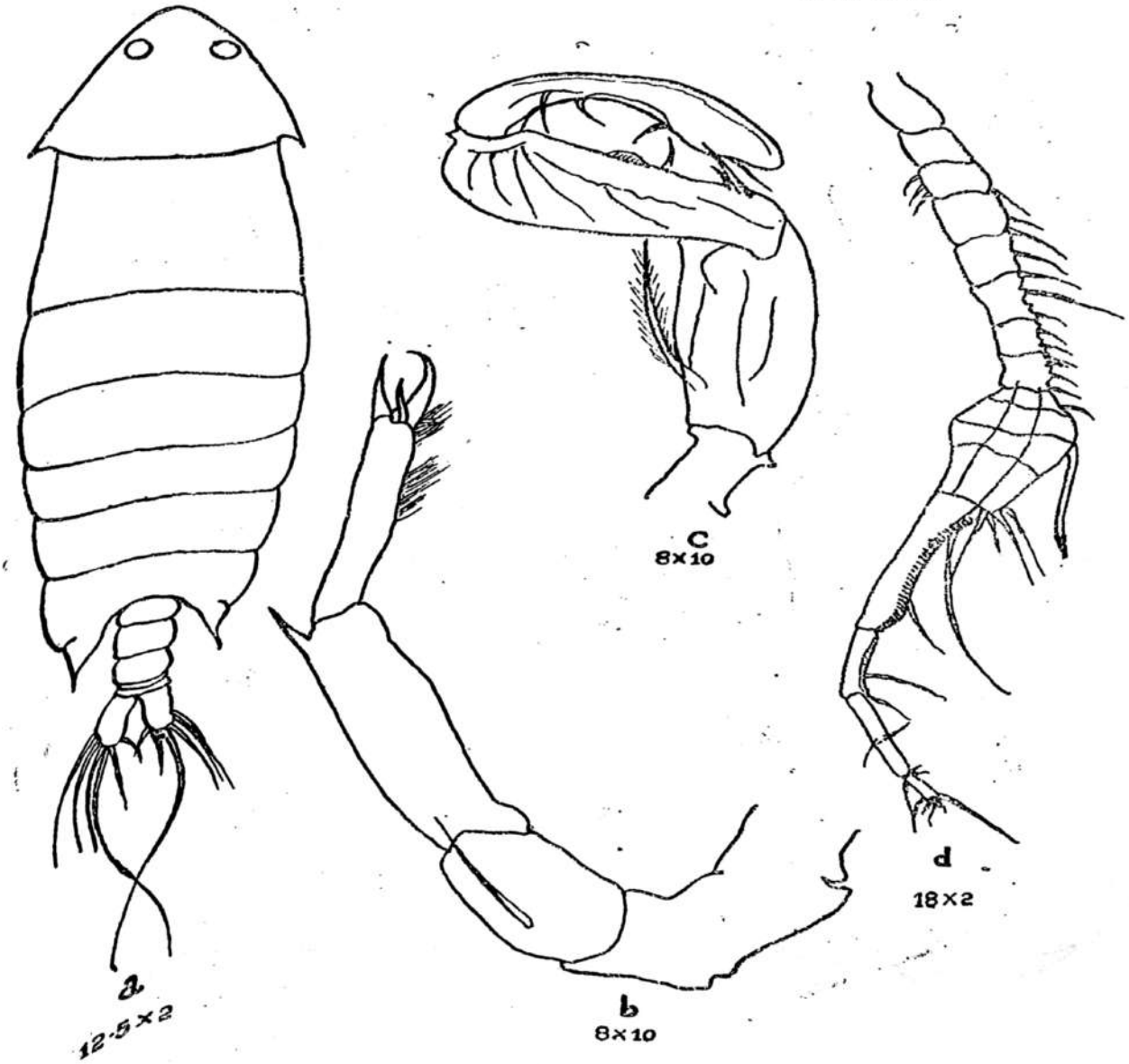


c 8×10

PLATE. VII



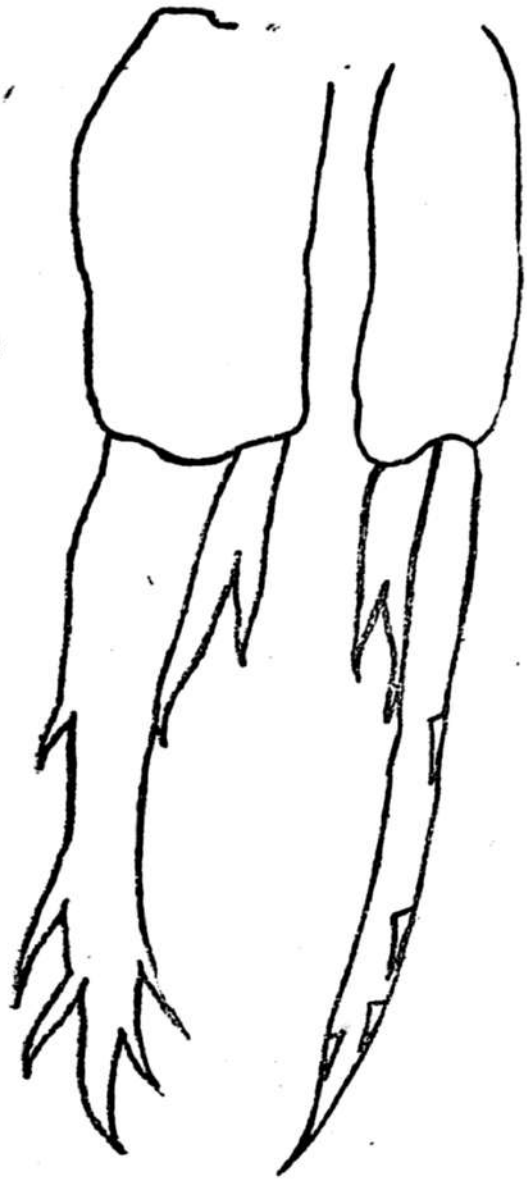
a
12·5×2

b
8×10

c
8×10

d
18×2

PLATE. VIII



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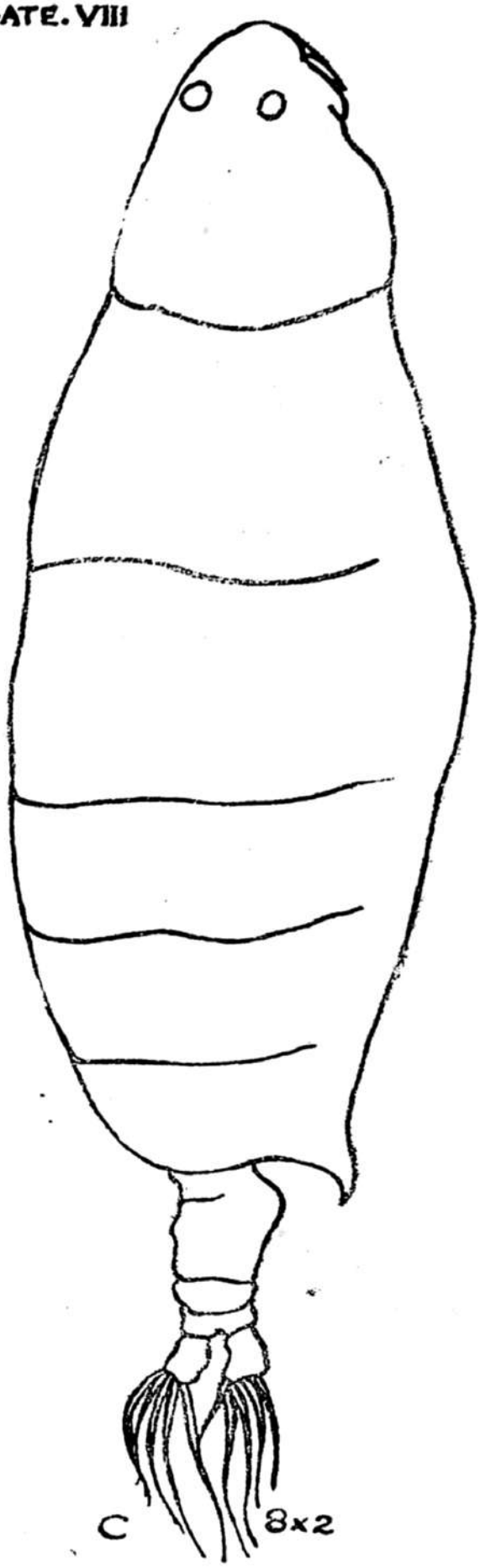
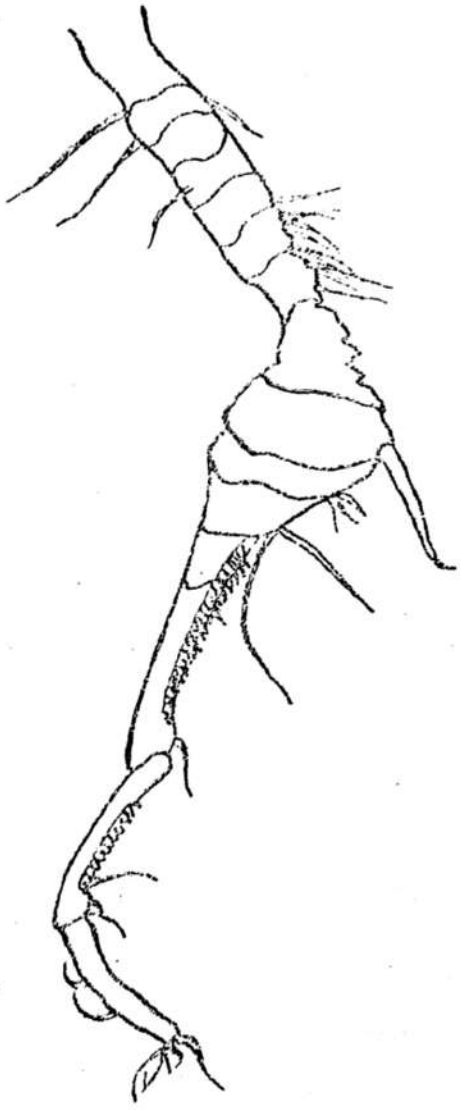


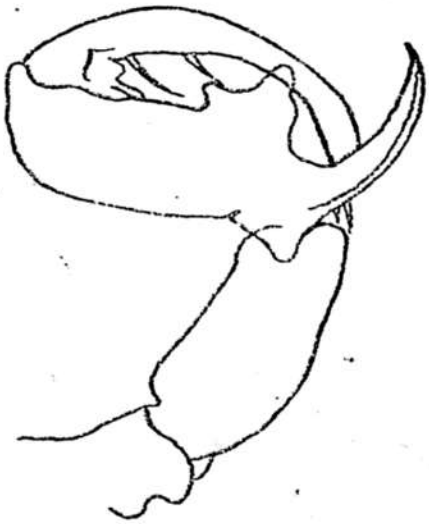
C 8×2

PLATE. IX



d
16x2

C
8x8



b
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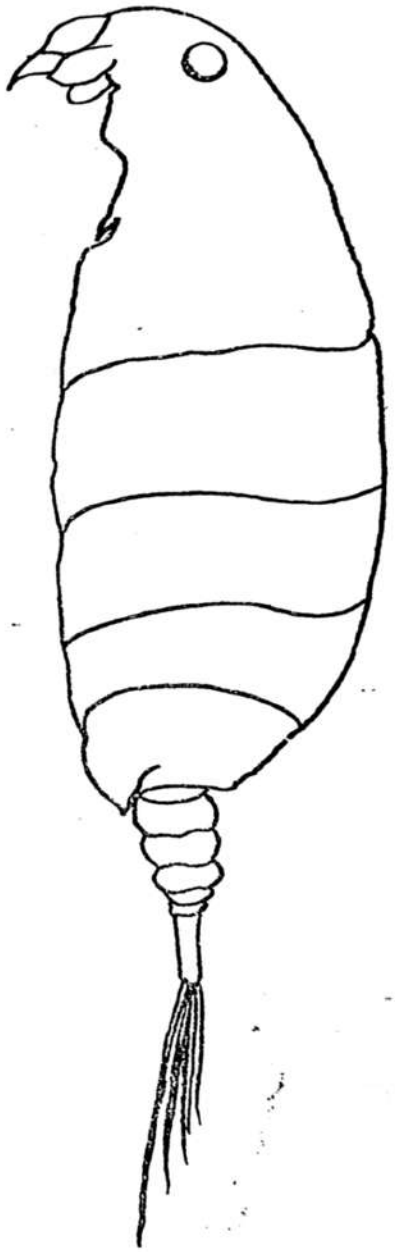

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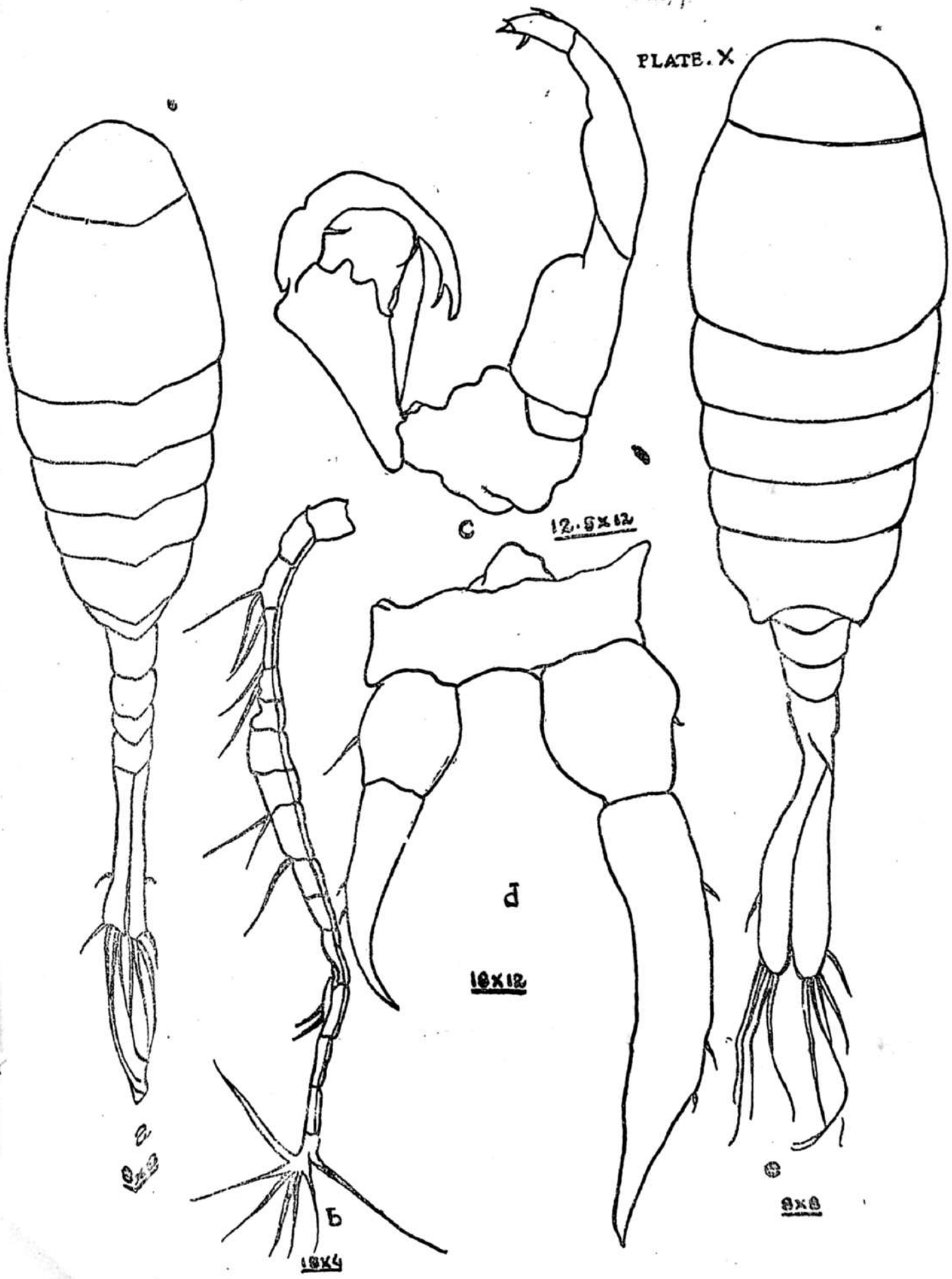
PLATE. X



ISOPOD PARASITES ON FISHES OF KARACHI COAST

BY

S. I. KARIM, M.Sc.

Carcinologist, M.B.R.L.

(Received on 1st Feb. 1973)

Such organism, living on other organism (its host) and derives its food from the body of host, is termed as parasite. This mode of living among the animal is very common and a large number of animals from protozoa to crustacea and others with the exception of a few show this mode of living. In certain cases the whole phylum except a few are parasite (*e.g.* Phylum-Platyhelminthes) and so is the case with the family cymothoidae (order-Isopoda, class-crustacea). Cymothoid parasites according to Menzies, Barnard and Alverson (1955) believed to have split from the primitive stalk of free living flabelliferan. These cymothoid parasities are very important because of their habit of parasitising fishes of economic importance such as lady-fish, Belone, Mugil, cat-fish, etc.

It was observed that some parasites are selective in choosing their host whereas others were found on different fishes, *e.g. N. pigmentata* Bal & Joshi on lady-fish, cat-fish, etc.

In total, four species have been identified of which two belong to one genus Nerocila, while the other two, to two different genera Irona and Anilocra, respectively.

None of the four species of the cymothoid parasite dealt was found with males. *Irona melanosticta* (to be reported in the next paper) was, however, found with its male, the ratio being 1 : 1, *i.e.*, one male and one female in each species. In most cases the females were found to carry juvenile stages in their mar-supium.

In determining the genera and species, the specific characters have been adopted after D. V. Bal & U. N. Joshi (J. Bombay Nat. Hist. Soc., Vol. 56, No. 3, pp. 563—569) & Hale, M. H. (Trans. Roy. Soc., S. Austr.) Vol. 1, part II, 1920, pp. 201—232, Fig. 1—20).

MATERIALS AND METHODS

The parasites, were collected from the body of the fishes, brought to the Ibrahim Hyderi Fish Landing Jetty. They were preserved in spirit. Temporary slides were made for the Illustrations.

SPECIES WORKED OUT

Nerocila pigmentata Bal & Joshi

Family ——————Cymothoidae

Genus ——————Nerocila Leech

Host ——————*Mugil, Umbrina dussumeiri* (Musca fish), *maculatus* (Bloch)

Date ——————4-7-70 and 22-7-70

Collection——————3 ovigerous female.

The parasite is oval in shape, broad in the middle and gradually converging at the end. The animal is yellowish grey in colour with presence of lateral dark violet band running almost throughout the entire length of the body. The pigmentation is sparse and faint on the thorax and deep on the abdomen, peduncle, uropods and outer ramous.

The head is broader than that of its length, bluntly rounded at its anterior end and posteriorly trilobate. The middle lobe is larger and rounded, while the side ones are small and acute. The eyes are small and situated on the postero-lateral angles of the head. The antennae are short and mandibles with three jointed palps. There are a few apical spines on the first maxilla. It is styliform. The apex of 2nd maxilla is two jointed.

The thorax is long and composed of seven segments. The posterolateral portions of all segments are produced backwards and a little outwards with the posterior angle acute.

The abdomen consists of five segments or pleons. The peduncle and outer ramous of the uropods are deeply coloured. The outer ramous is double the length of the inner and darkly pigmented.

The first five legs are pretensile and closely situated. The 6th and 7th legs are situated wide apart among themselves. The seventh leg is the longest.

Average length ——————20.00 mm.

Average breadth —————— 6 mm.

Locality——————Ibrahim Hyderi.

2. *Nerocila serra*

Family ——————Cymothoidae

Genus ——————Nerocila

Host-sole fish, lady fish, mugil, pomadysis maculatus, etc.

Date ——————5-5-72

Collection————————13 Ovigerated females.

Synonymy—Nerocila serra, Sch and Mein., Naturh Tidds Kr., (3) xiii. 1881., pp. 17, pt. i. figs. 12—14.

Nierstrasy, Zool. Medet. i. 1915, p. 74 ; Barnard Ann. S. Afr. Mus. xx., 1925, p. 392.

This species is represented by thirteen female individuals and most of them are ovigerated.

The animal is twice as long as wide having the greatest breadth at the 5th segment.

The head is broader than that of its length, bluntly rounded at the anterior margin and strongly trilobate at the posterior end. The eyes are small and situated on the posterolateral angles of the head. The first antenna is shorter than that of the second one and composed of eight segments, while the second one consists of nine segments.

The body is composed of seven segments of which the 5th one is the widest. Posterolateral portions of all segments are produced backwards and a little outwards with the posterior angle acute.

The abdomen consists of five(5) subequal pleon segments. The endopod of uropods reaches beyond the apex of pleon. It is shorter and wider than exopod, with inner margin and proximal part of outer margin, slightly convex and with outer margin coarsely and conspicuously serrated Peraepods are moderately stout and successively increase in length. The seventh one with 7 stout spines on the inner margin of the merus ; four spines on inner margin of carpus and nine on inner margin of propodus. Here the ninth spine is situated far away from the others.

Fresh Colour—transparent white, P. colour—yellow.

Average length——————23.6 mm.

Average breadth ——————10.8 mm.

Locality ——————Ibrahim Hyderi.

Habitat ——————Malay Archipelago, South Africa (Barnard) and Queens Land.

3. *Anilocra Cavicauda*, Richardson.

Family ——————Cymothoidae.

Genus ——————Anilocra.

Host ——————*Nematolosa nasus* (Bloch).

Date ——————4-7-1971.

Collection ——————— 10 females

Synonymy ——————*Anilocra cavicauda*, Rich.,

Wash. Bur. Fish., Dc 736, 1910, p. 18, fig 17, Part II.

Trans. Roy. Soc., S. Austr. L., 1926, pp. 210— 212, Fig. 7 (a-h).

The animal is long has a smooth surface and a few scattered punctures. The cephalon is much wider than the medion length. It is narrow in front of eyes. Its anterior margin is round, truncated and down bent. The eyes are rather large, oval, composite and widely separated and are situated at the posterolateral portion of cephalon. The first antenna is stouter than the second one and composed of eight articles. It is about 2/3 as long as second antenna. The second antenna is composed of ten articles. It reaches back to the hinder margin of first peraeon segment.

The body is composed of seven segment. It is widest at 5th segment. The first segment is longer than 2nd or 3rd but shorter than any other segment. The 6th segment is more than 3 times as long as the second segment, while the 7th segment is subequal to 6th in length. Uropod reaches to the level of the apex of telson. The endopod is suboval and subequal in length, but wider than exopod. The inner margin is almost straight, while the outer one is curved. The Peraepods are gradually increasing in length ; the 7th one being the largest and have minute spinules on inner margin of some of the joints.

Length ——————34 mm.

Breadth——————10.25 mm.

Locality ——————Ibrahim Hyderi.

Habitat ——————Philippine Perlud 2nd, Queensland.

4. *Irona renardi* Bleeker.

Family ——————Cymothoidae.

Genus ——————Irona.

Host ——————Macreal.

Synonymy.—Livoneca renardi Bleeker Actu. Soc. Scient. Indo-Necrland., 1857, p. 28, pl. 1, fig. 8 Ann. Mag. Nat. Hist., 157 v., 1880, p. 465. Frona renardi, Sch and Mein. Naturls. Tides. Kn., 3 xic, 1884, p. 383, pl. xvi fig. 810811.

This species is represented in the collection by 20 individuals of which 10 are females (ovigerated) and 10 males.

The animal is irregularly subovate and twice as long as the greatest breadth. The cephalon is strongly immersed in the first peraeon segment. It is about 1/3 wider than the medial length. The eyes are moderately large. The first antenna is stouter than the 2nd one. Both of them are composed of seven segments. The peraeon segment is transversely convex. The anterolateral angles are narrowly rounded and reaching almost to the level of anterior margin of the eyes. The second peraeon segment is longer than the four successive segments, which are subequal in length. The pleon is deeply immersed in peraeon. The uropad is longer than the pleon. Both the rami are long and narrow, endopod being narrower than the exopod.

Length of the	= 13.8 mm.	Length of the	12 mm.
Breadth of the	= 7 mm.	Breadth of the	4 mm.
Locality	Ibrahim Hydari.		
Habitat	—India, Philippine Island and Australia.		

ACKNOWLEDGEMENT

I am thankful to Mr. M. S. U. Siddiqi, Director, Marine Biological Research Laboratory, Zoological Survey Deptt., for providing me research facilities.

REFERENCES

Bal. D. V. 1959 & Joshi, U.N. — Some new Isopod parasites on Fishes. J. Bombay Nat. Hist. Soc. 56 ; 563—569.

Herbert, M. H, 1926. — Review of Australian Isopods of the cymothoid group part II Trans. & proc. of the Royal Soc. of South Australia vol. 50.

Pillai, N. K. 1967. — Littoral and Parasitic Isopods from Kerala. Families Eurydicidae, Corallanidae & Aegidae. J. Bombay Nat. His. Soc. Vol. 64, No. 2 pp. 267.

ILLUSTRATIONS

Nerocila pigmentata

FIGURE 1. Antenna & antennule of the same 8 × 4.
" 2. First maxilla.
" 3. Maxilliped.

FIGURE 4. 1st Peraeopod.

„ 5. 7th Peraeopod.

„ 6. Telson.

Nerocila serra.

„ 7. Antenna & antennule of the parasite.

„ 8. First Maxilla.

„ 9. Second Maxilla.

„ 10. Paop of Mandibile.

„ 11. 1st leg.

„ 12. 7th leg.

„ 13. Telson (uropod of ovigerous female reduced to half after magnifying 8× 2).

Anilocra Cavicunda.

„ 14. Antenna and Antennule.

„ 15. 1st Maxilla.

„ 16. Maxilliped.

„ 17. 1st leg.

„ 18. 7th leg.

„ 19. Telson.

Irona renardi.

„ 20. Cephalothorax (reduced to half magnifying 8 × 2).

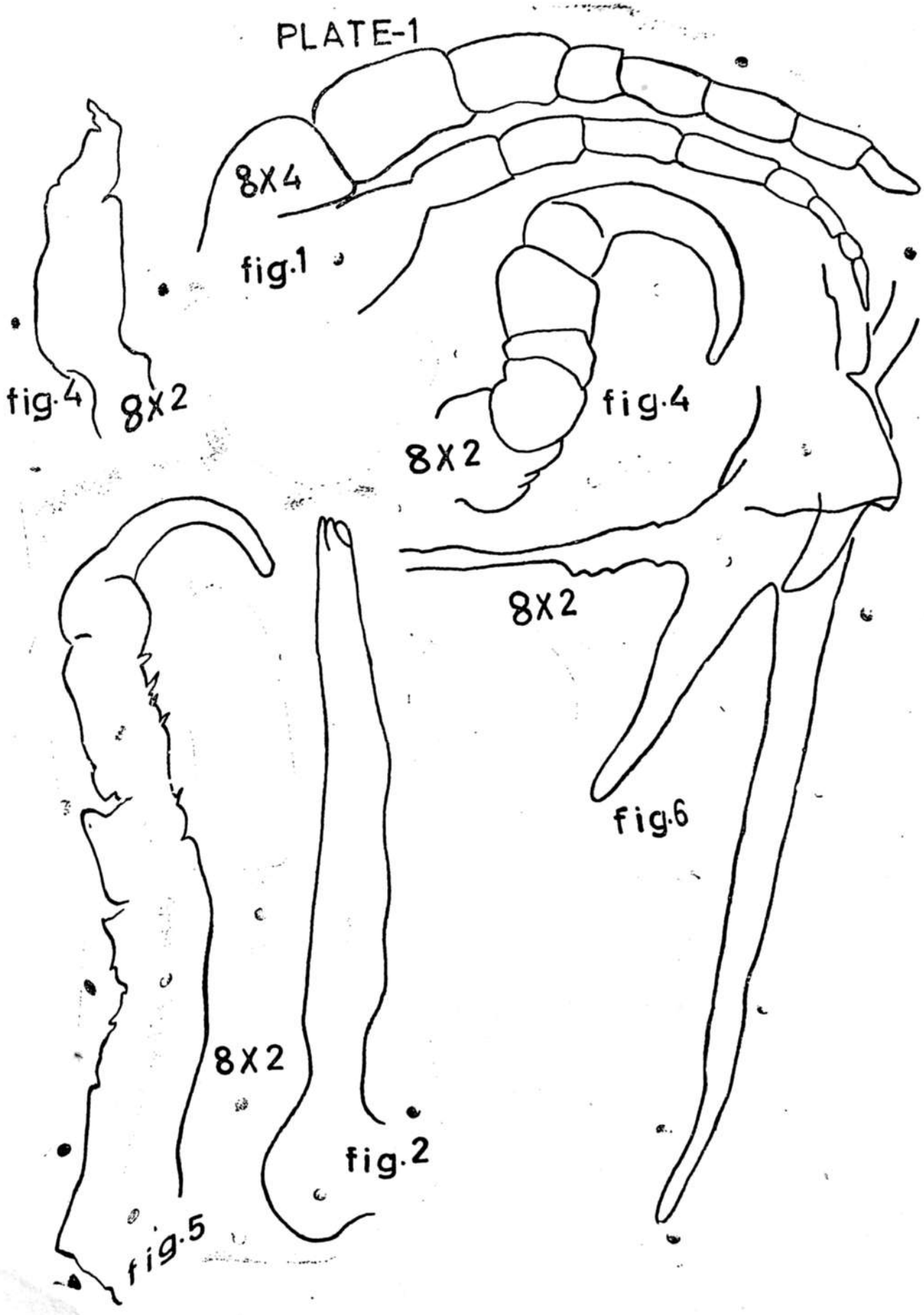
„ 21. Antenna and antennule.

„ 22. 1st leg.

„ 23. 7th leg.

„ 24. Telson (reduced to half after magnifying 8× 2).

PLATE-1



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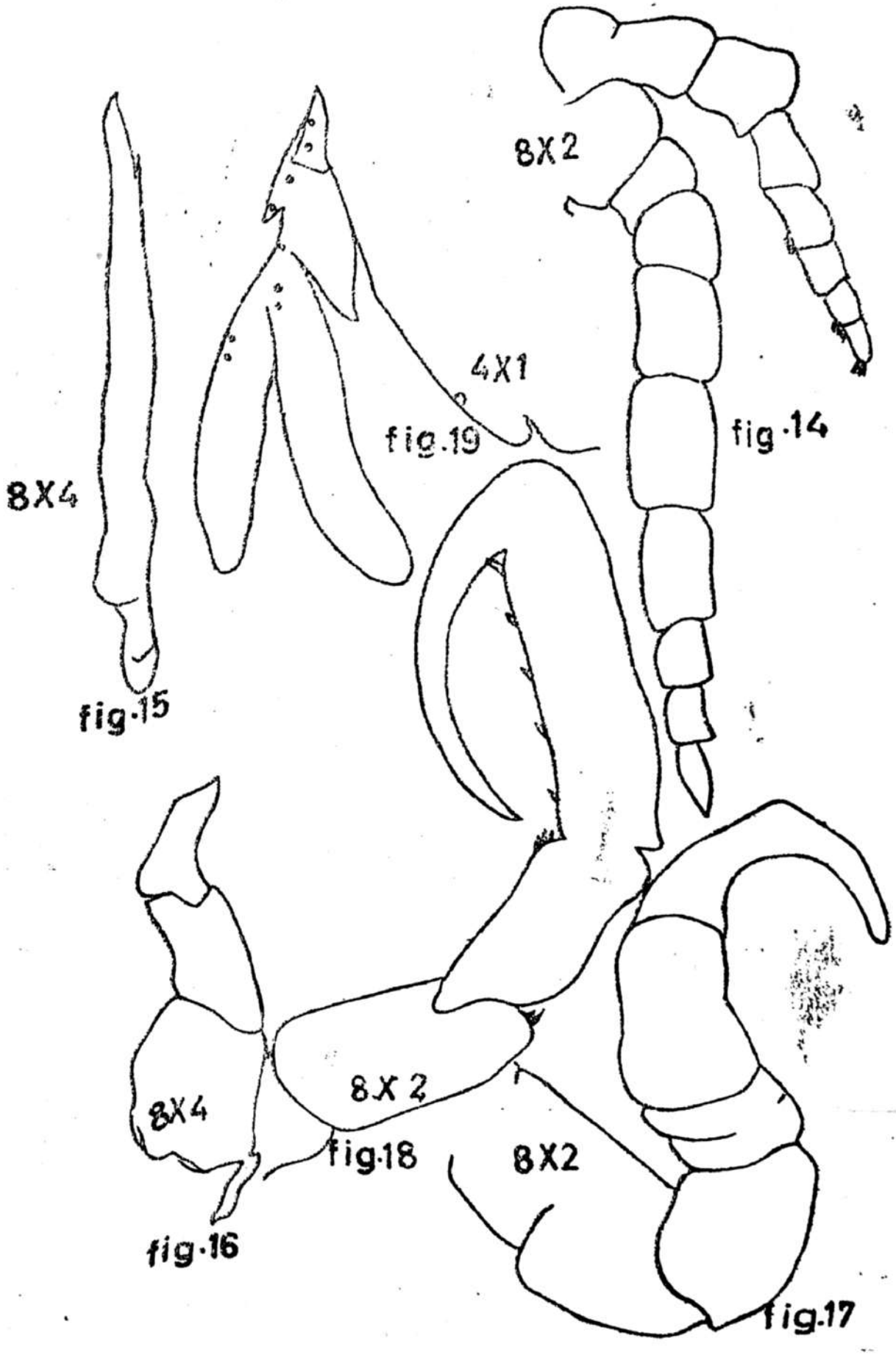

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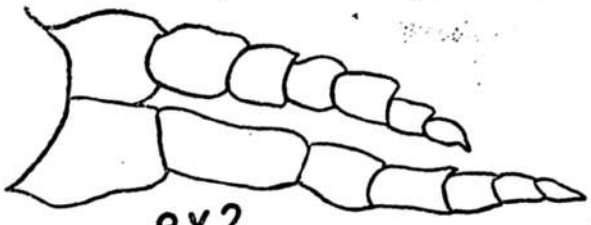
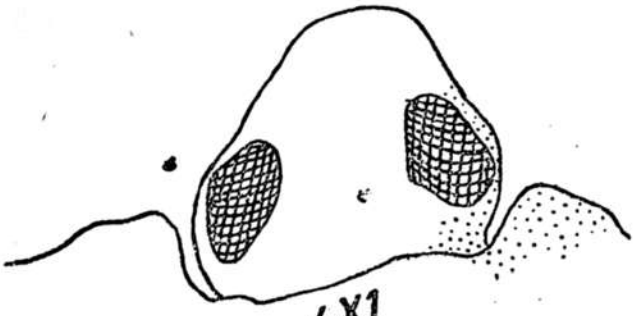


8X2
fig.21



4X1
fig. 20

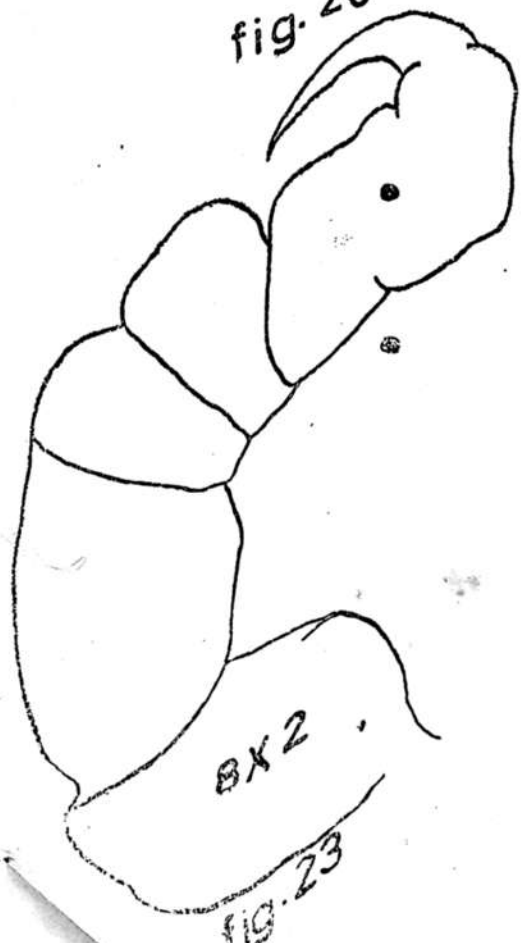


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fig. 23

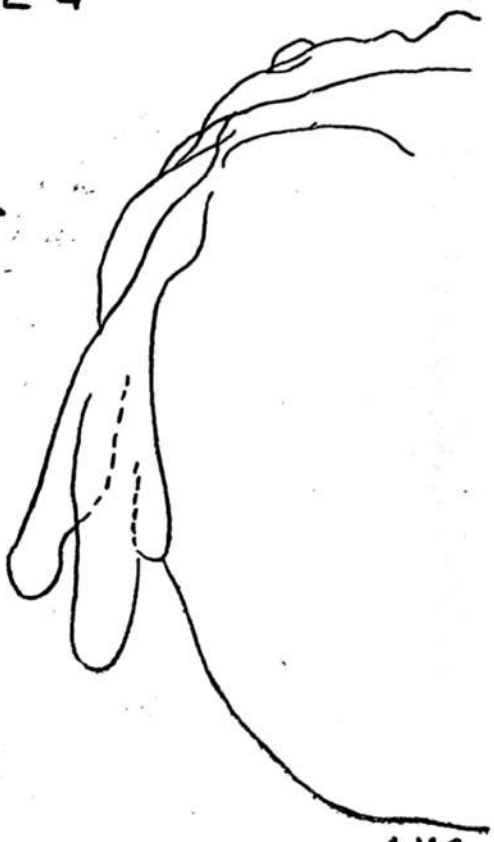

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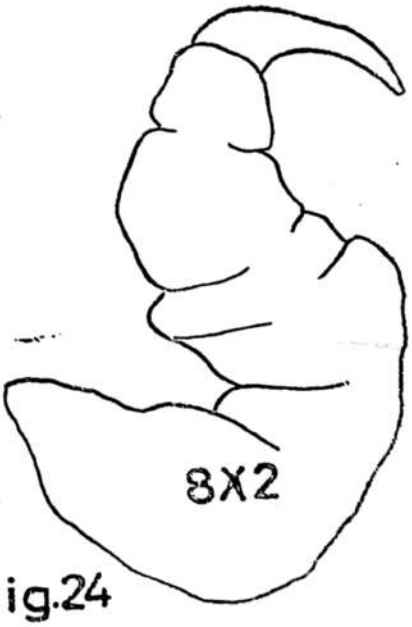
fig.24



8X2
fig.24

NATURAL HISTORY MUSEUM—A MULTIDISCIPLINARY INSTITUTION

BY

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(Received on 30th May 1973)

INTRODUCTION

Museums are the "Show Windows" of a country's educational and cultural development. A culture of a country is not a separate identity. It is co-related and very much integrated with its surroundings. The evolutionary periods of a nation have indicated how its culture has been influenced, by its fauna, flora and topography. Thus the museums are considered as the greatest exponents of visual instructions to the people and are termed as "People's Universities". The museums are of different sizes and kinds, some are purely depicting arts and culture, physical and chemical sciences and industry, engineering, meteorological and aeronautical sciences, geological and geophysical sciences, while others the Biloogical Sciences. Those depicting Biological Sciences are known as Natural History Museums. Such a museum is the only place where the Natural History of a country can be exhibited in a limited space. The exhibits represent not only the fauna and flora of a country but also those of the world.

MODERN CONCEPT

In addition to the old concept of the enlightenment of the philosophically curious by displaying the fauna and flora, the present concepts are to study them, and their inter-relationship and interactions with environment. This is the study of the Bio-ecology of various ecosystems. Such studies contribute to the elucidation of the mechanism and course of evolution. This is possible only when series of specimens are collected in different seasons and from different habitat and their nomenclature is established. Such a study is termed as taxonomical research which needs very large series of specimens, extensive and comprehensive enough to be statistically significant, as well as showing variation and distribution in two, there or even four dimensions. The responsibility of addition to the collections rest with the scientific research staff by means of faunistic surveys, purchase, donations or exchange.

The museums serve as a repository of the standardised collections declared as such by the local or foreign scientists on the material present in the museum or on that of the country and worked out in any University or research organization.

The museum is also a place of education which it discharges by means of displaying exhibits in their natural habitat in the galleries with proper scientific data about each exhibit. The films are prepared on the Natural History objects

which are projected with a lecture in the auditorium of the museum for aged, illiterates and children as well as by preparing charts and cards of exhibits to be sold at the counter of the Museum.

NATURAL HISTORY MUSEUMS IN OTHER DEVELOPED COUNTRIES

The Natural History Museums in the developed countries are a combination of the old and the modern concepts. They have further made advances in developing technique by introducing habitat groups and comparative osteology groups in their display galleries and with the sound tapes play back courtship and other behaviour of the exhibits as they are viewed. This is the method of audio-visual aids to impart better knowledge and understanding of various exhibits and their behaviour.

NATURAL HISTORY MUSEUM IN THE INDO-PAKISTAN SUB-CONTINENT

The ruling Britishers in the Indo-Pakistan sub-continent in 1916 enacted *vide* Resolution No. 19, dated Simla, the 20th June 1916, of the Department of Education, Government of India, for the establishment of Zoological Survey of India with the object that the Indian Museum which was already in existence under the Royal Asiatic Society, Bengal, Calcutta, would be a part of Zoological Survey of India, so far as the reserve material, standardised specimens and exhibit galleries are concerned. The British did not set up a separate organization called as the Natural History Museum, giving all the activities of faunistic survey, research material and exhibits, etc., to it, because they assessed that the people of the Indo-Pakistan sub-continent neither had the initiative nor the spirit of collecting the Natural History objects and preserving them or donating them to other organizations but instead they generally destroyed the natural history object wherever and whenever they came across, nor they were so much interested to donate funds for carrying out faunistic surveys and collections. Hence the British Government purposely created a Department with the name of Zoological Survey. Its name indicates that the fauna will be collected by the research staff of the Department during their faunistic survey tours to be financed out of the budget of the Deptt. In no other country of the world the Natural History Museums have any provision in their budget for carrying out their faunistic survey tours and collection of specimens. The various literature and reports of the various museums of the world indicate that the museums in their countries have been established either by the donation of the specimens by various workers and naturalists collecting in different parts of the world or the philanthropists donating funds for similar activities so that those collections may be named after them. Hence the need in the Indo-Pakistan sub-continent to have a Zoological Survey Department, with all its aims and objects and not an autonomous natural history museum with similar aims and objects, was felt and was established, although the Britishers had Natural History Museums in their own country, and no Zoological Survey. This would indicate their planning in relation to our approach to the living objects.

The aims and objects notified by the then Government of India are given below :

1. The Zoological Survey will be a scientific department to the Government of India under the direct control of the Department of Education.

2. The Zoological Survey of India will act as guardian of the Standard Zoological Collections of the Indian Museum.

3. The Zoological Survey will also obtain the fullest possible information about the systematics and geographical zoology of the Indian Empire.

4. The Forest and Agriculture Departments, sub-ordinate to the Government of India, agreed to collaborate in the zoological survey on the same conditions of co-operation as existed between the Botanical Survey and other Departments, *i.e.*, collaboration without subordination.

5. The Director, Zoological Survey of India, will act as Zoological Adviser to the Government of India in the same way as the Directors of Botanical and Archaeological Surveys. He will be treated as a Head of the Department.

6. The Zoological publications of the Indian Museum, namely Records of Indian Museum and the Memmoirs of the Indian Museum, will be continued in their present form and will be edited by the Director, Zoological Survey of India.

NATURAL HISTORY MUSEUM IN PAKISTAN

The Sind Natural History Society was running a Natural History Museum known as the Victoria and Albert Museum at Karachi till 1947, but in 1948 when our beloved Quaid-e-Azam inaugurated the State Bank of Pakistan in the building of the Victoria and Albert Museum, Ingle Road, Karachi the collections were ultimately transferred to the Karachi University where they now form part of Museum of Zoology Department.

The Zoological Survey Department was established in Pakistan in June, 1948, with the following approved aims and objects as a counterpart of the Zoological Survey of India :—

1. To set up and maintain Standard Zoological Collections for reference and to act as their Guardian.

2. To obtain information on the systematic and geographical distribution of the animal life in Pakistan and its territorial waters.

3. To set up and maintain National Natural History Museums.

4. To advise the Government of Pakistan on all zoological and biological matters including conservation, preservation and export of wild life as well as the import of wild life for zoos, etc.

Unlike the Zoological Survey of India which inherited the staff, collections and publications of the Zoological and Anthropological Section of the Indian Museum, Calcutta, the Zoological Survey Department in Pakistan started from scratch two Muslim officers and a few lower technical staff who opted for Pakistan constituted the nucleus of this Department. Very few standardised and identified zoological specimens were handed over to this Department by the Zoological Survey of India and not a single piece of literature or reference and scientific equipments were given to this Department. Thus the Department started in Pakistan with the same aims and objects as of its counterpart in India but unfortunately handicapped in every respect.

TAXONOMIC RESEARCH

The following are some of the essentials for the taxonomic research on the fauna of country :

1. Well-equipped Library.

2. Sufficient funds for faunistic surveys.

3. Sufficient funds for equipments like vehicles, camping and laboratory, store, glasswares, chemicals and preservates.

4. Trained research officers and other technical staff.

5. Facilities for maintaining standardised collections.

In Pakistan the Zoological Survey is responsible for carrying out taxonomic research as well as the collection of the data of the Zoogeography of Pakistan. The Department is now in a far better position in equipment, staff (knowhow) and curatorial facilities than it was in the past and is proud of its maintenance of standardized zoological collections and research material. The publications of "Records : Zoological Survey of Pakistan" and other papers so far published in the Agriculture Pakistan, the Journal of Zoology, Lahore, and in foreign journals would speak themselves the contributions made on the fauna of Pakistan by this Department.

The Zoological Survey considers the Natural History Museum as one of the resultant aspects of the research activities of this Department. A nucleus of the Museum is already in existence at Karachi and a full-fledged scheme for this project to be established at Islamabad, is already being implemented. In this connection, it may also be put on record that the Wild Life Enquiry Committee

of the Government of Pakistan had already recommended for the establishment of a Natural History Museum. Further the Department of Tourism has also desired that the Museum may be established at the earliest.

This Department feels that apart from the above-mentioned activities and responsibilities designated to the Natural History Museum, the visit to a Natural History Museum will also create love for natural objects and desire to keep pets for children's reaction and pleasure. The exhibits will also include the exportable species of wild life from Pakistan on account of which foreign exchange to the extent of approximately Rs. 4,00,000 annually is earned. It is also planned to have "Floating Museum" cell as a part of Natural History Museum. This Floating Museum would be sent to different Awami Melas and village festivals so that the common masses and peasants may be able to see the National wealth (specimens of the fauna and flora), its usefulness or otherwise to agriculture, horticulture and for the production of protein food. The masses would thus, also be given folk talks in their local languages about the need to preserve the wild life and shall also be shown films on wild life to impress upon their usefulness in a moving prospect.

PARASITIC COPEPODS OF MARINE FISHES OF KARACHI COAST, FAMILY CALIGIDAE

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INTRODUCTION

Very little work on the parasitic Copepods of fishes from the coastal areas of Pakistan has been carried out as compared to the adjoining areas in Indian Ocean. Parasitic Copepods have got a great importance in the field of Biological Research as it causes great damage in most of the edible marine fishes due to heavy infestation. Visualizing the above fact, we started collecting Parasitic Copepods of marine fishes from Karachi coast since 1970 at Marine Biological Research Laboratory. The present paper deals with the parasitic Copepods belonging to family Caligidae.

MATERIALS AND METHODS

This work is based on materials, collected from Korangi Creek Harbour. However, few samples were taken from the coastal waters of Korangi Creek with the help of Cast Net.

The external surface, gill cavities, buccal cavity and nasal cavities of the Teleost fishes were examined for Parasitic Copepods. The parasites collected from these fishes were killed in 10% Formalin and preserved in 95% Ethyl Alcohol. Later they were dissected in 85% Lactic acid and slides of the different parts of the parasites were prepared in Glycerine Jelly. Diagrams were drawn with the help of camera lucida. The hosts (fishes) were identified and preserved in 95% Ethyl Alcohol.

In present paper emphasis is given mainly to the comparative study rather than the mere description of the species.

SYSTEMATIC ACCOUNT

Family : *Caligidae*

Sub-Family : *Caliginae*

Genus : *Caligus. Muller.* 1785.

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1. *Caligus diaphanus* Nordman, 1832.

FIGURE 1

Caligus diaphanus : Kroyer18 63. Bidrag til kundskab on Snyttekrebsene. Copenhagen. p. 79, pl. 7 Fig. 5.

Scott, T. and A., 1913 British Paraitic Copepoda, London. P. 60, Pl. 17.

Kirtisinghe, P. 1964, Bull. Fish Res. Stn. Ceylon, Vol. 17 (1) : P. 56, Fig. 31.

Caligus multispinosus : (not Shen) Pillai, 1961, Bull. Cent. Res. Inst. Univ. Kerala, Trivandrum 8, pp. 89—91 fig. 2 (Not seen).

Host : *Pampus argenteus*: in gill cavity on gills and inside surface of operculum.

Distribution : On *Autisthes puta* (=Therapon puta) on the Pearl Banks, Ceylon (Thompson and Scott, 1903) *vide* kirtisinghe 1964 Latis calcarifer at Colombo, Ceylon (Kirtisinghe 1969) ;

Pampus argenteus at Trivandrum (pillai, 1961).

Remarks : Not uncommon species of copepod parasitic on various types of marine fishes. It can be distinguished from other spp. in peculiar structure of cephalothorax, genital segment and abdomen. In females the cephalothora is as long as broad, margins rounded, modian lobe more than half the entire width of the cephalothorax, genital segments flask-shaped, distal margin of the segment straight; abdomen narrow, margins subparallel.

2. *Caligus robustus* Bassett-Smith, 1898

FIGURE 2

Caligus robustus — Bassett-Smith, 1898, Ann. Mag. Nat. Hist. Ser. 7, Vol. 2, pp. 361—363pl. 11, figs. 1 and 2. Pillai, 1963, J. Mar. Biol. Ass. India vl. v (1) pp. 73-74, fig. 4.

Host : *Argyrops spinifer* and *Caranx sp.* in the gill cavity on gills and inside-surface of operculum.

Distribution : On *Neothynnus macropterus, Selar mate, Atule djedabe* (=Caranx djedaba) at Trincomali, Ceylon (Bassett-Smith, 1898); *Caranx melampygus* at Colombo Ceylon (Kirtisinghe, 1964); *Carnax sansun* and *C. melampygus* at Trivandrum (pillai, 1963).

Remarks : Parasite of Carangid fishes, not so common, seen in worm season, generally found attached to the inner surface of the opercle and on the gills.

It resembles the above species but can be easily distinguished due to the following character : in female, the cephalothorax is semi-elliptical with median lobe less than half the entire width of the cephalothorax ; distal margins of the genital segment much curved inside and postero-lateral corners produced a little; abdomen long barrel shaped, proximally narrow. In our specimens there is some variation in general shape of the body. Cephalothorax of a typical *C. robustus* is semi-elliptical whereas it is round or often lateral margins subparallel in various forms. Males possess vestigeal 5th and 6th pairs of legs characteristically located at the genital segment.

3. *Caligus bombayensis Rangnekar*, 1955.

FIGURE 3

Caligus bombayensis. — Rangnekar, 1955, J. Univ. Bombay 24 (3) : 55-59 Yamaguti, 1963. Parasitic copepods and Branchyure of fishes p. 50, pl. 54 fig. 5.

Host : *Mugil Cephalus* and *Mugil speigleri.*

Distribution : Previously recorded only from Bomay (Rangnekar, 1955), from *Mugil cephalus.*

Remarks : Rare copepod parasite of grey-mulets in our coast. A large female (7 mm) was caught in the plankton sample from Korangi Creek channel. It resembles the above two species but, however, differs in the following characters : Cephalothorax narrow anteriorly and wide posteriorly ; genital segment flask-shaped, posterolateral margins of which raised a little outwards ; abdomen comparatively much longer.

4. *Caligus longicaudus* Bassett-Smith, 1898.

FIGURE 4

Caligus longicaudus Bassett-smith, 1898 Loc. cit vl. 1; 8-9, pl. 4, fig. 1-2.

Pillai, 1963, Loc. cit. pp. 70-71, fig. 2.

Kirtiginghe, 1964 Loc. cit. p. 59, fig. 35.

Host : *Megalaspis cordyla, Rastralliger Kanagurta,* and *Chirocentrus dorab.*

Distribution : Found in the branchical cavity o *Chirocentrus dorab* at Colombo, Ceylon (kirtisginghe, 1964), *Trichiurus haumela* and *Chirocentrus dorab* off Bombay (Bassett-smith 1898), *Chirocentrus dorab,* at Trivandreen, South India (Pillai, 1963).

Remarks : Fairly common parasite of marine fishes generally found parasitizing *Chirocentrus dorab.* but we have obtained it from *Megalaspes Cordyla* and *Rastralliger kanagurta* for the first time. Female of this species can easily be distingusihed from others due to their long two segmented abdomen and specialized genital segment with posterolateral margins produced to form concavity in the axil of abdomen on either side. Genital segment of males is of inverted U-shaped and

abdomen clearly two-segmented, with the distal segment double of the proximal one. In female specimens of our locality there are slight variations. Tip of the distal segment of first leg bears four claws but their size and location is different, *i.e.*, upper one is bent over the remaining three that are subequal and in series. Fourth leg is comparatively compact, distal three segments together are much less than the proximal long segment. Furca is different from Pillai's figure (1963) and resembles with that of *C. seriole*. No such variations were observed in males.

5. *Caligus dakari* van Beneden, 1892.

FIGURE 5

Caligus dakari. van Beneden, 1892. Bull. Acad. Roy Sc. Belg. an. 62, 3.s. 24(9-10), p. 243, pl. 5, figs. 1-4.

Kirtisinghe, 1964. Lo. cit. p. 60, figs. 36-37.

Caligus arii (non Bassett-smith) Barnard, 1955. Ann. S. Afr. Mus. 41, p. 248, fig. 10 a, b.

Host : *Arius malabaricus.*

Distribution : From gills of *Arius sp.* Ceylon (kirtisinghe 1964) and *Arius. dussumierei* off Africa (Barnard 1955).

Remarks : Parasites of cat-fishes, fairly common at Korangi Creek attacking particular species. *Caligus dakari* van Beneden and *Caligus arii* Bassett-smith are two closely resembling parasites of the same types of fishes. The easily observable character of abdomen, however, differentiate them. In the former species the abdomen is one segmented whereas it is two-segmented in the latter species. Barnard's specimens possess three joined 4th leg and undivided long abdomen (*vide* pillai 1963) and according to Kirtisingle (1964) these are *Caligus dakari* and not *C. arii*. In our specimens, abdomen is long and two segmented.

6. *Caligus cunicephalus* Gnanamuthu, 1950.

FIGURE 6

Caligus cunicephalus : Gnanamuthu, 1950, J. Parasit, 36 (2) pp. 113, pl. 1, fig. 1-16.

Pillai 1963. Loc. cit. pp. 77-79. fig. 7.

Host : In the buccal cavity of *Trichiurus haumela.*

Distribution : From the buccal cavity of ribbon fish, *Trichiurus haumela* from South India (Gnanamuthu, 1950) *T. Savala* at Trivandrum (Pillai 1963).

Remarks : It is quite common in warm seasons in the buccal cavity of *Trichiurus haumela* at Korangi Creek and adjacent areas. The peculiar shape of cephalothorax and genital segment and characteristic structure of 1st and 2nd maxilliped, and 4th leg are so striking that this species can easily be detected. The cephalothorax is longer than broad, and about the length of genital segment. Abdomen narrowly long, one segmented in female and two segmented in male, the segments are subequal.

7. *Caligus cordyla* Pillai, 1963.

FIGURE 7

Caligus cordyla Pillai, 1963. Loc. cit. pp. 32-83 fig. 10.

Host : *Magalaspis cordyla.*

Distribution : Reported from the gill-arches of *Megalaspis* cordyla at trivandrum by Pillai, 1963.

Remarks : It is a rare species in our coast. In female the cephalothorax is slightly round, as long as broad, the posterolateral angles of the cephalothorax round. Fourth thoracic segment short, fused with the genital segment and much broader than long. Genital segment long flask-shaped, a short neck like construction at the anterior end, becoming broader posteriorly, which is almost flat at the distal end, Abdomen short, two segmented, the segments not clearly defined. Anal Laminae small. In male the cephalothorax is like that of female. Fourth thoracic segment as long as broad, laterally produced so as to cover the base of the legs. Genital segment elliptical, broadest in the distal half, containing 5th and 6th vestigial legs. Abdomen short, two segmented, proximal being shorter than the distal. Anal laminae short.

Genus : *PARAPETALUS* STEENSTRUPET LUTKEN 1861

8. *Parapetalus hirsutus* (Bassett-smith, 1898)

FIGURE 8

Caligus hirsutus	Bassett-smith, 1898. Lcc. cit. (7) vii. pp. 6-7 pl. 3, fig. 1 and 2.
Parapetalus hirsutus	Kirtisinghe, 1950 Parasitology 40: p. 77, Figs. 1-4.
	Pillai, 1962, Crustaceanea 3.4. pp. 288-290, fig. 1.

Host : *Eleutheronema tetradactylum;* on the inner surface of the operculum and on the gillarches.

Distribution: On *Eleutheronema tetradactylum* off Bombay (Bassett-smith, 1898) off Colombo. Ceylon (Kirtisinghe, 1950) on *Polynemus Plebius off* Trivandrum (Pillai, 1962).

Remarks : A parasite of threadfins, not uncommon at our coast. It is a variable species due to different shapes of abdomen. Bassett-smith described the abdomen of the female as oblong, Kirtisinghe as polygonal, and Shen as pear-shaped (Pellai, 1962). According to Pillai, 1962 the abdominal segment is pear-shaped but comparatively broader posteriorly. In our specimens it is oval in smaller forms (4-5 mm) pear-shaped in larger one (6 mm) and oblong oval in the largest specimen (7 mm). This segment is subequal with genital segment but in large specimens, it is slightly longer. Genital segment is slightly triangular in outline, *i. e.*, narrow anteriorly, Postero-lateral processes wide, not covering abdominal segment as in Pillais' (1962) and Kirtisinghe's (1950) specimens. No such variations in males are observed.

Genus : PSEUDOPETA LUS PILLAI 1962

9. *Pseudopetalus formicoides*, Redkar, Rangnekar and Murti, 1949.

FIGURE 9a

Parapetalus formicoidas:	Redkar, Rangnikar, et Murti, 1949.
	J. Univ. Bombay n. s. 18 (3) Sec. B (26) pp. 36-50 (not seen).

Pseudopetalus formicoidas Pillai, 1962, Loc. cit. pp.

Host : In the gill cavity of *Sardinelle longiceps.*

Distribution : Reported from *Dussumieria acuta* off Bombay (Redkar et. al. 1949) *Sardiniella fimbriata* at Trivandrum (Pillai, 1962).

Remarks : A parasite of clupeid fishes (Sardines) which is rare in our coast. Cephalothroax of female small as compared to the rest of the body, it is broader posteriorly, lunules small and shallow. Fourth thoracic segment fused with the long swollen genital segment, genital segment, narrow anteriorly, becoming wider posteriorly, it produces conical processes, one on each posterolateral side, wings absent. Abdomen long, spindle-shaped and much longer than broad. Anal lamine short.

Genus : SYNESTIUS STEENSTRUP ET. LUTKEN, 1861

10. *Synestius caliginus* Steemstrup et. Lutken, 1861

FIGURE 10a

Synestius caliginus : Steenstrup et Lutken, 1861. Loc. cit. pp. cit. pp. 364-365, pl. 6 fig. 11 (not seen).

Gnanamuthu, 1950, Rec. Ind. Mus. vl. 47, pp. 253-258, figs. 1-3.

Kirtisinghe, 1964, Loc. cit. p. 75, fig. 87.

Host : On the gills of *Pampus argenteus* and *Parastromateus. niger.*

Distribution : On the gills of *Parastromateus niger* from Ceylon (Kirtisinghe, 1964), off South India (Steenstrup et lutken, 1961), off Madras (Gnanamuthu, 1950). Also on *Pampus argenteus* in the India Occan (Heller, 1865).

Remarks : A common parasite of pomfrets; found more occasionally attacking *Parastromateus niger* at our locality. Cephalothorax of female circular ; Lunules shallow. Fourth thoracic segment short ; Genital segment broad and sac-like, which

is narrow anteriorly, the posterolateral corners of the segment produced into a pair of long cylindrical processes on each side, the dorsal one being longer than the ventral. Abdomen cigar-shaped, long, indistinctly two segmented, the distal one being much longer.

Genus : CALIGODES HELLER, 1868

11. *Caligodes Laciniatus* (Kroyer), 1863

FIGURE 10b

Sciaenophilus laciniatus : Kroyer, 1863, Loc. cit. p. 153, pl. 8, fig. 3.

Caligodes laciniatus : Kirtisinghe 1937, Loc. cit. pp. 439-441, figs. 30-40.

Rangnekar, 1959, Rec. Ind. Mus. Vol. 28 (3); 49-51, fig. 3.

Host : In the mouth cavity of *Tylosurus strongylurus* and *T. leiurus.* One specimen was found on the lower jaw of *T. leiurus* covered by an isopod parasite.

Distribution : A common parasite of neelde-fishes. On *Belone sp* in the Indian Ocean (Kroyer 1863). (Heller 1865) ; on *Tylosurus strongylurus* and *T. leisurus* off Hikkaduwa, Ceylon (Kirtisinghe, 1937) ; on *T. crocodylus* and *Ablennes hians,* off South India (Pillai, 1961). Male of this species is not known.

Remarks : Cephalothorax very small as compared with rest of the body; it is round, frontal plates small with shallow lunules ; Fourth thoracic segment narrowly longed forming a connecting link between the cephalothorax and the genital segment. Genital segment is sac-like nrraow at the anterior and becoming wider posteriorly; laterally the swollen part is produced into baminate processes ending in small spines, Abdomen one-segmented, long and cylindrical. Anal laminae minute.

Sub-family : Lepeophtheirinae.

Genus : Lepeophtheirus Nordman, 1832.

12. *Lepeophtheirus plotsoi,* Barnard, 1948.

FIGURE 9 b.c.

Lepeophtheirus plotosi : Barnard, 1948, Ann. Mag. Nat. Hist. 12. B., (4) v. i. pp. 242-254.

Host : On the gills of *Plotosus anguillaris.*

Distribution : Previously recorded from the same fish in South Africa (Barnard, 1948).

Remarks : A parasite of catfish-eel, not so common on our coast. There is a remarkable difference in the shape of genital segment which is long elliptical rather than barrel shaped. Morever, abdomen is comparatively long and anal laminae short.

Genus : Diphyllogaster Brain, 1897

13. *Diphyllogaster aliuncus* Rangnikar, 1955

Diphyllogaster aliuncus : Rangnikar, 1955, J. Univ. Bombay 23 (5) ; 44-55 (not seen).

Host : Pampus argenteus and Parastromateus niger.

Distribution : Previously recorded from *Pampus argenteus* at Bombay, (Rangnikar, 1955).

Remarks : It is a rare species in our coast, Our specimens show no trace of variation.

Genus : Hermilius Heller, 1868

14. *Hermilius longicornis* Bassett-smith, 1898

FIGURE 12

Hermilius longicornis : Bassett-Smith, 1898, Loc. cit. 7.2 pp. 80-82 pl. 3, fig. 2.

Host : *Arius sp.*

Distribution : Previously recorded from the gill of *Arius sp.* from Ceylon (Kirtisinghe, 1964). off Trivandrawn (Pillai, 1961), on the grills of *Arias acutirostris* at Trincomalee, Ceylon (Bassett-smith, 1898).

Remarks : A fairly common parasite of cat-fishes. General shape and structure of our specimens are quite similar to Pillai's description which is, in turn, showing no differenciation from the original species of Bassett-Smith. Kirtisinghe (1964) has quite correctly placed Pillai's specimens under H. longicornes.

Key to the Genera of Family Caligidae Present in the sea of Pakistan and its Adjoining Areas

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1. Lunules present..... (Sub family Caliginae) 2

   Lunules absent.....7

2. Fourth Leg vestigial or even absent..... *Pseudocaligus* Scott, 1901

   Fourth Leg present ; may be short.....3

3. Genital segment and abdomen normal... *Caligus* Muller, 1785

   Genital segment and abdomen modified.....4

4. Genital segment furnished with membrranous wings ; such wings also present on abdomen..... *Parapetalus* St. et. lutk, 1861

   Genital segment produced posteriorly into finger like processes.....5

5. The backward processes on genital segment much shorter then abdomen..... *Pseudopetalus* Pillai, 1962.

   The backward process on genital segment nearly as long as abdomen.....6

6. Genital segment with 4-backward processes *Synestius*, St. et. lutk. 1861.

   Genital segment with 2 backward processes..... *Caligodes* Heller, 1868.

7. Free thoracic segment produced into a very long neck (Subfamily : Echetinae)..... *Echetes* Kroyer, 1864.

   Free thoracic segment short.....8

8. Abdomen normal, usually small (subfamily Lepeophtheirinae).....9

   Abdomen lackinger reduced..... (Subfamily Anuretinae).....12

9. Genital segment produced posteriorly into two processes twice as long as itself..... *Diphyllogaster* Brian, 1899.

   Genital segment simple, without process..... 10

10. Carapace deeply incised at middle of fronted maring with strong chitenous ridgs (which are three in number)..... (*Hermilius* Heller, 1868).

    Carapace not deeply incised.....11

11. Carapace with spenous processes on median lobe and ribs..... *Mappatus* Ranguker 1958.

    Carapace normal..... *Lepeophtheirus*, Nordman, 1832.

12. Maxillary hook present; maxillae simple *Anuretes* Heller, 1868.

    Maxillary hook and maxillae absent..... *Pseudoanuretes*, Youmagat, 1936.

HOST-SPECIFICITY

Caligids are among the actoparasites needing no intermediate host. Being parasites, there is to some extent a notable host-specificity for each species. Thus *Lepeophtheirus Plotose* lives attached to the gill elements of *Plotosus anguillaris* same host was recorded in South Africa by Barnard (1948) and the same is our observation through other species. *Plotosus canius* is available in the same locality. This peculiarity is due to some biochemical and physiological factors present in the host and suitable for the parasite, or in other words such factors are only available in the peculiar species of parasite. If a chalimus larva gets attached to a fish other than the peculiar host, it fails to survive due to unavailability of such factors.

The host specificity more oftenly extends to a group of similar fishes ; they may be allied species, or subfamilies or even families Classical examples of this case are the and Polynemidae. *Caligodes lociniatus*, a parasite of needle-fishes, is a good example. We have recorded it from *Tylosurus strongylurus* and *T. Leiurus*, whereas its previous records are from *T. Strongylurus*, *T. Leiurus* from Ceylon (Kirtisinghe-1937), Italy (Brian....) *Belonde sp.* in the Indian Ocean (Kroyer-1863) (Heller-1865). *T. Strongylurus* off Bombay (Rangneker-1959) and *T. Crocodylus* and *Ablennes hianus* off South India (Pillai-1961); not a single example of record from a fish other than family. *T. Strongylurus* and *T. Lieuruse* are the common needle-fishes, and *Caligodes lociniatus* is occasionally found in the mouth cavity of these fishes. *T. Strongylurus* is more common than the other and is more occasionally parasitized than the other : *T. Crocodylus* appears in warm season but its population is comparatively very low andhence no parasite from this fish could be picked up. Similar is the case with *Caligus bombayensis* Rangneker which has been reported from *Mugul cephalus* at Bombay. In our particulars locality, the parasite is not associated with *M. cephalus* alone, as it is equally found attacking other species will, *i.e.*, *M. speigleri* and M. pairsa, the more common Grey Mulets and *Liza waigieonsis* and *M. cephbus* occasionally present in the scholding form in warm season at Korangi Creek and adjoining areas. The parasite is not common, hence rarely seen, and we guess there is every chance that it can attack all grey nullets. Exactly similar is the case with *Caligus dakari* V. Beneden, *Parapetalus hirsutus* (Bassett-smith), *Synestius caliginus* St. et. lutk, *Hermilus longicornis* Bassett-smith and *Dipbyllogoster aliuncus* Rangnekar.

Host-specificity, on the contrary, is further relaxed in some parasites like *Caligus robustus* and *Caligus cordyla* Pillai, that are found attached certain fishes other than the particular host-group. *Caligus robustus* Bassett-smith is a carangid-fish parasite as observed by Bassett-smith (1898) Wilson (1913), Brian (1924), Bere (1936), Kirtisinghe (1964) and Pillai (1963) but besides the arangid-fish, *Neothynnus macropterus* and *Argyrops spinifer* are non-carangid fishes. Reason for such a type of host-specificity may be due to accidental release from a host and reattachment to other ; because we have collected (by chance) a male *Caligus bombayensias* from plankton sample from Korangi Creek channel and attached it to the number surface of the operculum of *M. Speigleri* and we found that the parasite survived. There may be another reason, the availability of host at a chalimus stage of the parasite. In general the particular group of fishes (the hosts) are available at that time, but there may be a chance of other fishes to be present there and thus to get the parasite attached.

There is yet another category of parasites that attack not a difinite group of fishes but is found attached to different types of fishes such cases are met with in *Caligus diaphanus* and *C. longicaudus*. We have collected the former argus while the same has been reported from *Pampus argenteus* at Trivaudrun, South India by Pillai (1961) *Autisthes puta* on Pearl Banks, Ceylon by Thompson and Scott (1903) and Latis calcalifer at Colombo, Ceylon by Kirtisinghe (1964).

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REFERENCES

Barnard, K.H. New records and descriptions of new species of parasitic copepods from South Africa.

Mag. Nat. Hist. (12) 1:242—254.

Bassett-smith, P.W. 1898 Some new parasitic copepods found on fish at Bombay, that (7)1: 9—17.

1898b Further new parasitic copepods found on fish in Indotropiedregion. Hid. (7) 2 : 77—98.

1898c Some new or rare parasitic copepods found on fish in the Indo-tropical region. Ibid. (7) 2 : 357—372.

Gnanamutha, C.P. 1950 There new copepod parasites of the ribbon fish from south India. J. Parasit. 36 : 113—119.

1950a Synestius caliginus St: et. Luth. a copepod parasite on the gills of the greay ponfret Rec. Ind. Mus. 47.

Kirtisinghe, P. 1937 Parasitic copepods of fish from Ceylon 71 Parasitology 29 (4) : 435—452.

1950 Parasitic copepods of fish from Ceylon. 111 Ibid. 40 (1-2) : 77—86.

1956 Parasitic copepods of fish from Ceylon. Iv. Ibid. 46 (1-2) 14—21.

1964 A review of the parasitic copepods of fish recorded from Ceylon with Description of additional forms. Bull. Fish Res. Stn. Ceylon, 17(1) : 45—132.

Pillai, N.K. 1961 Copepods parasitic on south Indian Fishes. I. Caligidoe. Bull. Cent. Res. Inst. Univ. : Kerala, Trivaudrun, 8.

1962 A reoision of the Genera parapetalus St. et. Luth and Psendopetalus non Crustaceana 3.4.

1963 Copepods parasitic on south Indian Fihses Family caligidoe. J. Mar. Biol. Ass. India, 5(1) : 68—96.

Rangnekar, M. 1955 Prendocaligus lanimatus sp. nov. and Diphyllogaster aliumcus sp. nov. (copepoda) parasitic on Bombay fishes. J. Univ. Bombay 23 (5) : 44—52.

1955 Caligus bombayenurs sp. now. a copepod parasitic on Magil ceplalus ibid. 25 (3) : 55—59.

Scott : T and A 1913 The British parasitic copeopda Vol. Irs. Ray Soc. Land.

Yamaguti, S. 1963 Parasitic copepoda and Branchiura of Fishes. Interscience publishers New York.

DESCRIPTION OF THE FIGURES

FIGURE 1.

a. Caligus diaphanus Nordman, female X16.

b. 2nd ant. X64.

c. 2nd maxpd. X64.

d. Fourth leg X64.

e. Furea X64.

FIGURE 2.

a. Caligus robustus Bassett-smith, female (from Therapon jerbua) —X16.

b. 4th leg of the same. X72.

c. Furca X144.

d. Female (From Mugil cephalus) lower portion X16.

e. Furca X36.

f. 4th leg of the same X36.

g. Male (from Argyrops spinifer) lower portion X16.

h. Furca of the same X36.

FIGURE 3.

a. Caligus bombayensis Rangnekar, female X16.

b. Male, lower portion X16.

FIGURE 4.

a. Caligus lonicaudus Bassett-smith, female X16.

b. Furca X144.

c. First leg X120.

d. Fourth leg X144.

FIGURE 5.

a. Caligus dakari V. Beneden, Female X16.

FIGURE 6.

a. Caligus cunicephalus Gnanamuthu, Male X16.

b. Same Female X16.

FIGURE 7.

a. Caligus cordyla Pillai, Female X16.

b. Furca X80.

c. First leg X120.

d. Fourth leg X80.

e. Male X32.

FIGURE 8. a. Parapetalus hirsutus (Bassett-smith) Female X16.

b. Variable lower parts of Females X16.

FIGURE 9. a. Pseudopetalus formicoides (Redkar et. al.) Female X4.

b. Lepeophtherius plotosi Barnard, Female X4.

c. Lower part of the same X32.

FIGURE 10. a. Synestius caliginus St. et. Lutk, Female X16.

b. Caligodes Lacimiatus (Kroyer), Female X8.

FIGURE 11. a. Diphyllogaster aliuncus Rangnekar, Female X16.

FIGURE 12. Hermilius longicornis Bassett-smith, Female X16.

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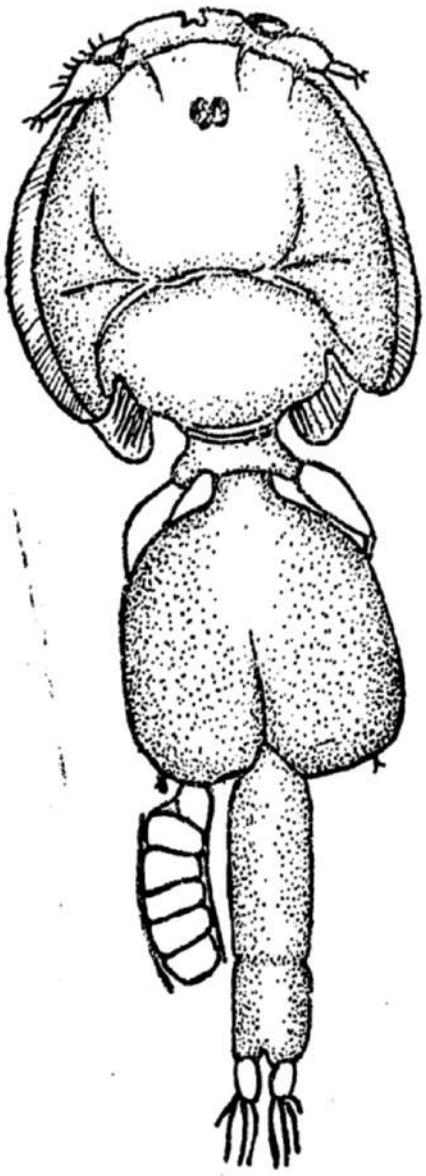

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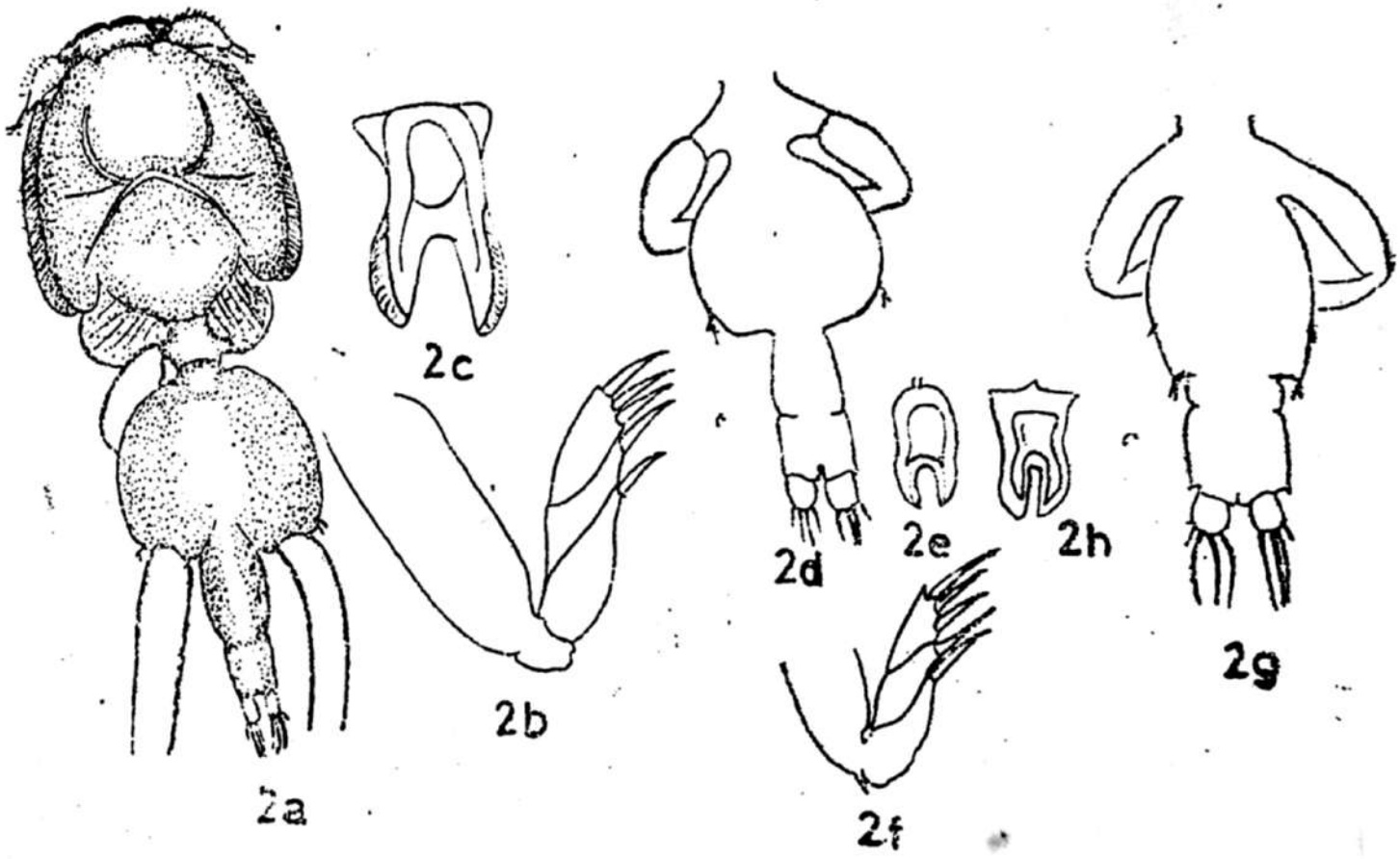
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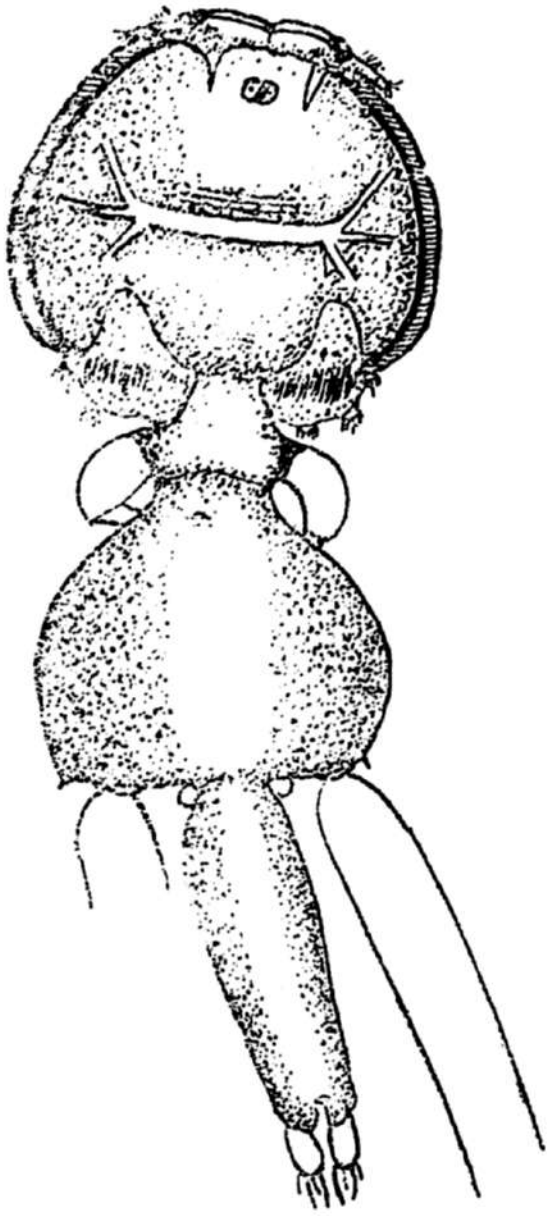

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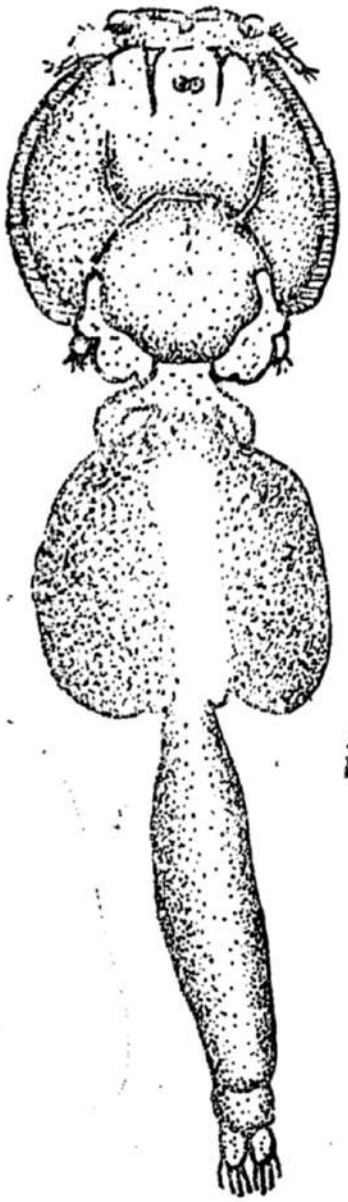

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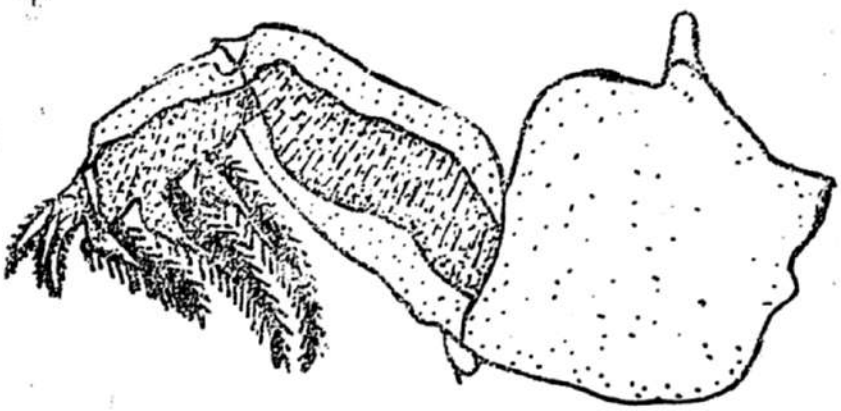

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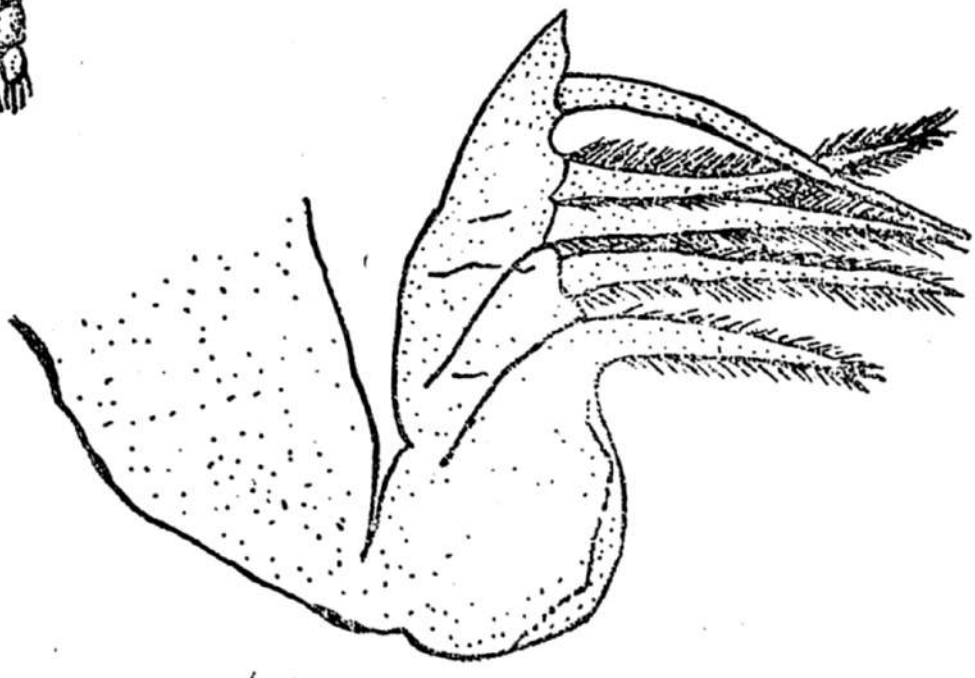

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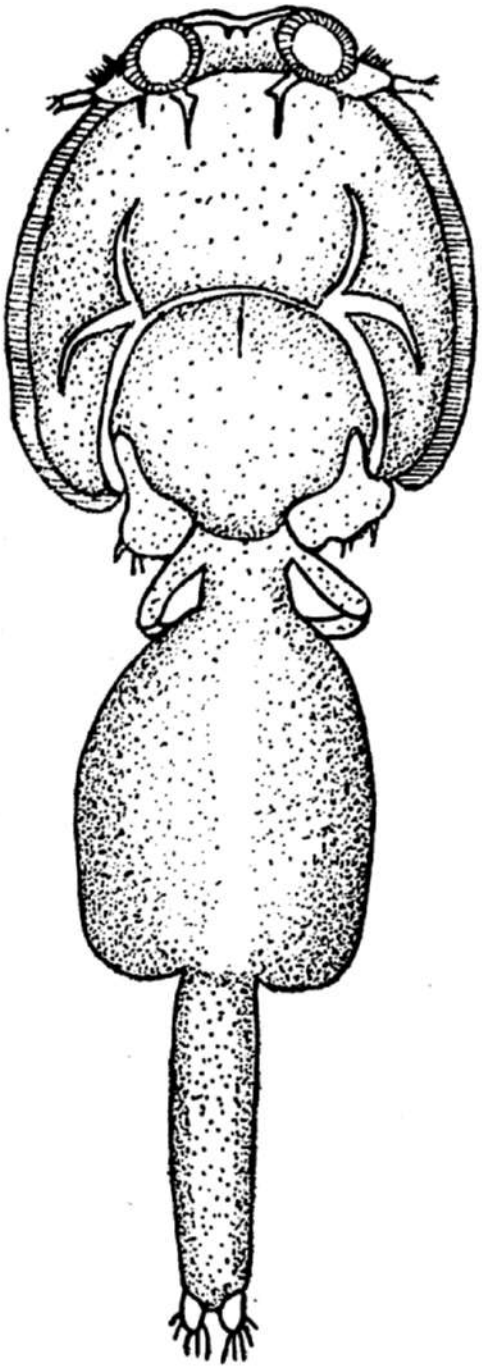

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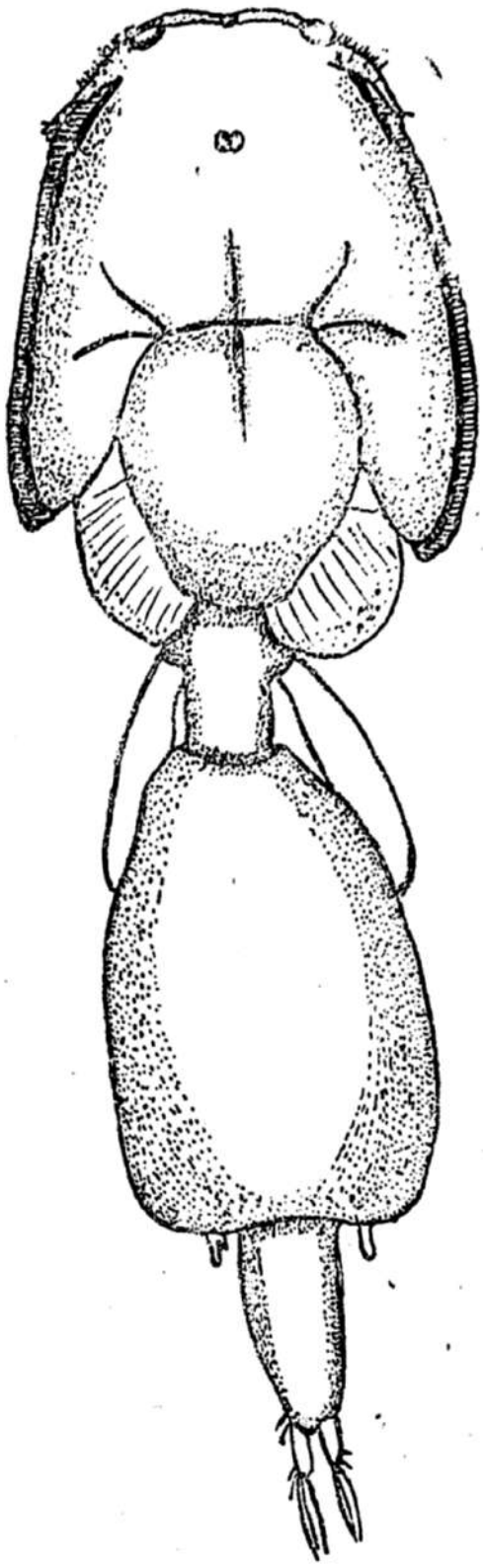

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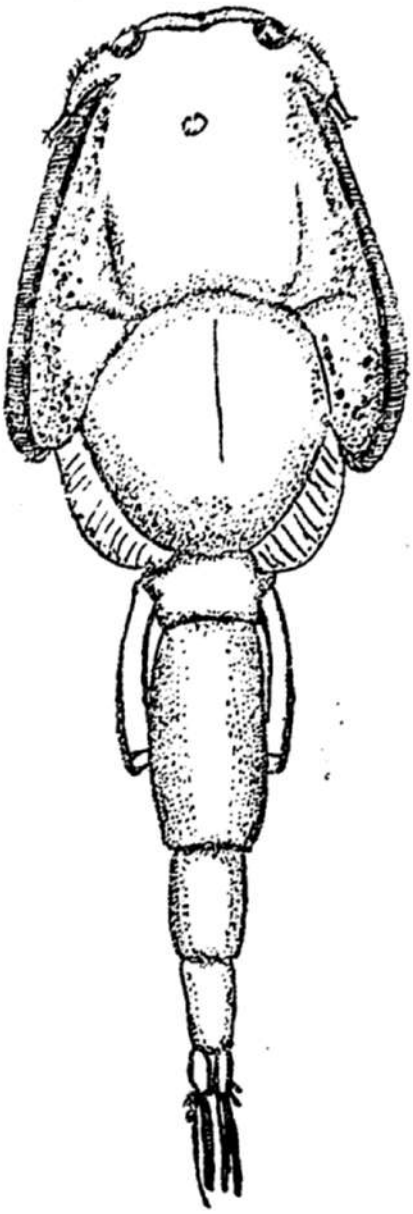

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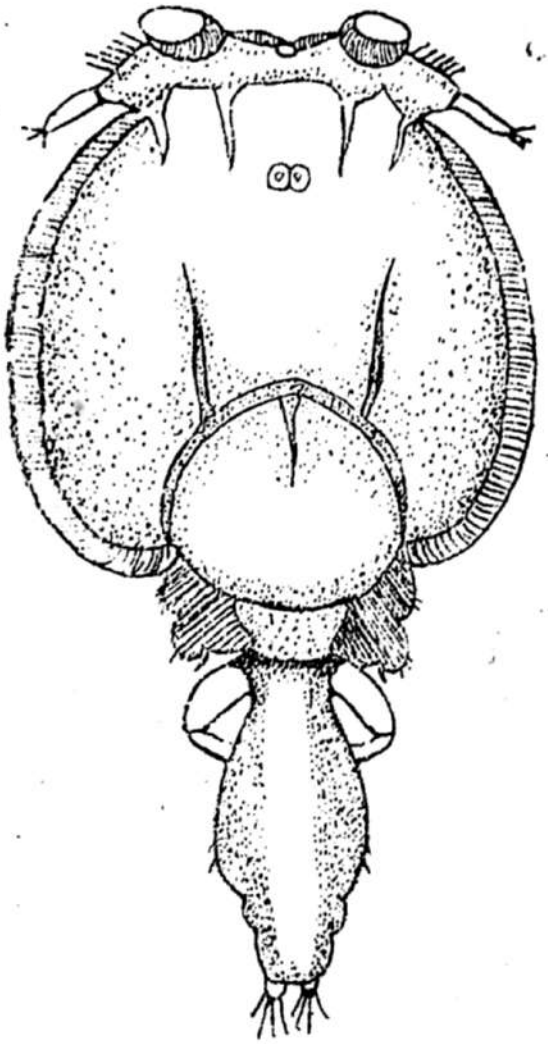

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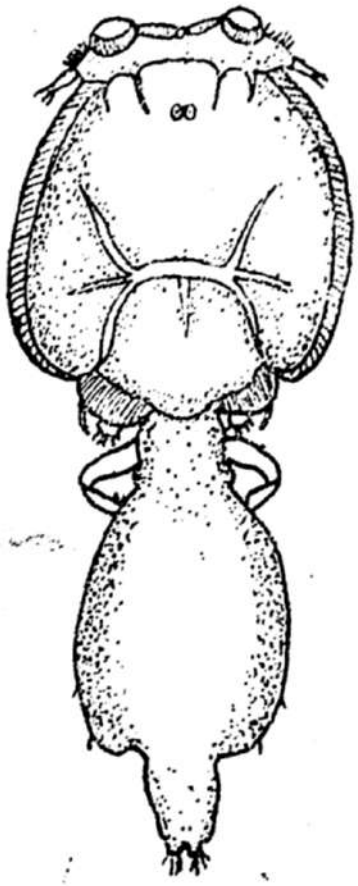

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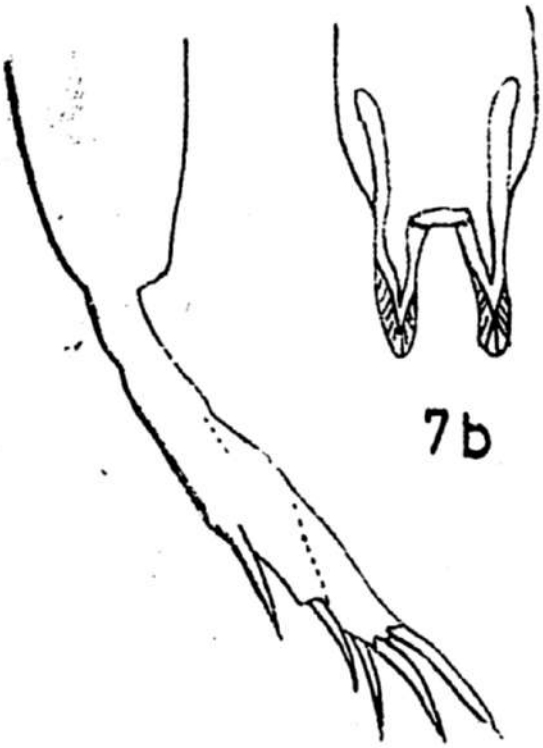

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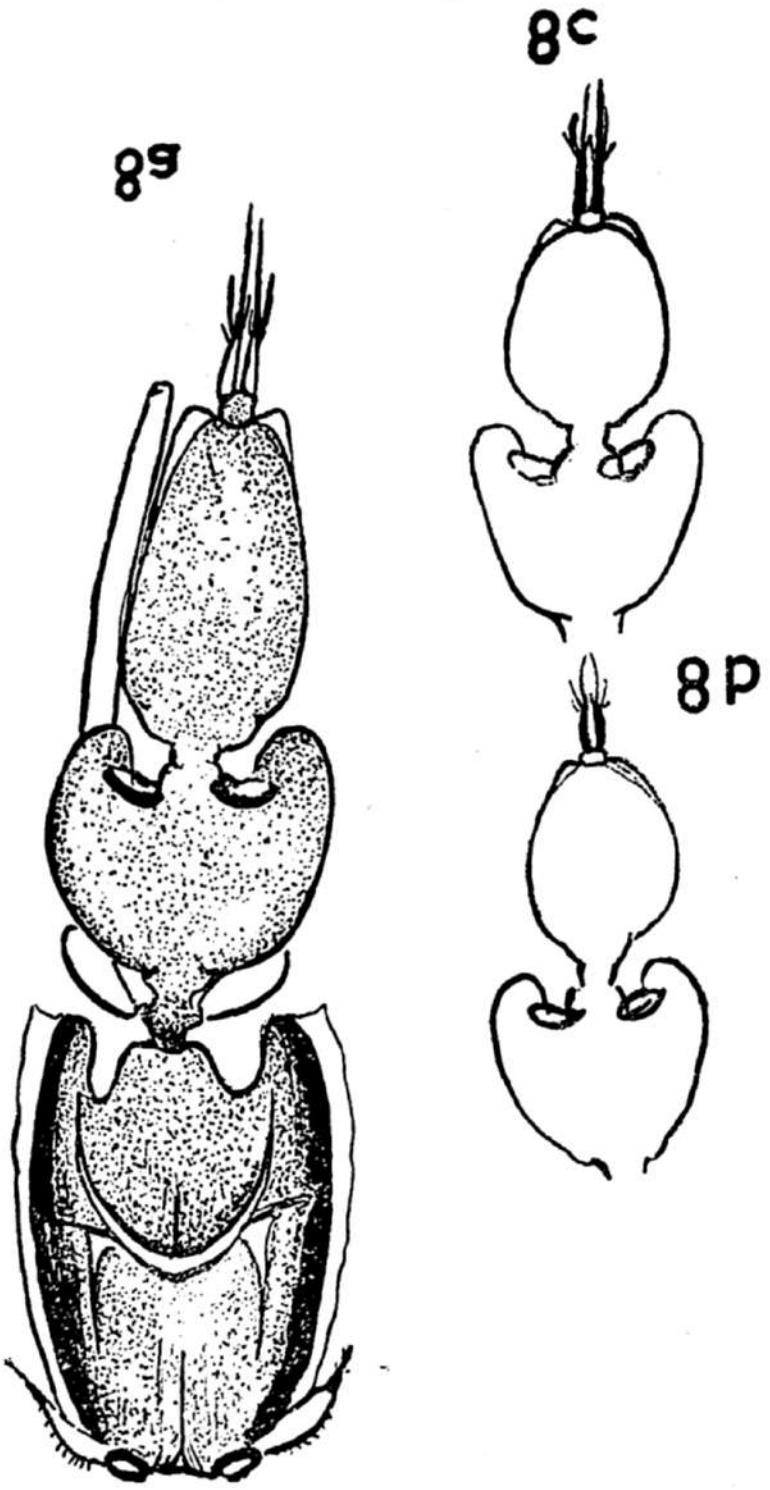
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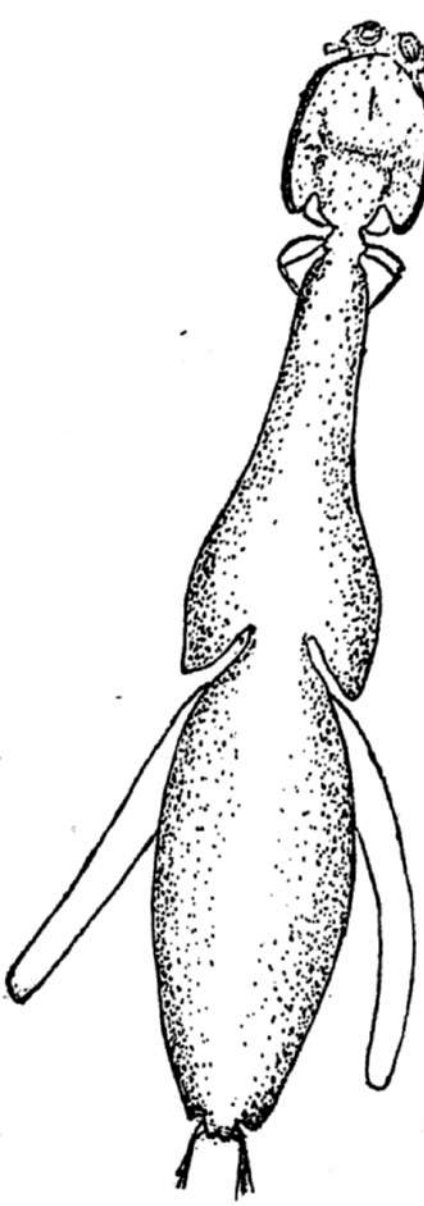

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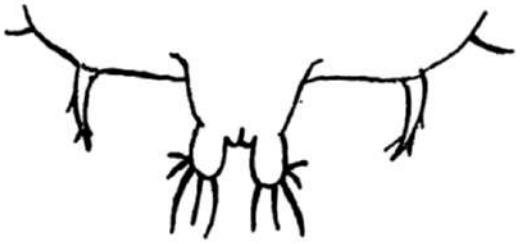

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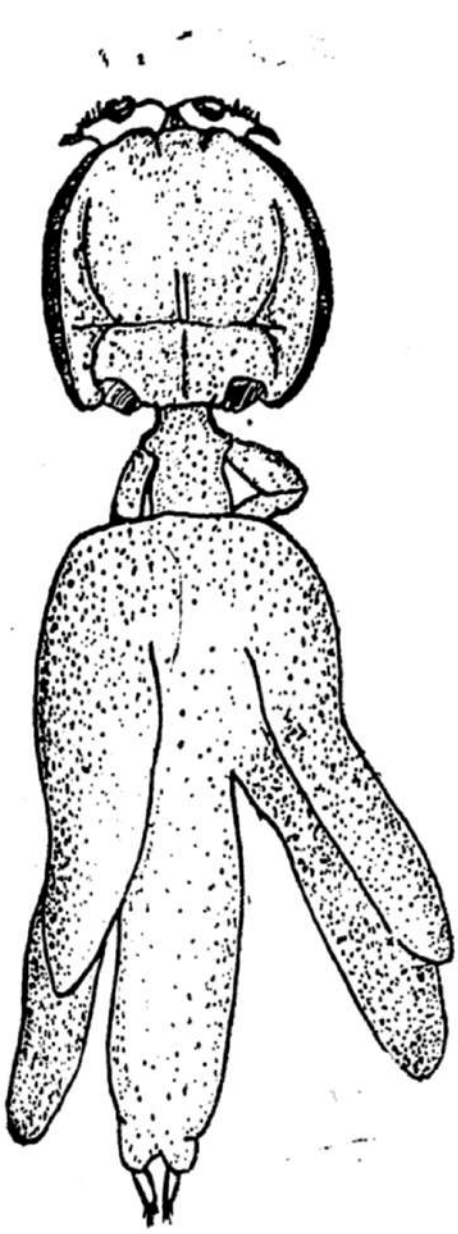

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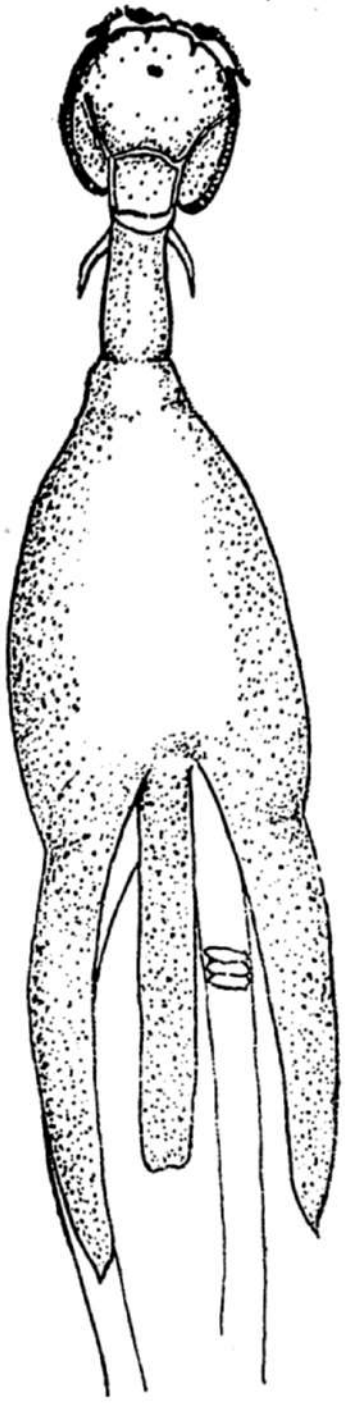

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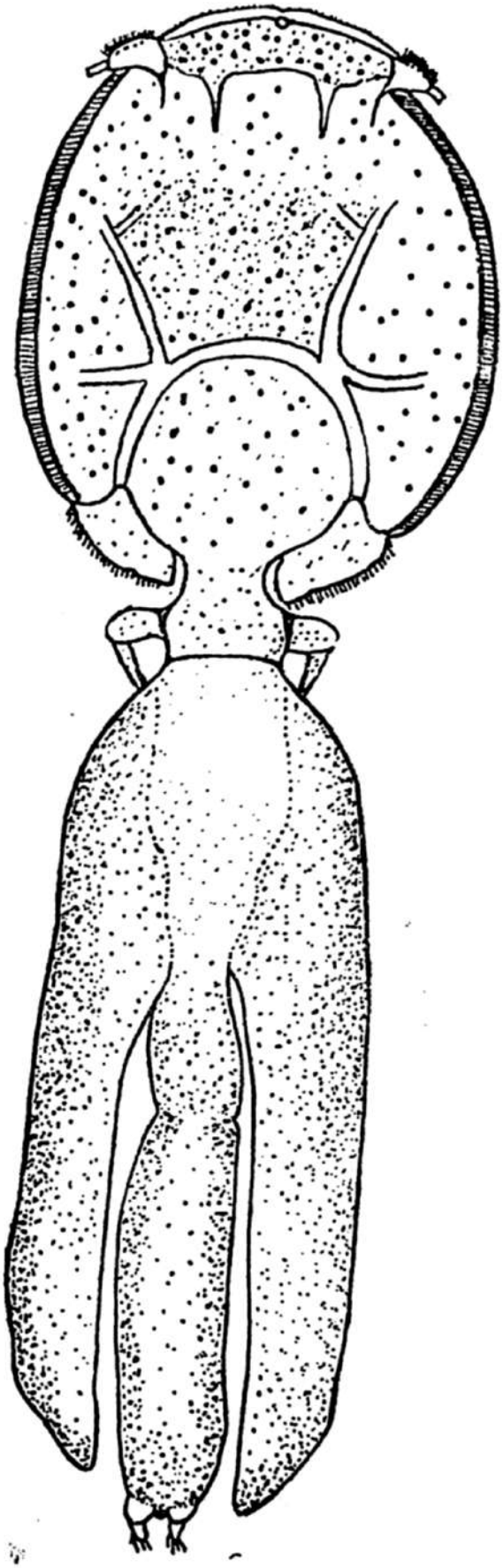

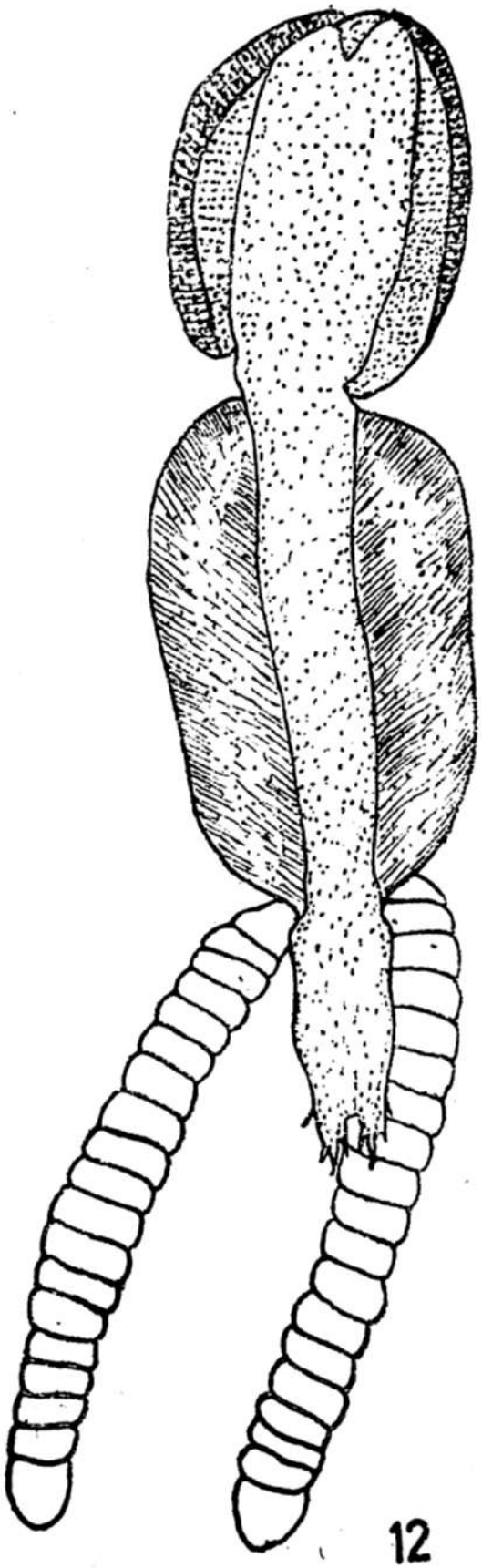

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