

The Thalassinoidea (Crustacea, Anomura) of Maharashtra

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(With four text-figures)

Though Thalassinoidea to which mud-lobsters or ghost-shrimps belong, has been accepted as a distinct superfamily of Decapod crustacea, there have been contradictory opinions regarding its taxonomic status. Alcock & Anderson (1894), de Man (1925 and 1928) and Holthuis (1956) have included it in Macrura, while Borradaile (1907), Calman (1909), Balss (1927 and 1957) and Barnard (1950) are of the opinion that it belongs to Anomura. Gurney (1938) working on the larvae of Thalassinoidea and Nephropsidae, suggests separation of Thalassinoidea into two groups, a Homarine and an Anomuran. In the present study, however, the changes effected by Calman (op. cit) have been followed in the inclusion of Thalassinoidea in Anomura.

In India, studies on Thalassinoidea have been mainly undertaken with reference to the deep sea forms (Miers 1884; Henderson 1893; de Man 1887-88; Alcock & Anderson 1894; Anderson 1896; Alcock 1901; Borradaile 1907 and Kemp 1915). Comparatively much less work has been done on the coastal forms: on the east coast, Southwell (1906) deals with Thalassinids from Ceylon; Gravely (1927) while working on the fauna of Krusadai Island, deals with 1 species of Callianassidae which he refers to subgenus *Calliadne* (= *Gebiopsis*); Chopra (1933) discusses the taxonomic position of *Entrichocheles modestus* in the family Axiidae. On the west coast, Pillai (1954) deals with *Callianassa maxima* in brief and Sankolli (1963) deals with the occurrence and natural history aspect of *Thalassina anomala*. Thus practically no work has been done on the intertidal forms along the west coast and more especially along the Maharashtra coast.

In Maharashtra, the superfamily Thalassinoidea is represented by 4 species belonging to 3 families, collected from intertidal areas. Of these one species, *Laomedea astacina* de Haan is a new record to India and two

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species, *Callianassa (Callichirus) kewalramanii* and *Upogebia (Upogebia) kempii* are new to science.

Identification of the present material is mainly based on de Man (1888, 1927, 1928a & b).

KEY TO THE FAMILIES OF THALASSINOIDEA

- I. No *linea thalassinica*; both movable and fixed antennal thorns present though sometimes minute; abdominal pleura large..... *Axiidae*
- II. *Linea thalassinica* present (except in Callianidea); fixed antennal thorn wanting, scale (movable thorn) reduced to a flattened vestige or wanting; abdominal pleura usually small.
 - 1. Sutures on both the rami of uropods; abdominal pleura of good size..
..... *Laomediidae*
 - 2. No sutures on uropods; abdominal pleura small.
 - (a) Second leg chelate or simple; no podobranchs on legs; third to sixth abdominal appendages broad; antennal scale present as a vestige..... *Callianassidae*
 - (b) Second leg sub-chelate; podobranchs on first to third legs; all abdominal appendages narrow; no vestige of antennal scale..
..... *Thalassinidae*

Family LAOMEDIIDAE

Remarks: This family contains 2 genera and in Maharashtra, it is represented by a single genus *Laomedea*.

Genus *Laomedea* de Haan

1. *Laomedea astacina* de Haan (Figs. 1-2).

Laomedea astacina, de Haan, 1849, p. 165; Ortmann, 1892, p. 51; Borradaile, 1903, p. 540; Kamita, 1957, pp. 105-106; Sakai, 1962, pp. 27-34.

Carapace (Fig. 1, a): Rostrum fairly long reaching nearly to the middle of the penultimate joint of the antennal peduncle; provided with 3 minute teeth on either lateral margin near the tip. Length more or less equal to breadth at base. Antennal angles fairly well-developed. No tubercles or hairs on carapace except for short hairs on the antennal and maxillary margins. Cervical groove distinct, dividing the carapace into two equal parts, the anterior and the posterior.

Linea thalassinica is rather well-developed. The eyes reach slightly more than $\frac{1}{2}$ the length of the rostrum.

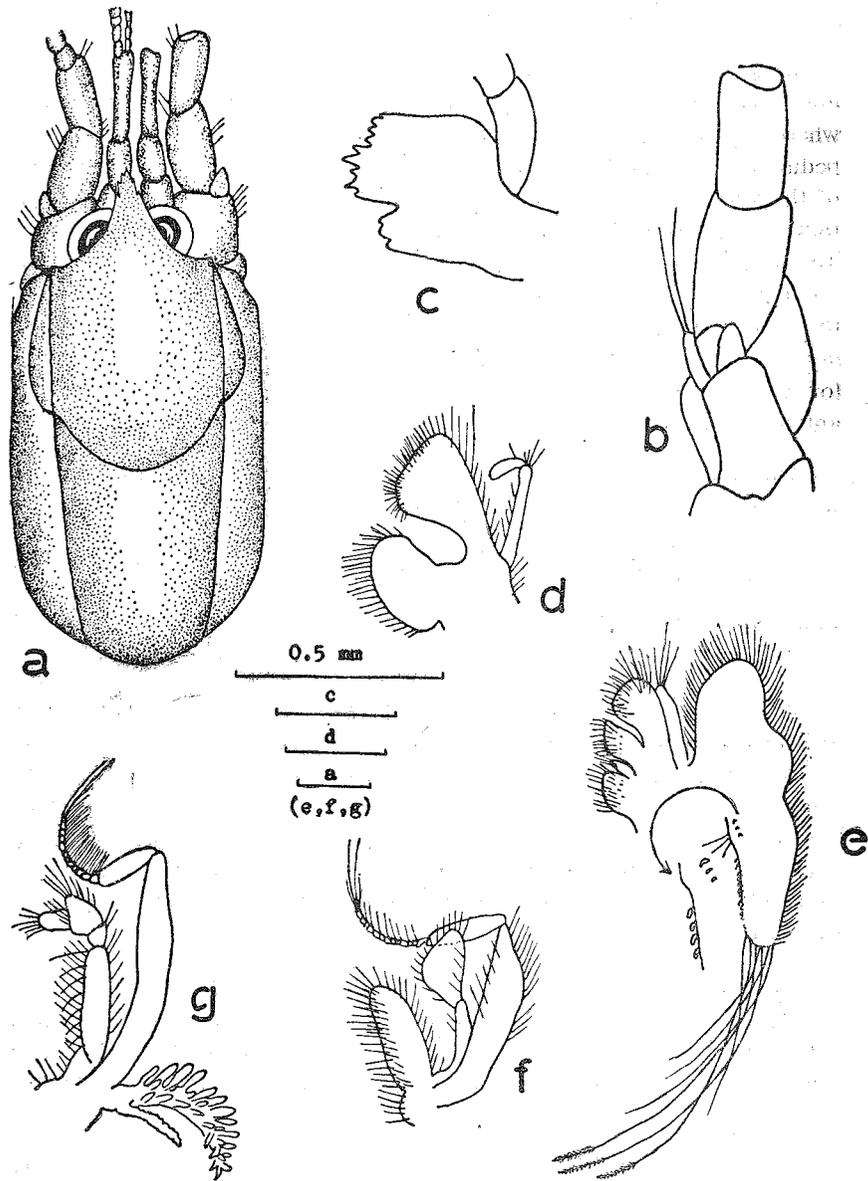


Fig. 1. *Laomedia astacina* de Haan. *a*—anterior part of animal (legs etc. not shown), *b*—antenna, *c*—mandible, *d*—first maxilla, *e*—second maxilla, *f*—first maxilliped, *g*—second maxilliped.

Antennule (Fig. 1, a) : The basal segment falls short of reaching the rostrum. The penultimate joint is almost half the length of the ultimate joint.

Antenna (Fig. 1, b) : The antenna consists of 5 segments and a flagellum. The peduncle extends slightly beyond the antennular peduncle, whereas in the Japanese specimens, it extends well beyond the antennular peduncle as figured by Sakai (1962). The coxopodite shows the opening of the antennal gland. The 2nd segment is divided into two parts and these two parts are clearly seen in the outer-lateral view of the peduncle. The inner part distally bears the scale which is triangularly oval and the outer part bears the antennal thorn which is not that well-developed as the scale or scaphocerite. The 3rd segment which is hardly seen in the dorsal view, is situated latero-ventrally. The 4th segment is slightly longer than the last segment. The antennal peduncle is stouter than the antennular peduncle.

Mandible (Fig. 1, c) : The cutting edge of the ventral plate is provided with 9 unequal teeth and that of dorsal has 3 teeth. The palp is 3-jointed.

First maxilla (Fig. 1, d) : The lower endite is broad and more or less rounded, the upper endite is almost as broad as the lower and the palp is well-developed with its tip deflexed.

Second maxilla (Fig. 1, e) : Both its endites are bilobed, the upper lobe of the lower endite being very small. The palp is long, narrow and does not reach the inner margin of the upper lobe of the upper endite. The scaphognathite is large with a convexity near the distal half on the outer margin. The posterior end bears about 11 very large setae which are minutely spinulose distally except at the tip portion where it is naked. There are several bent hook-like projections present on the inner margin and a few such projections are also present on the anterior portion of the inner margin.

First maxilliped (Fig. 1, f) : The endites are separated by a distinct notch, the palp is well-developed and has a broad, roughly triangular lobe at its distal end. The exopod is well-developed and has a flagellum which is almost as long as the non-flagellated portion and is sub-divided into several joints.

Second maxilliped (Fig. 1, g) : It is normal in shape, with well-developed endopod and exopod. A small, elongated epipod and a single podobranch are present.

Third maxilliped : The dactylus is longer than the propodus and the propodus in turn is slightly longer than the carpus. The merus is longer

than the dactylus and the ischium is longer than the merus and is provided with about 12 teeth on its inner margin. The exopod almost reaches the middle of the merus and is segmented in the distal part.

Pereiopods : The first pair of legs is equal in size and shape and much stouter than the second pair.

Cheliped (Fig. 2, a) : The ischium is short (as long as the fixed finger) and bears about 18 or more minute and fine teeth almost all along the posterior margin. The merus is shorter than the propodus and its anterior margin is plain. The posterior margin is provided almost along the proximal half with several minute and fine teeth of which the proximal ones are more prominent than the remaining ones. The carpus is about $\frac{1}{2}$ the length of the merus and its inner upper surface is armed in its distal half with small rounded tubercles, of which the distal ones are more prominent. The propodus is longer than broad and is about 1.3 times the length of the merus. The fixed finger is almost as long the ischium and its cutting edge is provided with several minute teeth of which the proximal 3rd to 7th are larger. The dactylus is more than $\frac{1}{2}$ the length of the propodus and its upper surface is traversed by a thin, longitudinal ridge, which begins near its articulation with propodus, runs a short distance obliquely outwards and then joins the anterior margin. The cutting edge is armed with 2 blunt, tooth-like processes at the proximal portion and then onwards there are several minute teeth more or less uniformly arranged. In the Japanese specimens (Sakai 1962), none of the segments bear tubercles or spines.

Fingers cross each other.

Second leg (Fig. 2, b) : It is simple, non-chelate. The dactylus is narrow and less than $\frac{1}{2}$ the length of the merus. The propodus measures about $1\frac{1}{2}$ the length of the dactylus and the carpus is nearly $\frac{1}{3}$ the length of the merus. None of the segments bear any spine or tubercle.

Third leg (Fig. 2, c) : The dactylus is slender, though slightly broad near the base. Minute, elongated tooth-like spines are arranged compactly along its posterior margin on the dorsal surface. The propodus is broader than the dactylus and is about twice the length of the latter. The carpus is nearly $\frac{2}{3}$ the length of the propodus and the merus is nearly as long as the dactylus and propodus combined.

Fourth leg (Fig. 2, d) : It is very similar to the third leg. The dactylus is twice the length of the propodus and the carpus is slightly more than $\frac{1}{2}$ the length of the propodus. The merus is nearly 3 times the length of the dactylus.

Fifth leg : The dactylus is absent. The propodus is nearly as long as the merus and the carpus is almost $\frac{1}{2}$ the length of the merus.

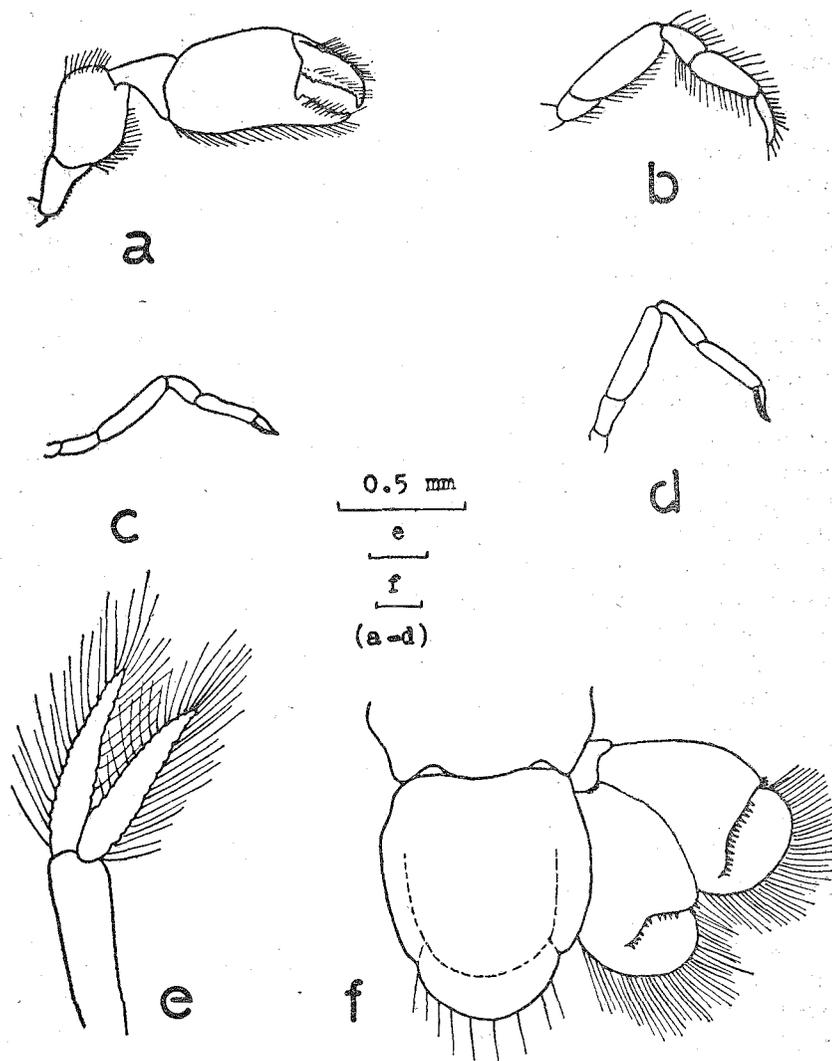


Fig. 2. *Laomedia astacina* de Haan, a—first leg, b—second leg, c—third leg, d—fourth leg, e—first pleopod, f—telson with uropods.

Abdomen : It is normal in shape and is about $1\frac{1}{2}$ times the length of the carapace. The pleura are well-developed. The first segment is the smallest, the 6th is more than $1\frac{1}{4}$ times the 1st, and the 2nd to the 6th are more or less equal in size, but the 1st and the 6th are slightly narrower.

Pleopods (Fig. 2, e): The 1st abdominal segment does not bear pleopod and there are 4 pairs of pleopods present on the 2nd to 5th segments. Each pleopod consists of a long and stout basal stalk and sabre-like, membranous endopod and exopod. The endopod and exopod are more or less of the same size and shape and are slightly larger than the basal stalk.

Uropods and Telson (Fig. 2, f): The protopod of the uropod bears 3-4 microscopic blunt teeth on its posterior margin facing the endopod. The exopod and endopod are quite similar in shape—roughly oval, though endopod is slightly smaller than the exopod. The anterior margin of either ramus is convex and terminates distally in a distinct notch from where the convex distal margin begins. From this lateral notch starts a very thin, wavy horizontal ridge which bears several minute but prominent teeth and extends almost beyond the $\frac{3}{4}$ area of the ramus. The exopod bears on the lateral notch 3 minute teeth of which the one near the junction of the distal and anterior margins is larger than the remaining two. There are 14-16 such teeth on the horizontal ridge of the exopod. In the endopod there are two minute teeth on the lateral notch and about 10 teeth on the horizontal ridge. No mid-longitudinal suture was observed.

Telson (Fig. 2, f): It is longer than broad with its lateral and posterior margins convex, the posterior margin being more convex than the lateral. There is on either side a shallow notch at the junction of the posterior and lateral margins. There are no teeth, tubercles, spines or carinae on the telson.

MATERIAL

A single specimen (male) was collected at the edge of Karla creek (Ratnagiri) while digging for *Thalassina anomala* (Herbst).

1 ♂
 Length of carapace=8.00 mm. } Total length=21.5 mm.
 Length of abdomen=13.5 mm. }

Variation :

The Japanese specimens as described by Sakai (1962) differ from the single Ratnagiri specimen in the following :

Rostrum has 5 lateral teeth ; all the joints of the chelipeds are smooth with no tubercles or teeth ; in the abdomen, the 6th segment is more than 3 times the 1st segment, the 2nd and 3rd are larger than the 6th, and the 4th and 5th are more or less of the same size ; no lateral notch on the rami of the uropods, protopodite without tubercles, a mid-longitudinal suture on the rami ; no lateral notch on the telson.

DISTRIBUTION: Tokyo Bay; Rukuoka, Amakusa; Kagoshima; Iriomote-jima, Ryukyu; Schuan, Korea.

This species is recorded for the first time from India.

Family THALASSINIDAE Dana

The family is monotypic.

Genus *Thalassina* Latreille

2. *Thalassina anomala* (Herbst) (Figs. 3-4).

Cancer (Astacus) anomalus Herbst, 1804, p. 45; *Thalassina anomala* de Man, 1915, p. 445; 1928 b, p. 5; Sankolli 1963, p. 600.

Carapace: As observed by de Man (1928 b), there are considerable variations in the armature of the carapace, chelipeds and the anterior margin of the sterna of the second to fifth abdominal segments of *T. anomala*. He has given fairly substantial account of these variations in the 22 specimens of the species, examined by him. However, whether these variations occur due to sex, size, season or locality have not been ascertained. As such studies from this viewpoint were extended to 70 specimens collected by me over a period of 4½ years. Though recorded, it is considered superfluous to include here an elaborate description of all the characters much less specimenwise in all the 70 specimens examined by me. However, an account of the range of variations in each of the characters is furnished as under:

The rostrum is triangular, with a slight median furrow and extends to the distal end of the last but one segment of the antennular peduncle. Its lateral margin is dentate. The teeth are small, broad and their number varies from minimum of 8-9 and maximum of 14-20 on either side in males, and from 3-6 to 17-19 in females.

The eyes are small and the cornea is generally antero-laterally placed and not dilated, but in a few cases, it is anteriorly situated.

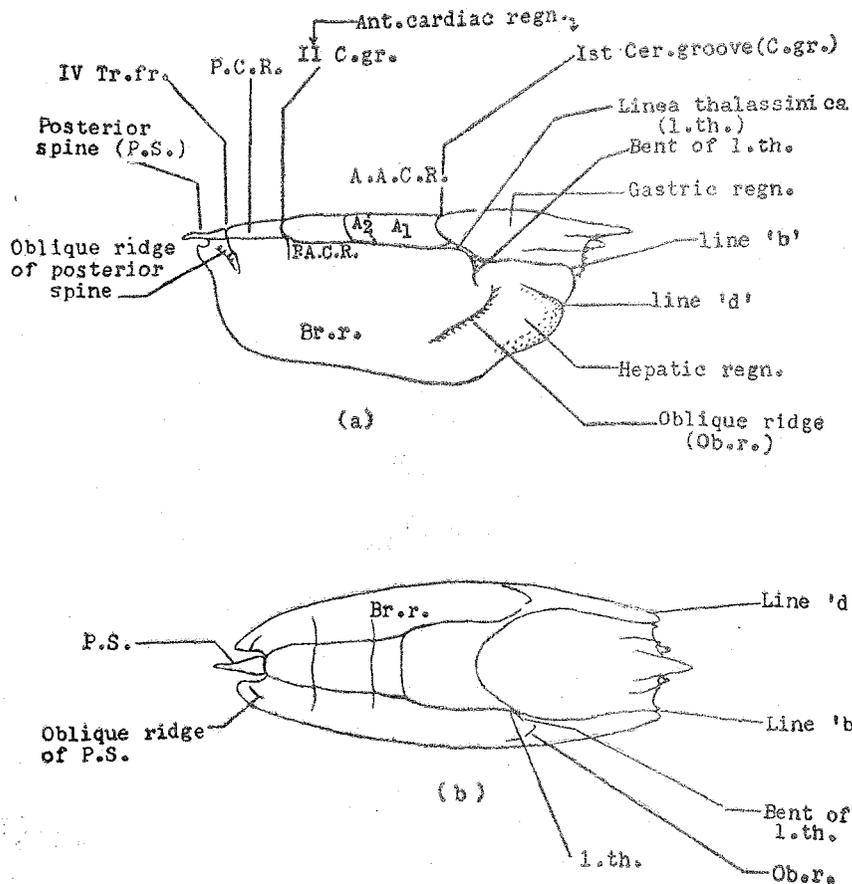
The gastric region is practically smooth except for a few punctae situated anteriorly and several rugae-like irregular depressions posteriorly on the sides (Fig. 3a & b).

The cervical groove is deep and armed with 2-12 spine-like tubercles.

The cardiac region which extends from 1st cervical groove to the 4th transverse furrow in front of the posterior spine, is divided into anterior and posterior (P.C.R.) portions by the 3rd transverse furrow or the 2nd cervical groove.

The anterior cardiac region, in turn, is further divided into anterior (A.A.C.R.=A₁+A₂) and posterior (P.A.C.R.) portions by the 2nd transverse furrow. The anterior portion of the anterior cardiac region is

again divided into two halves (A_1 and A_2) by the 1st transverse furrow. The A_1 region is armed with 1-2 spines on either side and a few punctae. Generally the 1st transverse furrow is distinctly visible. In two males, however, the furrow was very indistinct and A_1 region was provided with 5 spines. The A_2 region is also armed with spines which vary from 0-4 on either side, though 2 seems to be the common number. The 2nd



Thalassina anomala (Herbst) (Diagrammatic)

Fig. 3. a. Dorso-lateral view of anterior part of body, b. Dorsal view of anterior part of body.

transverse furrow is generally indistinct. A.P. (=P.A.C.R.), i.e. the posterior portion of the anterior cardiac region, is provided with 0-10 small spines, except in a male, 124 mm. long, which had 14 such spines.

The posterior cardiac region (P.C.R.), presents a lot of variations in its armature. There are 0-9 spines which are blunt to sharp and some punctae or irregular depressions. It is very rarely smooth.

The posterior spine (P.S.) region shows 0-4 tubercles which are blunt to sharp with irregular depressions.

The oblique ridge on either side of the posterior spine is armed with 3-4 sharp, erect spines, with their tips bent anteriorly.

The lower half of the branchial region (Br.r.) is studded with minute, sharp tubercles and in the anterior half, the tubercles become more sharp and prominent. The upper half between the *linea thalassinica* and the oblique ridge (Ob.r.) is provided with sharp spines which are fairly larger than those on the lower half. The remaining middle area of the branchial region is almost smooth with minute punctae. The oblique ridge is provided with 11-18 sharp, long spines.

The hepatic region is armed with granular but acute tubercles along its anterior border and the remaining part of its surface is smooth.

The antennal margin, situated between the lines 'b' and 'd' bears 5-15 small spines to irregular tubercles and the region between these two lines, is quite smooth.

The front between the rostrum and the line 'b' is armed with 2-6 acute spines of which the one nearest to the rostrum is generally much larger than the remaining ones, though sometimes it is twice as large as the others.

Chelipeds (Fig. 4, g) : The chelipeds are equal, subequal and similar or often unequal and dissimilar, the right or left being larger.

Dactylus : Its upper surface is smooth with a few punctae in the middle ; the upper border is often minutely dentate. The upper inner margin is armed almost to the tip with 24-28 compressed, small teeth, decreasing in size distally. A row of minute granules is present on the inner surface, more or less parallel to its cutting edge and a broken row of 3-5 unequal, minute tubercles present on the proximal half near the upper inner margin and is often armed with a large blunt tubercle at its base. Between this row and the cutting edge, which is armed with 24-26 unequal teeth, the proximal 1-3 of which are larger, there are 2-3 unequal but large, blunt tubercles proximally. The blunt tubercles are very large in larger specimens.

Propodus : The outer surface is studded entirely with small granules which are quite prominent in the lower half and near the carpal articulation ; the surface is smooth near the articulation with the dactylus. The upper inner margin is provided with 13-23 compressed teeth, which decrease in size distally. The upper outer border is armed with about 30-48 sharp teeth which are often depressed and quite low in larger specimens, and decrease in size distally. A row of 37-41 much depressed flat tubercles is present on the mid-lateral surface ; this row sometimes

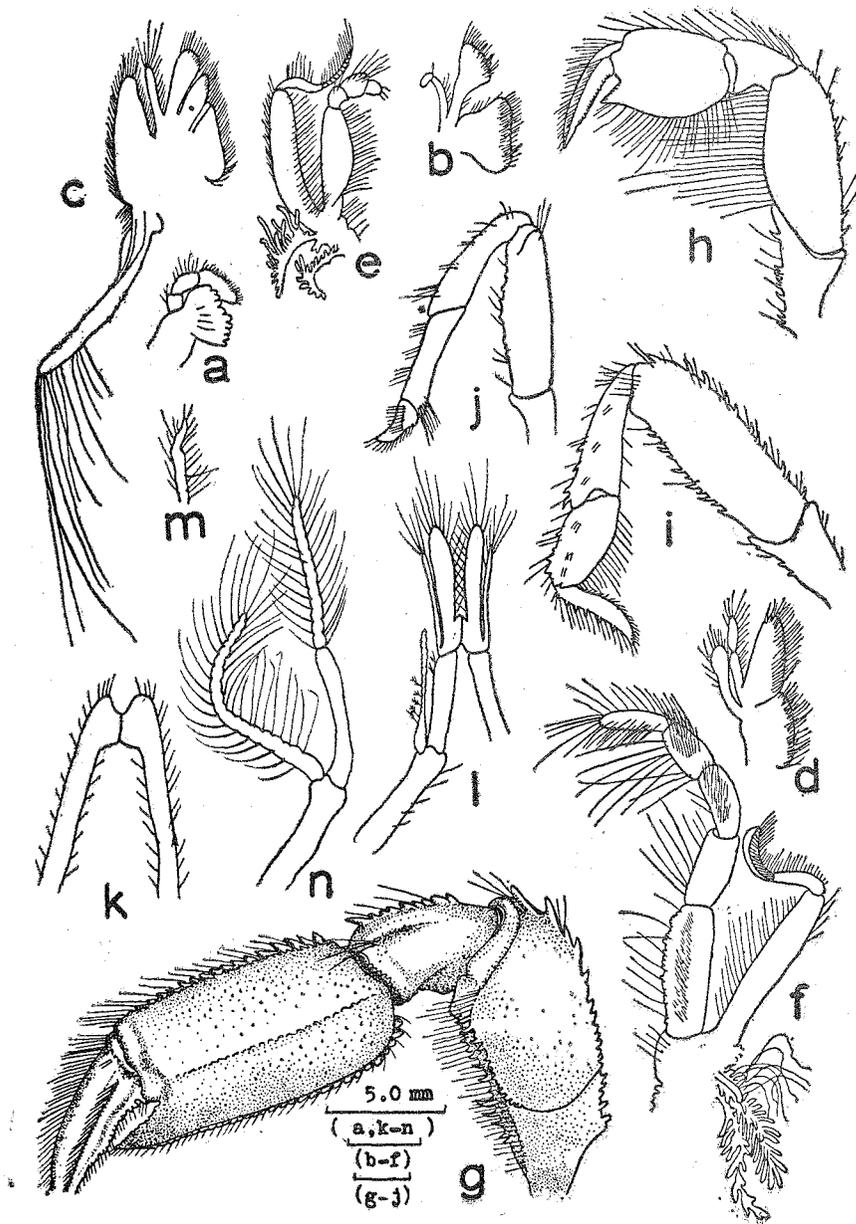


Fig. 4, *Thalassina anomala* (Herbst). *a*—mandible, *b*—first maxilla, *c*—second maxilla, *d*—first maxilliped, *e*—second maxilliped, *f*—third maxilliped, *g*—cheliped, *h*—second leg, *i*—third leg, *j*—fifth leg, *k*—first pleopod of male, *l*—second pleopod of male, *m*—first pleopod of female, *n*—second pleopod of female.

practically fades away near the distal margin. The outer lower margin is armed with 24-34 compressed teeth all along upto the base and not to the tip of the fixed finger. The inner surface is covered with fairly large conical tubercles in its lower proximal portion and with finely granulated tubercles on the rest of the area, as on the outer surface. There are two parallel rows, on the inner surface, of well-developed conical tubercles running near and along the outer lower margin, these two rows finally uniting into one near the distal $\frac{1}{3}$ and continuing almost to the tip of the fixed finger. There is generally, a semicircular row of 4-14 tubercles at the base on the inner side of the fixed finger but in very few specimens this row is absent. The outer surface of the fixed finger is practically smooth in my material. The oblique row of 12-13 tubercles on the outer surface of the fixed finger, as mentioned by de Man (1928b), is not present in my specimens.

The fixed finger is $\frac{1}{4}$ to $\frac{1}{2}$ the length of the dactylus and its cutting edge is armed with 11 low, flat teeth of which the proximal 1-3 are larger in many specimens.

In males, the proportion of length to breadth of palm was 1.37 : 1 and in females it was 1.56 : 1.

Carpus : The upper inner border is armed with 6-12 teeth of which the distal teeth are larger. The outer surface is almost smooth except for granular tubercles in the distal portion along the outer lower margin. There is, sometimes, a row of 2 small and 2-3 slightly larger tubercle-like teeth on the upper half of the outer surface, almost parallel to the upper inner margin. The inner surface, sometimes, has in the middle 4-5 granular tubercles, otherwise it is generally smooth.

Merus : The upper margin has generally 14-18 acute, small teeth of which the distal 3-4 are larger, though in a few specimens, the number of teeth was 24. The outer lower margin is armed with 14-23 spines, 15-18 appears to be the common number ; the distal 3-8 are generally larger. The mid-ventral line is fringed with long setae and armed with 3-9 unequal spines, 3-6 being the common number. The inner lower margin is with 21-24 low, short teeth which decrease in size distally.

Ischium : Its mid-ventral surface is armed with 5-9 unequal spines of which generally the distal 3-5 are thick and strongly developed. These spines are edged on the outer side with long setae as in the merus.

Smaller cheliped : In all the specimens examined, it does not differ much from the major cheliped except for the smaller size and the length of the propodus which is 1.53 times its breadth.

Second leg (Fig. 4, h) : It is subchelate. The propodus is highly flattened with its lower distal portion forming the chelate structure with

the dactylus. The basi-ischial joint is armed with 6-11 unequal spines of which the distal 1-2 are the largest. The upper margin of the merus is provided with 5-8, unequal anteriorly bent sharp spines and its lower border is smooth. This segment of the second leg is much broader than the corresponding segment of the remaining legs.

Third leg (Fig. 4, i) : The merus bears on its anterior margin 3-17 unequal spines, 6-11 (6-9 common) on outer posterior margin, of these the distal ones are larger than the rest. The inner posterior margin has 3-4 unequal tooth-like spines, the distal ones being larger. The basi-ischial joint has 3-9 spine-like tubercles, though 2-3 is the common number. The coxopodite is provided with 3-6 spine-like tubercles in the mid anterior margin.

Fourth leg : The anterior margin of the merus is provided with 3-10 small spines ; the inner posterior with 7-12 unequal spines. The outer posterior border bears 4-9 unequal spines. The basi-ischium is armed with 2-7 unequal spines. The coxopodite has 3-9 spine-like tubercles arranged along the mid-anterior portion, the number of tubercles rarely reaching up to 12.

Fifth leg (Fig. 4, j) : The merus has on its anterior margin 2-9 unequal spines or teeth and 2-8 very small teeth on its inner posterior margin. Its outer posterior margin is provided with 2-7 small, unequal teeth. The basi-ischium does not bear any spines or teeth. The coxopodite bears 3-9 unequal spines on its posterior margin.

Abdomen : In length the 4th abdominal tergum is 1.40 times its breadth. The lateral ridge of the second segment has 6-10 granular tubercles which are often indistinct. The lateral ridge of the third segment is less developed and in the subsequent segments this ridge becomes less and less prominent than that of the first segment and is provided with punctae. The pleural margin of the second to sixth abdominal segments is generally distinctly tuberculate, though sometimes with rudimentary tubercles.

The sternum of the second abdominal segment is provided at the middle with a single prominent and rather sharp tubercle which is either anteriorly or ventrally directed and the side tubercles are entirely absent. The median tubercle of the third segment is somewhat blunt and the side tubercles are generally absent but in one specimen (male, 124 mm.) a single distinct tubercle was present on the left anterior margin. In the fourth and fifth segments, the median tubercles though prominent, is posteriorly directed and the side tubercles are absent, but in the specimen mentioned above i.e. male, 124 mm., the fifth sternum has 2 distinct tubercles on either anterior margin. In the sixth segment, the median tubercle

is almost invariably absent, though in a male, 141 mm. there is a prominent tubercle just on either side of the middle and also in a female, 120 mm., a single very small tubercle is present on the middle. The side tubercles are usually absent but in a male, 150 mm., there is one tubercle present on either anterior margin and in another male, 138 mm., 2-3 minute indistinct tubercles are present on the right anterior margin only.

Antennal scale : It is generally absent but in a female (120 mm. long), a triangular, well-developed, movable, entire antennal scale was present on the right side only. The scale extended beyond the distal end of the last but one segment of the antennal peduncle. On the left side, however, the scale was found to be completely broken. Also in a male (145 mm. long), a partially broken scale was observed on the left side only, whereas on the right side it was altogether broken.

de Man (1928b, p. 9) remarks regarding a young male (116 mm. long) from the mouth of the river Barito, that the specimen presented, perhaps, on each antennal peduncle, a scaphocerite. But he could not observe it with certainty. Also regarding var. *squamifera* he expresses ' . . . it must be left to the later researchers to examine whether characters of this variety are indeed constant so that the possession of the scaphocerite constantly coincides with the characters of the sternal ridges.' Of course, the knowledge of *squamifera* is based on 4 specimens only—1 male and 3 females. Hence, it is possible that the presence or absence of the antennal scale may not be a reliable character in separating out the var. *squamifera* from the typical species *T. anomala*, as per above observations.

MATERIAL :

About 70 specimens were collected from the following localities : Karla and Mazgaon (Ratnagiri) ; Vengurla (Ratnagiri District) and Versova (Bombay suburban).

The males ranged from 86 to 155 mm. ; non-ovigerous females from 95 to 143 mm. and ovigerous females from 150 to 160 mm.

I have seen colonies of mounds of *T. anomala* in the mangrove swamps off Karla, Mazgaon and Vengurla in Ratnagiri District and in Versova and Port Navha in the Bombay suburban area. The detailed observations on the ecology of this animal is dealt with elsewhere (Sankolli 1963).

Only once, a few (3) berried females were collected in the month of October 1963. Thereafter, I have not been able to collect berried females.

Remarks :

This study reveals that variations are individual rather than due to sex, size, season or locality.

Also, the presence or absence of antennal scale or scaphocerite appears to be a variable character and probably it is not a reliable taxonomic character.

DISTRIBUTION: Mergui Archipelago ; North Coast of Nias ; Sumatra ; Indonesia ; Singapore ; East China Sea ; Philippines ; British New Guinea ; New Guinea ; North West Australia ; New Britain ; Fiji Islands ; Samoa Islands.

(to be continued)