

1955

A REVIEW OF PHILIPPINE ALBUNEIDÆ, WITH  
DESCRIPTIONS OF TWO NEW SPECIES

By RAOUL SERENE

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THE PHILIPPINE JOURNAL OF SCIENCE

Published by the National Institute of Science and Technology  
Manila, Philippines

VOLUME 94, No. 1, MARCH, 1965

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1965

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(Received for publication, February 8, 1965.)

SIX PLATES AND TWELVE TEXT FIGURES

The genera and species of Albuneidæ, which had been identified in the National Museum collection in Manila are: *Albunea symnista* Linné, *Albunea microps* Miers, *Albunea steinitzi* Holthuis, *Albunea dayriti* sp. nov., *Albunea paradoxa* Gordon, and *Zygopa nortoni* sp. nov. These specimens were collected in marine waters of the Philippines.

The actual status of the Indo-Pacific genera and species of Albuneidæ is here discussed briefly with a view to differentiating the new forms described. It is hoped that the key for the identification of the different species of *Albunea* together with the illustrations of the present paper will be useful in the revision of the existing collections in some of the museums in the Southeast Asian region.

Some specimens of *A. symnista* from the collection of the Marine Research Laboratory (Djakarta) of Indonesia had been examined for comparative purposes. One specimen, identified as *A. thurstoni*, in their collection, had been loaned to us by the Zoological Survey of India at Calcutta. The senior author was allowed to examine the specimens in the collection of the Crustacea Laboratory of the National Museum at Paris. The invaluable help of the Southeast Asia Science Cooperation Office of UNESCO in allowing us the use of UNESCO equipment in making the illustrations is gratefully acknowledged. We express our thanks to the personnel of all the scientific institutions or organizations who have, in some way or another, given us their assistance in our work. The specimens used bear catalogue numbers which are preceded by the following abbreviated names adopted for each institution: National Museum of the Philippines (NMP), Institute of Marine Research of Indonesia (IMRI), Zoological Survey of India (ZSI).

The sizes of the specimens given in this paper are always in millimeter and where, in a given catalogue number, two different sizes are listed, the figures represent the range from the largest specimen measured to the smallest; the dimensions  $l \times w$  are taken as follows:

The length ( $l$ ) is the vertical distance between the anterior border of the ocular sinus, rostral spinule excluded, and the border of the posterior sinus of the carapace measured at the median line.

The width ( $w$ ) is the horizontal distance between the tips of the two antero-lateral spines of the carapace.

#### Family ALBUNEIDÆ Stimpson

Albuneidæ STIMPSON (1858) 230; MIERS (1878) 326; NOBILI (1908) 142; GORDON (1938) 186; BALSS (1957) 1599.

The family Albuneidæ comprises the following genera: *Lophomastix* Benedict (1904), 3 species (Japan and California); *Blepharipoda* Randall (1839), 4 species (Chili, Argentina, China); *Albunea* Fabricius (1795), 13 species (Cosmopolitan); *Lepidopa* Stimpson (1858), 11 species (American Pacific and Atlantic); *Zygopa* Holthuis (1960), 1 species (Curaçao).

The separation between *Lophomastix* and *Blepharipoda* has been clearly established by Schmidt (1921). Balss (1957) considers *Blepharipoda* as strictly American, but Shen (1949) described *Blepharipoda liberta* from China (paper not seen).

The distinction between *Albunea* and *Lepidopa* was clearly defined by Gordon (1938) who considers the second genus as strictly American.

*Zygopa* was established by Holthuis (1960) for a new species with a very peculiar ocular peduncle entirely different from those of all the other genera.

These genera may be differentiated by using the following key:

1. Eye peduncles distinct, separated one from the other.
  - a. Eye peduncles cylindrical, slender, elongate.
    - a<sup>1</sup>. Eye peduncles rigid, composed of only one joint.
 

*Lophomastix*.
    - b<sup>1</sup>. Eye peduncles divided in two joints by a medium articulation.
 

*Blepharipoda*.
  - b. Eye peduncles more or less lamellar, generally squamiform, with a terminal cornea or with a more or less obsolete cornea.
    - a<sup>1</sup>. Spine at antero-lateral angle of carapace situated ventrad to *linea anomurica* ..... *Albunea*.
    - b<sup>1</sup> Spine at antero-lateral angle of carapace situated dorsad to *linea anomurica* ..... *Lepidopa*.

2. Eye peduncles small, fused together; spine at antero-lateral angle of carapace situated in dorsal position to *linea anomurica*, as in *Lepidopa* ..... *Zygopa*.

Genus ALBUNEA Fabricius

*Albunea* FABRICIUS (1793) 473; MIERS (1879) 326; GORDON (1938) 186; BALSS (1957) 1599.

The following are the Indo-Pacific species of this genus:

*Albunea symnista* Linné (1766) (Java, Australia, Red Sea, Indian Ocean); *Albunea speciosa* Dana (1852) (Hawaii); *Albunea microps* Miers (1878) (Sooloo); *Albunea thurstoni* Henderson (1893) (Madras, India); *Albunea elioti* Benedict (1904) (Samoa); *Albunea paradoxa* Gordon (1938) (Singapore); *Albunea steinitzi* Holthuis (1958) (Red Sea).

The insufficiency of the description and the lack of illustration of *A. speciosa*, a species never recorded after Dana (1852) as far as we know, constrains us from including it in our identification key.

*A. elioti*, only known by the type specimen, and generally considered as a synonym of *A. microps* is also excluded. In these two species, the cornea is situated at the external border of the eye peduncle, which latter structure presents a distal concavity instead of the regular convexity of this border in *A. symnista*. In *A. microps* the internal border is convex, while in *A. symnista* it is straight [for *A. elioti* see Benedict (1904) fig. 2; for *A. microps* Gordon (1938), fig. 3c; and for *A. symnista* Gordon (1938), fig. 3f].

Gordon (1938) described the precise distinction between *A. microps* and *A. thurstoni* by giving the illustrations of the eye peduncles of the two species which were made possible by actual reference to the type specimens, preserved in the British Museum. She also illustrated specific characters of *A. symnista* and *A. paradoxa*. Holthuis (1958) described the difference between *A. steinitzi*, *A. symnista*, and *A. thurstoni*. A new species, *A. dayriti*, is described in the present paper.

On the location of the types of the different species, we can state the following: *Albunea symnista* (probably no type designated); *Albunea thurstoni* in the British Museum, London; *Albunea microps* in the British Museum, London; *Albunea paradoxa* in the British Museum, London; *Albunea steinitzi* in Rijksmuseum van Natuurlijke Historie, Leyden; *Albunea dayriti* in the National Museum, Manila; *Albunea speciosa* (probably lost as were many of the types of Dana); *Albunea elioti* in the U. S. National Museum, Washington, D. C.

Key to the species of the genus *Albunea*

1. Frontal margin of carapace with spinules on either side of ocular sinus.
  - a. Eight or more frontal spinules on either side of ocular sinus; cornea well defined, more or less terminal.
    - a<sup>1</sup>. Eye peduncles approximately (a little less in *symnista* or more in *microps*) twice longer than wide, with a convex external border in an oval outline.
      - a<sup>2</sup>. Dactylus of pereopod 3 with a spur near articulation with propodus ..... *A. symnista*.
      - b<sup>2</sup>. Dactylus of pereopod 3 without spur [Miers (1878)].  
*A. microps*.
    - b<sup>1</sup>. Eye peduncles more than twice longer than wide with a conic outline.
      - a<sup>2</sup>. Dactylus of pereopod 3 with a spur near articulation with propodus; 9 to 11 frontal spinules on either side of ocular sinus ..... *A. steinitzi*.
      - b<sup>2</sup>. Dactylus of pereopod 3 without spur; 8 to 9 frontal spinules on either side of ocular sinus ..... *A. thurstoni*.
  - b. Less than eight frontal spinules on either side of ocular sinus; cornea not clearly visible, not terminal ..... *A. dayriti*.
2. Frontal margin of carapace without spinules on either side of ocular sinus; eye peduncles very flat, without visible cornea .... *A. paradoxa*.

**ALBUNEA SYMNISTA** Linné. Pl. 1, fig. 1. Pl. 2, fig. 1; Pl. 3, figs. 1, 1a; Pl. 4, fig. 1; Text figs. 1A, 2A, 3, 4A, 5A, B, D, 6A, B, B'

*Albunea symnista* LINNÉ (1766) 1053 (*Cancer symnista*); FABRICIUS (1793) 474; HERBST (1796) 5, Pl. 22, fig. 2 (*Cancer dorsipes* nce Linné); FABRICIUS (1798) 397; LATREILLE (1803) 221; DESMAREST (1825) 173, Pl. 29, fig. 3; H. MILNE EDWARDS (in Cuvier) (1837) 203, Pl. 42, fig. 3; LUCAS (1853), Pl. O, fig. 8; HELLER (1865) 72; MIERS (1878) 326; HENDERSON (1893) 409; ORTMANN (1896) 223; NOBILI (1906) 142, *pars=steinitzi*; GORDON (1938) 190, fig. 3f, 4c.

**Material.**—*NMP 298*, size range, from 15.9 × 19 to 14.9 × 17 (5 specimens) Nasugbu, Batangas Province; *NMP 495*, size range, from 10 × 11.5 to 9.5 × 10.5 (2 specimens) Sisiman Bay, Luzon; *NMP 537*, size range, from 11.4 × 13.7 to 10.1 × 11.8 (2 specimens) Catarman, Samar Province; *NMP 736*, size 7.5 × 9.5 (1 specimen) Nazasa Bay, Zambales Province; *NMP 908*, size range, from 10.5 × 12.2 to 10.4 × 12 (3 specimens) Lusong Cove, Bataan Province; *NMP 1258*, size 6.5 × 7.2 (1 specimen) Habangatanan, Agno, Pangasinan Province; *IMRI 274*, size 15 × 17.5, *IMRI 285*, size 16 × 19; *IMRI 286A*, size 15 × 18; *IMRI 286B*, size 13 × 15.5.

**Observations.**—*A. symnista* is the type species of the genus; it is the largest, the best known and the most common with the widest geographic distribution in the Indo-Pacific region.

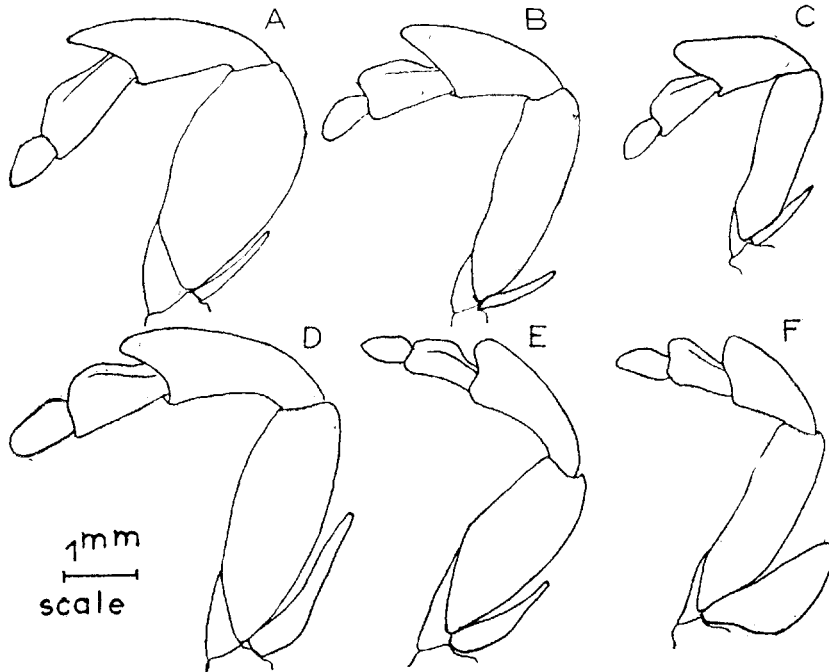


FIG. 1. Third left maxilliped: A, *Albunea symnista*, IMRI 174; B, *Albunea steinitzi*, NMP 796; C, *Albunea steinitzi*, NMP 498; D, *Albunea dayriti*, NMP 938; E, *Albunea paradoxa* NMP 732; F, *Zygopa nortoni*, NMP 733.

The magnification of A is one half that of B, C, D, E, F. All the setæ have been omitted.

All the specimens in the National Museum of the Philippines range in size from  $6.5 \times 7.2$  to  $15.9 \times 19$  and with from 8 to 13 spinules on each side of the ocular sinus.

The specimens from Indonesia (274, 285, 286A, 286B) are similar and approximately of the same size; all with 12 to 14 spinules on each side of the frontal margin.

*A. symnista* attains the length of 25, although specimens studied by us range from 7.2 to 19; all the other species of the genus are recorded with a length of less than 12 or 13. A good differentiation might be established by comparison of specimens of *A. symnista* of one size to specimens of the same size of other species. *A. symnista* resembles *A. steinitzi* closest, hence a comparison of the two species will be made by using specimens of approximately the same size.

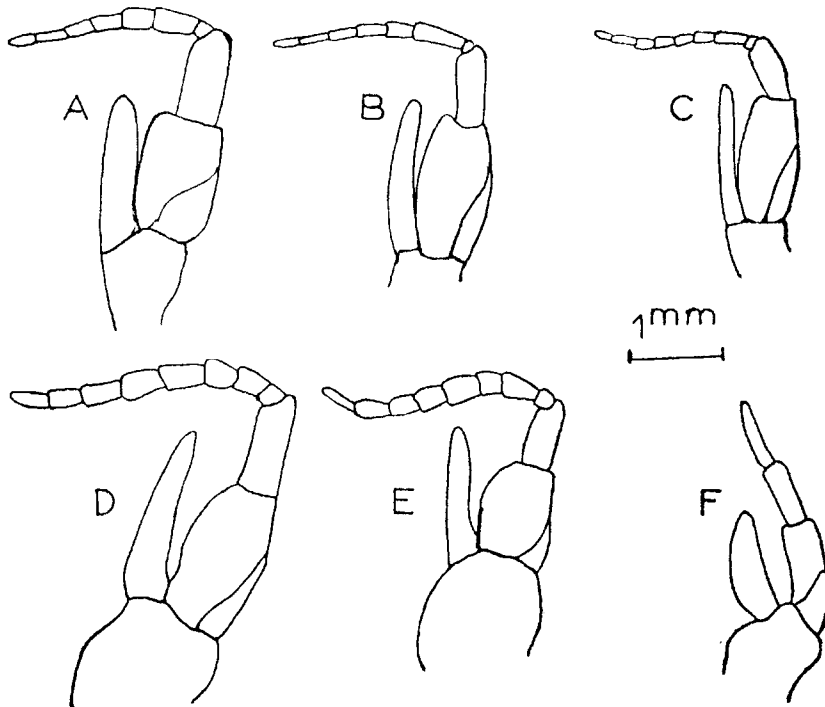


FIG. 2. Left antenna, in lateral view: A, *Alburnea symnista*, IMRI 274; B, *Alburnea steinitzi*, NMP 796; C, *Alburnea steinitzi*, NMP 498; D, *Alburnea dayriti*, NMP 938; E, *Alburnea paradoxa*, NMP 732; F, *Zygopa nortoni*, NMP 733.

The magnification of A is one half that of B, C, D, E, F. All the setæ have been omitted.

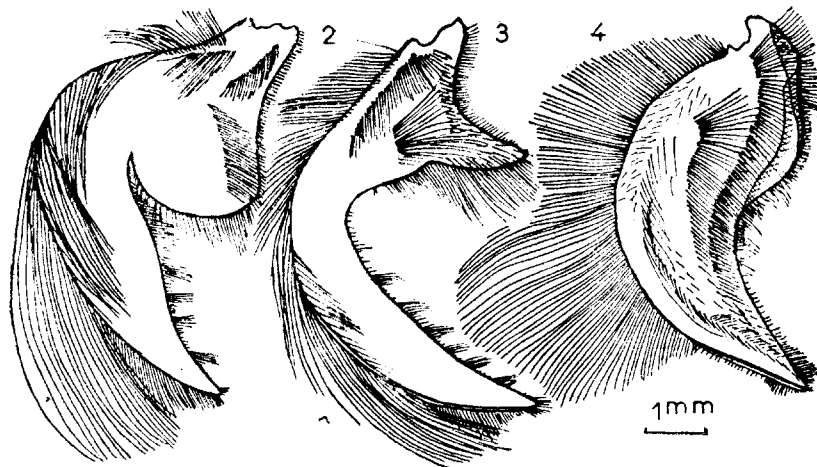


FIG. 3. Inner side of pereopods 2, 3, and 4 with setæ, of *Alburnea symnista*, IMRI 286.

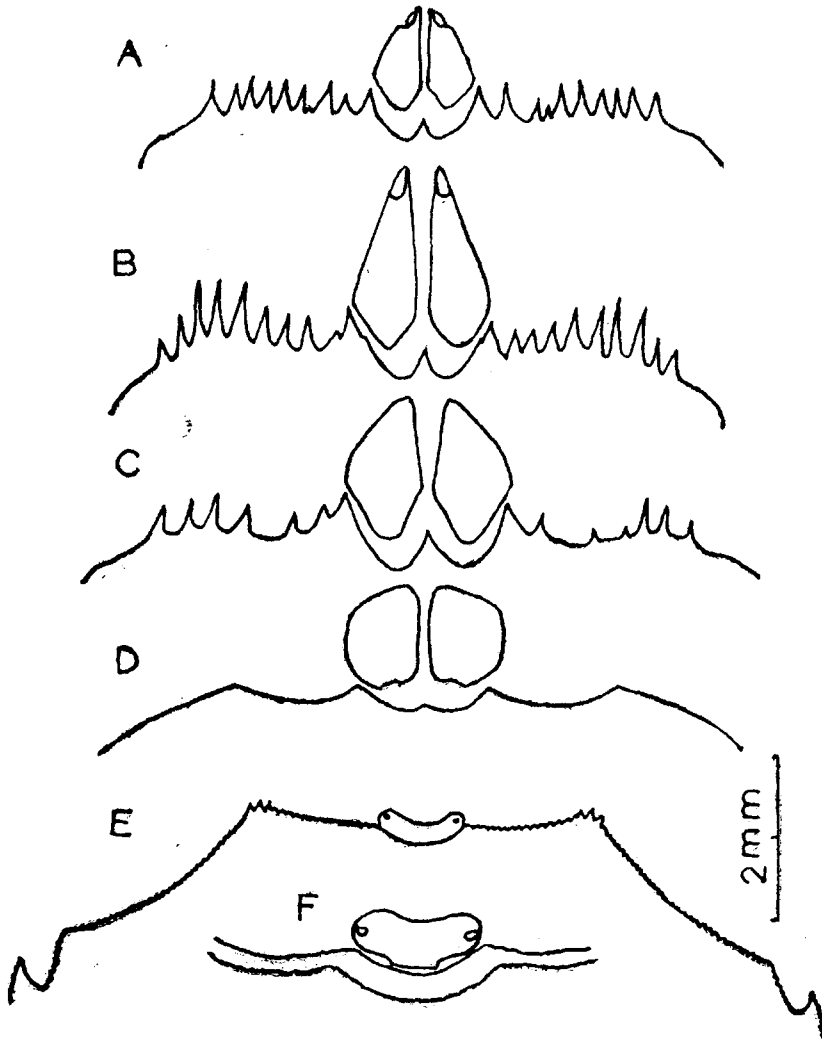


FIG. 4. Frontal margin of carapace with the eye peduncles of: A, *Albunea symnista*, NMP 1258; B, *Albunea steinitzi*, NMP 1261; C, *Albunea dayriti*, NMP 938; D, *Albunea paradoxa*, NMP 732; E, *Zygopa nortoni*, NMP 733; F, *Zygopa nortoni*, NMP 733, eye peduncles enlarged, in antero-frontal view (see photograph in Plate 3, figs. 8, 8a.)



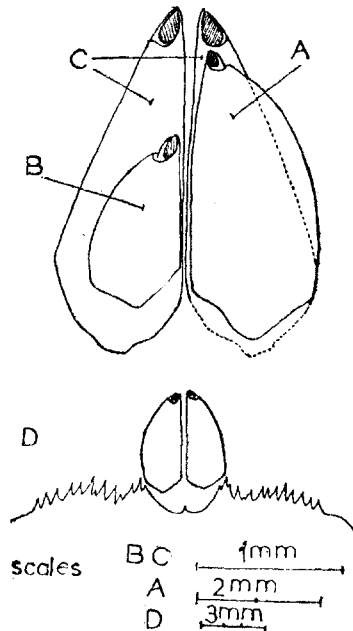


FIG. 5. The eye peduncles superimposed on each other of: A, *Albunea symnista*, IMRI 286A; B, *Albunea symnista*, NMP 1258; C, *Albunea steinltzi* 1261; D, *Albunea symnista*, IMRI 286A, eye peduncles in situ on antero-frontal margin of the carapace.

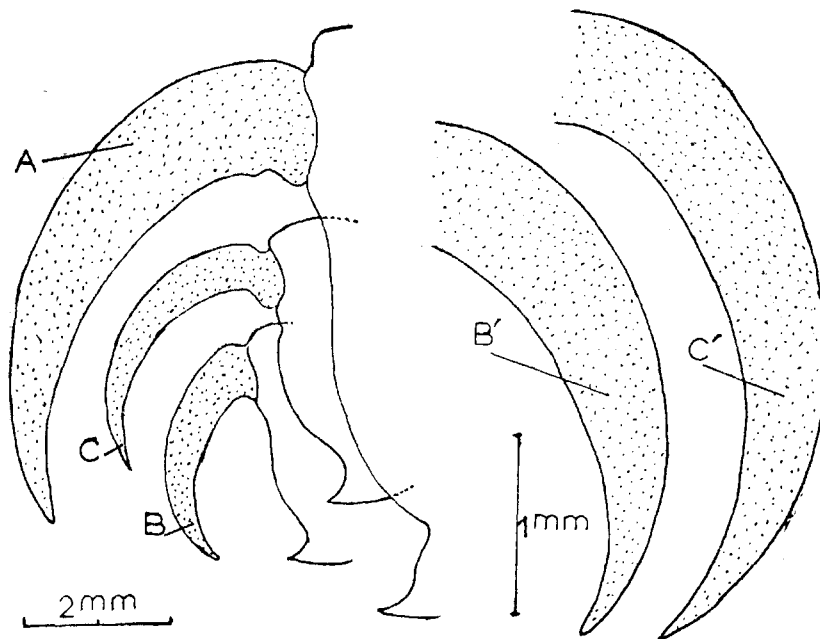


FIG. 6. Dactyli of the chelipeds of: A, *Albunea symnista*, IMRI 286A; B, B'—*Albunea symnista*, NMP 1258; C, C' *Albunea steinltzi*, NMP 1261.

However, *A. symnista* shows some individual variations of certain characters which are not always related to the size of the specimens. In 1960, the senior author examined some series of specimens of *A. symnista* in the collection of the National Museum in Paris and noted particularly the following:

1. The outline of eye peduncle—In certain specimens the external border is less convex than in others, although the outline is never similar to that of *A. steinitzi*. This variation sometimes seem to be without relation to the size. One specimen, 24 in length and approximately of same size as that illustrated by Gordon [(1938) fig. 3f] and with a very different outline has a less convex border. Nothing similar had been observed in the material of the present collection.

2. The dactylus of pereopod 4. The antero-lateral border shows a sharper curvature in some specimens. Such an outline which is similar to that illustrated by Gordon [(1938) fig. 4c] for a specimen 17.4 in length is typical of specimens 17 or 18 mm long. However, in some specimens of this size the arc is always strong.

3. The spur on the dactylus of pereopod 3 is always developed, but in some specimens it is much longer and with more acute tip. The distribution of the setæ on the internal surface of the dactyli of pereopods 2, 3, and 4 is illustrated (Text fig. 3).

**ALBUNEA MICROPS** Miers. Pl. 4, figs. 1-6; Text figs. 12 C.

*Albunea microps* MIERS (1879) 328, Pl. 5, figs. 12, 13; WHITE (1847) 129 (Descriptio nulla); GORDON (1938) fig. 3c.

*Material*.—*NMP 795*, size range, from 12.5 × 13.2 to 7.5 × 9 (32 specimens) Cape Calavite, Mindoro Island; *NMP 912*, size range, from 13.7 × 16 to 8 × 9 (10 specimens) Lusong Cove, Bataan Province; *NMP 1351*, size range, from 7.2 × 8.3 to 6.9 × 8.2 (2 specimens) off Cape Melville, Balabac Island; *NMP 1394*, size range, from 11.5 × 12.4 to 8 × 9 (15 specimens) Tawi-tawi Bay, Sulu Archipelago; *NMP 1397*, size range, from 11 × 13 to 6.9 × 8 (5 specimens) Lusong Cove, Bataan Province; *NMP 1400*, size 5.7 × 6.4 (1 specimen) Talasain Cove, Zambales Province.

*History*.—The only specimen recorded by white (1847) with neither a description nor an illustration and which was collected in the Sooloo Sea and maintained in the British Museum was re-examined by Miers (1879). Mier's description which was with figures and although short, was sufficient enough. Gordon (1938) illustrated the figure of the eye peduncle of this holotype and gave 14 mm as the size of the specimen.

*Observations*.—Our specimens agree with the specific characters defined by Miers (1879).

The eye peduncles of *A. microps* are wider and shorter than those of *A. symnista*. Also, the shape of the cornea is different. Miers (1879) described the cornea as situated on a little tuberculiform lobe and Gordon [(1938) fig. 3c] illustrated this particular characteristic in her description. Our specimens show the cornea situated at the outer edge of the overhanging anterior peduncular tip similar to what is seen in Gordon's illustration.

In our specimens, the setæ of the margins are long, numerous, and well-developed, like those in *A. dayriti* and *A. paradoxa*. The eye peduncles are somewhat ovate belonging to the *symnista* type. While the outer margin is convex, the inner is only slightly curved or arched towards both ends but never perfectly straight as in *A. symnista* proper. In fact, there is a noticeable tendency for them to be widely separated anteriorly and posteriorly. The absence of spur on the dactylus of pereopod 3, also true in our specimens, in which there is only a pronounced curvature near the articulation with the propodus, had been mentioned, by Miers (1879) as another characteristic which differentiates *A. microps* from *A. symnista*.

The carapace is widest between the antero-lateral spines, the outer outline abruptly tapering towards the posterior part where it is narrowest. As in the other species of *Albunea*, these spines are situated ventrad to the *linea anomurica*. The carapace is equally arcuate longitudinally as well as transversely. The ocular sinus is only moderately concave, in the middle portion of which is the rostral spine which is almost of the same size as the spinules immediately following it on both sides. These frontal spinules range from 8 to 10 on each side with the middle ones much larger in size.

As indicated by Miers (1879) the interrupted transverse rows of grooves which are densely fringed with short setæ on the dorsal surface of the carapace are more strongly conspicuous than in *A. symnista*.

The flagella of the antennule are approximately twice the maximum length of the carapace. The antenna is short with a long slender scaphocerite. The length of the scaphocerite is almost equal to the first segment of the antenna. This segment bears an antero-lateral spine. There is also one lateral spine on the carpus of pereopod 1, as in *A. symnista* and other allied species.

The antero-external angle of the carpus of the third maxilliped is produced to approximately a third of the proximal end of the propodus as in others of the *symnista* group.

**ALBUNEA STEINITZI** Holthuis. Pl. 1, fig. 2; Pl. 2, fig. 2; Pl. 3, figs. 2, 3, 3a, 4, 4a, 5, 5a; Pl. 4, fig. 2; Text fig. 1B, C, 2B, C, 4B, 5C, 6C, C', 7A, 9B, C.

*Albunca steinitzi* HOLTHUIS (1958) 42-44, figs. 1a-f; NOBILI (1906) 142 (*symnista* part).

*Material*.—*NMP 498*, size range, from  $6 \times 6.5$  to  $4.4 \times 4.7$  (4 specimens) Cabalite Island, Quezon Province; *NMP 499*, size range, from  $11 \times 12.6$  to  $5.7 \times 6.5$  (11 specimens) Cabalite Island, Quezon Province; *NMP 735*, size range, from  $7.1 \times 8.3$  to  $7 \times 8$  (4 specimens) Nazasa Bay, Zambales Province; *NMP 796*, size range, from  $14 \times 16$  to  $7 \times 8$  (11 specimens) Cape Calavite, Mindoro; *NMP 797*, size  $9.6 \times 11.4$  (1 specimen) Sisiran Bay, Luzon; *NMP 798*, size  $4 \times 5$  (1 specimen) Nazasa Bay, Zambales Province; *NMP 799*, size range, from  $7.7 \times 8.6$  to  $4.9 \times 5.4$  (2 specimens) Cape Calavite, Mindoro; *NMP 907*, size range, from  $8.3 \times 8.8$  to  $15 \times 16$  (15 specimens) Lusong Cove, Bataan Province; *NMP 1261*, size range, from  $7.5 \times 8.5$  to  $6 \times 6.7$  (5 specimens) Habagatanan, Agno, Pangasinan Province.

*History*.—Holthuis (1958) described the species based on 2 specimens from Eylath (Red Sea, Israel) with a length of 7 and 8, respectively. He thinks that the specimens from Obock, identified as *A. symnista* by Nobili (1906), evidently belongs to this species because they differ only in some few characteristics from other *A. symnista*, as for example, in the outline of the eye peduncle. This species is recorded from the Red Sea only; the present specimens from the Philippines extend its geographical distribution to the Far East.

*Observations*.—Our specimens agree in general with the description and figures of Holthuis (1958). Some exact characteristics of the eye peduncle will be given because this is the most specific character. Holthuis (1958) described the eye peduncle as "narrowly triangularly elongate, being broadest near the base and narrowing regularly towards the top which bears the cornea."

Nobili (1906) stated that "la longueur des peduncules oculaires deux fois largeur de leur base; la courbure des bords extérieurs est presque nulle, au lieu que chez les individus de

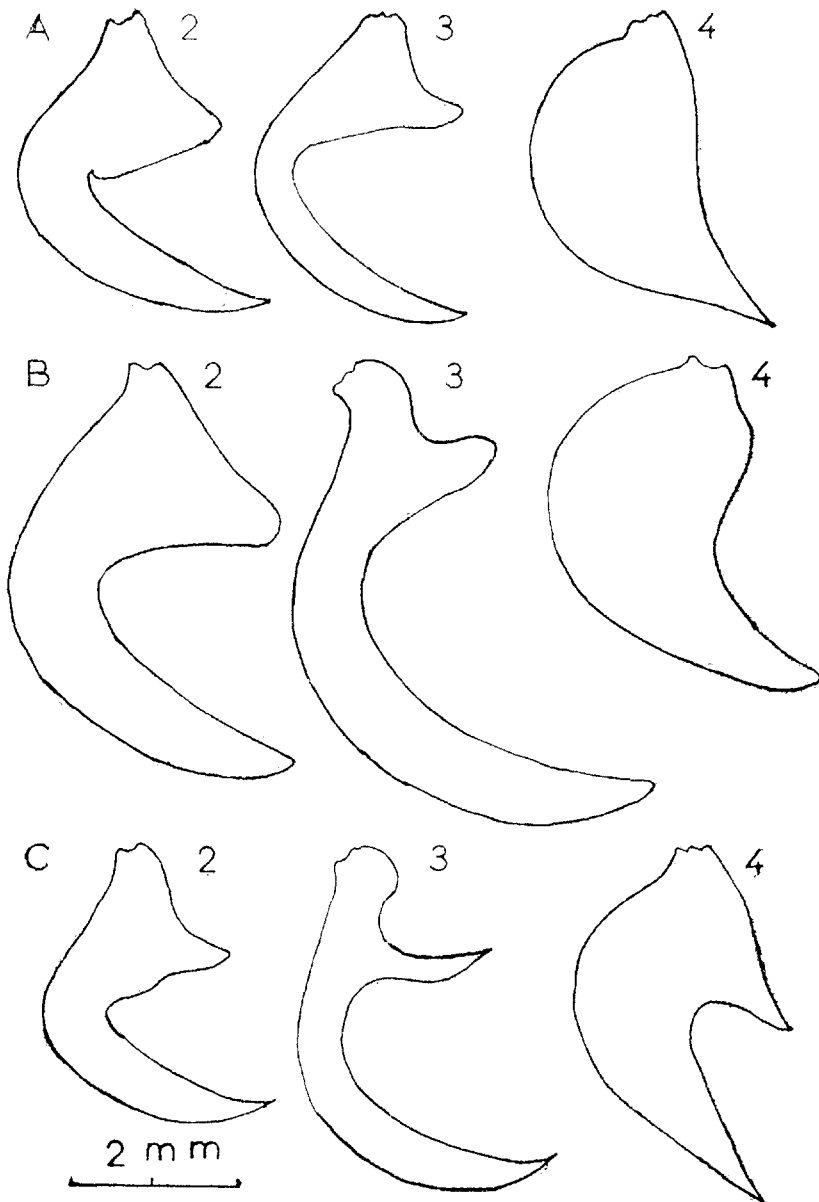


FIG. 7. The pereopods 2, 3, 4 of: A, *Alburnca steinitzi*, NMP 796; B, *Alburnca dayriti*, NMP 938; C, *Alburnca paradoxa*, NMP 732.

Pondichery la longueur est moins de deux fois la largeur et al courbure du bord est plus forte." He stated further that in his specimens the eyes are a little more than twice longer

than the width of the base. In our specimen No. 796 it is three times longer, and in Nos. 498 and 1261 a little more than twice.

The senior author examined Nobili's specimens in the National Museum of Paris and took photograph of the largest (approximately 10). In this specimen (referring to the photograph) the eyes are, like in our No. 796, thrice longer than wide. In specimen No. 1261 the length of the cornea is contained more than 8 times in the peduncle's total length; in Nobili's specimen (measured on the photograph), it is 8 times. In our small specimen No. 498, it seems that, with the size of the specimens, the length of the eye peduncle increases relatively more than its width; on the contrary, the cornea diminishes. In young specimens the external border of the eye peduncle is slightly convex but not perfectly straight as in the adult, although it is not similar to that of *A. symnista*.

Some other characters also present some slight individual variations, as for example the following:

1. The antennular flagellum is comparatively longer in No. 498 (18 for a carapace of 6.5) than in No. 796 (20 for carapace of 8).
2. The number of spines on either side of the frontal margin are as follows: in No. 498 at left 9, at right 10; in No. 796, at left 11, at right 10; in No. 1261 at left 9, at right 11. Holthuis (1958) mentions 9 to 11 in his description.

The largest specimens studied (NMP Nos. 796 and 907) reach the size ( $l \times w$ ) of  $16 \times 14$ .

*Position of the species.*—Holthuis (1958) states that although this species is very closely related to *A. symnista* and *A. thurstoni* it is clearly distinct from the latter species.

*A. steinitzi* differs from *A. symnista* by:

1. The acute apex of the dactylus of the cheliped which is blunt and truncate in *A. symnista*.
2. The triangular eye peduncle which is more than twice longer than wide, with the external border straight, as compared to *A. symnista* which is less than twice longer than wide and with a convex external border.

These differentiating characters had been established by a close comparison between our specimens of the two species with special emphasis on the following: No. 298, as a typical adult of *A. symnista*; No. 125, as a young of *A. symnista*, approximately of the same size as *A. steinitzi*; No. 1261, as a typical adult of *A. steinitzi* (size 7).

The slender tip of the dactylus of the cheliped as pointed out by Holthuis (1958), seems to be also true in our specimen, although it is difficult to detect. As is seen in the illustration (Text fig. 6), the tip which is more blunt in *A. symnista* is also observed in young specimens much smaller in size than our specimen of *A. steinitzi*. The distinguishing characteristic of the eye peduncle in the two species is also illustrated (Text fig. 5).

*A. steinitzi* also differs from *A. symnista* in the following:

1. The antennular flagellum is somewhat shorter.
2. The spines of the frontal margin are relatively longer and acute when compared, for example, to the length of the eye peduncle.

Holthuis (1958) states that *A. steinitzi* differs from *A. thurstoni*, mainly by the presence as in *A. symnista*, of a well-developed spur in the dactylus of pereopod 3, which is absent in *A. thurstoni*. This characteristic of *A. thurstoni* appears in the figures of Henderson (1893) but is not mentioned in his description. Holthuis (1958), published the illustration of pereopods 2, 3, 4 of *A. thurstoni* based on a cotype by Dr. I. Gordon.

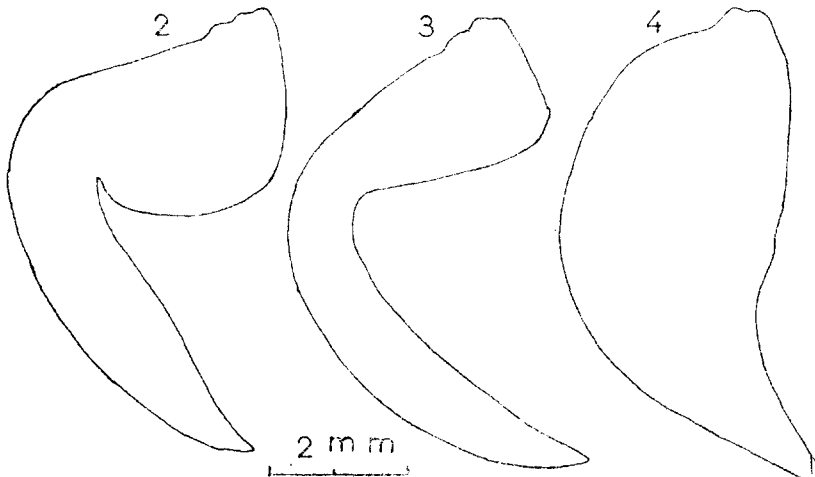


FIG. 8. The pereopods 2, 3, 4 of *Albinia thurstoni*, ZSI (Zoological Survey of India).

However, Holthuis (1958) considers that the eye peduncles of *A. thurstoni* and *A. steinitzi* are similar; Henderson (1893) had described those in *A. thurstoni* as twice longer than wide.

The individual variations of those in *A. steinitzi*, in relation to the size of the specimens, have been previously mentioned by us. The eye peduncles of our *A. steinitzi*, No. 498, are very similar to those of a cotype (with a length of 8.5 in which is shown an eye peduncle 2.5 times longer than wide, and with the cornea occupying 0.2 of the total length) of *A. thurstoni* as illustrated by Gordon [(1938) fig. 3a]. Our *A. steinitzi* No. 498 has approximately the same size; the eye peduncles less than thrice longer than wide and the cornea occupying a little less 0.25 of the total length. Because of this similarity, it was identified as *A. thurstoni* at the beginning of our study. The true identity was further confirmed by the presence of the spur on the dactylus of its pereopod 3 (Plate 4, fig. 2). The spur in our specimens seem to be a little shorter than in the figure given by Holthuis [(1958) fig. 1e] for *A. steinitzi*, and the shape of the dactylus is different from that illustrated by Holthuis [(1958) fig. 2b] for *A. thurstoni*. These remarks, however, must not be interpreted to cast any doubt as to the definite identity of our specimens as *A. steinitzi*; but rather these were included in order to give a more accurate description and illustration of *A. thurstoni*.

During a visit to the collection of the Zoological Survey of India at Calcutta (3-30-64) by the senior author, he saw a series of specimens identified as *A. thurstoni*?. He called the attention of the curator, Mr. Ramakrishna, on the importance of the study of these materials. As a result, one of these specimens, a female, size ( $l \times w$ )  $12 \times 14$  was sent to him on the loan basis. It was dry when received because the cork was in bad condition.

The identification, *A. thurstoni*, is confirmed, the illustrations included in this paper providing sufficient information on its characteristics. The eye peduncles (Text fig. 9; Plate 3, fig. 2) are very similar to those of *A. steinitzi*. The frontal margin is comparatively with less spinules. Henderson (1893) indicated 8 to 9 for *A. thurstoni* and Holthuis (1958) 9 to 11 for *A. steinitzi*. This difference is confirmed in our specimens (Plate 3). The dactyli of pereopods 2, 3, and 4 (Text fig. 7A and Plate 4, fig. 3) are similar to those illustrated by Holthuis [(1958) figs. 2a, b, c]. The telson seems to be also different in the two species; unfortunately our specimens of *A. steinitzi* are males and that of *A. thurstoni* (Plate 5, fig. 1a), a female.



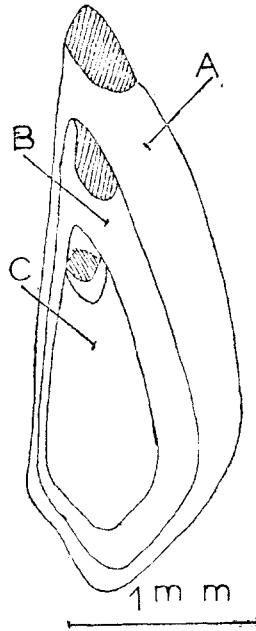


FIG. 9. The eye peduncles superimposed on each other of: A. *Albunea thurstoni*, ZSI; B, *Albunea steinitzi*, NMP 1261; C, *Albunea steinitzi*, NMP 498.

The carpus of pereopod 1 has a spine (Plate 5, fig. 1) as Holthuis (1958) had suggested, although the Henderson (1893) figure does not show it.

Henderson (1893) described *A. thurstoni* based on 5 specimens collected by Thurston at Cheval-Par (India). "The largest specimen, a male, is 14.5 long when the abdomen is extended, and the carapace is 7.5 in breadth at the front." The syntypes are deposited in the British Museum. Gordon (1938) stated that 8.5 is the carapace length of one cotype. Nobili (1906) identified 8 specimens from Beiloul (Red Sea) and are deposited in the Torino Museum as *A. thurstoni*, the largest of which is 10 long and 12 wide.

The only indication on the label of the present specimen under study is "*Albunea thurstoni* ? Orissa Coast." His size  $12 \times 14$  (using the standard measures of the present paper) is larger than the largest syntype and seems to be at least as large as the largest of Nobili (1906).

**ALBUNEA DAYRITI** sp. nov. P1. 1, fig. 4; P1. 2, fig. 4; Plate 3, figs. 6, 6a; P1. 4, fig. 4; Text figs. 1D, 2D, 4C, 7B, 10A, 12A.

*Material.*—*NMP 938*, size range, from  $8.5 \times 10.5$  type specimen to  $4.5 \times 6$  (8 specimens) Batangas Bay, Batangas Province; *NMP 500*, size,  $5 \times 6.5$  (1 specimen) Cabalite Island, Quezon Province; *NMP 913*, size range, from  $9 \times 11.6$  to  $6.4 \times 8.4$  (4 specimens) Lusong Cove, Bataan Province; *NMP 1151*, size range, from  $8 \times 10.4$  to  $5 \times 6$  (5 specimens) Busuanga, Palawan; *NMP 1260*, size  $5 \times 6$  (1 specimen) Habagatanan, Agno, Pangasinan Province; *NMP 1264*, size range, from  $7 \times 8.5$  to  $6 \times 4.6$  (3 specimens) Napo Point, Morong, Bataan Province.

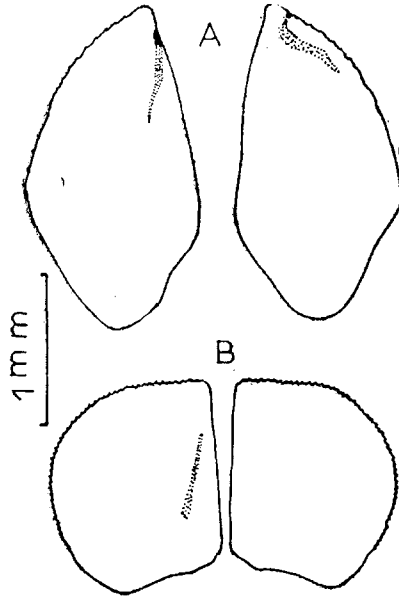


FIG. 10. The eye peduncles of: A, *Albunea dayriti*, NMP 938; B, *Albunea paradoxa*, NMP 732.

*Description.*—Carapace much wider than long, convex only towards both rear sides. It gradually narrows posteriorly where posterior border is rounded on either side of large median sinus. Deeply concave ocular sinus has an acute and strong median rostral spine. Frontal margin of carapace on either side of ocular sinus concave but becomes more convex laterally and armed with 6 or 7 widely separated spinules, submedian spinules included. In type specimen, left margin had 7 spinules and right 5, but with indications of 2 very poorly developed

ones. Strong antero-lateral spine of carapace situated on antero-lateral plate of carapace ventrad to *linea anomurica*.

Eye peduncles well developed, separated one from the other, a little less than twice longer than wide, with internal border slightly convex antero-laterally, and external margin strongly convex. Cornea sublatero-terminal, obsolete and hardly visible from dorsal view. A little calcified plate ending in two sharp triangular tips present between bases of eye peduncles.

Antennular flagella very long (43 in type specimen), more than five times length of carapace (8 in the type). Antennal peduncle with a strong scaphocerite, but without spine on antero-lateral border of first segment. Flagellum with 8 joints. Third maxilliped has antero-external angle of carpus slightly produced, just a little more than in *A. paradoxa*. Exognath strongly developed, wide at base and with a length more than half that of merus. Pereiopods of usual albuneid type; dactylus of pereiopod 3 with a spur but not very long. Telson as represented in Plate 5, fig. 2 and Text fig. 12A only a little longer than its maximum width.

*Remarks.*—In the type specimen, the cornea of the left eye peduncle differs from that of the right. The two cornea appear as pale dark spots, clearer on the ventral side of the peduncle and very slightly visible on the dorsal side. The linear pale dark spot on the right peduncle is visible as a crescent, more or less parallel to the antero-external border near the distal end. On the left peduncle it is situated more obliquely to the middle near the distal end of the antero-internal border. This pale dark spot which is completely under the translucent cuticle is more visible on the ventral side where the cuticle seem to be much thinner than on the dorsal. But where the cuticle is perfectly transparent, the distal tip of this spot presents a microscopic dot which appears like a perforation. On the right peduncle the dot is situated near the distal end of the antero-external border, while on the left peduncle, it is seen near the distal end of the antero-internal border.

The other specimens present some variations. NMP No. 938 contains specimens with spinular count of from 5 to 7 on each side of the orbital sinus. NMP No. 1260 with 4 spinules to the left and 5 to the right, and in NMP No. 1264 with 7 spinules to the left and 9 to the right, which are

somewhat juvenile specimens, the eye peduncles are characterized by a more pronounced curvature towards the outer borders and almost straight at the inner, with the anterior indentation shallow and just beginning to appear. Thus the spinular count in all these variants ranges from 4 to 7 to the left of the orbital sinus and 5 to 9 to the right. The cornea are oval masses of faded black tending to grayish.

In shape, the eye peduncles of *A. dayriti* and *A. microps* are closet—shorter and wider than in the other species of *Albunea*, *A. paradoxa* excepted. Two specimens included in the bottle of 8 specimens (NMP No. 938 which also contains the type specimen), are significant variants in that the eye peduncles consist of somewhat oval bodies with a deep indentation at the antero-lateral edge. However, while in *A. microps* the large and distinct cornea are situated in these well-developed indentations, in these variants of *A. dayriti* the indentations are little vacant spaces, and the eye spot (cornea) consisting of indistinct patches of either circular or elongated pale dark masses situated in the central portion of the eye peduncle.

*Position of the new species.*—The species of *Albunea* can be classified into two groups. The *symnista* group includes *A. symnista*, *A. microps*, *A. steinitzi*, *A. thurstoni* (and *A. speciosa*), and the *paradoxa* group to which *A. paradoxa* belongs. The new species is clearly an intermediate form between the two groups, more related to the *symnista* group but with some characteristics of the *paradoxa* as follows:

a. The outline of the eye peduncle is similar to that of the *symnista* group, but the weakness (deficiency) of the cornea is more of a characteristic of *A. paradoxa*. In *A. dayriti* the antero-lateral border of the peduncles presents some very tiny spinules, thus forming a kind of denticulation which is more noticeable on the ventral side. These denticulations are formed by the fixation-cups of lost setæ.

b. The presence of spinules in the frontal margin of the carapace places the species in the *symnista* group, although their reduced number tend to indicate the absence of these spinules in *A. paradoxa*.

c. The absence of spine in the first segment of the antennal peduncle is characteristic of both groups—the *paradoxa* and the *symnista*, *A. dayriti* which exhibits such a spine excepted.

d. While the development of the exognath of the third maxilliped is characteristic of *A. paradoxa* it is never of the *symnista* group.

This species is named after Fernando G. Dayrit, formerly Curator of Shells in the National Museum who, together with J. E. Norton, collected the type specimen in the course of their dredging expedition for shells in Batangas Bay.

Gordon (1958), in describing *A. paradoxa*, hesitated to place it in either the genus *Albunea* or *Lepidopa* or to erect a third genus. In a revision of the species of these two genera, Gordon definitely established the clear distinction between the two genera, where she included *paradoxa* in *Albunea*. Like *A. paradoxa*, the new species *A. dayriti* definitely belongs to the genus *Albunea*. The fact that the two species are very different from *A. symnista* and other species of *Albunea*, the establishment of a new genus might be considered. This new genus may be defined by: (1) lamellar eye peduncle without well-defined terminal cornea; (2) absence of spine in the first segment of the antennal peduncle; (3) reduced spinules on the frontal margin of the carapace or their complete absence; and (4) enlarged exognath of the third maxilliped. Under this new genus we could include *paradoxa* and *dayriti* as Indo-Pacific species, and *intermedia* Balss and perhaps *carabus* Linné as Atlantic and Mediterranean species. However, we are also inclined to believe that all these above-mentioned species belong to only one genus when it is considered, as pointed out in the preceding sentence, that *A. dayriti* could be a kind of link between *A. paradoxa* and the other species of the genus *Albunea*.

**ALBUNEA PARADOXA** Gordon. Pl. 1, fig. 5; Pl. 2, fig. 5; Pl. 3, fig. 7, Pl. 4, fig. 5; Pl. 5, figs. 3, 3a; Text figs. 1E, 2E, 4D, 7C, 10B.

*Albunea paradoxa* GORDON (1938) 193, fig. 3g, 5a, b, c, Pl. 29.

*Material*.—*NMP 732*, size  $5.5 \times 7.5$  (1 specimen) Nazasa Bay, Zambales Province; *NMP 910*, size  $6 \times 7.4$  (1 specimen) Lusong Cove, Bataan Province; *NMP 1263*, size range, from  $5.6 \times 7.6$  to  $4.1 \times 5.9$  (3 specimens) Napo Point, Morong, Bataan Province; *NMP 1267*, size  $5 \times 7.4$  (1 specimen) Talasain Cove, Zambales Province.

*Observations*.—The species was established by Gordon (1938) for a single specimen, female of  $10.2 \times 10.5$ , from Singapore. The holotype is deposited in the British Museum (London).

Our specimen (*NMP 732*) agrees with the description and illustration of Gordon (1938) and because of the very distinct characteristics of the species, our identification does not leave any doubt. Some characteristics not or insufficiently described by Gordon (1938) must, however, be emphasized principally with the view to establishing the exact relationship between *A.*

*paradoxa* and *A. dayriti*, the new species here described as follows:

(a) The first segment of the antennal peduncle does not bear any spine at the antero-lateral border. This characteristic which is commonly observed in *A. dayriti*, does not exist in the species of the *symnista* group. Although it is not mentioned by Gordon (1938) yet it appears clearly in her illustration (Fig. 5*b*).

(b) The exognath of the third maxilliped, as in *A. dayriti*, is more developed in *A. paradoxa* than in any other species of the genus. This characteristic, although also not mentioned by Gordon (1938), is readily seen by comparing her figures: in *A. paradoxa* [Gordon (1938) fig. 5*a*] the length of the exognath is two times in the length of the merus of the endognath; in *A. thurstoni* (id., fig. 3*k*) more than three (almost four) times; our specimens of *A. paradoxa* and *A. dayriti* show that the endognaths of these two species are not only comparatively longer but are also stronger with wider bases. Because of this characteristic these two species assume an intermediate position between the other species of the genus *Albunea* and the genus *Zygopa*, in which latter genus the endognath is strongly developed into a plate.

(c) The antero-lateral borders of the eye peduncles of *A. paradoxa* are edged with a continuous row of long setæ (approximately the same length as the length of the eye peduncle itself). This characteristic, not described by Gordon (1938), is clearly illustrated with only some setæ in her plate (Pl. 29), but not in her Text fig. 3*g*. These long setæ, with those of the proximal segments of the antennular peduncle and the squamiform eye peduncles combined, constitute the roof of the respiratory water circulation chamber; the other inner sides of this chamber being formed by the internal side of the segments of the antennular peduncles. The fixation cup into which the setæ of the eyes are inserted and which are present at the antero-lateral edge of the eye peduncles impart a denticulated appearance to this part. Although examination of the eye peduncle of the other species of *Albunea*, including *symnista*, at magnification  $\times 50$  always reveals the presence of some setæ on the rim of the external lateral border, these are generally more ventral; in *A. dayriti*, as pointed out above, the distribution is closer to that of *A. paradoxa*.

(d) Gordon's [(1938) 193] remarks on the squamiform eye peduncles of *A. intermedia* and *A. paradoxa* are as follows: "there is, in each species, a small suboval spot on the ventral surface, near the external margin but I am not sure whether or not this represents a vestigial eye." In the holotype of *A. paradoxa*, she noted (p. 195); "no eye spot is apparent on the dorsal surface (of the eye peduncles), but here is a small oval spot on the ventral surface near the middle of the external margin which may represent a vestigial eye (Fig 3*g*)." In our specimen NMP No. 732, we found no trace of black spot on the right eye peduncle, but on the left there is an elongated black spot situated at a certain distance from and parallel to the internal border. This spot which is distinctly visible on the ventral surface, but hardly per-

ceptible by transparency on the dorsal surface, we consider a vestigial cornea as in *A. dayriti*.

In addition, some variations were observed in the structure of the eye peduncles in specimens of *A. paradoxa* in the NMP collection as follows: In bottle No. 1263 containing 3 specimens, the eye peduncles are typical of the species, somewhat squarish in shape, although the cornea (eye spots) consist of more or less grayish elongated patches along the inner margins with distinct black spots toward the anterior tips. In one of the specimens, however, the eye peduncles are pointed on the upper inner edge and also at the posterior a little somewhat to the middle. The eye spots consist of grayish oval patches, breaking into dots toward the upper portion.

In No. 1267, the outer margins of the eye peduncles are irregular with the inner tips somewhat pointed anteriorly. Posteriorly the outline is very irregular with blunt bulges. The eye spots are visible as elongated grayish patches with a distinct black spot at the upper tip in the right eye peduncle.

#### Genus **ZYGOPA** Holthuis

*Zygopa* HOLTHUIS (1960) 21.

*Diagnosis*.—Eye peduncles small and joined with one another. Anterior border of carapace with a wide concave ocular sinus, without rostral spine, and delimited on either side by a submedian tooth. Antero-lateral spine of carapace on the dorsal shield (as in *Lepidopa*) and not on the anterior part of lateral plate (as in *Albunea*); this spine dorsad to *linea anomurica*. Scaphocerite well developed, reaching distal border of penultimate segment of antennal peduncle; antennal flagellum consists of only one segment. Exognath of third maxilliped lamelliform.

*History*.—Holthuis (1960) established *Zygopa* for *Z. michaelis*, a species from the South of Curaçao. From the biogeographical standpoint, it may be more advisable to create a new genus for this indo-Pacific species rather than to include it in a genus established for a single species that is only known from the Atlantic. But since *Albunea* is a cosmopolitan genus, it seems premature to do so; it is also inaccurate considering the very close relationship between the new species and the Atlantic species and more so because of our actual limited

information on the species of Albuneidæ with eye peduncles which are fused together.

The very slight difference between *Z. nortoni* and *Z. michaelis* is considered of a specific value only. Essentially the difference is in the shape of the coalescent eye peduncle of the species which can be differentiated by:

1. Lateral ends of coalescent eye peduncles "rather pointed and directed forward" Holthuis (1958) fig. 1d ..... *Z. michaelis*.
2. Lateral ends of coalescent eye peduncles round ..... *Z. nortoni*

*Remarks.*—The peculiar shape of the carapace of the genus *Zygopa* will be further differentiated by comparing it to that of the genus *Albunea* with the use of our specimens of *Z. nortoni* which were described in the foregoing as a commentary and confirmation of the remarks of Holthuis. In all the species of the genus *Albunea* the widest part of the carapace is between the antero-lateral spines, while in *Zygopa* it is at the posterior third.

*Frontal margin.*—In all the species of *Albunea* the frontal margin on either side of the ocular sinus exhibits a sinuous outline. From the ocular sinus to the antero-lateral spine, it shows a (internal) little concavity (more or less clearly visible) until the base of the antennular peduncle; then, a distinct convexity is visible between the antennular and the antennal peduncles; then again, a slight concavity (sometimes more or less straight) gently sloping towards the antero-lateral spine. The frontal spinules, when present, project directly from this sinuous margin, which do not present any thickness.

In *Z. nortoni*, the frontal margin is reinforced by a granulated bulge (not seen in any *Albunea* species) so that the line is never sinuous. The antennular concavity is very slight and bent frontally and laterally; the following convexity is short, strong, and relatively acute (marked on the bulge by three granules much greater and more acute than in others); the antennal concavity is strong, long and bent at the back.

Referring to Holthuis (1960) we use the term "submedian tooth" for the angle marking the limits between the ocular sinus and the antennular concavity; the term "intermediate tooth" for the angle between the antennular and the antennal concavities. The description of the frontal margin of *Z. nortoni* is exactly similar to that of *Z. michaelis*.



**ZYGOFA NORTONI** sp. nov. Pl. 1, fig. 6; Pl. 2, fig. 6; Pl. 3, fig. 8, 8a; Pl. 4, fig. 6; Pl. 5, fig. 4, 4a; Text fig. 1F, 2F, 4E, F, 2B.

*Material.*—*NMP 733*, size range, from  $7.5 \times 8$  to  $7.2 \times 7.7$  (3 specimens) Nazasa Bay, Zambales Province; *NMP 941*, size  $9 \times 9.5$  (1 specimen) type specimen, Batangas Bay, Luzon; *NMP 1273*, size  $11 \times 12.2$  (1 specimen) Cape Calavite, Mindoro Island.

*Description.*—Carapace distinctly wider than long, and therefore, has a more circular shape of all other Albuneidæ. Concave ocular sinus much shallower and without a median rostral spine; submedian teeth which delimit sinus on either side obsolete, but followed laterally by a much more distinct intermediate tooth. Frontal margin of carapace on either side without spines, but rather reinforced by a fine granular bulge. This bulge which forms intermediate tooth and situated between bases of antennular and antennal peduncles bearing 3 much stronger and more acute granules. (Text fig. 4E.) Strong antero-lateral spine of carapace situated on dorsal shield above *linea anomurica*. Posterior to this spine, lateral border of carapace exhibits a slight concavity, then it becomes distinctly convex up to posterior border. Thus, carapace which is narrow at front becomes wide up to posterior third and then narrows again producing a subcircular shape as stated above. On posterior border, median sinus comparatively shallow but much wider than in other Albuneidæ. Dorsal surface of carapace irregularly but only slightly granular, especially in anterior part near frontal margin. Ordinary sulci strong but very different from those of other Albuneidæ. Eye peduncles very short, fused together and hidden under margin of ocular sinus, hardly visible from dorsal view on superficial examination. Cornea also hardly perceptible, situated at rounded antero-lateral edge of short and wide structure formed by fusion of two ocular peduncles, anterior border of which structure presents a wide and shallow concavity. Antennular flagella short, approximately one-half length of carapace. Antennal peduncle, bearing a strong scaphocerite devoid of a spine on antero-lateral angle of its first segment, and a flagellum with only one joint. Third maxilliped with antero-lateral angle of carpus of endognath only slightly produced. Well-developed exognath lamellar. Pereiopods of usual albuneid type, although all dactyli without spur (or heel) near articulation with propodi (Text fig. 11). Telson appears as illustrated (Text fig. 12B).

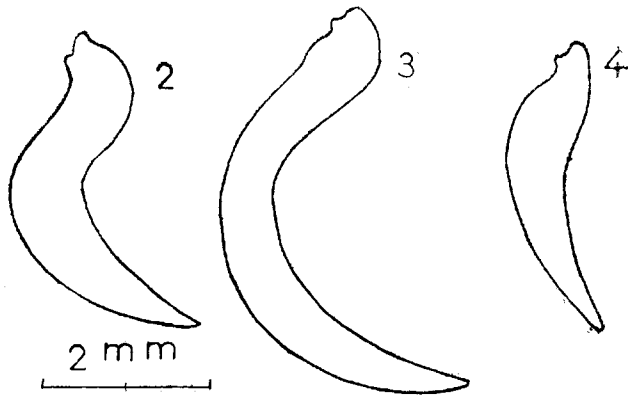


FIG. 11. Pereiopods 2, 3, 4 of *Zygopa nortoni*, NMP 733.

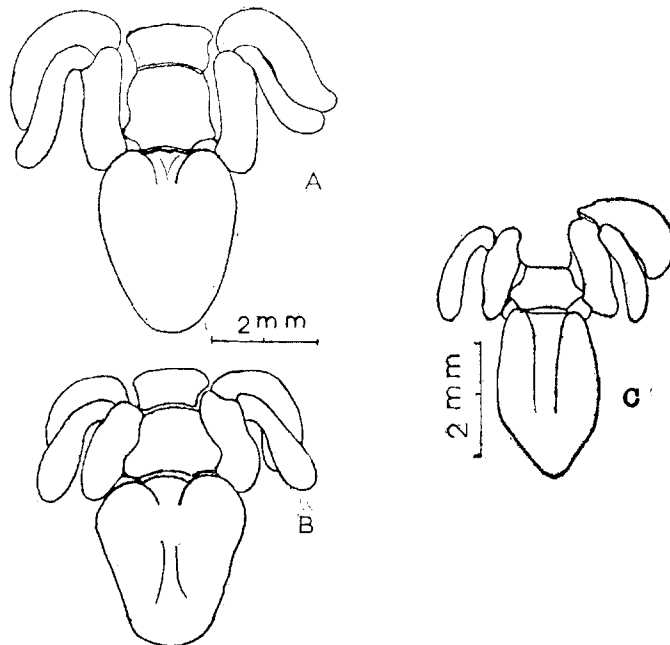


FIG. 12. Telson of; A, *Albunea dayriti*, NMP 938; B, *Zygopa nortoni*, NMP 733; C, *Albunea microps*, NMP 912.

*Position of the species.*—*Z. nortoni* differs from *Z. michaelis* by:

a. The eye peduncles (Plate 3, figs. 8 and 8a) which are rounded at their lateral ends instead of the "rather acute" ones in *Z. michaelis* [Holthuis (1960) fig. 1d]. In *Z. nortoni* a

clearly defined round pit is excavated near the lateral end which could be the optical element.

b. The antennular flagellum has 16 joints instead of the 20 as shown by Holthuis (1960) in *Z. michaelis*. In *Z. nortoni*, it is a little shorter than half the length of the carapace. In *Z. michaelis* the length cannot be estimated in relation to the length of the carapace because the flagellum was cut in Holthuis' illustration [(1961) fig. 1a].

c. The pereopods 1, 2, 3, 4, 5 of *Z. nortoni* are similar to those of *Z. michaelis* [Holthuis (1961) figs. 2a-e], but the fixed finger of pereopod 1 or chela (Plate 5, fig. 4) seems less truncate at its tip than in *Z. michaelis*. In fact, chelipeds of *Z. nortoni* seem to differ considerably from those of *Z. michaelis*. By referring to Holthuis' illustration, the fixed finger appears to have a different shape. On the outer surface of the palm there is, under the articulation of the dactylus, a transverse crest tipped at the cutting edge by a prominent tubercle. This is not stated in Holthuis' description of *michaelis*, although in his illustration [Holthuis (1960) fig. 2a] it is distinguishable as a faint protuberance. This cutting edge with a visible tubercle is never seen in any of the *Albunea* species.

This species is named after J. E. Norton, a shell enthusiast in Manila who is undertaking an extensive scientific dredging expedition with the use of his privately owned boat (LST) principally for the collection of molluscan shells.

*Technical note.*—The significance of the illustrations presented in this paper is that they demonstrate one aspect of the actual UNESCO-SEASCO project<sup>2</sup> concerning the development of taxonomic studies of marine animals at the regional level for the "Marine Sciences." This is initiated and promoted by the Office of Oceanography of UNESCO.

The photographs in Plate 1 were made with a "Contarex" camera with the exception of C. All the other photographs and drawings were made with a Projectina. The catalogue numbers given after the magnification are those of the Projectina utilizing macroobjectives.

× 3 (5.508b) Pl. 1, figs. 3-4; Pl. 2, fig. 1; × 5 (5.508c) Pl. 2, figs. 3-6; Pl. 3, figs. 1, 3-8; × 7 (5.508a) Pl. 2, fig. 2; Pl. 3, fig. 2; Pl. 4,

<sup>2</sup> UNESCO—United Nations Educational, Scientific and Cultural Organization (Paris); SEASCO—Southeast Asia Scientific Cooperations Office (Djakarta)

fig. 3; Pl. 5, fig. 1 and 1a;  $\times 10$  (5.509) Pl. 3, fig. 1a; Pl. 4, figs. 1, 4, 5, and 6; Pl. 5, fig. 2, 2a, 3, 4, and 4a;  $\times 20$  (5.510) Pl. 3, figs. 3a, 4a, 5a, 6a, and 8a; Pl. 4, fig. 2; Text figs. 1, 2, 3, 4, 5a, 7, 8, 11, 12;  $\times 50$  (5.511) Text figs. 5b, c, 6, 9, 10.

Another aspect of the project is to examine, and if necessary, to revise with the collaboration of the Curator in charge, the unidentified or misidentified specimens existing in the collections of the museums in the region. Originally the specimens in the collection of the National Museum in Manila which were used in this paper were tentatively listed in the carcinological catalogue as follows: *A. dayriti* was identified as *A. carabus*; *A. steinitzi* was identified as *A. oxyophthalma* and *A. thurstoni*; *Zygopa nortoni* was identified as a new genus.

The project will also encourage the intensification of the collecting work. The Albuneidæ collections in the National Museum of the Philippines is actually one of the richest, if not the richest in the world, considering the existing number of Indo-Pacific species—a total of 6 species as compared with the not more than 4 in the British Museum. The richness of this collection is the result of the intensive collecting work of J. E. Norton, a shell collector, who, during the past years had conducted numerous dredging operations in Philippine waters in his own boat, and who invited the participation of the National Museum of the Philippines. So, the Museum had received many mollusk shells and some crustaceans. The present paper is devoted to Albuneidæ, but the junior author had also segregated and tentatively identified some rare brachyuran species, which could probably be useful materials for another publication. It is our great pleasure to thank most specially Mr. Norton for his invaluable help in our scientific work.

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## ILLUSTRATIONS

### PLATE 1

General aspect on dorsal view of:

- FIG. 1. *Albunea symnista*, NMP 298  
2. *Albunea steinitzi*, NMP 796  
3. *Albunea thurstoni*, ZSI  
4. *Albunea dayriti*, NMP 938  
5. *Albunea paradoxa*, NMP 732  
6. *Zygopa nortoni*, NMP 733

The antennular flagella are excluded in all photographs, with the exception of Fig. 6.

NOTE.—In this plate, and in Plates 2 and 3, the magnifications are different. The real size of the specimens are given in the text with their corresponding numbers. Also refer to the technical note.

### PLATE 2

Dorsal view of the carapace of:

- FIG. 1. *Albunea symnista*, IMRI 274  
2. *Albunea steinitzi*, NMP 796  
3. *Albunea thurstoni*, ZSI  
4. *Albunea dayriti*, NMP 938  
5. *Albunea paradoxa*, NMP 732  
6. *Zygopa nortoni*, NMP 941

### PLATE 3

Frontal margin of the carapace with eye peduncles of:

- FIG. 1. *Albunea symnista*, IMRI 286A  
1a. *Albunea symnista*, IMRI 274  
2. *Albunea thurstoni*, ZSI  
3. *Albunea steinitzi*, NMP 1261  
3a. *Albunea steinitzi*, NMP 1261  
4. *Albunea steinitzi*, NMP 796  
4b. *Albunea steinitzi*, NMP 796  
5. *Albunea steinitzi*, NMP 498  
5a. *Albunea steinitzi*, NMP 498  
6. *Albunea dayriti*, NMP 938  
6a. *Albunea dayriti*, NMP 938  
7. *Albunea paradoxa*, NMP 732  
8. *Zygopa nortoni*, NMP 941  
8a. *Zygopa nortoni*, NMP 941

### PLATE 4

Dactyli of pereopod 3 of:

- FIG. 1. *Albunea symnista*, IMRI 285  
2. *Albunea steinitzi*, NMP 498  
3. *Albunea thurstoni*, ZSI

4. *Albunea dayriti*, NMP 938
5. *Albunea paradoxa*, NMP 732
6. *Zygopa nortoni*, NMP 733

All are dactyli of the right side, with the exception of Plate 4, fig. 3 and 4, which are from the left side. Photograph Fig. 3 shows those of pereopods and 2 and 3. The magnifications of Figs. 1, 4, 5, 6 are the same and with Fig. 2, twice more. The magnification of Fig. 3 is less than those of Figs. 1, 4, 5, 6.

## PLATE 5

Pereopod 1 and telson of:

- FIG. 1. *Albunea thurstoni*, ZSI
- 1a. *Albunea thurstoni*, ZSI
  2. *Albunea dayriti*, NMP 938
  - 2a. *Albunea dayriti*, NMP 938
  3. *Albunea paradoxa*, NMP 732
  - 3a. *Albunea paradoxa*, NMP 732
  4. *Zygopa nortoni*, NMP 941
  - 4a. *Zygopa nortoni*, NMP 941

The magnifications are the same with the exception of Fig. 1 which is lesser.

## PLATE 6

*Albunea microps*, NMP 912:

- FIG. 1. General aspect on dorsal view
2. Dorsal view of carapace
  3. Telson
  4. Dactyli of pereopods 2 and 3
  5. Frontal margin of carapace with the eye peduncles
  6. Eye peduncles
  7. Pereopod 1

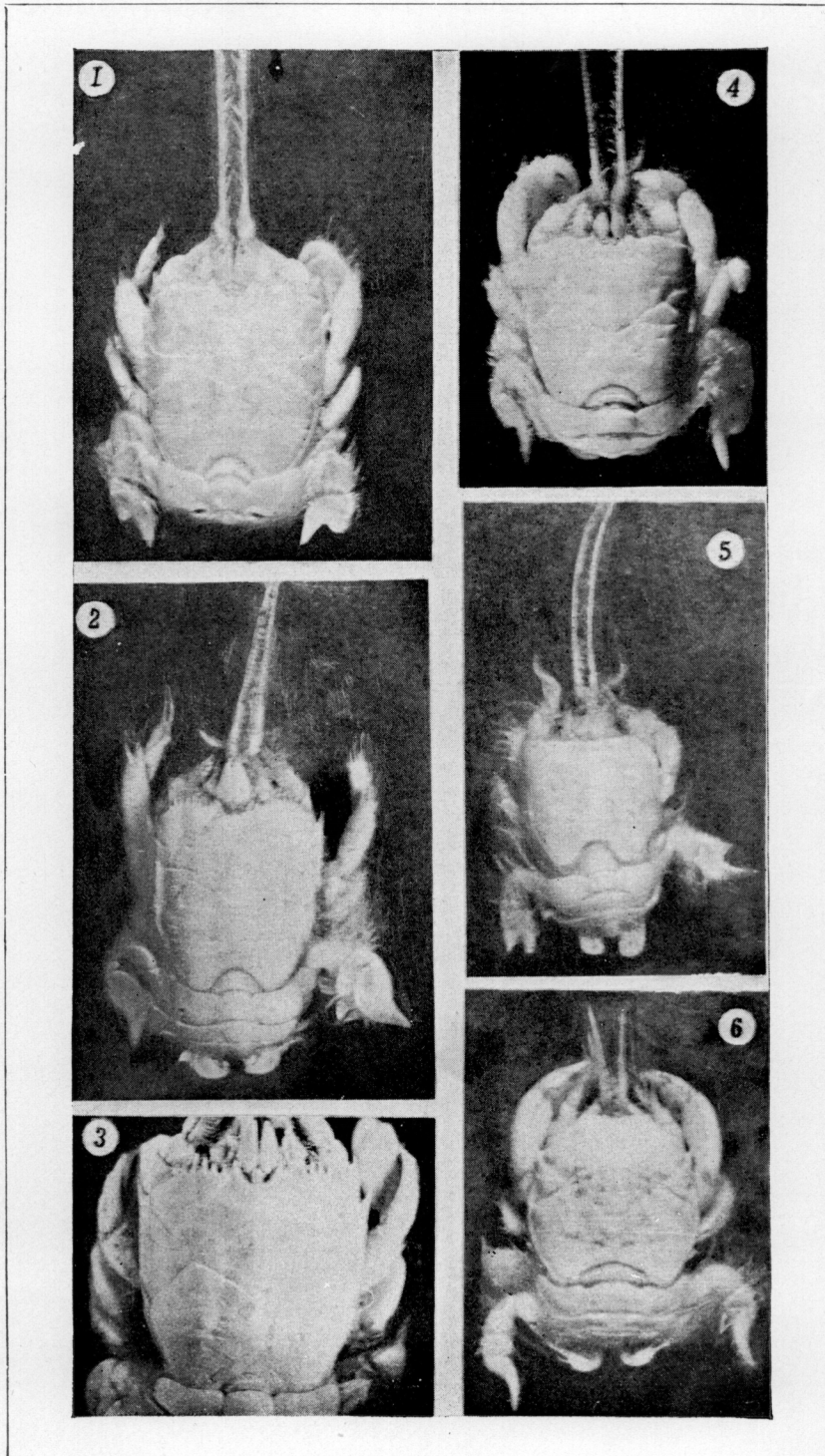


PLATE 1.



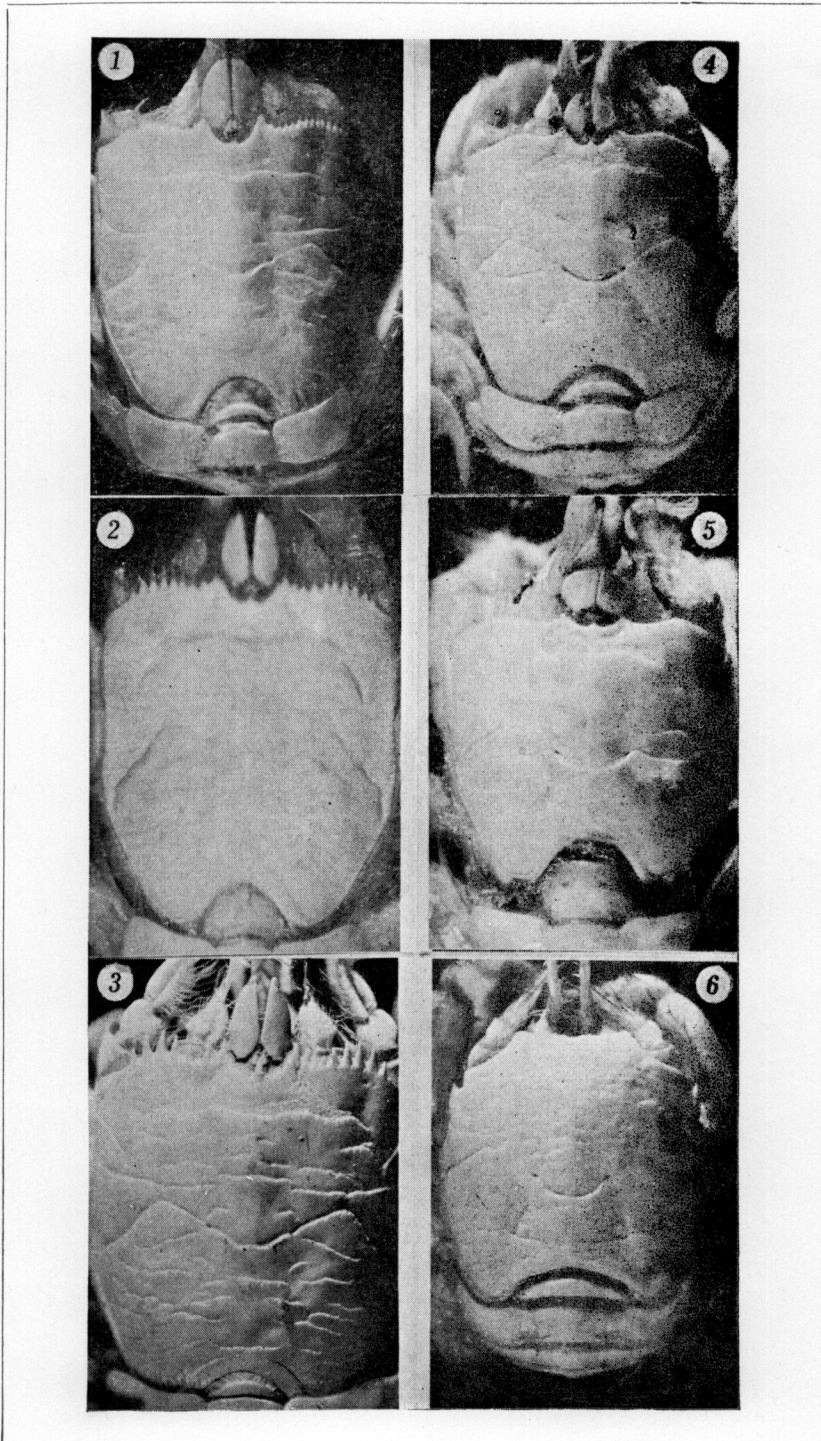


PLATE 2.

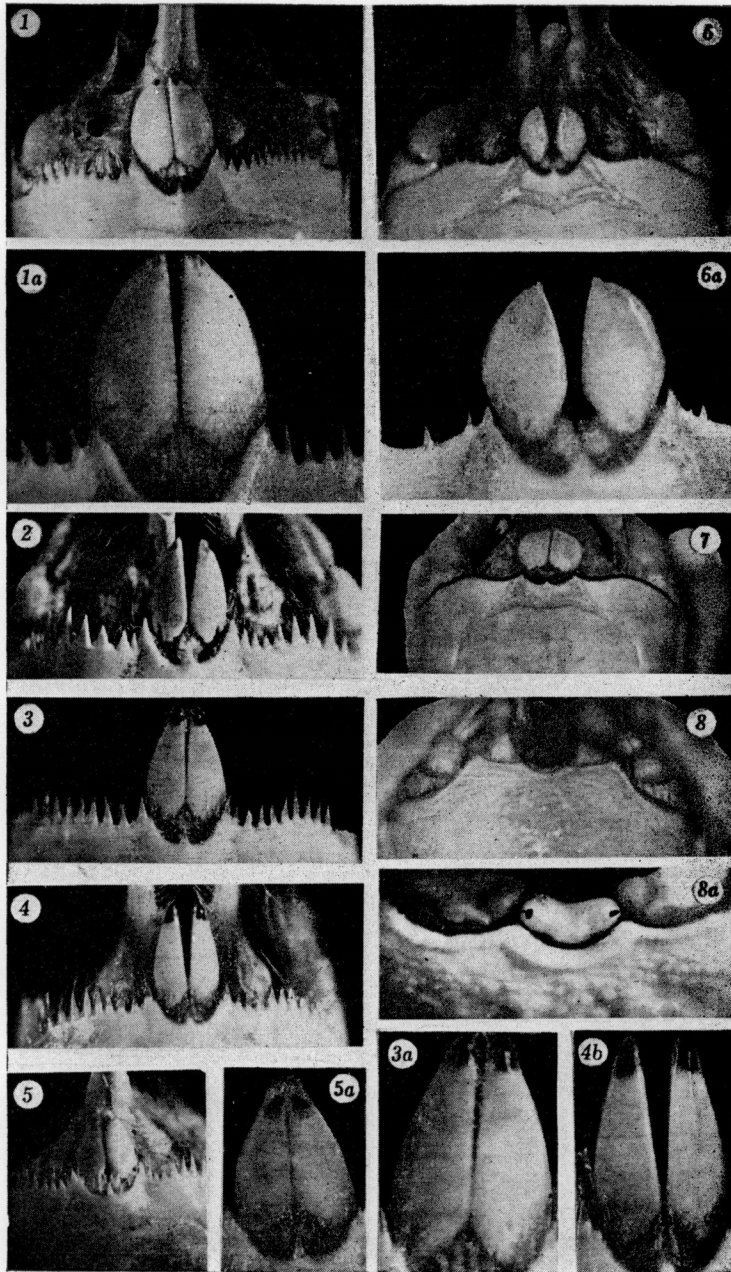


PLATE 3

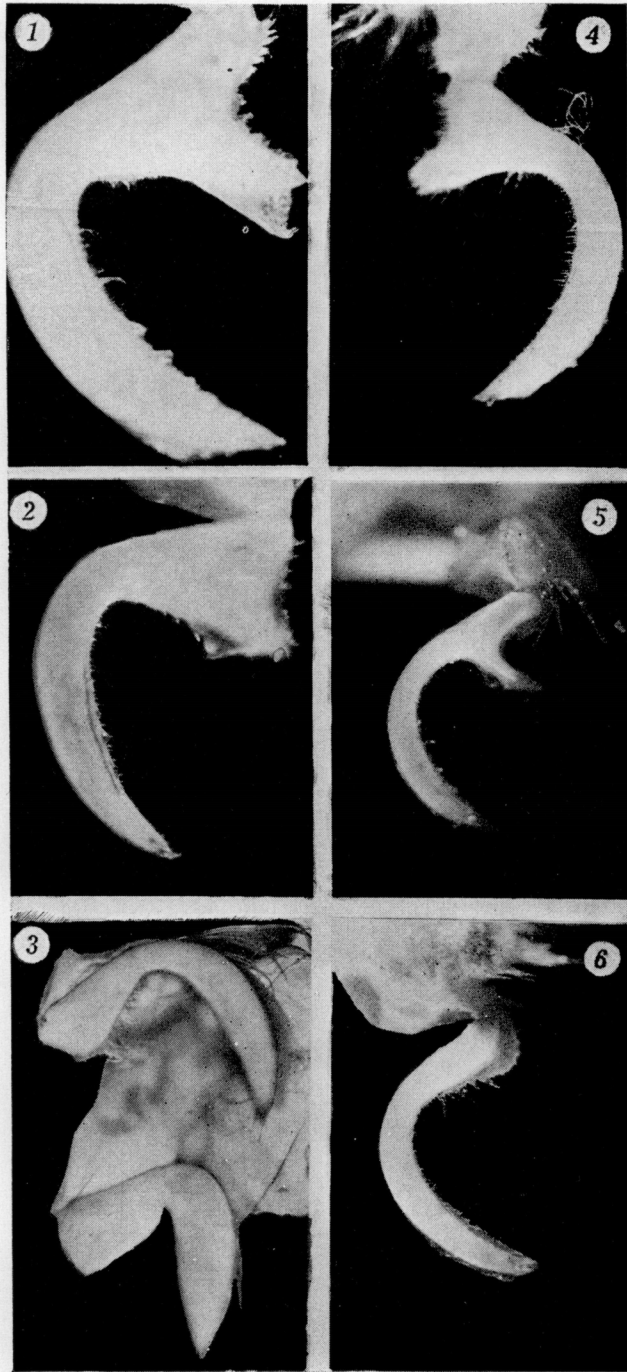


PLATE 4.

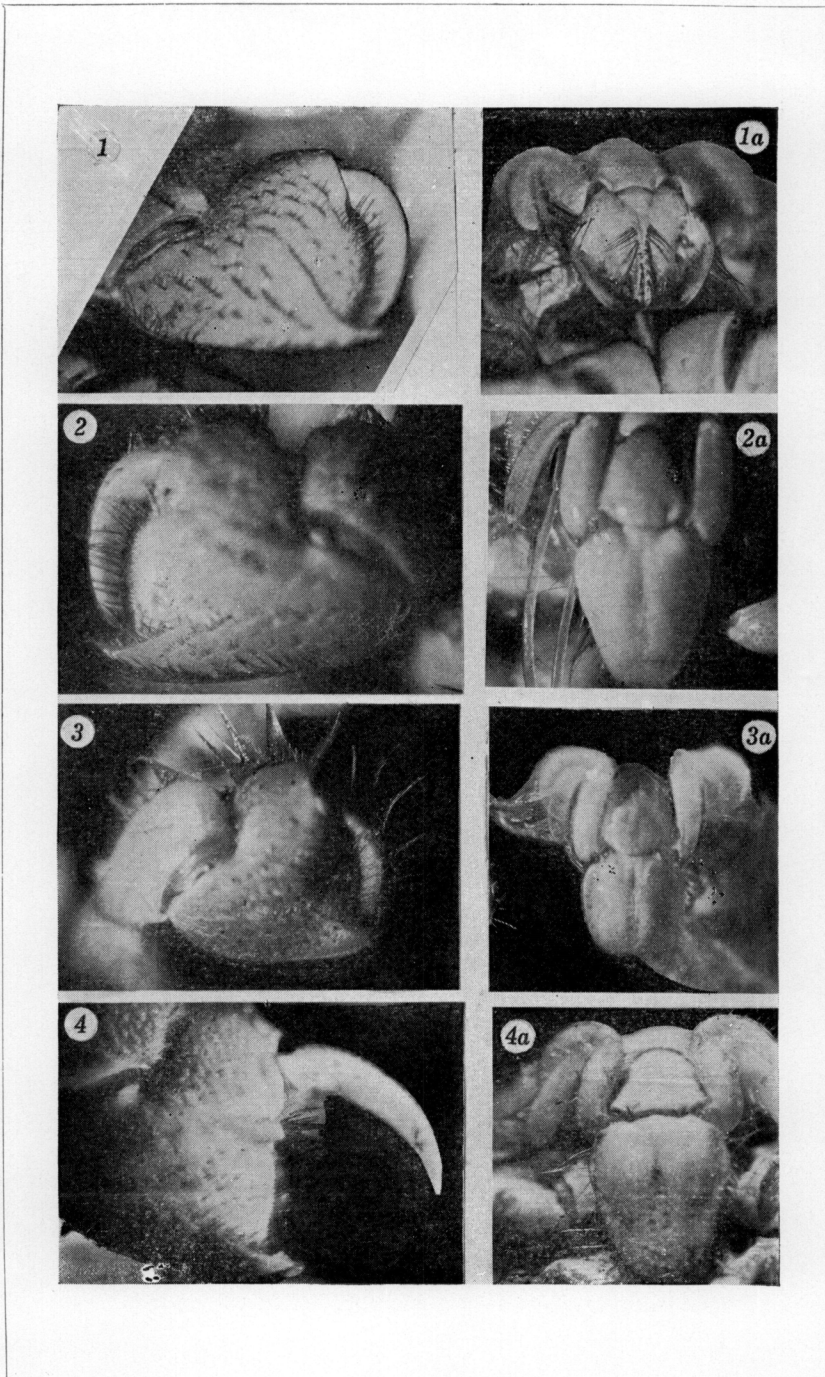


PLATE 5.

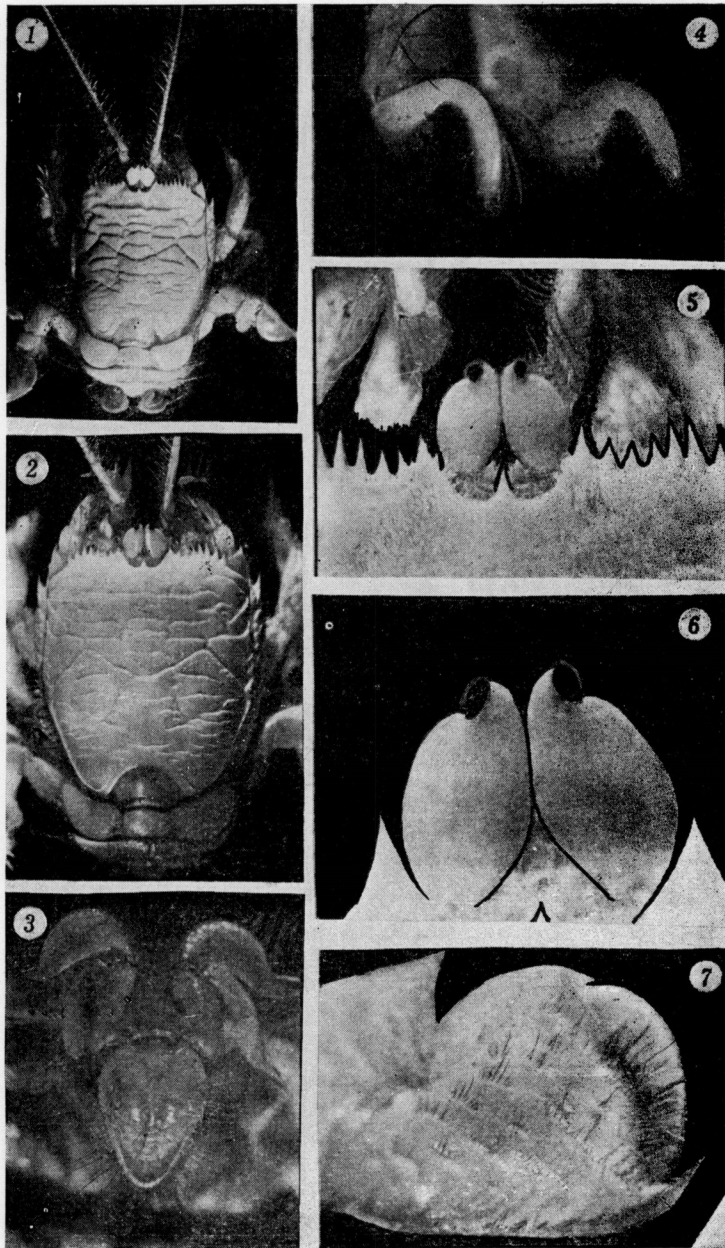


PLATE 6.