

Bopyrids from Tanabe Bay

By

Sueo M. SHINO

(Assistant in the Seto Marine Biological Laboratory)

(With 17 Text-figures)

(Received Nov. 10, 1932)

The Bopyrids described in the present paper were all collected by myself in Tanabe Bay from the spring of 1931 up to this date, except *Argeia pugettensis* which I found out in the collection of the Museum of the Laboratory. Of the 16 species examined, 11 are new to science, 5 of them even constituting new genera. The following is the list of the species:

Parapenacon consolidata var. *richardsonae*, n. var.

Pagurion tuberculata, n. gen. & n. sp.

Parapagurion calcimicola, n. gen. & n. sp.

Pleurocrypta yatsui, (PEARSE)

Propseudione rhombicosoma, n. gen. & n. sp.

Pseudione clibanaricola, n. sp.

Pseudione orientalis, n. sp.

Pseudione petrolisthaeae, n. sp.

Pseudione asymmetrica, n. sp.

Argeia pugettensis, DANA

Bopyrella pacifica, n. sp.

Bopyrus squillarum, LATREILLE

Bopyrina kossmanni, CHOPRA

Bopyrinina dorsimaculata, n. gen. & n. sp.

Pseudostegias setoensis, n. gen. & n. sp.

Diplophryxus jordani, RICHARDSON

The terminology of the various parts of the animal follows principally the use of NIERSTRASZ and BRENDER à BRANDIS in their joint works (1923),¹ with a little modification.

1. NIERSTRASZ and BRENDER à BRANDIS, literature no. 40, pp. 58-60.

The lateral part of the first four thoracic segments of the branchial Bopyrids is, as a rule, divided into the anterior and posterior lateral portion, these being termed "coxal plate" and "posterior lateral part" respectively. In many cases, the coxal plate of the last three segments of the thorax is not completely separated from the median part of the segment, and in such a case, the term "anterior lateral" is applied, instead of "coxal" for the part in question, so long as it is still separated from the posterior lateral part by a notch. The lateral side of the abdomen is not usually separated from the median part of the segment, but this part is also denoted the "lateral plate" the term "Seitenplatte" of NIERSTRASZ and BRENDER à BRANDIS being adopted. The first free thoracic segment is described, with most other authors, simply as the first segment instead of "Thoracomere II", since the morphologically first thoracic segment of the Isopods is always completely fused with the cephalon, and there is no confusion even when the first free thoracic segment is thus described.

Before going farther, I wish to express my gratitude to Prof. Dr. T. KOMAI and Prof. Dr. Yô K. OKADA, former and present Directors of the Laboratory, for their kindness in looking over the work and for their many important suggestions. I am also indebted to Mr. K. NAKAZAWA for determining some of the host animals.

Group of Branchial Bopyrids

Parapenaeon RICHARDSON

1904, RICHARDSON, H., Proc. U. S. Nation. Mus., 27, p. 43-44.

Female uropoda uniramous [RICHARDSON¹ (1904) and NIERSTRASZ and BRENDER à BRANDIS² (1923)] and not biramous [RICHARDSON³ (1910)].

Parapenaeon consolidata RICHARDSON

var. richardsonae n. var.

Female (Fig. 1, A & B): Broadly oval. Except for asymmetry in coxal plates, segments rather symmetrical. Length 7.5mm. Width 5.5 mm. No pigmentation. Dorsal surface flat, ventral convex.

Head (Fig. 1, D) small, wider than long, somewhat triangular. Frontal lamina lamellar, notched at anterior margin, extending laterally

1. RICHARDSON, literature no. 64, pp. 43-44.

2. NIERSTRASZ and BRENDER à BRANDIS, no. 40, pp. 66-67.

3. RICHARDSON, no. 70, p. 40.

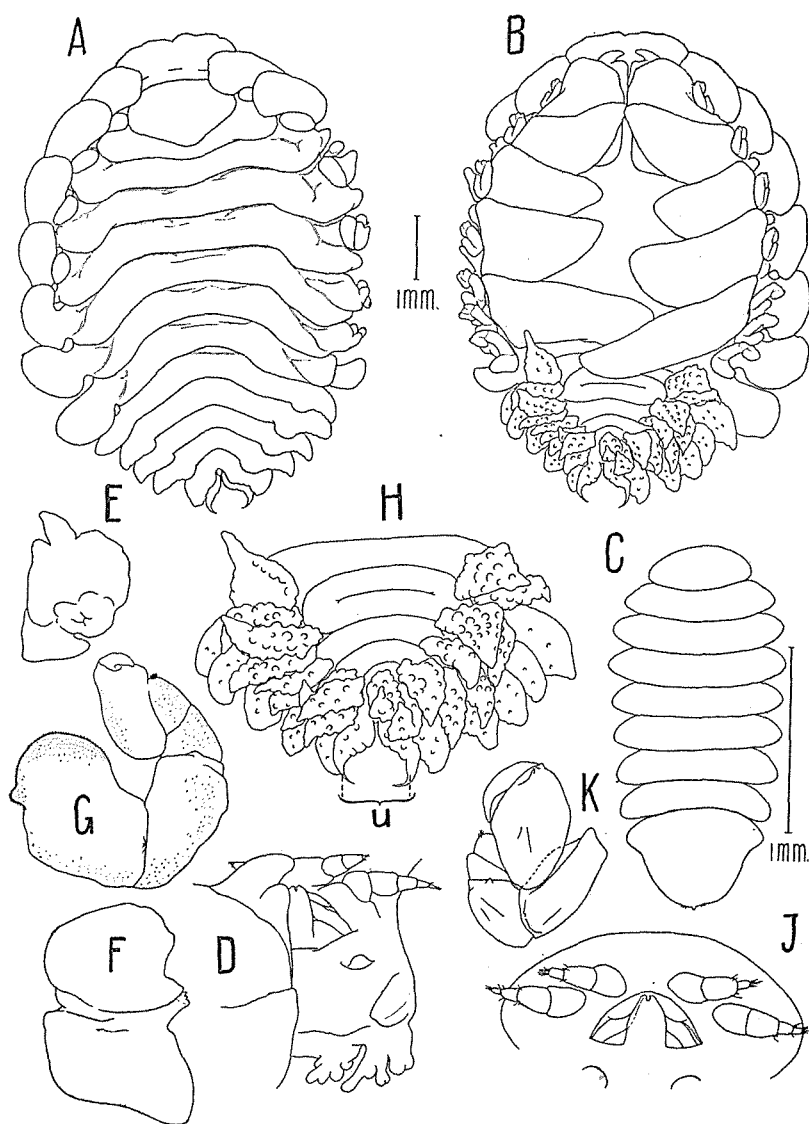


Fig. 1. *Parapenaeon consolidata* var. *richardsonae* n. var.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-H, ♀; D, head; E, maxilliped; F, marsupial plate I; G, thoracic leg, right V; H, abdomen. J-K, ♂; J, head; K, thoracic leg, right I.

Abbreviations used in figures: —

ANT I, antennule; ANT II, antenna; ENT, entopodite; EX, exopodite; LAT, lateral plate; MAX, maxilla; MP, marsupial plate; MXP, maxilliped; PL, Pleopod; PR, protopodite; R, rostrum; T, terminal segment; U, uropoda.

On other abbreviations see text.

beyond head-width. Antennules small, 4-jointed. Antennae longer than antennules, 6-jointed. Maxillipeds (Fig. 1, e) provided with palp unusually developed, triangular in shape and without bordering setae. Posterior lamina narrow, bearing 2 branched processes on each side.

Thoracic segments separate. Ovarian bosses present in first 4 segments. Posterior lateral parts slightly produced in these 4 segments, while rudimentary or absent in following 3 segments. Coxal plates well developed, but not equally large in all segments. Those of first 2 segments form large oval plates, while in other segments they are developed only on longer (left) side; they extend some distance in front of segment, overlapping the foregoing plate. Coxal plates of 1st segment overlap frontal lamina of head. Left coxal plate of 6th segment is elongated laterally instead of anteriorly and that of 7th segment turns postero-laterally. Right coxal plates of 3rd and 4th segments greatly reduced and more or less irregular in outline; those of 5th and 6th segments farther reduced, while in 7th segment coxal plate forms large oval plate bending towards ventral side, though smaller than its partner on left side.

Legs (Fig. 1, g) distinctly jointed and scaly; scales finer than usual, and basipodite provided with large lateral expansion. Not all 5 pairs of marsupial plates meet together on mid-ventral surface. Posterior lobe of 1st plate (Fig. 1, f) slightly produced towards postero-lateral corner, but posterior margin nearly straight.

6 abdominal segments distinct (See Fig. 1, a). First 5 provided with well-developed lateral plates, expanded at proximal portion and bluntly pointed at the distal end. 6th segment very minute and without lateral plates. Ventral surface of abdomen smooth, while that of lateral plates more or less tuberculated (See Fig. 1, b).

5 pairs of biramous pleopoda present (Fig. 1, h). External and internal ramus subequal, each being somewhat triangular and strongly tuberculated on both upper and lower surfaces. Each ramus directed outwards and mid-ventral surface of abdomen exposed. In dorsal view all pleopoda completely concealed. Uropoda (Fig. 1, h, u) uniramous, pointed and curved like hooks. They are also tuberculated and partly exposed in dorsal view.

Male (Fig. 1, c): Short, 2 mm. in length, compressed antero-posteriorly; no pigmentation, no eyes.

Head (Fig. 1, j) oval, about twice as wide as long. Antennules 3-jointed. Antennae 4-jointed. Maxillae present; maxillipeds absent.

Thoracic segments separate; each subequal in length. Joints of

legs (Fig. 1, κ) distinct; chela rather large.

All abdominal segments completely fused into a helmet-like piece, wider than long, laterally projecting at anterior border and posteriorly widely rounded. At posterior end a papilla — anal tube — present, and several short setae on each side of it. Pleopoda and uropoda absent.

Remarks: The differences of *richardsonae* from *consolidata* may be summarized in a table.

		<i>consolidata</i>	<i>richardsonae</i>
Female	Frontal lamina	Narrower than head.	Wider than head.
	Coxal plates	3rd to 6th plates of longer side not overlapping one another; 7th plate of shorter side rudimentary	All plates overlapping; 7th plate of shorter side developed
	Pleopoda	Large, partly visible in dorsal view	Small, invisible in dorsal view
	Uropoda	Neither pointed nor tuberculated	Pointed and tuberculated
Male	Body	Not compressed	Compressed
	Head length	Two-thirds of width	Half of width
	Abdomen	Longer than wide, triangular	Wider than long, helmet-shaped

Unfortunately, the descriptions and figures of RICHARDSON are difficult to use for farther comparison. However, even the characters given in the above comparison would be sufficient to separate the present specimen from *consolidata*, at least as a variety.

Occurrence: A female specimen carrying a male found in the branchial cavity of *Penaeopsis akayebi* RATHBUN was obtained in May, 1931, at a depth of 20-30 meters in Tanabe Bay. Another specimen infesting the same host came into my possession afterwards in March, 1932, from Mikawa Bay.

Pagurion n. gen.

Female cephalon separated from thorax.

Thoracic segments distinct. Rudimentary coxal plates present in first 4 segments. Marsupium complete.

Abdominal segments distinct. Lateral plates lamellar in all 6 segments. 5 pairs of pleopoda as well as uropoda biramous.

Male cephalon also separated from thorax. Both thoracic and abdominal segments distinct. Pleopoda uniramous. Uropoda absent.

From the diagnosis given above, *Pagurion* seems to be closely related to *Aporobopyroides* NOBILI and *Munidion* HANSEN, but differs from these in the characters shown in the following table:

		<i>Pagurion</i>	<i>Aporobopyroides</i>	<i>Munidion</i>
Female	Coxal plates	Rudimentary	Rudimentary	Developed
	Lateral plates of abdomen	Developed in all segments	Absent in all segments	Developed at least in first 5 segments
Male	Abdomen	Segments separate	5th and 6th segment fused and rudimentary	Segments fused
	Pleopoda	Present	Absent	Absent (?)

Pagurion tuberculata n. sp.

Female (Fig. 2, A & B): Broadly oval, slightly asymmetrical. No pigmentation even without eyes. Dorsal side flat, ventral convex. Length 14 mm. Width 9.8 mm.

Head wider than long, subtriangular. Frontal margin nearly straight and slightly produced at lateral corners. Both pairs of antennae (Fig. 2 D,) short; 1st pair 3-jointed, 2nd pair 4-jointed. Maxillipeds with palp (Fig. 2, B); internal margin of palp and antero-internal corner of anterior lobe provided with long setae. Posterior lamina (Fig. 2, F) narrow, its free margin and a pair of lateral processes strongly tuberculated.

7 thoracic segments distinct; first 2 segments compressed in mid-dorsal region. Oblong ovarian bosses and narrow coxal plates distinct only in first 4 segments. Posterior lateral parts shorter than coxal plates on each side of first 4 segments; in following 3 segments posterior lateral parts absent.

Legs (Fig. 2, H) distinctly jointed. Dactylopodite and propodite comparatively small. Meropodite has a small process on external margin; ischiopodite has 2 processes. Basipodite not laterally expanded. Scales absent on leg. Marsupium vaulted, plates meeting together on mid-ventral surface. First plate (Fig. 2, G) tuberculated in anterior half and produced at postero-lateral corner into a lobe, distally truncated. Internal crest (Fig. 2, G, Y) strongly tuberculated.

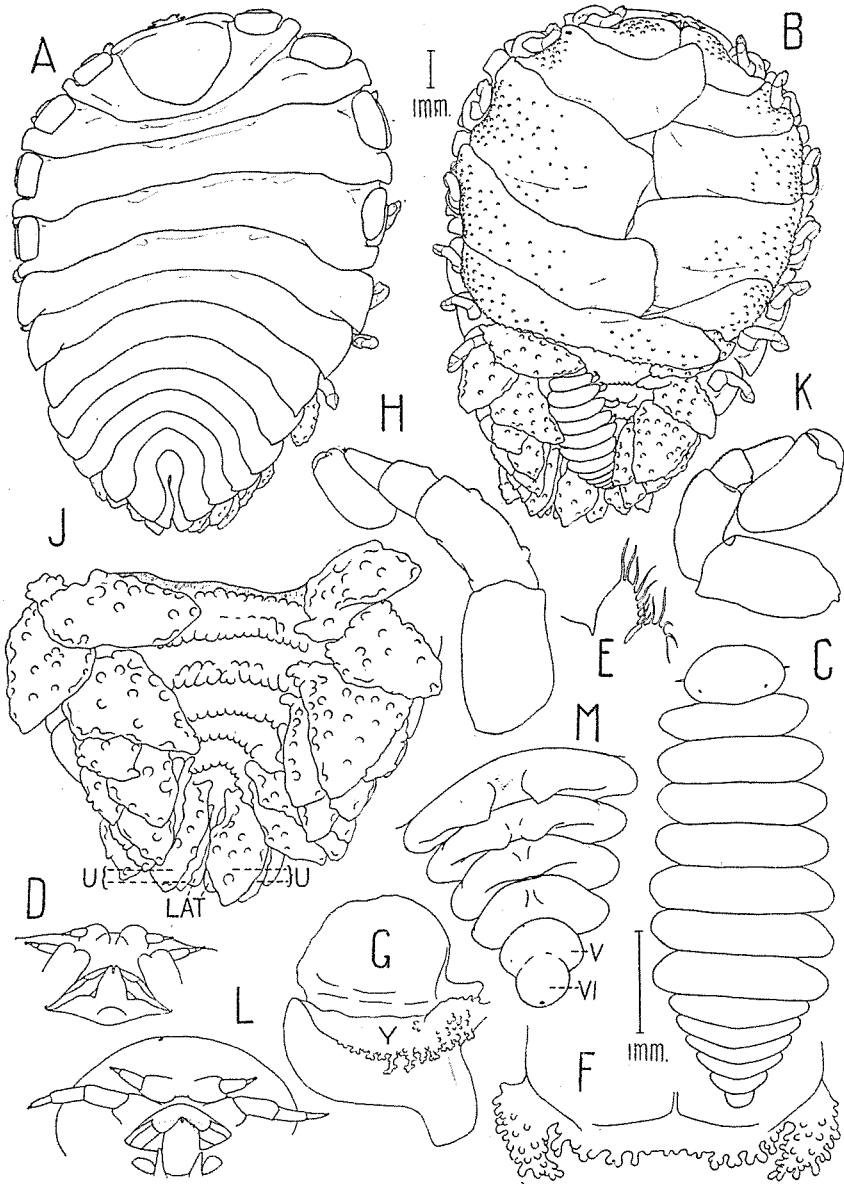


Fig. 2. *Pagurion tuberculata* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-J, ♀; D, anterior portion of head; E, palp of maxilliped; F, posterior lamina of head; G, marsupial plate I, inner side; H, thoracic leg, left V; J, abdomen. K-M, ♂; K, thoracic leg, right V; L, head; M, abdomen, ventral side.

6 abdominal segments distinct. Lateral plates well developed and slightly expanded on each side (See Fig. 2, A); in 6th segment lateral plates directed posteriorly and partly overlapping one upon another. On ventral surface segmental borders crenated.

5 pairs of biramous pleopoda (Fig. 2, J) invisible in dorsal view. Both external and internal rami similar in appearance, triangular and strongly tuberculated, but the former slightly smaller than the latter. Reduction of size in pleopoda from 1st to 5th not considerable. Uropoda biramous, consisting of 2 subequal plates, similar in shape and size to last pleopoda and likewise tuberculated.

Male (Fig. 2, C): Length 4.5 mm. No pigmentation.

Head (Fig. 2, L) oval, rather small, about 1.5 times as wide as long. Small eyes present. Antennules short, 3-jointed. Antennae long, projecting beyond cephalic margin, 4-jointed. Maxillae semi-circular. Maxillipeds elongated triangular.

Thoracic segments distinct, gradually widening from first to last. Legs (Fig. 2, K) distinctly jointed.

Abdominal segments (Fig. 2, M) separated, rapidly tapering towards the posterior end. Terminal segment cylindrical, indistinctly demarked from 5th segment on ventral side by shallow groove. Uniramous pleopoda are represented by protuberances on ventral surface of first 3 segments; those in 4th and 5th segment rather inconspicuous. Uropoda absent.

Remarks: HANSEN¹ gives an abnormal male of *Munidion princeps* in which all 6 abdominal segments are completely separated. Although the case is abnormal, the appearance of such a male in *Munidion* may be considered a reason for relating the new genus closely to this genus.

Occurrence: A female specimen carrying one male was obtained from the right branchial cavity of *Pagurus watasai* TERAOKA, caught in May, 1931 at a depth of 20-30 meters in Tanabe Bay.

Parapagurion n. gen.

Female cephalon separated from thorax.

Thoracic segments distinct. Rudimentary coxal plates present in first 4 segments. Marsupium complete.

First 5 abdominal segments provided with well-developed lateral plates. Terminal segment very small, without lateral plates. Pleopoda and uropoda biramous.

1. HANSEN, literature no. 26, p. 115; BONNIER, no. 4, p. 287.

Male cephalon and thoracic segments distinct. 6 abdominal segments separate. 5 pairs of pleopoda uniramous and rudimentary. Uropoda absent.

Parapagurion is most closely related to *Pagurion*. However, difference can be found in the terminal segment of the female. Differences of *Parapagurion* from *Pagurion* and other allied genera are shown in the table.

			<i>Parapagurion</i>	<i>Pagurion</i>	<i>Aporobopyroides</i>	<i>Munidion</i>
Female	Lateral plates of abdominal segment	I-V	Developed	Developed	Undeveloped	Developed
		VI	Undeveloped	Developed	Undeveloped	Developed or undeveloped
Male	Abdominal segment		All separated	All separated	5th and 6th fused and rudimentary	All fused
	Pleopoda		Present	Present	Absent	Absent (?)

Parapagurion calcinicola n. sp.

Female (Fig. 3, A & B): Pyriform, strongly asymmetrical. Head displaced rightwards and anterior segments greatly expanded on left side. Dorsal surface flat, ventral convex. No pigmentation. Length 6 mm. Width at 3rd thoracic segment 4.2 mm.

Head deeply set in thorax, anterior margin nearly straight and posterior margin rounded. No frontal lamina and no eyes. Both pairs of antennae reduced into unsegmented sac-like bodies (Fig. 3, D). Maxillipeds (Fig. 3, E) without palp. Posterior lamina (Fig. 3, F) narrow, with nearly straight margin and slightly expanded on each side; lateral processes long, hook-like and directed inwards.

Thoracic segments distinct. First 6 segments bilobed in lateral parts. Posterior area narrower than anterior area in all segments; posterior lateral parts rather long in first 3 segments on left side, very short in 5th and 6th and absent in 7th. Anterior lateral parts of last 3 segments bluntly pointed. Large ovarian bosses and rudimentary coxal plates present in first 4 segments.

Legs (Fig. 3, H) distinctly jointed and more or less scaly. Basipodite with quadrangular lateral expansion. Marsupium complete. Terminal projection of 1st plate (Fig. 3, G) directed postero-laterally ending in an acuminate tip.

6 abdominal segments separate. First 5 arched anteriorly and

have well developed lateral plates, covering underlying pleopoda. Last segment very small, lateral plates absent. On ventral surface

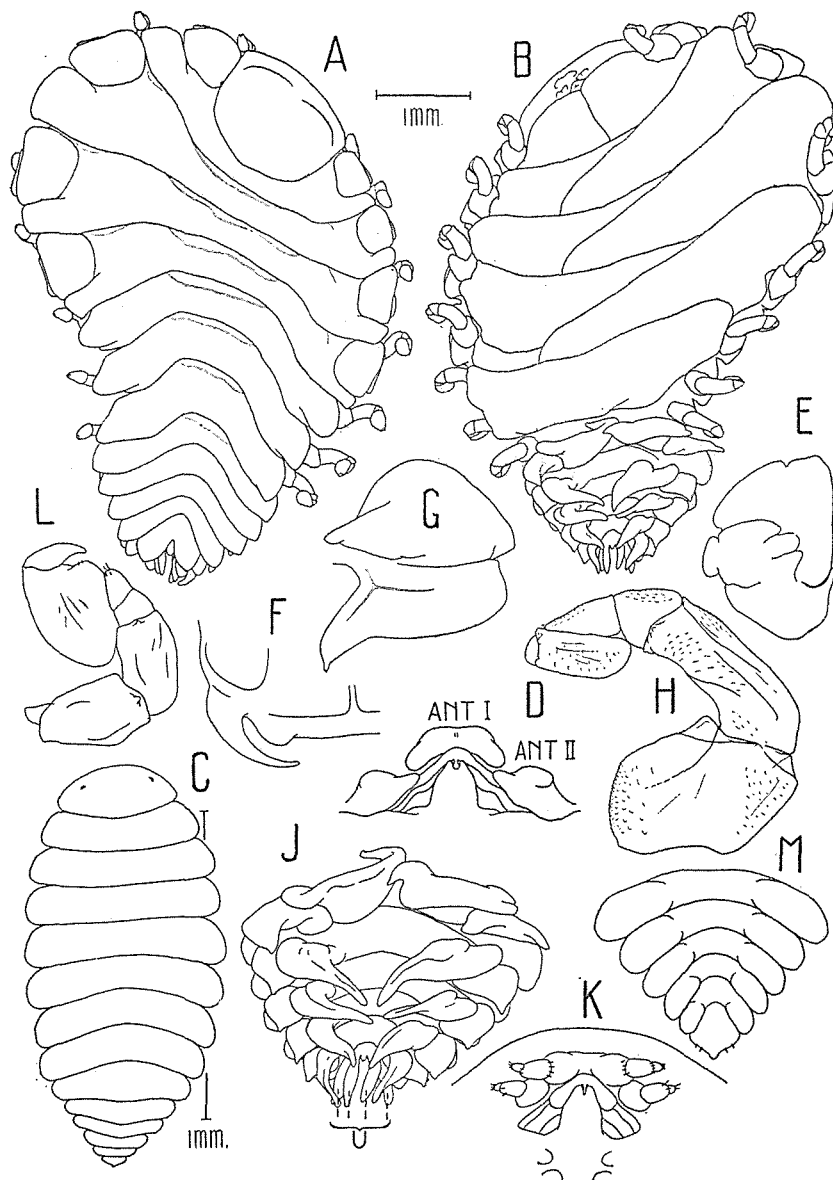


Fig. 3. *Parapagurion calcinicola* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-J, ♀; D, anterior portion of head; E, maxilliped; F, posterior lamina of head; G, marsupial plate I; H, thoracic leg, right I; J, abdomen. K-M, ♂; K, head; L, thoracic leg, right VI; M, abdomen, ventral side.

segmental borders entire.

5 pairs of pleopoda (Fig. 3, j) biramous. Endopodite foliaceous, tapering distally and directed inwards. Exopodite shorter than endopodite, cordiform and directed postero-outwards. Uropoda biramous. All rami similar in size, narrowly elongated, but not extending beyond posterior end of 5th pleopod.

Male (Fig. 3, c): Length 1.3 mm. No pigmentation.

Head small (Fig. 3, k), frontal margin widely rounded. Eyes small. Both pairs of antennae short, 3-jointed. Maxillae and maxillipeds semicircular.

7 thoracic segments distinct, subequal in length. From 4th segment thorax gradually narrows anteriorly and posteriorly. Pedal joints well defined (Fig. 3, l). Propodite and carpopodite setose at the distal end.

Abdomen (Fig. 3, m) triangular, tapering posteriorly. All 6 segments distinctly separated. Posterior margin of terminal segment has a median process and is provided with several setae on either side. 5 pairs of pleopoda uniramous, represented by protuberances in first 5 segments. Uropoda absent.

Occurrence: A female specimen carrying a male infesting left branchial cavity of the hermit-crab *Calcinus elegans* (MILNE-EDWARD) was obtained in June, 1931, at Seto, Kii.

Pleurocrypta HESSE

1865, HESSE, M., Ann. Sci. Nat., ser. 5, t. 3, p. 226.

Pleurocrypta yatsui (PEARSE)

Syn. *Probopyrus yatsui* PEARSE¹

Female (Fig. 4, A & B): Length 4.5 mm., width 2.8 mm. in largest specimen. Body oval, rather symmetrical than asymmetrical. Dorsal side somewhat concave, ventral convex. No trace of pigment.

Head wider than long, nearly oval, acuminate on each side. Frontal lamina broad and lamellar, with rounded anterior margin and produced on each side. Eyes absent. Both pairs of antennae (Fig. 4, d) short, 2-jointed. Maxillipeds without palp (Fig. 4, f), anterior lobe notched at antero-internal corner, each side of which is bordered with a few setae. Posterior lamina narrow, produced on either side into 2 internally curved hook-like processes.

Thoracic segments separate. Posterior lateral parts small in first 3 segments, rudimentary in 4th and entirely absent in next 3 segments.

¹ PEARSE, literature no. 55, pp. 5-6.

Ovarian bosses present in first 4 segments. Coxal plates developed in all segments, broad and lamellar, but not imbricate one upon another.

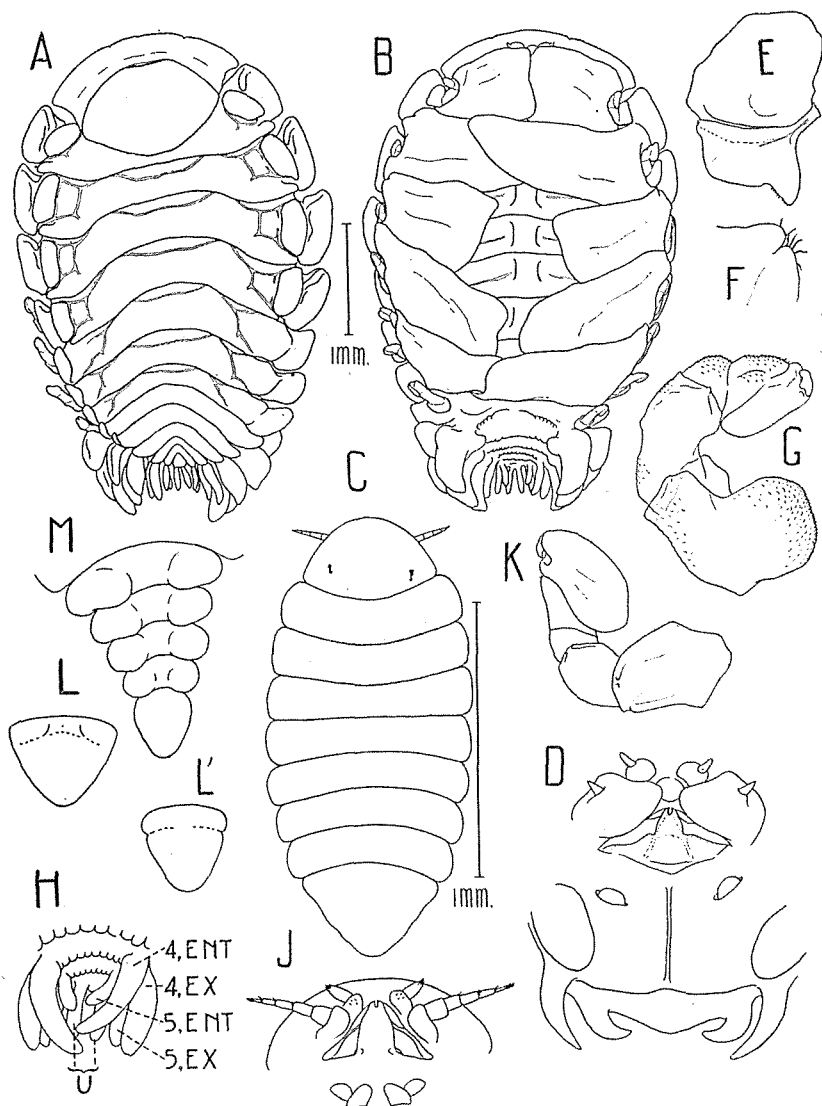


Fig. 4. *Pleurocrypta yatsui* (PEARSE)

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-H, ♀; D, head; E, marsupial plate I; F, antero-internal corner of maxilliped; G, thoracic leg, left VI; H, posterior portion of abdomen, ventral side. J-M, ♂; J, head; K, thoracic leg, left VII; L, L', abdomen, ventral side; M, abnormal abdomen, ventral side.

In first 4 pairs of coxal plates a longitudinal ridge present near anterior free margin, while absent in last 3 pairs.

Joints of legs (Fig. 4, g) distinct and more or less scaly. Dactylopodite rather small; basipodite with large quadrangular lateral expansion.

Marsupium vaulted; a small area in the mid-ventral surface remains uncovered. 1st plate (Fig. 4, e) produced backwards in linguiform lobe, bordered with a row of setae on inner margin.

Abdomen wider than long; segmental width rapidly narrowing posteriorly. First 5 segments V-shaped; lateral plates not well developed. Terminal segment small, triangular, with truncated posterior margin. Segmental borders crenated on ventral surface.

5 pairs of biramous pleopoda exposed for the most part and visible in dorsal view (See Fig. 4, A). In first 2 pairs of pleopoda protopodite rather large and slightly produced internally. Endopodite triangular and directed postero-internally; exopodite oval and directed postero-externally. Both rami as well as protopodite gradually reduced in posterior pairs. Last 2 pairs of pleopoda (Fig. 4, H) very short and lancet-shaped; not extending beyond posterior end of 3rd pair. In last pair of pleopoda endopodite much shorter than exopodite. Uropoda simple, lancet-shaped, not longer than exopodite of 5th pleopoda.

Male (Fig. 4, c): Length 1.5 mm. No pigmentation.

Head (Fig. 4, j) distinct from thorax, strongly curved in front. Eyes present. Antennules 2-jointed. Antennae long, projecting beyond cephalic margin, 6-jointed. Maxillae and maxillipeds present.

Thoracic segments distinct. From 4th segment thorax gradually narrows towards both ends of the body. Legs (Fig. 4, k) distinctly jointed.

All 6 abdominal segments fused in a triangular piece, which is wider than long. Lateral margin somewhat undulating. Pleopoda and uropoda absent.

In some cases, a faint transverse line is visible in anterior part of abdomen between notches at each lateral margin (Fig. 4, L'). In other cases, even slight protuberances emerge in front of the line (Fig. 4, L). These, possibly, represent rudiments of pleopoda of 1st abdominal segment.

Abnormal male: Among 61 specimens examined, 3 males were abnormal, in which the abdomen is separated into 5 segments with sac-like pleopoda in the first 4 (Fig. 4, M). 5th segment limbless. As a whole, the abdomen of such specimens is much more elongated than in normal case, being about $2/7$ times as long as entire body (1.8 mm. in largest specimen). Otherwise no difference from normal male.

This constitution of the abnormal male is regarded in the genus *Parione* RICHARDSON as its generic character.¹

Remarks: *Pleurocrypta yatsui* was found by PEARSE in the branchial cavity of *Petrolisthes japonicus* at Misaki and described under the title of *Probopyrus yatsui*. In his rather short description PEARSE² mentions that in the female "abdominal segments poorly defined dorsally" and "uropoda absent", and in the male "abdomen conical; all segments fused and only the first two indicated by lateral notches" and "pleopoda absent". In spite of this description, judging from his figures the constitution of the head and thorax of the female exactly accords with that of the specimen under my observation. Moreover, in both cases the parasite is found in the same host. From these points of similarity it is doubtful whether PEARSE's specimen can be included in the genus *Probopyrus*; it differs from the general constitution of the genus in question either in the female or in the male. PEARSE's description cited above may presumably be based upon the examination of a damaged specimen. I am rather of the opinion, therefore, that his type specimen belongs to *Pleurocrypta*, and not to *Probopyrus*.

The present species is most closely related to *Pl. porcellanae* HESSE, *macrocephala* NZ. & B. à B. and *perezi* NZ. & B. à B., all parasitic on *Porcellanae*. The difference between the present species and these is shown in the table.

Character of female	<i>yatsui</i>	<i>porcellanae</i>	<i>macrocephala</i>	<i>perezi</i>
Frontal lamina & coxal plates	Well developed	Well developed	Well developed	Not well developed
Uropoda	Shorter than 5th pleopoda	Longer than 5th pleopoda	Shorter than 5th pleopoda	Shorter than 5th pleopoda
Lateral plates of abdomen	Rounded at the tip	Pointed, directed backwards	Rudimentary	Narrowed at the base
Head	Large	Large	Excessively large	Large
Abdomen	Rather small	Moderate size	Excessively small	Small

Occurrence: The present species is common in the branchial cavity of *Petrolisthes japonicus* DE HAAN, along the coast of Tanabe Bay.

1. RICHARDSON, literature no. 70, p. 39; NIERSTRASZ & BRENDER à BRANDIS, no. 44, p. 8.

2. PEARSE, no. 55, pp. 5-6.

This host is infested also by another Bopyrid, *Pseudionc petroli*, which will be described later.

Propseudione n. gen.

Female cephalon distinct from thorax.

Thoracic segments separate. Rudimentary coxal plates present in first 4 segments. Marsupium complete.

All 6 abdominal segments distinct. First 5 have well developed lateral plates. 6th segment small, without lateral plates. 5 pairs of pleopoda biramous. Uropoda uniramous.

Male cephalon and thoracic segments distinct. 6 abdominal segments separate. 5 pairs of pleopoda biramous, tubercular-form. Uropoda absent.

The new genus is closely related to *Pseudionc*, but differs from that and other allied genera in having tubercle-shaped biramous pleopoda in the male abdomen.

Bopyrids in which the male has biramous pleopoda can be found in *Ionella* BONNIER besides the present new genus. In the male of *Ionella* the external and internal rami are attached to a common peduncle—the protopodite—, while in the new genus the protopodite has disappeared and both rami are only represented by protuberances on the ventral surface of the segment.

Propseudione rhombicosoma n. sp.

Female (Fig. 5, A & B): Narrow, elongated pyriform, rather asymmetrical, head displaced to left side and abdomen to right side. Dorsal surface flat, ventral convex. Length 2 mm. Width 1.2 mm. No pigmentation.

Head (Fig. 5, D) large, set in thorax. Anterior lamina narrow, rolled up, its free margin turning backwards. Small eyes present. Antennules short, 3-jointed. Antennae rather long, 6-jointed. Maxillipeds (Fig. 5, E) with linguiform palp, furnished with a few setae. Posterior lamina narrow, bearing on each side larger branched external and smaller unbranched internal processes.

Thoracic segments distinct. Lateral margin of segments longer on right side. Rudimentary coxal plates separate in first 4 segments. 4 pairs of ovarian bosses present in these segments. In last 3 segments posterior lateral parts rudimentary or even absent.

Joints of leg (Fig. 5, G) distinct on external side; propodite and carpopodite inseparable on internal side. All joints, except basipodite, more or less scaly. Meropodite bulged on external side; basipodite produced laterally at the base. Marsupium closed; 1st plate (Fig. 5, F) has terminal elongation and margin of posterior lobe bordered with a row of setae.

6 abdominal segments distinct. First 5 segments arched anteriorly,

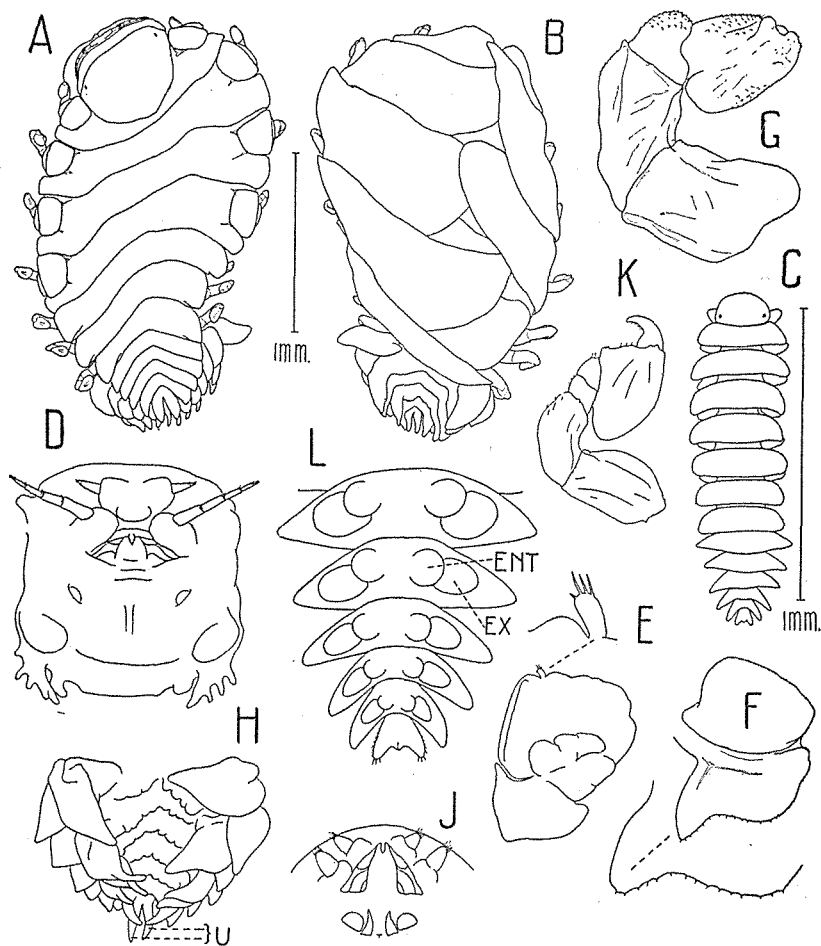


Fig. 5. *Propseudione rhombicosoma* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D—H, ♀; D, head; E, maxilliped and its palp; F, marsupial plate I and its posterior margin; G, thoracic leg, left VII; H, abdomen. J—L, ♂; J, head; K, thoracic leg, left IV; L, abdomen, ventral side.

lateral plates not well developed. Terminal segment very small, without lateral plates. On ventral surface segmental borders more or less crenated.

5 pairs of pleopoda (Fig. 5, н) not entirely concealed. External and internal rami similar in shape, foliaceous, acuminate towards the tip. Internal ramus slightly larger and directed inwards, external ramus turns postero-outwards. Uropoda uniramous, short and lancet-shaped.

Male (Fig. 5, c): Length 1.1 mm. No pigmentation.

Head (Fig. 5, j) small, frontal margin rounded, posterior margin nearly straight. Eyes present. Both pairs of antennae short, 2-jointed. Maxillae semicircular. Maxillipeds triangular.

Thorax discontinuous at the side. All 7 segments distinct, subequal in size. Joints of leg (Fig. 5, κ) distinctly defined. Propodite and dactylopodite large and provided with a few setae on inner margin. Carpopodite and meropodite rather small, setose on external margin.

6 abdominal segments (Fig. 5, л) separate and acuminate laterally. 1st segment slightly wider than last thoracic segment. Lateral plates of last 3 segments directed postero-laterally. Terminal segment produced in the middle between lateral plates and external margin bordered with a row of setae.

5 pairs of pleopoda biramous, tubercular. Uropoda absent.

Occurrence: The present species is frequently obtained from the branchial cavity of the hermit-crab *Calcinus herbstii* DE MAN at Seto, being found always in the right branchial cavity of the host and never in the left cavity.

Pseudione KOSSMANN

1881, KOSSMANN, R., Zeitschr. Wiss. Zool., xxxv, p. 663.

Pseudione clibanaricola n. sp.

Female (Fig. 6, A & B): pyriform, rather asymmetrical. Left side greatly swollen in anterior part, main axis twisted in S-form. Dorsal surface flat, ventral convex. No pigmentation. Length 5.3 mm. Width 3.7 mm.

Head (Fig. 6, d) sunk in thorax; frontal border nearly straight, posterior border rounded. Eyes absent. Both pairs of antennae short, 2-jointed. Maxillipeds (Fig. 6, e) without palp. Posterior lamina narrow, produced on each side into one long external and 2 short internal processes.

All 7 thoracic segments distinct and bilobed in lateral parts. Posterior lateral parts rather long in first 4 segments on left side, very

short or rudimentary in last 3 segments on both sides. Ovarian bosses and rudimentary coxal plates present in first 4 segments.

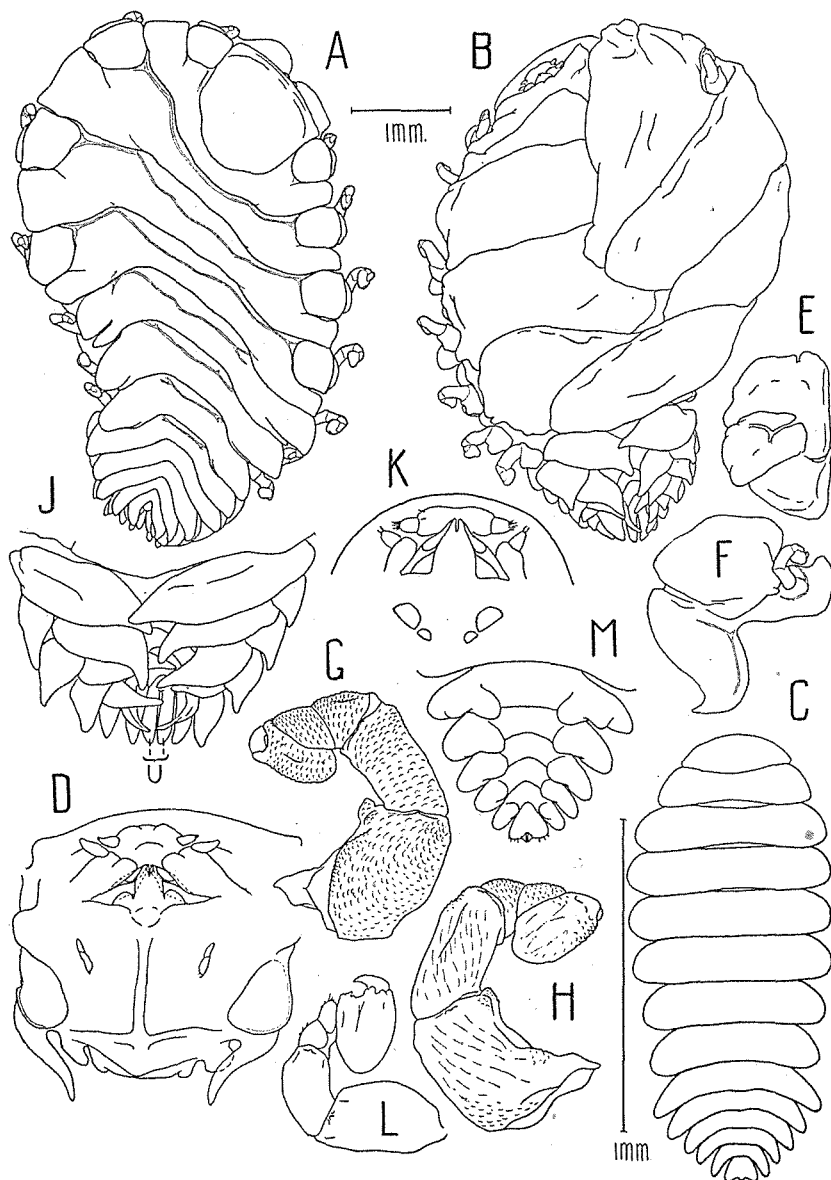


Fig. 6. *Pseudione clibanaricola* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D—J, ♀; D, head; E, maxilliped; F, marsupial plate I; G, thoracic leg, right V, outer surface; H, same, inner surface; J, abdomen. K—M, ♂; K, head; L, thoracic leg, left V; M, abdomen, ventral side.

Legs (Fig. 6, g & h) distinctly jointed. Carpopodite and meropodite scaly both on external and internal surfaces. Propodite, ischiopodite and basipodite scaly on external surface and ornamented with peculiar broken lines on internal surface. Basipodite has small lateral expansion. Marsupium complete; terminal process of 1st plate (Fig. 6, f) pointed internally.

Abdomen wider than long, with distinct segmentation. First 5 segments arched anteriorly, with well-developed lateral plates. Terminal segment small, without lateral plates.

5 pairs of biramous pleopoda (Fig. 6, j) diminishing in size from anterior to posterior. Both internal and external rami lamellar ending in an acuminate tip. Internal ramus larger, directed internally; external ramus smaller, directed postero-externally. Uropoda simple, narrow not extending beyond posterior end of 5th segment.

Male (Fig. 6, c): Length 1.5 mm. No pigmentation.

Head (Fig. 6, k) small, anterior margin rounded, posterior margin nearly straight. Eyes absent. Both pairs of antennae short, 2-jointed. Maxillae and maxillipeds present.

Thoracic segmentation distinct. From 3rd segment thorax narrows anteriorly and posteriorly. Pedal joints well defined (Fig. 6, l). Carpopodite and meropodite setose on external margin. Propodite denticulated on distal margin.

6 abdominal segments distinct (Fig. 6, m). 1st segment about as wide as last thoracic segment. From this part abdomen rapidly tapers towards the posterior end. Lateral plates directed postero-externally. Terminal segment triangular, with a median process and sparsely setose. Pleopoda uniramous, represented by a pair of protuberances. 1st pair tend to branch. Uropoda absent.

Remarks: NIERSTRASZ and BRENDER à BRANDIS¹ (1923) have tried to arrange numerous species of the genus *Pseudione* into 3 groups according to the constitution of the female with respect to the lateral plates of the abdomen and the coxal plates in the thorax; in group A, lateral plates not developed in abdomen, in group B, lateral plates well developed in abdomen and coxal plates not separated, and in group C, lateral plates well developed in abdomen and coxal plates separated.

According to that classification, the present species belongs to group C, but it differs from other species of the same group in the

1. NIERSTRASZ and BRENDER à BRANDIS, literature no. 40, p. 72.

great smallness of the abdomen as well as in poor development of the coxal plates and frontal lamina. Further, in the new species the segmental borders of the abdomen are rather straight and the lateral plates are not expanded on the proximal side, contrary to the general rule in group c.

However, the most remarkable characteristic of the present species seems to be the strongly asymmetrical structure of the female. In most cases the female of the genus is not so strongly asymmetrical as in the new species. Besides, the body of the female is twisted in S-form, which is quite unusual among Bopyrids. In general, if the thorax is twisted to the right side of the head, the abdomen is also dextrous to this side, or inversely if the twist of the thorax is sinistral, the abdomen is also sinistral; while in *Pseudione clibanaricola* the thorax is sinistral and the abdomen is dextrous. Such undulation of the body axis has been found in *Ps. giardi* CALMAN¹ and *latilamellaris* NZ. & B. à B², in the present genus. According to the above classification of NIERSTRASZ and BRENDER à BRANDIS, *Ps. giardi* belongs to group B. *Ps. latilamellaris* is also different from the present species in having the anterior segments of the thorax not expanded on one side, as well as in the presence of well developed coxal plates and a V-shaped exopodite in the pleopoda.

Occurrence: The present species is common in the left branchial cavity (never in the right) of the hermit-crab *Clibanarius bimaculatus* (DE HAAN) along the coast of Tanabe Bay. The right branchial cavity of the host is sometimes infested by another type of Bopyrid, quite different from *Ps. clibanaricola*. This form found in the right side will be described later.

Pseudione orientalis n. sp.

Female (Fig. 7, A & B): Narrow, slightly asymmetrical, one side nearly straight and other side boldly curved. Dorsal surface flat or slightly concave, ventral highly convex. Length 4 mm. Width 2.5 mm. No pigmentation.

Head wider than long, anterior and posterior margin widely rounded. Frontal lamina very narrow. Eyes present. Antennules (Fig. 7, D) short, 3-jointed. Antennae also short, 6-jointed. Max-

1. RICHARDSON, literature no. 67, p. 524, fig. 569.

2. NIERSTRASZ and BRENDER à BRANDIS, no. 47, p. 165, figs. 32-35.

illipeds (Fig. 7, E) without palp. Posterior lamina asymmetrical, with pairs 2 of lateral processes asymmetrically developed (Fig. 7, F).

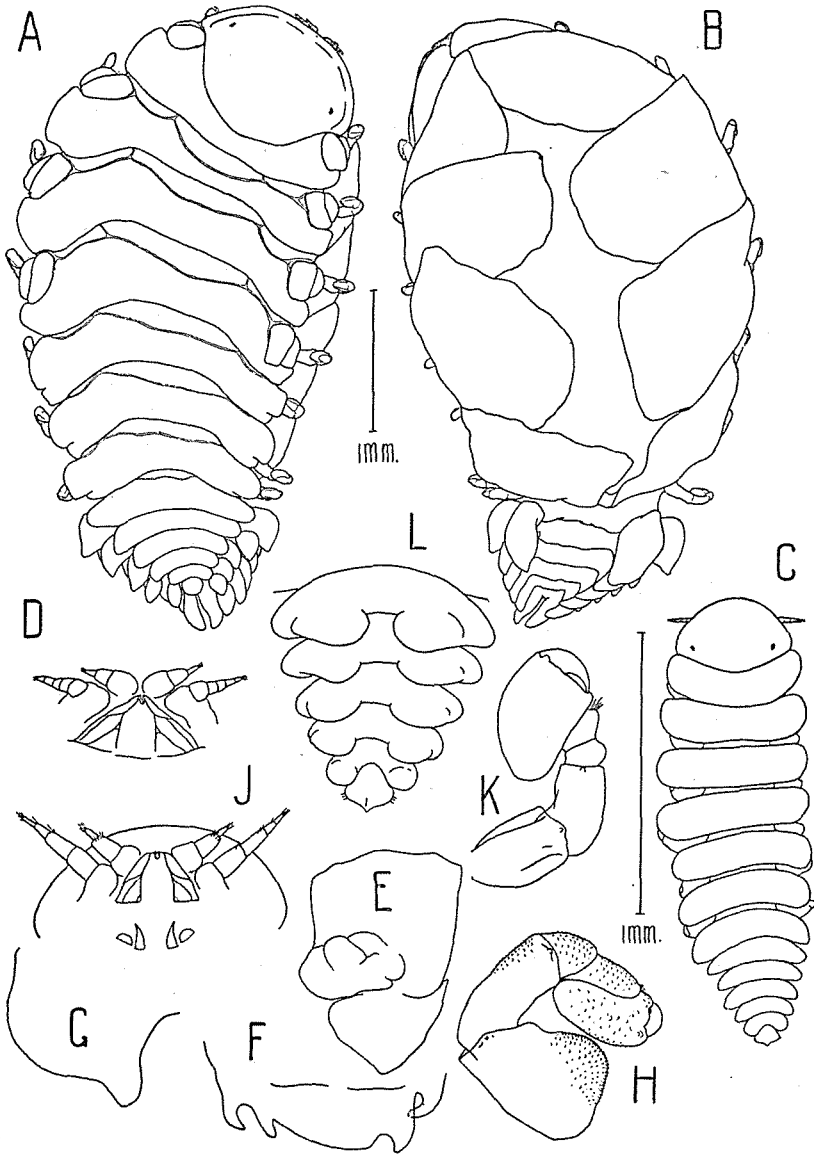


Fig. 7. *Pseudione orientalis* n. sp.

A, ♀, dorsal side; B, ♀, ventral side; C, ♂, dorsal side. D—H, ♀;
D, anterior portion of head; E, maxilliped; F, posterior lamina of head;
G, posterior lobe of marsupial plate I; H, thoracic leg, left IV. J—L, ♂;
J, head; K, thoracic leg, right IV; L, abdomen, ventral side.

Thoracic segments separate. All segments bilobed on lateral margin. Posterior lateral part of 7th segment rudimentary especially on shorter side. Ovarian bosses and narrow coxal plates present in first 4 segments.

Pedal joints distinct and more or less scaly (Fig. 7, H). Lateral expansion of basipodite semicircular. Marsupium highly vaulted. 5 pairs of marsupial plates very thin and hardly meeting on mid-ventral surface. 1st plate (Fig. 7, G) with linguiform process at postero-lateral corner of distal lobe.

6 abdominal segments separate. Lateral plates not well developed, exposing greater part of pleopoda in dorsal view. Terminal segment small and rounded. Segmental borders slightly curved on dorsal side. Ventral surface smooth and greater part exposed.

5 pairs of pleopoda biramous and lamellar (See Fig. 7, A & B). In 1st pair exopodite slightly shorter than endopodite. Difference in length between 2 rami increases posteriorly. In last pair exopodite less than half the length of endopodite. Endopodite directed posteriorly, exopodite postero-laterally. Uropoda uniramous, similar in shape to endopodite of last pleopoda, extending slightly beyond posterior end of the latter.

Male (Fig. 7, C); Length 1.6 mm. No pigmentation.

Head (Fig. 7, J) wider than long, semicircular in front, rounded behind. Eyes present. Antennules short, 3-jointed. Antennae rather long, projecting beyond cephalic margin, 5-jointed. Maxillae semicircular. Maxillipeds triangular.

Thoracic segmentation distinct. From 4th segment, thorax gradually narrows anteriorly and posteriorly. Pedal joints well defined (Fig. 7, K). Carpopodite bulged on external side and provided with long setae at the distal end; meropodite also bulged on the same side.

6 abdominal segments separate (Fig. 7, L), rapidly diminishing in width posteriorly. Segments much shorter than in thorax. Terminal segment somewhat triangular, with a median process and laterally setose. 5 pairs of uniramous pleopoda represented by conspicuous protuberances. Uropoda absent.

Remarks: Of the 3 groups of *Pseudione* as classified by NIERSTRASZ and BRENDER & BRANDIS, the present species belongs to group A, in which the lateral plates of the female abdomen are not well developed. The most remarkable feature of *Ps. orientalis*, by which this species can be distinguished from other members of the group, except *nobilii*,

is that the exopodite of the pleopoda is shorter than the endopodite. In *Ps. nobilii* Nz. & B. & B., however, the exopodite is much shorter than the endopodite in the 1st pleopoda, but this difference in length decreases posteriorly, until both rami become almost equal in the 5th pair. In this respect, the character in question is reversed in *orientalis* and *nobilii*.

The difference from other species of group A may be tabulated.

Character of female	<i>orientalis</i>	<i>retrorsa</i>	<i>curtata</i>	<i>trilobata</i>	<i>japanensis</i>
Frontal lamina	Very narrow	Very narrow	Absent	Trilobate	Very narrow
Uropoda	Short	Very long	Moderately long	Moderately long	Short
Lateral plates	Almost rudimentary	Small	Narrower than segment	Almost rudimentary	Narrower than segment

Occurrence: The present species is frequently found in the branchial cavity of *Galathea orientalis* STIMPSON, caught at Seto.

Pseudione petrolistheae n. sp.

Female (Fig. 8, A & B): Somewhat asymmetrical. Dorsal surface slightly concave, abdomen bending upwards, ventral highly convex. Length 4.2 mm., width 2.6 mm. in largest specimen. No pigmentation.

Head (Fig. 8, D) large, frontal margin rounded, posterior margin V-shaped. Frontal lamina not developed in the middle, but produced on lateral side in narrow lobe. Eyes present. Both pairs of antennae short; 1st pair 3-jointed, 2nd pair 5-jointed. Maxillipeds (Fig. 8, E) without palp. Posterior lamina rather wide, trapezoid; 2 pairs of lateral processes small and branched or tuberculated on outer edge.

Thoracic segments separate. Posterior lateral parts rather small in first 4 segments, absent in last 3. Ovarian bosses and narrow coxal plates distinct in first 4 segments.

Legs (Fig. 8, G) distinctly jointed. Carpopodite and meropodite scaly. Internal margin of basipodite expanded in triangular plate, directed distally. Marsupium highly vaulted. 5 pairs of delicate plates meet together on mid-ventral surface. Distal lobe of 1st plate (Fig. 8, F) produced posteriorly into triangular lobe, with sharply pointed tip.

6 abdominal segments distinct. First 5 segments slightly arched anteriorly; lateral plates not well developed, exposing greater part of pleopoda. Terminal segment small, rounded, without lateral plates.

On ventral surface segmental borders entire, except in front of 1st segment, which is crenated.

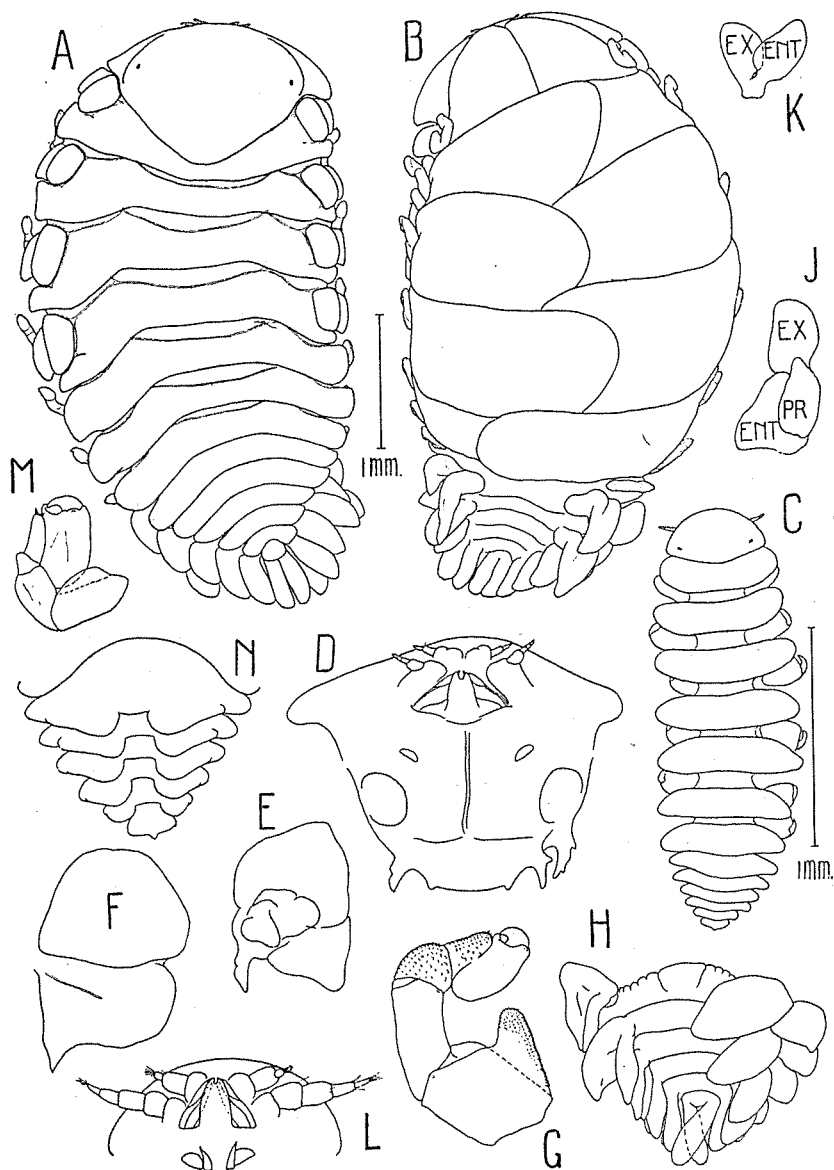


Fig. 8. *Pseudione petrolistheae* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-K, ♀;
D, head; E, maxilliped; F, marsupial plate I; G, thoracic leg, left VI;
H, abdomen; J, pleopod, left I, inner face; K, same, left III, outer face.
L-N ♂; L, head; M, thoracic leg, left VI; N, abdomen, ventral side.

5 pairs of pleopoda biramous (See Fig. 8, H). External and internal ramus oval in shape. Exopodite shorter than endopodite in anterior pairs; difference decreases in posterior pairs; in 5th pair both rami equal in length. Protodopite developed in 1st pair, reduced in posterior pairs (Fig. 8, K & J). Uropoda simple, lanceolate, extending slightly beyond posterior end of last pleopoda.

Male (Fig. 8, c): Length 1.5 mm. No trace of pigmentation.

Head (Fig. 8, L) wider than long, with round anterior margin. Eyes present. Antennules short, 3-jointed. Antennae long, projecting beyond cephalic margin, 5-jointed. Maxillae semicircular. Maxillipeds narrow and triangular.

Thoracic segmentation distinct. Thorax gradually narrows from 5th segment forwards and backwards. Pedal joints well defined (Fig. 8, M). Carpopodite rather slender. Meropodite small, much shorter than carpopodite.

6 abdominal segments (Fig. 8, N) crowded, rapidly diminishing in width posteriorly. 1st segment slightly narrower than last thoracic segment. Pleopoda uniramous and represented by conspicuous protuberances. Terminal segment somewhat triangular, with a median process and provided with a few setae on each side. Uropoda absent.

Remarks: The present species belongs to group A of *Pseudione* and is closely related to *Ps. orientalis*, but differs from the latter in the characters shown in the table.

Character of female	<i>orientalis</i>	<i>Petrolistheae</i>
Posterior margin of head	Rounded	V-shaped
Frontal lamina	Narrow, but entire	Absent in the middle
Relative length to width of abdomen	7 : 9	7 : 11
Relative length of exopodite and endopodite of pleopoda	Increases in posterior pairs	Decreases in posterior pairs

Occurrence: *Ps. petrolistheae* is common at Seto in the branchial cavity of *Petrolisthes japonicus* (DE HAAN). Another Bopyrid found in the branchial cavity of the same host has been described before under the name of *Pleurocrypta yatsui* (PEARSE).

Pseudione asymmetrica n. sp.

Female (Fig. 9, A & B): Elongated oval, exceedingly asymmetrical.

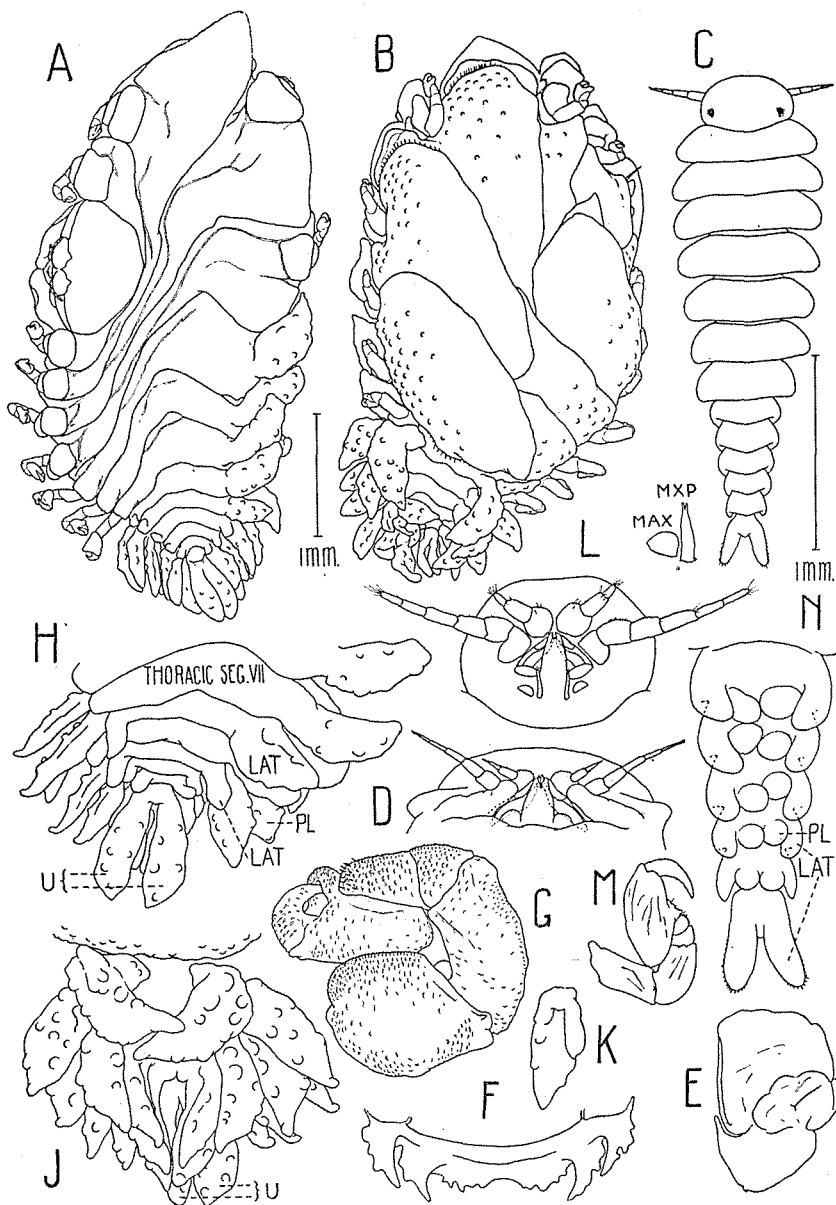


Fig. 9. *Pseudione asymmetrica* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-K, ♀; D, anterior portion of head; E, maxilliped; F, posterior lamina of head; G, thoracic leg, right III; H, abdomen, dorsal side; J, same, ventral side; K, pleopod, right V, inner face. L-N, ♂; L, head; M, thoracic leg, right I; N, abdomen, ventral side.

Anterior segments enormously expanded on right side, displacing head completely to left side. Largest diameter of body lies on the line between right lateral edge of 2nd thoracic segment and posterior extremity of last segment. Dorsal side concave; ventral convex. No pigmentation. Length 5 mm. Width 2.4 mm. in middle part of body.

Head wider than long, deeply set in thorax almost perpendicularly to longest axis of body; anterior margin straight, posterior margin round. Frontal lamina narrow, rolled up and produced backwards in the middle into a pair of small projections. Eyes absent. Antennules short, 3-jointed (Fig. 9, d). Antennae very long, projecting beyond cephalic margin, 6-jointed. Maxillipeds (Fig. 9, e) without palp. Posterior lamina (Fig. 9, f) narrow, divided into 2 parts with branched margin. 2 pairs of lateral processes also branched on external margin.

Thoracic segments compressed, crowding on left side, expanding on right side (See Fig. 9, A). Mid-dorsal region of 1st segment completely disappeared. In first 4 segments right lateral parts bilobed; in 2nd and 3rd segments posterior lateral parts enormously expanded on right side. On left side posterior lateral parts disappeared. In last 3 segments posterior lateral parts also absent on both sides. Ovarian bosses and narrow coxal plates present on both sides in first 4 segments. In last 3 segments coxal plates absent on left side, developed on right side as tuberculated foliaceous lamellae without demarcation from segment either by groove or line.

Legs (Fig. 9, c) distinctly jointed, and strongly scaly. Dactylopodite strong and greatly curved. Carpopodite setose at the distal end. Basipodite has lateral expansion. Marsupium complete. Terminal projection of 1st plate (Fig. 10) small and sharp. Successive plates larger on right side where special modification produced.

6 abdominal segments (Fig. 9, n) greatly asymmetrical as in thorax. Lateral plates of first 2 segments expanded on right side into tuberculated foliaceous plates like coxal plates of last 3 thoracic segments.

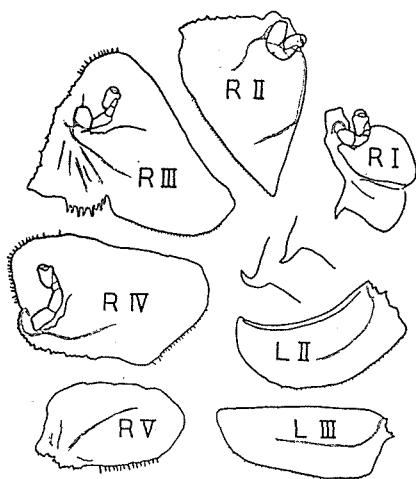


Fig. 10. *Pseudione asymmetrica* n. sp.
Marsupial plates of right (R) and left (L).

On left side of first 2 segments as well as on both sides of following 3 segments lateral plates greatly reduced into postero-dorsally directed small projections. Terminal segment small, without lateral plates.

5 pairs of biramous pleopoda visible in dorsal view. External and internal ramus lamellar and tuberculated, subequal in size (Fig. 9, j). In 5th pleopoda (Fig. 9, k) external ramus very short and rudimentary. Uropoda uniramous, also tuberculated.

Male (Fig. 9, c): Length 2.5 mm. Slender, narrowing posteriorly. No pigmentation.

Head (Fig. 9, l) oval, broader than long. Eyes large. Antennules 3-jointed. Antennae long, projecting beyond cephalic margin, 6-jointed. Maxillae semicircular. Maxillipeds long, filiform, bifurcated at the tip.

Thoracic segmentation distinct. From 2nd segment thorax gradually narrows posteriorly. Legs (Fig. 9, m) distinctly jointed. Dactylopodite large and strong. Carpopodite and meropodite small.

6 abdominal segments (Fig. 9, n) separate. Abdomen long, about $2/3$ the length of thorax. Lateral plates of first 5 segments well developed, turning to ventral side. Lateral plates of last segment elongated posteriorly in V-shape and external margin bordered with a row of setae.

Pleopoda uniramous, represented by pairs of spherical bodies on ventral surface of segments. Uropoda absent.

Remarks: The male is not found fixed on ventral surface of the female, but usually is creeping on the branchiae of the host.

Aberrancies of female pleopoda: The exopodite may be absent in the last 2 pairs of the pleopoda: in some cases the exopodite has completely disappeared in the 5th pleopoda, and in other cases the reduction is found even in the 4th pleopoda, which become uniramous. These variations can not be regarded as a developmental condition, but seem to be entirely due to individual variation, as is easily made out from the table in next page. The first 3 pairs of pleopoda never exhibit such reduction of the ramus.

In the classification of Bopyrids the constitution of the pleopoda is one of the most important generic characters. However, this can not be overestimated in the present case, where the reduction of the external ramus of the pleopoda normally occurs in varying degrees. Therefore, I shall include all the types of different constitution of the 4th and 5th pleopoda in a single species.

Reduction of the 1st thoracic segment in the mid-dorsal region as found in the present specimen is common among Phryxids, but

Group		Pleopoda		Number of individuals	Body length in mm.
		IV	V		
I	Right	Biramous	Biramous	2	5.2
	Left	Biramous	Biramous		
II	Right	Biramous	Uniramous	3	3.1-5.7
	Left	Biramous	Biramous		
III	Right	Biramous	Biramous	—	—
	Left	Biramous	Uniramous		
IV	Right	Biramous	Uniramous	6	3.0-7.2
	Left	Biramous	Uniramous		
V	Right	Uniramous	Uniramous	9	3.1-6.2
	Left	Uniramous	Uniramous		

quite unusual in the branchial Bopyrids. Other peculiarities are found in the disappearance of the left posterior lateral parts in the first 4 thoracic segments and the presence of well-lamellated coxal plates on the right side of the last 3 segments. These peculiarities as well as the above mentioned reduction of the middle part of the 1st thoracic segment seem, in all likelihood, to be due to an extraordinarily asymmetrical development of the body. At any rate, the constitution of the body in the present species is quite unique in the genus *Pseudione*.

Occurrence: *Ps. asymmetrica* is common in the right branchial cavity of *Clibanarius bimaculatus* (DE HAAN), but never infests the left side. Bopyrids in the left branchial cavity have been described in the preceding section under the name of *Ps. clibanaricola*. The hermit-crab is occasionally infested by two types of Bopyrids at the same time.

Argeia DANA

1853, DANA, J. D., U. S. Expl. Exped. Crust., xiv, p. 804.

Argeia pugettensis DANA¹

Syn. *Argeia calmani* BONNIER²

Female (fig. 11, A & B): Asymmetrical, rather compressed antero-

1) DANA, literature no. 11, p. 804; STIMPSON, no. 81, p. 511; BONNIER, no. 4, pp. 327-328; RICHARDSON, no. 60, p. 337, no. 64, p. 45 & no. 67, p. 545.

2) BONNIER, no. 4, p. 329.

posteriorly. Length 6.5 mm. Width in 3rd thoracic segment 6 mm. No pigmentation.

Head oval, twice as wide as long, swollen on dorsal surface. Frontal lamina narrow, anterior margin slightly rounded. Eyes absent. Both pairs of antennae (Fig. 11, D) short. 1st pair 2-jointed, fused in the middle by basal joint. 2nd pair 4-jointed. Palp of maxillipeds

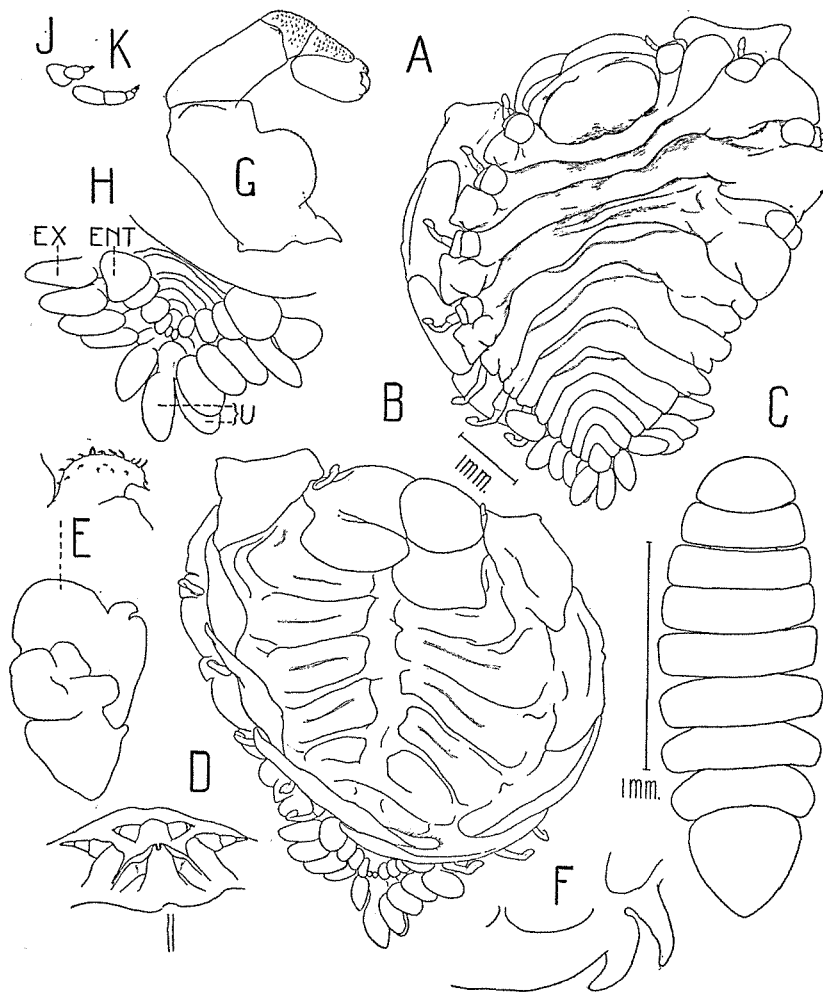


Fig. 11. *Argeia pugettensis* DANA

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-H, ♀; D, anterior portion of head; E, maxilliped and its palp; F, posterior lamina of head, left half; G, thoracic leg, left III; H, abdomen, ventral side. J-K, ♂; J, antennule; K, antenna.

(Fig. 11, E) linguiform, directed inwards and beset with minute setae on both surface and margin. Posterior lamina (Fig. 11, F) rather wide, and bears 2 pairs of hook-like lateral processes.

7 thoracic segments distinct and bilobed in lateral parts. Posterior lateral parts longer than anterior lateral parts in first 4 segments, shorter in following 2 segments. In last segment posterior lateral parts rudimentary. Small ovarian bosses and narrow rudimentary coxal plates present only in first 4 segments.

Legs (Fig. 11, G) slender, distinctly jointed. Carpopodite, meropodite and distal end of propodite scaly. Basipodite has round lateral expansion. Marsupium incomplete, with median space widely open; 1st plate without terminal projection.

6 abdominal segments distinct. Segmental borders arched anteriorly. 6th segment small, rounded. Lateral plates not developed in all segments.

5 pairs of pleopoda biramous (Fig. 11, H). Exopodites elongated oval, subequal in size in all pairs, attached closely to lateral margin and directed externally. Endopodites rounded, rapidly decreasing in size from 1st to last and attached internally somewhat apart from exopodites. Uropoda simple, similar in shape to exopodite of pleopoda.

Male (Fig. 11, C): Length 2 mm., no pigmentation.

Head small, wider than long, rounded on both anterior and posterior margins. Eyes absent. Antennules (Fig. 11, J) 3-jointed. Antennae (Fig. 11, K) 4-jointed. Maxillae and maxillipeds absent.

Thoracic segmentation distinct; from 5th segment thorax gradually narrows anteriorly and posteriorly. Lateral margin of segment nearly straight.

Abdominal segments coalesced to a single conical piece, with a pointed posterior end. Pleopoda and uropoda absent.

Remarks: In 2 specimens examined, the margin of posterior lateral part of the female thorax is not produced into a "thoracic process".¹

Occurrence: 2 rather small but mature females and a male attached to one of these are found in the collection of the Museum of the Laboratory. Locality and host are unknown.

Argeia pugettensis is a Northern Pacific form, occurring on both American and Asiatic sides in wide range. (Localities and various forms of the host have been precisely given by RICHARDSON (1905).²)

1. DANA, literature no. 11, p. 803, pl. LII, fig. 7; STIMPSON, no. 80, p. 511; BONNIER, no. 4, pp. 327-328, fig. 55; RICHARDSON, no. 67, p. 545, fig. 586.

2. RICHARDSON, no. 67, pp. 545-547.

Bopyrella BONNIER

1900, BONNIER, J., Trav. Stat. Zool. Wimmereux, VIII, p. 347.

Bopyrella pacifica n. sp.

Female (Fig. 12, A & B): Flattened, pyriform, asymmetrical. No pigmentation even without eyes. Length 11.5 mm. Width 7.5 mm.

Head (Fig. 12, D) completely fused with 1st thoracic segment on dorsal side, but laterally demarked by shallow notch. Anterior margin irregular with angular lateral corners. Antennules short, 2-jointed; fused in the middle by basal joint, terminal joint very small. Antennae also short, consisting of large basal and small terminal joint. Maxillipeds provided with palp (Fig. 12, E) continuous with inner margin of anterior lamella and bordered with setae. Posterior lamina narrow; 2 pairs of hook-like lateral processes thickset.

Thoracic segmentation distinct. 1st segment narrow and 2nd segment compressed in mid-dorsal part. First 4 segments bilobed in lateral parts. Posterior lateral part rather reduced except on right side of 2nd and 3rd segment where the plate is widely expanded. In last 3 segments lateral side undivided. Narrow coxal plates and quadrangular ovarian bosses present in first 4 segments.

Joints of legs (Fig. 12, G) distinct and scaly. Carpopodite and meropodite bulged on external side. Basipodite has round lateral expansion. Marsupium widely open. 1st plate does not cover anterior portion of maxilliped; posterior lobe has large triangular terminal process, directed posteriorly and bordered with a row of setae on inner margin (Fig. 12, F). Successive plates narrow. Last pair elongated to complete posterior boundary of marsupium.

6 abdominal segments fused in mid-dorsal region (See Fig. 12, A), but separated on both sides. Lateral plates apart from one another and obtusely truncated at margin. Posterior margin of terminal segment notched in the middle. Boundary between 1st and 2nd segments more or less distinct owing to a faint line on dorsal surface along entire length. In following segments boundary less distinct. On ventral surface lateral plates folded at anterior free margin (Fig. 12, B, X). Rather rudimentary fold also present in last segment.

5 pairs of biramous pleopoda gradually diminishing from first to last. Endopodite lamellar, directed inwards; exopodite smaller than endopodite, directed outwards. Both rami oval in shape. Uropoda absent.

Male (Fig. 12, C): Length 2.7 mm. No pigmentation.

Head (Fig. 12, H) small, rounded at anterior margin, fused posteriorly

with 1st thoracic segment, original segments laterally separated by shallow notch. Eyes small. 2 pairs of antennae short. Anterior pair

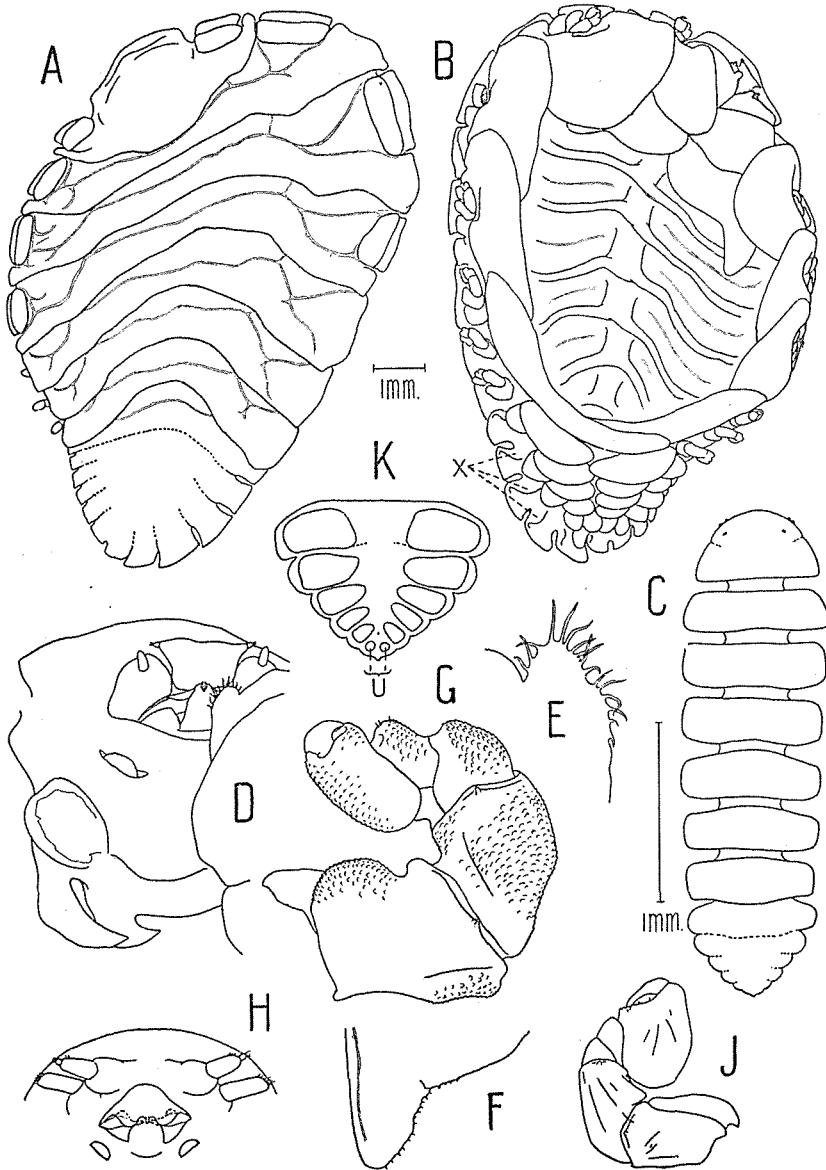


Fig. 12. *Bopyrella pacifica* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-G, ♀; D, head; E, palp of maxilliped; F, posterior projection of marsupial plate I; G, thoracic leg, right VII. H-K, ♂; H, head; J, thoracic leg, right I; K, abdomen, ventral side.

3-jointed; terminal joint minute. Posterior pair 2-jointed; terminal joint cylindrical, with truncated tip. Maxillae present. Maxillipeds absent.

Thoracic segments distinct and discontinuous. 2nd to 6th segments subequal in size, lateral margin straight. Pedal joints well defined (Fig. 12, j). Propodite slightly denticulated on distal margin and bears several setae.

All abdominal segments fused into a triangular piece, but laterally separated by notches (Fig. 12, k). Boundary between 1st and 2nd segment faintly visible on dorsal side along entire length. In following segments boundary indicated only for short distance at lateral margin. Terminal segment with a median process. 5 pairs of sac-like pleopoda uniramous. Uropoda represented by a pair of small rounded bodies.

Remarks: The most characteristic point by which the present species is distinguished from other species of *Bopyrella* is the presence of uropoda in the male. (As a rule, uropoda are absent in the male of this genus.) Another peculiarity of the new species is found in the constitution of the female abdomen, in which the lateral plates are widely separated from one another on both sides and the last segment is notched on the posterior margin.

Among the numerous species of this genus, the new species seems to be most closely related to *B. mortenseni* Nz. & B. à B., *barnardi* Nz. & B. à B., *choprae* Nz. & B. à B. and *richardsonae* Nz. & B. à B.; difference from these species is shown in the table.

		<i>pacifica</i>	<i>mortenseni</i>	<i>barnardi</i>	<i>choprae</i>	<i>richardsonae</i>
Female	Direction of terminal process of 1st marsupial plate	Backwards	Inwards	Unknown	Backwards	Unknown
	6th abdominal segment	Notched	Entire	Notched	With median process	Large and entire
Male	Notch between cephalon and 1st thoracic segment	Shallow	Deep	Deep	—	Shallow
	Abdomen	With pleopoda	With pleopoda	Without pleopoda	—	(Wider than thorax)
	Uropoda	Present	Absent	Absent	—	Absent

The remaining species of the genus are less closely related to the present species, having different constitution of the female abdomen.

Occurrence: One female and one male were obtained at Seto in the branchial cavity of *Synalpheus* sp.

In spite of the abundance of species only *B. choprae* has been collected by MORTENSEN in Taiwan-Kaikyô (Straight of Formosa). The new species is, therefore, the second of the genus found in Japan.

Bopyrus LATREILLE

1802, LATREILLE, P. A., Hist. natur. génér. et partic.
des Crustacés et des Insectes, VII, p. 50.

Bopyrus squillarum LATREILLE¹

Syn. *Monoculus crangorum* FABRICIUS

Bopyrus fougrouxii GIARD & BONNIER²

Bopyrus helleri GIARD & BONNIER³

Bopyrus rathkei GIARD & BONNIER⁴

Bopyrus xiphias GIARD & BONNIER⁵

Female (Fig. 13, A & B): Flattened, pyriform, asymmetrical. Marsupial plates and maxillipeds thickly pigmented; ventral surface and sometimes anterior part of dorsal surface also partly pigmented. Length 8 mm., width 5 mm. in largest specimen.

Head (Fig. 13, D) distinct and deeply sunk in thorax, triangular; frontal border nearly straight. Eyes absent. Both pairs of antennae short, 2-jointed. Maxillipeds (Fig. 13, E) with palp, bordered with a few setae. Posterior lamina wide, trapezoid; 2 pairs of lateral processes hook-like and directed inwards.

Thoracic segmentation distinct. First 4 segments bilobed, with very small posterior lateral parts. In last 3 segments lateral margin undivided. Narrow coxal plates and ovarian bosses present in first 4 segments.

Joints of legs (Fig. 13, F) more or less scaly. Propodite, carpopodite and meropodite partly fused on external side. Basipodite has large lateral expansion. Marsupium widely open. 1st plate covers only posterior two-thirds of maxilliped; terminal projection small, rounded and directed posteriorly. Other plates narrow. Last pair elongated to complete posterior side of marsupium.

6 abdominal segments distinct only for short distance from each lateral side (See Fig. 13, A). Segmental borders obliterated in the

¹ BATE and WESTWOOD, literature no. 3, pp. 214-222; SARS, no. 74, pp. 196-198, pl. 84.

² BONNIER, no. 4, pp. 359-362, pl. 35-36;

³ BONNIER, no. 4, pp. 362-363, pl. 37.

⁴ BONNIER, *ibid.*, p. 363.

⁵ BONNIER, *ibid.*, pp. 363-364, pl. 37.

middle region on both upper and lower surfaces. Lateral plates imbricated, though only slightly, on longer side and not on shorter

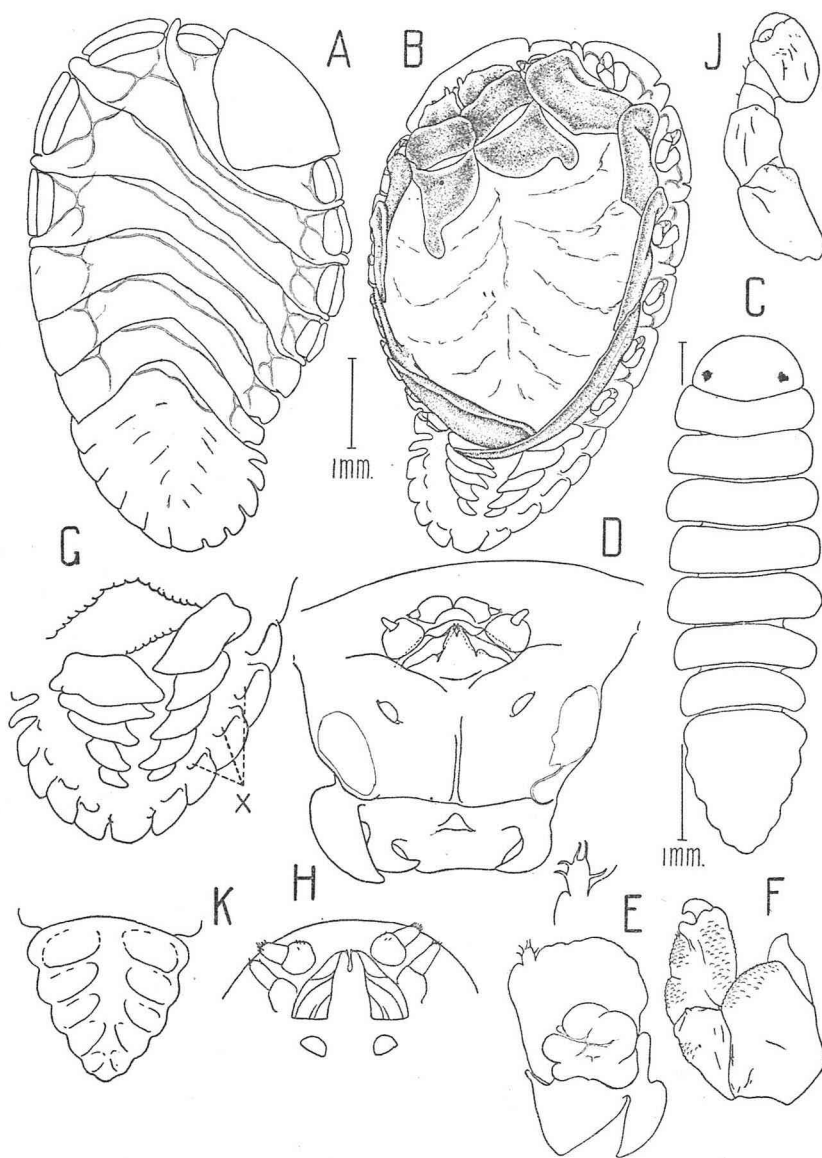


Fig. 13. *Bopyrus squillarum* LATREILLE

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-G, ♀; D, head; E, maxilliped and its palp; F, thoracic leg, left III; G, abdomen. H-K, ♂; H, head; J, thoracic leg, left II; K, abdomen, ventral side.

side. Lateral plates provided with longitudinal ridge at basal part on ventral surface, especially conspicuous on longer side (Fig. 13, G, X).

5 pairs of pleopoda uniramous, narrowed towards the tip and directed inwards. Uropoda absent.

Male (Fig. 13, c): 1.4 mm. long in largest specimen; thickly pigmented.

Head (Fig. 13, H) separated from thorax, anterior border semicircular. Large eyes present. Both pairs of antennae short, 2-jointed. Maxillae semicircular. Maxillipeds absent.

7 thoracic segments separate. Joints of leg (Fig. 13, J) well defined. Propodite and carpopodite sparsely setose at the distal end.

6 abdominal segments completely fused into a conical piece, tapering posteriorly. Original segmentation indicated on lateral side by marginal undulation. Uniramous pleopoda (Fig. 13, K) represented by oval protuberances. Uropoda absent.

Remarks: In spite of different host the present Bopyrid can be identified with *Bopyrus squillarum* LATR. The female specimen seems to be somewhat more slender than either that figured by G. O. SARS¹ or that of BONNIER² who described it under the name of *fougerouxii*. It is smaller than European forms, the largest specimen being 8 mm., while the measurement given by SARS³ and others is 11 mm. According to BONNIER⁴, the female of *fougerouxii* is from 5 mm. to 11 mm., varying with the age as well as the size of the host animals. The male of the present specimen is also more slender than that figured by SARS and BONNIER and very similar to that of BONNIER's *xiphias*.⁵

It is generally accepted that the names *helleri*, *xiphias* and *rathkei* of GIARD and BONNIER are synonymous with *fougerouxii*, which is given to the same animal as *squillarum*.⁶

Occurrence: This Bopyrid is found at Seto in the branchial cavity of *Leander scerrifer* STIMPSON and *pacificus* STIMPSON. So far as I am aware this is the first occurrence to be reported from the Pacific coast, though it seems to be quite common in Europe along the Atlantic coast as well as in the Mediterranean Sea, where the species is found parasitic on various species of the genus *Leander*.

1 SARS, literature no. 74, pl. 84, fig. 1.

2 BONNIER, no. 4, pl. 35, figs. 1 & 2.

3 SARS, no. 74, pl. 84, fig. 1.

4 BONNIER, no. 4, pp. 359-362.

5 BONNIER, *ibid.*, pl. 37, fig. 8.

6 CHOPRA, no. 7, pp. 518-520; NIERSTRASZ and BRENDER à BRANDIS, no. 44, pp. 26-27.

Bopyrina KOSSMANN

1881, KOSSMANN, R., Zeitschr. Wiss. Zool., xxxv, p. 667.

Bopyrina kossmanni CHOPRA¹

Female (Fig. 14, A & B): Quite asymmetrical, greatly expanding on right side; lateral parts of segments darkly pigmented as shown in Fig. 14, A & B. Length 5.7 mm. Width 3.5 mm.

Head (Fig. 14, c) fused with 1st thoracic segment; boundary faintly visible as shallow groove in mid-dorsal region. Frontal margin irregular with angular lateral corner. Antennae and rostrum exposed. Both pairs of antennae short, 2-jointed. Maxillipeds have palp (Fig. 14, D), bordered with setae. Posterior lamina provided with 2 pairs of hook-like lateral processes.

Thoracic segmentation distinct. 1st segment compressed in mid-dorsal region and anteriorly fused with head. Lateral margin of first 4 segments bilobed; anterior lateral part longer than posterior lateral part. In last 3 segments lateral side entire. Ovarian bosses and narrow coxal plates present in first 4 segments. Coxal plate of 1st segment especially wider on shorter side.

Legs (Fig. 14, F) distinctly jointed. Internal margin of basipodite has round lateral expansion in all legs from 1st to 6th pair. (This structure of legs is somewhat different from that in CHOPRA's original drawing,² which, however, is comparable to the 7th pair of the present specimen.) Marsupium widely open. Small terminal projection of 1st plate (Fig. 14, E) directed inwards and bordered with a row of setae on inner side. Posterior end of 5th plate untouched and posterior border of marsupium incomplete.

Abdomen (See Fig. 14, A) about as wide as long; segments fused in the middle and separated on each side. Segmental borders distinct for some distance from lateral margin. Lateral plates slightly imbricate. On ventral surface lateral plates provided with ridges (Fig. 14, B, x), but rather inconspicuous on shorter side. Posterior extremity of 5th segment slightly beyond 6th segment.

4 pairs of uniramous pleopoda present, lamellar, narrowed to the tip and directed inwards. 5th pleopoda and uropoda absent.

Male undiscovered.

Remarks: Although the general constitution of the present specimen is largely in accord with that given by CHOPRA for his Indian

1 CHOPRA, literature no. 7, pp. 527-529, pl. XX, figs. 7-11.

2 CHOPRA, *ibid.*, p. 528, text-fig. 29.

specimen, there are some differences between them: for example, 4 pairs of ovarian bosses, which are quite distinct in the present case, are absent in the other. Another difference exists in the relative length of the female abdomen to the width; in the present specimen the abdomen is about as wide as long, while it is wider than long, though only slightly, in the Indian specimen. As to the ventral ridge on the lateral plates of the abdomen, CHOPRA has given no description.

Occurrence: Only a female specimen was found in the branchial cavity of *Periclimenes* *sp.* caught at Seto in a rock-pool.

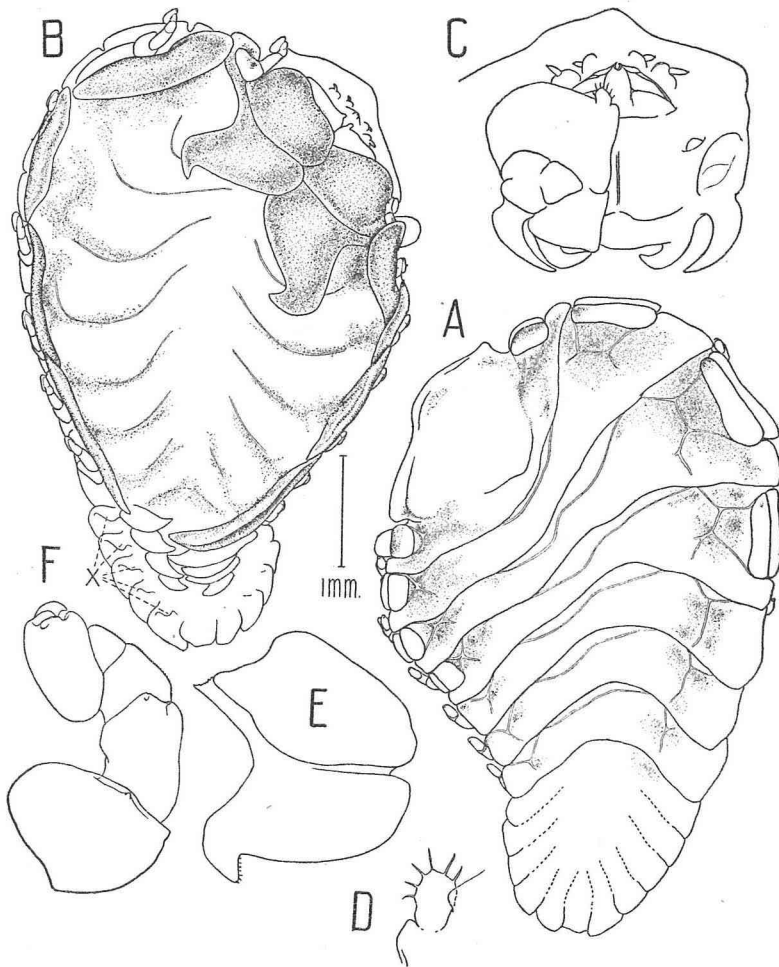


Fig. 14. *Bopyrina kossmanni* CHOPRA

All figures, female. A, dorsal view; B, ventral view; C, head; D, palp of maxilliped; E, marsupial plate I; F, thoracic leg, right I.

Bopyrinina n. gen.

Female cephalon distinct from thorax.

All thoracic segments separate. Marsupium widely open.

6 abdominal segments fused in the middle, but separated on lateral sides. Only first 3 segments provided with uniramous pleopoda. Last 2 pairs and uropoda absent.

Male cephalon also distinct from thorax.

Abdominal segments completely fused. Pleopoda and uropoda absent.

The new genus is closely related to *Bopyrina* KOSSMANN, *Bopyrinella* NZ. & B. A. B. and *Bopyrus* LATR., but differs from these in having only 3 pairs of uniramous pleopoda.

Bopyrinina dorsimaculata n. sp.

Female (Fig. 15, A & B); Pyriform, very asymmetrical. Characteristic distribution of pigments present on both dorsal and ventral surfaces. Length 5 mm. Width 3.5 mm.

Head (Fig. 15, D) wider than long, separated from thorax; anterior border somewhat trapezoid, posterior border also angular. Antennules very short, unsegmented; proximal joint completely fused with head surface. Antennae also short, 5-jointed; proximal joint indistinctly demarcated from head surface. Rostrum very short. Maxillae longer than usual and triangular. Palp of maxillipeds (Fig. 15, E) linguiform, directed inwards and without bordering setae. Posterior lamella of maxillipeds thickly pigmented; anterior lamella scarcely. Posterior lamina bilobed and provided with 2 hook-like processes on each side.

Thoracic segmentation distinct, segments greatly expanded on right side. First 6 segments bilobed on lateral margin. Posterior lateral parts much longer than anterior lateral parts in first 4 segments on right side, but shorter on left side and in next 2 segments on both sides. In 7th segment posterior lateral part rudimentary on right side and absent on left side. Only 3 pairs of small ovarian bosses present in 2nd to 4th segment. Coxal plates distinct in first 4 segments; those of 1st segment wider than others.

Legs (Fig. 15, F) distinctly jointed. Scales of legs coarse and sparse. Basipodite has round lateral expansion. Marsupium widely open. Distal lobe of 1st plate very short, lunar-shaped and without postero-lateral process. Last pair elongated to complete posterior border of marsupium.

Abdominal segments fused in the middle, separated on lateral side (See Fig. 15, A). Lateral plates widely apart from one another, each plate ovate, slightly narrowed at the base. Left lateral plates from

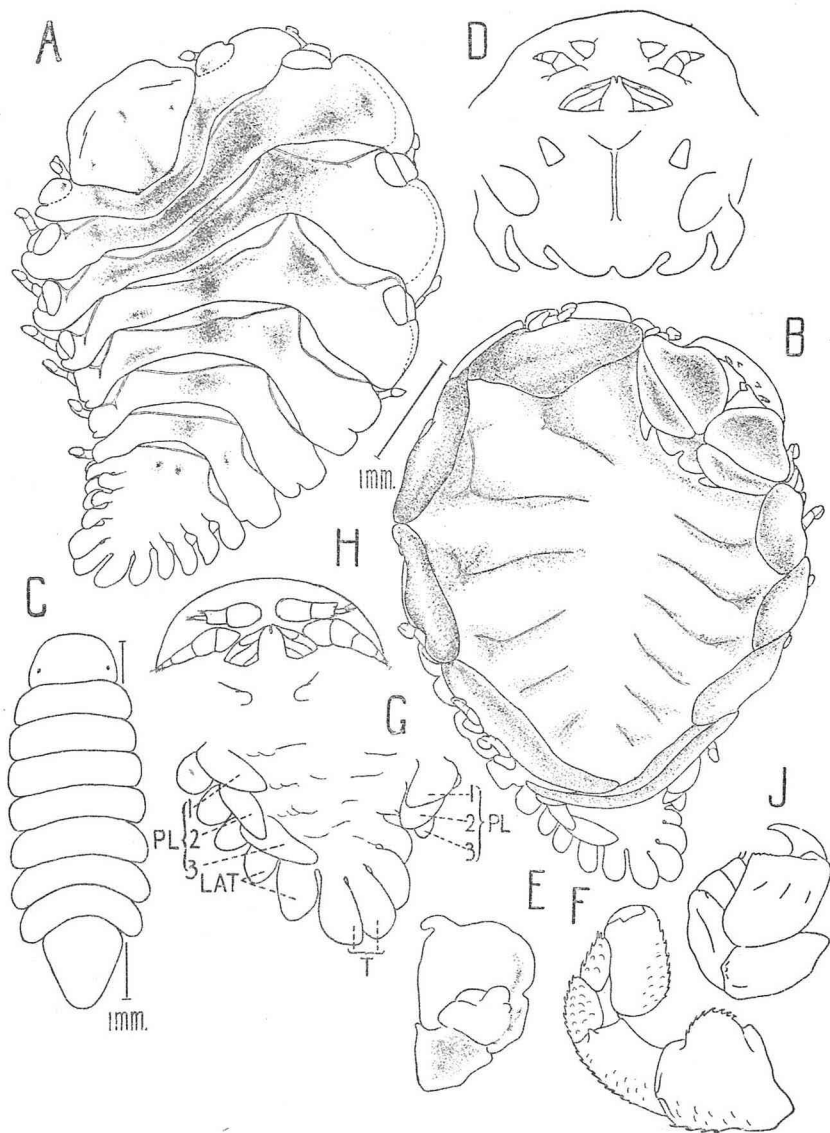


Fig. 15. *Bopyrinina dorsiniaculata* n. gen. & n. sp.
A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-G, ♀; D, head; E, maxilliped; F, thoracic leg, left I; G, abdomen, ventral side. H-J, ♂; H, head; J, thoracic leg, left I.

2nd to 4th segment somewhat bent dorsally, partly exposing pleopoda in dorsal view. Terminal segment bilobed, the lobes having the same appearance as those of the preceding segments. Segmental borders indicated on ventral surface by faintly defined folds in the middle; obliterated on dorsal surface except for only short distance from lateral margin.

3 pairs of pleopoda present, uniramous, elongated oval and directed postero-inwards (Fig. 15, c). Last 3 segments limbless.

Male (Fig. 15, c): Length 1 mm., thickly pigmented.

Head (Fig. 15, h) distinct from thorax, semicircular in front, and provided with small eyes. Antennules 3-jointed. Antennae 5-jointed. Maxillae directed inwards. Maxillipeds absent.

7 thoracic segments distinct, slightly widened posteriorly. Last 2 segments somewhat curved posteriorly. Legs (Fig. 15, j) distinctly jointed. Chela rather large. Inner margin of propodite denticulated.

Abdominal segments fused into a conical piece; slightly wider than long, narrower than thorax and tapering posteriorly into a blunt end. Pleopoda and uropoda absent.

Occurrence: One female carrying a male was found at Seto in the branchial cavity of *Periclimenes* sp.

Group of Abdominal Parasites

Pseudostegias n. gen.

Female abdomen flattened, gradually narrowing from thorax. All 6 abdominal segments distinct, with lateral plates only in first 4. 5 pairs of pleopoda biramous. Uropoda uniramous.

Male abdominal segments coalesced. Pleopoda and uropoda absent.

Pseudostegias is closely related to *Stegias* RICHARDSON, *Stegophryxus* THOMPSON and *Parathelges* BONNIER, but differs from these in having lateral plates in first 4 abdominal segments. In *Stegophryxus* and *Parathelges* they exist in 5 segments and in *Stegias* only in the first 3.

Pseudostegias setoensis. n. sp.

Female (Fig. 16, A & B): Length 12 mm. Width 3 mm. Slightly asymmetrical, median axis turning to left side; ventral surface convex, dorsal concave. No pigmentation.

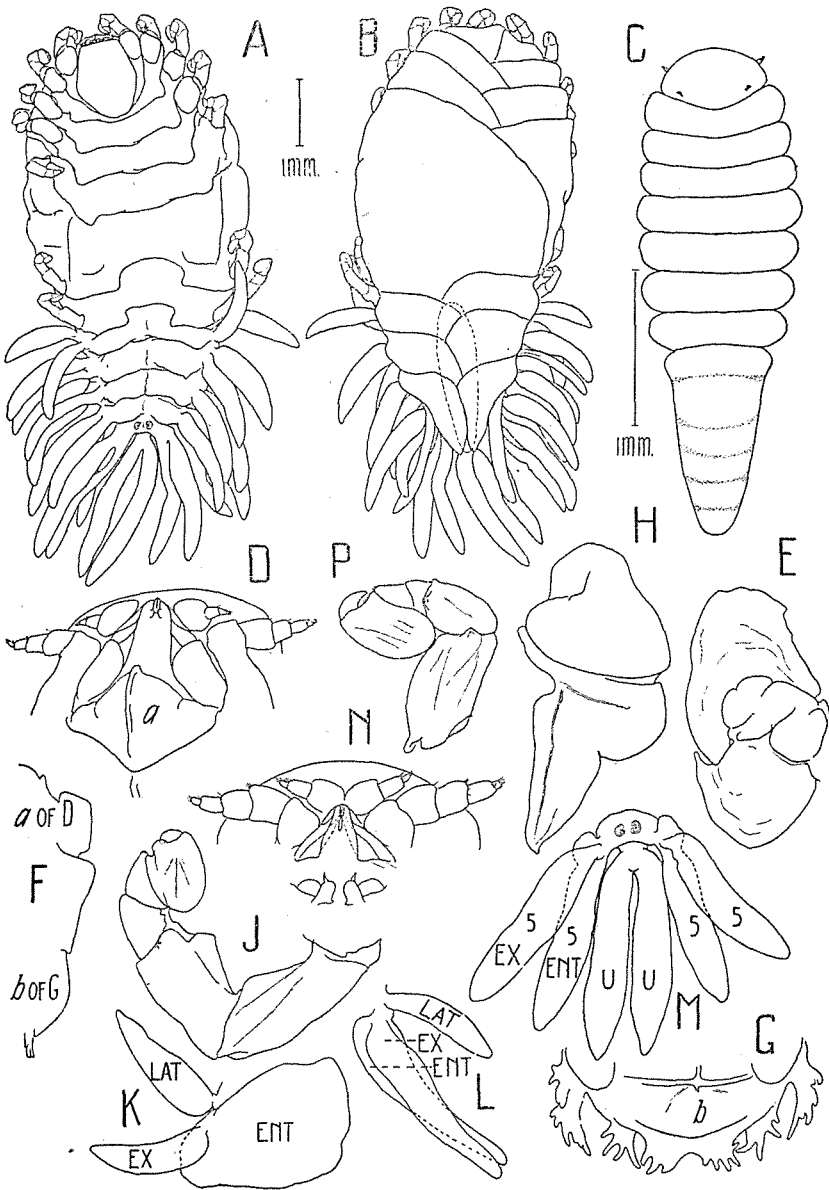


Fig. 16. *Pseudostegias setoensis* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view. D-M, ♀; D, anterior portion of head; E, maxilliped; F, comb-like elevation of under face of head; G, posterior lamina of head; H, marsupial plate I; J, thoracic leg, left VII; K, pleopod, right I, ventral view; L, same, right IV, dorsal view; M, pleopoda V and uropoda, dorsal view. N-J, ♂; N, head; P, thoracic leg, right VI.

Head deeply set in thorax, longer than broad. Anterior border straight, posterior border acutely curved. Both pairs of antennae (Fig. 16, D) visible in dorsal view; 1st pair 4-jointed, 2nd pair 5-jointed. Ventral surface of head highly keeled along median longitudinal axis (Fig. 16, F). Posterior lamina (Fig. 16, G) bilobed and digitate. 2 pairs of lateral processes also digitate. Maxillipeds (Fig. 16, E) somewhat elongated, without palp.

7 thoracic segments separate. First 5 segments more or less short, with lateral parts turned forwards. 1st segment reduced in mid-dorsal region. 6th and 7th segments long, with lateral parts not directed forwards and posterior border curved anteriorly in middle part. Small ovarian bosses and narrow coxal plates present in first 4 segments.

First 5 pairs of legs short and directed anteriorly; last 2 pairs rather long, attached at posterior margin of segment and not directed forwards (See Fig. 16, A). Legs distinctly jointed and not scaly (Fig. 16, J). Basipodite without lateral expansion. 5 pairs of marsupial plates complete (See Fig. 16, B), covering ventral surface of head and thorax. 5th pair especially large and covers more than half ventral surface of thorax, extending along entire lateral border of 5th and 6th segments. Terminal projection of 1st plate (Fig. 16, H) long, triangular and directed backwards. 2nd plate completely overlapped by 3rd plate and invisible from without.

6 abdominal segments distinct, gradually narrowing from 1st to last. Segments flattened and not cylindrical.

5 pairs of biramous pleopoda attached to lateral side of segment (See Fig. 16, A & B). In first 3 pairs endopodites broadly lamellar, and imbricated like the marsupium; exopodites narrow, lanceolate and directed externally (Fig. 16, K). In 4th and 5th pairs (Fig. 16, L & M) endopodite narrowed and directed externally like exopodite.

Lateral plates of first 4 segments elongated into the shape of the exopodite on dorsal side of pleopoda. 5th segment without lateral plates. Last segment very small. Uropoda (Fig. 16, M) uniramous, lanceolate, similar in appearance to pleopoda.

Male (Fig. 16, C): Length 3 mm. No pigmentation.

Head (Fig. 16, N) wider than long, anterior border semicircular. Eyes present. Antennules 3-jointed. Antennae 5-jointed. Maxillae and maxillipeds present.

All thoracic segments separate. Joints of legs (Fig. 16, P) well defined. Propodite and carpopodite sparsely setose at the distal end.

Abdominal segments completely coalesced into a narrow conical

piece, (5 semi-transparent lines visible, probably representing original boundaries of segments), $2/5$ the length of entire body; antero-lateral part slightly produced, posterior end rounded. Pleopoda and uropoda absent.

Male always found on ventral surface of female abdomen, contained in marsupium-like cavity produced by lamellated endopodites of pleopoda.

Remarks: *Pseudostegias setoensis* shows a great resemblance to *Stegias andronopholos* Nz. & B. à B., especially in the lamellar endopodite of the first 3 pairs of pleopoda. The present species may be distinguished by the presence of lateral plates in the 4th abdominal segment and in the absence of a long median process in the terminal segment.

Occurrence: The present species is frequently found at Seto on the hermit-crab *Clibanarius bimaculatus*. The parasite clings by the dorsal side to the upper surface of the host abdomen, invariably having its head turned backwards in relation to that of the host.

Diplophryxus RICHARDSON

1904, RICHARDSON, H., Proc. U. S. Nation. Mus., 27, p. 50-51.

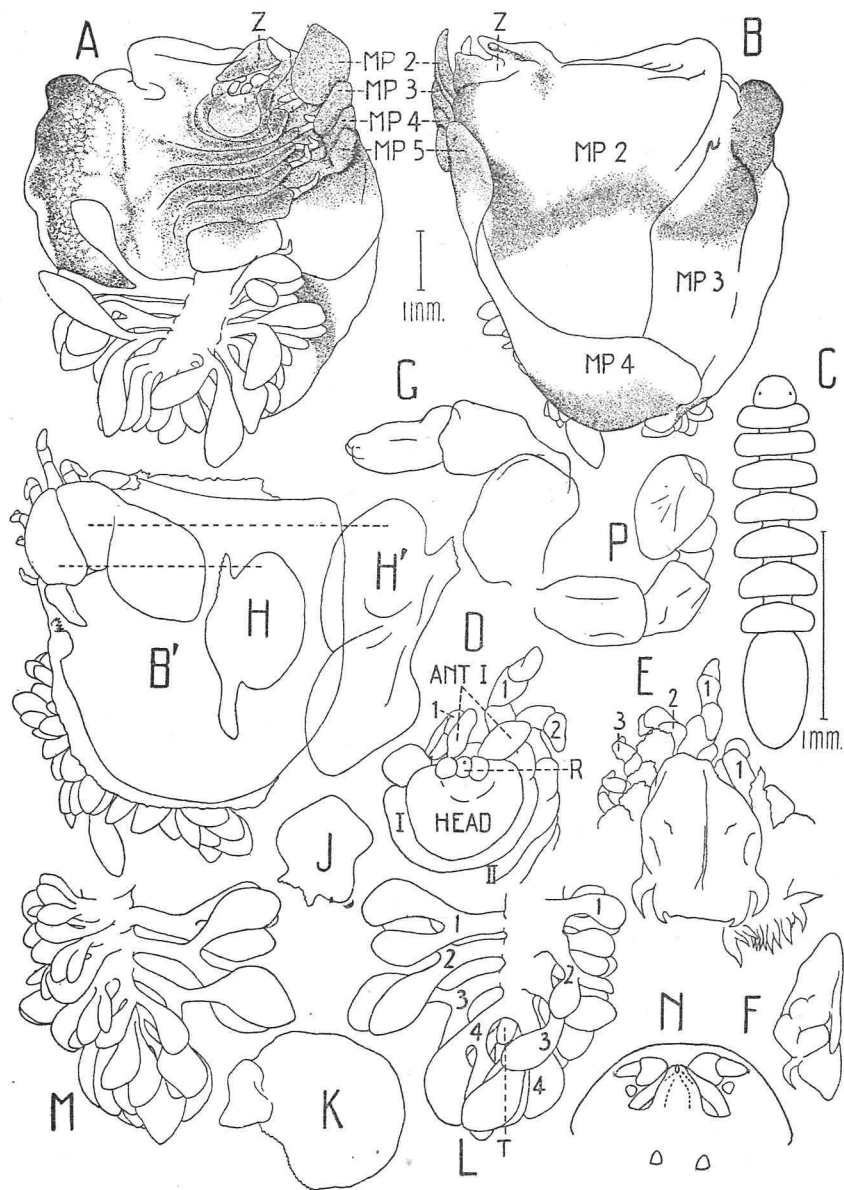
Diplophryxus jordanii RICHARDSON¹

Female (Fig. 17, A & B): Extraordinarily asymmetrical, greatly swollen on one side; spheroidal and massive and not dorso-ventrally depressed; peculiarly pigmented. Length 6.5 mm. Width 6 mm. Dorso-ventral thickness 4 mm.

Head (Fig. 17, D) circular in dorsal view, deeply sunk into thorax. Ventral surface (Fig. 17, E) nearly quadrangular and longer than dorsal surface. 1st antennae shifted to antero-dorsal side, 2-jointed with round basal and lamellar terminal piece. 2nd antennae absent. Rostrum (Fig. 17, D, R) short and conical, also shifted to cephalic extremity between 1st antennae. Maxillae rudimentary. Maxillipeds (Fig. 17, F) strongly elongated. Posterior lamina provided with 2 pairs of small hook-like lateral processes.

Thoracic segmentation visible on smaller side, invisible on swollen side and obliterated on ventral surface (See Fig. 17, A & B'). First 5 segments short, more or less crowded in mid-dorsal region; 6th segment somewhat longer and 7th adequately long. Ovarian bosses and coxal plates absent.

¹ RICHARDSON, literature no. 64, pp. 50-51; CHOPRA, no. 7, pp. 443-444; no. 9, pp. 119-121.

Fig. 17. *Diplophryxus jordani* RICHARDSON

A, ♀, dorsal view; B, ♀, ventral view; B', ♀, same, all plates of marsupium removed; C, ♂, dorsal view. D-M, ♀ D, head, dorsal side; E, same, ventral side; F, maxilliped; G, thoracic leg, right I; H, marsupial plate I, left; H', same, right; J, marsupial plate, right II; K, same, right V; L, abdomen, dorsal side; M, same, ventral side. N-P, ♂; N, head; P, thoracic leg, left V.

All 7 legs present on smaller side. Only 1st leg present on swollen side and others completely disappeared. Legs, except 1st pair, small and feeble (Fig. 17, c). Propodite, carpopodite and meropodite fused into a cylindrical piece surmounted by small dactylopodite at the distal end; other joints more or less distinct, not scaly. Marsupium spacious; 5 plates present on shorter side and 4 plates on swollen side (See Fig. 17, A & B). 1st pair dissimilar on each side (Fig. 17, H & H'). 2nd to 4th plates small, freely projecting anteriorly on shorter side, taking no important part in marsupium formation (Fig. 17, J). Corresponding plates of swollen side greatly developed, highly concave and form principal part of marsupium. 2nd plate on this side has process (Fig. 17, A & B, Z) projecting over the head. 5th plate existing only on smaller side and divided into anterior smaller and posterior larger part (Fig. 17, K); first part rudimentary as in other plates on the same side, while second part is expanded to some extent in participating in marsupium formation.

Abdomen (Fig. 17, M & L) cylindrical; 5 segments defined. First 4 segments provided with 2 pairs of branched appendages.¹ Of the 4 appendages in each segment only the largest one found on swollen side, while the other 3 crowded on smaller side. Largest appendage on swollen side and most dorsally situated one on smaller side divided at a considerable distance from the base into 2 oval lobes. Remaining 2 appendages on smaller side, arising one ventrally and the other laterally, bi- or tri-, or even quadriramous. Last segment rounded up and without appendages.

Male (Fig. 17, c): Length 2 mm.; rather slender.

Head (Fig. 17, N) small, as wide as long, anterior border semi-circular. Eyes present. Antennules short, 2-jointed. Antennae reduced into small unsegmented wart-like process. Maxillae small. Maxillipeds absent.

7 thoracic segments separate, discontinuous. Joints of legs (Fig. 17, P) distinct. Carpopodite without setae at the distal end.

6 abdominal segments completely fused into an ovoidal piece, about $1/3$ of entire body length. Pleopoda and uropoda absent.

Male always found interior of female marsupium.

Remarks: Both RICHARDSON¹ and CHOPRA² have mentioned the presence of 2 pairs of double-branched appendages in the first 4 abdominal segments, disposed in a pair on either side. However, according

¹ RICHARDSON, literature no. 64, pp. 50-51.

² CHOPRA, no. 7, p. 442; no. 9, pp. 119-120.

to my examination of fresh specimens, one of the appendages on the swollen side is shifted to the other side and situated most ventrally to the appendages on this side. Among these appendages in question the largest on the swollen side and the most dorsal on the shorter side are always biramous, while the remaining 2 on the shorter side are, in not a few cases, branched into 3 or even 4 lobes.

The presence of 4 ramified appendages in a single segment may be interpreted in two ways. Interpreted in one way, all 4 appendages represent a pair of pleopoda, the external and internal rami of which have become attached directly to the abdomen by degeneration of the protopodite; while the two rami are secondarily branched into oval lobes. In the other way, 2 of the appendages belong to the pleopoda while the other 2 belong to the lateral plates and are modified so that they look like pleopoda.

According to NIERSTRASZ and BRENDER à BRANDIS¹ the lateral plates are found in Phryxids as in branchial Bopyrids, and if so, it is quite probable that the same structure should be present also in *Diplophryxus*. Since the lateral plate is situated dorsally to the pleopod and the former is, as a rule, more developed than the latter in certain Phryxids very like the present species such as *Apophryxus* Nz. & B. à B., *Paraphryxus* Caroli, *Metaphryxus* Nz. & B. à B., etc., the constitution of the abdominal appendages of *Diplophryxus jordani* may be as follows: Of the 4 appendages in question, the largest on the swollen side and the most dorsal (larger than others) on the shorter side belong to the lateral plates, while the remaining 2 (bi-, tri-, or quadriramous) on the shorter side represent a pair of pleopoda. The presence of 3 or 4 lobes in a pleopod may be due to the secondary ramification of one or both rami of the pleopod.

The present species is found fixed on the ventral surface of the host by its back, invariably with its head turned towards the tail of the host. Since the parasite attaches itself by the legs on the shorter side to the base of the host's pleopoda, asymmetry of the body is brought about according to which side the parasite clings to; i. e., if it is the left of the host the left side is swollen, or if it is the right a reverse asymmetry is followed.

Occurrence: The present species is usually found at Seto on *Leander scerrifer* STIMPSON and *pacificus* STIMPSON. It was first recorded from Misaki by RICHARDSON and then from India by CHOPRA.

¹ NIERSTRASZ and BRENDER à BRANDIS, literature no, 47, pp. 196-201.

Literature

1. BABIĆ, K., 1912. Ueber einen Athelges von Pelagosa. Zool. Anz., vol. 40, pp. 176-178.
2. BARNARD, K., 1920. Contributions to the Crustacean Fauna of South Africa. Ann. S. Afr. Mus., vol. 17, pp. 319-438.
3. BATE, C. S. and WESTWOOD, J. O., 1868. British sessile-eyed Crustacea, II. pp. 210-272.
4. BONNIER, J., 1900. Contribution à l'étude des Épicarides: Les Bopyridae. Trav. St. Zool. Wimmereux, t. 8, 475 pages.
5. BOONE, L., 1927. Crustacea from tropical east American Seas. Bull. Bingham Ocean. Coll., no. 2, pp. 1-147.
6. CARUS, I. V., 1885. Prodrömus Faunae Mediterraneae, II Arthropoda. p. 451.
7. CHOPRA, B., 1923. Bopyrid Isopods parasitic on Indian Decapoda Macrura. Rec. Ind. Mus., vol. 25, pp. 411-550.
8. — 1927. The littoral Fauna of Krušadai Island in the Gulf of Manaar, Bopyrid Isopods. Bull. Madras Govern. Mus., new ser., nat. hist., vol. 1, pp. 1-4.
9. — 1930. Further notes on Bopyrid Isopods parasitic on Indian Decapoda Macrura. Rec. Ind. Mus., vol. 32, pp. 113-147.
10. COLGAN, N., 1909. Dublin Marine Biological Report for 1908. Irish Naturalist, 18, pp. 166-177.
11. DANA, J. D., 1852. United States Exploring Expedition 1838-1842. vol. 13. Crustacea, pt. II, p. 803.
12. GERSTAECKER, A., 1882. Bronn's Klassen und Ordnungen des Thierreichs. Bd. 6, Art. II, Arthropoden.
13. GIARD, A., 1906. Sur le Grapsicepon typus Duvernoy parasite de Grapsus strigosus Herbst. C. R. Soc. Biol., t. 61, pp. 704-706.
14. — 1907. Sur l'Anisarthrus pelseneeri (nov. gen. et nov. sp.) Bopyrien parasite d'Athanas nitescens Leach et sur la synonymie du genre Hemiarthrus. C. R. Soc. Biol., t. 63, pp. 321-324.
15. GIARD, A. and BONNIER, J., 1886. Sur le genre Cepen. C. R. Ac. Sci., t. 103, p. 889.
16. — 1887. Sur la phylogenie des Bopyriens. C. R. Ac. Sci., t. 104, p. 1309.
17. — 1887. Contribution à l'études des Bopyriens. Trav. Inst. Zool. Lille et Lab. Zool. Mar. Wimm., t. V, 272 pages.
18. — 1888. Sur deux nouveaux genres d'Épicarides (Probopyrus et Palaegyge). Bull. sci. France et Belg., t. 19, pp. 53-77.
19. — 1888. Sur quelques espèces nouvelles de Cepeniens. C. R. Ac. Sci., t. 107, pp. 44-47.
20. — 1890. Prodröme d'une monographie des Épicarides du Golfe de Naples. Bull. Sci. France et Belg., t. 22, pp. 367-391.
21. GISSLER, C. F., 1881. The common prawn and its parasite. Sci. American, 65, p. 151.
22. — 1882. A singular parasitic Isopod Crustacean and some of its developmental stages. Amer. Nat., vol. 16, pp. 6-12.
23. — 1882. Bopyroides latreuticola, a new species of Isopod Crustacean parasitic on gulf weed shrimp. Amer. Nat., vol. IV, pp. 591-594.
24. GIUDICE, P. L., 1908. Modificazione negli organi di locomozione della Gyge branchialis indotte dal passaggio dalla vita libera alla vita parassitaria e vice versa. Zeitschr. Wiss. Zool., XCI, p. 52.
25. HANSEN, H. J., 1895. Isopoden, Cumaceen und Stomatopoden der Plankton Expedition. Ergebn. Plankton Exped. Humboldt-Stiftung., Vol. 2, G, c, pp. 1-105.
26. — 1897. Report on the dredging operations off the West Coast of Central America to Galapagos,, Albatross, during 1891, 22, Isopoda. Bull. Mus. Comp. Zool. Harvard, vol. 31, no. 5, pp. 95-129.

27. NANSEN, H. J., 1916. Crustacea Malacostraca III. The Danish Ingolf-Expedition, vol. III. pt. 5, pp. 203.
28. HARGER, O., 1878. Report on the Marine Isopoda of New England and adjacent waters. Report U. S. Comm. Fish. Fisher., vol. 6, pp. 297-462.
29. HAY, W. P., 1917. A new genus and three new species of parasitic Isopod Crustaceans. Proc. U. S. Nation. Mus., 51, pp. 569-574.
30. HESSE, M., 1861. Memoire sur deux nouveaux genre des l'ordre des Crustacés Isopodes sedentaires et sur les espèces typus de ces genres. Ann. Sci. Nat., ser. 4, vol. 15. pp. 91-116.
31. — 1865. Recherches sur les Crustacés rares ou nouveaux des côtes de France. Ann. Sci. Nat., ser. 5, vol. III. pp. 226.
32. — 1876. Description des Crustacés rares ou nouveaux des côtes de France. Ann. Sci. Nat., ser. 6, vol. IV, pp. 1-42.
33. ISHII, S., 1914. On a new Epicaridan Isopod (*Athelges takanosimensis* sp. nov.) from *Eupagurus samuelis* Stimp.. Annot. Zool. Japon., vol. 8, pp. 519-530.
34. KOSSMANN, R., 1881. Studien über Bopyriden. I, Gigantonæ Moebii und Allgemeines über die Mundwerkzeuge der Bopyriden. II, Bopyrina virbii, Beiträge zur Kenntniss der Anatomie und Metamorphose der Bopyriden. Zeitschr. Wiss. Zool., XXXV, pp. 652-680.
35. — 1881. Studien über Bopyriden. III, Ione thoracica und Cepen portuni. Mittheil. Zool. St. Neapel, Vol. 3. pp. 170-183.
36. MÜLLER, Fr., 1871. Bruchstücke zur Naturgeschichte der Bopyriden. Jena. Zeitschr. Naturw., Vol. 6, pp. 53-73.
37. VAN NAME, W. G., 1920. Isopods collected by the American Congo Expedition. Bull. Amer. Mus. Nat. Hist., 43, pp. 41-108.
38. — 1926. The Isopods of Kartabo, Bartica district, British Guinea. Zoologica, New York, 6, pp. 46-503.
39. NIERSTRASZ, H. F., 1931. Phylogenie der Epicariden. Verhandl. Deutsch. Zool. Gesellsch., 1931, pp. 123-128.
40. NIERSTRASZ, H. F. and BRENDER à BRANDIS, G. A., 1923. Die Isopoden der Siboga-Expedition II. Isopoda Genuina, Epicaridea. Siboga-Expeditie, 95, monogr. 32 b, pp. 57-121.
41. — 1925. Bijdrage tot de Kennis der Fauna van Curaçao, Epicaridea. Bijdr. Dierk. Amsterdamm, 24, pp. 1-8.
42. — 1926. Isopoda, Epicaridea. Die Tierwelt der Nord- u. Ostsee, Lief. VI, Teil Xe, pp. 1-56.
43. — 1926. Neue Epicaridea. Zool. Anz., Bd. 85. pp. 295-302.
44. — 1929. Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16, Epicaridea I. Vidensk. Medd. fra Dansk. Naturh. Foren., Bd. 87, pp. 1-44.
45. — 1930. Three new genera and five new species of parasitic Crustacea. Proc. U. S. Nation. Mus., 77, pp. 1-9.
46. — 1930. Resultats scientifiques du voyage aux Indes Orientales Néerlandaises. Isopoda Epicaridea. Mem. Mus. Royal d'Hist. Nat. de Belgique. vol. III, pp. 12-17.
47. — 1931. Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16, Epicaridea II. Vidensk. Medd. fra Dansk. Naturh. Foren., Bd. 91, pp. 147-225.
48. NIERSTRASZ, H. F. and DE MAREES VAN SWINDEREN, J. W., 1931. Süßwasser-Isopoden der Deutschen Limnologischen Sunda-Expedition. Arch. f. Hydrobiol., Suppl.-Bd. IX, Tropische Binnengewässer, Bd. II, pp. 394-402.
49. NOBILI, G., 1905. Decapodi e Isopodi della Nuova Guinea Tedisca raccolti dal Sign. L. Biro. Ann. Mus. Hungar., III, pp. 480-507.
50. — 1906. Diagnoses preliminaire de Crustacés, Decapodes et Isopodes nouveaux

- recueillies par M. le Dr. G. Suerat aux îles Tonamoton. Bull. Mus. d'Hist. Nat. Paris, 12, pp. 256-270.
51. NOBILI, G., 1906. Nuovi Bopiridi. Atti. R. Acad. Sci. Torino, vol. 41, pp. 1098-1113.
 52. — 1907. Recherche sui Crostacei della Polinesia Decapodi, Stomatopodi, Anisopodi e Isopodi. Mem. R. Acad. Sci. Torino, ser. 2, vol. 57, pp. 351-430.
 53. NORMAN, A. M., 1905. Revised Nomenclature of the sp. described in Bate and Westwood's British sessile-eyed Crustacea. Ann. Nat. Hist., (7) xvi, pp. 78-95.
 54. — 1907. Notes on the Crustacea of Channel Islands. Ann. Mag. Nat. Hist., ser. 7, 20, pp. 356-371.
 55. PEARSE, A. S., 1930. Parasites of Japanese Crustacea. Annot. Zool. Japon., vol. 13, pp. 1-6.
 56. PÉREZ, Crt., 1920. Sur un type nouveaux d'Épicarides, Rhopalions uromyzon, n. gen. n. sp., parasite sous-abdominal d'un Pinnothère. C. R. Acad. Sci., t. 170, pp. 1615-1617.
 57. — 1921. Sur un Céponien nouveaux Onychocepon harpax (n. gen. n. sp.) parasite branchial d'un Pinnothère. C. R. Acad. Sci., t. 173, pp. 59-61.
 58. — 1928. Notes sur les Épicarides et les Rhizocéphales des côtes de France. Bull. Zool. France, t. 53, pp. 523-528.
 59. POPOV, W., 1929. Rhizocephala and Bopyridae of the Bay of Sevastopol. Trav. St. Biol. Soc. de Sebastopol, t. I, pp. 1-14.
 60. RICHARDSON, H., 1899. Key to the Isopoda of the Pacific Coast of North America, with description of twenty-two new species. Proc. U. S. Nation. Mus., vol. 21, pp. 815-869.
 61. — 1900. Results of Branner-Agassiz Expedition II. The Isopod Crustaceans. Proc. Wash. Acad. Sci., II, pp. 157-159.
 62. — 1900. Synopsis of North-American Invertebrates, VIII. The Isopoda Part II. Asellota, Oniscoidea, Epicaridea. Amer. Nat., 34, pp. 295-309.
 63. — 1903. Isopoda collected at the Hawaiian Isl. by the U. S. Fish. Comm. Steamer Albatross. Bull. U. S. Fish. Comm., XXII, pt. 3, p. 823.
 64. — 1904. Contribution to the natural history of Isopoda. Proc. U. S. Nation. Mus., 27, pp. 1-89.
 65. — 1904. Contribution to the natural history of Isopoda. Part II. Proc. U. S. Nation. Mus., 27, pp. 657-681.
 66. — 1904. Isopods from the Alaska Salmon Investigation. Bull. U. S. Bureau of Fish. XXIV, pp. 209-221.
 67. — 1905. Monograph on the Isopods of North America. Bull. U. S. Nation. Mus., 54, pp. 1-727.
 68. — 1908. The parasitic Isopod Leidyia distorta found on a new host. Proc. U. S. Nation. Mus., 34, pp. 23-26.
 69. — 1909. Isopods collected in the Northwest Pacific by the U. S. Bureau of Fish. Steamer Albatross in 1906. Proc. U. S. Nation. Mus., 37, p. 121.
 70. — 1910. Marine Isopods collected in the Phillipine by the U. S. Fish. Steamer Albatross in 1907-8. Report Comm. Lab. Bureau of Fish., Doc. no. 736, pp. 1-44.
 71. — 1910. Report on Isopod from Peru, collected by Dr. Coker. Proc. U. S. Nation. Mus., 38, pp. 79-85.
 72. — 1910. Description of a new parasitic Isopod from the Hawaiian Islands. Proc. U. S. Nation. Mus., 38, pp. 645-647.
 73. — 1912. Description of two new parasitic Isopods belonging to the genera Palaegyge and Probopyrus from Panama. Proc. U. S. Nation. Mus., 42, pp. 1-8.
 74. SAKS, G. O., 1899. An Account of the Crustacea of Norway. II. Isopoda. pp. 193-220.
 75. SCOTT, T. 1902. Notes on Scottish Crustacea. Ann. Nat. Hist., (7) X, pp. 1-5.
 76. STEBBING, T. R. R., 1893. A History of Crustacea. Internat. Scientif. Ser., vol. 74, 466 pages.

77. — 1904. Marine Crustacea XII, Isopoda with description of a new genus. The Fauna and Geography of the Maldive and Laccadive Archipelago, vol. II, pt. 3, pp. 699-721.
 78. STEBBING, T. R. R., 1908. South African Crustacea, pt. IV, Marine investigation in S. Africa. Ann. S. Afr. Mus., 6, pp. 1-96.
 79. — 1910. Isopods from the Indian Ocean and British East Africa. in Percy Sladen Trust Exped. to the Indian Ocean in 1905, vol. 3, no. 6. Trans. Linn. Soc., ser. 2, Zool. 14, pt. I, pp. 83-118.
 80. — 1914. South African Crustacea, Pt. VII, Marine Investigation in S. Africa. Ann. S. Afr. Mus., 15, pp. 1-55.
 81. STIMPSON, W., 1857. On the Crustacea and Echinodermata of the Pacific shores of N. America. Boston Journ. Nat. Hist., VI, pp. 503-513.
 82. — 1864. Description of new sp. of Marine Invertebrata from Puget Sound, collected by the Naturalist etc. Proc. Acad. Nat. Sci. Philadelphia, XVI, pp. 155-156.
 83. TATTERSALL, W. M., 1905. The marine fauna of the coast of Ireland, pt. V, Isopoda. Fisheries, Ireland sci. invest., 90 pages.
 84. — 1911. Nordischen Isopoden. Nordisches Plankton, Lf. 14.
 85. — 1912. Clare Island Survey. Marine Isopoda and Tanaidacea Dublin Proc. R. Irish Acad., 31, pt. 43, pp. 1-6.
 86. THIELEMANN, M., 1911. Beiträge zur Kenntnis der Isopodenfauna Ostasiens. Abh. Bayer. Akad. Wiss. München II, Suppl. Bd. 3, Abh., pp. 1-81.
 87. THOMPSON, M. T., 1902. A new Isopod parasitic on the hermit-crab. Bull. U. S. Fish. Comm. XXI, pp. 53-56.
 88. WALZ, R., 1882. Ueber die Familie der Bopyriden mit besondere Berücksichtigung der Fauna der Adria. Arbeit Zool. Inst. Wien. T. 4, pp. 125-193.
 89. WEBER, M., 1891-1892. Die Süßwasser-Crustaceen des Indischen Archipels, nebst Bemerkungen über die Süßwasser-Fauna im Allgemeinen. Zool. Ergebn. Reise Niederl. Ost-Indien, Leiden, Brill, Vol. 2, pp. 528-571.
 90. WHITELEGGE, TH., 1897. The Crustacea; The Atoll of Funafuti, Ellice group: its Zoology, Botany, Ethnology and general Structure. Australian Mus., Sydney. Mem. 3, pp. 127-151.
 91. PEARSE, A. S., 1932. New Bopyrid Isopod Crustaceans from Dry Tortugas Florida. U. S. Nation. Mus. Proc., vol. 81, pp. 1-6.
-