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Bopyrids from Tanabe Bay II

By

Sueo M. SHIINO

Assistant in the Seto Marine Biological Laboratory

With 12 Text-figures

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Introduction

Since the publication of my previous paper on Bopyrids from Tanabe Bay[1] a good many new specimens have been listed among the fauna of the district. All the specimens now to be described were collected in Tanabe Bay, with the exception of *Apocepon pulcher* which came from Tokyo Bay. The following is the list of the species:

Orbione halipori var. *libera* Nz. & B à B.
Apopenaeon japonicum (THIELEMANN)
Aporobopyrina lamellata n. gen. & n. sp.
Aporobopyrus oviformis n. sp.
Parabopyrus kiiensis n. gen. & n. sp.
Bopyrina giardi BONNIER
Apocepon pulcher Nz. & B. à B.
Portunicepon gocticii n. sp.
Athelges takanoshimensis ISHII
Diplophryxus alphei n. sp.
Epiphryxus primus n. gen. & n. sp.
Hypophryxus yusakiensis n. gen. & n. sp.

Orbione BONNIER

1900, BONNIER, J., Trav. Stat. Zool. Wimmereux, VIII, pp. 280-284.

1. SHIINO, literature no. 31.

Orbione halipori Nz. & B. à B.[1] var. **libera** Nz. & B. à B.[2]

Female (fig. 1, A & B): Ovate, rather symmetrical than asymmetrical. Dorsal flat, ventral convex. No pigmentation. Length 14 mm. Width 11.5 mm.

Cephalon wider than long, widest in the middle, rounded both anteriorly and posteriorly. Frontal lamina broad, lamellar and somewhat crenated on margin.

7 thoracic segments distinct, only posterior boundaries of 2nd and 3rd segments more or less obliterated in mid-dorsal region. First 4 segments bilobed on lateral side and provided with ovarian bosses. In last 3 segments posterior lateral parts rudimentary or absent. On both sides of first 2 segments and on longer side of following 2 segments lateral parts developed into broad, lamellar coxal plates with more or less crenated margin. They extend some distance in front to cover the foregoing plates and are produced internally in the anterior portion. Coxal plates of 1st segment overlap frontal lamina of cephalon. On longer side of last 3 segments coxal plates oval and constricted at the base; those on shorter side narrow in 3rd and 4th segments, fused to segment in 5th, but elongated posteriorly in last 2 segments. Marsupium partly open in mid-ventral region.

6 abdominal segments separate and V-shaped. Larger part of ventral surface of abdomen exposed showing many longitudinal rugae. Lateral plates lamellar, strongly tuberculated on both dorsal and ventral surfaces as well as on free margin and tapering towards the tip. They are longer on the shorter side.

5 pairs of pleopoda biramous (fig. 1, D). Both rami of pleopoda pointed at the tip, strongly tuberculated on surface and margin and directed externally. Uropoda uniramous (fig. 1, D, U), slightly smaller than last pair of pleopoda. Pleopoda and uropoda not extending beyond lateral plates.

Male (fig. 1, C): Rather compressed, no pigmentation. Length 4.5 mm.

Cephalon nearly trapezoid in shape. Eyes absent.

7 thoracic segments distinct and discontiguous. From narrowest 1st segment thorax gradually widens posteriorly.

All abdominal segments completely fused into a piece, somewhat triangular and with round posterior margin. Pleopoda and uropoda absent.

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1. NIERSTRASZ and BRENDER À BRANDIS, literature no. 17, pp. 64-65, Pl. I, Fig. 2.
2. NIERSTRASZ and BRENDER À BRANDIS, no. 23, p. 155, Pl. I, Fig. 1.

Remarks: The present Bopyrid can be identified with *Orbione halipori* var. *libera*, with some slight differences from the type of the

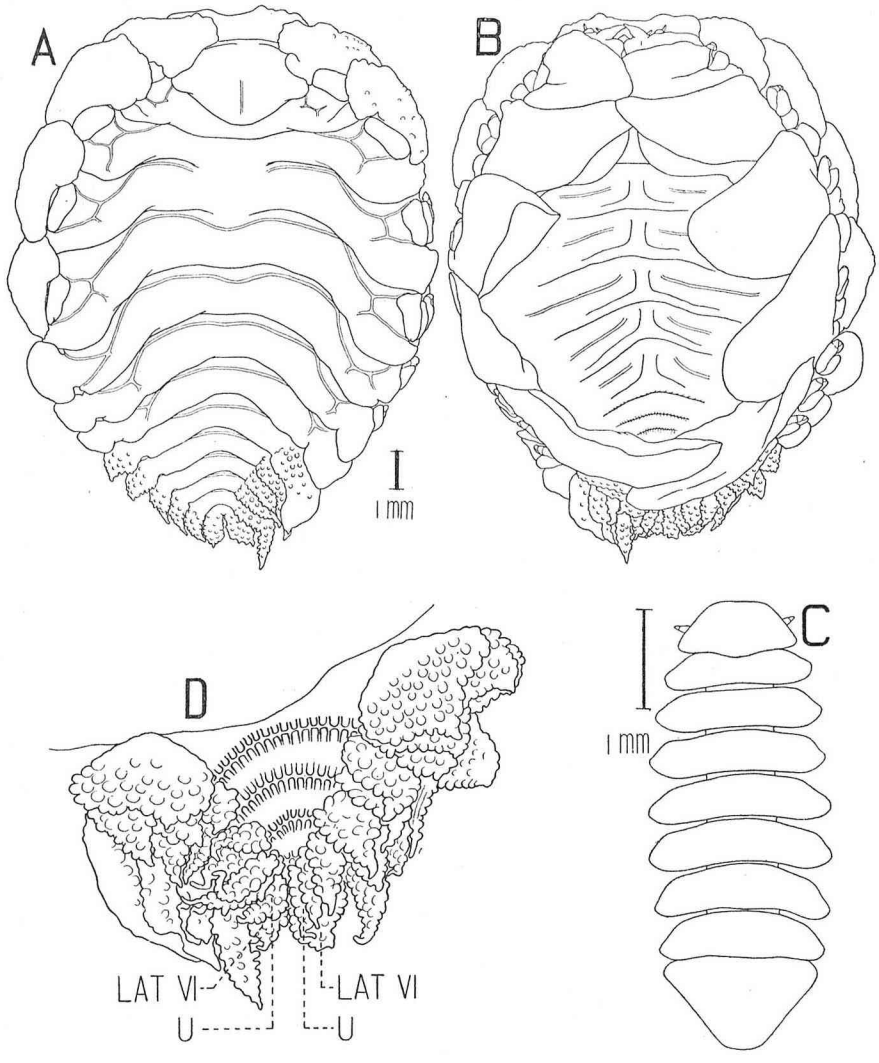

Fig. 1 *Orbione halipori* var. *libera* Nz. & B. à B.

A, ♀, dorsal view; B, ♀, ventral view; C, ♀, dorsal view; D, ♀, abdomen, ventral view.

Abbreviations used in text-figures :—ANT I, antenule; ANT II, antenna; C, coxal plate or cephalon; ENT, entopodite; EX, exopodite; L, thoracic leg (*e. g.* L I-R or L I-L=first thoracic leg of right or left side); LAT, lateral plate; MP, marsupial plate (*e. g.* MP II-R or MP II-L=second marsupial plates of right or left side); MXP, maxilliped; OV, ovarian boss; PL, pleopod; SEG, segment; U, uropod; X, projection of 2nd marsupial plate of Phryxids.

Kei-islands. Comparison with this and with the *forma typica* may be tabulated as in the following table:

		halipori	*libera* from Kei-Is.	*libera* from Tanabe Bay
Female	Thoracic segmentation	obliterated in the middle of segments I–V	distinct in all segments	obliterated in the middle of segments II–III
	Coxal plates of anterior segments	produced markedly inwards, margin much crenated	produced slightly inwards, margin not very much crenated	as in Kei-Is. form
	Coxal plates of segments VI & VII	not demarcated from segments	well demarcated from segment by notch	as in Kei-Is. form
	Lateral plates of abdomen	not well developed on both sides	well developed on both sides	well developed only on shorter side
	Pleopoda	longer than lateral plates in I–III	shorter than lateral plates	as in Kei-Is. form
Male	Thoracic segment	longer in the middle than in lateral part	have same length in the middle and in lateral part	as in Kei-Is. form
	Abdomen	rhombic	?	triangular

Occurrence: One female specimen carrying a male was found in the branchial cavity of *Solenocera distincta* (DE HAAN) collected in Tanabe Bay from a depth of 20-30 meters, in May 1931.

Apopenaeon NZ. & B. À B.

1931, NIERSTRASZ, H. F., and BRENDER À BRANDIS, G. A., Vidensk. Medd. fra Dansk Naturh. Foren, Bd. 91, 1931, pp. 153-154.

Apopenaeon japonicum (THIELEMANN)

Syn. *Epipenaeon japonicum* THIELEMANN[1]

Female (fig. 2, A & B): Rather symmeterical, except for asymmetry in coxal plates. Dorsal flat, ventral convex. Length 10.5 mm., width 8 mm. No pigmentation.

Cephalon triangular, distinctly separated from thorax. Frontal lamina broad, slightly crenated on margin. Eyes absent.

1. THIELEMANN, literature no. 34, pp. 79-81.

7 thoracic segments distinct; lateral margin of first 4 bilobed; posterior lateral parts rudimentary or absent in last 3. In first 2 segments on both sides and in following 2 on longer side coxal plates broad, lamellar and slightly crenated on margin. Coxal plates of first 2 segments greatly developed, the posterior overlapping the anterior which extends over frontal lamina of cephalon. 3rd and 4th coxal plates of shorter side greatly reduced and irregular in outline. In last 3 segments coxal plate not differentiated from segment on shorter side, somewhat expanded posteriorly on longer side. Ovarian bosses present in first 4 segments. Marsupium complete.

6 abdominal segments distinctly separated, with well-developed lateral plates (fig. 2, D). Terminal segment small, without lateral

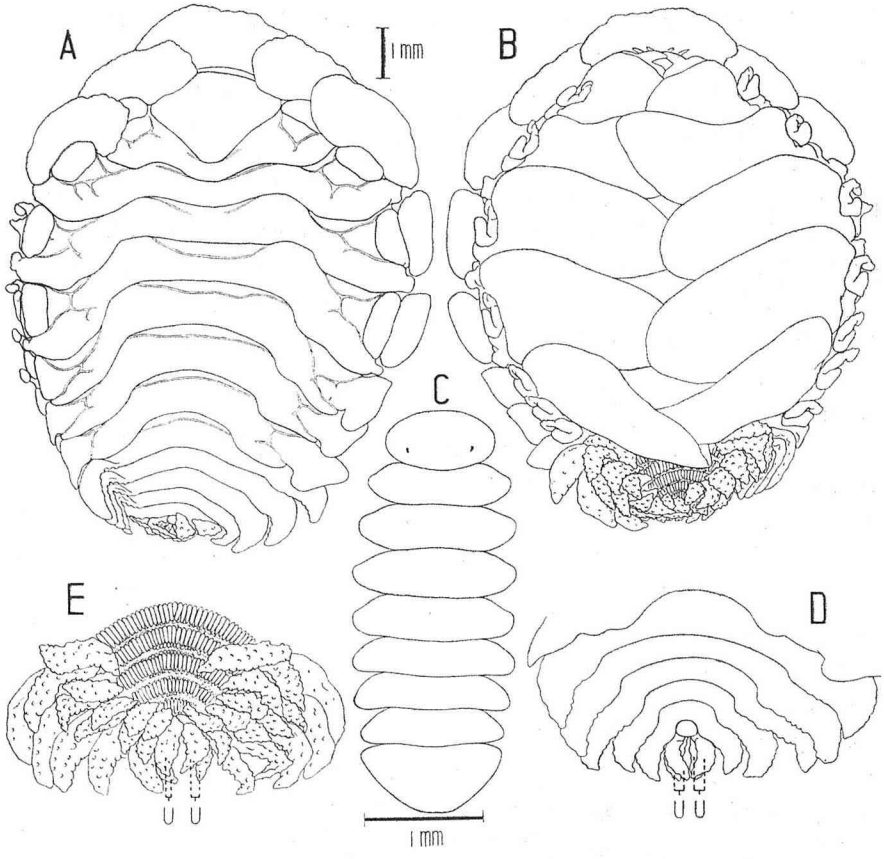

Fig. 2 *Apopenaeon japonicum* (THIELEMANN)

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view; D, ♀, abdomen, dorsal view; E, same, ventral view.

plates. Ventral surface of abdomen largely exposed and ornamented with longitudinal rugae. Same side of lateral plates covered with tuberculae.

5 pairs of biramous pleopoda (fig. 2, E) completely concealed in dorsal view, strongly tuberculated and directed externally except the 1st. Uropoda biramous (fig. 2, D & E, U), tuberculated and similar in appearance to pleopoda. Both rami subequal in length and about twice as long as last pleopoda.

Male (fig. 2, C): Compressed antero-posteriorly. Length 3.4 mm. No pigmentation.

Cephalon wider than long, ovoid in shape, distinct from thorax. Small eyes present.

7 thoracic segments indepedent and subequal in size.

Abdominal segments fused into a flat, semi-circular piece. Pleopoda and uropoda absent.

Remarks: The present specimens show certain differences from THIELEMANN's type[1] in the constitution of the female abdomen, especially in the degree of development of the lateral plates. However, HIRAIWA,[2] who has recently examined a large number of parasites of *Penaeopsis akayebi*, gives a complete series of variations in the lateral plates from short and round ones such as are drawn in THIELEMANN's figure to those elogated and well-developed ones shown in my figures. The difference in the size of the animal is probably not an important character. The present species may be therefore identified with that found parasitic on *Penaeus sp.* by THIELEMANN.

The species described by THIELEMANN as *Epipenaeon japonicum* departs too much from the general constitution of the genus, especially in the constitution of the female abdomen. The abdomen of *Epipenaeon* consists of 5 segments, while that of the species in question has one more segment. THIELEMANN himself has found in one specimen the presence of the rudimentary 6th segment which according him is invisible in dorsal view. In such a case the segment is always found to be placed at the ventro-posterior end of the 5th segment. So far as my observation goes there is no case in which the segment is absent or fused with the 5th segment. The irregular attachment of the pleopoda and uropoda in *Epipenaeon* is not found in the present species, a pair of pleopoda being attached to each segment. On these

1. THIELEMANN, literature no. 34, p. 79, fig. 86.
2. HIRAIWA, no. 13, pp. 51-55, text-fig. 1 & 2.

grounds I remove the present species from the genus *Epipenaeon* and transfer it to the genus *Apopenaeon*, in which the last abdominal segment of the female is present, but without lateral plates and the uropoda biramous.

Occurrence: The present species is commonly found in the branchial cavity of *Penaeopsis akayebi* RATHBUN in Tanabe Bay. It can be abundantly collected in spring.

Aporobopyrina n. gen.

Female cephalon distinct from thorax; thoracic segments independent; coxal plates present, lamellar; marsupium complete. 6 abdominal segments also separated; not well-developed lateral plates present in first 5 segments; 5 pairs of pleopoda and uropoda biramous.

Male cephalon, 7 thoracic and 4 abdominal segments distinct; pleopoda and uropoda absent.

The new genus is characterized by having only 4 segments in the male abdomen and biramous uropoda and lamellar coxal plates in the female. Differences from the allied genera are shown in the following table:

Genera	Female characters			Male characters	
	Coxal plates of thorax	Abdominal segments	Uropoda	Abdominal segments	Pleopoda
Aporobopyrina	lamellar	6	biramous	4	absent
Parionella	lamellar	6	uniramous	5	absent
Parionina	lamellar	6	uniramous	4	absent
Parioninella	lamellar	6	uniramous	4	present
Orbimorphus	lamellar	5	biramous	fused	absent
Munidion	lamellar	6	biramous	fused	absent
Pleurocrypta	lamellar	6	uniramous	fused	absent
Aporobopyroides	rudimentary	6	biramous	5	absent
Pagurion	rudimentary	6	biramous	6	present
Parapagurion	rudimentary	6	biramous	6	present

Aporobopyrina lamellata n. sp.

Female (fig. 3, A & B): Ovoid, rather symmetrical than asymmetrical. Dorsal flat, ventral convex. No pigmentation. Length 8.2 mm. Width 5.5 mm.

Cephalon semi-circular both in front and behind, distinctly separated from thorax. Frontal lamina broad, lamellar and slightly produced on each side. Eyes absent.

7 thoracic segments separate; first 5 bilobed on lateral side, with longer anterior and shorter posterior parts. In last 2 segments posterior lateral parts rudimentary or absent. Coxal plates well developed in all segments, broad and lamellar, slightly longer than segmental length and partly imbricated one upon another. Ovarian bosses present in first 4 segments. Marsupium complete.

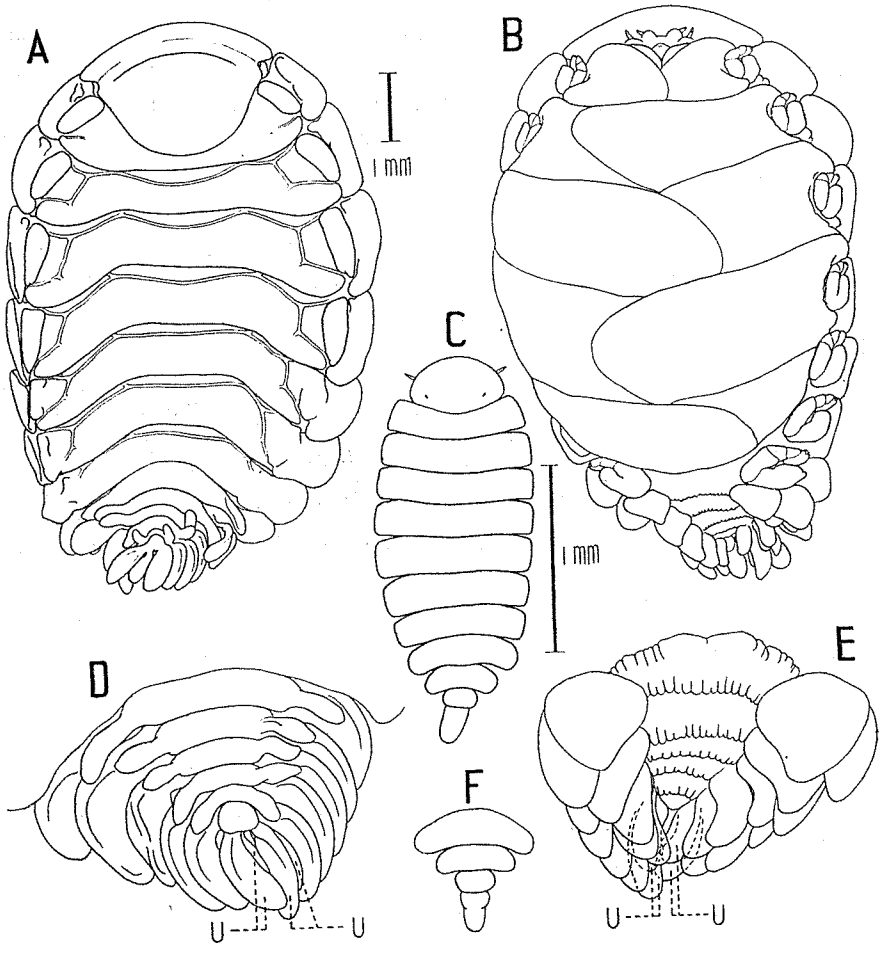

Fig. 3 *Aporobopyrina lamellata* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view; D, ♀, abdomen, dorsal view; E, same, ventral view; F, abdomen of another ♂.

6 abdominal segments distinct. Lateral plates not well developed and greater part of pleopoda exposed in dorsal view (fig. 3, D). Each plate narrower than segment and projecting laterally. Segmental borders crenated on ventral surface (fig. 3, E). Last segment small, round, without lateral plates.

5 pairs of biramous pleopoda present (fig. 3, E). Both rami broad, triangular in anterior pairs, gradually diminishing in width towards posterior pairs. Uropoda (fig. 3, D & E, U) biramous, entopodite shorter than exopodite.

Male (fig. 3, C): Compressed, 2.1 mm. in length. No pigmentation.

Cephalon distinct from thorax, small, semi-circular in front.

7 thoracic segments independent. Widest in 4th segment, from which body narrows towards both ends. Lateral margin of segments truncated.

Abdomen narrow posteriorly and of only 4 segments (fig. 3, C & E). Terminal segment cylindrical, longer than others. Pleopoda and uropoda absent.

Occurrence: 3 females accompanied by a male were obtained from the branchial cavity of *Petrolisthes pubescens* HOLMES collected at Yusaki, Seto, in April 1932.

Aporobopyrus NOBILI

1906, NOBILI, G., Atti. R. Accad. delle Sci. di Torino, vol. 41, pp. 11-13.

Aporobopyrus oviformis n. sp.

Female (fig. 4, A & B): Ovate, slightly asymmetrical. Dorsal flat, ventral convex. No pigmentation. Length 5.8 mm. Width 4.3 mm.

Cephalon broader than long, rounded on both anterior and posterior margins, distinctly separated from thorax. Eyes absent. Frontal lamina narrow.

7 thoracic segments independent. Lateral margin biolobed, anterior part longer than posterior part. In last 3 segments posterior lateral parts rudimentary and retreating from general outline of thorax. Rudimentary coxal plates present only in 3rd and 4th segments. Ovarian bosses rather inconspicuous, present in first 4 segments. Marsupium complete.

Abdomen more than twice wider than long. First 5 segments V-shaped, with lateral margin rounded. Lateral plates very short, exposing greater part of pleopoda in dorsal view. Terminal segment small, triangular and provided with a median posterior process.

5 pairs of pleopoda biramous. Both external and internal rami oval and directed posteriorly. Ventral surface of abdomen largely exposed; segmental borders crenated. Uropoda uniramous, not longer than last pair of pleopoda.

Male (fig. 4, C & D): Rather compressed antero-posteriorly. No pigmentation. Length 2.5 mm.

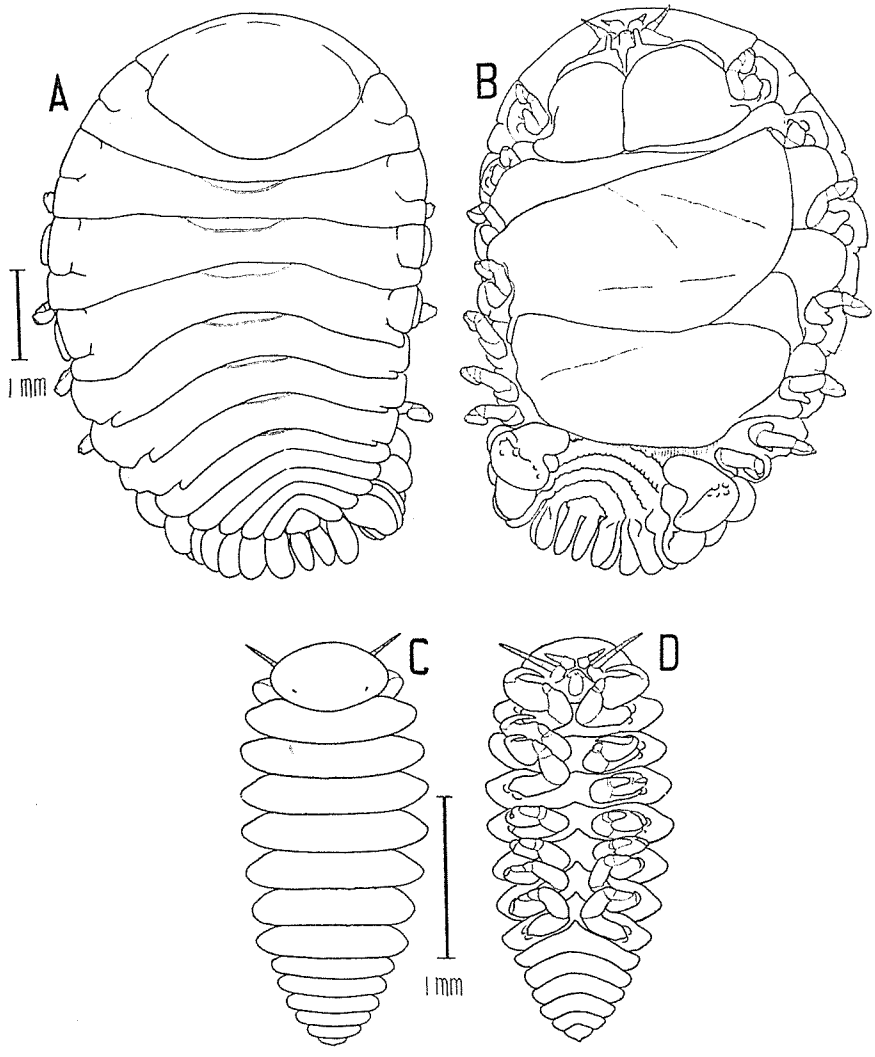

Fig. 4 *Aporobopyrus oviformis* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view D, ♂, ventral view.

Cephalon distinct from thorax, oval in shape. Small eyes present. 2nd antennae elongated beyond cephalic margin.

7 thoracic segments independent. Ventral border projects anteriorly in a median process from about 5th segment downwards (fig. 4, D).

Abdomen wider than long, diminishing in width posteriorly. 6 segments distinct. Segments much shorter than in thorax, with a median process on ventral surface of 1st segment. Terminal segment small, slightly produced in the middle of posterior margin. Pleopoda and uropoda absent.

Remarks: Differences from the known species of *Aporobopyrus* may be tabulated:

		oviformis	*adulticus*	*johannis*	*gracilis*	*curtatus*
Female	Body	wide	wide, very asymmetrical	narrow	narrow	wide, very asymmetrical
	Frontal lamina	present	absent	absent	present	absent
	Coxal plates	only in 3rd and 4th segments	in first 4 segments	in first 4 segments	in first 4 segments, except on shorter side of 1st	in first 4 segments
	Ovarian bosses	rudimentary	in first 4 segments	absent	in first 4 segments, except on shorter side of 1st and 2nd	in first 4 segments
	Lateral plates	rounded	swollen	pointed	pointed	narrower than segment
	Abdomen	more than twice wider than long	twice as wide as long	slightly wider than long	slightly wider than long	less than twice wider than long
Male	Abdomen	wider than long	slightly longer than wide	longer than wide	longer than wide	wider than long

Occurrence: The present new species was found in the branchial cavity of *Petrolisthes pubescens* HOLMES caught at Yusaki, Seto. The host was infested also by other Bopyrid *Aporobopyrina lamellata* described in the previous section.

Parabopyrus n. gen.

Female cephalon and thoracic segments distictly separated from one another. Marsupium widely open. 6 abdominal segments fused in the middle and laterally separated. 6 pairs of uniramous pleopoda present. Uropoda absent.

Male cephalon, 7 thoracic and 6 abdominal segments separated. Pleopoda and uropoda absent.

The new genus is closely related to *Bopyrus* LATR. and *Bopyrinella* Nz. & B. & B., in having fused abdominal segments and 5 pairs of uniramous pleopoda and in the absence of uropoda in the female. Differences from the named genera and other allied ones are shown in the table:

		Parabopyrus	*Bopyrus*	*Bopyrinella*	*Bopyrina*	*Bopyrinina*
Female	Cephalon	distinct from thorax	distinct from thorax	fused with thorax	fused or distinct from thorax	distinct from thorax
	Pleopoda	5 pairs	5 pairs	5 pairs	4 pairs	3 pairs
Male	Cephalon	distinct from thorax	distinct from thorax	fused with thorax	fused or distinct from thorax	distinct from thorax
	Abdominal segments	separated	fused, but laterally defined	fused, but laterally defined	fused, more or less defined laterally	fused, not laterally defined
	Pleopoda	absent	present	absent	absent	absent

Parabopyrus kiiensis n. sp.

Female (fig. 5, A & B); Flattened, much asymmetrical, pyriform. No pigmentation. Length 4 mm. Width 2.5 mm.

Cephalon distinct from thorax, triangular in shape. Anterior margin irregular. Eyes absent.

7 thoracic segments separate; first 4 bilobed on lateral margin into anterior and posterior parts. Posterior lateral parts quite long on longer side, while very short on shorter side: In last 3 segments they are absent on shorter side and rudimentary on other side. Anterior lateral parts of last 3 segments more or less produced backwards. Narrow coxal plates (fig. 5, A, C) present in 2nd—4th segments on both sides. In 1st segment they are absent. Ovarian bosses absent. Marsupium widely open. Development of 1st marsupial plates dissimilar on the two sides, linguiform process present only on shorter

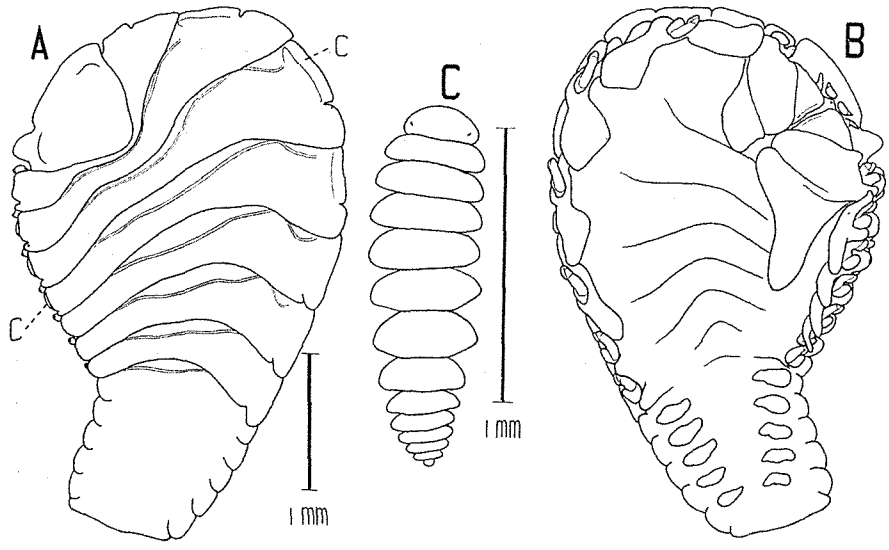

Fig. 5 *Parabopyrus kiiensis* n. sp.
A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view.

side. Other plates rudimentary, posterior margin of marsupium not closed.

Abdomen nearly quadranglar. Segments completely fused except in lateral portion. Lateral plates imbricated one upon another, with rounded margin. Terminal segment wide, about 5/8 the width of 1st segment; posterior margin nearly straight.

5 pairs of pleopoda uniramous, greatly reduced, irregular in outline and directed inwards. Uropoda absent.

Male (fig. 5, c): Length 1.3 mm. No pigmentation.

Cephalon distinct from 1st thoracic segment, bulged in front, straight behind. Small eyes present.

7 thoracic segments separate, largest in 5th and 6th.

6 abdonimal segments distinct. Segments much shorter than in thorax. Terminal segment small, rounded. Pleopoda and uropoda absent.

Occurrence: One female carrying a male was found in the branchial cavity of *Hippolysmata sp.* caught at Yusaki, Seto, in April 1932. Another specimen of both sexes was also found in the same host at Shisôjima, Seto, in September 1932.

Bopyrina KOSSMANN

1881, KOSSMANN, R., Zeitschr. Wiss. Zool., XXXV, pp. 667-668.

Bopyrina giardi BONNIER[1]

Syn. *Bopyrina abbreviata* RICHARDSON[2] (?)

Female (fig. 6, A & B): Very asymmetrical, scattered pigment spots on dorsal surface. Dorsal side flat or slightly concave, ventral highly convex. Length 3 mm. Width 2.1 mm.

Cephalon fused with 1st thoracic segment. Anterior margin irregular. Small eyes (?) present.

First 4 thoracic segments fused in mid-dorsal region. Other segments more or less distinct. Lateral margin of first 5 segments bilobed on longer side, not bilobed on shorter side and in other segments. Narrow coxal plates present only in 1st segment on both sides.

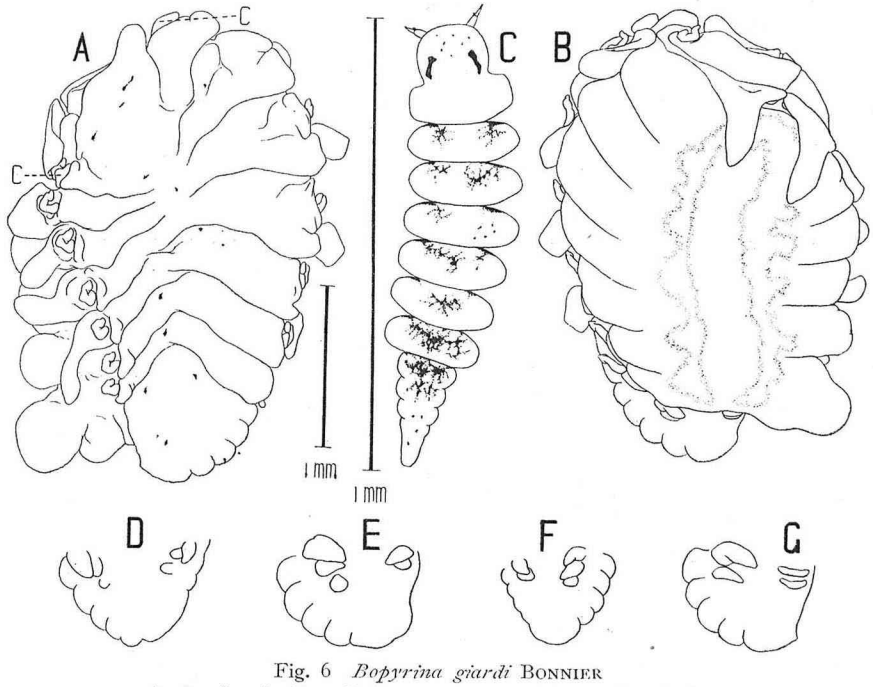

Fig. 6 *Bopyrina giardi* BONNIER
A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view;
D, E, F, G, various types of abdomen of ♀.

1. BONNIER, literature no. 1, pp. 365-368, Pl. 38—40; CHOPRA, no. 4, p. 523 & pp. 532-534, text-fig. 31; NIERSTRASZ and BRENDER À BRANDIS, no. 19, pp. 30-31, figs. 87-99; NORMAN, no. 35, p. 363; STEBBING, no. 32, p. 417.

2. RICHARDSON, no. 28, pp. 563-564; CHOPRA, no. 4, p. 523 & 534.

Ovarian bosses entirely absent. Ventral side of thoracic segments swollen out far beyond lateral margin on shorter side. All segments fused in mid-ventral region and on shorter side of 6th and 7th segments. 1st marsupial plates linguiform with posterior elongation. Other plates reduced, externally directed and not enclosing a cavity.

Abdominal segments completely fused leaving 5 or 6 segmental relics on longer side (fig. 6, D-G). Ventral surface of abdomen considerably encroached upon by swollen thorax.

Pleopoda uniramous and rudimentary. Only 2 or 3 of anterior pairs remaining, others not differentiated from surface of abdomen (fig. 6, D-G. Uropoda absent.

Male (fig. 6, C): Attenuated, coloured pattern on both dorsal and ventral surfaces. Length 1 mm.

Cephalon rather long, completely fused with 1st thoracic segment. Large eyes present.

Thoracic segmentation distinct. 1st segment truncated on lateral margin, others rounded.

Abdomen tapers posteriorly, much narrower than thorax. Segments fused, laterally separated by 3 notches. Pleopoda absent. Anal spines (uropoda) also absent.

Remarks: Although the general constitution of the present specimen is largely in accord with that given by BONNIER[1] for the European specimen, there are yet some differences between them: for

		Japanese form	European form	Indian form	American form (*abbreviata*)
Female	Posterior border of cephalon	obliterated	obliterated	distinct	distinct
	Thoracic segments	first 4 fused in the middle	all fused in the middle	(?)	all distinct
	Posterior elongation of oostegite 1	well developed	well developed	absent	not well developed
Male	Posterior border of cephalon	obliterated	distinct	distinct (?)	distinct
	Abdominal segments	4	4	3 or 4	6
	Anal spines	absent	present	present	absent

1. BONNIER, literature no. 1, pp. 365-368, Pl. 38—40.

example, the cephalon of the male fused with the 1st thoracic segment in the present specimen (separate in the European form) and the anal spines (uropoda) are present. The male abdomen is somewhat more slender than that figured by BONNIER, but similar to that of *B. virbii* KOSSMANN.[1] The last named species is, however, quite different from the present one in the constitution of the female. Comparison between the Japanese specimen and that from Europe as well as other hitherto described specimens (including RICHARDSON's *abbreviata*)[2], may be tabulated as shown in the preceding page.

Occurrence: 4 females each carrying a male were found in the branchial cavity of *Hippolyte sp.* collected at Seto in April 1933.

Apocepon Nz. & B. à B.

1930, NIERSTRASZ, H. F. and BRENDER À BRANDIS, G. A., Proc. U. S. Nation. Mus., vol. 77, art. 9, pp. 7-9.

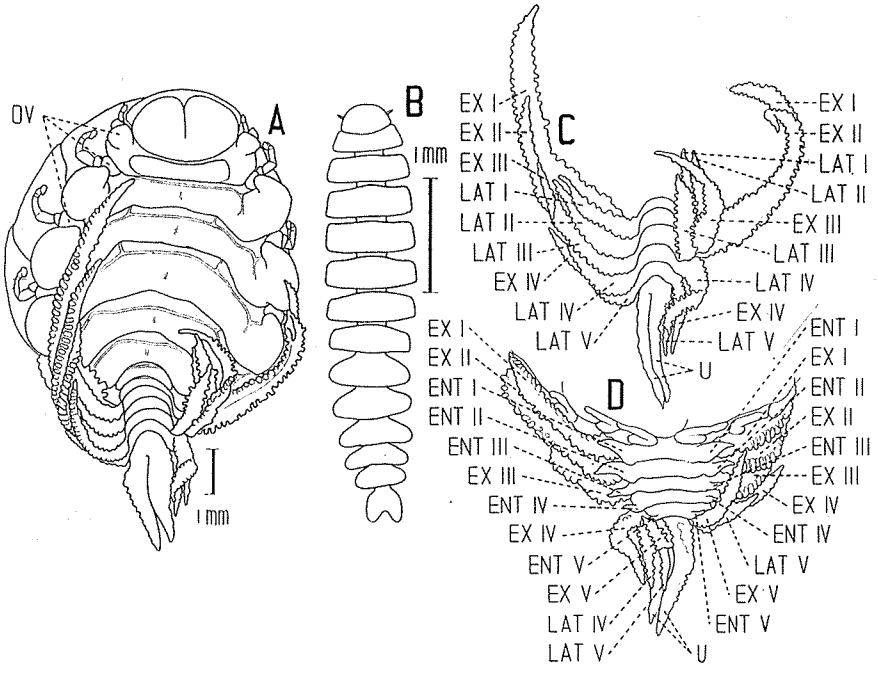

Fig. 7 *Apocepon pulcher* Nz. & B. à B.
A, ♀, dorsal view; B, ♂, dorsal view; C. ♀, abdomen, dorsal view; D, same, ventral view.

1. KOSSMANN, literature no. 15, Pl. 34, fig. 3.
2. CHOPRA, no. 4, p. 523 & 534.
3. NIERSTRASZ and BRENDER À BRANDIS, no. 22, pp. 7-9.

Apocepon pulcher Nz. & B. à B.[3)]

Female (fig. 7, A): Length (excl. uropoda) 8.3 mm. Width 6 mm. Dorsal slightly concave, ventral highly convex, somewhat asymmetrical. No pigmentation.

Head wider than long, ovoid and bilobed on anterior side. Frontal lamina narrow. Eyes absent.

Thoracic segments distinctly separated from one another; without medio-dorsal processes. 7th segment very short and narrow. Ovarian bosses small (fig. 7, A, ov). Posterior lateral parts of 2nd to 4th segments prominently swollen and somewhat directed forwards. In last 3 segments posterior lateral parts not swollen and ovarian bosses absent. Small rudimentary coxal plates present in first 4 segments. Marsupium complete, highly vaulted.

Abdomen cylindrical, 6 segments distinct (fig. 7, C & D). Lateral plates (LAT) of first 5 segments freely projected antero-laterally, thickly and regularly tuberculated on margin. Pleopoda biramous. Exopodite (EX) much longer than lateral plate, likewise directed anteriorly and tuberculated on margin. Endopodite (ENT) very small, rudimentary, represented by linguiform protuberance at the base of the exopodite. Uropoda (U) uniramous, rather broad, tuberculated on margin and directed posteriorly.

Male (fig. 7, B): Elongated, 3.0 mm. in length. No pigmentation.

Cephalon semi-circular in front, widely rounded behind, distinct from thorax. Eyes absent. 2nd antennae projecting beyond cephalic margin.

Thoracic segments discontiguous, truncated on lateral margin.

6 abdominal segments separate, rounded on margin. Last segment divided in V-shape. Pleopoda and uropoda absent.

Remarks: The swellings on the lateral side of 2nd–4th thoracic segments described by NIERSTRASZ and BRENDER À BRANDIS[1)] as ovarian bosses probably represent the posterior lateral parts. Ovarian bosses, though very small, are found in front of the swellings, being partly covered by the latter. However, in the 1st segment posterior lateral parts are inconspicuous and the greater part of the segmental margin is occupied by ovarian bosses.

Occurrence: One female accompanied by a male was found in the branchial cavity of *Philyra pisum* DE HAAN taken at Tomioka, Kanazawachô, Kanagawa-ken (near Tokyo) in April 10th, 1929. The specimen was kindly sent for examination by Dr. N. NAKAI of the Imperial Marine Experimental Station.

1. NIERSTRASZ and BRENDER À BRANDIS, literature no. 22, fig. 17.

Portunicepon GIARD & BONNIER

1887, GIARD, A. and BONNIER, J., Trav. Inst. Zool. Lille et Lab. Zool. Mar. Wimm., t. v, pp. 73-74.

Syn. *Ergyne* RISSO *pro parte*.

The genus *Portunicepon* was first established by GIARD and BONNIER (1887)[1] for *Cepon portuni* KOSSMANN (1881) to distinguish it from *Cepon typus* of DUVERNOY which bore many characters different from the former species. Afterwards, GIARD and BONNIR made *portuni* synonymous with *Ergyne cervicornis*, which had been discovered by RISSO (1816) in the branchial cavity of the same host *Portunus arcuatus*.[2] But, notwithstanding RISSO's priority GIARD and BONNIER (1890)[3] and BONNIER (1900)[4] preserved their own generic term describing the species as *Portunicepon cervicornis*. STEBBING (1893[5] & 1910[6]) adopted the term *Ergyne* in describing his new species *savignyi*, with the remark that *cervicornis* and *hendersoni* (*Portunicepon hendersoni* GIARD & BONNIER) should be given the old generic name.

RISSO's original description remains inaccessible to me. However, according to KOSSMANN[7] the male of *Cepon portuni* has no pleopoda. Pleopoda are present in the male of other species of *Ergyne*. The presence or absence of the pleopoda provides one of the most important generic differences among Bopyrids. Therefore, it seems to me better to divide the present group into 2 genera on account of the male pleopoda. Since *hendersoni* was first described under the generic name of *Portunicepon*, the name should be applied to those Bopyrids bearing pleopoda in the male, while the term *Ergyne* should be retained only for *cervicornis* which is without pleopoda in the male.

Portunicepon goetici n. sp.

Female (fig. 8, A & B): Dorsal flat, ventral highly convex; only slightly asymmetrical. No pigmentation. Length (excl. uropoda) 4.2 mm. Width 2.6 mm.

Cephalon distinct from thorax, swollen on dorsal side, bilobed in front, bluntly projecting behind. Frontal lamina rather broad, margin entire. Eyes absent.

7 thoracic segments separate; mid-dorsal surface more or less

1. GIARD and BONNIER, literature no. 8, pp. 73-74, fig. 14.
2. KOSSMANN, no. 16, pp. 170-183.
3. GIARD and BONNIER, no. 10, pp. 379.
4. BONNIER, no. 1, pp. 272-274.
5. STEBBING, no. 32, pp. 413-414.
6. STEBBING, no. 33, pp. 115-116.
7. KOSSMANN, no. 16, p. 181.

elevated, in 5th and 6th segments developing into "medio-dorsal processes" (fig 8, c). 7th segment very small and retreating from general surface of thorax. Lateral side of first 4 segments and right side of 5th segment bilobed. Ovarian bosses present and swollen in these segments, but not clearly defined. Coxal plates absent. Marsupium vaulted and complete.

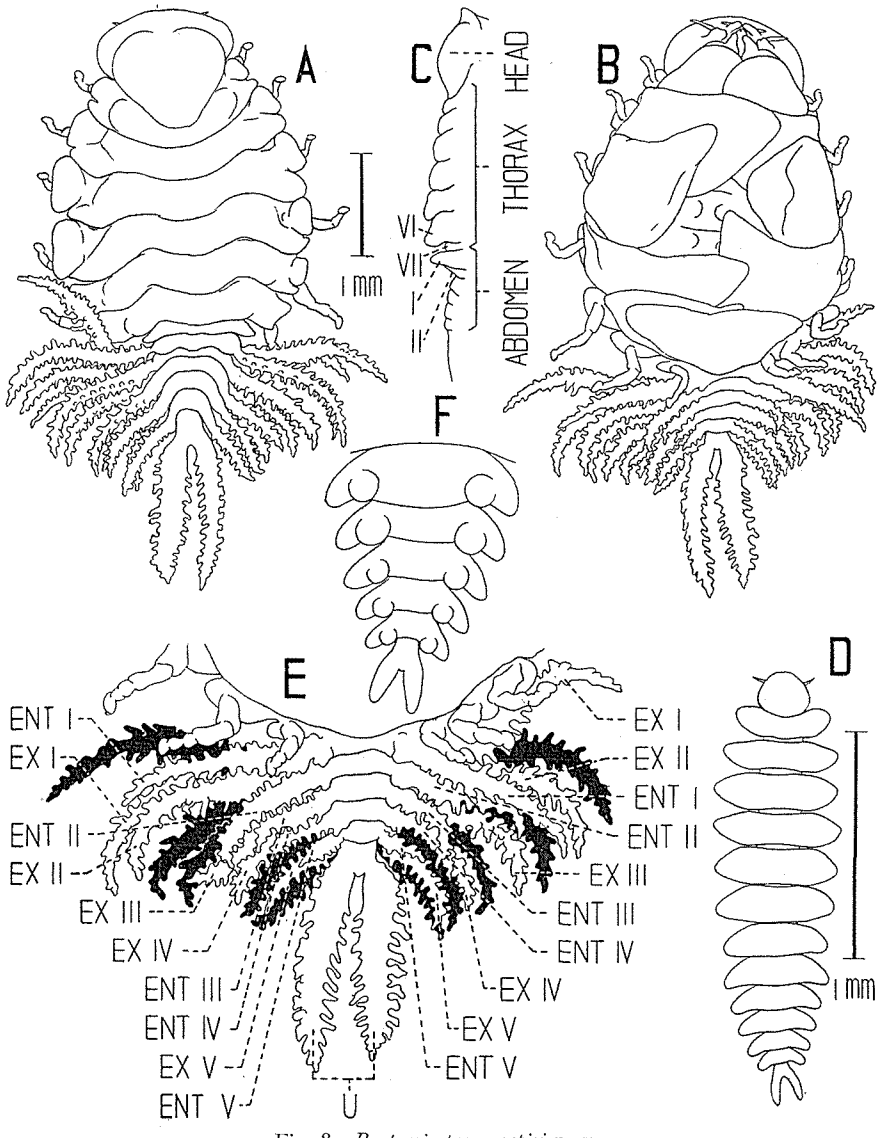

Fig. 8 *Portunicepon goetici* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♀, lateral view of dorsal half; D, ♂, dorsal view; E, ♀, abdomen, ventral view; F, ♂, abdomen, ventral view.

6 abdominal segments distinct. 1st segmgnt with medio-dorsal process, other segments without it (fig. 8, C). Lateral plates (fig. 8, E, LAT) elongated, freely projected laterally, with tuberculated margin and similar in appearance to pleopoda. Last segment without lateral plates.

5 pairs of pleopoda biramous (fig. 8, E), elongated, narrow, tuberculated on margin and projecting externally. Exopodite (EX) longer than endopodite (ENT) and slightly shorter than lateral plates. Uropoda (U) uniramous, much longer and broader than pleopoda, about twice as long as exopodite of 5th pleopoda and tuberculated on margin.

Male (fig. 8, D): Elongated, no pigmentation. Length 2.1 mm.

Cephalon rounded, slightly wider than long and distinct from thorax. Eyes absent.

Thoracic segments separate, attenuated laterally. Medio-ventral tubercles present in 2nd–7th segments.

6 abdominal segments distinct; first 5 trapeziform, terminal bilobed in V-shape. 5 pairs of pleopoda present (fig. 8, F), uniramous, tubercle-shaped. Uropoda absent.

Remarks: Comparison with other known species of the genus is given in the following table:

		goeticii	*hendersoni*	*savignyi*	*rissoi*
Female	Anterior lamina of cephalon	developed, entire	reduced, trilobed	developed, entire	developed, trilobed
	Processes of posterior lamina	inner pair rudimentary, outer pair lancet-form	both pairs rudimentary	both pairs rudimentary	both pairs rudimentary
	Thorax	lozenge-shaped	lozenge-shaped	compressed antero-posteriorly	ovoid
	Medio-dorsal processes	in 5th-6th thoracic and 1st abdominal segments	in 6th-7th thoracic segments	in 5th-7th thoracic segments	in 6th-7th thoracic segments
	Lateral plates of abdomen	long, directed laterally	very long, directed anteriorly	comparatively short, directed laterally	short, directed antero-laterally
Male	Medio-ventral processes	in 2nd-7th thoracic segment	in 1st-7th thoracic and 1st abdominal segments	in 1st-7th thoracic and 1st abdominal segments	absent
	Uropoda	absent	present as a bundle of setae	tubercle-shaped	absent

Occurrence: One female carrying a male was found in the branchial cavity of *Goetice depressus* DE HAAN caught by Mr. Y. MIYASHITA at Shirahama, Seto, in March 1933.

Athelges HESSE

1861, HESSE, M., Ann. Sci. Nat., ser. 4, vol. 15, pp. 112-113.

Athelges takanoshimensis ISHII[1]

Female (fig. 9, A): Asymmetrical, dorsal concave, ventral convex. No pigmentation. Length 9 mm. Width 4.7 mm.

Cephalon deeply set in thorax, anterior margin straight, posterior border rounded. Eyes absent. Cephalic appendages exposed in dorsal view.

7 thoracic segments distinct. 1st segment narrowed, but not obliterated in mid-dorsal region. In first 4 segments lateral parts directed forwards, coxal plates and ovarian bosses small. 5th to 7th segments larger than preceding segments and lateral parts not directed forwards. Marsupium complete. 1st plates provided with funnel-shaped anterior lobe.

Only 5 abdominal segments present, cylindrical and without lateral plates. Last seg-

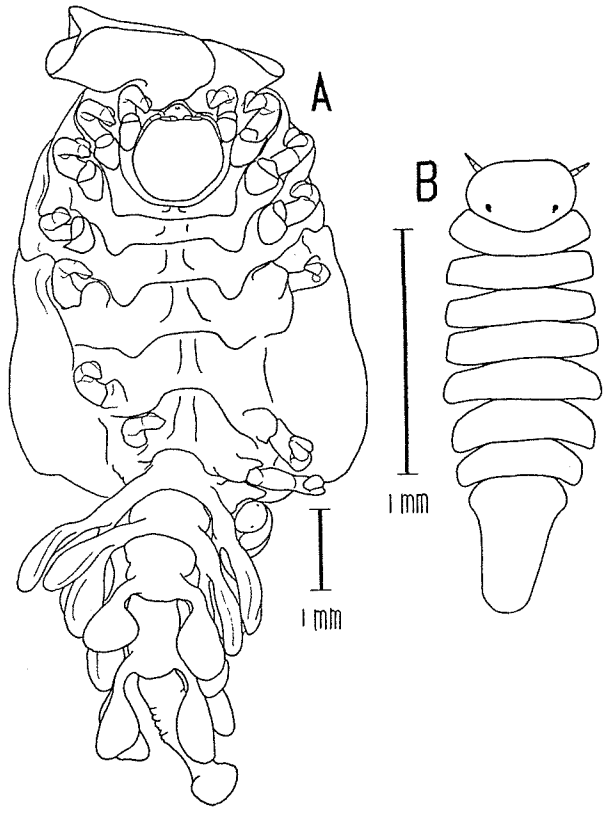

Fig. 9 *Athelges takanoshimensis* ISHII
A, ♀, dorsal view; B, ♂, dorsal view.

1. ISHII, literature no. 14, pp. 519-530.

ment longest, swollen like a knob at the posterior end. 4 pairs of pleopoda biramous. Both external and internal rami oval and attached by common peduncle. Uropoda absent.

Male (fig. 9, B): Length 1.8 mm. No pigmentation.

Cephalon wider than long, anterior margin straight, posterior border rounded.

Thoracic segments separated. First 4 segments truncated on margin, others rounded.

All abdominal segments fused into a conical piece; laterally produced in anterior part and rounded at posterior end; no original segmentation. Pleopoda and uropoda absent.

Occurrence: At Seto the species is generally found on the abdomen of *Eupagurus samuelis* STIMPSON. But the present specimens consisting of 2 females carrying a male were found on quite different host (*Eupagurus japonicus* STIMPSON.) The description and figures given above are based upon one of these specimens.

Diplophryxus RICHARDSON

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

Diplophryxus alphei n. sp.

Female (fig. 10, A & B): Deformed, irregularly asymmetrical, with one side greatly swollen. No pigmentation. Eyes absent. Length (excl. uropoda) 5.8 mm. Width 4.3 mm.

Cephalon distinct from thorax, posterior and longer side swollen (fig. 10, E, C). Both antennae and rostrum shifted to dorsal side. 1st antennae (ANT I) transformed into narrow unsegmented lobes. 2nd antennae (ANT II) usual. Maxilliped (fig. 10, F, MXP) narrow, without palp. Posterior lamina provided with 3 hook-like processes on each side.

Thorax greatly swoollen on one side. Segmentation distinct on smaller side, oblitera'ed on longer side. 1st and 7th segments more or less distinct in entire length. 7 legs present on smaller side, only the first on swollen side (fig. 10, D). 1st leg of smaller side largest while that of larger side smallest. Marsupium complete, highly vaulted. 1st plate dissimilar on each side and completely concealed (fig. 10, D, MP 1). 2nd to 4th plates on swollen side large, representing principal part of marsupium. Those plates on other side small and concealed. 5th plate present only on smaller side. 2nd plate on larger side provided with long process projecting over cephalon (fig. 10, A, X).

Abdomen narrow, 4 segmented. Lateral plates (fig. 10, G, LAT) bilobed, oval and similar in appearance to pleopoda. Pleopoda (PL) attached somewhat apart from lateral plates, tri- or even quadriramous as shown in the table. Each ramus oval in shape.

	Pleopoda	Left	Right
Number of branches of pleopoda in holotype	I	3	4
	II	3	4
	III	3	3
	IV	4	4

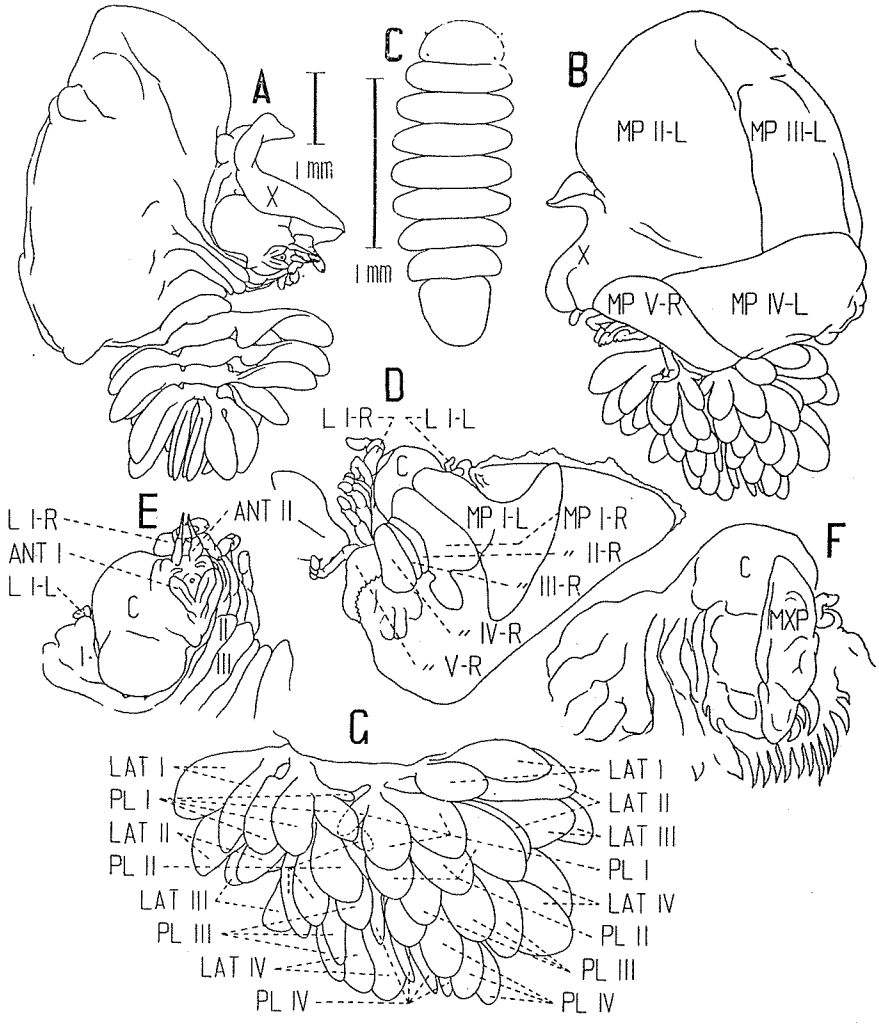

Fig. 10 *Diplophryxus alphei* n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view; D, ♀, ventral view, 2nd-4th marsupial plates of longer side removed; E, ♀, cephalon, dorsal view; F, same, ventral view; G, ♀, abdomen, ventral view.

Male (fig. 10, c): Found in female marsupium. Compressed, 1.9 mm. in length. No pigmentation.

Cephalon distinct from thorax, with round anterior and straight posterior borders. Minute eyes present.

Thoracic segments separate, rounded on side.

Abdominal segments coalesced into a single piece, occupying about 1/5 of total length and rounded posteriorly. Pleopoda and uropoda absent.

Remarks: In spite of the absence of the 5th abdominal segment in the female the present species can be assigned to the genus *Diplophryxus*. The body is strongly asymmetrical the head being turned to one side by more than 90 degrees.

Comparison with other known species is given in the table.

		alphei	*jordani*	*kempi*	*richardsoni*
Female	Abdominal segment V	absent	present	?	present
	Abdominal segmentation	distinct	rather indistinct	indistinct	indistinct
	Pleopoda	disposed on either side	pleopoda of swollen side shifted to the other side	disposed on either side	disposed on either side
		with 2—4 branches	with 2—4 branches	biramous	biramous
	Thoracic legs	7 on shorter side, 1 on longer side	7 on shorter side, 1 on longer side	2 or 3 on shorter side, 1 on longer side	7 on shorter side, 3 or 4 on longer side
Male	Abdominal length	1/4 of body length	1/3 of body length	2/7 of body length	unknown
	Body	compressed, short	slender, elongated	slender, elongated	

In the classification of Phryxids, CAROLI (1929)[1] laid much stress upon the number of remnant legs in the thorax and divided the genus *Phryxus* into 5 subgenera on account of this character.

These subgenera were subsequently elevated by NIERSTRASZ and BRENDER À BRANDIS (1931)[2] to the rank of a genus. Therefore, in view of the original definition it would be inadequate to assign *kempi*

1. CAROLI, literature no. 2, pp. 254-265.
2. NIERSTRASZ and BRENDER À BRANDIS, no. 23, p. 201.

and *richardsoni* to *Diplophryxus* as CHOPRA did.[1] They also differ much from *jordani* and *alphei* of the genus in the constitution of the pleopoda and lateral plates. Those 2 species of CHOPRA, in my opinion, may deserve each a new genus.

Occurrence: 2 females carrying a male were found on the abdomen of *Alpheus sp.* (Edwardsi-type) collected at Yusaki, Seto in April, 1933.

Epiphryxus n. gen.

Female phryxid-form. Thoracic segmentation obliterated on longer side. 7 pairs of thoracic legs present. 5 abdominal segments separate; first 4 with bilobed lateral plates. Last segment small, without lateral plates. 4 pairs of pleopoda bi- or triramous. Uropoda absent.

Male cephalon and thoracic segments distinct. Abdominal segments completely fused. Pleopoda and uropoda absent.

The present new genus is closely related to *Diplophryxus* in having bilobed lateral plates and ramified pleopoda in the female and in having a completely fused abdomen in the male. These two genera can be distinguished by the number of thoracic legs on the longer side: in *Diplophryxus* there is only the first leg, while in *Epiphryxus* all the legs are present.

Epiphryxus primus n. gen.

Female (fig. 11, A & B): Deformed, very asymmetrical with one side greatly swollen, Dorsal concave, ventral convex. No pigmentation, no eyes. Length (excl. uropoda) 6.3 mm. Width 4.7 mm.

Cephalon distinct from thorax, anterior margin divided, posterior margin rounded (fig. 11, E). Both pairs of antennae usual. Maxillipeds narrow, without palp (fig. 11, F, MXP). Posterior lamina has 2 lateral processes on each side, the external slender and curved like a hook, the internal thick and club-shaped.

Thoracic segmentation distinct on smaller side, obliterated on swollen side. 1st and last segments more or less distinct in entire length. 7 pairs of legs present. First 2 pairs closely applied to cephalon and directed forwards (fig. 11, E, L 1 & 11). 3rd to 7th legs on larger side reduced, smaller than those on smaller side (fig. 11, C). A considerable distance separates 2nd legs from 3rd and 3rd from 4th. 5th to 7th legs crowded on posterior side. Marsupium vaulted. 1st plates

1. CHOPRA, literature no. 5, pp. 121-127.

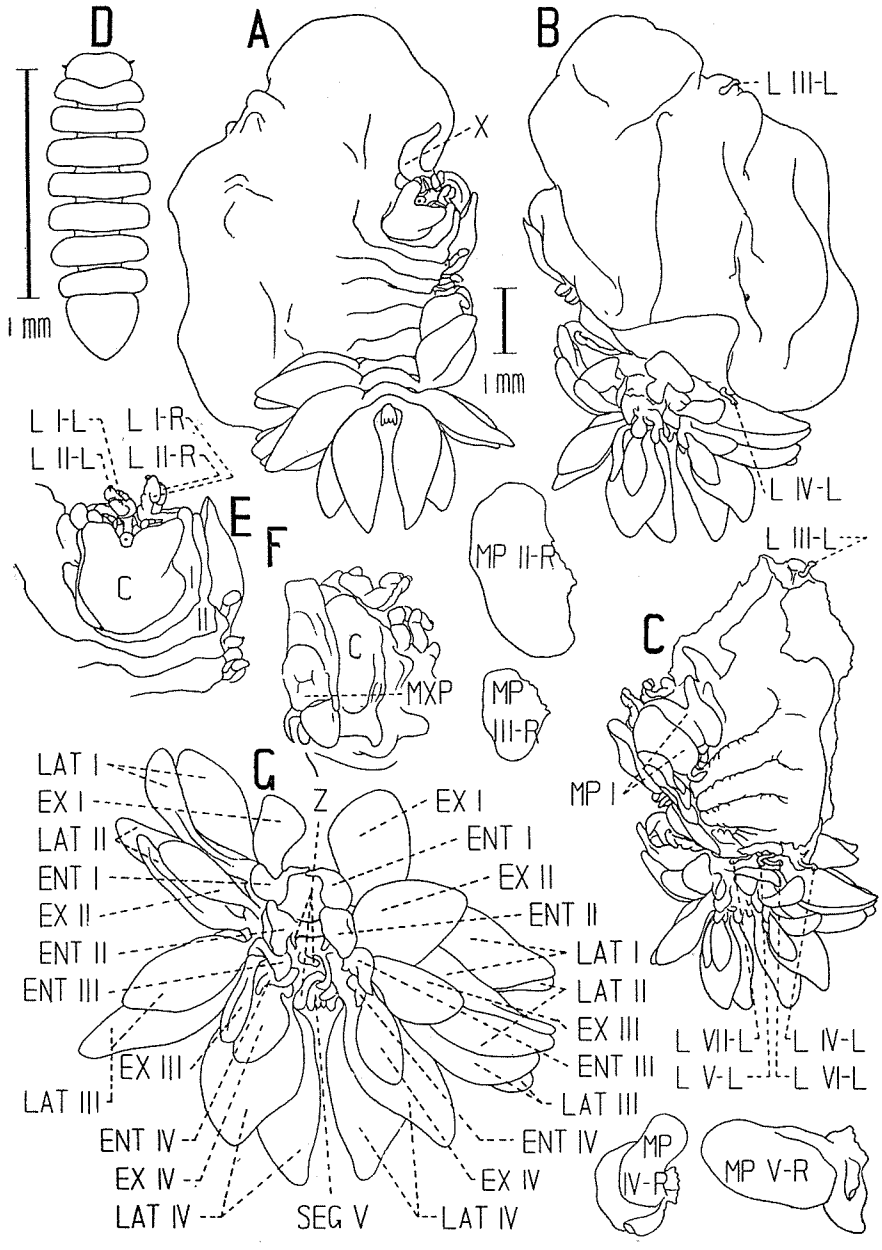

Fig. 11 *Epiphryxus primus* n. gen. & n. sp.

A, ♀, dorsal view; B, ♀, ventral view; C, same, 2nd-4th marsupial plates of longer side removed; D, ♂, dorsal view; E, ♀, cephalon, dorsal view; F, same, ventral view; G. ♀, abdomen, ventral view.

dissimilar (fig. 11, C, MP 1). 2nd to 4th plates of larger side form principal part of marsupium, with projecting lobe on 2nd plate. 5th plate of this side wanting. Plates of smaller side reduced and largely covered by those of larger side. 4th and 5th plates consisting of 3 lobes (fig. 11, MP IV & V).

5 abdominal segments distinct. Bilobed lateral plates present in first 4 segments (fig. 11, G, LAT). Each lobe large, subequal, elongated oval and provided with narrow peduncle. Pleopoda smaller than lateral plates, completely covered in dorsal view. Exopodite (EX) similar in shape to lateral plates; endopodite (ENT) much smaller than exopodite, somewhat irregular in shape and attached to the base of the latter. On ventral surface of 2nd to 4th segments, a papilla-like appendage present (fig. 11, G, Z), probably a secondary branch of pleopoda. 5th segment small, provided with posterior digitiform processes (fig. 11, G, SEG V). In some specimens posterior end entire, and without processes.

Male (fig. 11, D): Short, 1.3 mm. in length. No pigmentation. Cephalon distinct from thorax, anterior margin with slight depression. Eyes absent.

7 thoracic segments discontiguous.

Abdominal segments completely fused. Abdominal piece rounded on the side and pointed at the end. No pleopoda and uropoda.

Remarks: The papilla-like appendages that appear on the ventral surface of the female abdomen are probably derived from the exceedingly ramified endopodite and the condition is comparable to a certain extent to the ramification of the pleopoda in *Diplophryxus* as described in a former paper.[1]

Occurrence: 2 females each carrying a male were found on the abdomen of *Hippolysmata sp.* caught at Yusaki, Seto in April, 1933.

Hypophryxus n. gen.

Female body phryxid-form. Thoracic segmentation distinct on shorter side. 7 pairs of thoracic legs present. 5 abdominal segments distinct. Lateral plates of first 4 segments unilobed. 4 pairs of pleopoda biramous. Uropoda uniramous.

Male cephalon fused with 1st thoracic segment. Abdominal segments fused into one piece. No pleopoda and uropoda.

The new genus is closely related to *Hyperphryxus* Nz. & B. à B., but differs from the latter in having 7 pairs of legs in the female and

1. SHIINO, literature no. 31, pp. 295-296.

in the constitution of the male. Differences from *Hyperphryxus* and other allied genera are shown in the table:

			Hypo-phryxus	*Hyper-phryxus*	*Epiphryxus*	*Diplo-phryxus*
Female	Thoracic legs present on	longer side	7	1	7	1
		shorter side	7	7	7	7
	Lateral plates		unilobed	unilobed	bilobed	bilobed
	Pleopoda		biramous	biramous	biramous	multiramous
	Uropoda		*present*	*absent*	*absent*	*absent*
Male	Posterior border of cephalon		obliterated	distinct	distinct	distinct
	Abdominal segments		fused, but more or less defined laterally	completely fused	completely fused	completely fused

Hypophryxus yusakiensis n. sp.

Female (fig. 12, A & B): Greatly deformed and asymmetrical. Dorsal flat or slightly concave, ventral convex. No pigmentation. Length 6.6 mm. Width 3.3 mm.

Cephalon distinct from thorax, anterior margin divided, posterior margin irregularly rounded. Both pairs of antennae of usual type, filiform; 2nd pair very long.

Thoracic segmentation distinct on smaller side, obliterated on swollen side. Borders of first 2 segments more or less distinct, surrounding posterior and lateral margin of cephalon. 7 pairs of legs present; first 2 pairs shifted to anterior side of head (see fig. 11, A). 3rd leg on shorter side somewhat apart from 2nd and crowded with succeeding legs. On longer side (see fig. 12, B), a considerable distance separates 2nd leg from 3rd and 3rd from 4th. 4th to 7th legs larger than others, crowded together on posterior part of thorax. Marsupium vaulted and complete; projecting lobe of 2nd plate of longer side rather small.

5 abdominal segments distinct. Lateral plates (fig. 12, D, LAT) of first 4 segments, unilobed, large and oval in shape. 4 pairs of pleopoda biramous and completely covered by lateral plates. Exopodites (EX) oval, similar in appearance to lateral plates, but far smaller. Endopodites (ENT) rudimentary, quardrangular, directed inwards and attached some-

what apart from the base of exopodites. Lateral plates and endopodites become smaller posteriorly, exopodites become larger. Last segment very small, with uniramous uropoda.

Male (fig. 12, c): Attenuated posteriorly, 2 or 3 small pigment spots. Length 2 mm.

Cephalon fused with 1st thoracic segment, somewhat trapezoid in shape, laterally demarked by deep notches. Small eyes present. 2nd antennae long, projecting far beyond cephalic margin. Thorax slightly narrow towards posterior.

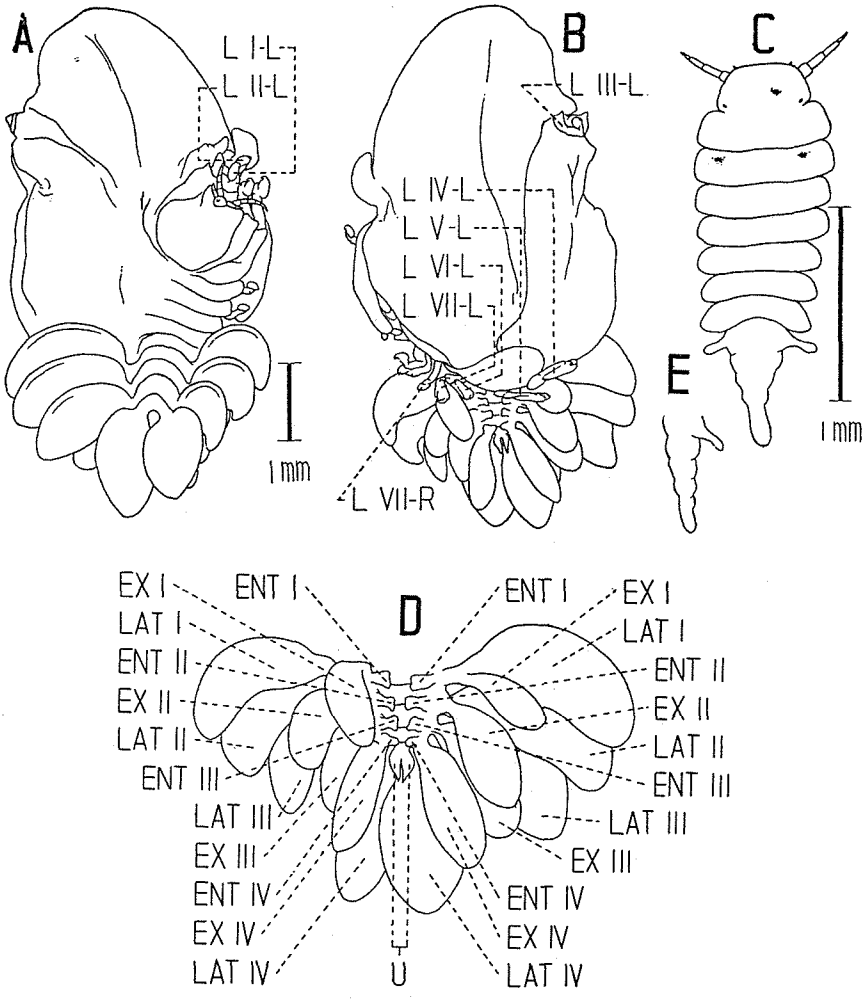

Fig. 12 *Hypophryxus yusakiensis* n. gen. & n. sp.
A, ♀, dorsal view; B, ♀, ventral view; C, ♂, dorsal view; D, ♀, abdomen, ventral view; E, ♂, abdomen, lateral view.

Abdominal segments fused into one piece, tapering posteriorly, but laterally defined by 5 slight marginal notches (fig. 11, C & E). Last segment twice as long as previous segment. 1st segment carries on each lateral side a rod-like appendage (origin of which is not definitely known). Pleopoda and uropoda absent.

Occurrence: One female carrying a male was found on the abdomen of *Alpheus sp.* (Edwardsi-type) caught at Yusaki, Seto in April 1933. The host of the present species seems to differ from that of *Diplophryxus alphei*.

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