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## NORTHERN PACIFIC GIGANTIONE (ISOPODA)

CHARLES G. DANFORTH<sup>1</sup>

*Biology Department, Glendale College, Glendale, California 91208*

While carrying out research on the crabs of Eniwetok Atoll, Dr. Jens Knudsen of Pacific Lutheran University noticed a laterally distorted specimen in the collection of the Eniwetok Marine Biological Laboratory. He very kindly sent this crab to the writer. The animal had been identified by Dr. J. Garth of the University of Southern California, and had been collected by Dr. A. H. Banner of the University of Hawaii. The host (Fig. 1A) had an isopod located in the left gill area, and this ectoparasite was found to be a member of the Bopyridae family in the Epicaridea suborder.

Some years ago the first record of a shore bopyrid for the Hawaiian Islands was reported by Danforth (1963). At that time an exact identification was not made; however, the assumption was that the form was in the "Ione" or "Cepon" group. Verification of the former hypothesis may be aided by comparison with the first bopyrid to be reported from Eniwetok Atoll. This new form is in the genus *Gigantione*, and it and the Hawaiian specimen related to two species of *Gigantione* reported by Shiino (1941, 1958). Thus it now appears that there are four species of the genus in the northern Pacific, two of which have been previously undescribed.

Genus *Gigantione* Kossmann 1881

*Gigantione pratti* n. sp.

Material: one pair.

Host: *Phymodius unguatus* (Milne Edwards). Parasitized in the left branchial region.

Locality: Bruce (Aniyaanii) Island, Eniwetok Atoll. Approximately 162° 28' E. Long., 11° 28' N. Lat., in dead *Acropora* coral, at a depth of about 6 feet.

Date: collected on 23 February 1957.

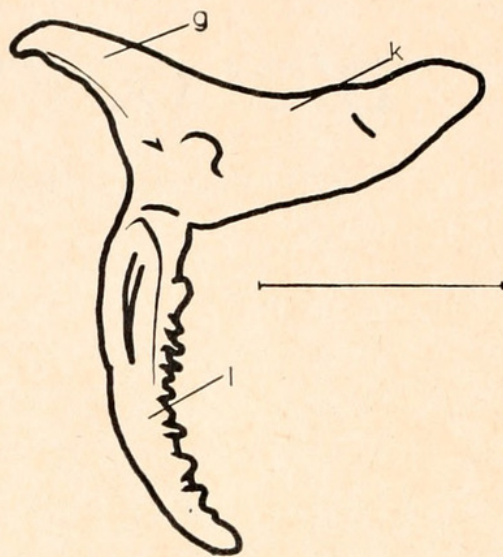
### FEMALE

Dimensions: 5.0 mm. greatest length, excluding lamellae; 4.5 mm. greatest width, at the third thoracomere.

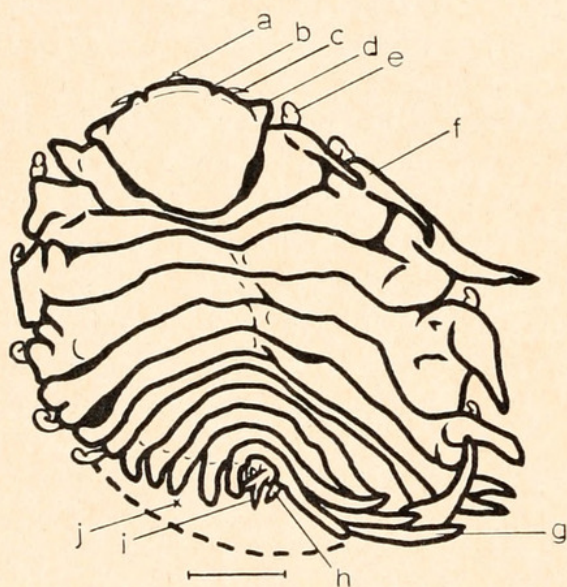
<sup>1</sup> Mailing address: 3612 Angelus Avenue, Glendale, California 91208.



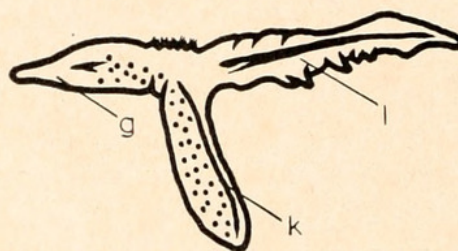
A



C



B



D



E

All sketches, except that of the crab, are of *Gigantione pratti* n. sp. Unless otherwise indicated, each sketch was drawn by means of a camera lucida. Where a bar (I) is shown, it represents 1 millimeter.

FIGURE 1A. *Phymodius unguulatus*, drawn from a photograph. The portion of the carapace which was removed is indicated by a dotted line.

FIGURE 1B. Dorsal aspect of the female bopyrid. The extent of the marsupium is indicated by a dotted line.

FIGURE 1C. First right pleopod of the female, with adjacent epimere. Drawn from a photomicrograph.

FIGURE 1D. First left pleopod of the female, with adjacent epimere.

FIGURE 1E. Pleopod #4 of the female.

**Cephalon.** Comprising 1 large lobe, deeply sunken into the thorax, with 2 ear-like processes. There is a barely discernible anterior border or velum on the head, having a notch just antero-medial to each of the processes. No eyes. No pigmentation. The tip of the oral cone can just be seen from the dorsal aspect of the parasite.

**Thorax.** Seven segments, with no pigment, and with only moderate axial flexion. Most of the distortion to the right is due to unequal growth of the two sides (Fig. 1B). All the pereopods are present. The oöstegites do not completely cover the marsupium, leaving a slight gap at the third and fourth thoracomeres. There is no hook on the first incubatory lamella (Fig. 2F), although a slight ridge is present. Obvious, finger-like coxal plates are on the right side, being larger from segments 1 through 3, and then decreasing through segment 7. The coxal plates of the left side range posteriad from blade-like to anvil-shaped.

**Abdomen.** Considerably foreshortened, being about one-fifth of the total body length, and hidden to a large extent ventrally by the swollen marsupium. Six segments evident, the sixth having 2 "Y-shaped" uropods (Fig. 2G). There are 5 pairs of pleopods, each pair being biramous, and having the exopods of numbers 2 through 5 relatively smooth and elongate, while the corresponding endopods are long, thin, and slightly tuberculated (Fig. 1E). The first pair of pleopods on either side (Figs. 1C, 1D) are much larger than the others, and tend to cover them. The exopodite is smooth and blade-like, whereas the endopodites are tuberculated or somewhat pinnately divided at the border. Each biramous pleopod is adjacent to a smooth-edged, elongated epimeral plate.

## MALE

**Dimensions:** Length 2.5 mm. Width 1.0 mm. at the fourth thoracomere.

**Location.** On the smaller side of the ventral abdomen of the female, with the male's head in the same direction as that of its mate. Although the male was not within the marsupium (Fig. 1B), it was covered by the bulbous oöstegites.

**Cephalon.** Blunt, with neither a border nor any processes. Eyes distinct, with a reddish cast. First antenna of 2 articles, second antenna of 4 articles, tipped with bristles. No pigment.

**Thorax.** Typical fusiform shape, widest at the fourth segment. Lateral plates not unusual in appearance. Seven distinct segments and 7 pairs of pereopods. No pigment.

**Abdomen.** Five separate, tapering segments, plus the telson. No pigmentation. The lateral plates gently rounded, except the fifth pair, which is hooked posteriad. Five pairs of pleopods, each with a short and a longer ramus (Fig. 2I). The rami are tube- or rod-like, and lie almost transversely to the abdominal axis. The short ramus of each is lateral, with the longer ramus nearly meeting its counterpart at the abdominal midline. The uropods are 2 in number, heart-shaped, with the pointed end anteriorly. There is a posterior indentation on each which is quite evident (Fig. 2J), rather than being merely a slight notching. The uropods are plainly visible from the dorsal aspect of the male (Fig. 2H), and are slightly roughened, but not hirsute.

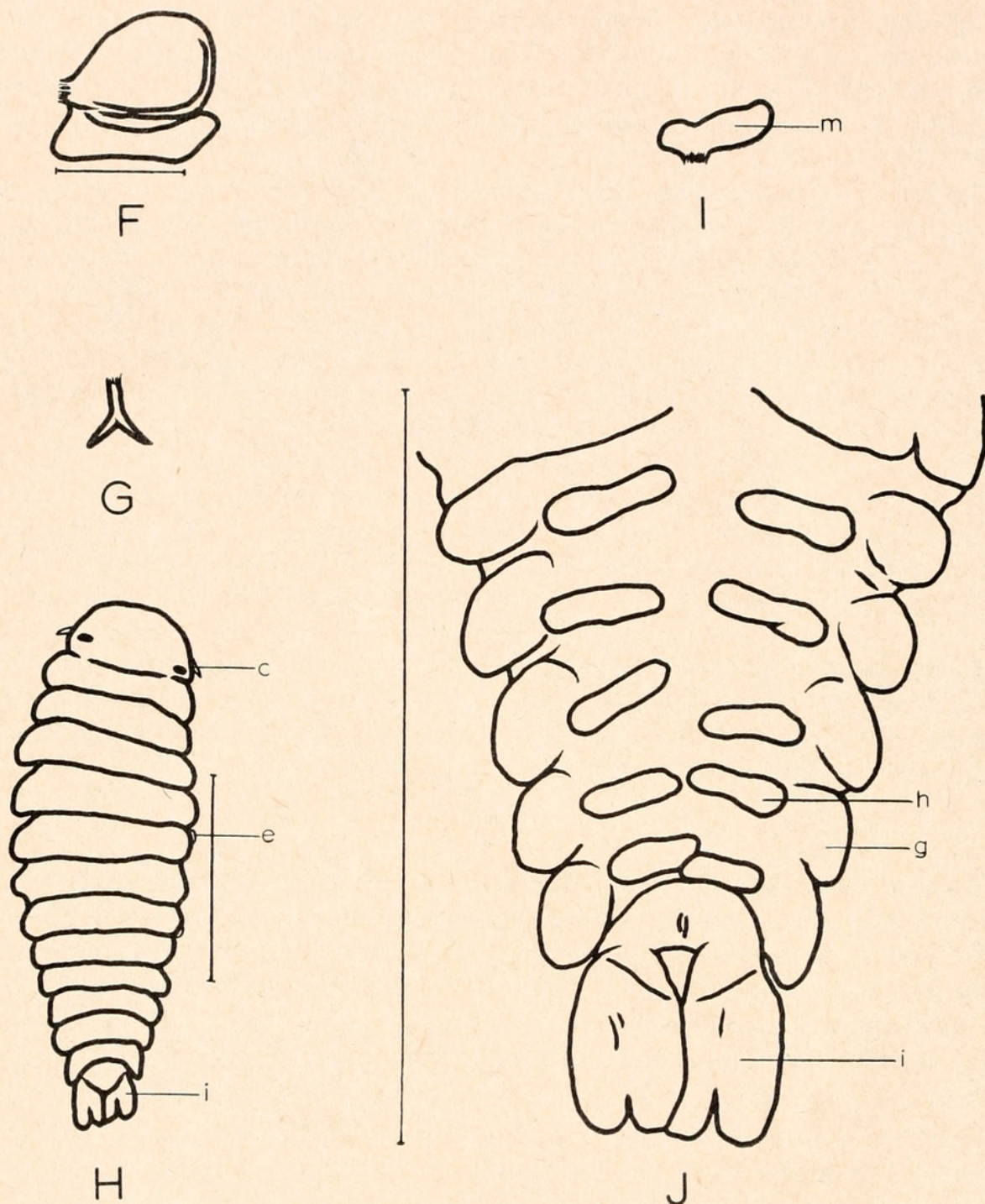


FIGURE 2F. Internal face of the first oostegite of the female.

FIGURE 2G. Right uropod of the female.

FIGURE 2H. Dorsal aspect of the male bopyrid. Drawn from a photomicrograph.

FIGURE 2I. Second right pleopod of the male.

FIGURE 2J. Ventral aspect of the abdomen of the male. Drawn from a photomicrograph.

a = oral cone, b = notch in marginal velum, c = antenna, d = cephalic process, e = pereopod, f = coxal plate, g = abdominal lamella, h = pleopod, i = uropod, j = position of male, k = exopodite, l = endopodite, m = medial ramus.

## REMARKS

As can be seen from the accompanying tables, *G. pratti* differs from all males in the genus by the form of the uropoda. The male pleopods are similar to those of *sagamiensis*, but there is pigmentation and a pair of uniramous, foliaceous uropods

TABLE I  
Major characteristics of *Gigantione* species

Name, size, locale, host	Head	Thorax and appendages	Abdomen and appendages	Uropoda
<i>bouvieri</i> ♀ = 3–4 mm. ♂ = 0.5? mm. Azores, in <i>Pilumnus</i> W. Indies, in <i>Hypoconcha</i>	“Ear-like” processes. ♂ No eyes.	Coxal plates narrow and folded. Plates on all 7 segments	1st 2 pleomeres fused in midline. Pleomeres 1–5 with straight prolongations. Pleopods almost triramous, 2–5 tuberculated. 1st pair largest. ♂ Pleopods 1–5 rod-like.	Shaped like a two-fingered glove. ♂ Pea-shaped.
<i>giardi</i> ♀ = 20 mm. ♂ = 7 mm. Tuamotu, in <i>Xantho</i>	Processes. Large, with fleshy border. ♂ Eyes.	2 “saillies” on anterior portions of each segment. Lateral plates on 1–7. 5 pairs large oöstegites, #1 with internal ridge.	Plates 1–5 like those of the pereon. #6 with 2 lamellae plus uropods. Pleopods like those of <i>moebii</i> . ♂ Pleopods = “laminaires.”	Fleshy base with 2 small cylindrical branches. ♂ 2 leaf-like plates.
<i>hawaiiensis</i> ♀ = 9.7 mm. ♂ = 3.4 mm. Hawaii, in <i>Xantho</i>	Bilobed at posterior. Processes. ♂ Eyes. Slight pigmentation.	Long, thick lamellae or coxal plates on one side, triangular on other side. ♂ Lateral pigmentation.	Long, thin lamellae on 1–5. Pleopods subtriramous; more pinnate than tuberculated. ♂ Pleopods uniramous rods. Slight pigmentation.	Narrow base with 2 elongate, finger-like branches. ♂ Kidney-shaped and pubescent.
<i>ishigakiensis</i> ♀ = 13 mm. ♂ = 3.2 mm. Japan, in <i>Carpilius</i>	Processes. Frontal lamina. ♂ Eyes. No pigment.	Elongate, tapering coxal plates. Closed marsupium. ♂ Widest at segment 6.	Lamellae on 1–5 like coxal plates. Pleopod 1 largest, lamellar; digitiform processes on both rami. 2–5 are heavily tuberculated. ♂ 5 pairs of rod-shaped, uniramous pleopods.	Shaped like a 2-fingered glove. ♂ Uniramous, foliaceous.
<i>moebii</i> ♀ = 15 mm. ♂ = 3? mm. Isle Maurice, in <i>Ruppelia</i>	No margin. Processes. ♂ Eyes. No pigment.	Marsupium covered. Coxal plates heavy, but not long.	Small pleon plates. Pleopod 1 triramous, relatively smooth. Pleopods 2–5 triramous, with heavy tuberculation. ♂ Pleopods 1–5 egg-shaped.	Swollen base with 2 thin branches. ♂ Uniramous and leaf-like.

TABLE I (continued)

Name, size, locale, host	Head	Thorax and appendages	Abdomen and appendages	Uropoda
<i>pratti</i> ♀ = 5.0 mm. ♂ = 2.5 mm. Eniwetok, in <i>Phymodius</i>	Processes. Notched anterior margin.  ♂ Eyes. No pigment.	Marsupium slightly open. Coxal plates thin, long on larger side; tri- angular on smaller side.	Pleomeres 1-5 with blade-like plates. Pleopod 1 largest, biramous. Endo- podites of other pleopods slightly tuberculated. ♂ 5 pairs of biramous, rod-like pleopods.	"Y-shaped," with a narrow base.  ♂ Cordate, but still uniramous.
<i>rathbunae</i> ♀ = 4 mm. ♂ = 1 mm. "Salomon Is- lands," in <i>Actaea</i>	No margin. No proc- esses. Eyes. ♂ Eyes. No pigment.	Coxal plates thin and finger-like. Segments 1-4 double on the left.	Plates large and finger-like on large side; triangular on small side. Pleopod 1 largest, with mar- ginal serrations. ♂ 5 pairs of bulbous pleopods.	Swollen base with 2 tapered rami.  ♂ Uniramous, foliaceous and hirsute.
<i>sagamiensis</i> ♀ = 3.7 mm. ♂ = 1.4 mm. Japan, in <i>Carpiliodes</i>	No margin. No proc- esses.  ♂ Eyes.	Coxal plates from slightly pointed to crescentic and blunt. Mar- supium almost closed.	Plates 1-5 tubercu- lated and folded back. 5 pairs of bi- ramous pleopods: endopod is filiform, tuberculated; exo- pod more blunt. Pleopod 1 is largest, nearly triramous. ♂ Pigmented. 5 pairs of rod-shaped, biram- ous pleopods.	Swollen base with 2 short, blunt rami. ♂ Uniramous, leaf-like.

on the latter. The *G. pratti* female has ear-like cephalic processes, as do all other species except *rathbunae* and *sagamiensis*; however in these, neither has a cephalic margin, and in the case of *rathbunae*, eyes are present. The female *bouvieri*, as illustrated by Nierstrasz and Brender à Brandis (1931), has structurally different coxal plates, and a partial fusion of pleomeres 1 and 2. The female *giardi* has a fleshy cephalic border, and lamellae on pleomere 6. The female *ishigakiensis* has a different frontal lamella, a closed marsupium, and digitiform processes on the exopodite of the first pleopod. The female *moebii* lacks a cephalic margin, has differently shaped coxal plates, shorter abdominal lamellae, and a triramous condition for pleopod 1. Aside from the foregoing differences, the female *pratti* seems to be unique in the possession of "Y-shaped" uropods. The uropoda of other females of the genus are biramous, but the branches range from short and separated to fairly long and distinct; in none do they diverge abruptly from a narrow base.

The male allotype, and female holotype have been deposited in the United States National Museum, catalog number 113940. The host crab is catalog number 113939.

Named for Dr. Ivan Pratt, parasitologist at Oregon State University, who first suggested to the writer that the epicarid isopods might be an interesting field of study.

*Gigantione hawaiiensis* n. sp.

For added data and sketches, refer to Danforth (1963).

Material: one pair.

Host: *Xantho crassimanus* Milne Edwards. Parasitized in the left branchial region.

Locality: tide pool at Diamond Head, Oahu, Hawaii.

Date: collected on 13 January 1962.

FEMALE

As described. The female is stated to have 6 pairs of abdominal lamellae, while the drawing shows but 5 pairs.

MALE

As described. The pleopods are referred to as tubercles.

REMARKS

A reconsideration of this previously described Hawaiian form seems to indicate that the genus is correctly *Gigantione*. The structure of the male, and some of the features of the female, make it obvious that it does not belong in one of the existing species. The "claw-shaped" appendages which were found free in the preservative undoubtedly are the uropoda of the female.

The accompanying tabulation indicates the differences between *G. hawaiiensis* and other species of the genus. The partially bilobed head of the female is unique, and the pinnate structure of the pleopod rami is in contrast to the more commonly found tuberculations of other forms. The male has pigmentation, as opposed to others except *sagamiensis*, and the disc-like uropoda are distinctly at variance with the foliaceous, pea-shaped, or cordate shapes illustrated by other males.

The specimens have been deposited in the United States National Museum, catalog numbers: 110192 (larvae), 110191 (female holotype), and 110190 (male allotype).

DISCUSSION

As stated by Bonnier (1900, p. 276) for *Gigantione*: "Deux caractères suffisent à caractériser ce genre: la femelle adulte possède des lames pleurales sur tous les somites, tant ceux du thorax que ceux de l'abdomen, et ses uropodes sont biramés." The species described so far are:

*G. bouvieri* Bonnier

*G. giardi* Nobili

*G. hawaiiensis* n. sp

*G. ishigakiensis* Shiino (1941)

*G. moebii* Kossmann

*G. pratti* n. sp.

*G. rathbunae* Stebbing

*G. sagamiensis* Shiino (1958)

The major characteristics of these species are shown on the accompanying tabulation (all female forms have 7 thoracomeres, 6 pleomeres, a single-lobed head, and biramous uropoda). Reference was made to *Paragigantione papillosa* Barnard, since it is only a matter of degree between: "Eine Anzahl Coxalplatten am Pereion sehr entwickelt (odor sehr abweichend gestaltet)," and, "Alle Coxalplatten am Pereion nur mässig entwickelt bis fehlend," as used in the key by Nierstrasz and Brender à Brandis (1932, pp. 90, 91). However, the two genera are quite dissimilar in many respects, so *Paragigantione* is not included in the table.

In reviewing almost any of the information on epicarids, one finds many instances of contradiction or confusion. Some points are purely typographical errors, others misinterpretation, etc. A disconcerting item for *G. giardi* is Nobili's (1906, p. 270) statement: "Lames pleurales des segments de l'abdomen conformées comme celles du thorax; sixième segment pourvu aussi de deux lamelles, et de petits uropodes charnus." If correct, this is entirely different from all other species in the genus, and might lead one to place the form into the genus *Orbione*. Unfortunately, there is no illustration against which the description could be checked (such as is the case in Bonnier's description of *G. moebii* in which he mentions the presence of 6 pairs of pleopods, while his drawing shows 5 pairs). Further ambiguity is encountered in a key by Dakin (1931), wherein *Crassione* is separated from *Gigantione* on the basis of the uropods of the former being biramous, whereas those of the latter are given as uniramous! Since *Gigantione* has biramous uropoda, it is indeed fortunate that sketches of *Crassione* indicate that the specimen is in fact not *Gigantione*. It is points such as these, coupled with accidental mislabeling or identification, that indicate the great need for an evaluation of the available literature on epicarids.

#### SUMMARY

1. Eight species of *Gigantione* have now been described. One was from the north Atlantic, one from the Indian Ocean, two from the south Pacific, and four from the north Pacific. Of these last, *G. pratti* and *G. hawaiiensis* are new species. The hosts of the different species have all been in separate genera, with the exception of those for *G. giardi* and *G. hawaiiensis*, both of which were in *Xantho*.

2. Dr. Shiino is carrying out an intensive investigation of epicarids in the Japanese archipelago, and the writer is in the process of preparing a monograph covering the Epicaridea of the northern Pacific (except for those areas and forms near Japan). Therefore, it should be expected that many new species and possibly genera will be found in the Pacific as collecting continues.

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