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A New Shrimp *Phyllognathia simplex* sp. nov. (Crustacea,  
Decapoda, Gnathophyllidae) from Sagami Bay, Japan

With 3 Text-figures

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**ABSTRACT** A new gnathophyllid shrimp, *Phyllognathia simplex* sp. nov., the second species of this genus, is described here on the material from Sagami Bay. Remarkable for this species is having the simple dactyli of the ambulatory pereopods, instead of biunguiculated ones as seen in the other species, *P. ceratophthalma* (Balss, 1913).

The genus *Phyllognathia* Borradaile, 1915, of the family Gnathophyllidae contains a single species, *P. ceratophthalma* (Balss, 1913), which has so far been recorded only from southern Japan and the Maldive Archipelago. In a comprehensive series of the recent crustacean collections, made by His Majesty the Emperor of Japan in Sagami Bay, central Japan, was the second species of this genus, *P. simplex* sp. nov. that is described hereupon. This species is remarkable for the ambulatory pereopods with the dactyli simple, while *P. ceratophthalma* has the dactyli distinctly biunguiculated. Therefore, the generic diagnosis, with reference to the form of the dactyli of the ambulatory pereopods, is to be extended for the inclusion of this new shrimp.

*Phyllognathia simplex* sp. nov.

*Description of holotype* (ovigerous female). A small-sized shrimp, with large and extremely flattened chelae of second pereopods.

The rostrum is directed almost straight and very deep in the middle, the apex slightly outreaching the end of the antennular peduncle. The straight upper border is armed with nine subequal teeth, the intervals between these teeth feebly decreasing anteriorly. The first proximal tooth is just over the orbit, and the distal separated from the apex by a short interval. The ventral border is strongly convex in the middle, with five small teeth in the anterior third; the first proximal tooth is large and the distal minute. The interspaces between the upper teeth as well as the anterior

*Remarks.* This new species belongs to a group of the genus *Heterocypris* that has "sa valve droite tuberculée" and "son palpe maxillaire dont le dernier article est deux fois plus long que large et non dilaté à son extrémité" (Gauthier, 1938, p. 58). As Gauthier has pointed out, the species of this group, which comprise *H. incongruens*, are difficult to discriminate from one another. Yet the new species distinctly differs from most of the allied species in the shape of the carapace; namely, the height is rather low, the anterior margin is narrow, and the posterior extremity of each valve is unusually high. Besides the shape and the size of the carapace, this new species is distinguishable from the coexisting *H. incongruens* by the absence of pits on the surface of valves. It resembles closely *H. rotundatus* (Bronstein, 1928) from USSR (see Bronstein, 1947, p. 140) in its outline, but differs from that in the following features: *H. rotundatus* has 1) noticeably rounded posterior margins, and 2) one almost smooth and one toothed maxillary spine. The outline of the present new species resembles also that of *H. levis* Hartmann, 1964, from Iran, in which "die linke Schale ist deutlich kürzer als die rechte," and "Randhöcher, —, fanden sich nur an wenigen Exemplaren — und dann schwach — entwickelt" (p. 36).

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half of the ventral border are fringed with setae. An obscure lateral carina runs parallel to the ventral border, being closer to the ventral border than to the dorsal one. The postrostral carina extends backwards approximately to the posterior margin of the carapace.

The carapace is considerably depressed and smooth. A well-defined antennal spine is placed behind the anterior margin of the carapace. The lateral portion of the carapace is considerably flexed inwards, with a narrowly produced antero-inferior corner below the basicerite of the antennal peduncle.

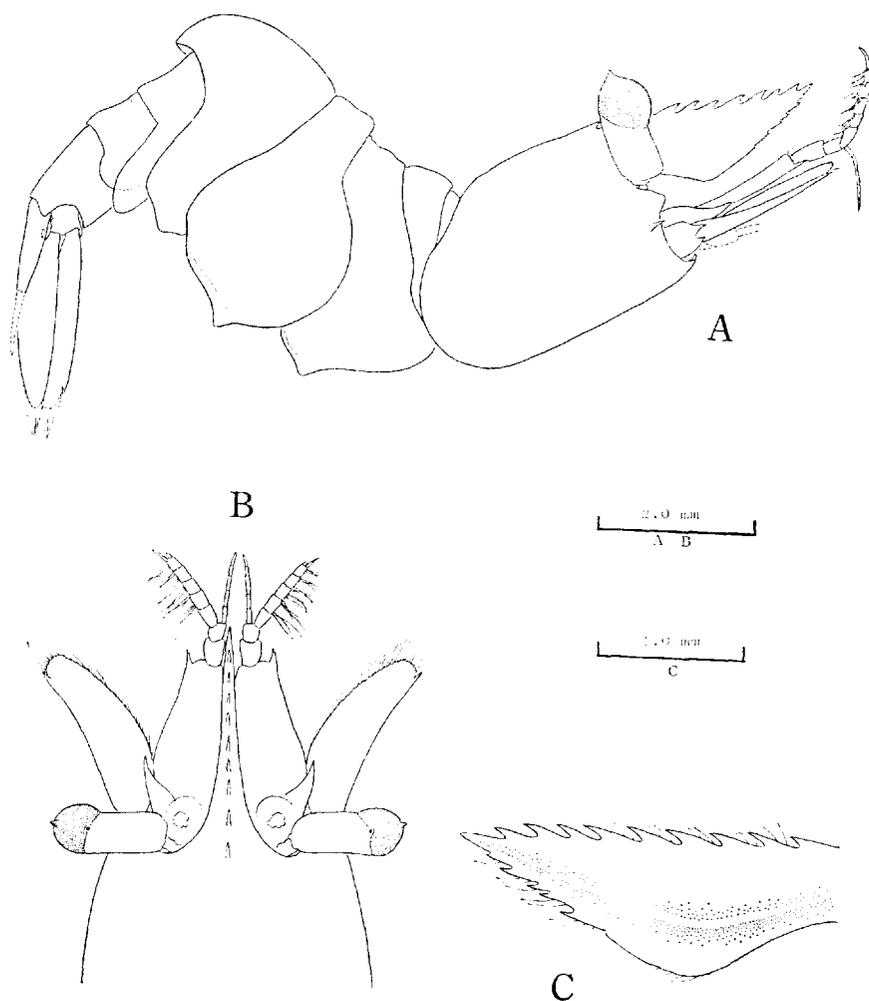


Fig. 1. *Phyllognathia simplex* sp. nov., holotype, ovigerous female.—A, entire animal in lateral view; B, anterior part of body in dorsal view; C, rostrum.

The abdomen is smooth, with sporadically set, long, fine hairs. The pleura of the first three somites are broadly rounded, with the ventral margin obtusely pointed. The third somite is produced backwards roundly at the posterodorsal portion, somewhat overhanging the fourth somite. The pleuron of the fourth somite narrowly extends posteriorly, exceeding the posterior end of the fifth somite. The sixth somite is comparatively short and stout, measuring about one and a half the length of the fifth somite.

The telson is damaged off distally. On the dorsal surface lies a pair of small spines near the lateral margins proximally.

The cornea is somewhat depressed and obliquely situated on the peduncle, with a distinct papillary process at the top. A small ocellus is spotted above on the border between the cornea and the peduncle. The peduncle is cylindrical and more slender and longer than the cornea.

The basal segment of the antennular peduncle is broad, diminishing distally; the outer lateral margin is convex near the base and becomes gently concave towards the well-defined terminal spine reaching the level of the middle of the second segment. The stylocerite is broad, with an acutely pointed tip which falls short of the middle of the basal segment. Two distal segments are short, the second being broader and longer than the third. The upper flagellum is fused basally for five segments, with free rami very short. The lower flagellum is composed of five slender joints and is slightly shorter than the upper.

The basicerite of the antennal peduncle bears a small lateral spine. The carpocerite is rather short and cylindrical. The antennal scale is to some extent elongate and is about three times as long as the maximum breadth. The feebly concave lateral margin terminates in a distinct tooth which almost extends to the broad anterior margin of the lamella.

The mandible lacks the incisor process. The molar process is bent at a right angle basally and tapers distally to two acutely pointed teeth with thick setae near the base. The maxillula has a palp curved and feebly concave distally, with a small terminal spine. The upper lacinia is curved and provided with six spines and setae on the distal margin. The lower lacinia is slender and narrows distally, slightly longer than the upper. The palp of the maxilla is very broad and setose, with the tip bluntly pointed. The endite is reduced into a small round protrusion, with two setae distally. The scaphognathite is more or less clongate. The first maxilliped has a large, non-setose palp. The separation between the basal and the coxal endites is not distinct. The exopod bears a narrow caridean lobe whose anterior margin is blunt. A large, broad and feebly bilobed epipod is present. The distal segment of the endopod of the second maxilliped is fringed with nine stout, serrated spines as well as long coarse setae. The lateral margins of the penultimate segment are considerably convex. The antepenultimate segment is short, and its distinction from the penultimate segment is obscure. The well-developed exopod and a broad and round epipod are present. The third maxilliped is broadly expanded and thin,

reaching beyond the middle of the basal antennular segment. The ultimate segment is ovoid and naked, measuring one and a half as long as its maximum breadth. The penultimate segment is much longer and broader than the ultimate; the maximum breadth lies proximally and is about two-thirds the maximum length; it is strongly

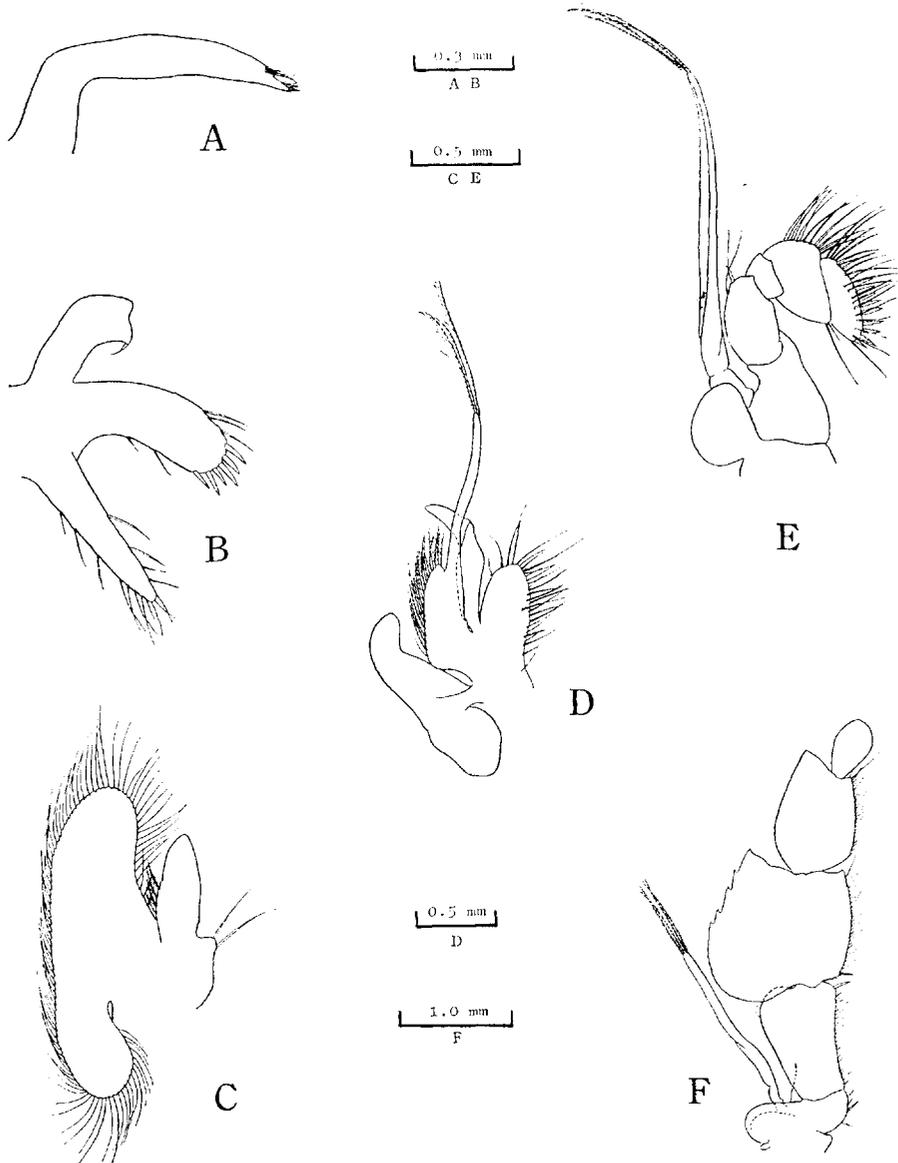


Fig. 2. *Phyllognathia simplex* sp. nov., paratype, ovigerous female.—A, mandible; B, maxillula; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped.

projected into a blunt angle at the outer distal corner. The excessively broadened antepenultimate segment is broader than long; the inner margin is slightly convex, with a small spinous process distally; the outer margin is broadly rounded proximally and finely serrated in the anterior half, with a triangular process at the outer distal corner. The basal segment, broader distally than proximally, is subequal in the maximum breadth to the penultimate segment, and is one and a half as long as broad; the inner margin is slightly concave, with two spines distally; the distal margin is bluntly angled without any spine. A round and rigid epipod is present. A minute vestigial arthrobranch is definable. The moderately developed exopod extends as far as the middle of the antepenultimate segment. All the segments except for the ultimate one are beset with short setae on the inner borders.

The first pereopods are slender, just reaching the end of the antennal scale. The fingers are narrow and as long as the palmar portion, the cutting edges being entire without teeth or crenulation. The tips of the fingers are curved and pointed, with some tufts of setae. The carpus is slender and cylindrical, measuring a little less than one and a half the length of the chela. The merus is somewhat shorter and stouter than the carpus, and is twice the length of the ischium.

The second left pereopod is lacking. The chela of the right pereopod is extremely flattened and broad, forming an elongated elliptical plate. The movable finger is distinctly narrower than the immovable, and is as long as the palm; the outer margin is smooth and gently curved to a blunt terminal point. The cutting edges of both the fingers are almost straight and entire. The immovable finger has a small obscure tooth at the proximal quarter on the cutting edge, which fits in a small excavation on the movable finger. The palm is broad and slightly less than twice as long as the maximum breadth which lies distally. The outer border of the palm is smooth, with a strong spine terminally. The inner border of the propodus is gently curved, acutely carinated and armed with four small teeth on the immovable finger; the distal one is placed at the anterior quarter of the immovable finger, the second distal behind the middle, and the proximal two close to each other and lie near the base. The carpus is short and depressed; it is flat dorsally and armed with a strong spine on either side of the distolateral corner. The merus is subequal to the fingers in length. The dorsal border is more or less convex, with a strong distal spine. The distoventral corner is also pointed into a much stronger spine. A minute spine stands at the inner distal corner. The ischium is much shorter than the merus.

The ambulatory pereopods closely resemble one another. The dactylus of the third pereopod is simple, slender, gently curved and acutely pointed. The propodus measures two and a half the length of the dactylus, and is armed posteriorly with six spinules. The carpus is less than half the length of the propodus. The merus is shorter than the propodus. The ischium is longer than the carpus.

The thoracic sternite is entire except for a pair of triangular projections placed in the median line between the second and the third pereopods, which are followed

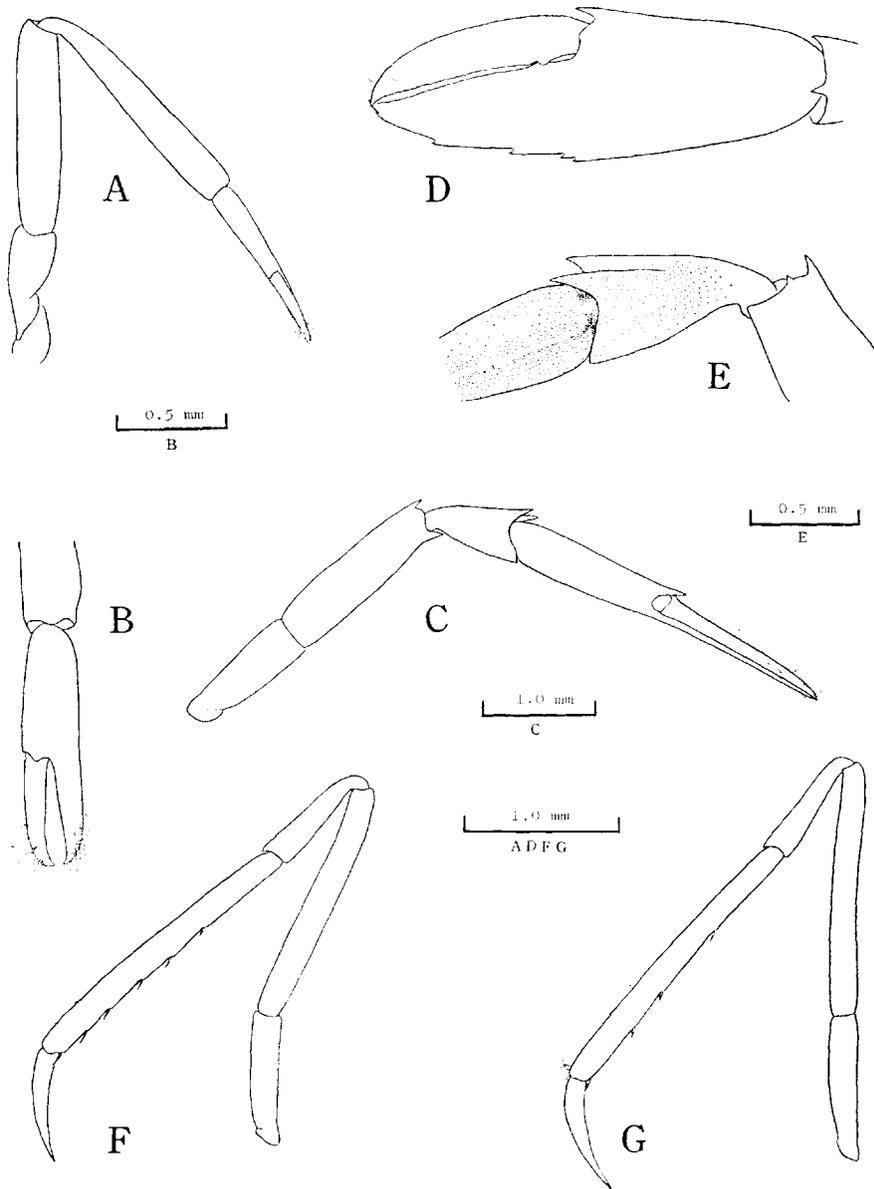


Fig. 3. *Phyllognathia simplex* sp. nov., holotype, ovigerous female.—A, first pereopod in outer view; B, chela of first pereopod; C, second pereopod in outer view; D, chela of second pereopod; E, carpus and distal portion of merus in inner view; F, third pereopod; G, fourth pereopod.

by a tubercular process at the base of the third pereopods.

The pleopods are well developed. The endopod of the first pleopod is narrow, short and bar-shaped, falling short of the middle of the exopod. In the second pleopod the endopod and the exopod are almost of the same size and similar shape. A developed appendix interna is present.

The endopod of the uropods is slightly longer than the exopod. The outer margin of the exopod is nearly straight, with two spines terminally, the inner one of which is small.

The eyed ova, after preservation, measure  $0.5 \times 0.4$  mm.

*Description of paratype.* An ovigerous female is considerably mutilated. The rostrum and the telson are damaged off distally. Both the second pereopods are also missing. The body characters are almost all closely similar to those of the holotype.

*Types.* Holotype: ovig. ♀, BLIH No. 1928, near Shuragane, Sagami Bay, central Japan, 40–50 m deep, Jan. 25, 1962; paratype: 1 ovig. ♀, BLIH No. 1973, near Shuragane, Sagami Bay, 20–30 m deep, Jan. 25, 1963.

*Measurements* (mm).

	Holotype (ovig. ♀)	Paratype (ovig. ♀)
Rostrum length	2.8	— (broken)
Carapace length	2.0	2.4
Length of antennal scale	2.3	2.3
Length of chela of second pereopod	3.0	— (missing)
Length of third maxilliped	3.4	3.3

*Coloration.* No data are available.

*Relationship.* The present species bears general resemblance to the other forms of this genus, *Phyllognathia ceratophthalma* (Balss, 1913). The characteristics that distinguish *P. simplex* sp. nov. from it are easily detected as mentioned followingly with reference to the shape of the rostrum, the structure of the dactyli of the ambulatory pereopods, the configuration of the antennular peduncle, stylocerite, and antennal scale, and the proportional length of each segment of the endopod of the third maxilliped. The rostrum of *P. ceratophthalma*, whose illustration was given by Balss (1914), though damaged distally, is relatively shallow, and the first proximal tooth is located fairly at the back of the orbit. In the present species, the rostrum, as described above, is very deep and the dorsal teeth are more closely spaced in an arrangement. The sharply pointed simple dactyli of the ambulatory pereopods offer the present species a definite discrimination from *P. ceratophthalma*, in which the dactyli are clearly biunguiculated. Both the antennular peduncle and the antennal scale are much broader in *P. simplex* than in *P. ceratophthalma*. The stylocerite of *P. simplex* is short and broad, failing to reach the level of the middle of the basal segment of the antennular peduncle, whereas it is slender and extends beyond the

middle of that segment in *P. ceratophthalma*. The endopod of the third maxilliped is much more elongate in *P. ceratophthalma* than in the present species, especially noticeable in the antepenultimate segment. In addition to the differences noted above, the entire outer margin of the movable finger of the second pereopods and the less protruded papillary process on the cornea are also of specific importance for the distinction of the present species from *P. ceratophthalma*.

Balss (1913, 1914) reported the presence of the well-developed branchiostegal spine in *P. ceratophthalma*. In the present species, however, the anterolateral angle of the carapace is only narrowly extended and strongly inflected ventrally without such a spine. In lateral view this portion looks like just a spinous process, so that it is probable that Balss has mistaken this portion for a strong spine in his specimen, in view of the fact that the representatives of all the genera of the family Gnathophyllidae are provided with or without an antennal spine alone.

*Discussion.* The family Gnathophyllidae consists of four genera, *Gnathophylloides* Schmitt, *Hymenocera* Latreille, *Gnathophyllum* Latreille, and *Phyllognathia* Borradaile. Of these, the latter two were known from southern Japan, represented by *Gnathophyllum americanum* Guérin, 1856, and *Phyllognathia ceratophthalma* (Balss, 1913), respectively. The former species has the wide-spread distribution in the tropical and subtropical regions of the Atlantic and in the Indo-West Pacific regions from the Red Sea to Japan including Australia and Oceania. The latter species was originally made known from Kagoshima, Japan, and subsequently recorded from South Nilandu Atoll, the Maldive Archipelago (Borradaile, 1917). It is probable that the present species is assigned to *Phyllognathia* by having the normal thread-like antennular flagellum, the broad and flat chelae of the second pereopods, the carpus and the merus of the same pereopods having strong spines, and the broadened segments of the endopod of the third maxilliped, the two distal of which, as in Holthuis' (1955) definition, are not broader than the antepenultimate segment.

The simple dactyli of the ambulatory pereopods in the present species are distinctly opposed to the apparently biunguiculated ones in *P. ceratophthalma*. Such a character was used as one of the key points for the separation of *Gnathophyllum* from *Gnathophylloides* by Holthuis (1955). In the systematically close families to Gnathophyllidae, namely, Palaemonidae and Alpheidae, whether the dactyli are simple or divided is regarded as being effective for the distinction in some genera and subgenera. However, it seems reasonable not to make a separation of the present species from *Phyllognathia* because only one species is known at present in this genus.

*Phyllognathia* in general form is more closely related to the monotypic genus *Hymenocera*, represented by *H. picta* Dana, 1852, that is distributed throughout the Indo-West Pacific region, than to the other genera, especially in the shape of the mouthparts and in the flattened and expanded chelae of the second pereopods which are armed in both the carpus and the merus. Edmondson (1923) described

and illustrated the rudimentary mandibular palp in the species of *Hymenocera*. He noted that, "the mandibular palp is rudimentary, so much so that without close scrutiny it may be overlooked. No information is at hand regarding the mandibular palp in the type specimens." Similar type of the rudimentary mandibular palp is found in the genus *Palaemonella* Dana of the subfamily Pontoniinae of the family Palaemonidae. This genus is regarded as being the least specialized morphologically in Pontoniinae (Holthuis, 1952; Bruce, 1970), and the mandible of this genus is closely related to that of the forms in the subfamily Palaemoninae. On such accounts it may also be considered that *Hymenocera* maintains a less specialized character with reference to the mandible than *Phyllognathia*. Both the upper and the lower laciniae of the maxillula in *Phyllognathia*, like those of *Hymenocera*, are narrow. Especially, the lower lobe, as observed in *P. simplex*, is narrow and elongate, tapering distally. The palp of the maxillula of *Phyllognathia* is slightly incised, but it is apparently bilobed in *Hymenocera*. In both *Phyllognathia* and *Hymenocera* the endite of the maxilla is rudimentary and remains only as a small lobe. The second maxillipeds in both the genera are very similar, and the two distal segments are distinct and movable in articulation, unlike the genus *Gnathophyllum* in which both the segments are completely fused into a scythe-like organ. *Phyllognathia* also shares the segmentation of the endopod of the third maxilliped with *Hymenocera*. In both the genera the merus is not fused with the ischium, but the shape of each segment is considerably different; in *Phyllognathia* three distal segments become broader in order from the ultimate segment to the antepenultimate, while in *Hymenocera* the penultimate segment is the broadest and the antepenultimate the smallest, all the segments being rounded at each angle. On the other hand, in *Gnathophyllum* and *Gnathophylloides* the articulation between the merus and the ischium disappears and remains only as a small notch. The arthrobranch is distinct in *Hymenocera* but to a great extent rudimentary and remains only as a tiny tubercular process in *Phyllognathia*. The chela of the first pereopod of *Hymenocera* is extremely slender with a very small fingers, though that of *Phyllognathia* being rather typical in form. Characteristic of *Hymenocera* is the palmar portion of the second pereopods, which is broadly expanded roundly inside. In *Phyllognathia*, however, the chela is broadened but not so extremely as in *Hymenocera*. In addition, the upper antennular flagellum of *Hymenocera* makes a foliaceous expansion and is very diagnostic of this genus. On the contrary, in *Phyllognathia* it is of a normal thread-like form.

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