

## On a new Epicaridan Isopod

(*Athelges takanoshimensis* sp. nov.) from *Eupagurus samuelis* Stimp.

By

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*With Plate VII.*

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During last summer, while staying at Takanoshima, an islet near the entrance to the gulf of Tokyo, my attention was called to an Epicaridan Isopod belonging to the genus *Athelges* and found parasitic on hermit-crabs which were kindly determined for me by Mr. Terao to be *Eupagurus samuelis* Stimps. On study, the *Athelges* turned out to represent a species which seems to be new to science. I propose to call it *A. takanoshimensis*.

As in other Epicarids, the species shows marked sexual dimorphism. The male is, as compared with the female, of a very diminutive size besides being of a very different appearance, and is usually found clinging to the metasome of the female in the manner of a parasite.

### 1. Adult female.

The female is found attached, by means of its prehensile legs, to the anterior part of the dorsal surface of the metasome of the host. It stands in contact with the host surface by the entire extent of its dorsal mesosome surface. Consequently, all the prehensile legs are more or less twisted and dorsally directed. The marked concaveness of the dorsal surface is due to the above mode of attachment. All the females were invariably found with the head directed backwards in relation to the host body.

Measurements taken from 3 female specimens are as follows :

Spec.	Body without tail.		Length of tail.
	Legth.	Width in the widest part of mesosome.	
A	5 mm.	3,5 mm.	3,5 mm.
B	7 "		5 "
C	6 "	3,5 "	4 "

*Cephalon.* The cephalon is small and of a roundish shape. In specimen C, it is 0,8 mm. long and about as wide. It is deeply sunk into the mesosome, and can be seen only from the dorsal side after detachment from the host. Eyes are present in a pair in the anterior part of the cephalon. They are feebly developed and usually not clearly visible from the outside, being more or less concealed under adjacent legs. There are two pairs of rudimentary antennæ. Measurements of them taken from specimen C are as follows :

First or inner antennæ (3-jointed) :

Basal joint, 0,140 mm. long, 0,140 mm. thick.

Middle ,, 0,048 mm. ,, 0,040 mm. ,,

Distal ,, 0,020 mm. ,, 0,028 mm. ,,

Second or outer antennæ (7-jointed)<sup>1)</sup> :

Basal joint .....

2nd joint, 0,160 mm. long, 0,080 mm. thick.

3rd ,, 0,084 mm. ,, 0,060 mm. ,,

4th ,, 0,072 mm. ,, 0,042 mm. ,,

5th ,, 0,032 mm. ,, 0,024 mm. ,,

6th ,, 0,032 mm. ,, 0,016 mm. ,,

7th ,, 0,010 mm. ,, 0,008 mm. ,,

1) In one case, one of the second antennæ was observed to be 5-jointed.

Each joint is provided with a greater or less number of short stiff hairs, which decrease in length from distal towards proximal joints. The surface of proximal joints is beset with numerous minute spinous processes.

The mouth is guarded by a pair of mandibles, which are provided in the distal parts with minute curved hooks. These hooks are found on both inner and outer sides of the mouth opening (Pl. VII, Fig. 3).

The maxillipeds are lamellar. Each is composed of two segments, of which the anterior is larger than the posterior. The anterior segment is anteriorly usually rounded, but sometimes narrowed and obtusely pointed; without hairs; posterior outer margin concave, with two powerful muscles attached close to it; two short beak-like projections may be seen at the outer border. Anterior end of the posterior segment is elongate and acutely pointed, overwrapping the anterior segment at base. No epignath was observed.

*Mesosome.* Mesosome segments are best defined along the median line of the dorsal surface. The first segment is very narrow and band-like, flanking the cephalon on sides. Length of each mesosome segment in specimen C, as follows.

1st or foremost segment, 0,1 mm.

2nd segment, 0,3 mm.

3rd „ 0,5 mm.

4th „ 0,6 mm.

5th „ 0,8 mm.

6th „ 0,8 mm.

7th or hindmost segment, 0,8 mm.

Sars seems to consider the assymetry of body in adultfe male *Athelges* to constitute one of the characteristic features of the genus. At a place he remarks: "The peculiar contortion of the body in fully grown female specimens has not yet been sufficiently recognized, for the species have generally been described as perfectly symmetrical or nearly so, an appearance which is only exhibited by immature

specimens." <sup>1)</sup> In the specimens before me, the greater parts of the mesosome does not exhibit contortion to any marked degree, though in the hindmost parts a slight twisting, corresponding to that of the metasome, may often be noticed.

*Thoracic legs.* There are seven pairs of thoracic legs, arranged along sides of the body on the dorsal aspect. They are all prehensile in function and similar in structure. Legs of the first pair are the smallest, those of the second not so large as any other of the more posterior pairs. Each leg is composed of apparently five joints, <sup>2)</sup> not including the coxal piece; of the joints the two proximal ones are the longest, the third and fourth of a medium size, and the fifth the smallest. The fourth is of a somewhat ovoid outline; a set of two powerful muscles is seen arising from one end and converging towards the base of the fifth joint, which is of a beak-like appearance and together with the fourth forms a chelate arrangement. The cuticula of the fourth joint is, in the parts which come in contact with the beak-like fifth joint in the depressed state, is considerably thickened, and moreover presents a more or less roughened surface. The distal end of the third joint is provided with a number of minute obtusely pointed cuticular processes (Pl. VII Fig. 5, *c.p.*). The third and fourth joints seem to be firmly jointed together. No conspicuous muscle seems to occur in the third joint. Measurements of the right leg of the sixth pair from specimen C, as follows:

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1) G. O. Sars,—“An account of the crustacea of Norway,” vol. 2, Isopoda, p. 210, 1899.

2) According to the figures given by G. O. Sars (*loc. cit.*), it seems that the legs in *Athelges paguri* (Rathke) are six-jointed. Sars also represents six-jointed legs for other Epicaridan parasites. The third and fourth joints as represented in the figures of Sars together seem to correspond to the single third joint of my specimens. There exists a constriction near the middle of this joint; it is less marked in the male than in the female (Pl. VII Fig. 5). It probably indicates the origin of the joint by fusion of two originally separate segments. The third joint is possibly a combination of carpus and meros, while the first joint corresponds to the basos of an ordinary Isopod leg.

	Length.	Width.
1st or proximal joint,	0,455 mm.	0,327 mm.
2nd joint,	0,419 mm.	0,218 mm.
3rd „	0,255 mm.	0,164 mm.
4th „	0,291 mm.	0,164 mm.

Exposed length of the beak-like fifth joint, 0,091 mm.

*Marsupial plates.* Of marsupial plates there are five pairs. Those of the first or foremost pair are of a somewhat complicated structure and differ considerably in shape from all the other, each plate of that pair being made up of two parts, the anterior and the posterior, divided from each other by a distinct constriction (Pl. VII Fig. 6). The anterior part is much the larger, it is folded so as to present a small dorsal and a large ventral lobe. It is by the posterior inner margin of the former that the plate is attached to the body. The posterior part of the plate is relatively small and narrow, its posterior inner margin is provided with a series of a few (five or six) short hair-like processes. The folded edge of the anterior part is exposed to the outside, projecting far beyond the anterior end of the animal, while all the remaining parts are hidden under the following pairs of marsupial plates. Plates of the second pair are simple, each presenting a more or less cup-like form; the anterior margin is concave, while both the inner and posterior margins are slightly convex. The posterior margin as well as a part of the inner and outer margin are provided with a series of short hair-like processes. The plate is attached to the body by a part of its outer border, and is completely covered over by the next pair, so that it is not at all visible on the outside. The third, fourth and fifth pairs are generally similar to the second in shape. However, in all these pairs the anterior margin of the plates is not concave as in the second; on the contrary, it is slightly convex. The hair-like processes on the posterior margin of the fifth pair are considerably longer than those of other pairs. The marsupial plates gradually increase in size with every pair posteriorly,

the foremost being the smallest and the hindmost the largest. The convexity of the plates also increases gradually in the more posteriorly situated ones, the fifth pair being in part so vaulted as to present an almost pouch-like appearance.

*Metasome.* The body is abruptly narrowed at the somewhat cylindrical metasome, which thus stands in conspicuous contrast with the massive mesosome. At base rather thick, it gradually tapers distally, finally to terminate with a clavate end-piece. The metasome is usually slightly bent towards the left side of body. It is fairly distinctly segmented, showing six segments inclusive of the clavate end-piece.<sup>1)</sup> Appendages of the metasome or the pleopods are present in only four pairs, the two hindmost segments being devoid of any appendage. The pleopod is attached to the posterior part of the segment it belongs to, and is composed of two ovate or subcircular plates, each with a short stalk and both connected by a short common stalk to the metasome. The size of pleopod is usually larger in anterior than in posterior pairs. All the pleopods seem to be of respiratory nature. Measurements of the metasome taken from specimen A are as follows:

Length of entire metasome, 3,5 mm.

Thickness at base, 0,8 mm.

Length of the two distal segments without appendages taken together, 1,31 mm.

Pleopod of the 1st pair,		
	Length including stalk.	Width.
One of the plates	1,037 mm.	0,651 mm.
The other plate	0,946 mm.	0,688 mm.

1) Sars states of the genus *Athelges* in general that the metasome consists apparently of only 5 segments, and that the last 2 segments are united to a narrow, more or less claviform piece, although he figures 6-segmented metasome for *Athelges tenuicaudis* G. O. Sars (*loc. cit.*, pp. 209, 210, and Pl. 89).

Pleopod of the fourth pair,		
	Length including stalk.	Width.
One of the plates	0,801 mm.	0,400 mm.
The other plate	0,783 mm.	0,491 mm.

No uropod exists. Sometimes, but not always, two or four knob-like tubercles are observed near tip of the distalmost segment, which tubercles were considered by Sars to be the rudiments of uropods.<sup>1)</sup>

## 2. Adult male.

The adult male has thick body of an oblong outline, usually somewhat convex dorsally and concave ventrally. It is of a whitish colour. Measurements of a male taken from the female specimen B, as follows:

Length of cephalon,	0,255 mm.
Length of mesosome,	1,474 mm.
Length of metasome,	0,692 mm.
Greatest width of body,	0,855 mm.

The cephalon is somewhat halfmoon-shaped. There exists on the dorsal surface a pair of distinct but irregularly outlined eyes, widely apart from each other and situated near the posterior margin of cephalon. In one specimen I have observed a pair of small and shallow depressions situated near the middle of the dorsal surface of cephalon; each of them presented a somewhat reniform shape measuring  $72\mu$  in length and lying obliquely so as to be nearly parallel with the side of cephalon.

The antennæ are short and usually hidden under the cephalon, except the tips of the second pair. The very short first antennæ are composed of three joints. The second are slightly longer, and consist

1) *loc. cit.* p. 209.

usually of seven joints, of which the distal three are very minute and bead-like. In the male taken from the female specimen B, I have observed that the right second antenna was made up of eight joints of which four were bead-like, while the left side one exhibited only seven joints as usual, a fact which stands in accord with what Thielemann<sup>1)</sup> has stated for Isopods generally to the effect that even in one and the same individual the antennæ of both sides are mostly somewhat, often strongly, assymmetrically developed. Lengths of right side antennæ of the male just referred to are: first antenna 0,118 mm. and second antenna 0,272 mm. (both exclusive of hairs). The basal joint of second antennæ is without hairs, the second shows one or two short hairs near its antero-distal end; other joints of that antenna, as also all the joints of the first, are provided with a variable number of short hairs at their disal end.

The mouth parts project under the base of antennæ as a prominent conical process, at the tip of which the styliform ends of mandibles may be seen. The free end of the mandible seems to become cornified, and is of a brownish colour. It is pointed and very slender, having a thickness of only  $3\mu$  near tip.

The mesosome is distinctly segmented, the segments being separated from one another by deep incisions in the lateral parts. There are seven segments in all. These are of much the same appearance, except in the fact that those nearer to both the cephalon and the metasome are somewhat smaller than those in the middle. Measurements of mesosome segments in the male taken from the female specimen B are as follows:

	Length.	Width.
1st or the foremost segment of mesosome,	0,164 mm.	0,692 mm.
2nd segment of mesosome,	0,182 mm.	0,783 mm.
3rd       "       "       "	0,237 mm.	0,837 mm.
4th       "       "       "	0,218 mm.	0,855 mm.
5th       "       "       "	0,218 mm.	0,801 mm.

1) Thielemann,—“Beiträge zur Kenntniss der Isopodenfauna Ostasiens,” p. 6, 1910



	Length.	Width.
6th segment of mesosome,	0,237 mm.	0,746 mm.
7th     "     "     "	0,218 mm.	0,655 mm.

Each segment of the mesosome has a pair of legs. The leg is much like that of females in structure. As in these it is composed of five joints exclusive of the coxal piece, of which the first, the second and the fourth are larger than the third and the fifth. The fourth is of an oval outline and forms a chela with the claw-like fifth joint. The fourth joint shows at the proximal end a few (some seven or eight) short tooth-like processes varying from 4 to  $8\mu$  in length. The third joint has a few minute spinous processes near the distal end and a single similar process near the middle. Measurements of the fourth left leg of the male taken from the female specimen B are as follows:

Length of the 1st or proximal joint,	0,220 mm.
Length of the 2nd joint,	0,160 mm.
Length of the 3rd joint,	0,076 mm.
Length (longest diameter) of the 4th joint,	0,196 mm.
Length of the exposed claw of the fifth joint,	0,060 mm.

The metasome is small and not divided, all the segments composing it being completely coalesced into a single plate-like urus. It is of a triangular shape, attached with base to the mesosome. The posterior end is obtusely pointed, and here the small anal opening is situated. No appendages exist on the metasome. Along each side on the ventral surface there stand at intervals three or four short hairs; besides, near the posterior end, there is a group of similar hairs. Also on the dorsal surface hairs are present in similar arrangement; only a posterior group of them is wanting. (The cephalon and the mesosome are also sparsely covered with hairs of the same kind.)

The eggs are generally spherical in shape, though often modified into polygonal as the result of mutual pressure in the brood chamber. They measure on an average 0,168 mm. in diameter. They occur in the brood chamber in a very large number.

## 3. Larva.

In the brood chamber of an adult female I have discovered a number of larvæ in the *Microniscus*-stage. Measurements of an average sized larva:

Total length of body, 0,280 mm.

Length of cephalon, 0,068 mm.

Breadth of cephalon, 0,160 mm.

Length of mesosome, 0,128 mm.

Breadth of mesosome, 0,156 mm.

Length of metasome, 0,084 mm.

The cephalon is halfmoon-shaped. It exhibits on the dorsal surface a number of variously sized brownish-black spots, arranged in an irregular group near the posterior margin (Pl. VII Fig. 10). Similar but smaller spots are also present on the mesosome. I could not however find distinct eyes such as were figured by Sars<sup>1)</sup> for the embryo of *Phryxus abdominalis* (Kröyer) and for *Microniscus*. The first antenna is short and is usually antero-laterally directed. It consists of three joints and has a length of 0,024 mm. excepting the hairs. The second antenna is longer than the first, having a length of 0,280 mm.; it is usually posteriorly directed. It is provided with a long distal flagellum and six short proximal joints, of which the two distalmost are more slender than the rest. At base of flagellum, there often exists a bristle of some length beset with a few minute spinous processes on one side. In many specimens the fourth joint also shows a long bristle at the distal end. The mouth is situated on a small elevation between bases of antennæ. It is guarded by two pairs of appendages yet weakly developed.

The mesosome is distinctly segmented, being composed of seven similar segments. There are six pairs of legs. Each leg is composed of five joints excepting coxal piece and is of a similar structure and

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1) *loc. cit.* Pl. 91 and 92.

appearance as that of the adult, except in being generally somewhat more slender. The fourth joint is ovoid in shape; the fifth is claw-like and comparatively very thin and long. Legs of the posteriormost one or two pairs are usually slightly smaller in size than more anteriorly situated ones. Measurements taken from the first left leg of a larva are as follows:

Length of 1st or proximal joint, 0,040 mm.

Length of 2nd joint, 0,026 mm.

Length of 3rd joint, 0,012 mm.

Length of 4th joint, 0,034 mm.

Length of exposed claw, 0,024 mm.

The metasome is somewhat smaller than the mesosome. Its posterior end is broadly rounded, excepting the presence of a short median process. It consists of six segments, but is not so distinctly segmented as in the mesosome. There exist five pairs of well developed pleopods, each of which bifurcates into a ventral and a dorsal ramus, the former usually having a single long bristle and the latter two or more of same. The dorsal ramus is articulated to the basal joint, while the ventral one represents only an off-shoot of the latter. The bristles of pleopods are about  $76\mu$  long. The uropod is large and powerful, with two equally long branches, each measuring 0,104 mm. in length.

Tokyo, Oct. 25, 1913.

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## Explanation of Plate VII.

### Reference letters.

*1.a.* First antenna. *1.l.* First leg. *1.m.p.* First marsupial plate.  
*2. a.* Second antenna. *3.* Third joint. *3.m.p.* Third marsupial plate.  
*4.* Fourth joint. *5.m.p.* Fifth marsupial plate. *7.l.* Seventh leg.  
*a.p.* Anterior part. *a.s.* Anterior segment. *cep.* Cephalon. *c.h.* Curved  
 hooks. *cl.* Claw. *c.p.* Cuticular processes. *d.l.* Dorsal lobe. *e.* Eye.  
*l.* Legs. *m.* Muscles. *m.o.* Mouth opening. *m.p.* Mouth part. *ms.*  
 Mesosome. *mt.* Metasome. *pl.* Pleopods. *p.p.* Posterior part. *p.s.*  
 Posterior segment. *t.p.* Tooth-like processes. *up.* Uropod. *ur.* Urus.  
*v.l.* Ventral lobe.

### Plate VII.

- Fig. 1.—Adult female, dorsal view. ca.  $\times 7$ .  
 Fig. 2.—Adult female, ventral view. ca.  $\times 7$ .  
 Fig. 3.—Mouth of the female specimen C, ventral view.  $\times 280$ .  
 Fig. 4.—Left side maxilliped of an adult female.  $\times 39$ .  
 Fig. 5.—Terminal portion of sixth right leg of the female speci-  
 men C.  $\times 130$ .  
 Fig. 6.—First left side marsupial plate of an adult female, dorsal  
 view.  $\times 28$ .  
 Fig. 7.—Adult male, dorsal view.  $\times 28$ .  
 Fig. 8.—Ventral surface of head of the male, taken from the  
 female specimen B, showing its antennæ and the mouth part.  $\times 28$ .  
 Fig. 9.—Fourth left side leg of the male from the female specimen  
 B.  $\times 130$ .  
 Fig. 10.—*Microniscus* larva, taken from marsupial chamber of a  
 female, dorsal view.  $\times 130$ .  
 Fig. 11.—Ventral surface of head of a larva.  $\times 180$ .

