THE PYCNOGNID GENUS PROPALLENE SCHIMKEWITSCH, 1909

Jan H. STOCK

ABSTRACT
The type material of Pallene (now Propallene) longiceps Böhm, 1879, from Enosima (Enoshima), Japan, is re-described. A new species of Propallene, P. ardica, is described from shallow waters and plankton tows near Kunduchi, Tanzania. Remarks on other species of the genus are provided, as well as a key to the species actually included in Propallene.

INTRODUCTION
In 1879, Böhm described a pycnogonid, collected by Dr. Hilgendorf in Japan at (in the original spelling) Enosima, which is no doubt Enoshima island in Sagami Bay. The description of this Pallene longiceps was unaccompanied by illustrations. The species was found again by several other authors, who gave more or less detailed descriptions and figures (Ortmann, 1890; Oshima, 1933b; Schimkewitsch, 1909 and 1929; Stock, 1954, and others). Schimkewitsch (1909) correctly assigned this species to a special genus, Propallene, in virtue of the presence of a 2-segmented palp in the male sex. Although P. longiceps has repeatedly been collected since, several points in its morphology remained unsettled, such as the details of the sexual dimorphism, the structure of the male oviger, the shape and number of the cement gland apertures. In other points, the existing descriptions were contradictory, e.g. as to the length of tibia 2, the relative length of the basal palp segment, the slenderness of the 2nd palp segment, and the number of teeth on the fingers of the chela.

The situation became taxonomically confused when two very similar new species were described. Calman (1923) described (as Parapallene) a new species from India, P. kempi; he did not examine any material of P. longiceps but based the distinction of the new taxon on a comparison with Böhm's and Ortmann's scanty notes. In 1955, Barnard described a new species of Propallene, P. similis, from South Africa, but remarked that he has not seen Böhm's and Ortmann's papers. Barnard's description is far from complete and poorly illus-
trated; he had a single male at his disposal. An attempt to re-study the holotype of *P. similis* failed, since the vial in South African Museum, Cape Town, labelled as such contains an anomotheid and not a pallenid.

When I discovered another very similar *Propallene* among the pycnogonid material collected recently by Dr. M. Bacescu, of Bucharest, on the Tanzanian coast, the moment seemed to be right to do some revisionary work.

Up to now, the following species of *Propallene* are known: (1) *P. longiceps* (Böhm, 1879), the type-species of the genus; (2) *P. kempi* (Calman, 1923); (3) *P. similis* Burward, 1955; (4) *P. stocki* Page, 1956; (5) *P. crassimana* Stock, 1959; (6) *P. artinus* Stock, 1968. Of these, I have seen type material of the numbers 1, 5, and 6, and other material of the numbers 2 and 3. For the permission to study the type material of the generotype, *P. longiceps*, I am greatly indebted to Dr. H.-E. Gruner, Zoologisches Museum an der Humboldt Universität, Berlin (German Democratic Republic). Likewise, I wish to express my gratitude to Dr. T. Wolff, Zoologisk Museum, Kopenhagen, for the loan of specimens of *P. longiceps* and *P. kempi*, and to Dr. M. Bacescu, for the Tanzanian samples of *Propallene*, which represented a new species, described in the sequel. In the following paragraphs, a re-description of *P. longiceps*, based on the types, is given, and some complementary notes on *P. kempi* are provided. The new species from Tanzania is described, as well as the genus *Propallene* is constructed, as well as a tentative key to the species actually included in that genus.

*Propallene longiceps* (Böhm, 1879).

Figs. 1-20.

*Pallene longiceps* Böhm, 1879: 59-60; Ortmann, 1890: 165-166, pl. XXIV fig. 7; Shishido, 1939: 199; Fukui, 1959: 99; Ohshima, 1933a: 96; Ohshima, 1933b: 212-216, figs. 1-7.


Material examined.—5 syntypes: 2 d ovig., 2 f, 1 juv. Enosima, Japan, coll. Hildendorf, Zool. Mus. Berlin Pant. 32. (1 d ovig. has been selected herewith as lectotype).


Descriptive notes.—The trunk is slightly more slender in male than in female; this is expressed by the slenderness of the neck and the space between the lateral processes. The lateral processes are slightly longer than the diameter of the corresponding trunk segment. Trunk segments 2 and 3 are slightly longer than wide (width measured at the posterior articulation of the segment). Ocular tubercle low, flattened, rounded; eyes not visible in the present (preserved) specimens; lateral sense organs distinct. Abdomen short, cylindrical, expanded at the base where it is wedged in between the 4th pair of lateral processes, implanted somewhat ventral. Chela with long, gaping fingers; movable finger with 6, immovable with 4 to 5 teeth; palm with several long setae. No obvious sexual dimorphism. Palp only present in male. Basal segment squarish, short, unarmed. Distal segment very elongated, finger-shaped, with a slight constriction at about 40% of its length. This constriction, when observed in situ, looks very much like an articulation; this is, however, an optical illusion: when mounted, no segmentation appears to be present. Distally, the palp bears 5 long, stiff setae.

Male oviger with reversed spines on segments 4 and 5. Segment 5 is the longest, distally provided with a setiferous lobe and a pointed apophysis. Segment 7 with 4 long distal setae. The compound spine formula is 10:9:10:10. No terminal claw. The compound spines are polymorphic: the more proximal ones on each segment are lanceolate, with some 7 lateral teeth; the more distal ones are wider, with 3 or 4 very large basal teeth and a distal lobe laterally provided with 0 to 2 very small teeth.

Female oviger lacks reversed spines. Segment 4 is the longest; segment 5 lacks distal lobes; segment 7 is without setae. The compound spines are of the same shape as in male, arranged according to the formula 10:10:8:12.

Legs of male fairly slender. Coxa 3 bears long ventral setae. Femur with a ventral row of 12 to 17 cement gland ducts. Tibiae, more in particular the second, with a row of long setae on both its anterior and posterior surfaces. Such long anterior and posterior setae are likewise present on the propodus. Propodus with 2 basal spines, the distalmost of which is very elongate; these spines
are distally provided with about 3 crenulations (which may be worn and then hardly discernible). The sole is almost straight, armed with 11 or 12 slightly S-shaped spines, each placed on a distinct sole. The claw is slender; auxiliary claws are absent.

Legs of female with strongly swollen femora, containing the ovaries. These legs are only slightly less setose than in male. Propodal structure and armature as in male.

Remarks.- The rather compact body shape, the feebly curved propodus, the very elongate spines on the propodal heel, and the high number (> 10) of cement gland ducts in male, characterise this species. Propallene similis Barnard, 1955, is (as the name suggests) very similar indeed to P. longiceps (see Stock, 1959: 558-559, fig. 4 for additional figures, based on the 9 sex, of P. similis). Since the male of similis is imperfectly described by Barnard, I refrain for the moment from synonymizing the two taxa.

Ortmann's statement (1890: 165) that the 2nd tibia is only half as long as the first, is erroneous. Usually the 2nd tibia is only a trifle shorter than the first; in the large (old ?) female from Misaki (vide infra), referred to by Stock, 1954, the 2nd tibia is even slightly longer than the first.

Ohshima's (1933b) figure 6 is incorrect in that the palp is illustrated with a short instead of with a slender distal segment. Schinkelwitsch's figures (1909, 1929) are mistaken in that the constriction of palp segment 2 is illustrated as an articulation.

None of the specimens studied here has such low numbers of teeth of the chelar finger, as shown in Utinomi's (1966) fig. 3B.

In addition to a series of new figures (1-14) of the syntypes, I include also some new figures of the Misaki female (figs. 15-20), to supplement my earlier, 1954, illustrations. As mentioned above, this specimen differs from the syntypes, in having tibia 2 slightly longer than tibia 1, and in having 7 instead of 6 teeth on the movable finger of the chela.

As shown in the synonymy, there are quite a few literature records of this species, though there are few trustworthy illustrations of it. All published records are from Japan, where P. longiceps is, according to Utinomi (1971) "prevalent and abundant in shallow waters". Like several other species of the genus Propallene, P. longiceps is often taken in in pelagic tows at night (Ohshima, 1933b; Utinomi, 1971). P. similis, which might, as said, be synonymous with P. longiceps is known from southern Africa (Algoa Bay, Mossel Bay).

**Measurements (in mm).—**

<table>
<thead>
<tr>
<th></th>
<th>d (syntype)</th>
<th>9 (syntype)</th>
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</thead>
<tbody>
<tr>
<td>Length trunk (frontal margin cephalic segment to tip of abdomen)</td>
<td>2223</td>
<td>2430</td>
</tr>
<tr>
<td>Width across 2nd lateral processes</td>
<td>1098</td>
<td>1233</td>
</tr>
<tr>
<td>Diameter cephalon</td>
<td>568</td>
<td>803</td>
</tr>
<tr>
<td>Length scape</td>
<td>505</td>
<td>--</td>
</tr>
<tr>
<td>Length chela</td>
<td>390</td>
<td>--</td>
</tr>
<tr>
<td>Length proboscis (ventral)</td>
<td>548</td>
<td>--</td>
</tr>
<tr>
<td>Greatest diameter proboscis</td>
<td>340</td>
<td>--</td>
</tr>
<tr>
<td>Length palp</td>
<td>345</td>
<td>--</td>
</tr>
<tr>
<td>Diameter of eggs on the male oviger</td>
<td>229-237</td>
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**Measurements of the segments of the leg**

<table>
<thead>
<tr>
<th></th>
<th>P2 d (syntype)</th>
<th>P1 V (syntype)</th>
<th>P3 V (syntype)</th>
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<tbody>
<tr>
<td>coxa 1</td>
<td>430</td>
<td>350</td>
<td>338</td>
</tr>
<tr>
<td>coxa 2</td>
<td>545</td>
<td>458</td>
<td>673</td>
</tr>
<tr>
<td>coxa 3</td>
<td>338</td>
<td>320</td>
<td>247</td>
</tr>
<tr>
<td>femur</td>
<td>1258</td>
<td>1305</td>
<td>1653</td>
</tr>
<tr>
<td>tibia 1</td>
<td>1120</td>
<td>1085</td>
<td>1315</td>
</tr>
<tr>
<td>tibia 2</td>
<td>1100</td>
<td>1045</td>
<td>1385</td>
</tr>
<tr>
<td>tarsus</td>
<td>68</td>
<td>69</td>
<td>95</td>
</tr>
<tr>
<td>propodus</td>
<td>654</td>
<td>592</td>
<td>783</td>
</tr>
<tr>
<td>claw</td>
<td>392</td>
<td>369</td>
<td>533</td>
</tr>
<tr>
<td>distal diameter of coxa 2</td>
<td>230</td>
<td>225</td>
<td>305</td>
</tr>
<tr>
<td>proximal diameter of coxa 2</td>
<td>170</td>
<td>164</td>
<td>231</td>
</tr>
</tbody>
</table>

**Propallene kempi** (Calman, 1923).

Figs. 21-26.

**Propallene kempi** Calman, 1923: 277-278, fig. 6.


Doubtful record: Arnaud, 1972: 161-162, figs. 3-6 (see under P. artus).


Remarks.— The Singapore specimen, recorded by me in 1954, has been re-examined and some new figures have been made. The chelar fingers have only 3 or 4 teeth. The legs are not very setose or spinose. The 2nd coxa is very elongate; it is more than 4 times as long as the basal diameter of the article. There are 8 cement gland ducts on the femur of leg 3. The propodus is curved; the heel spines
are less elongate than in *P. longiceps*, distally crenulated; sole with 6 or 7 spinules. Oviger segment 4 is less slender than in *longiceps*, but the distal armature of segment 5 is similar to that of *longiceps*; segment 7 with 3 distal setae. Compound spine formula 10:7:6:8; the compound spines show the polymorphism usual for the genus *Propallene*.

**Measurements (male) in um.**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
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<tr>
<td>Length trunk (frontal margin cephalic segment to tip of abdomen)</td>
<td>1483</td>
</tr>
<tr>
<td>Width across the 2nd lateral processes</td>
<td>725</td>
</tr>
<tr>
<td>Length cephalic segment</td>
<td>640</td>
</tr>
<tr>
<td>Diameter cephalon</td>
<td>368</td>
</tr>
</tbody>
</table>

**Third leg:**
- coxa 1 273
- coxa 2 1440
- coxa 3 202
- femur 760
- tibia 1 703
- tibia 2 698
- propodus 476
- claw 284
- distal diameter coxa 2 164
- proximal diameter coxa 2 97

**Remarks.** - The great slenderness of the body (as illustrated by Calman, 1923, and Stock, 1954) and legs (particularly distinct in the elongate 2nd coxa) characterize this species. Calman's material came from the Gulf of Manar and from Waltair (Madras), Gnamamthu's specimens from Madras, and Stock's material from Singapore. Arnaud's (1972) specimens from Madagascar may belong to another species; at any rate the 2nd coxa is illustrated shorter than usual for *P. kempi*.

*Propallene ardua* n.sp. Figs. 27-41.

**Material examined.** - 18 4, 29 9, 38 juveniles and larvae, taken at different dates and at various depths (0-24 m) near Kunduchi (25 km N. of Dar es Salaam, Tanzania), partly in dredging, partly in the plankton at night; Dec. 1973 and Jan. 1974. Holotype 4, allotype 9, and 22 paratypes in the Zoologisch Museum, Amsterdam.

**Description.** - Trunk completely segmented. Lateral processes shorter than the diameter of the trunk, separated by a distance that is equal to, or less than, their own diameter. Neck rather long, gradually widening into the cephalon. Abdomen very short, somewhat trapezoidal in shape, slightly bent downward. Ocular tubercle low, rounded or roundedly conical; eyes not distinctly pigmented (or pigment lost in preserved state?).

Chelifore scape 1-segmented in both sexes. Chela armed with several long setae on the more or less triangular palm, and with a row of some 4 long setae implanted from the proximal part of the movable finger to the articulation of the movable finger. Both fingers curved, gaping when closed, with 3 or 4 or 5 (very rarely 6) teeth in both sexes.

Palm only present in male, 2-segmented. Basal article very short, unadorned. Distal article very elongate, reaching far beyond the middle of the proboscis, but not overreaching it; armed in its distal part with some 6 setae.

Oviger of male: segment 5 the longest, distally provided with a setiferous lobe and a pointed process; a row of (usually curved) spines is implanted on segments 3, 4, and 5; segment 6 is short, segment 7 is longer again, distally armed with 4 to 6 long setae; no terminal claw. Special spines on oviger segments 7 to 10, according to the formula 10:10:8:9. The more proximal compound spines on each segment are lanceolate, with some 8 regular lateral denticles on either side; the more distal compound spines are shorter and much wider, the two basal lateral denticles are enlarged, sometimes in a delirious way.

Oviger of female: segment 4 the longest; neither curved spines, nor long setae on the segments (2 shorter distal setae are present on segment 5); segment 5 without distal apophysis or process; compound spine formula 12:10:9:11; shape of the spines as in male.

Legs rather slender. In male, about 9 cement gland tubules arise on the ventral surface of the femur; in female, the femur is strongly swollen to contain a limited number (1 to 3) large eggs. The 2nd tibia (d) bears an anterior and a posterior row, each of 4 to 6 long setae; about 3 long setae are found on the propodus as well. In female, these long setae are absent. The femur is the longest segment, tibia 1 the shortest of the three longer articles. The 2nd coxa is 2.9 to 3.4 times as long as its proximal diameter (6, 9). The propodus is moderately curved, tapering towards the distal end; heel with 2 basal spines, the distal end of which is crenulated; sole with about 10 spinules, each placed on a low socle, each with a more or less marked hum or indentation near the proximal end. Claw slender. In several specimens, e.g. in the holotype and allotype, a marked prominence is present at the base of the claw. In several other
specimens, this prominence is less distinct. It is supposed, that the prominence is retractable into the articulation membrane of claw/propodus (cf. figs. 29, 30, 31).

Measurements of paratypes (in μm).--

<table>
<thead>
<tr>
<th>Description</th>
<th>d</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length trunk (frontal margin cephalic segment to tip of abdomen)</td>
<td>1628</td>
<td>1603</td>
</tr>
<tr>
<td>Diameter trunk (across 2nd lateral processes)</td>
<td>736</td>
<td>708</td>
</tr>
<tr>
<td>Diameter trunk (2nd segment, without lateral processes)</td>
<td>273</td>
<td>270</td>
</tr>
</tbody>
</table>

Length proboscis (ventral) | 407 | -- |
| Greatest diameter proboscis | 257 | -- |
| Length scape               | 388 | -- |
| Length chela               | 433 | -- |
| Palp segment 1             | 440 | -- |
| Palp segment 2             | 287 | -- |
| Third leg:                  |     |     |
| coxa 1                      |     |     |
| coxa 2                      |     |     |
| proximal diameter coxa 2    | 136 | 118 |
| coxa 3                      | 230 | 232 |
| femur                       | 863 | 832 |
| tibia 1                     | 785 | 635 |
| tibia 2                     | 798 | 734 |
| tarsus                      | 63  | 61  |
| propodus                    | 535 | 447 |
| claw                        | 330 | --  |

Remarks.--I have hesitated whether I should base a new species on the present material, or attribute it to *P. longiceps* (Böhm, 1879) or *P. kempi* (Calman, 1923). After re-examination of the type-material of *longiceps* (in the Berlin Museum) and of additional material of *longiceps* and *kempi* (in the Copenhagen Museum) (*vide supra*), I arrived at the conclusion that the Tanzanian material must be considered a separate species, which is, however, exceedingly close to *longiceps* and *kempi*. The proposed specific name, *ardua* (Latin, = difficult) alludes to this situation.

The new species differs from the Japanese *P. longiceps* in its smaller size (e.g., the P3 9 of *ardua* is 3.9 mm long, that of *longiceps* 5.4-7.1 mm), in the more strongly curved propodus with shorter heel spines, and in the lower number of cement gland ducts (less than 10). *P. ardua* agrees with *longiceps* in the more compact configuration of the trunk and the not very elongated 2nd coxa.

*P. kempi*, known from south-eastern Asia, differs from *P. ardua* in the following respects: the lateral processes of *kempi* are longer than the diameter of the trunk (versus shorter in *ardua*); the length of trunk segment 3 in *kempi* is more than the diameter of the trunk at the boundary of segments 2 and 3 (less than that diameter in *ardua*); the lateral processes of *kempi* are separated by intervals that are wider than the diameter of the lateral process (less in *ardua*); the 2nd coxa in *kempi* is more slender (4½ times as long as its basal diameter) than in *ardua* (< 3½ times); finally, the 2nd tibia of *kempi* (at least in the single male that I have examined) is devoid of rows of long setae, whereas such rows are present in *ardua*. The body size of *kempi* agrees rather well with that of *ardua*.

*P. arsinefamus* Stock, 1959, a species known from south-eastern Africa, has more teeth on the fingers of the chela, the propodus and its claw are more heavily built, and the number of cement glands is higher (about 15).

Arnaud, 1972, recently recorded *P. kempi* from Madagascar. Several of the salient differences that separate *P. kempi* from *P. ardua* are not illustrated by Arnaud, except for the 2nd coxa which resembles that of *ardua* and not that of *kempi*. In the light of the close zoogeographical relationship between the Malagasy and Tanzanian marine littoral fauna, it would not be surprising if Arnaud's presumed material of *P. kempi* would turn out to be *P. ardua*.

**DIAGNOSIS OF THE GENUS PROPALLENE.**

The type-species, *P. longiceps*, being more completely known now, it is possible to adjust the previous diagnosis (Stock, 1954: 31) of Propallene as follows:

Trunk well-segmented. Ocular tubercle in the posterior part of the cephalic segment. Abdomen small, implanted somewhat ventrad. Propodus roughly of type D'. Scape 1-segmented. Chela with gaping, toothed fingers. Palp 2-segmented, only present in male. Oviger 10-segmented (d, q). Segment 5 (d) with distal apophysis, and opposite distal hook-like process. Compound spines present, in 1 row, proximal and distal spines on each segment very dissimilar in shape (d, q). No terminal oviger claw (d, q). Cement glands (d) opening through numerous (6-17) short ducts on the ventral surface of the femur. Propodal heel spines (often?) crenulated. No auxiliary claws.

Habitat: shallow waters, often pelagic.

Distribution: Japan, south-eastern Asia, southern and south-eastern Africa, Madagascar, Sierra Lecne.
TENTATIVE KEY TO THE SPECIES OF PALLALLENE,
BASED ON ADULT ♀

1a) Lateral processes separated by more than twice
their own diameter.
P. crimplipes Stock, 1958
Strait of Malacca
b) Lateral processes separated by about their own
diameter, or less.------------------ 2.

2a) Palp segment 2 about 3 times as long as wide, 
unarmed.
P. stocki Page, 1956
Sierra Leone
b) Palp segment 2 much more than 3 times as long
as wide, setiferous------------------ 3.

3a) Movable finger of chela with 3 or 4 (rarely 5 
or 6) teeth. At most 10 cement gland ducts. b) 
Movable finger with 6 to 8 teeth. More than 10
cement gland ducts.------------------ 4.

4a) Coxa 2 very slender (length > 4 times its basi-
dam diameter); lateral processes longer than
the diameter of the trunk. Tibia 2 without
rows of long setae.
P. kemp (Calman, 1923)
South-eastern Asia
b) Coxa 2 moderately slender (length < 4 times
its basal diameter); lateral processes shorter
than the diameter of the trunk. Tibia 2 with
rows of long setae.
P. ardua n. sp.
Tanzania

Pycnogonida Stock, 1959
South-eastern Africa
b) Palpulicosa (Böhm, 1879)
Japan
and P. similis Barnard, 1955
South Africa

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* not seen in the original.

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1, trunk of $d$, dorsal (scale a); 2, trunk of $q$, dorsal (a); 3, chela, $d$ (b); 4, ocular tubercle, $q$, from the left (free-hand sketch); 5, palp, $d$ (c); 6, oviger, $q$ (d); 7, oviger, $q$ (d); 8, terminal spine of oviger segment 10, $q$ (e); 9, tenth spine of oviger segment 8, $q$ (e); 10, second spine of oviger segment 7, $q$ (e); 11, leg 2, $d$ (f); 12, distal leg segments, $q$ (c); 13, distal end of longest propodal heel spine (left: not worn; right: worn), free-hand sketch; spine of propodal sole (free-hand sketch).
15, chela (scale c); 16, leg (g); 17, distal leg segments (h); 18, terminal spine of oviger segment 10 (e); 19, terminal spine of oviger segment 9 (e); 20, proximal spine of oviger segment 7 (e).

21, chela (scale b); 22, oviger (c); 23 proximal spine of oviger segment 9 (e); 24, distal spine of oviger segment 9 (e); 25, leg 3 (a); 26, distal segments of leg 3 (c).
Figs. 27-41. *Propallene ardua* n. sp. From the type locality, Kunduchi (Tanzania).

27, trunk of male, dorsal (scale a); 28, chela, δ (b); 29, distal segments of 3rd leg, δ (c); 30, 31, claw of 3rd leg, δ, in different specimens (c); 32, oviger, 9 (c); 33, distal compound spine from 9th oviger segment, δ (free-hand sketch); 34, 3rd leg, δ (a); 35, palp, δ (c); 36, proximal segments of leg 3, 9 (a); 37, section of the 2nd tibia, δ (free-hand sketch); 38, cement gland ducts, δ (free-hand sketch); 39, oviger, δ (c); 40, proximal compound spine from oviger segment 7, δ (free-hand sketch); 41, distal part of oviger segment 10, δ (i).