

PYCNOGONIDA OF THE WESTERN PACIFIC ISLANDS
IV. ON SOME SPECIES FROM THE
RYUKYU ISLANDS

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Abstract.—A small collection of Pycnogonida from the southern Ryukyus and miscellaneous specimens from Okinawa are recorded with their zoogeography. One new species, *Callipallene tridens*, is described and figured and 11 known species are recorded for the first time in the Ryukyus. A high incidence of juveniles and larvae suggests that the months of collection, May and June, may be the peak of the breeding and hatching season in these islands.

Only two species of pycnogonids were known from the Ryukyu Islands prior to this report. The specimens reported here were taken in the Sakishima Group of the southern Ryukyus and from Okinawa. The first pycnogonid described from Okinawa was *Pycnogonum benokianum* Ohshima (1935:137-139), from Benoki (=Benochi, 26°48'N, 128°14'E). The second species reported from the Ryukyus was *Endeis mollis* (Carpenter), also by Ohshima (1935:139), taken at Ishigaki Island in the Sakishima Group south of Okinawa. Specimens of *E. mollis* are reported from the Sakishima Group, but *P. benokianum* has not been recorded since the type specimens were described. Hedgpeth (1949:304-397, fig. 49) subsequently redescribed this species from Ohshima's notes and a preserved type specimen in his paper on collections taken in Japan by the *Albatross*. Utinomi (1971:327) also repeated Ohshima's record in his list of Japanese pycnogonids.

There are now 13 species known from the Ryukyus with one of them, *Callipallene tridens*, described herein as new. At least two and probably three other species are represented in these collections but the questionable specimens are juveniles or larvae and do not have characters sufficiently developed for recognition or description.

The known Ryukyu Islands species have

their strongest faunal affinity with the Philippines where six of the species are also known, suggesting some form of transport by shallow northward-flowing currents. Three of the species are also found in Japan while three are found to the south in Indonesia and beyond. There are also three species found in the Marshall, Hawaii, and Samoa Island groups while a more distant distribution occurs for two species recently described from Aldabra Atoll in the Indian Ocean. Two other widely distributed species are known from the western Indian Ocean while one additional species, *Pigrogromitus timsanus*, is known to be pantropical. The distribution of most of these species is so incompletely known that their true distribution can not be suggested at this time. They are all shallow-water species.

Family Phoxichilidiidae

Genus *Anoplodactylus* Wilson, 1878

Anoplodactylus pectinus Hedgpeth

Anoplodactylus pectinus Hedgpeth, 1948: 234-236, fig. 34.—Child, 1982a:372-373 [literature]; 1988a:20.

Material examined.—Sakishima: Funauki Bay, Iriomote Island, 5 m, 7 Jun 1987; 1 ♂ with eggs, 2 ♀, 1 juv. Southwest Ishigaki Harbor, Ishigaki Island, 2-4 m, 10 Jun 1987; 1 ♂.

Distribution.—This species was first described from specimens taken in the Florida Keys and is now known from many localities in Florida and the Caribbean. It has also been taken in Madagascar and more recently in the northern Philippines. Its occurrence in the southern Ryukyus constitutes only a small range extension from the Philippines, but the range of collections in which the species appears suggests that it may be another pantropical species. All known depths of capture are shallow, the deepest being 27 meters.

Remarks.—The moderately large size (leg span about 12 mm) of this species in relation to other tropical members of this genus, its slender appearance, and the fairly long cribriform cement gland slit of the male along with the serrate major heel spine in both sexes all serve to make this an easily identified species.

Anoplodactylus perforatus
Nakamura & Child

Anoplodactylus perforatus Nakamura & Child, 1982:288–291, fig. 3; 1983:49; (in press).

Material examined.—Sakishima: southwest Ishigaki Harbor, Ishigaki Island, 8–12 m, 4 Jun 1987; 1 ♂, 1 ♀.

Distribution.—This species is often taken in large numbers per capture effort in western Sagami Bay, Japan, while another similar large aggregation was recently reported from Western Samoa. These 2 Ryukyu specimens serve to help bridge the wide distributional gap between Japan and Samoa while contributing nothing new to the known depth range of 7–113 meters.

Remarks.—This is an easily recognized species, at least in the male, by its many cement gland pores (17 to 25) per femur and the long slender oviger having an inconspicuously tiny terminal segment. Both sexes have a very short propodal lamina and long chelae fingers lacking teeth.

Anoplodactylus, species indeterminate

Material examined.—Sakishima: Funaura Bay, Iriomote Island, night, at surface, 10 May 1986; 2 juv, 1 larva. Same locality, depth, 3 Jun 1986; 4 juv, 5 larvae. Funauki Bay, Iriomote Island, 5 m, 7 Jun 1987; 1 larva. Iriomote Island, 11–20 m, 7 Jun 1987; 1 ♀ juv. Southwest Ishigaki Harbor, Ishigaki Island, 2–4 m, 10 Jun 1987; 1 ♀.

Remarks.—There are at least two species represented by these females and young but none of them is sufficiently developed or was taken with adult males to permit identification. The relatively large number of *Anoplodactylus* young in relation to the total number of pycnogonids taken during collecting in the Sakishima Islands group is possibly significant in suggesting that May and June represent the breeding-hatching season for the genus.

Family Endeidae
Genus *Endeis* Philippi, 1843
Endeis nodosa Hilton

Endeis (Phoxichilus) nodosa Hilton, 1942: 47–48, fig. 4.

Endeis nodosa.—Stock, 1968:59 [key].—Child, 1982b:275–277, fig. 2g–i.

Material examined.—Okinawa: Naha Harbor, on breakwater, 1.5 m, 27 Jun 1987; 1 subadult.

Distribution.—This species is rare because it is found on islands seldom or never exposed to collecting for marine microinvertebrates. Its type locality is Hawaii and it has subsequently been taken at Enewetak Atoll in the Marshall Islands. Okinawa is only the third known locality where it has been found and it is apparently not common in any of these places. All known collecting depths are littoral or very shallow waters.

Remarks.—This species is fairly easily distinguished from others of the genus by the presence of a large node or low conical tubercle on the midventral femur and for

the many diverticula or blind pockets of the central intestinal branches in the legs. The integument is usually opaque so that the gut branches and diverticula are easily seen. There are sometimes many more finger-like diverticula on the intestines than are figured by Child (1982b:276, fig. 2h).

Endeis mollis (Carpenter)

Phoxichilus mollis Carpenter, 1904:182–183, figs. 1–7.

Endeis mollis.—Utinomi, 1971:327 [literature].—Stock, 1975a:1083–1085; 1975b:76.—Child, 1979:66.—Nakamura & Child, 1983:41.—Stock, 1986:440.—Child, 1988a:20–21.

Material examined.—Sakishima: Funaura Bay, Iriomote Island, 3 Jun 1986; 2 juv. Same locality and date, night, at surface; 1 juv.

Distribution.—This is a pantropical-temperate species found as far north as Sagami Bay, Japan. Ohshima reported it from the Sakishima Group at Ishigaki Island (Ohshima 1935:139), the only pycnogonid found in the southern Ryukyus, but it could also be expected to inhabit Okinawa. It is a shallow-water species, having been taken from the shoreline down to 60 meters.

Remarks.—This species does not have the small side pockets along its gut diverticula in each leg nor does it have the conspicuous conical ventral tubercle on the femorae as does *E. nodosa*.

Family Ammotheidae

Genus *Eurycyde* Schiödte, 1857

Eurycyde, species indeterminate

Material examined.—Sakishima: Iriomote Island, 11–20 m, 7 Jun 1987; 1 juv.

Remarks.—This juvenile specimen is indeterminate although it has several characters reminiscent of *Eurycyde setosa* Child (1988a:8–10, fig. 3), from the Philippines. This recently described species has 7 large spines at the ocular tubercle apex, but the abdomen of the unique type is missing. The

Iriomote specimen has 4–5 large spines at the ocular apex and several similar spines on the curved abdomen. The lateral processes are also closely spaced as in *E. setosa*. The proboscis of this juvenile has not yet divided into the characteristic 2 segments and the specimen otherwise has no visible identifying characters.

Family Callipallenidae

Genus *Callipallene* Flynn, 1929

Callipallene novaezealandiae (Thomson)

Pallene novae-zealandiae Thomson, 1884:246–247, pl. 14, figs. 1–4.

Callipallene novaezealandiae.—Child, 1983:708 [literature].

Material examined.—Sakishima: Funaura Bay, Iriomote Island, night, at surface, 3 Jun 1986; 2 ♂, 1 juv. Southwest Ishigaki Harbor, Ishigaki Island, 3 m, 4 Jun 1987; 4 ♂ with eggs, 2 ♂, 4 ♀, 8 juv, 15 larvae. Same locality, 2–4 m, 10 Jun 1987; 2 ♂, 3 ♀, 7 juv, 1 larva.

Distribution.—This species is known from eastern Africa, Australia, Japan, New Zealand, and from Palau and Enewetak Atoll in Micronesia, all from shallow localities. This series of specimens extends its distribution to an intermediate locality between Japan and islands to the south and east.

Remarks.—These specimens, particularly the males, have the same variation in oviger denticulate spine counts per segment as seen in the Micronesian specimens, but otherwise agree with these specimens in diagnostic characters.

Callipallene tridens, new species

Fig. 1

Material examined.—Sakishima: southwest Ishigaki Harbor, Ishigaki Island, 3 m, 4 Jun 1987; 1 ♂ with eggs (holotype, USNM 234430), 5 ♂, 5 ♀, 2 juv (paratypes, USNM 234431).

Description.—Size very tiny, leg span only 3.6 mm. Trunk fairly elongate, segmentation lines faint, incomplete. Lateral pro-

cesses no longer than wide, distally separated by their own diameter or less, glabrous. Neck very short, without parallel sides, expansion before chelifores no wider than long. Ocular tubercle very broad-based, only half as tall as basal width, eyes large, slightly pigmented, lateral papillae present, not prominent. Proboscis short, 1.5 times longer than diameter, with low rounded ventrodistal bulges, constricted distally just posterior to flat lips. Abdomen very short, less than length of 4th lateral processes, distally rounded, armed with 2 short lateral setae.

Chelifore scape moderately slender, 3 times longer than its diameter, armed with 3 dorso- and laterodistal setae longer than scape diameter. Chela palm subtriangular, with 10–11 ectal and lateral setae longer than palm diameter. Fingers longer than palm, carried anaxially, slender, overlap strongly at tips, armed with 4–5 long sharp teeth on immovable finger and 6 similar teeth on movable finger. Movable finger longer and more curved than immovable finger.

Oviger short, 4th segment only slightly longer than 3rd, 0.6 as long as 5th which is armed with rounded distal apophysis bearing 2–3 short setae. Strigilis segments each shorter than last, armed with 1–2 ectal short setae distally and dimorphic denticulate spines endally in the formula 5:5:5:6. Proximal spines with many tiny lateral serrations, distal serrations slightly larger; distal spines with tiny serrations on proximal side, long finger-like serrations on distal side of spines. Egg size very large, 4 times larger than 5th segment diameter.

Legs fairly short, slightly inflated, cement gland tubes or pores not evident. Second and 3rd coxae armed with very long ventrodistal setae, each 2–3 times longer than segment diameter. Femur with slight ventrodistal bend, armed with several distal and lateral setae not as long as segment diameter. Tibiae slightly shorter than femur, 1st tibia armed with few lateral and distal setae shorter than segment diameter, 2nd tibia

with more setae, some longer than segment diameter. Tarsus very short, armed with dorsal and ventral setae, some longer than segment diameter. Propodus slightly inflated, straight, without heel but with 4 stout heel spines and 7–8 sole spines, very short distal lamina, and few lateral and distal setae. Claw moderately curved, half propodal length, with very short auxiliary claws shaped like tridents bearing broad pointed spatulate median spine flanked by 1 or 2 tiny pointed lateral serrations. Auxiliaries slightly inflated, curved in lateral view.

Female paratype: propodal claw longer, 0.7 propodus length, more curved distally. Trunk and legs slightly larger than those of male, oviger reduced, without distal apophysis on 5th segment.

Measurements (holotype in mm).—Trunk length, 0.6; trunk width (across 2nd lateral processes), 0.29; proboscis length, 0.2; abdomen length, 0.05; third leg, coxa 1, 0.08; coxa 2, 0.19; coxa 3, 0.1; femur, 0.33; tibia 1, 0.29; tibia 2, 0.31; tarsus, 0.04; propodus, 0.22; claw, 0.11.

Distribution.—Known only from the type locality, Ishigaki Harbor, Ishigaki Island, in the southern Ryukyus, in 3 meters.

Etymology.—The name *tridens* (Latin: forked with 3 tines) refers to the 3-lobed “trident” auxiliary claws of this species.

Remarks.—The presence of short trident-like auxiliary claws is unique among known pycnogonid species. Auxiliary claws are used as a usually reliable diagnostic character among pycnogonid genera and some have them while some do not. They are usually simple curved claws, but some species have tiny endal setules or spinules. These are most often found among *Callipallene* species and these trident-like claws add another form to the seemingly endless variety of characters.

This new species does not conform in other ways to most *Callipallene* species; the chelae are atypical in having very slender fingers placed anaxially on the palm and bearing long slender teeth, the ocular tubercle is broader based and is shorter than

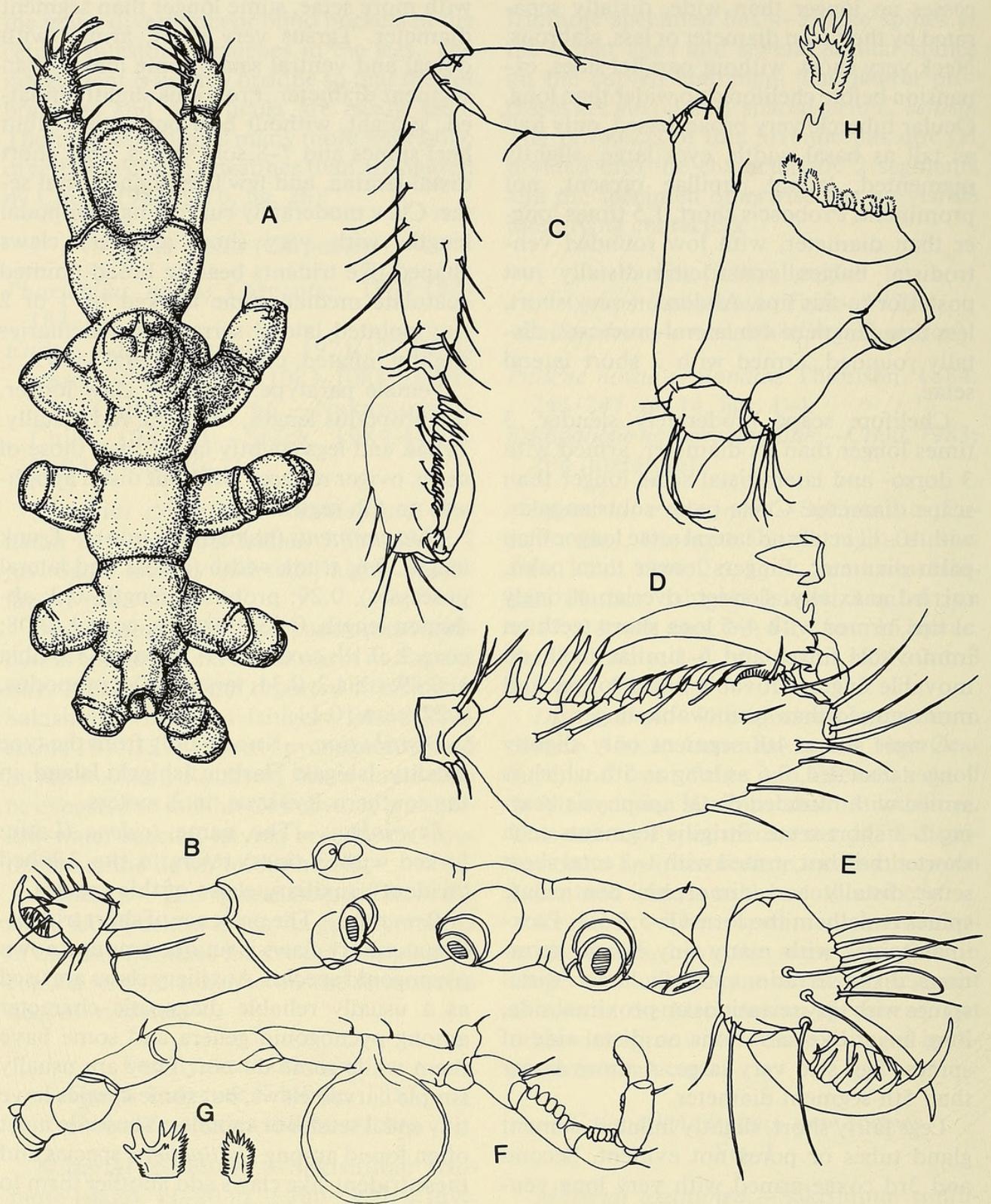


Fig. 1. *Callipallene tridens*, holotype male: A, Trunk, dorsal view; B, Trunk, lateral view; C, Third leg; D, Distal segments of third leg with auxiliary claw enlarged; E, Chela; F, Oviger with single egg attached; G, Oviger distal and proximal denticulate spines, enlarged; H, Oviger terminal segment, distal spine enlarged.

in almost any other species known, and the propodus has a short distal sole lamina, a character unknown to this genus but common among species of the genus *Anoplo-dactylus*. These atypical and unique characters are sufficient to permit description of this as a new species and they continue to expand the diversity of characters found among the Pycnogonida.

Genus *Cheilopallene* Stock, 1955

Cheilopallene hirta Child

Cheilopallene hirta Child, 1988b:63–66, fig. 5.

Material examined. — Sakishima: Funaura Bay, Iriomote Island, night, at surface, 3 Jun 1986; 1 ♂, 1 ♀. Funauki Bay, Iriomote Island, 5 m, 7 Jun 1987; 1 ♀. Southwest Ishigaki Harbor, Ishigaki Island, 5 m, 4 Jun 1987; 1 juv.

Distribution. — This species is known only from Aldabra Atoll, western Indian Ocean, its type locality, in 0–21 meters. The Sakishima specimens greatly extend this distribution eastward into the Pacific and northward to the southern Ryukyus in similarly shallow waters.

Remarks. — There is remarkably little difference between these specimens and the type series. The male fourth oviger segment is very slightly longer than with the Aldabra specimens and there are the usual 1–2 spine differences in the denticulate spine counts among specimens. The four stout spines next to the chela immovable finger of the type are reduced to three with several additional slender setae on the adjacent raised pad, but the specimens agree exactly otherwise, including the hirsute distal proboscis.

Genus *Pigrogromitus* Calman, 1927

Pigrogromitus timsanus Calman

Pigrogromitus timsanus Calman, 1927:408–410, fig. 104a–f. — Child, 1982a:367–368; 1988a:21 [literature].

Material examined. — Okinawa: Maeda

Misaki, reef flat, on *Lybia tesellata* [Xanthidae: Crustacea], 15 Nov 1985; 1 juv.

Distribution. — This species has a pan-tropical but scattered distribution in many varied localities. It has been taken in Hawaii and is known from the Philippines, so it is not surprising to find it in Okinawan waters. It inhabits shallow depths, the deepest capture being 108 meters.

Remarks. — This is an easily recognized species in a monotypic genus. It superficially looks like several species of the genus *Pycnogonum* in habitus, but has chelifores with small functional chelae, and has an oviger without denticulate spines but with a terminal claw having a proximal spine in a forcipulate arrangement with the large claw. Live specimens of this species have a uniform whitish-tan coloration.

Genus *Propallene* Schimkewitsch, 1909

Propallene curtipalpus Child

Propallene curtipalpus Child, 1988a:21–23, fig. 9.

Material examined. — Sakishima: Iriomote Island, 11–20 m, 7 Jun 1987; 2 ♂, 1 ♀, 2 juv.

Distribution. — This species was originally described from material taken in the Visayan Islands, central Philippines, from depths of 2 meters or less. The presence of the species in the southern Ryukyus is not surprising considering the supposed corridor of pycnogonid genera thought to inhabit islands from New Zealand north along the western Pacific archipelagoes as far as Japan (Child 1983:713). The corridor hypothesis was originally proposed to include the predominantly Antarctic genus *Austrodecus* which has several species found from New Zealand to Japan. It now appears that the corridor should include other genera, among them *Propallene*, with the majority of its species found from the Indian Ocean (including South Africa) and Australia north along the corridor to Japan. The genus *Scipiolus* with representatives from South Af-

rica, Indonesia, and Japan, and the genus *Hemichela* having species known from Australia, Indonesia, and the Philippines, should possibly be included as members of this corridor fauna. There are several endemic genera known to the East Indies, but none of the above genera nor any families are confined to the western Pacific corridor as endemics although the majority of their species are known from parts of the corridor and Indian Ocean-Australian localities. Our knowledge of the pycnogonids of this vast region remains very fragmentary and the distribution of any of these genera may be greatly expanded to more distant parts of the Pacific in future collecting.

The known depth at which this species has been taken is now extended to 20 meters by the Ryukyu records. It has not been taken on Okinawa Island.

Remarks.—This is the only known species in a genus with very look-alike members to have a reduced number of cement gland tubes (4–5) arranged on the femur (1) and both tibiae (1–2 each), and a very reduced palp which is less than half the proboscis length. Where specimens are sympatric, they can not be differentiated to species with only females in hand. The males with palps and cement glands bear the only characters with which to separate any two species. Necks have some variation in length among a large suite of females. The only instance of sympatry in this genus, to our knowledge, is in *P. longiceps* and *P. saengeri*, both of which appear in Sagami Bay collections (Nakamura & Child 1983:61–62).

Propallene longiceps (Böhm)

Pallene longiceps Böhm, 1879:59–60.

Propallene longiceps.—Nakamura & Child, 1983:61–62 [literature].—Kim & Hong, 1986:41.—Hong & Kim, 1987:158.

Material examined.—Okinawa: Heanza Shima, 30 Apr 1987; 11 ♂ with eggs.

Distribution.—This species was believed

to be endemic to the main Japanese Islands until it was reported from the Korean coast by Kim & Hong (1986:41). This record is the first for the species from the Ryukyus. Further collecting in these many islands will possibly yield other endemics from the main islands to the north.

Remarks.—One of the most common pycnogonids in Sagami Bay, this species has more than 10 cement gland tubes per leg which are usually confined to the ventral femur and has a palp almost as long as the proboscis with a constriction in the second or longest segment.

Family Nymphonidae

Genus *Nymphon* Fabricius, 1794

Nymphon diabolus Child

Nymphon diabolus Child, 1988a:23–25, fig. 10; 1988b:75.

Material examined.—Sakishima: Funaura Bay, Iriomote Island, night, at surface, 3 Jun 1986; 1 ♀.

Distribution.—This species was described from specimens taken in Negros Oriental Province, central Philippines, and was subsequently found on Aldabra Atoll, Indian Ocean. All collecting depths are very shallow. Its distribution is extended northward to the Ryukyus by the above record. This is the first known record of the species being taken in a night plankton haul at the surface.

Remarks.—This specimen is very much like the adult female listed under other material from the Philippines. The species is notable for its reduced anterior size (chela, proboscis and palps) in relation to its trunk, for the “horns” at the ocular tubercle apex, for the short main and auxiliary claws as related to the length of the propodus, and for the slender graceful chela having long fingers bearing from 9 to 12 long pointed teeth. This female has the marked horns of the Philippine specimen, but there are slight variations in the tarsus-propodus ratio and the oviger denticulate spine count.

Nymphon, species indeterminate

Material examined.—Sakishima: Iriomote Island, 11–20 m, 7 Jun 1987; 1 juv.

Remarks.—This juvenile is close to *N. micronesicum* Child, but is insufficiently developed for determination. It has the tiny lateral tubercles on the ocular tubercle, but without horns, and has short auxiliaries and a main claw with rugosities. The bifurcate chelae teeth are on much more slender fingers which strongly overlap at the tips, unlike those of the type specimen. The ovigers are not sufficiently developed to permit comparison.

Family Austrodecidae

Genus *Austrodecus* Hodgson, 1907

Austrodecus tubiferum Stock

Austrodecus gordonae (part).—Stock, 1954: 153, fig. 76e.

Austrodecus tubiferum Stock, 1957:75–77, fig. 43.

Material examined.—Okinawa: Horse-shoe Cliffs, 1 km WNW of Onna Village, 73.2 m, coll. R. F. Bolland, 28 Sep 1981; 1 ♀.

Distribution.—This species is only known from off Okinose in Sagami Bay, Japan, at 183 meters (type locality) and the above specimen extends this distribution south to the Ryukyus in shallower water.

Remarks.—This female conforms very well to the figures given for the type (a male), except that the median trunk tubercles and those of the first coxae are smaller, the oviger is very similar, and the palp has the deep cleft in its terminal segment although there is apparently no indication of a suture line beyond the cleft as shown for the type (Stock 1957:76, fig. 43c).

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All specimens are deposited in the National Museum of Natural History, Smithsonian Institution, under the catalog numbers of the old U. S. National Museum system.

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