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Korean Pycnogonids Chiefly Based on the Collections of the Korea Ocean Research and Development Institute

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한국산 바다거미류, 주로 해양연구소에 보관되어 있던 재료에 대하여

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적 요

37개 지점으로부터 채집된 약 500개체의 한국산 바다거미류를 조사한 결과 13속 30종이 구별되었다. 이중 4종(*Ammothella monotuberculata, Ascorhynchus stocki, Paranymphon magnidigitum* 및 *Cheilopallene nodulosa*)은 신종이며 종명미상의 1종을 포함한 6종이 한국내 미기록종인 것으로 밝혀졌다. 불가사리에 기생하는 *Decachela dogieli* Losina-Losinsky에 대해서도 기록하였다.

Key words: Pycnogonids, Taxonomy, Korea.

In our previous paper (Kim & Hong, 1986) we recorded 21 Korean pycongonids on the basis of the materials deposited in the Korea Ocean Research and Development Institute (KORDI). But our knowledge about Korean Pycongonida is still fragmentary, and the majority of recorded pycongonids were sampled from the shallow waters.

The specimens on which the present work is based were collected partly by the junior author at several localities (open circles in Fig. 1), but most of them are those newly sorted by the senior author from the KORDI collections of marine organisms which include the materials taken during the benthic survey on the continental shelf of the Yellow Sea.

As a result of examination, it was found that they were revealed to represent 30 species belonging to 13 genera, including 4 new and 1 unnamed species. Most of them are common and rediscovered in Korean waters, but one third of them (10 species including the new species: marked with an asterisk in the following list) are added for the first time to Korean pycnogonid fauna, which comprises now 36 species, since 26 species were previously recorded. The materials examined in this paper are deposited in the Department of Biology, Kangreung National University, Korea.

Before going further one of the authors (IHK) should like to express his thanks to Dr. C. A. Child, U. S. National Museum of Natural History, Smithsonian Institution for the loan of several specimens.

Family Ammotheidae

1. *Achelia bituberculata* Hedgpeth
2. *Achelia echinata sinensis* (Lou)
3. **Ammothea hedgpethi* Utinomi
4. *Ammothea hilgendorfi* (Böhm)
5. *Ammothella biunguiculata* (Dohrn)
6. *Ammothella indica* Stock
7. **Ammothella monotuberculata,* new species
8. *Ascorhynchus glaberrimum* Schimkewitsch
9. *Ascorhynchus ramipes* (Böhm)
10. **Ascorhynchus stocki,* new species
11. **Paranymphon spinosum* Caullery
12. **Paranymphon magnidigitum,* new species
13. *Tanystylum ulreungum* Kim

Family Callipallenidae

14. *Callipallene amaxana* (Ohshima)
15. *Callipallene dubiosa* Hedgpeth
16. *Callipallene sagamiensis* Nakamura & Child
17. **Cheilopallene nodulosa,* new species
18. **Decachela dogieli* Losina-Losinsky
19. *Propallene longiceps* (Böhm)

Family Nymphonidae

20. *Nymphon akane* Nakamura & Child
21. **Nymphon elongatum* Hilton
22. **Nymphon japonicum* Ortmann
23. *Nymphon striatum* Losina-Losinsky
24. *Nymphon uniunguiculatum* Losina-Losinsky

Family Phoxichilidiidae

25. *Anoplodactylus erectus* Cole

26. *Anoplodactylus hwanghaensis* Kim & Hong
27. *Anoplodactylus pycnosoma* (Helfer)
28. *Anoplodactylus viridintestinalis* (Cole)
29. **Anoplodactylus* spec. α Stock

Family Pycnogonidae

30. *Pycnogonum koreanum* Kim & Stock

List of collecting sites (Fig. 1) and collected species.

1. Off Taejin, from fishing net, 1/1987: *Nymphon striatum.*
2. Off Kŏjin, from fishing net, 19/1/1985: *Nymphon striatum.*
3. Off Sokch'o, from fishing net, 17/11/1984: *Nymphon striatum.*
4. Off Namae, from a starfish, *Solaster* sp., 11/2/1983: *Decachela dogieli.*
5. Off Chumunjin, from fishing net, 1) 6/10/1986: *Nymphon elongatum.* 2) 10/12/1986: *Nymphon uniunguiculatum.*
6. Changho, 1) 5 m depth, cave, 20/7/1984: *Tanystylum ulreungum.* 2) littoral, 2/6/1986: *Pycnogonum koreanum.*
7. Off Imwŏn, 1) 25/5/1986: *Nymphon striatum.* 2) about 10 m depth, 2/8/1986: *Ammothea hedgpethi, Nymphon striatum.* 3) 27/12/1986: *Nymphon striatum.*
8. Namyang in Ullŭng-do, 5-7 m depth: *Callipallene dubiosa, Bradypallene espina* (already recorded by Kim & Hong, 1987).
9. Tokt'o, 1/10/1981. 1) littoral: *Anoplodactylus pycnosoma.* 2) 2 m depth: *Achelia bituberculata, Ammothea hilgendorfi, Anoplodactylus pycnosoma, A. viridintestinalis, Tanystylum ulreungum.*
10. Ulsanman, soft bottom, 20 m depth, 13/2/1984: *Ammothella monotuberculata,* n. sp.
11. Off Pusan, from fishing net. 1) from a starfish, 1/7/1970, Dr. H. S. Kim: *Decachela dogieli.* 2) 3/11/1986: *Nymphon japonicum.*
12. Chinhaeman, 3/1983. 1) Ungdo: *Ammothea hilgendorfi, Anoplodactylus viridintestinalis.* 2) Taejukt'o: *Ammothella indica, Anoplodactylus viridintestinalis.* 3) Chamdo: *Achelia bituberculata, Ammothea hilgendorfi, Anoplodactylus viridintestinalis.* 4) near Korea Heavy Industries Co.: *Anoplodactylus viridintestinalis.*
13. Hansan-do, about 8 m depth, soft bottom. 1) 8/1984: *Ascorhynchus stocki,* n. sp. 2) 9/1984: *Achelia bituberculata, Ascorhynchus glaberrimum, A. ramipes.* 3) 8/1987: *Propallene longiceps, Callipallene amaxana.*
14. Kwangyangman, 1) Myodo, littoral, 7/1983: *Achelia echinata sinensis, Ammothea hilgendorfi.* 2) soft bottom, with a pinnid bivalve, Atrina pectinata, 7/1983: *Ascorhynchus stocki,* n. sp.
15. Kamakman, soft bottom, 5 m depth, 9/1980: *Ascorhynchus stocki,* n. sp.
16. Sŏgwip'o, from the gastrovascular cavity of a sea anemone, 5 m depth, Dr. J. I. Song, 12/7/1985: *Ammothella biunguiculata.*
17. Mara-do, 29/7/1984. 1) littoral: *Achelia bituberculata.* 2) 3 m depth: *Achelia bituberculata.* 3) 5 m depth: *Achelia bituberculata, Ammothea hilgendorfi.*
18. Mosŭlp'o, from fishing net, 16/8/1985: *Achelia echinata sinensis, Anoplodactylus erectus.*

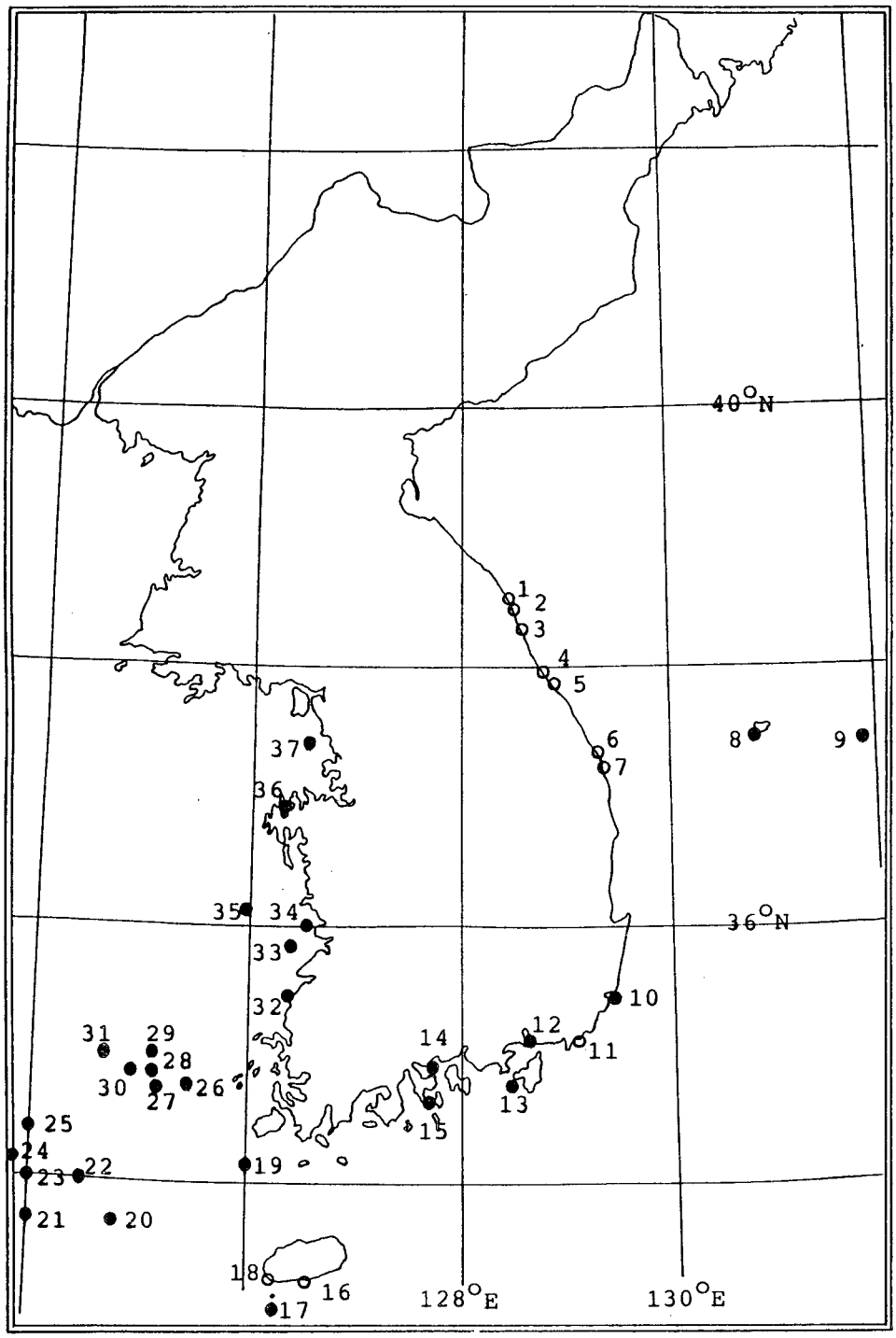

Fig. 1. Collecting sites (See the list on page *139-141*).

19. 34° 10′N, 126°00′E, soft bottom, 40 m depth, 11/1984: *Pycnogonum koreanum.*
20. 33°40′N, 124°50′E, soft bottom, 75 m depth, 11/1984: *Paranymphon spinosum, Nymphon japonicum.*
21. 33°40′N, 124°00′E, soft bottom, 74 m depth, 11/1984: *Paranymphon spinosum.*

22. 34°00′N, 124°30′E, soft bottom, 92 m depth, 8/1982: *Paranymphon spinosum.*
23. 34°00′N, 124°00′E, soft bottom, 85 m depth, 8/1982: *Paranymphon spinosum.*
24. 34°10′N, 123°30′E, soft bottom, 70 m depth, 11/1984: *Paranymphon spinosum.*
25. 34°20′N, 124°00′E, soft bottom, 72 m depth, 8/1983: *Paranymphon spinosum.*
26. Hojang-do, 34°42′N, 125°30′E, 20/8/1983. 1) on *Septifer virgatus*, littoral: *Ammothea hilgendorfi.* 2) on *Septifer virgatus*, infralittoral: *Achelia echinata sinensis, Callipallene dubiosa, Pycnogonum koreanum.* 3) on *Sargassum thunbergii*: *Achelia bituberculata, Ammothea hilgendorfi, Callipallene dubiosa.* 4) on *Hizikia fusiformis: Ammothea hilgendorfi.* 5) 5 m depth: *Ammothea hilgendorfi.*
27. Hongdo, littoral, 20/8/1982: *Callipallene dubiosa.*
28. 34°50′N, 125°10′E, soft bottom, 102 m depth, 8/1983: *Paranymphon spinosum.*
29. 35°00′N, 125°10′E, soft bottom, 59 m depth, 8/1982: *Paranymphon magnidigitum*, n. sp.
30. 34°50′N, 125°00′E, soft bottom, 68 m depth, 8/1983: *Paranymphon magnidigitum*, n. sp.
31. 35°00′N, 124°40′E, soft bottom, 100 m depth, 8/1982: *Paranymphon spinosum.*
32. Kyema-ri, 35°25′N, 126°27′E, 4/1986: *Achelia echinata sinensis.*
33. Sŏnyu-do, 35°48′N, 126°26′E, 12/81983. 1) on *Sargassum thunbergii*: *Callipallene dubiosa.* 2) on *Sargassum piluliferum*, infralittoral: *Achelia echinata sinensis, Ammothea hilgendorfi, Cheilopallene nodulosa*, n. sp.
34. 36°00′N, 126°30′E, soft bottom, 15 m depth, 8/1982: *Ascorhynchus ramipes.*
35. Ŏchŏng-do, 36°07′N, 126°59′E, on algae, infralittoral, 18/8/1982: *Achelia bituberculata, Ammothea hilgendorfi, Callipallene dubiosa.*
36. Karorimman, 1) Kopa-do, soft bottom, 12/1980: *Ascorhynchus ramipes.* 2) 8/1981: *Ascorhynchus ramipes.* 3) bottom trawl, soft bottom, 27/5/1981: *Ascorhynchus ramipes, Pycnogonum koreanum.* 4) Kopa-do, soft bottom, 10/1981: *Ammothea hilgendorfi, Ascorhynchus ramipes, Callipallene dubiosa, Nymphon akane.* 5) Hwangkŭm-do, hard bottom, 10/1981: *Ammothea hilgendorfi, Anoplodactylus hwanghaensis.* 6) Soft bottom, 10/1981: *Achelia echinata sinensis, Ammothea hilgendorfi, Ascorhynchus ramipes, Callipallene sagamiensis, Nymphon akane.* 7) Kudo, bottom trawl, soft bottom, 11/1981: *Ascorhynchus ramipes.*
37. Chawŏl-do, 37°16′N, 126°18′E, on oysters, 11/8/1983: *Achelia echinata sinensis.*

Systematic account

Family Ammotheidae

1. Achelia bituberculata Hedgpeth, 1949

Achelia bituberculata Hedgpeth, 1949 (p. 287. fig. 41a-g); Stock, 1954 (p. 94, fig. 44); Utinomi, 1962 (p. 97, fig. 4); Nakamura & Child, 1983 (p. 6); Kim, 1984 (p. 537, fig. 6a-i); Kim & Hong, 1986 (p. 46).

Achelia ohshimai Utinomi, 1951 (p. 163, fig. 2); 1954 (p. 18, fig. 8); Kim, 1984 (p. 538, fig. 8a-h).

Material: 9-2): 1 juv.; 12-3): 1♂; 13-1): 1 juv.; 17-1): 2 juv.: 17-2): 2 juv.; 17-3): 3 juv.; 26-3): 1♂; 35: 2 juv.

2. Achelia echinata sinensis (Lou, 1936)

Achelia echinata orientalis: Hedgpeth, 1949 (p. 318).

Achelia echinata: Utinomi, 1954 (p. 11, figs. 4, 5); 1959 (p. 201, fig. 1).

Achelia echinata nasuta: Stock, 1956 (p. 98, fig. 16a).

Achelia echinata sinensis: Utinomi, 1971 (p. 328); Nakamura & Child, 1983 (p. 7); Kim, 1984 (p. 537, fig. 7a-i); Kim & Hong, 1986 (p. 46).

Material: 14-1): 2♂♂(1♂ ovi.); 18: 1 juv.; 32: 1♂; 33-2): 1 juv.; 36-6): 1♂, 1♀; 27: 1♂.

3. *Ammothea hedgpethi* (Utinomi, 1959) (Fig. 2)

Lecythorhynchus hedgpethi Utinomi, 1959 (p. 213, figs. 7-9); 1962 (p. 103); 1971 (p. 336).

Material: 7-2): 1♀.

Remarks: The present specimen coincides with types in having the prominent dorsodistal apophysis

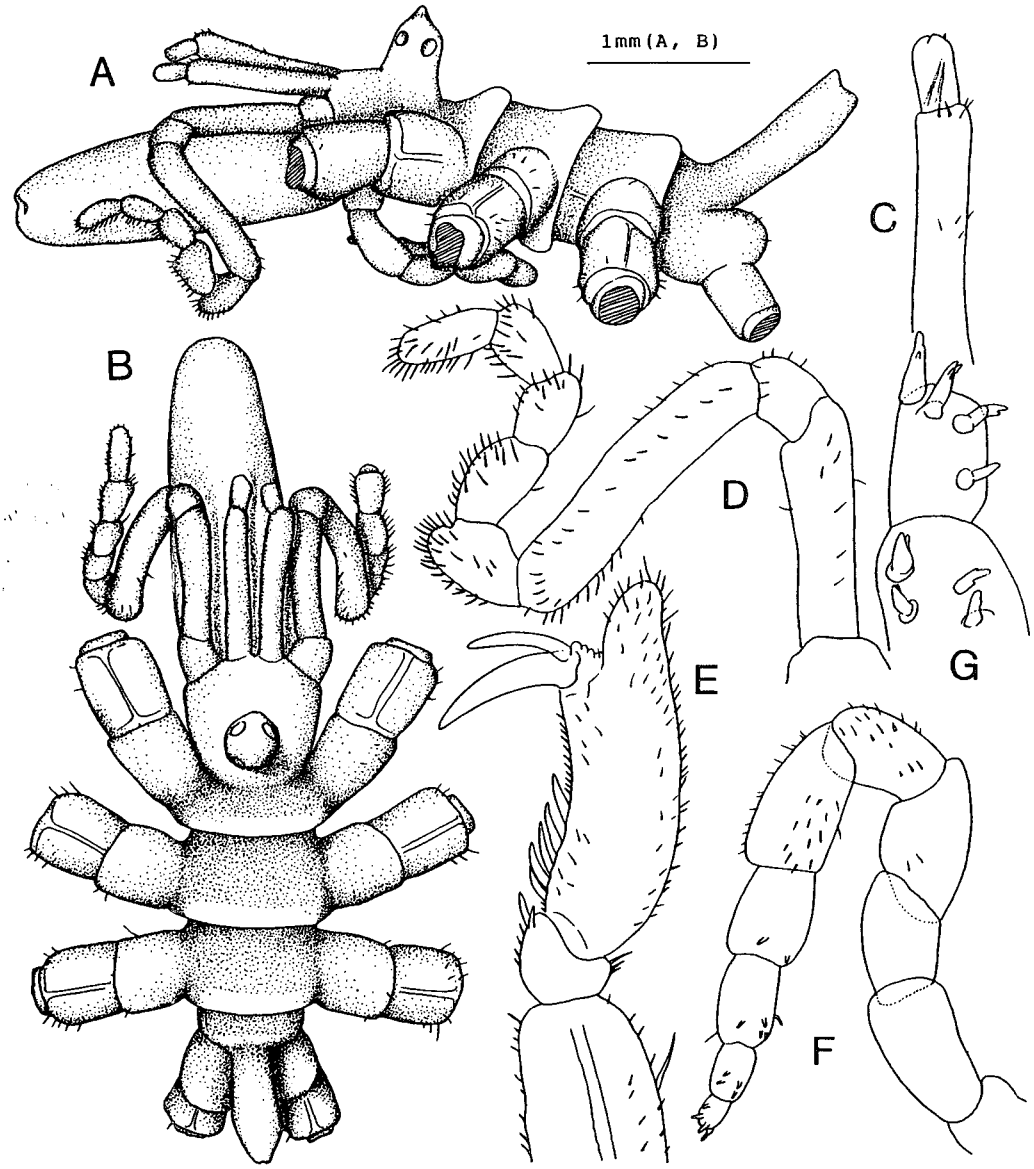

Fig. 2. *Ammothea hedgpethi* Utinomi, female. A, lateral view; B, dorsal view; C, chelifore; D, palp; E, terminal segments of first leg; F, oviger; G, terminal segments of oviger.

of the propodus, the distal expansion of the fifth palp segment, and in the shapes of the chela and oviger spines. But the tip of the abdomen in our specimen is squarish and widened in lateral view instead of tapered appearance in Utinomi's figure. The chelifore is slightly longer than half length of the proboscis, which is slightly tapering toward its tip.

4. Ammothea hilgendorfi (Böhm, 1879)

Lecythorhynchus hilgendorfi: Hedgpeth, 1949 (p. 296, fig. a, b); Utinomi, 1951 (p. 166); 1959 (p. 209, figs. 5, 6); 1971 (p. 336); Losina-Losinsky, 1961 (p. 53).

Lecythorhynchus marginatus Cole, 1904 (p. 260, pl. 11, figs. 1, 2, pl. 15, figs. 1-8); Stock, 1954 (p. 139, fig. 69).

Ammothea hilgendorfi: Child, 1970 (p. 292); Clark, 1977 (p. 174); Kim & Hong, 1986 (p. 48).

Material: 9-2): 2 juv.; 12-1): 12♂♂ (all ovi.), 8 ♀♀, 13 juv.; 12-3): 2♂♂(1♂ovi.), 1 juv.; 14-1): 1♂ (ovi.), 2 ♀♀, 5 juv.; 26-1): 2♂♂, 2♀♀, 15 juv.; 26-3): 2 juv.; 26-4): 1♀, 13 juv.; 26-5): 1 juv.; 33-2): 1 juv.; 36-4): 1♂; 36-5): 1♂; 36-6): 2♂♂, 1♀, 2 juv.

5. Ammothella biunguiculata (Dohrn, 1881) (Fig. 3)

Ammothella biunguiculata: Stock, 1968. (p. 14); Utinomi, 1971 (p. 330); Kim, 1984 (p. 539, fig. 9b-f); Kim & Hong, 1986 (p. 48).

Material: 16: 7 juv.

Remarks: These juvenile specimens taken out from the gastrovascular cavity of a sea anemone belong apparently to *Ammothella biungiculata*.The main claw on the leg is typically vestigial, but still they have 2-segmented chelifores and distinct chela fingers. Palp segmentation is incomplete.

6. Ammothella indica Stock, 1954.

Ammothella indica Stock, 1954 (p. 113, figs. 54-56c, 57a-c); 1968 (p. 11); Utinomi, 1959 (p. 203, figs. 2, 3);

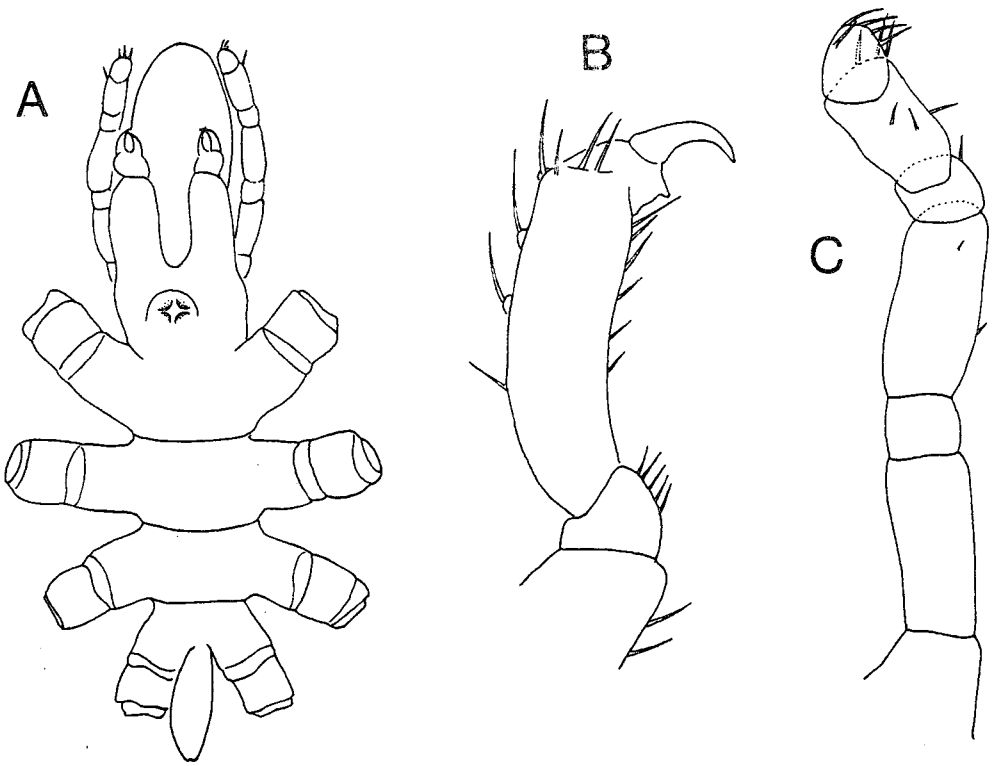

Fig. 3. *Ammothella biunguiculata* (Dohrn). A, dorsal view; B, terminal segments of leg; C, palp.

Kim, 1986 (p. 5, fig. 3); Kim & Hong, 1986 (p. 48).

Material: 12-2): 1 young specimen.

7. Ammothella monotuberculata, new species (Figs. 4, 5)

Material: 10: 3♂♂ (2♂♂ ovi., 1 ovigerous ♂ is holotype), 6♀♀, 1 juv.

Description: Trunk oval in outline, distinctly segmented between segments 1 and 2, and segments 2 and 3. Lateral processes separated by slightly more than their diameter distally, twice as long as

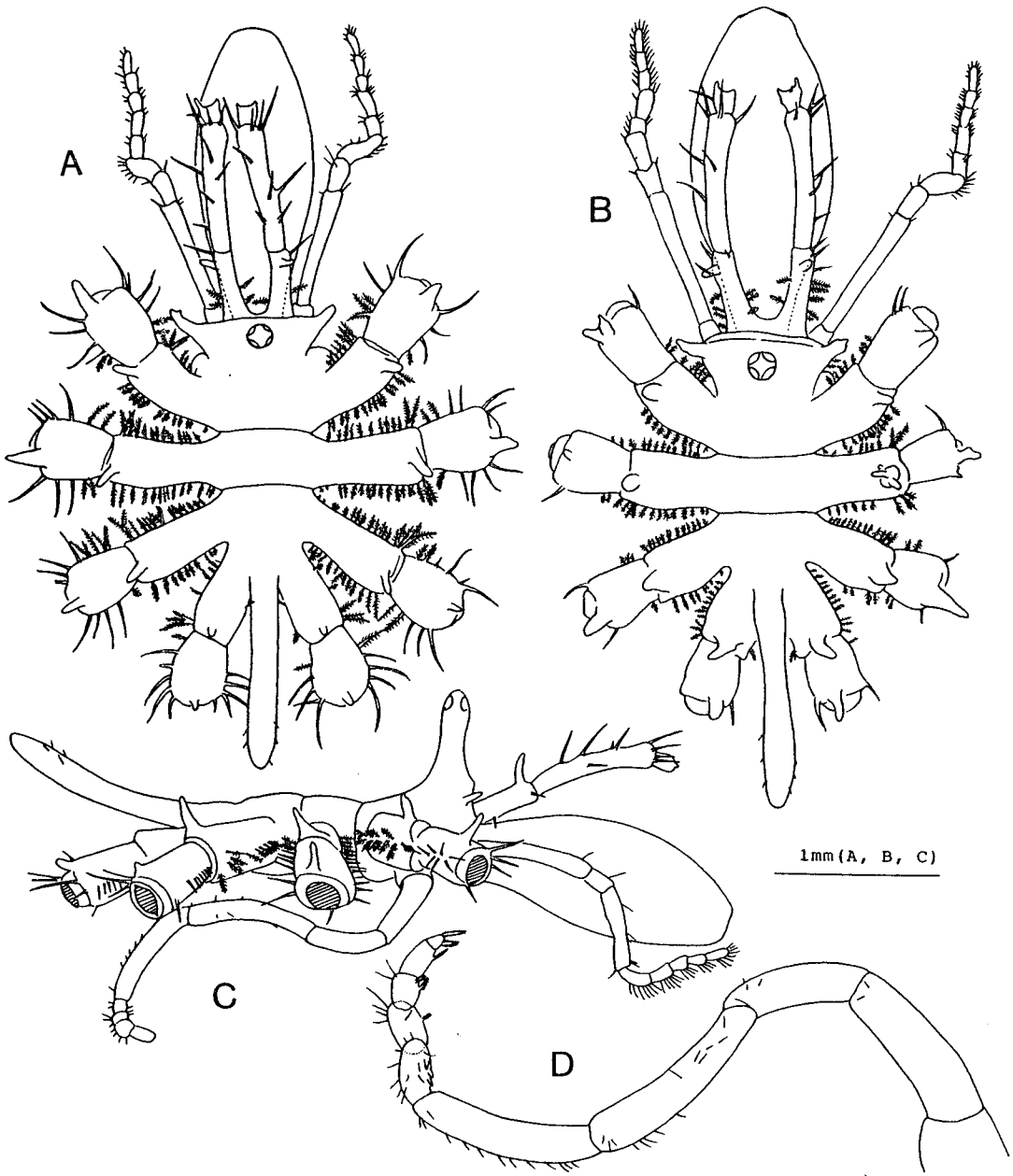

Fig. 4. *Ammothella monotuberculata,* new species. A, dorsal view of male (holotype); B, dorsal view of female; C, lateral view of male (holotype); D, oviger (holotype).

the diameter, armed with single dorsodistal tubercle and many lateral complex spines. Each anterior corner of cephalic segment armed with a large tubercle. Ocular tubercle long, about 3 times as long as its median diameter, rounded at tip. Eyes at tip of ocular tubercle. Proboscis oval, widest at middle. Abdomen long and slender, reaching near middle of second coxa of last legs, slightly curved upward at middle.

Chelifore 3-segmented. First segments of scapes joined basally each other, and both armed with a long dorsodistal tubercle and several complex spines on basal half. Second scape segment twice as long as the first, armed with a number of stiff spines. Chela small, as long as wide. Chela fingers vestigial, located at each disterolateral corners.

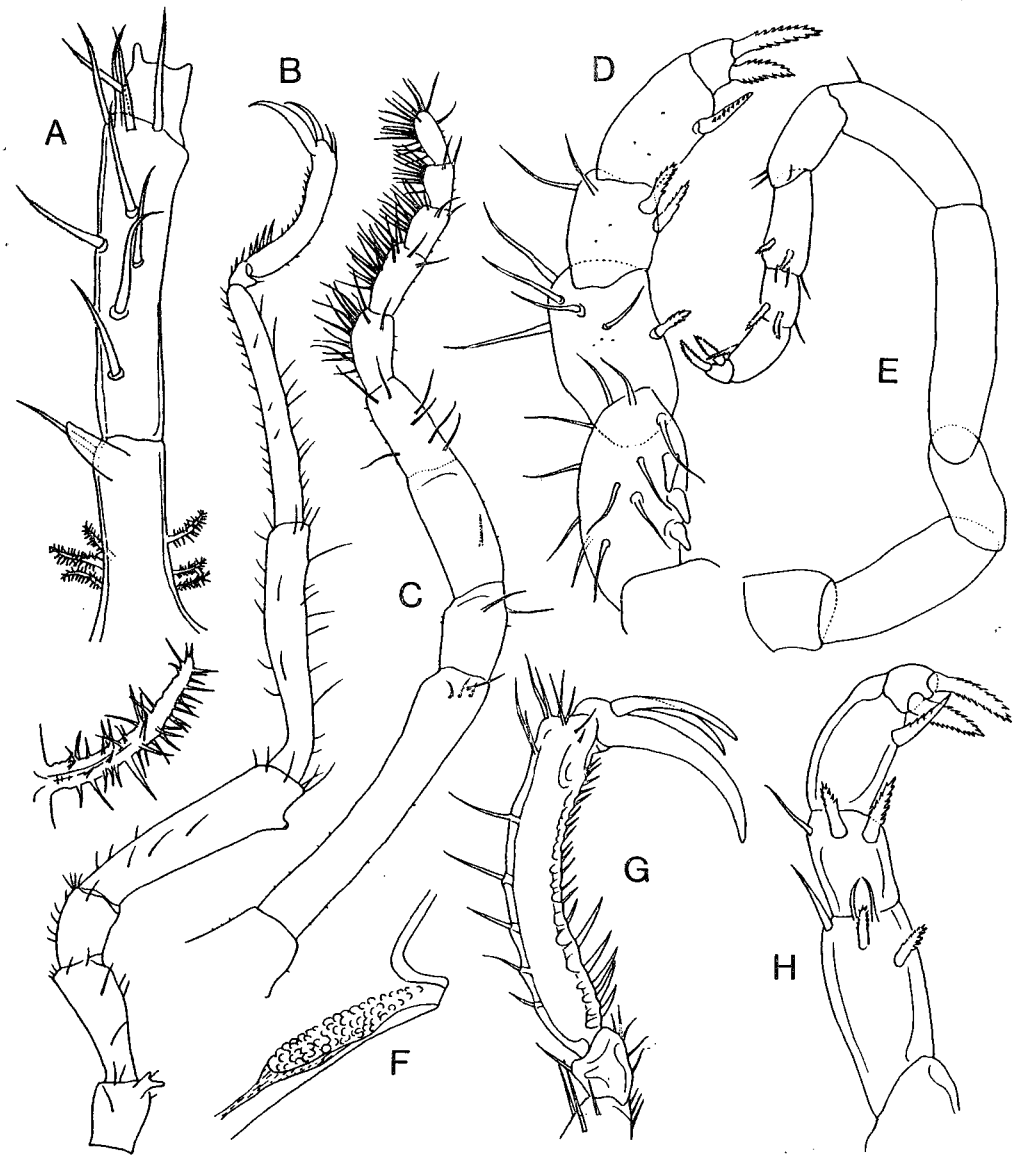

Fig. 5. *Ammothella monotuberculata,* new species. A, chelifore; B, third leg; C, palp; D, terminal segments of oviger, male; E, female oviger; F, cement gland; G, tip of first leg; H, terminal segments of female oviger. A, B, C, D, F and G: holotype.

Palp 9-segmented. Second segment longest. Fourth segment with a faint line at 3/5 the segment length. Terminal 5 segments armed with many long setae on ventral margin.

Oviger 10-segmented. First segment wider than long. Second segment smooth, with few setae distally. Third slightly curved, shorter than the second. Fourth longest, slightly widened distally, with a number of setae. Fifth slightly shorter than the fourth, with a number of setae on outer margin. Terminal 5 segments short. Sixth with 2 or 3 reversed thick spines on inner margin and many spines. Seventh as long as the sixth, with 1 denticulate spine and several spines near distal outer corner. Ninth longer than the eighth, armed only with a denticulate spine. Last segment short, as long as wide, with 2 terminal denticulate spines.

Legs slender. First coxa armed with single dorsal tubercle, 1-3 complex spines on proximal lateral margin and 1 or 2 disterolateral simple spines. Second coxa twice as long as the first. Third coxa subequal to the first. Femur shorter than first tibia. Femoral cement gland placed at 4/5 the dorsal segment length, with short tube. First and second tibia nearly equal in length. Both tibiae spiniferous. Tarsus short, slightly longer than wide. Propodus curved, longer than half length of second tibia, without heel, but armed with 4 or 5 large heel spines. Sole armed with a number of short spines. Claw more than half the propodus length. Auxiliary claws slender, over half of main claw length.

Measurement of holotype (mm). Trunk length (from frontal margin of cephalic segment to tip of fourth lateral processes), 1.92; trunk width (across second lateral processes), 1.89; proboscis length, 1.75; abdomen lenght, 1.13; third leg: first coxa, 0.40; second coxa, 0.75; third coxa, 0.43; femur, 1.35; first tibia, 1.51; second tibia, 1.50; tarsus, 0.15; propodus, 0.75; claw, 0.48; auxiliary claw, 0.29.

Remarks: This species is similar to *Ammothella cymosa* Nakamura & Child, 1983 in having complex spines on the lateral sides of the lateral processes. But unlike the new species *A. cymosa* have unsegmented trunk, and the lateral processes, the first coxa and the first segment of the chelifore scape are not armed with tubercles. When considered the tuberculation, the new species allied to *A. rostrata* Losina-Losinsky, 1961. The two species equally have long abdomen, conspicuous tubercle on anterior corners of cephalic segment and similar armature of chelifore. Though Losina-Losinsky's illustrations are not far from diagrammatic, her figures about *A. rostrata* show enough that the lateral processes are armed with 2 or more tubercles and the first coxae also armed with 2 or 3 isolated slender tubercles, whereas the new species bears 1 lateral process tubercle and 1 first coxa tubercle. We think that these differences are sufficient to differenciate them and to establish a new species. This species occurred in a shallow subtidal muddy bottom off Ulsan, Korea.

8. Ascorhynchus glaberrimum Schimkewitsch, 1913

Ascorhynchus glaberrimum: Hedgpeth, 1949 (p. 293); Utinomi, 1955 (p. 26, fig. 15); 1959 (p. 208); Nakamura & Child, 1983 (p. 24, fig. 7); Kim & Hong, 1986 (p. 48, fig. 9).

Material: 13-2): 1♂.

9. Ascorhynchus ramipes (Böhm, 1879)

Aacorhynchus ramipes: Loman, 1911 (p. 6); Hedgpeth, 1949 (p. 292); Utinomi, 1959 (p. 207, fig. 4B); 1962 (p. 99); 1971 (p. 332); Nakamura & Child, 1983 (p. 29); Kim, 1986 (p. 7, fig. 4); Kim & Hong, 1986 (p. 50).

Ascorhynchus latum: Stock, 1954 (p. 128, fig. 63 a-c).

Material: 13-2): 1♀; 34: 1♂; 36-1): 1♀; 36-2): 1♂; 36-3): 3♂♂, 4♀♀; 36-4): 6♂♂, 4♀♀; 36-6): 19♂♂, 14♀♀; 36-7): 3♀♀.

10. Ascorhynchus stocki, new species (Figs. 6, 7)

Ascorhynchus spec. A Stock, 1953 (p. 305, fig. 16).

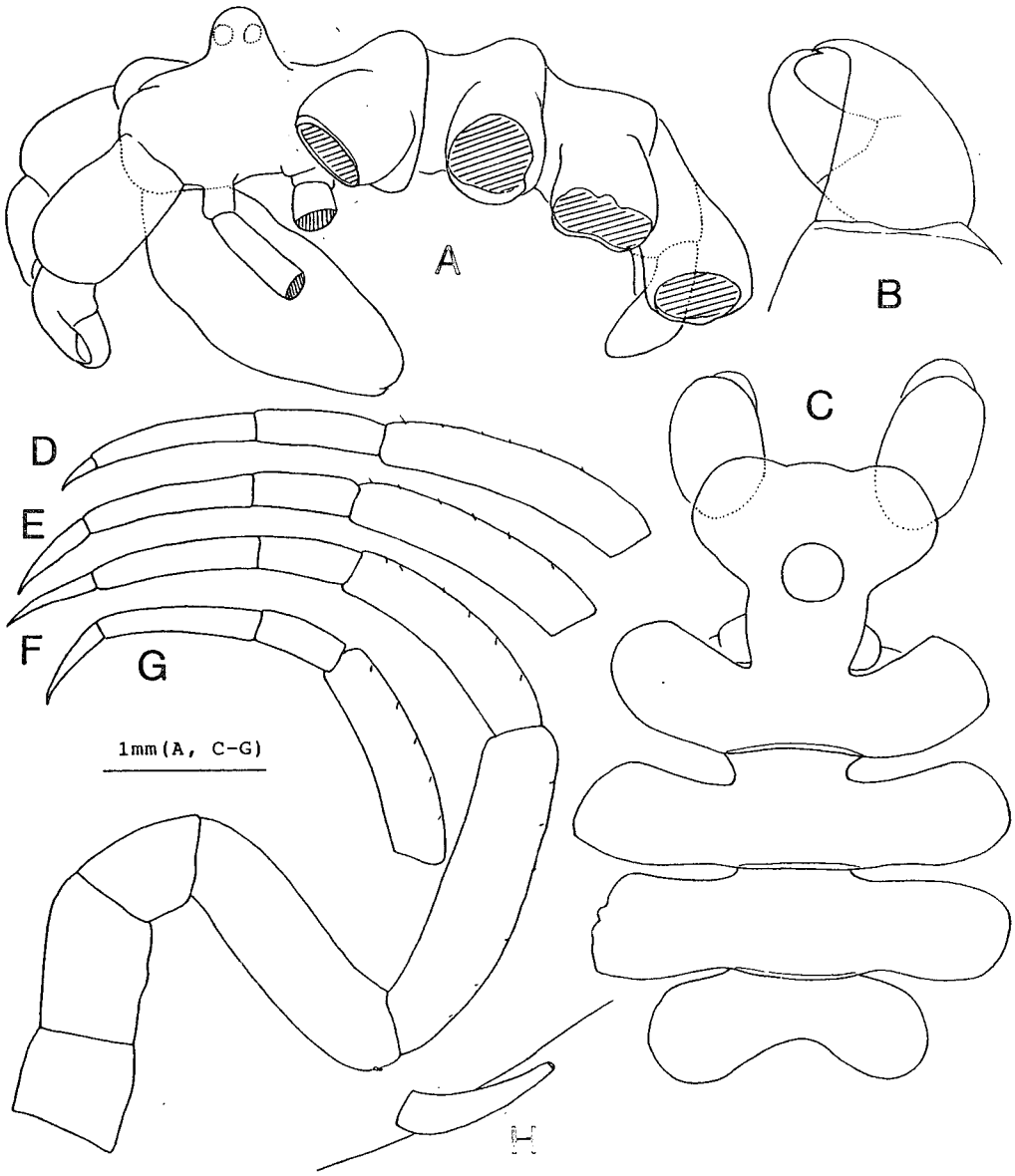

Fig. 6. *Ascorhynchus stocki,* new species, holotype. A, lateral view; B, chela; C, dorsal view; D, terminal segments of first leg; E, terminal segments of second leg; F, third leg; G, terminal segments of fourth leg, H, cement gland.

Material: 13-3): 1♂ (holotype); 14-2): 1♀; 15: 4 young ♂♂, 1♀.

Descriprtion: Stock (1953) described about this species on the basis of immature specimens, and the following is a supplementary description.

Palp 9-segmented. Proximal 3 segments smooth. Fourth segment longest, with a few setae. Fifth segment as long as wide. Terminal 4 segments subequal in length, with many short setae ventrally. Last segment terminates in a spine-like process.

Oviger 10-segmented. First to sixth segments glabrous. First 3 segments each wider than long. Fourth longest and widest. Terminal 4 segments each armed with a row of short simple spines on

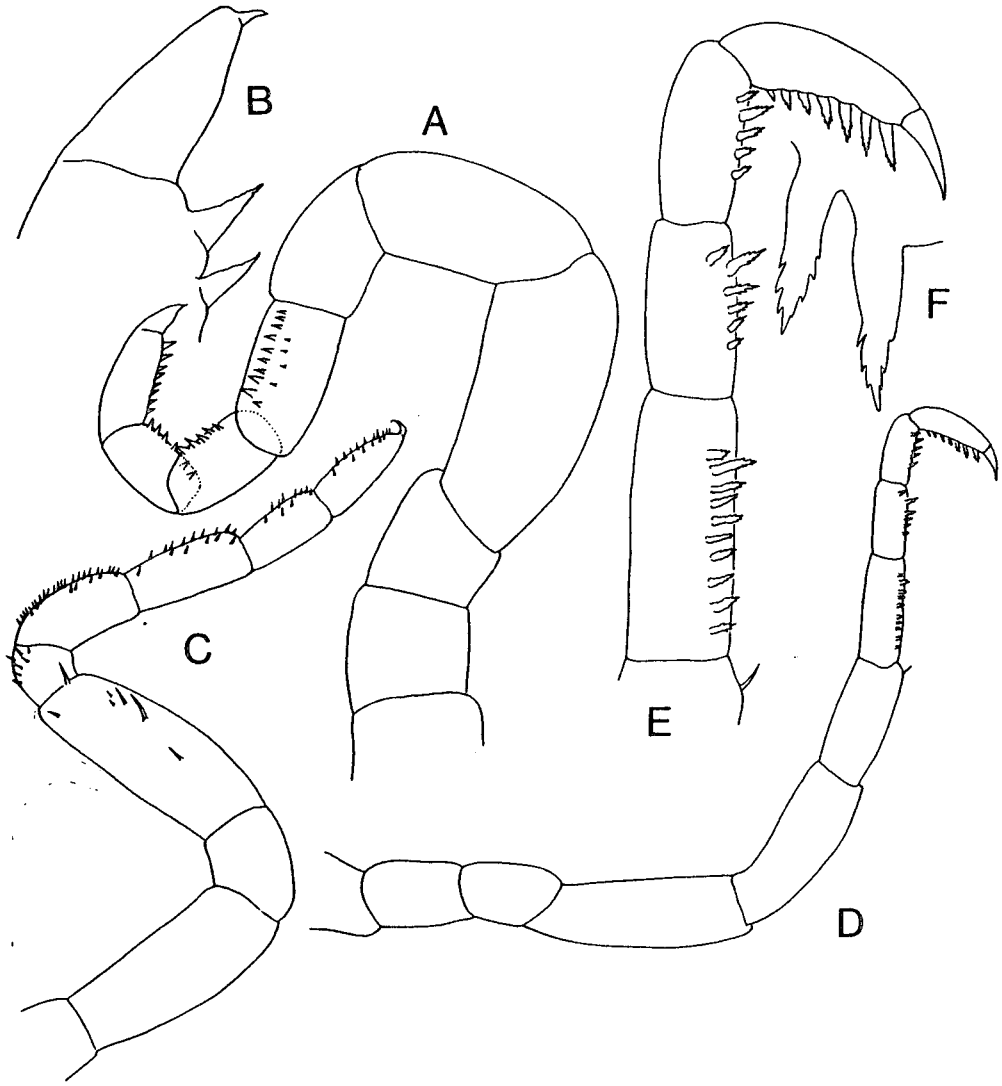

Fig. 7. *Ascorhynchus stocki*, new species. A, male oviger; B, terminal claw of male oviger; C, palp, male; D, female oviger; E, terminal segments of female oviger; F, denticultate spines of female oviger.

ventral margin, and a row of smaller spines on seventh segment. Last segment terminates in a wide claw.

Legs glabrous, only with small setae on first and second tibiae. Femoral cement gland opens dorsodistally through a short, curved cone. First tibia the longest segment.

Other characters are as described by Stock.

Measurement of holotype (mm). Trunk length (frontal margin of cephalic segment to tips of last lateral processes), 4.13; trunk width (across second lateral processes), 2.80; proboscis length, 1.83; abdomen length, 0.90; third leg: coxa 1, 0.68; coxa 2, 0.88; coxa 3, 0.60; femur, 1.60; tibia 1, 2.04; tibia 2, 1.44; tarsus, 0.60; propodus, 1.04; claw, 0.60.

Remarks: Stock (1953) described correctly this species, but he did not give a name because, according to him, of lack of mature material. Immediately on examining our materials under microscope, we could easily recognize them as the same species as Stock's materials. His prediction, "it may be easily recognized if found again", is found to be correct.

Some of our materials were sampled by grab from shallow mud bottom where the pinnid bivalve, *Atrina pectinata* (Linné) was dominated, and we conceive that a kind of association between these two species may be present.

11. Paranymphon spinosum Caullery, 1896 (Figs. 8, 9)

Paranymphon spinosum Caullery, 1896 (p. 361, pl. 12, figs. 1-6); Hedgpeth, 1948 (p. 253, fig. 41); Stock, 1978 (p. 204, fig. 5d-g); Nakamura & Child, 1983 (p. 38); Chimenz & Cottarelli, 1986 (p. 138, figs. 2-13).

Material: 20: 1 juv.; 21: 2♀♀; 22: 1♀; 23: 1♂; 24: 1♀; 25: 1♀; 28: 1♂, 1 juv.; 31: 1 young ♀.

Remarks: A number of materials were collected from the mud bottoms of south Yellow Sea. The body and legs are usually tangled with fibril-like substance. This species have been often recorded from the Atlantic, so that there seems no need to redescribe herewith, but we prepared illustrations about Korean specimens for a comparison with the following new species of this genus.

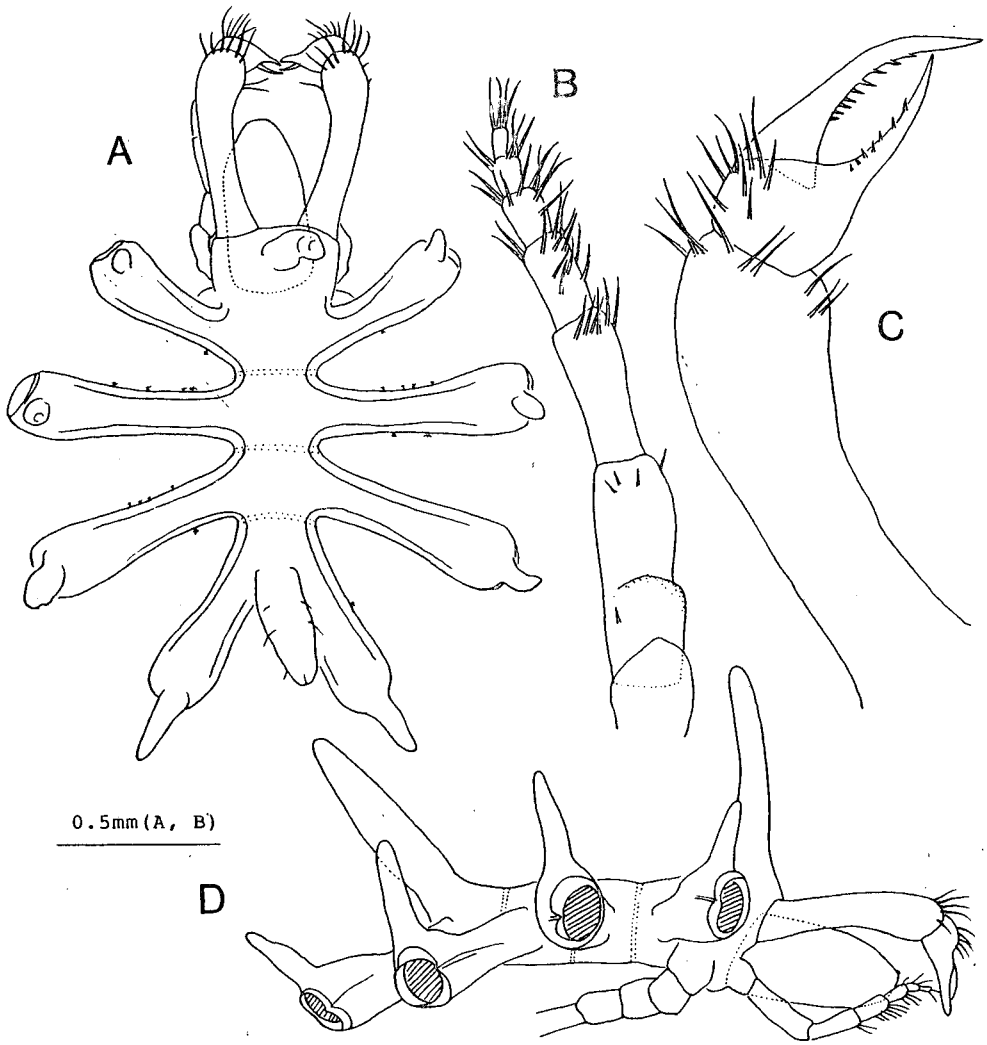

Fig. 8. *Paranymphon spinosum* Caullery, male. A, dorsal view of trunk; B, palp; C, chelifore; D, lateral view of trunk.

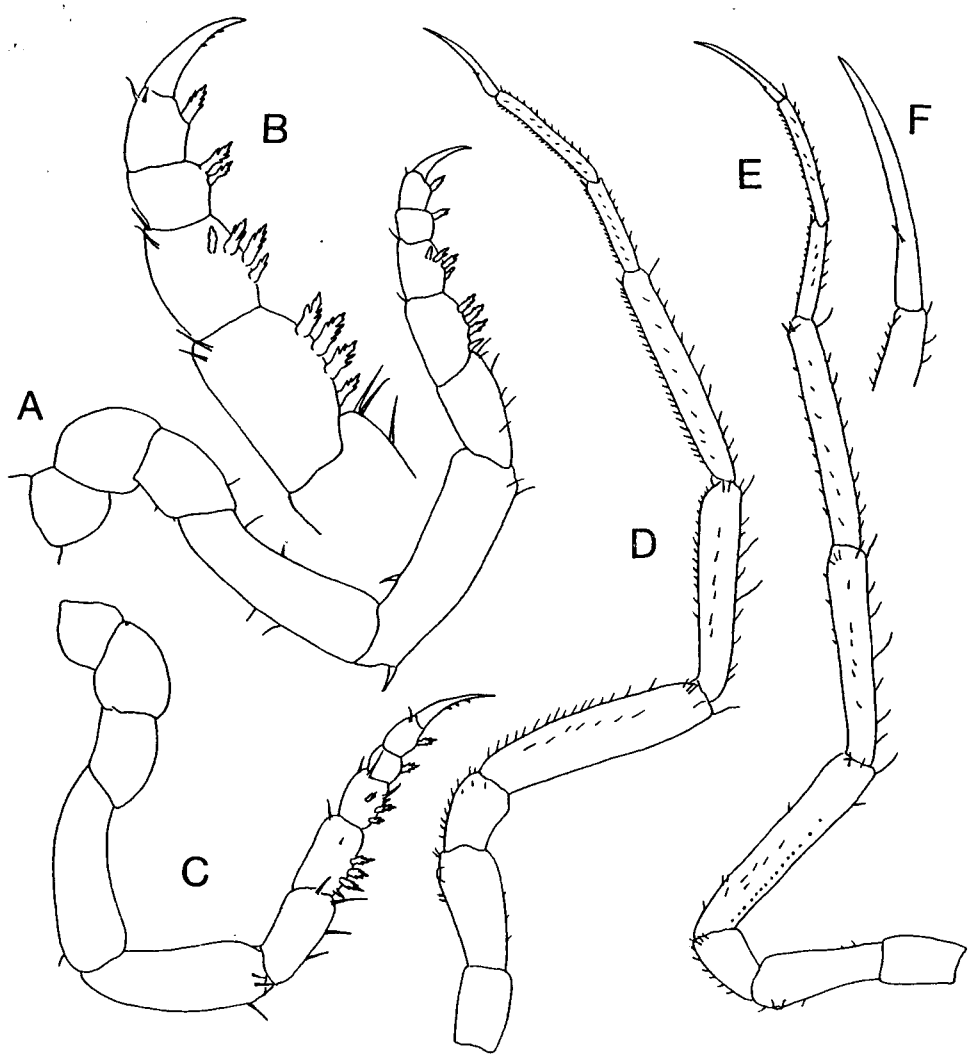

Fig. 9. *Paranymphon spinosum* Caullery. A, male oviger; B, terminal segments of male oviger; C, female oviger; D, third leg of female; E, fourth leg of male; F, main claw of leg.

12. ***Paranymphon magnidigitum,*** new species (Figs. 10, 11)

Material: 29: 2♂♂ (1♂ is holotype), 1♀, 1 juv.; 30: 1 juv.

Description: Body shape and trunk segmentation as *P. spinosum.* Cephalic segment wider than long. Lateral processes separated from each other by more than their diameter distally, with a dorsodistal tubercle, which is not longer than distal diameter of lateral process. Stellate spinules on lateral processes present. Abdomen directed posteriorly at about 45°, shorter than last pair of Lateral processes. Ocular tubercle erect, locate on anterior cephalic segment, about 3 times as high as its diameter, rounded at tip. Eye not visible. Proboscis tubular, a little longer than cephalic segment.

Chelifore scape much longer than proboscis, slightly curved inward distally, with a few setae distally. Fingers large, chelate. Movable finger very long, roundedly curved, with 10 to 12 large reversed teeth. Immovable finger wide, curved at tip, with 11 or 12 large erect teeth.

Palp 7-segmented. Second segment with a swelling at the middle. Third segment much narriower

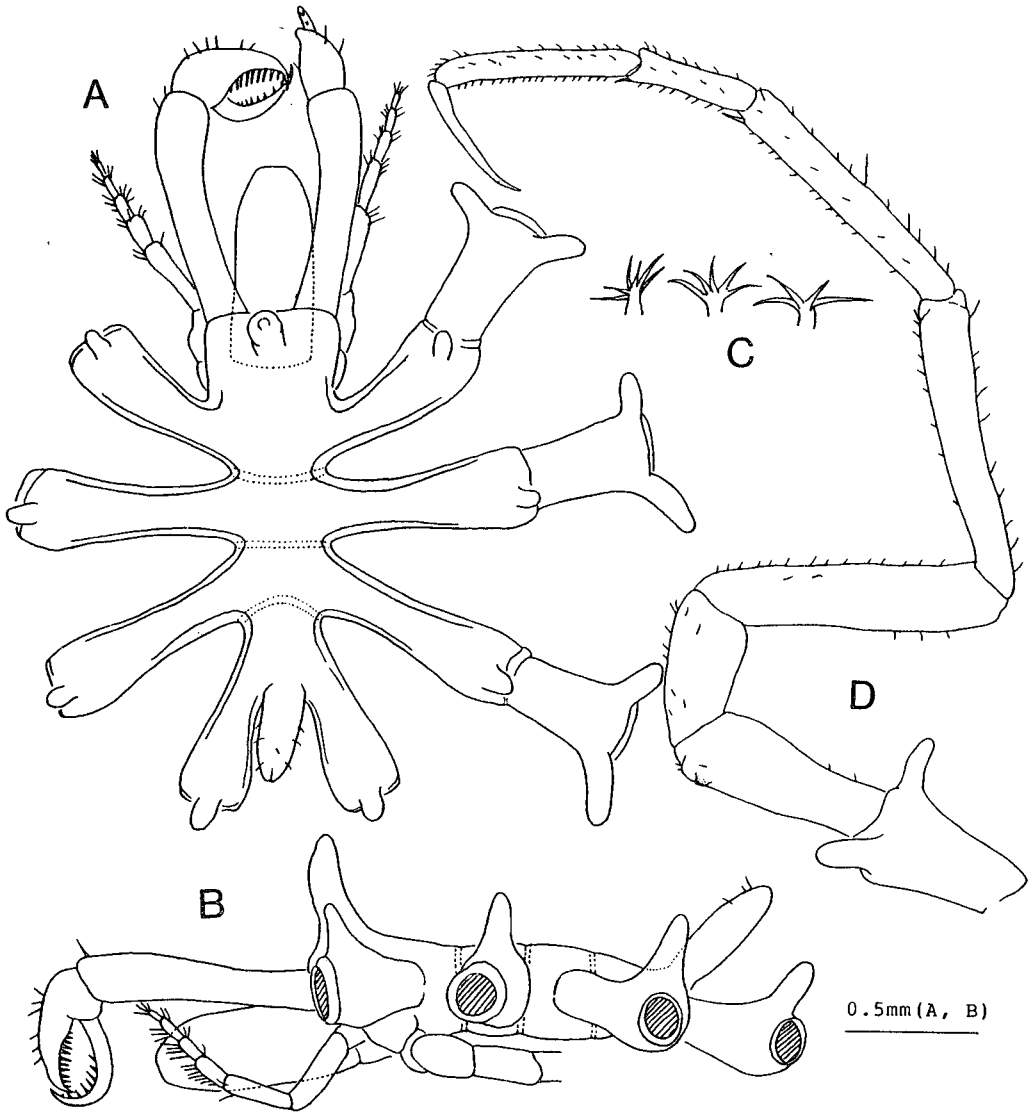

Fig. 10. *Paranymphon magnidigitum*, new specie, holotype, male. A, trunk, dorsal; B, trunk, lateral; C, stellate spinules of lateral processes; D, fourth leg.

than the second, but as long as the second. Terminal segments gradually shorter and narrower, armed each with many setae ventrally and distally.

Oviger fifth segment longest, armed with 2 reversed spines; one on proximal corner of inner margin and another on proximal 1/5 of outer margin. Terminal segments with compound spine formula of 3(4)-3(4)-1-1(2). Each compound spine with 1 or 2 pairs of denticulations. Terminal claw longer than last segment, armed with or without denticles on inner margin.

Legs are all equal in length. First coxa with 2 conspicuous tubercles on each dorsodistal corner, the tubercles as long as those on lateral processes. Sex opening on second coxa present in third and fourth legs. Femoral cement glands about 15 in number, but hardly visible. First, second tibiae and femur nearly equal in length. Tarsus about 3/5 propodus length. Propodus and claw as those of *P. spinosum*.

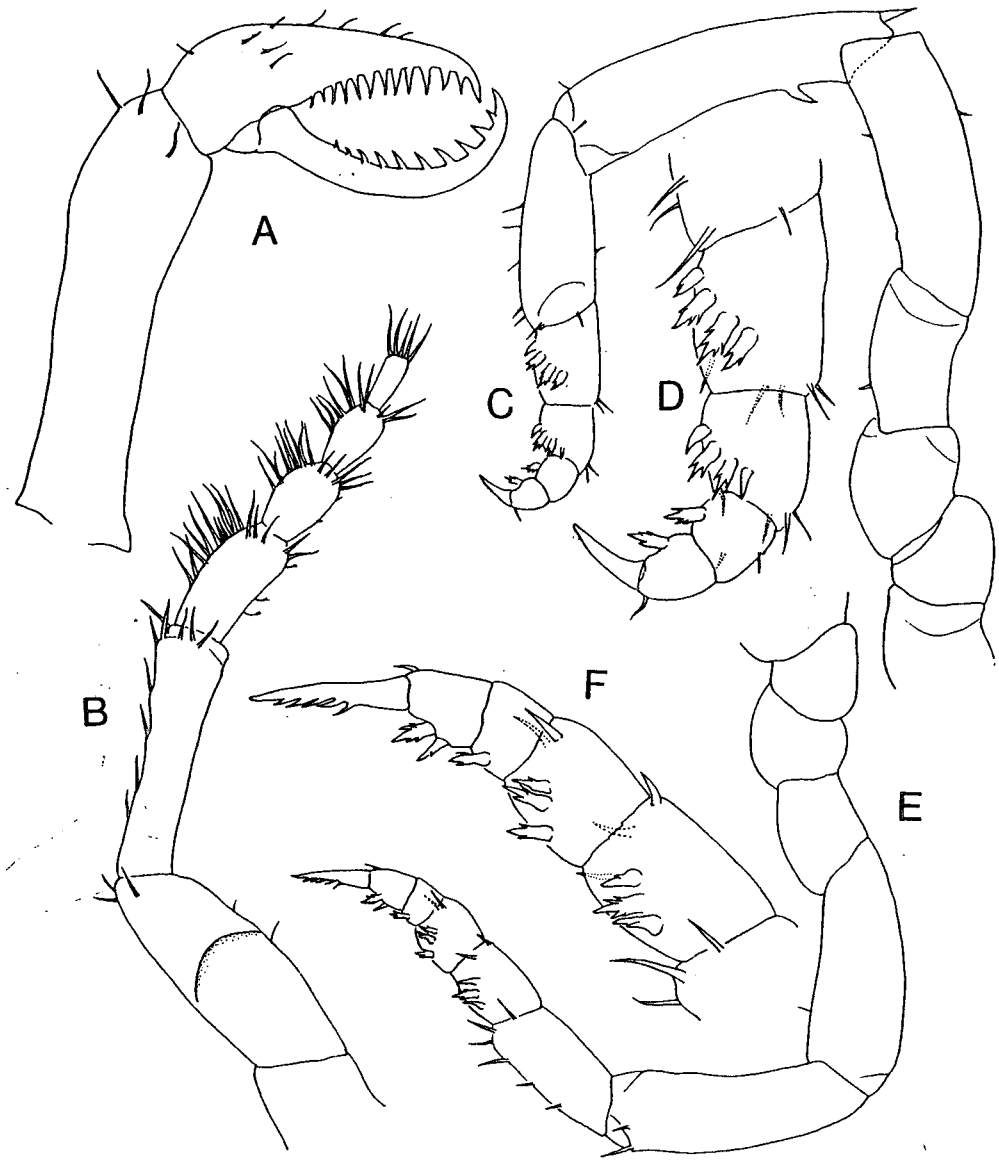

Fig. 11. *Paranymphon magnidigitum,* new species. A, chelifore; B, palp; C, male oviger; D, terminal segments of male oviger; E, female oviger; F, terminal segments of female oviger. A, B, C and D: holotype.

Remarks: The large chela fingers (from which the specific name is originated) and the presence of two tubercles on the first coxa are peculiar to this species. The ocular tubercle, abdomen and lateral processes are markedly shorter than those of other two previously recorded species, *P. spinosum,* 1896 and *P. filarium* Stock, 1986. *P. filarium* has the long, thread-like tubercle on the lateral processes, therefore this species is easily separable from *P. spinosum* and the new species. The morphological and dimensional differences are showed in Table 1 on the basis of Korean materials.

13. Tanystylum ulreungum Kim, 1983

Tanystylum ulreungum Kim, 1983 (p. 467, figs. 1, 2); Kim & Hong, 1986 (p. 50).

Tanystylum nabetensis Nakamura & Child, 1983 (p. 39, fig. 13).

Table 1. Major differences between two *Paranymphon* species collected from Korean waters.

	P. magnidigitum (holotype)	*P. spinosum* (a mature male)
Lateral process tubercle	shorter than distal width of lateral process.	longer than distal width of lateral process.
Ocular tubercle height	0.40 mm.	0.75 mm.
Abdomen length	0.42 mm.	0.75 mm.
movable finger	semi-circular, strong.	moderately curved.
immov. finger	wide.	relatively narrow.
Chelifore		
finger teeth	large, and erect or reversed.	small, directed distally.
length	1.42 mm (0.80+0.62).	0.88 mm (0.55+0.33).
Tarsus/Propodus	about 3/5.	about 3/4.
Trunk length (frontal margin of cephalic segment to tip of 4th lateral process)	1.90 mm.	1.53 mm.
Trunk width (across 2nd lateral processes)	1.94 mm.	1.65 mm.
Palp third segment	as long as second segment.	shorter than second segment.
Oviger fifth segment	longer than fourth segment.	as long as fourth segment.
Fourth leg	5.58 mm (0.50-62.0-0.40-0.90-0.91-0.85-0.38-0.60-0.42).	5.64 mm (0.33-0.60-0.33-1.05 0.95-1.03-0.40-0.55-0.40).

Material: 6-1): 1♂; 9-2): 1♂.

Family Callipallenidae

14. Callipallene amaxana (Ohshima, 1933)

Pallene amaxana Ohshima, 1933 (p. 216, figs. 8-12).

Callipallene phantoma: Utinomi, 1962 (p. 95, fig. 3).

Callipallene phantoma amaxana: Stock, 1968 (p. 37, fig. 14a-d).

Callipallene amaxana: Nakamura & Child, 1983 (p. 57: in key); Kim, 1986 (p. 1, fig. 1); Kim & Hong, 1986 (p. 38).

Material: 13-4): 3♂♂ (all ovi.), 1♀.

15. Callipallene dubiosa Hedgpeth, 1949

Callipallene dubiosa Hedgpeth, 1949 (p. 275, fig. 35); Stock, 1954 (p. 41, fig. 17); Utinomi, 1971 (p. 322); Kim 1984 (p. 535, figs. 4f-i, 5a-c); Kim & Hong, 1986 (p. 38).

Material: 8: 1♀; 26-2): 1♂; 26-3) 1♀; 33-1): 1♂ (ovi.), 1♀; 35: 3♂♂ (2♂♂ ovi.), 1♀; 36-4): 2♂, 1♀.

16. Callipallene sagamiensis Nakamura & Child, 1983

Callipallene sagaminesis Nakamura & Child, 1983 (p. 59, fig. 20); Kim & Hong, 1986 (p. 38).

Material: 36-6): 1♀.

17. Cheilopallene nodulosa, new species (Fig. 12)

Material: 33-2): 1♀ (holotype), 1 juv.

Description: Trunk broad, clearly segmented. Both frontal sides of cephalic segment swollen.

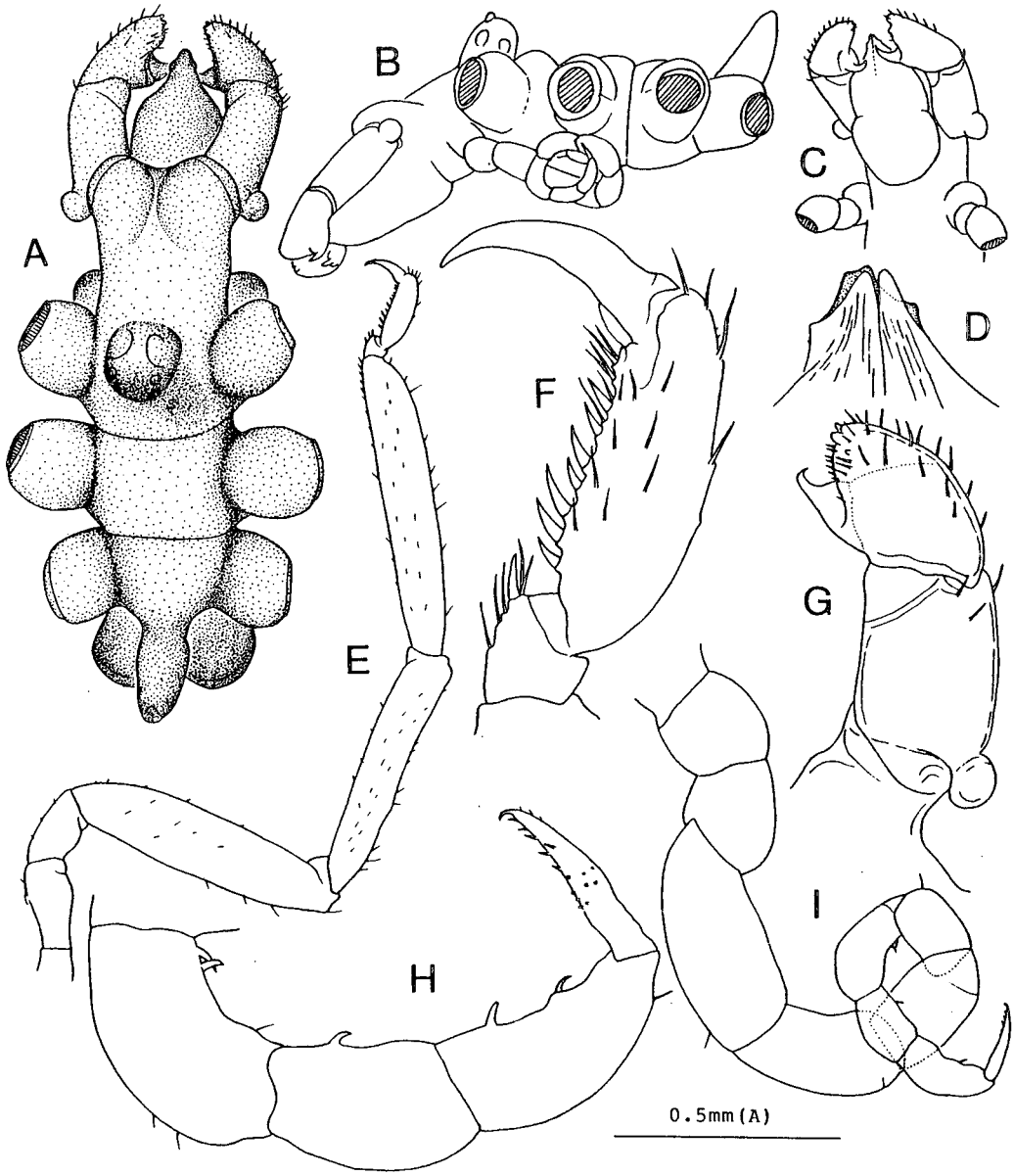

Fig. 12. *Cheilopallene nodulosa,* new species, holotype, female. A, trunk, dorsal; B, trunk, lateral; C, anterior trunk, ventral; D, lips, ventral; E, second leg; F, terminal segments of second leg; G, chelifore; H, terminal segments of oviger; I, oviger.

Cephalic segment longer than remainder of trunk. Lateral processes nearly as long as wide, smooth, separated by less than half of their own diameter, more widely separated anteriorly than posteriorly, bounded by a constriction from trunk. Ocular tubercle as high as wide, slightly directed posteriorly, positioned between first lateral processes, with 2 small globular processes on both sides of tip. Eye visible, but not pigmented. Abdomen obtusely conical in lateral view, but constricted at base in upper view, reaches beyond fourth lateral processes, set at about 45° from horizontal. Proboscis cylindrical, proximal half expanded laterally. Lips tripartite, projecting, with 2 small swellings near base of both sides of upper lip.

Chelifore very robust, based on a swelling of cephalic segment, with a large globular tubercle at outer proximal corner. Movable finger short, curved inward distally, without teeth or spines. Immovable finger armed with many spines and 3 or 4 tubercles near blunt tip.

Oviger thick, 10-segmented. Fourth segment the longest. Terminal 3 segments each armed with 1 or 2 simple, curved spines on inner margin: 2 on eighth proximally, 1 on near middle of ninth, and widely separated 2 on last segment. Last segment as long as eighth, but a little longer than penultimate segment. Terminal claw slightly shorter than last segment, with a number of small spines on inner margin.

Legs moderately thick. First coxa short. Second coxa more than twice as long as first coxa, with sex opening on all legs. Femur and first tibia subequal in length, armed with many setae on all margins. Second tibia the longest segment. Tarsus short, with several spines and 1 larger spine on inner side. Propodus straight, without heel, but with 7 larger spines. Claw slightly curved, about 2/3 times as long as propodus, without auxiliary claws.

Measurement (mm). Trunk length (frontal margin of cephalic segment to tip of fourth lateral process), 1.21; trunk width (across second lateral processes), 0.73; proboscis length, 0.45.

Remarks: The genus *Cheilopallene* Stock, 1955 is weakly defined from other related genera as mentioned by Clark (1971). The genotype was described on the basis of one specimen that has 6-segmented oviger. Since then two other species, i.e., *C. brevichela* Clark, 1961 from Maldive Islands, Indian Ocean and *C. trappa* Clark, 1971 from Snares Islands, southwest Pacific have been recorded. These two species have 10-segmented oviger, and in the latter species the chelifore is of usual shape, but Clark could not assign his two species to any known genera. Therefore the reliable character of the genus differenciating from other genera seems to be remained only by projected lips.

The present species resembles *C. clavigera* and *C. brevichela.* The position of oculr tubercle and the shape of the terminal segments of the legs are like those of *C. clavigera,* but the shapes of trunk and proboscis, and the presence of two processes on the tip of the ocular tubercle are similar to those of *C. brevichela.*

The new species differs from the former species in having the 10-segemnted oviger and shorter lips, and from the latter in having the different shape of the propodus and different position of the ocular tubercle. The presence of the large tubercle, hence the specific name, at base of chelifore is characteristic to the new species.

18. Decachela dogieli Losina-Losinsky, 1961 (Figs. 13, 14)

Decachela dogieli Losina-Losinsky, 1961 (p. 88, fig. 16).

Material: 4: 34♂♂ (32♂♂ ovi.), 21♀♀, 1 juv.; 11-1): 4♂♂ (all ovi.), 3♀♀.

Description: Body circular, disk-shaped. Trunk unsegemnted, dorsal surface smooth or armed with small tubercles. Proboscis cylindrical, about 3 times as long as its width, directed downward at 30° to 45° from horizontal. Cephalic segment a little wider than trunk, expanded anteriorly over base of proboscis. Frontal edge of cephalic segment prominently crenulate in male, but weakly crenulate or smooth in female. Ocular tubercle small, low, placed slightly posteriorly from the middle. Eye weakly or not pigmented. Lateral processes touching each other, narrower at base, dorsodistal edge smooth in female, but in male armed with 1 largest tubercle on anterior corner, smallest 1 on the middle and 1 on posterior corner. Abdomen long, cylindrical, slightly narrower at base, horizontal or slightly directed downward, reaches slightly beyond first coxae of last lateral processes.

Chelifore longer than length of proboscis. Scape smooth in female, but armed with many spine-

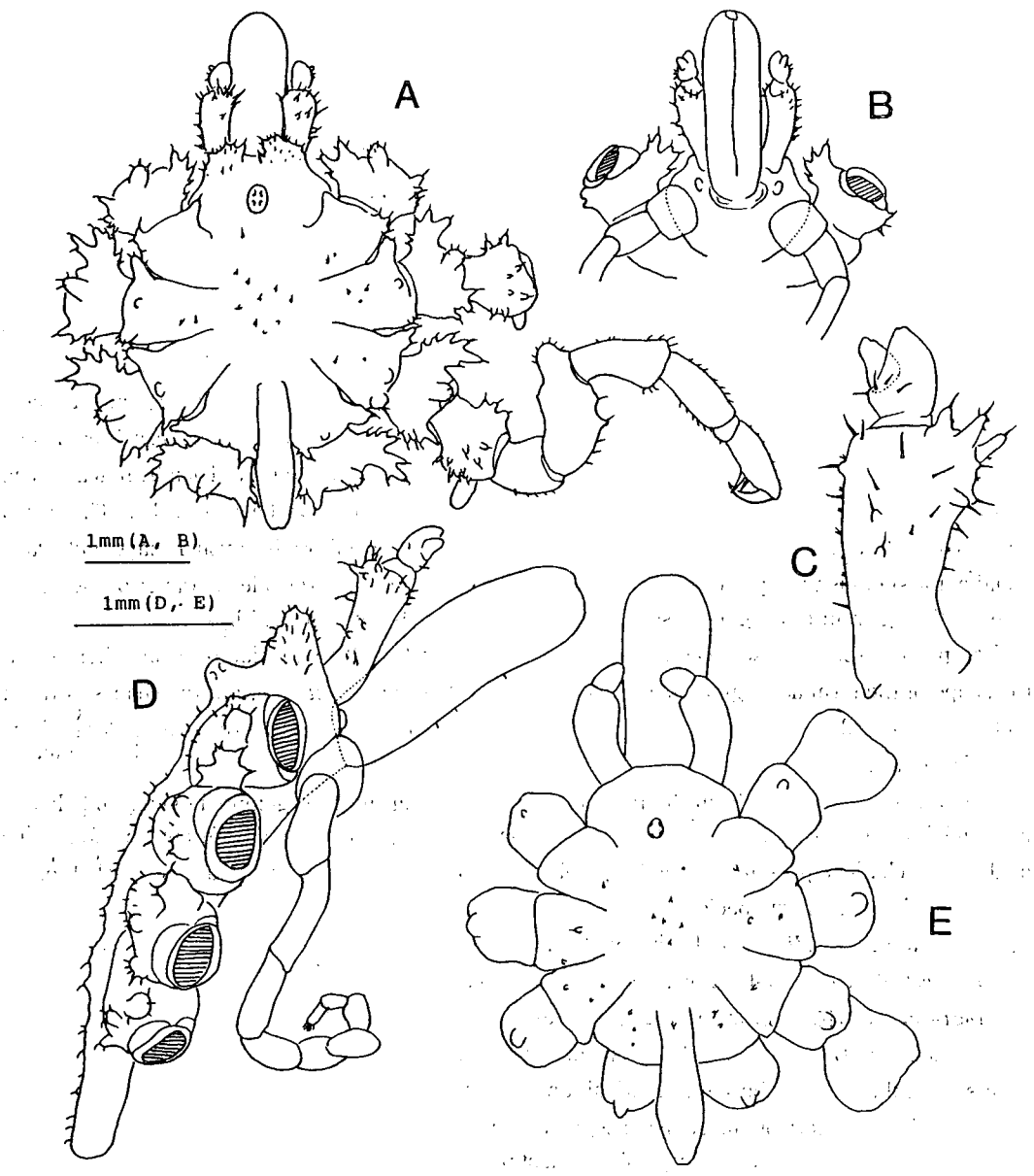

Fig. 13. *Decachela dogieli* Losina-Losinsky. A, trunk and third leg, dorsal; B, cephalic segment, lateral; C, chelifore; D, trunk, lateral; E, trunk, dorsal. A, B, C and D: male; E: female.

tipped tubercles in male. Chela small, subchelate.

Palp present as a rudimentary knob near base of chelifore.

Male oviger 10-segmented. First segment wider than long. Third to eighth segments with setae on outer margin. Third and fourth segments equal in length. Fifth slightly shorter than the fourth. Seventh thick, globular, with setae on outer margin. Terminal 3 segments shorter and narrower, all subequal in length. Eighth and ninth armed distally with several spines. Terminal segment without claw, but armed distally with 4-6, thick, simple spines. Egg clusters 4-11 (usually 6-8) in number, usually cover all ventral side of animal.

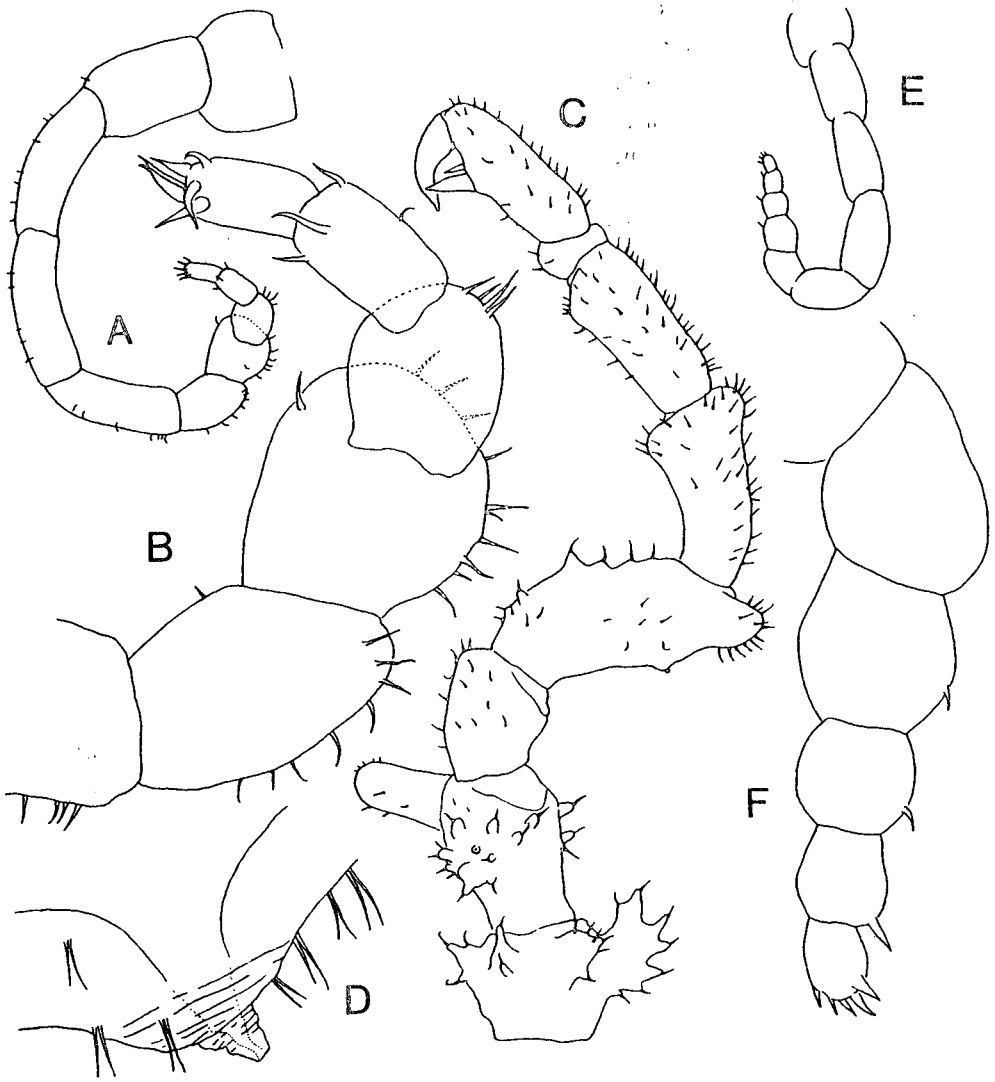

Fig. 14. *Decachela dogieli* Losina-Losinsky. A, male oviger; B, terminal segments of male oviger; C, third leg of male; D, cement gland; E, female oviger; F, terminal segments of female oviger.

Female oviger about 2/3 times as long as that of male. Second to fifth segments subequal in length. Remaining 5 segments arranged straightly, gradually shorter and narrower. Seventh to ninth segments each armed with 1 small simple spine on inner margin. Terminal segment armed distally with 2-5 thick simple spines.

Legs short, spiniferous. First coxa in male armed with a large, palm-like process which has 2-7 spine-tipped, finger-like tubercles on anterodorsal margin, 1 tubercle on the dorsodistal middle and 2-4 spine-tipped tubercles on posterodistal corner. First coxa in female armed only with 1 smooth tubercle on the dorsodistal middle. Second coxa in male armed with many spine-tipped tubercles dorsally and laterally, but smooth in female. Genital process prominent in all legs of male, largest in third leg in which it is twice as long as wide. Female second coxa swollen, with sex opening on all legs. Third coxa as long as wide. Femur with 1-4 tubercles ventrally and a distinct dorsodistal apophysis.

Cement gland opened by a short, cone-shaped tube near middle of dorsal surface of femur. First and second tibiae subequal in length, armed each with many setae on all margins. Tarsus short, much wider than long. Propodus 3 times as long as wide, without heel, but with a large heel spine on distal third of sole and with a small subsidiary spine distally just near heel spine. Claw strong, curved, giving chelate appearance with heel spine. Auxiliary claw absent.

Measurement of a mature male (mm). Trunk length (frontal margin of cephalic segment to tip of fourth lateral process), 3.50; trunk width (across second lateral processes), 2.85; proboscis length, 1.85; abdomen length, 1.40; chelifore length, 1.20; third leg, 6.20 (0.54-0.80-0.57-1.09-0.92-0.92-0.14-0.80-0.42).

Remarks: The genus *Decachela* contains only two species, *D. discata* Hilton, 1939, the genotype, and *D. dogieli* Losina-Losinsky, 1961. The genotype was erroneously described by Hilton (1939) in several points, and he created this genus and the family Decachelidae on the basis of the materials from California. But when this species was rediscovered from west coast of Hokkaido, Japan, Hedgpeth (1949) corrected Hilton's errors and transferred this genus under Callipallenidae.

In the description of *D. dogieli* based on a single male on a starfish *Pteraster* collected from off northern tip of Sakhalin, Losina-Losinsky seemed to overlook the parasitic relationship between the two animals. Our materials were taken out from the ambulacral grooves of starfishes and found parasitic relationship between the two animals. In one case (from site 4) of our collections we found that several dead specimens were still seizing the tube feet of the host starfish *Solaster* sp. with their chelate structure of the legs and driving tightly more than half of the proboscis into the tube feet.

Stock (1981) recorded first asteroid-parasitic pycnogonid *Pycnosomia asterophila* on *Calliaster* from the Philippines, and this is the second record on this kind of association between the two taxa.

19. Propallene longiceps (Böhm, 1879)

Pallene longiceps: Ohshima, 1933 (p. 212, figs. 1-6).

Propallene longiceps: Stock, 1954 (p. 31, fig. 12a-b); 1975 (p. 90, figs. 1-20); Utinomi, 1959 (p. 199); 1962, (p. 96); 1971 (p. 322); Kim & Hong, 1986 (p. 41, fig. 4).

Material: 13-4): 1♂, 6♀♀.

Family Nymphonidae

20. Nymphon akane Nakamura & Child, 1983

Nymphon akane Nakamura & Child, 1983 (p. 54, fig. 19); Kim & Hong, 1986 (p. 37, fig. 2).

Material: 36-4): 1♂; 36-6): 1♂, 3♀♀.

21. Nymphon elongatum Hilton, 1942 (Fig. 15)

Nymphon elongatum: Hedgpeth, 1949 (p. 251, fig. 22, p. 273, fig. 34f); Stock, 1954 (p. 17, fig. 5).

Material: 5-1): 1♂ (ovi.).

Remarks: The larger spines on the propodal sole of our specimen are not so strong as Hedgpeth's (1949) figure 34f. Moreover, these spines are restricted to the last two pairs of legs and absent in the first two pairs of legs. Like the Stock's (1954) material the spines are 3 to 5 in number and located on the distal half of the propodus. The compound spine formula of the oviger is 19-15-15-16:20 or 20-14-16-15:20.

22. Nymphon japonicum Ortmann, 1891 (Fig. 16)

Nymphon japonicum: Hedgpeth, 1949 (p. 249); Utinomi, 1951 (p. 159); 1955 (p. 5); 1959 (p. 199); 1962 (p. 92); Stock, 1954 (p. 19, fig. 6a-c): Nakamura & Child, 1983 (p. 56).

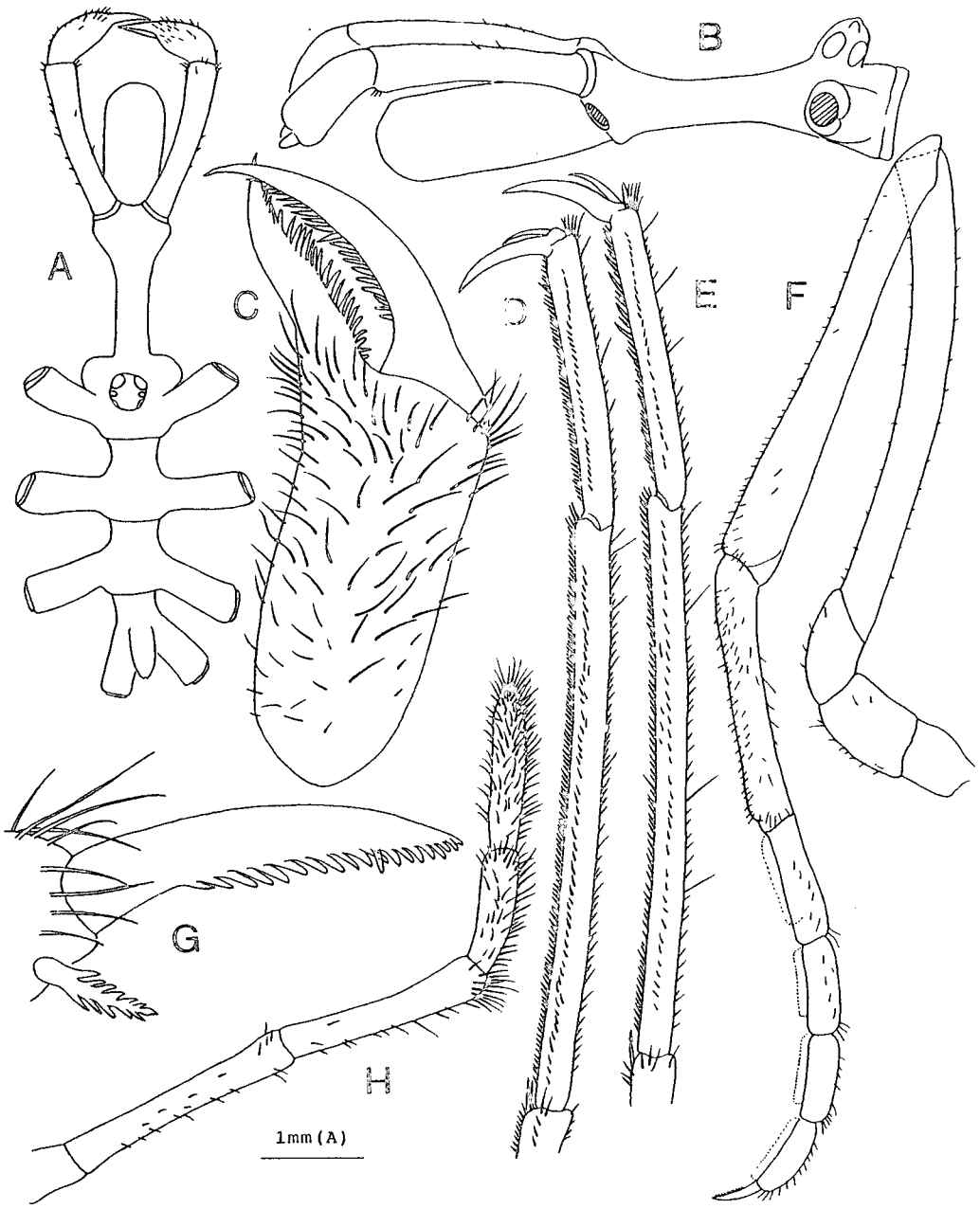

Fig. 15. *Nymphon elongatum* Hilton, male. A, trunk, dorsal; B, cephalic segment, lateral; C, chela; D, terminal segments of first leg; E, terminal segments of fourth leg; F, oviger; G, terminal claw of oviger; H, palp.

Material: 11-2): 5♂♂, 3♀♀; 20: 4♂♂, 4♀♀.

Remarks: Several authors (Hedgpeth, 1949; Utinomi, 1951; Stock, 1954) explained that their materials are in subequal condition of tarsus and propodus. Though the tarsus of the first legs of our specimens is subequal in length to the propodus, the segment becomes gradually shorter in the posterior legs and reduces to 2/3 or less of the propodus in the fourth leg (Fig. 16C-F). We had a chance to examine the specimens collected from Albatross st. 4826, west coast of Japan and identified as this

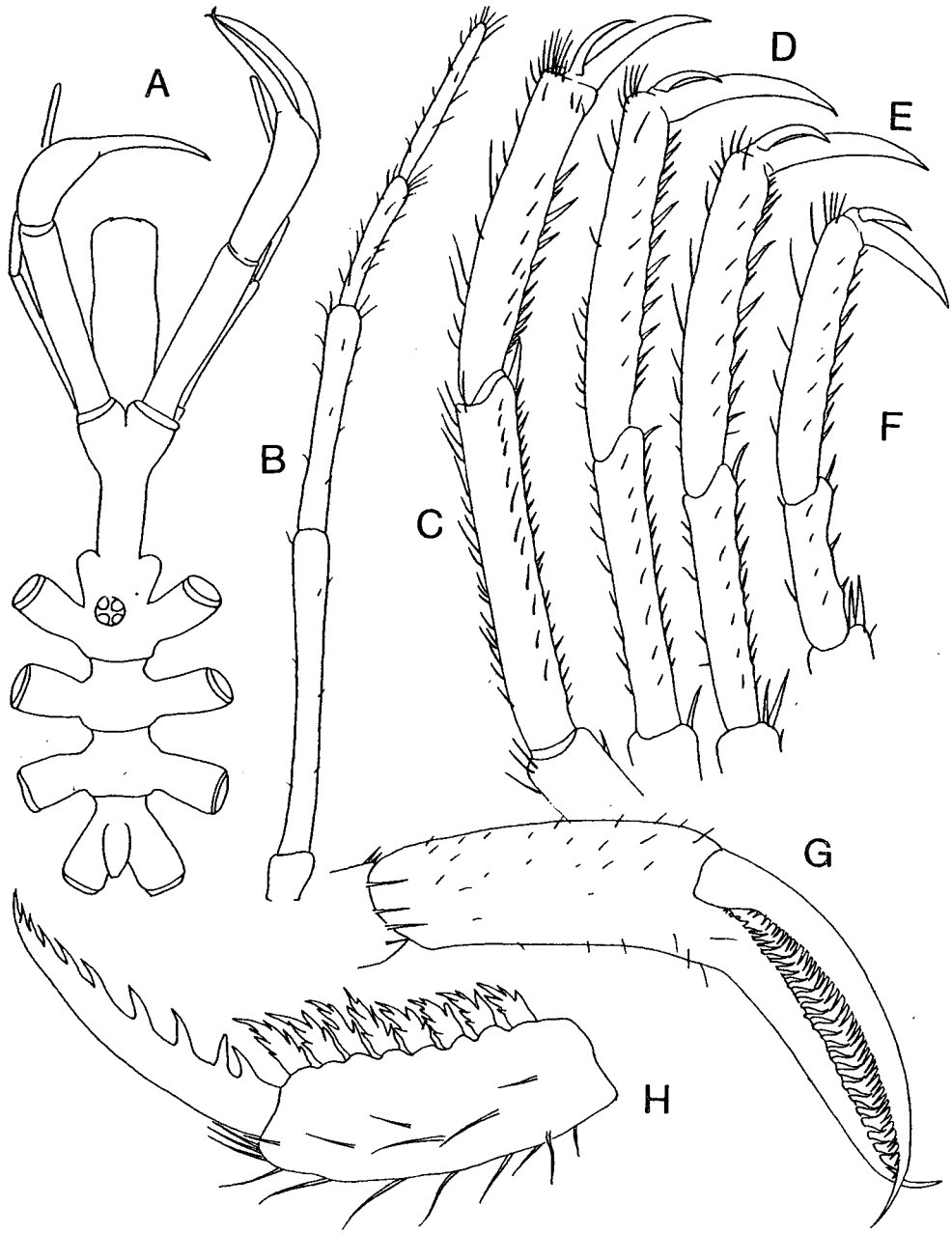

Fig. 16. *Nymphon japonicum* Ortmann, male. A, trunk, dorsal; B, palp; C, propodus and tarsus of first leg; D, same, second leg; E, same, third leg; F, same, fourth leg; G, chela; H, terminal segment and claw of oviger.

species by Hedgpeth (1949), but these specimens show no difference from ours.

The palp segments become gradually narrower to the last segment, that is 5/4 times as long as the fourth segment. The ocular tubercles are always obliquely directed posteriorly, and the tip is truncate. The compound spine formula of the terminal oviger segments is 12(13, 14)-8-8-8:5(~9).

23. Nymphon striatum Losina-Losinsky, 1929

Nymphon striatum: Hedgpeth, 1949 (p. 246: key); Utinomi, 1954 (p. 2, fig. 1); 1971 (p. 319); Kim, 1984 (p.

535, fig. 4a-e).

Material: 1: 16♂♂ (11 ovi. or larvi.), 1♂; 2: 1♂ (ovi.); 3: 1♀; 7-1): 2♂♂ (1♂ larvi.); 7-2): 9♂♂, 17♀♀, 4 juv.; 7-3): 42♂♂ (39 ovi. or larvi.).

24. Nymphon uniunguiculatum Losina-Losinsky, 1933

Nymphon uniunguiculatum: Hedgpeth, 1949 (p. 263, fig. 29); Kim, 1984 (p. 534, fig. 3a-f).

Material: 5-2): 1♂

Family Phoxichilidiidae

25. Anoplodactylus erectus Cole, 1904

Anoplodactylus erectus Cole, 1904 (p. 289, pl. 14, fig. 12, pl. 26, figs. 1-9); Hilton, 1942 (p. 283); Stock, 1955 (p. 239, figs. 13, 14); Child, 1970 (p. 288); 1979, (p. 52); Kim & Hong, 1986 (p. 41, fig. 5).

Material: *18:* 1♂ (ovi), 1♀.

26. Anoplodactylus hwanghaensis Kim & Hong, 1986

Anolpodactylus hwanghaensis Kim & Hong, 1986 (p. 41, fig. 6).

Material. 36-5): 1:♀.

27. Anoplodactylus pycnosoma (Helfer, 1939)

Anoplodactylus pycnosoma: Stock, 1954 (p. 75, fig. 33); Utinomi, 1971 (p. 326); Nakamura & Child, 1983 (p. 50); Kim, 1984 (p. 536, fig. 5d-h); Kim & Hong, 1986 (p. 44).

Material: 9-1): 1♂; 9-2): 2♂♂, 1♀.

28. Anoplodactylus viridintestinalis (Cole, 1904)

Halosoma viridintestinalis Cole, 1904 (p. 286, pl. 14, fig. 11, pl. 24, figs. 6-8, pl. 25, figs. 1-4); Hedgpeth, 1948 (p. 217, fig. 25).

Anoplodactylus viridintestinalis: Stock, 1955 (p. 239); Child, 1979 (p. 63); Kim, 1986 (p. 3, fig. 2); Kim & Hong, 1986 (p. 44).

Material: 9-2): 1♂; 12-1): 2♂♂, 7♀♀; 12-2): 1♂, 3♀♀; 12-3): 6♂♂, 3♀♀; 12-4): 18♂♂, 41♀♀.

29. Anoplodactylus spec. *α* Stock, 1954 (Fig. 17)

Anoplodactylus spec. *α* Stock, 1954 (p. 88, fig. 40c-d).

Material: 9-2): 1 broken ♀.

Remarks: Unfortunately only one female specimen was collected again. We are sure that it is the same species as *Anoplodactylus* spec. *α* Stock, 1954 from Misaki, Japan. The presence of distal spurs on scape and femur, size, absence of propodal lamina and general form are as Stock's figures and short description indicate.

Family Pycongonidae

30. Pycnogonum koreanum Kim & Stock, 1984

Pycnogonum koreanum Kim & Stock, 1984 (p. 685, figs. 1-6); Kim & Hong, 1988 (p. 50).

Material: 6-2): 4♂♂ (all ovi.), 3♀♀; 26-2): 1♂; 36-3); 2♂♂, 4♀♀.

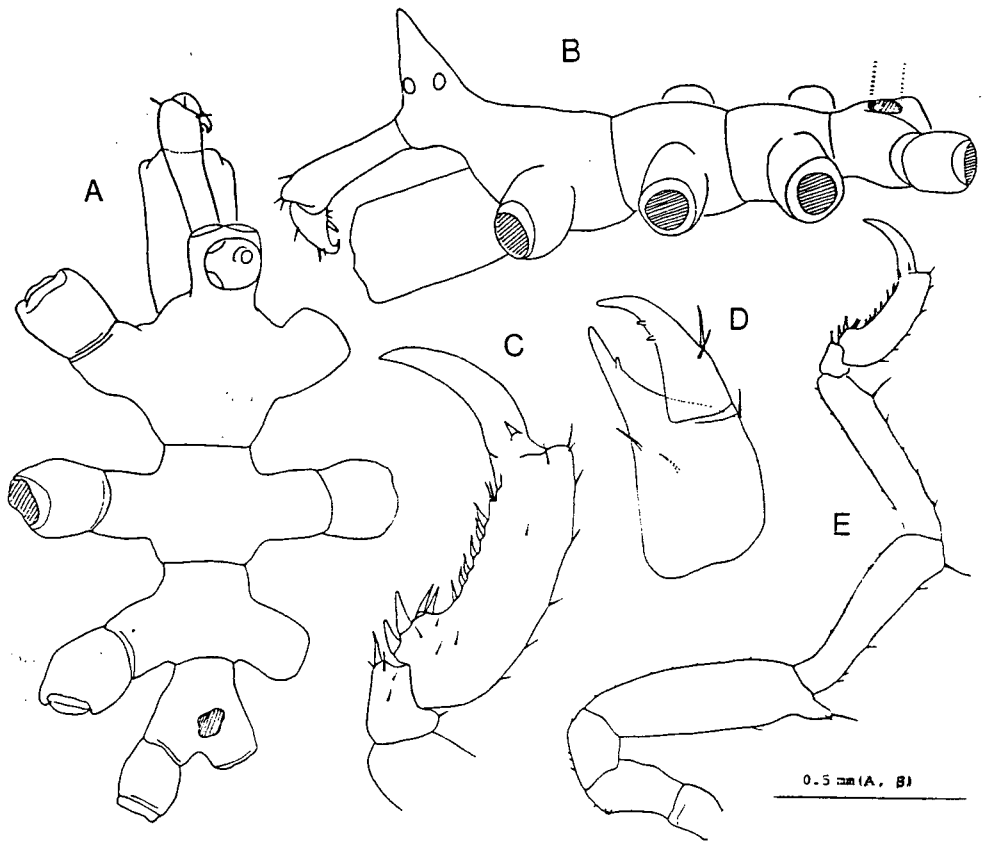

Fig. 17. *Anoplodactylus* spec. *a* Stock, female. A, trunk, dorsal; B, trunk, lateral; C, terminal segments of leg; D, chela; E, third leg.

ABSTRACT

Some five hundreds of pycnogonid specimens, belonging to 30 species in 13 genera, were examined from 37 collecting sites around Korean Peninsula. Of these 4 represent new species *(Ammothella monotuberculata, Ascorhynchus stocki, Paranymphon magnidigitum* and *Cheilopallene nodulosa)* and 6 including 1 unnamed species are recorded for the first time from Korean waters. *Decachela dogieli* Losina-Losinsky is also recorded as a parasitic pycnogonid on starfishes.

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