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Faunal Studies on the Genus *Caprella* (Crustacea: Amphipoda, Caprellidae) in Korea

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한국산 *Caprella* 속 (Crustacea: Amphipoda, Caprellidae)의 분류

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적 요

1955년, 1964년 그리고 1969년부터 1975년까지 동해, 남해, 서해의 여러 곳에서 채집된 바다대벌레(*Caprella*)를 동정한 결과 11종을 얻었다. 이것들 중 다음의 9종은 한국 미기록 종이다.

Caprella californica Stimpson, 1857, *C. danilevskii* Czerniavski, 1868, *C. decipiens* Mayer, 1890, *C. equilibra* Say, 1818, *C. kroeyeri* De Haan, 1849, *C. polyacantha* Utinomi, 1947, *C. scaura* Templeton, 1836, *C. tsugarensis* Utinomi, 1947, *C. verrucosa* Boeck, 1871

INTRODUCTION

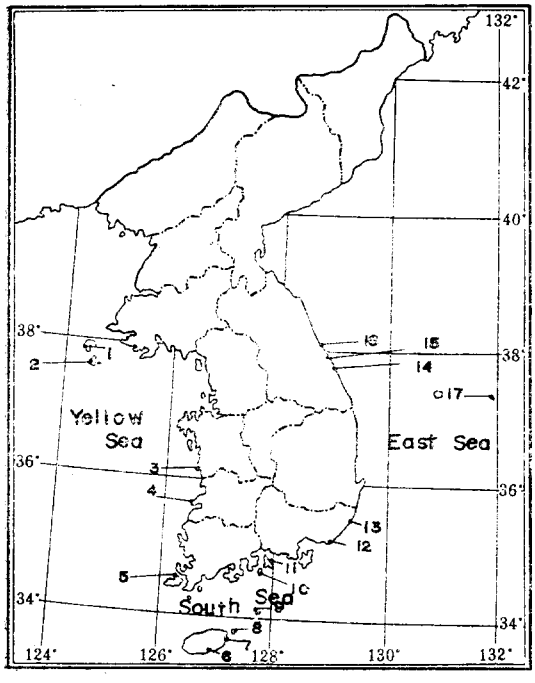
Mayer reported once *Caprella* in the East Sea (Sea of Japan) and in the Korea Strait in 1903. The species in Korea Strait among these, however, were collected in the coastal waters of Japan far from the Korean coasts. The authors, therefore, consider only 5 species, *C. gracillima, C. subtilis, C. eximia, C. simplex, C. acutifrons,* reported by him from the coasts of the East Sea to be recorded from Korean waters. Utinomi (1947) quoted only Mayer's reports. This paper deals with the specimens of *Caprella* obtained on intertidal and subtidal zones of South Korean coasts by simple collecting method without special tools.

The authors should like to express their gratitudes to Dr. B.J. Rho at the Department of Biology, Ewha Womans University and Dr. I. K. Lee at the Department of Botany, Seoul National University for their helping to collect specimens.

MATERIALS AND METHODS

The examined specimens were collected in 1955, 1961, and during the period from 1969 to 1975 and have been kept in the specimen room of the Department of

Zoology, Seoul National University. Collections were made chiefly among algae of intertidal zones and among algae caught in gill nets by hand with pincette. All the specimens have been preserved in alcohol (75%). All the appendages and mouth parts were mounted in CMC-S mounting medium for permanent preparations and drawings were made with a camera lucida. Body length was measured from head between the insertions of antenna 1 and 2, through the midlateral portion of each pereonite, to the posterior tip of the abdomen.



1. Baegryeong-do (白翎島)
2. Daecheong-do (大靑島)
3. Maryangri, Biin (馬良里, 仁)
4. Gyeogpori (格浦里)
5. Jin-do (珍 島)
6. Seogwipo (西歸浦)
7. Seongsanpo (城山浦)
8. U-do, Jeju-do (濟州島 牛島)
9. Geomun-do (巨文島)
10. Dolsan-do (突山島)
11. Namhae-do (南海島)
12. Haeundae (海雲臺)
13. Bangeojin (方魚鎭)
14. Gangreung (江 陵)
15. Mulchi, Sogcho (束 草)
16. Nagsansa (洛山寺)
17. Dog-do (獨 島)

Fig. 1. The map showing localities where materials were collected.

DESCRIPTIONS

Among above materials, 11 species could be identified and described briefly as follows:

1. *Caprella andreae* Mayer, 1890

Fig. 2

Caprella acutifrons f. Andreae Mayer, 1890, pp. 51, 55-56, pl. 2, fig. 38, pl. 4, fig. 56, 70-71, (cited from McCain, 1968); 1903, pp. 80-81.

Caprella acutifrons Latr. f. Andreae: Utinomi, 1947

Caprella andreae: McCain, 1968, pp. 19-22, figs. 8-9.

Materials examined: 19♂♂, 19♀♀ (3 ovig.), Bangeojin July 23, 1964, B.J. Rho.

Diagnosis: Head with anteriorly directed triangular projection, palm of propodus of pereopods 5-7 convex with medial grasping spines.

Description: Length of larger male 13.5mm. Body smooth except for anteriorly directed triangular projection on the head. Propodus of gnathopod 2 in males with proximal poison tooth and distal rectangular projection, palm densely setose; in females propodus with proximal poison tooth, distal projection and small middistal projection. Gills oval and usually quite large. Propodus of pereopods 5-7 with 2 grasping spines at mid length, palm convex. Lacinia mobilis of right mandible 5-toothed. Antenna 1, flagellum with as many as 3 fused articles in males. Antenna 2 larger than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (East Sea); Japan and World wide distribution.

Table. 1. Measurements of the largest specimen of each species.

Species	H	P_1	P_2	P_3	P_4	P_5	P_6	P_7	A_1	A_2	Gb	Gp
1. *C. andreae*	1.11	0.44	2.33	2.83	2.56	2.06	1.11	1.00	4.72	4.00	0.83	2.22
2. *C. californica*	0.67	0.94	2.17	1.94	1.83	2.39	0.94	0.94	8.17	4.33	0.94	1.67
3. *C. danilevskii*	0.83	1.11	3.89	2.33	2.22	1.39	0.83	0.72	5.67	2.51	1.10	3.06
4. *C. decipiens*	1.00	1.20	3.10	3.00	3.00	3.00	1.20	1.00	6.20	3.00	1.20	2.50
5. *C. equilibra*	0.67	0.67	1.94	1.10	1.10	1.39	0.67	0.67	6.94	3.89	0.80	1.67
6. *C. kroeyeri*	1.00	3.70	6.00	3.40	3.50	4.00	1.70	1.70	17.00	6.00	4.00	3.50
7. *C. penantis*	1.11	0.56	2.78	2.50	2.50	1.94	1.39	1.11	5.50	3.50	0.90	2.70
8. *C. polyacantha*	0.44		0.67	1.06	0.83	0.83	0.44	0.33	1.22	0.94	0.44	0.72
9. *C. scaura*	0.56	1.39	2.89	2.22	1.94	1.67	0.83	0.83	7.56	2.78	2.11	2.58
10. *C. tsugarensis*	0.67	0.67	2.39	2.50	2.22	1.39	0.83	0.83	4.28	2.30	0.39	2.06
11. *C. verrucosa*	0.56	0.44	1.67	1.67	1.67	1.39	0.83	0.83	4.17	2.50	0.72	0.67

Unit: mm. H: head, P_1-P_7: pereonite 1-pereonite 7, A_1: antenna 1, A_2: antenna 2, Gb: basis of gnathopod 2, Gp: propodus of gnathopod 2

2. *Caprella californica* Stimpson, 1857

Fig. 3

Caprella californica Stimpson, 1857 (cited from McCain, 1968, p. 44).

Caprella scaura f. californica Mayer, 1903, pp. 119-120, pl. 5, fig. 13.

Material examined: 15♂♂, 6♀♀ (1 ovig.), Mipo, Haeundae, May 5, 1973, H.S. Kim. 3♂♂, 1♀, Mipo, Haeundae, May 6, 1973, H.S. Kim.

Diagnosis: Head with anteriorly directed sharp, long spine, pereonite 2 with one ventral spine between insertions of gnathopod 2, pereonite 5 with small dorsal spine.

Description: Length of largest male 21.5mm. Body slender. Head with long and sharp spine. Pereonite 2 with one ventral spine beteen insertions of gnathopod 2. Pereonite 5 with small one dorsal spine. Basis of gnathopod 2 shorter than half of pereonite 2 in males, propodus of gnathopod 2 elongate and two strong teeth in palm, with distal triangular projection, carpus with medial sharp tooth; in females propodus of gnathopod 2 with proximal poison tooth, submedial small tooth and distal triangular projeciton. Gills elongate. Propodus of pereopods 5-7 with two proximal grasping spines. Lacinia mobilis of right mandible 5-toothed. Antenna 2

longer than article 2 of peduncle of antenna 1. In females, Pereonite 3 with two proximal spines in the both lateral sides.

Measurement: See Table 1.

Distribution: Korea (South Sea); Japan.

3. *Caprella danilevskii* Czerniavski, 1868

Fig. 4

Caprella Danilevskii Czerniavski, 1868, pp. 92-93, pl. 6, figs. 21-34. (cited from McCain 1968); Mayer, 1903, p. 99.; Hiro, 1937, p. 312, pl. 22, fig. 6.; McCain, 1968, pp. 22—25, figs. 10-11.

Material examined: 6♂♂, 4♀♀, Mijoseom, Namhae-do, June 7, 1974, K. S. Lee. 1♂, Seongsanpo, July 15, 1973, K.S. Lee. 8♂♂, 9♀♀, Seonjinpo, Daecheong-do, July 22, 1973, H.S. Kim. 44♂♂, 17♀♀, Mulchi, June 4, 1972, H.S. Kim.

Diagnosis: Propodus of pereopods 5-7 with numerous setae but lacking grasping spine, in males both pairs of gills elliptical, abdomen of male with hooked papillae at tip of appendage.

Description: Length of male 13.3mm, female 10.5mm. Body slender, smooth. Propodus of gnathopod 2 in males elongate with poison tooth distally, sparsely setose, dactylus very short; in females, gnathopod 2 very small almost subequal with gnathopod 1. Gills small, elliptical. Propodus of pereopods 5-7 without grasping spine, usually with numerous setae. Lacinia mobilis of right mandible indistinctly 5-toothed. Abdomen of male with hooked papillae at tip of appendage. Antenna 1 with 10 articles, antenna 2 reached middle of article 2 of peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (East Sea, South Sea, Yellow Sea); World wide distribution.

4. *Caprella decipiens* Mayer, 1890

Fig. 5

Caprella decipiens Mayer, 1890, p. 86, pl. 7, figs. 37-49. (cited from Utinomi, 1969); Hiro, 1937, p, 313, pl. 22, fig. 7.; Utinomi, 1947, p. 73.; Utinomi, 1969, pp. 299-300, fig. 3.

Material examined: 12♂♂, 2♀♀, Namuseom, Namhae-do, June 7, 1974, K.S. Lee. 1♀, Mijoseom, Namhae-do, June 8, 1974, K.S.Lee. 1♂, Geomun-do, July 9, 1972, H.S. Kim.

Diagnosis: Antenna 1 characteristic, two basal articles of peduncle being very stout, and a distal article of peduncle very short, as slender as multiarticulated flagellum. Antenna 2 shorter than peduncle of antenna 1. Pereopods 5-7 without grasping spine.

Description: Length of larger male 17.4mm, female 14.3mm. Body smooth, slender. Gnathopod 2 attached near fore end of pereonite 2, basis a little shorter than a half of pereonite 2, propodus elongate, setose, palmar margin slightly

convex with two rudimentary poison teeth submedially and two grasping spines close to a spine-bearing proximal projection. Gills oval.

Propodus of pereopods 5-7 without grasping spine.

Lacinia mobilis of right mandible indistinctly 5-toothed.

Measurement: See Table 1.

Distribution; Korea (South Sea); Japan.

5. *Caprella equilibra* Say, 1818

Fig. 6

Caprella equilibra Say, 1818, pp. 391-392 (cited from McCain, 1968); McCain, 1968, pp. 25-30, figs. 12-13.

Caprella aequilibra: Mayer, 1903, pp. 89-92, pl. 3, figs. 29-34, pl. 7, figs. 66-69.; Utinomi, 1947, p. 72.

Material examined: 1♀, Haeundae, May 6, 1973, H.S. Kim. 1♂, Seogwipo, July 14, 1973, K.S. Lee.

Diagnosis: Basis of gnathopod 2 less than one-half lengh of pereonite 2. Pereonite 2 usually with ventarl spine between insertions gnathopod 2.

Description: Length of larger female, 8.5mm, body smooth except for ventral spine between insertions of gnathopod 2. Insertion of gnathopod 2 with a small dorsal spine. Pereonite 3 with two anterolateral margin spines. Pereonite 5 with small ventral projection. Basis of gnathopod 2, anterodistal margin produced into triangular projection; Palm of propodus with numerous setae, single proximal grasping spine, distally with rectangular tooth. Antenna 1, flagellum with 15 articles. Antenna 2 slightly shorter than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (South Sea); World wide distribution.

6. *Caprella kroeyeri* De Haan, 1849

Fig. 7

Caprella kröyeri De Haan, 1849, pp. 228-229, pl. 50, fig. 8.; Mayer, 1903, pp 107-108, pl. 5, fig. 1, pl. 8, fig. 13.; Utinomi, 1947,; Holthuis, L.B. and T. Sakai, 1970, p. 98.

Material examined: 5♂♂, 3♀♀, Maryangri, Biin, July 21, 1971, B.J. Rho.

Diagnosis: Antenna 1 especially long. Eyes projected in side. Gills are longer than pereonite 3, 4.

Description: Head smooth and flattened. Body 34mm long, relatively big species. Basis of gnathopod 2 longer than a half of pereonite 2, anterodistal margin produced into triangular projection, propodus similar to *C. scaura* but relatively smaller than *C. scaura*, with two strong teeth and triangular projection, dactylus serrate. Gills longer than thier pereonites and elliptical. Propodus of pereopods 5-7 with two grasping spines and stout setae. Lacinia mobilis of right mandible

with distinctly 5-toothed. Antenna 1 much longer than 2/3 of body length with six fused articles. Antenna 2 shorter than article 2 of peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (Yellow Sea): Japan.

7. *Caprella penantis* Leach, 1814

Fig. 8

Caprella Penantis Leach, 1814, p. 404. (cited from McCain, 1968); McCain, 1968, pp. 33-40, figs. 15-16.

Caprella acutifrons f. testudo Mayer, 1903, p. 82.

Caprella acutifrons f. angusta Mayer, 1903, p. 82, pl. 3, fig. 4.

Material examined: 55♂♂, 14♀♀, Mijoseom, Namhae-do, June 8, 1974, K.S. Lee. 80♂♂, 63♀♀, Namuseom, Namhae-do, June 7, K.S. Lee. 17♂♂, 4♀♀, Haeundae, May 10, 1974, H.S. Kim. 180♂♂, 123♀♀, Mipo, Haeundae, May 11, 1974, H.S. Kim. 1♂, 3♀♀, Mulchi, June 14, 1972, H.S. Kim. 60♂♂, 55, ♀♀, Gangreung, March 28, 1974, Y.H.Kim. 11♂♂, 3♀♀, Dog-do, Aug. 5, 1958, B.J. Rho.

Diagnosis: Head with anteriorly directed triangular projection. Basis of gnathopod 2 shorter than pereonite 2, propodus of pereopods 5—7 concave with two proximal grasping spines.

Description: Body 12.7mm long, smooth except head with anteriorly directed triangular projection. Larger individuals having a robust body and well-developed pleura. As a whole, very similar to *C. andreae*. Propodus of gnathopod 2 with proximal poison tooth, palm concave with distal elevated rectangular projection and compact setae, dactylus serrate; in females palm slightly convex with distal elevated rectangular projection and one stout proximal spine. Gills large and ovate. Propodus of pereopods 5—7 concave with two proximal grasping spines. Lacinia mobilis of right mandible indistinctly 5-toothed. Peduncle of antenna 1 in larger individual very stout, flagellum with 13 articles. Antenna 2 longer than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (East Sea, South Sea); Japan, Atlantic coast; South Africa.

8. *Caprella polyacantha* Utinomi, 1947

Fig. 9

Caprella polyacantha Utinomi, 1947, pp. 75—76, figs. 4—5; Utinomi, 1969, pp. 302—304, fig. 5.

Material examined: 1♂, Bangeojin, July 23, 1963, B.J. Rho. 1♂, Nagsan, Aug. 14, 1973, B.J. Rho.

Diagnosis: Body covered with many thorny spines, head completely fused with pereonite 1 without any suture and with many spines.

Description: Body 4.6mm long, covered with many thorny spines. Head not pointed at fore end, completely fused with pereonite 1 without any suture. Gnathopod 2 attached to near fore end of pereonite 2, basis thin and long but shorter than pereonite 2, propodus round elliptical with dorsal denticulation, palmar margin bearing two grasping spines proximally, distal triangular projection, dactylus strong, serrate. Gills ovate. In pereopods 5—7, hind margin of basis and merus denticulate, carpus pentagonal in outline, propodus concave with proximal two grasping spines. Antenna 1 shorter than a half of body length, flagellum with 8 articles. Antenna 2 longer than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (East Sea); Japan.

9. *Caprella scaura* Templeton, 1836

Fig. 10

Caprella scaura Templeton, 1836, pp.191—192, pl.20, fig. 6. (cited from McCain, 1968); Mayer, 1903, pp.117—120, pl.5, figs. 13—18, pl.10, fig.11 (in part).; Hiro, 1937, pp.314—315, fig. 3, pl.22, figs. 11—12.; McCain, 1968, pp. 40—44, figs. 17—18.

Caprella scaura f. typica Mayer, 1903, p.118.; Utinomi, 1947, p.77.

Caprella scaura f. diceros Mayer, 1903, p.118.; Utinomi, 1947. p.77.

Caprella scaura f. cornuta Mayer, 1903. p.118.

Caprella scaura f. undetermined Mayer, 1903. p.120.

Caprella scaura f. hamata Utinomi, 1947, p.77, fig. 7.

Material examined: 1♂, Baegryeong-do, July 17, 1973, H.S. Kim. 16♂♂, 2♀♀, Mipo, Haeundae, May 11, 1974, H.S. Kim. 2♂♂, 1♀, Geomun-do, July 9, 1972, H.S. Kim. 4♂♂, 3♀♀, Mulchi, June 4, 1972, H.S. Kim. 19♂♂, 6♀♀, Haeundae, May 10, 1974, H.S. Kim. 17♂♂, 3♀♀ (2 ovig.), Dolmog, Jin-do, Aug. 7, 1974, H.S. Kim. 1♀, 1♀, Nagsan, Aug. 1, 1973, H.S. Kim. 80♂♂, 101♀♀, Seogwipo, Jeju-do, July 14, 1973, K.S. Lee. ♂♂, 1♀, U-do, Jeju-do, July 15, 1973, K.S. Lee. 34♂♂, 8♀♀, Mijoseom, Namhae-do, June 8, 1974, K.S. Lee. 1♂, 1♀, Sangjuri, Namhae-do, June 6, 1974, K.S. Lee. 4♂♂, Jin-do, Aug. 3, 1974, H.S. Kim. 3♂♂, 2♀♀, Biin, July 21, 1971, B.J. Rho.

Diagnosis: Head with anteriorly directed spine, pereonites 1—2 elongate in males, basis of gnathopod 2 approximately equal to length of pereonite 2.

Description: Body 16.5mm long, slender. Head with anteriorly directed spine. Pereonites 1, 2 elongate. Basis of gnathopod 2 in males thin and long with anterodistal margin produced into triangular projection, propodus with two strong teeth and distal rectangular projection, dactylus constricted; in females palm with proximal spine, small distal tooth and distal rectangular projection. Gills long and elliptical. Propodus of pereopods 5—7 with two proximal grasping spines. Lacinia

mobilis of right mandible indistinctly 5-toothed. Antenna 1 approximately equal to a half of body length, flagellum with as many as 9 fused articles in males. Antenna 2 shorter than article 2 of peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (East Sea, South Sea, Yellow Sea); World wide distribution.

10. *Caprella tsugarensis* Utinomi, 1947

Fig. 11

Caprella tsugarensis Utinomi, 1947, pp.78—79, fig.8.

Material examined: 1♂, Mijoseom, Namhae-do, June 8, 1974. K.S. Lee. 1♂, 2♀♀, Namuseom, Namhae-do, June 7, 1974, K.S. Lee. 2♀♀, Mipo, Haeundae, May 11, 1974, H.S. Kim.

Diagnosis: Pereopods 5—7 with two proximal tetradent spines, propodus of gnathopod 2 with four subspines, appendage of abdomen in males serrate.

Description: Body 11.5mm long, slender, Head flattend. Gnathopod 2 medially attached to pereonite 2, basis short, propodus elliptical with one medial grasping spine and four subspines and with distal triangular projection without poison tooth. Gills small and elliptical. Pereopods increasing in length from 5 to 7, pereopod 7 approximately twice of pereopod 5. Propodus of pereopods 5—7 with two proximal grasping spines. Lacinia mobilis of right mandible indistinctly 5-toothed. Antenna 1, flagellum with 12 articles in males, antenna 2 longer than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (South Sea); Japan, Black Sea, Mediterranean, South Africa.

11. *Caprella verrucosa* Boeck, 1871

Fig. 12

Caprella verrucosa Boeck, 1871, p.38. (cited from McCain, 1968, p.38); McCain, 1968, p.38.; Utinomi, 1969, pp.304—305.

Caprella acutifrons forma verrucosa Mayer, 1903, p.83, pl.3, figs. 17—19.; Utinomi 1947, p.72.

Material examined: 1♂, Mipo, Haeundae, July 17, 1974, K.S. Lee. 6♂♂, 1♀, Haeundae, July 12, 1969, H.S. Kim.

Diagnosis: Head with anteriorly directed sharp spine. Body covered with tubercles. Pereonite 2 with ventral spine between insertions of gnathopod 2.

Description: Body 8.9mm long. Head with anteriorly directed sharp spine. Pereonite 1 with one distal small tubercle, pereonite 2 with one medial spine, one distal tubercle, pereonite 3, 4 furnished with several dorsal tubercles, pereonite 5, 6, 7 with small spines. Gnathopod 2 medially attached to pereonite 2, basis short, propodus relatively large with proximal sharp poison tooth, below poison tooth one small spine, dactylus serrate. Lacinia mobilis of right mandible indistinctly

5-toothed. Gills ovate. Propodus of pereopods 5-7 with two proximal grasping spines. Antenna 1, flagellum with 13 articles, antenna 2 longer than peduncle of antenna 1.

Measurement: See Table 1.

Distribution: Korea (South Sea); Japan, California.

SUMMARY

In order to know the fauna of Korean Caprellidae, the authors examined the materials which were collected from many places of East Sea, South Sea and Yellow Sea in 1955, 1964 and during the period from 1969 to 1975. Collections were made chiefly by hand with pincette at intertidal zones and with gill nets at subtidal zones.

The results of the identification were found to be 11 species of *Caprella* of which the following 9 species were hitherto unrecorded from Korean waters.

1. *Caprella californica* Stimpson, 1857
2. *C. danilevskii* Czerniavski, 1868
3. *C. decipiens* Mayer, 1890
4. *C. equilibra* Say, 1818
5. *C. kroeyeri* De Hann, 1849
6. *C. polyacantha* Utinomi, 1947
7. *C. scaura* Templeton, 1836
8. *C. tsugarensis* Utinomi, 1947
9. *C. verrucosa* Boeck, 1871

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EXPLANATION OF FIGURES

Al: Antenna 1, Abd.: Abdomen, L.V.: Lateral view, G_2: Gnathopod 2 Pd. 5: Pereopod 5, R. M.: Right mandible

Fig. 2: *C. andreae:* A. L.v.♂ (4X), B. L.v.♀ (4X), C. G2.♂(8X), D. G2.♀ (8X), E. Pd. 5.♂ (8X), F. R.m.♂ (90X).

Fig. 3: *C. californica:* A. L.v.♂ (4X), D. L.v.♀ (4X), C. G2.♂ (8X), D. G2.♀ (16X), E. Pd. 5.♂ (16X), F. R.m. ♂ (90X).

Fig. 4: *C. danilevskii:* A. L.v.♂ (4X), B. L.v.♀ (4X), C. G2.♂ (12X), D. G2.♀ (8X), E. Pd. 5.♂ (8X), F. R.m.♂ (90X).

Fig. 5: *C. decipiens:* A. L.v.♂ (4X), B. L.v.♀ (4X), C. G2.♂ (8X), D. G2.♀ (8X), E. R.m.♂ (90X), F. A1.♂ (4X), G.Pd. 5.♂ (8X).

Fig. 6: *C. equilibra:* A. L.v.♀ (4X), B. G2.♀ (12X), C. Pd. 5.♀ (16X), D.R.m.♀ (90X),

Fig. 7: *C. kroeyeri:* A. L.v.♂ (3X), B. L.v.♀ (3X), C. G2.♂ (9X), D. G2.♀ (16X), E. Pd. 5.♀ (16X), F. R.m.♂ (45X).

Fig. 8: *C. penantis:* A. L.v.♂ (4X), B. L.v.♀ (4X), C. G2.♂ (13X), D. G2.♀ (16X), E. Pd. 5.♂ (16X), F.R.m.♂ (90X).

Fig. 9: *C. polyacantha:* A. L.v.♂ (12X), B. G2.♂ (44X), C. Pd. 5.♂ (44X), D. Spine♂ (135X).

Fig. 10: *C. scaura:* A. L.v.♂ (4X), B. L.v.♀ (4X), C. G2.♂ (8X), D. G2.♀ (16X), E. Pd. 5.♂ (16X), F. R.m.♂ (90X).

Fig. 11: *C. tsugarensis:* A. L.v.♂(4X), B. L.v.♀ (4X), C. G2.♂ (22X), D. G2.♂ (22X), D. G2♀ (22X), E. Pd. 5.♂ (13X), F. Pd. 7.♂ (19X), G. Spine of Pd. 5.♂ (55X), H. R.m.♂ (90X), I. Abd.♂ (90X).

Fig. 12: *C. verrucosa:* A. L.v.♀ (4X), B. G2.♀ (16X), C. Pd. 5.♀ (32X), D. Spine of Pd. 5.♀ (135X), E. R.m.♀ (90X).

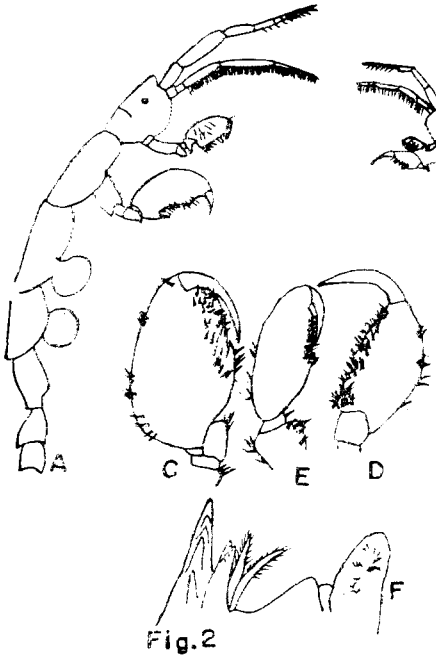

Fig.2

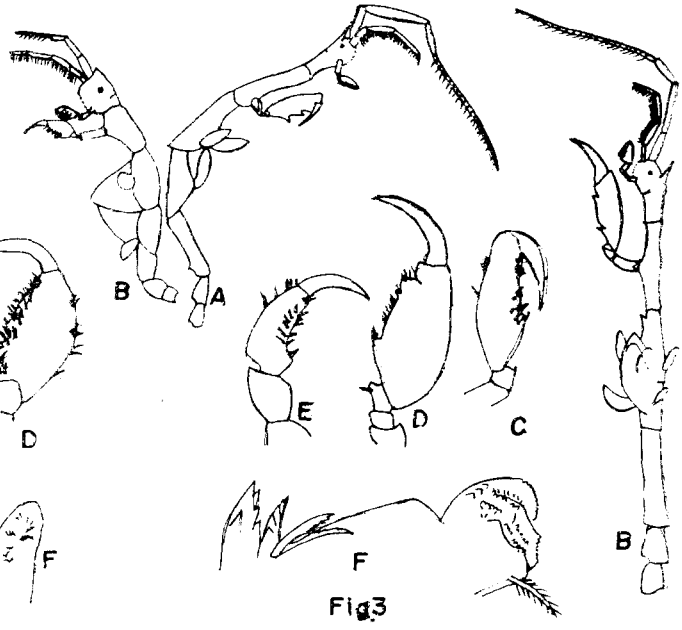

Fig3

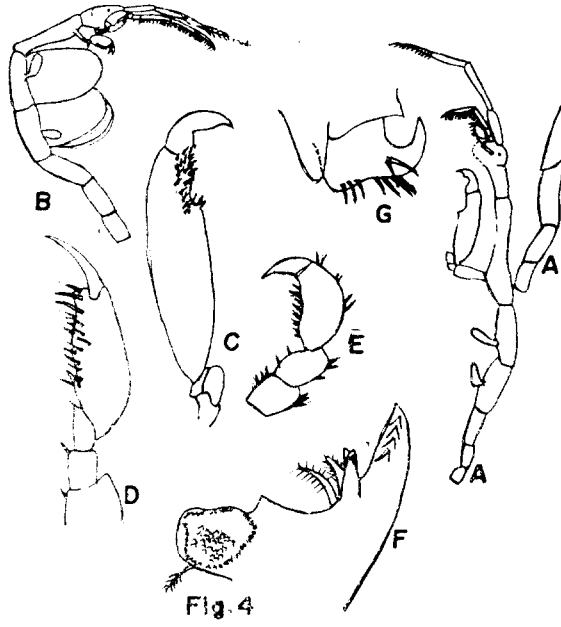

Fig.4

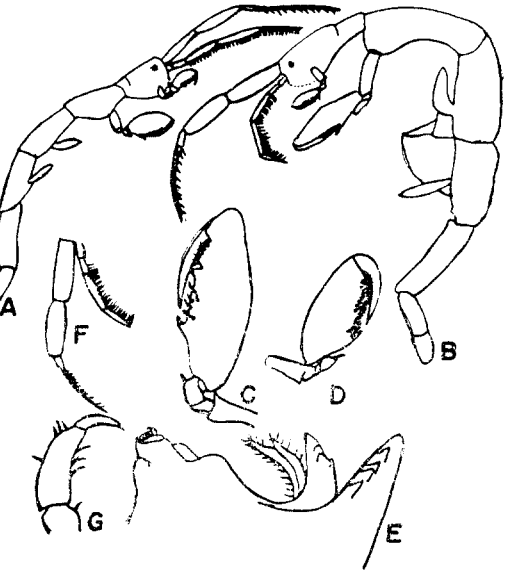

Fig.5

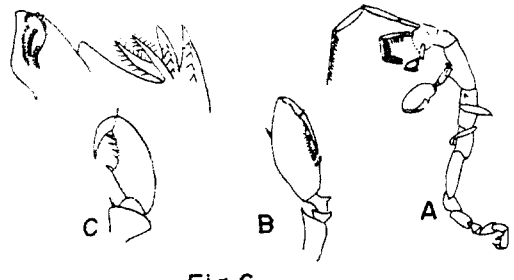

Fig.6

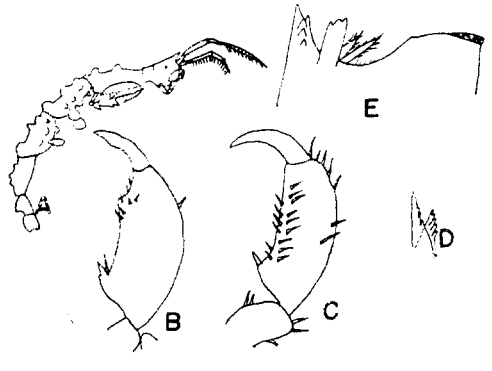

FIG.12

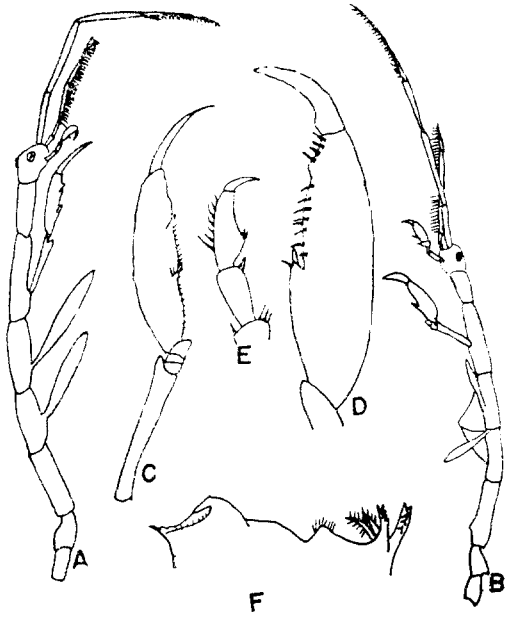

Fig.7

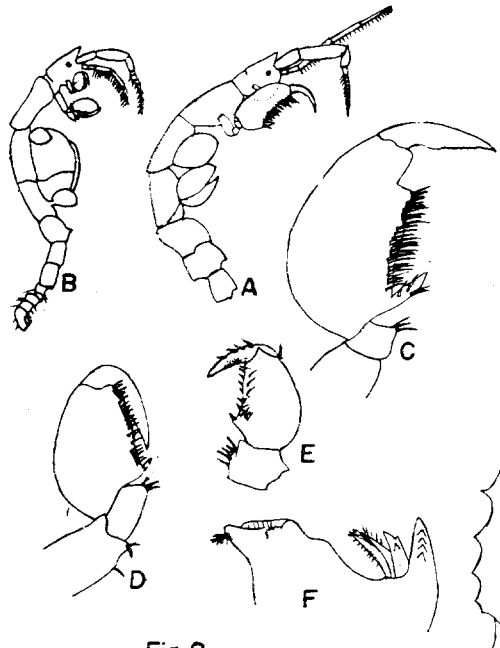

Fig.8

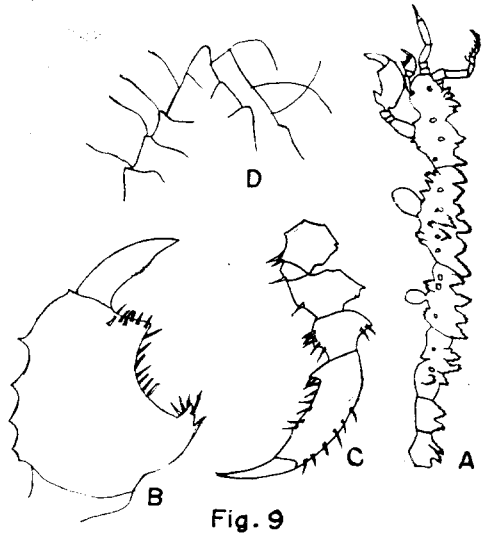

Fig. 9

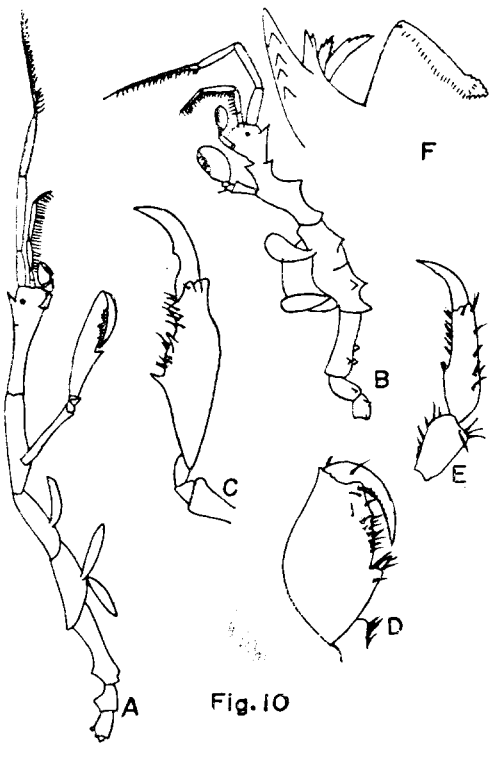

Fig. 10

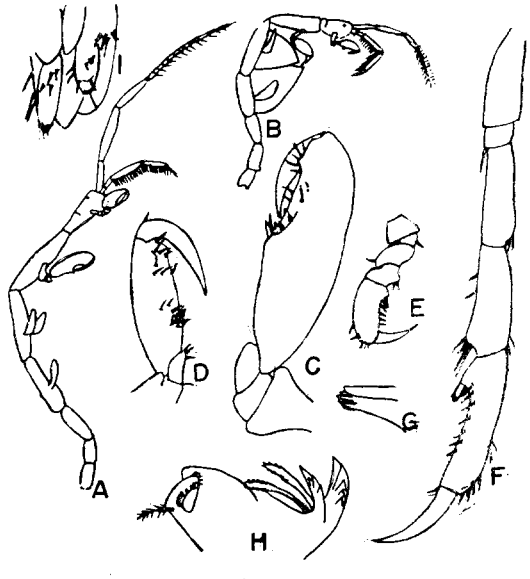

Fig.11