

On the Genus *Gnorimosphaeroma* (Crustacea, Isopoda, Sphaeromatidae)  
in Japan with Descriptions of Six New Species\*

Noboru Nunomura

Toyama Science Museum

Nishinakano-machi, Toyama-shi, 939-8084 JAPAN

日本列島のイソコツブムシ属 (甲殻綱, 等脚目, コツブムシ科)

布村 昇

富山市科学文化センター

〒939-8084 富山市西中野町1-8-31

日本列島には海水域や汽水域のみならず, 日本海側の地域や北海道を中心にして, 純淡水を含めた多様な水域から, 多数の個体群の存在が知られている。そこで日本列島各地に生息するイソコツブムシ属 (甲殻綱, 等脚目, コツブムシ科) の標本を収集し, 次の口器, ほかの付属肢の形態, 剛毛の生え方の状況などを比較し, 6新種を含む次の12種の生息を確認した。

ヒメコツブムシ (新称) *Gnorimosphaeroma pulchellum* n. sp.

サイゴクコツブムシ (新称) *Gnorimosphaeroma iriei* n. sp.

レブンコツブムシ (新称) *Gnorimosphaeroma rebunense* n. sp.

ホクリクコツブムシ (新称) *Gnorimosphaeroma hokurikuense* n. sp.

アカンコツブムシ (新称) *Gnorimosphaeroma akanense* n. sp.

ツシマコツブムシ (新称) *Gnorimosphaeroma tsushimaense* n. sp.

イソコツブムシ *Gnorimosphaeroma rayi*, Hoestlandt, 1969

フタゲイソコツブムシ (新称) *Gnorimosphaeroma hoestlandti* Kim and Kwon, 1985

マルコツブムシ *Gnorimosphaeroma ovatum* (Gurjanova, 1933)

シナコツブムシ (新称) *Gnorimosphaeroma chinesense* (Tattersall, 1921)

ミギワコツブムシ (新称) *Gnorimosphaeroma anchialos* Jang and Kwon, 1993

チョウセンコツブムシ *Gnorimosphaeroma naktongense* Kwon and Kim, 1987

キーワード: イソコツブムシ, コツブムシ科, 等脚目, 淡水産, 汽水産, 海産分類

In Japan, the genus *Gnorimosphaeroma* occurs often abundantly, not only from sea water but also from freshwater and they show complicated morphological variations and the taxonomy of this group has been much confused. So, I examined more than 800 specimens from 45 localities and I confirmed 12 species including new species; *Gnorimosphaeroma oligostrigosum*, *Gnorimosphaeroma iriei*, *Gnorimosphaeroma rebunense*, *Gnorimosphaeroma Hokurikuense*, *Gnorimosphaeroma akanense* and *Gnorimosphaeroma tsushimaense*.

**Key words** : *Gnorimosphaeroma*, Sphaeromatidae, Isopoda, Freshwater, Brackish, Marine.

Hitherto, only four species of the genus *Gnorimosphaeroma* have been recorded in Japan : *G. ovatum*, *Grayi*, *G. hoestlandti* and *G. naktongense*. As the result of my survey of more than 800 specimens collected more than 45 areas, I found 12 species including 6 new ones.

The holotype and a part of paratypes deposited at the Toyama Science Museum. Other paratypes are deposited at Osaka Museum of Natural History, the Natural History Museum and Institute, Chiba, and the Department of Zoology, Rishiri Town Museum.

\* Contribution from the Toyama Science Museum No.193

Keys to the species of the *Gnorimosphaeroma* in Japan

- 1 Uropod smaller than half length of endopod. Each ramus of exopod of maxilla with less than 4 recurved spines ..... 2
- 1' Uropod not smaller half length of endopod. Each ramus of exopod of maxilla with more than 8 recurved spines ..... 3
- 2 Stylus of male pleopod 2 completely divided from the endopod ..... *chinense*
- 2' Stylus of male pleopod 2 not completely divided from the endopod ..... *pulchellum*, n. sp.
3. Pereopod 1 with basis bearing more than six setae at inner distal corner ..... *rayi*
- 3' Pereopod 1 with basis bearing less than three setae at inner distal corner ..... 4
- 4 Pereopod 1 with merus bearing two setae at inner distal corner ..... 5
- 4' Pereopod 1 with merus bearing three to five setae at inner distal corner ..... 7
- 4'' Pereopod 1 with merus bearing about eight setae at inner distal corner ..... *hoestlandti*
- 5 Maxilla with exopod bearing less than ten spines of each ramus. Maxilliped with palpal segment 3 with 3 setae ..... *ovatum*
- 5' Maxilla with exopod bearing more than eleven spines of each ramus. Maxilliped with palpal segment 3 with 1 or 2 setae ..... 6
- 6 Maxilliped with palpal segment 3 bearing a seta. Exopod of uropod about 3/4 time as long as endopod ..... *akanense*, n. sp.
- 6' Maxilliped with palpal segment 3 bearing 2 setae. Exopod of uropod about 3/5 time as long as endopod ..... *riei*, n. sp.
- 7 Maxilliped with palpal segment 2 bearing 2 setae. Endopod of maxilla with 11~12 setae ..... 8
- 7' Maxilliped with palpal segment 2 bearing a seta. Endopod of maxilla with 9 setae ..... *hokurikuense*, n. sp.
- 7'' Maxilliped with palpal segment 2 bearing no seta. Endopod of maxilla with 14 setae ..... *rebunense*, n. sp.
- 8 Maxilliped with palpal segment 4 bearing 5 setae ..... 9
- 8' Maxilliped with palpal segment 4 bearing 2 setae ..... *tushimaense*, n. sp.
- 9 Antenna with flagellum more than 17-segmented ..... *naktongnese*
- 9' Antenna with flagellum less than 13-segmented ..... *anchialos*

***Gnorimosphaeroma pulchellum* n. sp.**

(Jap. name : Hime-kotsubumushi, new)

(Fig.1)

*Description* : Body ovate 2.0 times as long as wide. Color dull yellow. Surface smooth. Eyes mediocre in size and each eye composed of about 45~47 ommatidia. Lateral corner subparallel. Pleonite with 2 anterior lines slightly longer than posterior one.

Antennule (Fig.1B), reaching posterior half of first pereon somite, consists of 3 peduncular segments and 5~11 flagellar segments. Antenna (Fig.1C), reaching the anterior end of second pereon somite, consists of 5 peduncular segments and 10~11 flagellar segments.

Right mandible (Fig.1D) pars incisiva 3-headed ; lacinia mobilis 3-headed but not chitinized ; 3 setae behind lacinia mobilis ; processus molaris wide. Palpal segment with 7 setae ; segment 3 with setae. Left mandible ; pars incisiva 3-headed ; lacinia mobilis 3-headed but not chitinized ; 3 setae behind lacinia mobilis ; processus molaris wide ; Palpal segment 2 with 4 setae, palpal segment 3 with 7 setae. Maxillula (Fig.1E) with endopod bearing 3 pectinated setae. Exopod bearing 8 setae, all are simple type. Maxilla (Fig.1F) with endopod bearing 6 plumose setae ; exopod bearing 3 curved spines on inner lobe and 3 curved spines. Maxilliped (Fig.1G) with a coupling hook. Palpal segment 1 bearing a seta at inner distal corner ; segment 2 with 15 setae on inner margin but no seta on outer margin ; segment 3 with 12 setae on inner margin but no seta on outer margin ; segment 4 with 11~12 setae on inner margin and a seta outer distal corner ; segment 5 with 10 setae

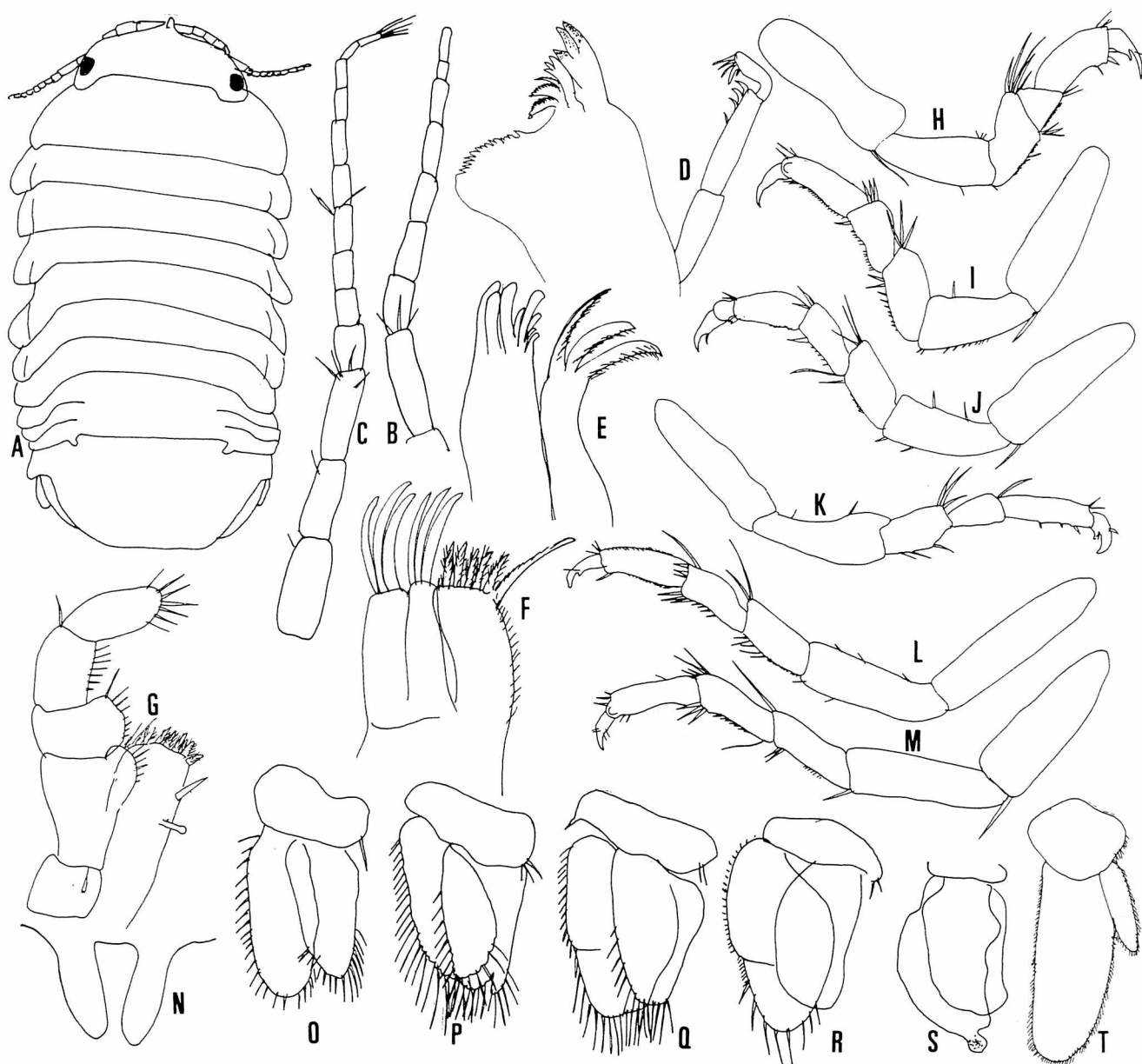


Fig.1 *Gnorimosphaeroma pulchellum* n. sp.

A. Dorsal view ; B. Antennule ; C. Antenna; . D. Right mandible ; E.. Maxillula ; F. Maxilla ; G. Maxilliped ; H-J. Pereopods 1-3 ; K-M. Pereopods 5-7 ; N. Penes ; O-S. Pleopods 1-5 ; T. Uropod (All : Holotype male).

around the margin.

Pereopod 1 (Fig.1H). Basis rectangular, 3.3 times as long as wide bearing a seta at inner distal corner ; ischium slightly tapering towards the tip with 2 short setae on inner margin and 3 very short setae near the outer distal corner ; merus triangular with 3 setae at inner distal corner, many hair on inner margin and 5 setae at outer distal corner ; carpus triangular with inner distal corner ; propodus 3 setae near the inner distal corner ; dactylus bifid.

Pereopod 2 (Fig.1I). Basis rectangular 3.7 times as long as wide bearing a seta at inner distal corner ; ischium slightly tapering towards the tip with several short setae on both margin ; merus with 3 setae outer

distal corner and, many hair on inner margin ; carpus with a stout seta inner distal corner and 4 setae at outer distal corner ; propodus 3 setae at the outer distal corner. ; dactylus bifid.

Pereopod 3 (Fig.1J). Basis rectangular 3.5 times as long as wide bearing a setae at inner distal corner ; ischium a little shorter than basis ; merus with 3 setae outer distal corner and 3 setae at inner distal corner ; .carpus with a stout seta inner distal corner and 2 setae at outer distal corner ; propodus with 3 setae at the inner distal corner and 2 setae at outer distal corner ; dactylus bifid.

Pereopod 4 (Fig.1J). Basis rectangular 3.5 times as long as wide bearing a seta at inner distal corner ; ischium a little shorter than basis, with 2 setae on inner margin and 2 setae on outer margin ; merus with 3 setae outer distal corner and 2 setae at inner margin ; carpus with a stout seta inner distal corner and a seta at outer distal corner ; propodus with a seta at the inner distal corner and a seta at outer distal corner. ; dactylus bifid.

Pereopod 5 (Fig.1K). Basis rectangular 3.9 times as long as wide bearing a setae at inner distal corner ; ischium a little shorter than basis with a seta on outer margin ; merus with 4 setae outer distal corner and 3 setae at inner margin ; carpus with a seta at outer distal corner ; propodus with 2 setae at outer distal corner ; dactylus bifid.

Pereopod 6 (Fig.1L). Basis oblong, 5 times as long as wide ; ischium  $3/4$  as long as asis with 3 setae on both margins ; merus half length of ischium with 4~5 setae and many short setae on inner margin and 3 long setae at outer distal corner ; carpus as long as merus with 3 longer and 9~10 shorter setae on inner margin and 4 setae on distal margin, 3 of them are setae with sensory edge ; propodus 1.6 times as long as wide with pubescent both margin ; dactylus bifid.

Pereopod 7 (Fig.1M). Basis oblong, twice as long as wide, with a seta at inner distal corner ; ischium as long as basis with a seta at inner distal corner ; merus half length of ischium with 3 longer and many shorter setae on inner margin and 2 long setae at outer distal corner ; carpus as long as merus with 3 longer and many shorter setae on inner margin and 9~10 setae at outer distal margin, propodus as long as carpus with 2 seta on the distal area on inner margin and 3 setae ion outer margin ; dactylus with 4-5 short setae.

Penes (Fig.1N) relatively short, each penes almost twice as long as wide.

Pleopod 1 (Fig.1O). Basis wit 3 setae ; endopod with 25~28 setae exopod with about 45 setae around the margin.

Pleopod 2 (Fig.1P). Basis with 2 coupling hooks ; endopod unique, stylus incompletely separated from the main part, with 6~7 setae around the margin, main part with about 25 setae around the margin ; exopod lanceolate wit 42~46 setae.

Pleopod 3 (Fig.1Q). Basis with 3 setae ; endopod with 16~18 setae ; exopod with 34~37 setae.

Pleopod 4 (Fig.1R). Basis with 2 coupling hooks ; endopod with 30~35 setae ; exopod with 1 or 2 setae.

Pleopod 5 (Fig.1S) with 2 bosses.

Uropod (Fig.1T). Basis round ; endopod rectangular densely pubescent along inner margin ; exopod small and 42% as long as endopod.

*Remarks* : The present species is most closely allied to *G. chinense*, especially in having small endopod of uropod and lacking of any setae of original description from the of setae 2-3, and in having a small number of teeth on Maxilla, but the former is separated from the latter in the following features : (1) more numerous setae on endopod of maxilla, whereas less numerous setae of exopod ; (2) less numerous flagella of antennule, (3)less numerous flagella of antenna, (4) longer anterior suture line than the posterior one, (5) more numerous setae on outer distal corner of merus of pereopod 1 (6)not completely separated stylus from endopod, in male second pleopod, (7)less numerous teeth on the exopod of maxilliped.

*Etymology* : *L. pulcelium/pulchellus* = very pretty.

*Material examined*;; 7 ♂♂ (1 ♂ holotype, 5.5 mm in body length and 6 ♂♂ paratypes 4.3~5.0 mm in body length) and 2 ♀♀ (paratypes, 4.2~4.5 mm in body length), mouth of Obitsu river, Kisarazu City, Chiba



Prefecture Nov. 18, 1997, coll. Akira Tukagoshi, of the University of Tokyo. Type series is deposited as follows : Holotype (TOYA Cr-12482) and 4 paratypes (12483 ~12486) at the Toyama Science Museum 2 paratypes (OMNH Ar 3943~3944) at the Osaka Museum of Natural History ; 2 paratypes (CBM-ZC 4076) at the Natural History Museum and 2 paratypes, Institute, Chiba..

***Gnorimosphaeroma iriei* n. sp.**

(Jap. name : Saigoku-kotsubumushi, new)

(Fig.2)

*Description. of male.* Body ovate, 1.8 times as long as wide. Color grayish-brown. Dorsal surface smooth with minute granules. Pleonal somite with 2 suture lines and anterior one slightly longer than the posterior one. Eyes mediocre in length, each eye with 34~36 ommatidia.

Antennule (Fig.2B) short, reaching 1st pereonal somite, consists of 2 peduncular segments and 8 flagellar segments. Antenna (Fig.2C), reaching 2nd pereonal somite, consists of 4 peduncular segments and 10 flagellar segments.

Right mandible (Fig.2D). Pars incisiva composed of 1~3-headed ; lacinia mobilis 4-headed but not chitinized ; 5~6 setae ; processus molaris wide. Palpal segment 2 with 6 setae in lateral margin ; palpal segment 3 with 2 setae on inner apical area. Left mandible ; pars incisiva 4-headed ; lacinia mobilis 3-headed and chitinized ; 4 or 5 setae ; processus molaris wide. Maxillula (Fig.2E). Outer lobe with 10 Pectinated setae at the tip, inner four of with denticles on their inner margins ; Inner lobe with 4 serrated teeth. Maxilla (Fig.2F) with endopod with 12 plumose setae ; exopod bilobed ; inner lobe 10~11 curved spines and 12 curved spines. Maxilliped (Fig.2G) a coupling hook on inner margin. Palpal segment 2 trapezoid with 10 setae on inner margin and a seta near the outer distal corner ; segment 3 with 12 setae on inner margin and with 2 long setae at outer distal end ; segment 4 with 8 setae on distal half of inner margin and 2 long setae at middle part and outer distal corner ; terminal segment with 9~10 setae around the margin.

Pereopod 1 (Fig.2H). Basis rectangular with a seta at inner distal corner, ischium as long as basis with 5-6 setae on inner margin ; merus about half the length of basis with 3 relatively long setae at outer distal corner ; carpus as long as merus with 8 setae along distal margin ; propodus relatively stout with 6 setae on inner margin ; dactylus bifid.

Pereopod 2 (Fig.2I). Basis long, 4 times as long as wide ; ischium 4/5 time as long as wide, with 4-5 setae on inner margin and 4 setae on outer margin ; merus with a long seta at inner distal corner and 2 setae at outer distal margin ; carpus rectangular a little longer than merus, with a seta on inner margin and 2 setae on outer margin ; dactylus bifid.

Pereopod 3 (Fig.2J). Basis rectangular, 4 times as long as wide, with 3 setae on inner margin and a long seta at inner distal margin ; ischium a little shorter than basis and densely pubescent along inner margin on inner margin ; merus half length of basis, with 6~7 segment on inner margin and 2 setae at outer distal corner ; carpus 2/3 time as long as basis with 30~33 stout setae on inner margin and a seta at inner most corner and outer distal corner respectively. ; dactylus bifid..

Pereopod 4 Basis rectangular, 3 times as long as wide, with 4 short setae on inner margin ; ischium 3/4 time as long as basis ; with pubescent inner margin ; merus with 2setae on inner margin and 3 setae at outer distal corner inner margin pubescent. ; carpus rectangular with 2setae at inner disatal corner and 3 setae at outer distal corner ; propodus as long as ischium wirh 5~6 short seta on inner margin ; dactylus bifid with 3 setae .

Pereopod 5 (Fig.2K). Basis rectangular, 3.5 times as long as wide with 5 setae on inner margin ; ischium as long as basis densely pubescent along inner margin on inner margin ; merus, about half length of ischium with pubescent inner margin, with 2 setae at inner distal corner and 3 setae at outer distal corner ; carpus a stout seta at inner distal corner and 2 setae at outer distal corner ; propodus with 5 setae on inner martin and

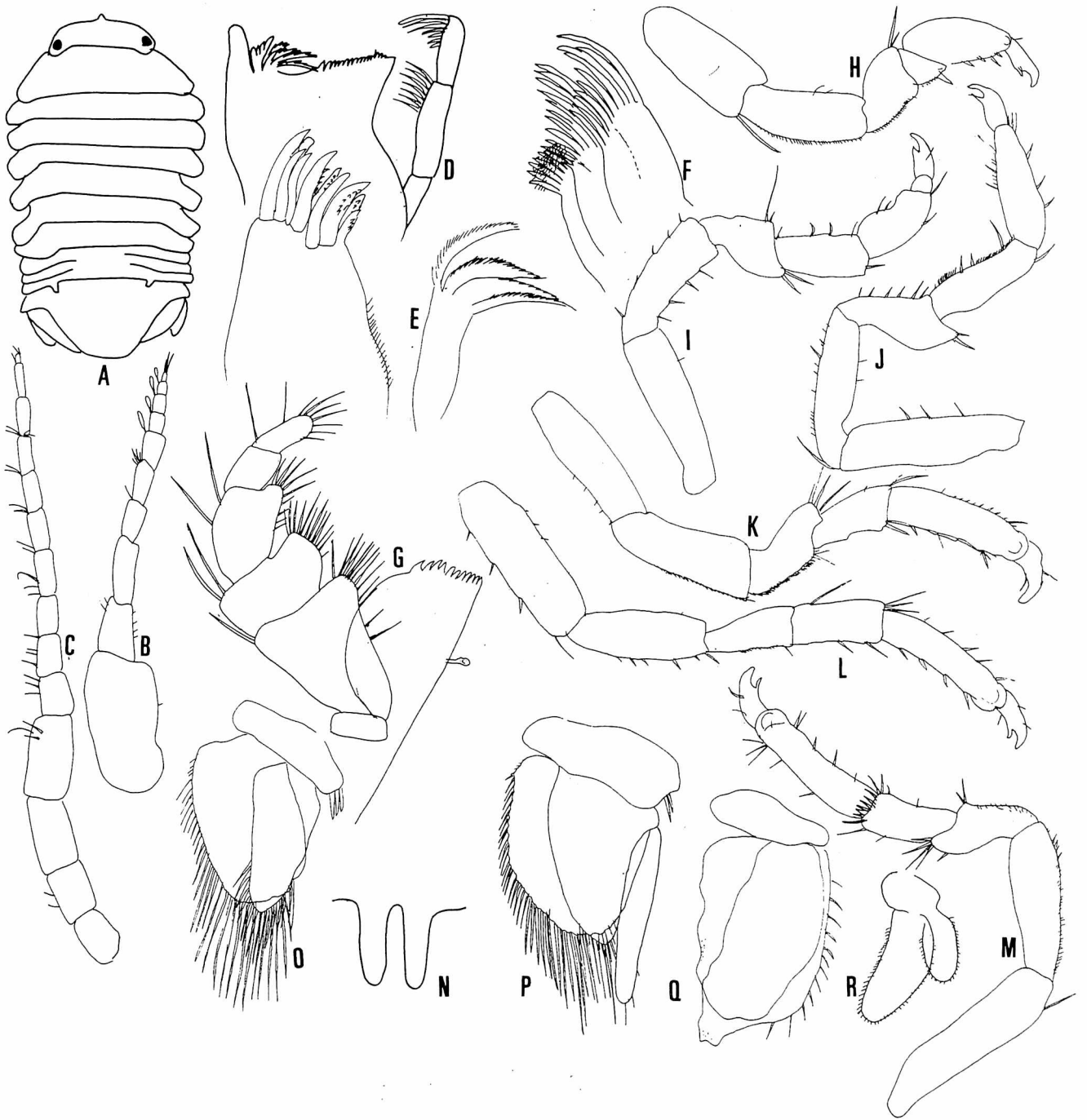


Fig.2. *Gnorimosphaeroma iriei* n.sp.

A. Dorsal view ; B. Antennule ; C. Antenna ; D. right mandible ; E. Maxillula ; F. Maxilla ; G. Maxilliped ; H-J. Pereopods 1-3 ; K-M. Pereopods 5-7 ; N. Penes ; O-P. Pleopods 1-2 ; Q. Pleopod 5 ; R. Uropod (All : Holotype male).

several seta on outer margin ; dactylus bifid.

Pereopod 6 (Fig.2L). Basis 3 times as long as wide, with 4 seta on inner margin and 3 setae on outer margin ; ischium 3/4 time as long as basis, with 4~5 setae on inner margin ; merus with many fine setae on

inner margin and a long seta at outer distal corner ; carpus as long as merus, with 3 setae on inner margin and 3 setae at outer distal corner ; propodus with 4 stout setae on inner margin and 6 seta on outer margin dactylus bifid

Pereopod 7. (Fig.2M). Basis oblong, 4.5 times as long as wide, with a seta at inner distal corner ; ischium 5/7 time as long as basis, densely pubescent along inner margin on inner margin ; merus 3/5 time as long as ischium densely pubescent along inner margin on inner margin and 4 setae at outer distal ; corner ; carpus as long as merus with 2 setae at inner distal corner and a seta at outer distal corner ; propodus as long as ischium with 5 setae on inner margin and 7 setae on outer margin ; dactylus bifid.

Penes (Fig.2N) straight and relatively short, each penis 3 times as long as wide.

Pleopod 1 (Fig.2O) Basis with 3 coupling hooks ; endopod with 15-16 plumose setae around the margin ; exopod with 50-56 plumose setae around the margin. ;

Pleopod 2 (Fig.2P). Basis with 4 coupling hooks ; endopod with 33 plumose setae around the margin ; stylus ; exopod narrower than endopod with 15 plumose setae around the margin.

Pleopod 3 Basis with coupling hooks ; endopod with 13 plumose setae around the margin ; exopod with 10 plumose setae around the margin.

Pleopod 4 (Fig.2Q). Basis with coupling hooks ; endopod plumose setae around the margin ; exopod with 16 plumose setae around the margin.

Pleopod 5 basis elliptical ; endopod rectangular ; exopod with relatively short 12 ~ 14 plumose setae around the margin and 2 bosses.

Uropod (Fig.2R). Basis round ; endopod slightly tapering toward the tip ; exopod 3/5 times as long as wide

*Remarks* : The present new species is allied to *Gnorimosphaeroma naktongnese*, collected from southern end Korean Peninsula but differs from *naktongnese* in the following features (1)less numerous flagellum of antennae (2)less numerous flagellum of antennule (3)more numerous setae at the outer distal corners of pereopod 1 (4) more numerous setae of maxilla, (5) a little shorter exopod of uropod, (6)shorter penes, (7)smaller eyes, (8) less protruded inner margin of propodus of pereopod 2, (9) single coupling hook.

*Etymology* : The species name is named for Mr. Teruo Irie, who kindly gave me the species from the type locality and studied on the ecology of this species.

*Material examined* ; 10 ♂♂ (1 ♂ holotype, 5.6 mm in body length and 9 ♂♂ paratypes 5.0~5.7mm in body length) and 24 ♀♀ (paratypes 4.1~5.8mm in body length), Ezu-ko Lake, Kumamoto City, Kumamoto Pref., coll. Teruo Irie, Aug. 28 1984 Type series is deposited as follows : Holotype (TOYA Cr-12487) and 11 paratypes (12488~12498) at the Toyama Science Museum, 11 paratypes (OMNH Ar-3945~3955) at the Osaka Museum of Natural History ; 11 paratypes (CBM-ZC-4077) at the Natural History Museum and Institute, Chiba.

***Gnorimosphaeroma rebunense* n. sp.**

(Jap.name : Rebun-kotusubumushi, new)

(Fig. 3)

*Description* ; Body 1.9 times as long as wide. Height of body is almost average of this genus. Color brownish and blackish gray with many paler irregular patterns. Central part of projection on the anterior part of cephalon and both antennae completely divided. Eyes mediocre in size, each eye composed of 30 ommatidia. Two suture lines are almost same in length. Posterior end slightly protruded.

Antennule, (Fig.3A) reaching the anterior half of first pereonal somite ; peduncle slender and- three segmented ; Flagellum 8 segmented. Antenna (Fig.3C) longer than antennule and reaching the middle part of pereonal somite 2. Flagellum four-segmented and Flagellum composed of 10~11 segments.

Right mandible (Fig.3D) pars incisiva 4-headed ; lacinia mobilis 4-headed but not chitinized ; 4 setae behind lacinia mobilis ; processus molaris wide. Palp three-segmented, segment 2 with 13~15 setae ; segment 3 with 14~15 setae, the terminal one is especially long. Left mandible Pars incisiva 7-headed ; lacinia mobilis

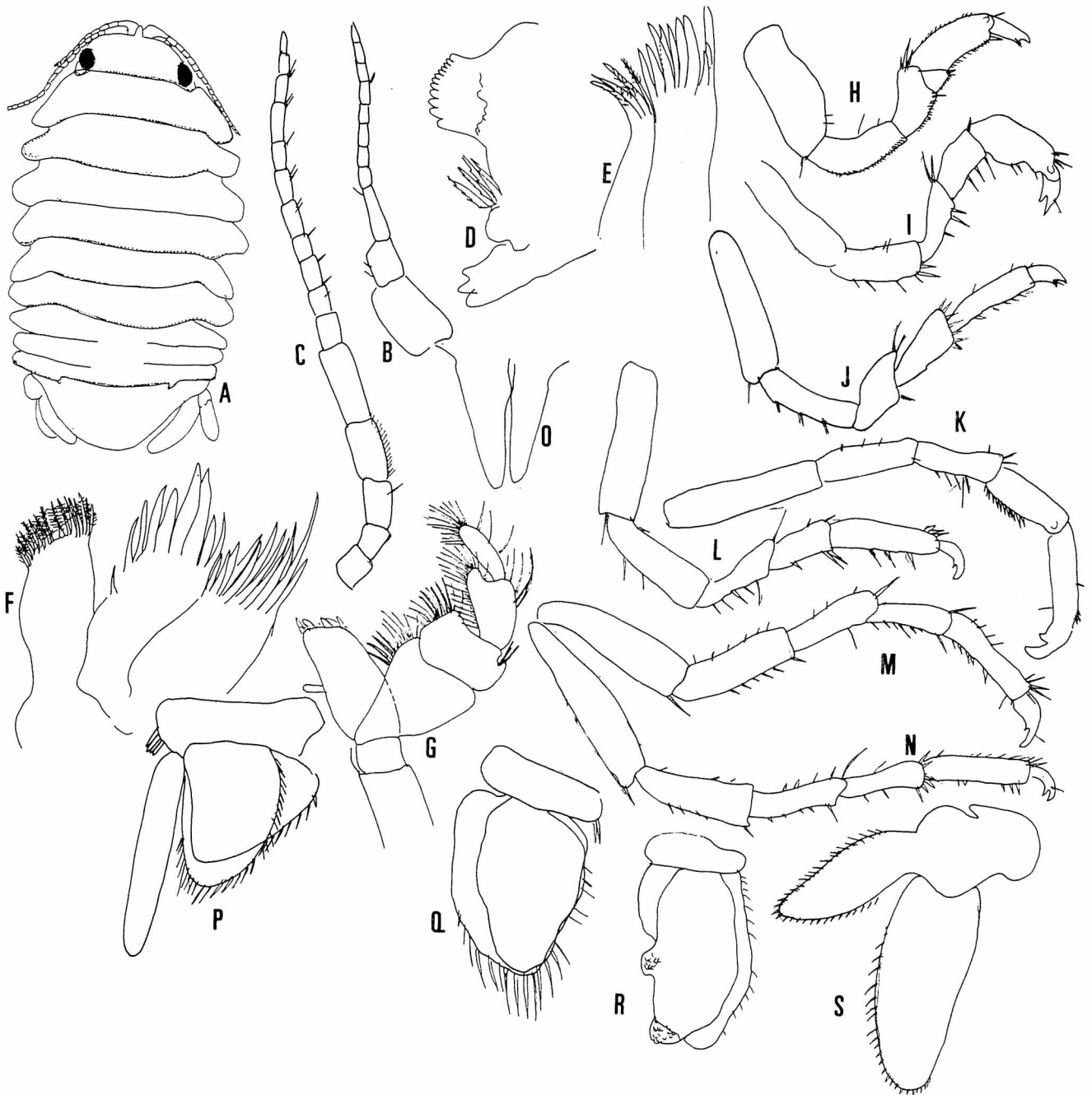


Fig.3 *Gnorimosphaeroma rebunense* n. sp.

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Right mandible ; E. maxillula ; F. Maxilla ; G. Maxilliped ; H. -N. Pereopods 1-7 ; O. Penes ; P-Q. Pleropods 2-3 ; S. Uoprod (All ; Holotype male).

4-headed and not chitinized 3-setae behind lacina mobilis ; processus molaris wide. Palpal segment 2 with 8 setae ; palpal segment 3 with 13 setae. Maxillula. (Fig.3E) with endopod bearing 4 pectinated setae ; exopod bearing 10~11 teeth, all are simple type. Maxilla (Fig.3F) with endopod bearing 16 plumose setae ; exopod with 5 teeth and 16 teeth on inner lobe and outer lobe respectively, outermost 2 are especially long. Maxilliped (Fig.3G). Endite rectangular with a coupling hook and 6 stout setae and many hair on distal margin. Palp

stout ; segment 1 ; segment 2 big and triangular with 14~15 setae on inner margin and a seta a stouter distal corner ; segment 3 triangular and somewhat shorter than segment 2, with a shallow mouth and 17~20 setae on inner margin ; segment 4 rectangular, as long as segment 3 with 10 setae on inner margin and 3 setae on outer margin segment 5 with 12~13 setae around the margin..

Pereopod 1 (Fig.3H) relatively short. Basis rectangular, with a seta at inner distal corner with long seta at inner distal corner and 3 shorter setae on inner margin ; ischium a little shorter than basis with a little shorter than basis with short many hair and a long seta at the middle are of inner margin ; merus short, half length of ischium, with 2-3 relatively long setae and many fine setae on inner margin and 4 long setae at outer distal corner;; carpus short and triangular with 2 stopus setae on inner margin ; propodus as long as ischium with 2 stout setae on inner margin ; dactylus bifid with 2~3 setae .

Pereopod 2. (Fig.3I) Basis rectangular ; Ischium rectangular with 3~4 short setae and 3 setae on inner margin and a middle part of outer margin ; merus 3/4 of ischium with 2 setae on inner margin and 2 long setae at the outer distal area ; carpus as long as merus with 3 setae and seta at outer distal corner ; propodus as long as carpus with a swollen area on the basal half of inner margin bearing 3 setae and with 3 setae at outer distal corner. ; propodus with setae on inner margin ; dactylus bifid.

Pereopod 3. (Fig.3J) Basis long, 4 times as long as wide, with a long seta at the outer distal corner ; ischium 2/3 time as long as basis, with 3 setae on inner margin ; merus half length with a seta at inner distal corner and 2 setae at outer distal corner ; carpus as long as merus, with 7 setae on distal end ; propodus rectangular with 3 setae on inner margin and 2 setae on outer margin ; dactylus bifid.

Pereopod 4 (Fig.3K) Basis long, 5 times as long as wide ; ischium half length of basis, with 3 setae on inner margin ; merus a little shorter than ischium, densely pubescent along inner margin on inner margin and a 3 setae at outer distal corner ; carpus a little shorter than merus with fine hair on inner margin and 3 setae at outer distal corner ; propodus as long as ischium, with a seta on inner margin and 3 setae on outer margins ; dactylus bifid.

Pereopod 5 (Fig.3L). Basis rectangular, 4 times as long as wide with a seta at outer distal seta on inner margin ; ischium a little shorter than basis, with 2 setae on inner margin ; merus with 2 setae at outer distal corner ; carpus rectangular with 3 setae on inner margin and 2 setae on outer margin ; propodus rectangular with 3 setae on inner margin ; dactylus bifid.

Pereopod 6 (Fig.3M) Basis rather short, 4 times as long as wide with a relatively long setae at inner distal corner ; ischium a little shorter than basis, with relatively short setae on both margins ; merus rectangular with a long seta on each margin ; carpus a little shorter than merus, with 5 setae on inner margin ; propodus rectangular with a group of setae near outer distal area ; dactylus bifid.

Pereopod 7. (Fig.3N) Basis long, 4.5 times as long as wide without seta ; ischium 2/3 times as long as basis with many fine setae on inner margin ; merus a little shorter than ischium with short setae on inner margin and with a seta inner distal corner and a seta outer distal corner ; carpus as long as merus, with fine hair ; carpus as long as merus, bearing and a seta at inner distal corner and a outer distal corner ; propodus as long as carpus with 3 relatively ; long setae and many fine hair. ; dactylus bifid.

Penes (Fig.3O) Each penis 4 times as long as wide, slightly tapering towards the tip.

Pleopod 1. Basis with 4 coupling hooks ; endopod with 24~35 setae around the margin ; exopod with 41~44 setae around the margin

Pleopod 2. (Fig.3P) Basis low rectangular with 4 setae ; endopod with 16 plumose setae. Stylus stout and club-shaped times as long as wide.

Pleopod 3. basis with 15~16 setae exopod lanceolate with 16~20 setae around the margin.

Pleopod 4 (Fig.3Q). Basis with 2 coupling hooks.

Pleopod 5 (Fig.3R) : Basis round ; endopod with 20~23 short setae and 2 bosses; exopod 4/5 of endopod with 15-17 short setae around the margin.

Uropod (Fig.3S) relatively stout Basis endopod ; exopod 0.85 times as long as endopod.

*Remarks:* The present new species is allied to *G. ovatum* but differs from the latter in the following features (1) less numerous flagellum of antennule, (2) less numerous flagellum of antenna, (3) more numerous setae of mandible.

*Etymology:* The specific name is derived from the type locality

*Material examined;* 8 ♂♂ (1 ♂ holotype, 7.6 mm in body length and 7 ♂♂ paratypes 6.0~9.6 mm in body length) and 17 ♀♀ (paratypes 6.5~8.7 mm in body length), 10-40cm Kushu-Lake. Rebun Island Hokkaido, coll. Noboru Nunomura July 10, 1995., Type series is deposited as follows : Holotype (TOYA Cr-12499) and 11 paratypes (TOYA Cr-12500~12510) at the Toyama Science Museum, 6 paratypes (OMNH Ar-3596~3961) at the Osaka Museum of Natural History ; 6 paratypes (CBM ZC-4078) at the Natural History Museum and Institute, Chiba, and 6 paratypes (RTMCRU 15~20) at the Rishiri Town Museum.

***Gnorimosphaeroma hokurikuense* n. sp.**

(Jap. name : Hokuriku-kotsubumushi, new)

(Fig.4)

*Description :* Body 2.2 times as long as wide. Color blackish gray. Eyes mediocre in size, each eye with about 90 ommatidia. Hind margin of pleotelson rounded. Dorsal surface smooth with minute granules. Pleonite with 2 suture lines and anterior one slightly longer than the posterior one.

Antennule (Fig.4B) Flagellum composed of 8~10 segments. Antenna (Fig.4C), reaching the posterior half of pereopod segment 2, Flagellum composed of 11~13 segments.

Right mandible (Fig.4D) Pars incisiva 4-headed ; lacinia mobilis thin and 4-headed but not chitinized ; four setae behind lacinia mobilis ; processus molaris stout ; palpal segment 2 with 9 setae and a long seta ; segment 3 with 15 setae on inner margin. Left mandible. Pars incisiva 4-headed ; lacinia mobilis 3-headed ; 3 setae behind lacinia mobilis ; processus molaris wide ; palpal segment 2 with 9 setae and a long seta ; segment 3 with 15 setae on inner margin. palpal segment 2 with 6 long setae ; segment 3 with 10 short setae. Maxillula. (Fig.4E) Endopod with 9 pectinated setae, 2nd, 3rd, 4th and 6th are dentate. Endopod with 4 pectinated setae. Maxilla (Fig.4F) with 9 setae on endopod. Exopod with 9 setae on inner ramus and 13~14 setae on outer ramus. Maxilliped. (Fig.4G) Endite with one or two coupling hooks on the lateral border, and 11~12 stout setae on distal margin. ; palpal segment 2 with 10~12 setae on inner margin and a seta at outer distal corner ; segment 3 broad with segment ; 4 with 12~14 setae on inner margin, terminal segment with 3 setae on inner margin, 3 setae on outer margin and 4 setae on distal area.

Pereopod 1 (Fig.4H). Basis with a seta on outer margin ; ischium 2~3 as long as basis, with a long seta on inner margin and 2 setae in outer margin ; merus a little shorter than ischium, densely pubescent along the inner margin, and with 3 setae on outer distal margin ; carpus triangular with 7~10 setae on inner margin ; propodus as long as ischium, with 5 stout setae on inner margin and 5~6 simple margin on outer margin ; dactylus bifid.

Pereopod 2 (Fig.4I). Basis long, 4 times as long as wide with 2 short setae on outer margin ; ischium 2/3 time as long as basis ; merus as long as ischium with 6 setae on inner margin and 2 setae outer-distal margin ; carpus as long as merus with 6 setae on inner margin ; propodus, as long as carpus and slightly swollen, with 3 setae on inner margin and a seta on outer margin. ; dactylus bifid.

Pereopod 3 (Fig.4J). Basis long, 4.5 times as long as wide, with a seta at inner distal corner and many hair on both margins ; ischium 4/5 time as long as basis with 4 setae on inner margin and 2 setae on outer margin ; merus half length of ischium with a long seta and many short setae on inner margin ; carpus a little shorter than merus, with a long seta and dense hair on inner margin ; propodus, as long as ischium, with 3 setae on inner margin and 2 setae at outer distal corner. ; dactylus bifid.

Pereopod 4 (Fig.4K). Basis rectangular, 3 times as long as wide, with 3 setae on outer margin and a



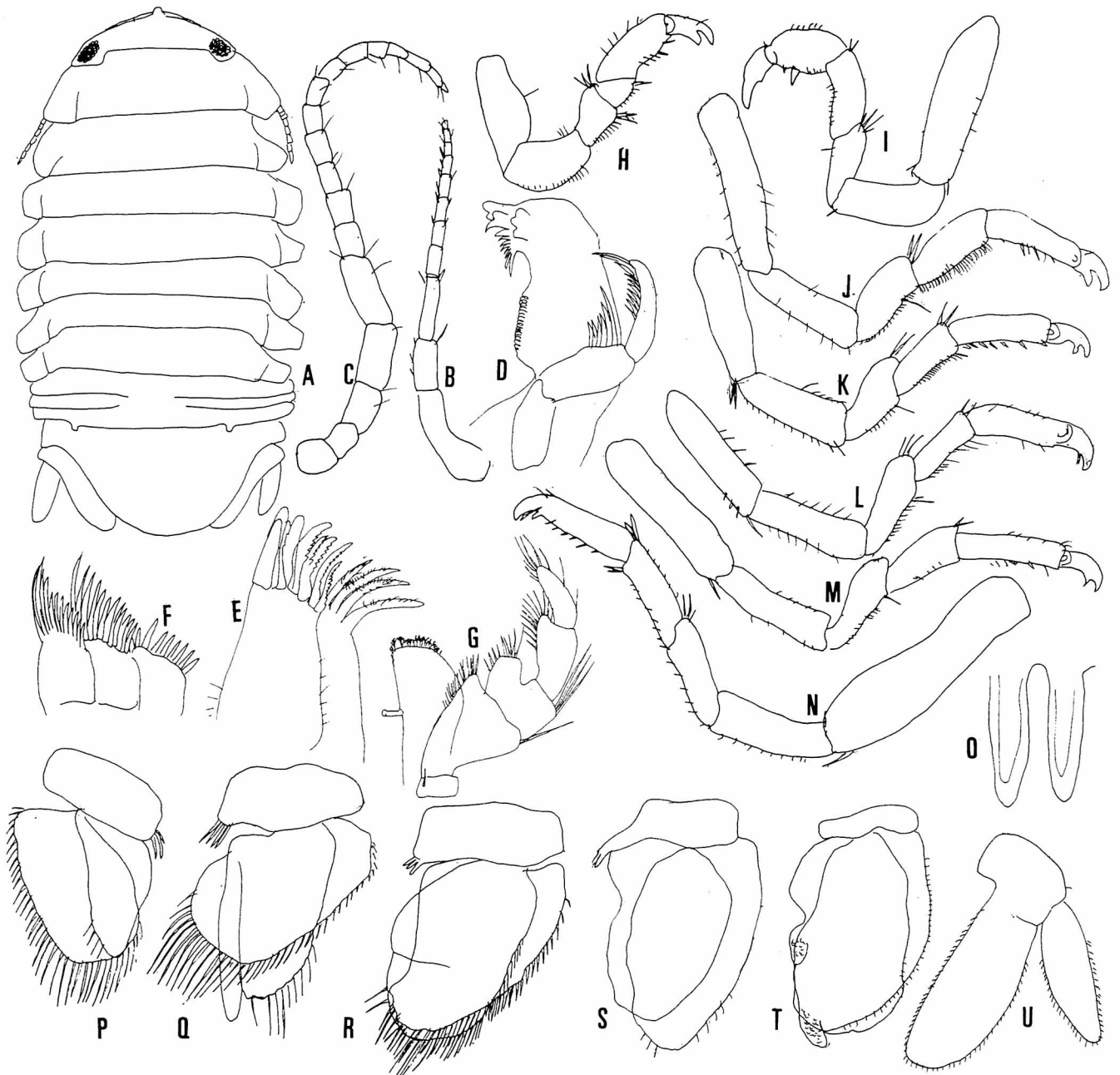


Fig.4. *Gnorimosphaeroma hokurikuense* n. sp

A. Dorsal view ; B. Antennule ; C. Antenna ; . D. Right mandible ; . E. Maxillula ; F Maxilla ; G. Maxilliped ; . H-N. Pereopods 1-7 ; O. Penes ; P-T. Pleopods 1-5 ; U. Uropod (All : Holotype male).

relatively long seta at inner distal corner ; ischium  $\frac{3}{5}$  time as long as basis with 2 setae on inner margin ; merus half length of ischium with a seta and many setae on inner margin ; carpus a little longer than merus, with 2 setae on inner margin and 2 setae on outer distal corner ; propodus as long as ischium, with 2 setae at outer distal corner ; dactylus bifid.

Pereopod 5 (Fig.4L) long 3.2 times as long as wide ; ischium  $\frac{2}{3}$  time as long as basis ; merus half length of ischium with a seta on margin ; carpus rectangular, with 2 setae on inner distal and outer distal margins,

respectively ; propodus rectangular with 3 setae on inner margin and 3 setae on outer margin ; dactylus bifid.

Pereopod 6 (Fig.4M). Basis relatively stout with 6 setae on outer margin and a long seta at inner distal corner ; ischium a little shorter than basis, with 5~6 setae on inner margin ; merus 2/3 as long as wide, with 5~6 setae on inner margin ; carpus as long as merus with 6~7 short setae on inner margin and 2 setae at outer distal corner ; propodus a little longer than carpus, with 2 long setae on inner margin.. ; dactylus bifid.

Pereopod 7 (Fig.4N). Basis 4.5 times as long as wide, with a short seta near the distal end ; ischium 4/5 time as long as basis, with 6~7 setae on inner margin and 4~5 seta on outer margin ; merus with a long seta and densely pubescent along the inner margin, and 2 setae at outer distal corner ; carpus rectangular with 4 setae on distal margin ; propodus with 2 setae on outer margin and 4 setae on inner margin ; dactylus bifid.

Penes (Fig.4O) paired, each penis 3 times or more, as long as wide.

Pleopod 1 (Fig.4P). Basis low rectangular with 4 pectinate setules .endopod triangular with 15~17 setae around the margin ; exopod rectangular with 35~40 plumose setae around the margin.

Pleopod 2. (Fig.4Q). Basis low rectangular with 2~3 pectinate setules ; endopod triangular with 20 plumose setae around the margin ; appendix masculina stout ; exopod rectangular with 50 plumose setae around the margin.

Pleopod 3 (Fig.4R). Basis low rectangular ; endopod triangular with 10 setae around the margin ; exopod rectangular with 30 plumose setae around the margin.

Pleopod 4 (Fig.4S). Basis elliptical ; endopod triangular with 4 setae around the margin ; exopod elliptical with a shallow concavity at the end and 2 short setae around the margin.

Pleopod 5 (Fig.4T). Basis round ; . endopod triangular with ; exopod rectangular with short setae sparsely.

Uropod (Fig.4U). Basis elliptical ; endopod of with swollen and rounded tip ; exopod lanceolate, 2/3 time as long as wide.

*Remarks* : The present new species is allied to *G. naktongense*, but the former is separated from the latter in the following features : (1)less numerous flagellum of antenna, (2) less numerous flagellum of antenna ; (3) more numerous pectinated spines of mandible (4)single coupling hook on the lateral border of maxilliped, (5) more numerous setae on merus of pereopod 1(6)

*Etymology* : The specific name derives from the type locality.

*Material examined* ; 3♂♂ (1♂, holotype, 9.0 mm in body length and 2♂♂ paratypes 6.1~7.0 mm in body length) and 10♀♀ (paratypes, 3.1~5.2 mm in body length), Small stream from a pond called "Yomokurouike", Takaoka City, Toyama, coll. Noboru Nunomura, July 24 1987.

Type series is deposited as follows : Holotype (TOYA Cr-12511) and 5 paratypes (TOYA Cr-12512~12517) at the Toyama Science Museum, 3 paratypes (OMNH Ar-3962~9364) at the Osaka Museum of Natural History ; 3 paratypes (CBM-ZC-4079) at the Natural History Museum and Institute, Chiba..

### ***Gnorimosphaeroma akanense* n. sp.**

(Akan-kotsubumushi, new)

(Fig.5)

*Description* : Male. Body ovate, 2.0 times as long as wide, Color blackish brown. Dorsal surface smooth with minute granules. Cephalon (Fig.5D) with a protruded medial area. Clypeus and frontal lamina (Fig.5E) trapezoid. Eyes relatively big, each eyes with 95~100 ommatidia. Pleonal somite with 2 suture lines and anterior one slightly longer than the posterior one. Adult male reaches 9 mm in length. Pleon with 2 pairs of suture lines, anterior ones only a little longer than the posterior one.

Antennule (Fig.5B) short with 3 peduncular and 5 flagellar segments. Antenna (Fig.5C), reaching the anterior half of pereonal somite 1., composed of with 5 peduncular segments and 13~15 flagellar segments.

Right mandible (Fig.5F) pars incisiva 3-headed ; lacinia mobilis 2-headed but not chitinized ; 5~6 setae behind lacinia mobilis ; processus molaris wide. Palpal segment 2 with 9~10 setae and palpal segment 3 with 12

setae. Left mandible pars incisiva 3-headed ; lacinia mobilis 3-headed and chitinized ; 8 setae behind lacinia mobilis. processus molaris wide. Palpal segment 2 with 5 setae ; palpal segment segment. Maxillula, endopod with 4 long serrated spine ; exopod with 10 pectinated setae. Maxilla (Fig.5G). Inner lobe wide with 14 setae ; each ramus of outer lobe with 9 teeth Maxilliped (Fig.5H) with a coupling hook ; palpal segment 2 with 12~13 setae on inner margin and a seta at outer distal corner ; segment 3 with 14 setae and several fine setae on inner margin and a long a seta at outer distal corner ; segment 4 with 4 setae on outer margin ; segment 5 with 11~12 setae on inner margin and 2 long setae on outer margin 5~6 setae in apical area.

Pereopod 1 (Fig.5I). Basis relatively stout, about twice as long as wide, with 11~13 short setae on inner margin and 5~6 setae on outer margin, and a relatively long seta at inner distal corner ; ischium  $3/4$  time as long as basis, inner margin with merus  $3/5$  time as long as ischium both margins pubescent densely and with 2 setae at outer distal margin ; carpus triangular, inner margin pubescent ; propodus  $4/5$  time as long as ischium, inner margin densely pubescent and with a stout seta at the inner distal corner and outer distal corner ; dactylus bifid.

Pereopod 2 (Fig.5J). Basis 3.5 times as long as wide ; ischium 3 time as long as basis ; merus short, half length of ischium, with 2 setae at outer distal corner ; carpus rectangular as long as ischium ; propodus a little shorter than carpus and inner margin swollen, and densely pubescent ; dactylus bifid.

Pereopod 3. Basis rectangular ; 3 times as long as wide ; ischium a little shorter than basis ; merus with longer setae and pubescent inner margin ; carpus as long as merus and pubescent inner margin ; propodus with a long a seta ; dactylus bifid.

Pereopod 4. Basis relatively stout. twice as long as wide ; ischium a little longer than basis, inner margin densely pubescent and a seta at inner distal corner ; merus  $3/4$  time as long as ischium, inner margin densely pubescent and 4~5 setae at outer distal corner ; carpus  $4/5$  time, inner margin densely pubescent ; propodus as long as ischium and both margins densely pubescent ; dactylus bifid.

Pereopod 5 (Fig.5K). Basis rounded with 3 setae on inner margin ; ischium rectangular with pubescent inner margin ; merus a little shorter than ischium with, pubescent inner margin and 5 setae at outer distal corner ; carpus rectangular with a seta at inner distal corner margin ; propodus rectangular, inner margin densely pubescent. dactylus bifid.

Pereopod 6 (Fig.5L). Basis oblong, 4 times as long as wide, with a seta at outer distal corner ; ischium 5-6 setae on inner margin ; ischium 2-3 seta on inner margin and 2 seta at outer distal corner ; merus as long as merus with 2~3 seta on inner margin and 2 setae at outer distal corner propodus a little longer than carpus.. ; dactylus bifid.

Pereopod 7 (Fig.5M) Basis oblong, 4 times as long as wide ; ischium  $3/5$  time as long as basis ; inner margin densely pubescent ; merus  $2/3$  time as long as ischium with 2 setae at outer distal corner ; carpus as long as merus with 10 setae on distal margin ; propodus 0.7 time as long as carpus ; dactylus bifid.

Penes (Fig.5N) straight but only slightly bent innerward at the tip.

Pleopod 1 (Fig.5O). Basis with 3 or 4 coupling hooks ; endopod triangular with 16~17 setae plumose setae ; exopod semicircular with 42 plumose setae .

Pleopod 2 (Fig.5P). Basis with a coupling hook ; endopod semicircular with 18 plumose setae ; exopod semicircular with 40 plumose setae. Appendix masculina club shaped.

Pleopod 3 (Fig.5Q). Basis with 2 coupling hooks ; endopod lanceolate with 13 plumose setae ; exopod semicircular with 15 plumose setae.

Pleopod 4 (Fig.5R). Basis small ; endopod triangular without seta ; exopod semicircular with plumose setae.

Pleopod 5 (Fig.5S) Basis without coupling hooks ; endopod lanceolate without seta ; exopod semicircular without seta.

Uropod (Fig.5T). Basis small ; endopod 2 times longer than width ; both side parallel and apical end with fine setae around the margin ; exopod 0.8 time as long as endopod.

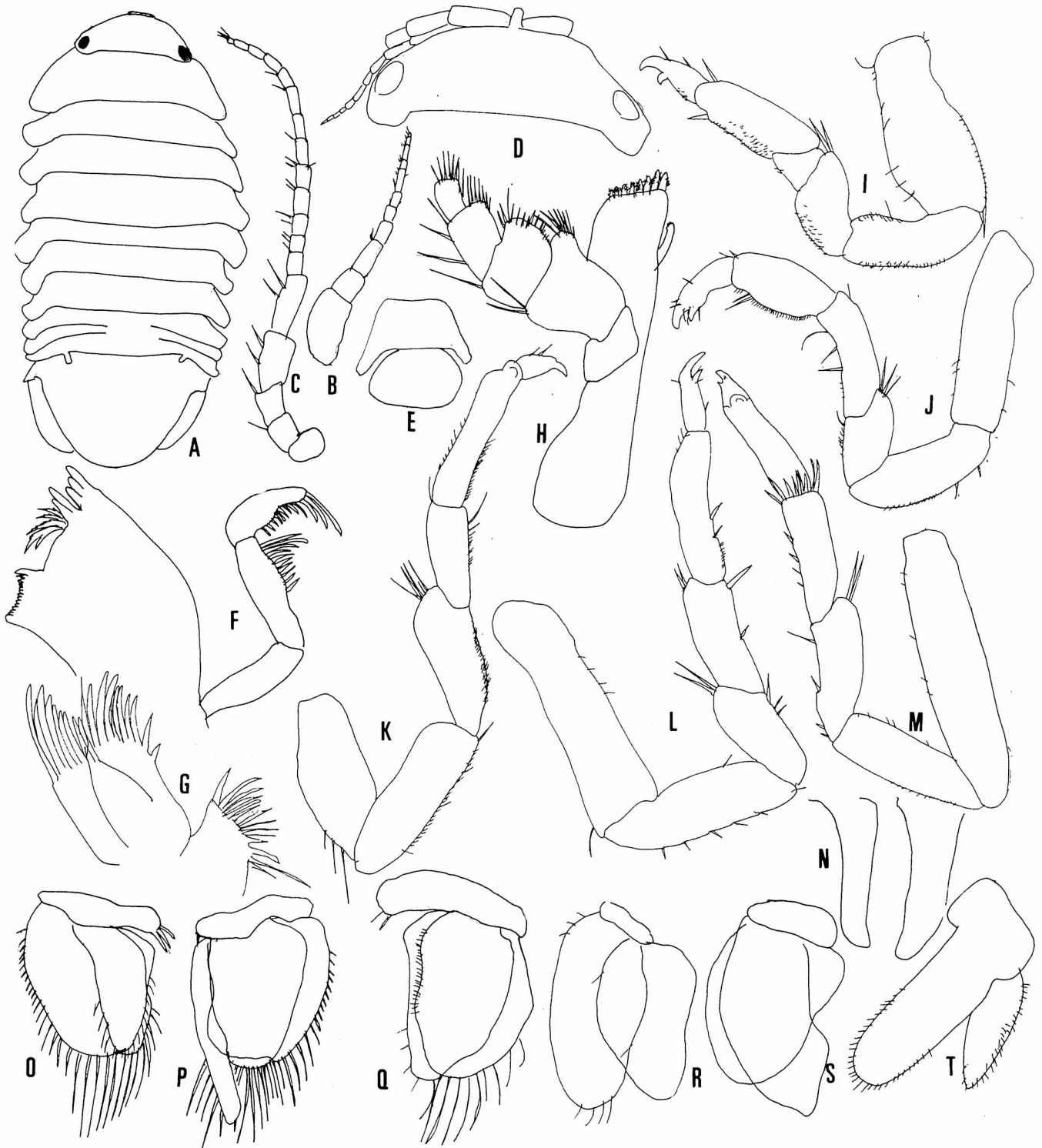


Fig.5 *Gnorimosphaeroma akanense* n. sp.

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Dorsal view of cephalon ; E. Clypeus and frontal lamina ; F. Right mandibl ; G. Maxiilla ; H. Maxilliped ; I-J. Pereopods 1-2 ; K-M. Pereopods 5-7 ; N. Penes ; O-R. Pleopods 1-5 ; S. Uropod (All : Holotype male).

*Remarks* : The present new species is allied to *G. nacktongense*, but the former is separated from the latter in the following features : (1)less numerous flagellum of antennule, (2)less numerous flagellum of antenna, (3)

less numerous setae of palpal segment 3, (4) less numerous, (5) single coupling hook on endite of maxilliped.

The present new species is also allied to *G. hokurikuensis*, but it differs from the latter in the following features : (1)less numerous flagella of both antenna, (2)more numerous, (3)less numerous setae on endopod of maxillua and (4)less numerous setae on maxilla.

*Etymology* : The specific name derives from the type locality

*Material examined* ; 8♂♂ (1♂♂, 6.6 mm in body length and 7♂♂ paratypes 4.8~7.2 mm) in body length and 31♀♀ paratypes 2.2-8.9 mm in body length), Freshwater of Akan-gawa, River from the Oskandake, Hokkaido, Riffle June 13, 1990, R. Kuranishi. Type series is deposited as follows : Holotype (TOYA Cr 12518) and 8 paratypes (12519~12526) at the Toyama Science Museum 10 paratypes (OMNH Ar 3965~3974) at the Osaka Museum of Natural History ; 10 paratypes (CBM-ZC-4080) at the Natural History Museum and Institute, Chiba, and 10 paratypes (RTMCRU 21~30) at the Rishiri Town Museum.

***Gnorimosphaeroma tsushimaense* n. sp.**

(Jap.name : Tsushima-kotsubumushi, new)

(Fig. 6)

*Description* ; Body 1.7 times as long as wide. Color grayish brown. Hind margin of pleotelson rounded. Dorsal surface smooth with minute granules. Cephalon with a protruded medial area. Pleonal somite with 2 suture lines and anterior one slightly longer than the posterior one. Pleon with 2 pairs of suture lines, anterior ones only a little longer than the posterior one.

Antennule (Fig.6B) with flagellum 6~10 segmented, not reaching the posterior margin of the pereonite I. Antenna (Fig.6C) with 17~20 flagellar segments, exceeds beyond the posterior end of pereonite 3.

Right mandible (Fig.6D). pars incisiva 3-headed ; lacinia mobilis 3-headed but not chitinous ; 3 setae behind lacinia mobilis, processus molaris wide ; palpal segment 2 with 4 setae on inner margin ; segment 3 with 13-14 setae. Left mandible pars incisiva 2-headed ; lacinia mobilis 3-headed but chitinous ; 3 setae behind lacinia mobilis ; processus molaris wide. ; palpal segment 2 with 11 setae on inner margin ; segment 3 with 12~13 setae. Maxillula (Fig.6E). Endopod with 4 pectinated setae, exopod with 8 Spines 4 of which are dentate Endopod with senated setae. Maxilla (Fig.6F). Endopod with 11~12 plumose setae ; inner lobe of exopod with 8-11 recurved spines, and outer lobe 8-12 curved teeth. Maxilliped (Fig.6G). Endite with 2 (1 in some specimens) coupling hooks on lateral border and with 9 plumose spine on distal border. Palpal segment 2 with 6~7 setae on inner margin and a seta at outer distal corner ; segment 3 with 10~11 setae on inner margin and 2 setae on outer-distal margin segment 4 with 11 inner margin densely pubescent and 6 setae on outer margin ; terminal segment 9-12 setae around the margin.

Pereopod 1 (Fig.6H) elliptical, twice as long as wide, with a seta at inner distal corner ; ischium a little shorter than basis, inner margin densely pubescent and with a seta on outer margin ; merus half length of ischium, inner margin densely pubescent and 2~3 setae on inner margin and 2~3 longer setae at the outer-distal corner ; carpus short and triangular, inner margin densely pubescent and with a seta on inner margin ; propodus as long as ischium, inner margin densely pubescent and with 3 setae on inner margin ; dactylus bifid.

Pereopod 2 (Fig.6I). Basis long, 4 times as long as wide, ischium a little shorter than basis ; merus half length of ischium with a seta at inner-distal corner and 3 setae at outer distal corner ; merus ; carpus with inner margin with swollen area and 3 setae ; propodus with 2 setae ; dactylus bifid..

Pereopod 3 (Fig.6J). Basis rectangular, 2.5 times as long as wide ; ischium a little shorter than basis ; merus with pubescent inner margin ; carpus as long as merus with pubescent inner margin ; propodus a little longer than carpus with pubescent both margins ; dactylus bifid.

Pereopod 4 (Fig.6K). Basis oblong, 4 times as long as wide ; ischium with pubescent inner margin ; merus as long as ischium with 2 setae at outer distal corner ; carpus a little shorter than merus with 2 setae at outer

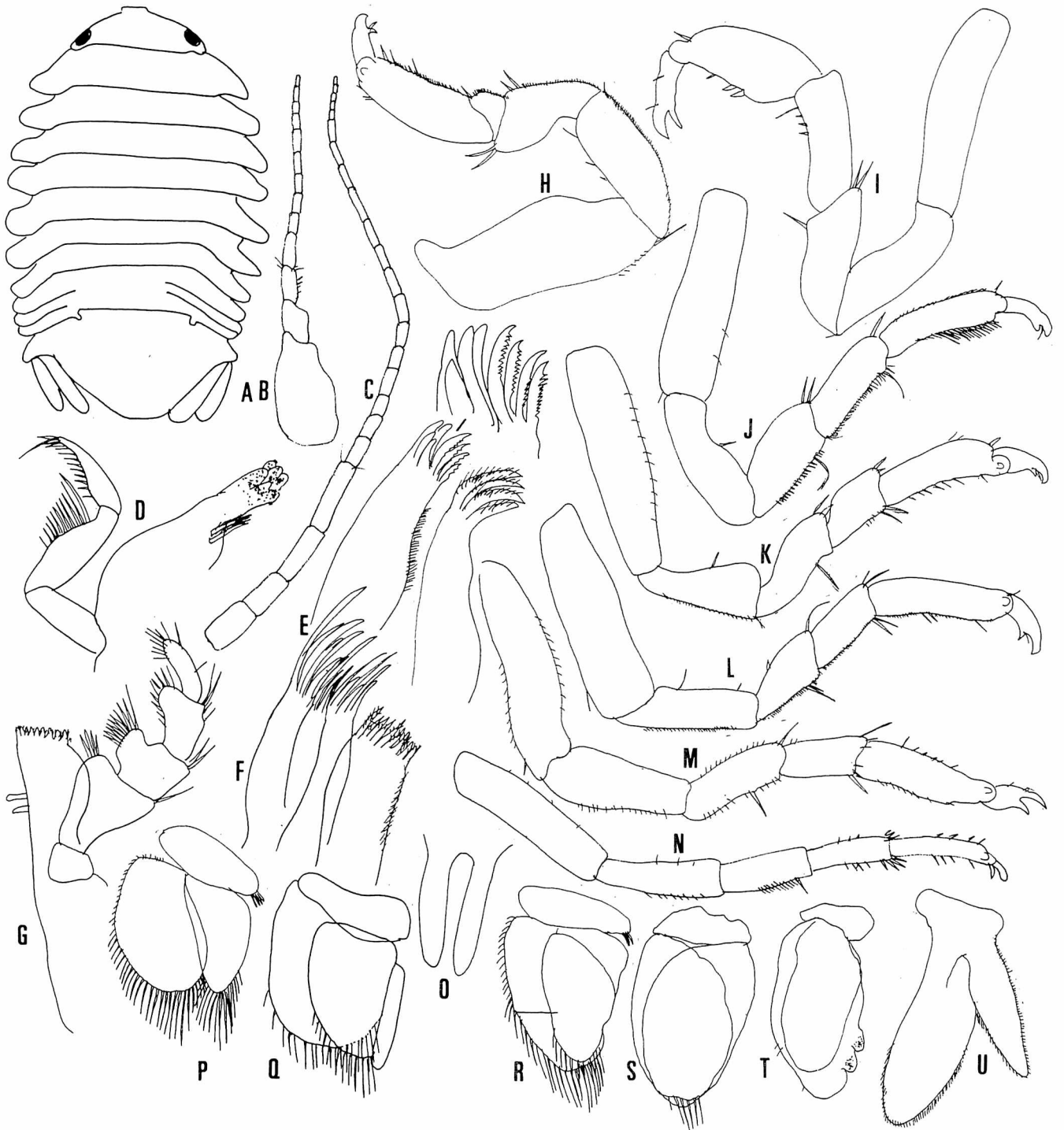


Fig.6 *Gnorimosphaeroma tsushimaense* n. sp.

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Right mandible ; E. Maxillula ; F Maxilla ; .G . Maxilliped ; H-N. Pereopods 1-7 ; O. Penes ; P-T. Pleopods 1-5 ; U. Uropd (All : Holotype male).

distal corner and 2 seta at inner distal corner ; propodus with 6~7 setae on inner margin ; dactylus bifid.

Pereopod 5 (Fig.6L). Basis oblong, 4 times as long as wide ; ischium half length of basis, with pubescent inner margin ; merus as long as ischium with a seta at outer distal corner ; carpus a little shorter than merus with 2 setae at outer distal corner and 2 seta at inner distal corner ; propodus with 3 setae and many fine



setae on inner margin ; dactylus bifid.

Pereopod 6 (Fig.6M). Basis oblong, 4 times as long as wide ; ischium with pubescent inner margin ; merus as long as ischium with a seta at outer distal corner ; carpus a little shorter than merus with 2 setae at outer distal corner and a seta at inner distal corner ; propodus with 10~13. setae on inner margin ; dactylus bifid

Pereopod 7 (Fig.6N). Basis oblong, 4.5 times as long as wide ; ischium 2/3 time as long as basis, with 4 setae on both margins ; merus a little shorter than ischium, with several setae on inner margin ; carpus as long as merus with 4 setae at inner-distal corner and 2 setae at outer-distal corner ; propodus as long ; carpus with 4 seta on inner margin and 4 setae on inner margin ; dactylus bifid.

Penes (Fig.6O) straight, each penis 4 times as long as wide.

Pleopod 1 (Fig.6P). Basis with 6~7 coupling hooks ; endopod with 16~17 plumose setae ; exopod round with 40~42 setae.

Pleopod 2 (Fig.6Q). Basis with coupling hooks ; endopod with 14~15 plumose setae ; appendix masculina straight and slightly exceeds beyond both rami ; exopod round with 18~20 setae.

Pleopod 3 (Fig.6R). Basis with coupling hooks ; endopod with 12~15 plumose setae ; exopod round with 26~28 setae.

Pleopod 4 (Fig.6S). Basis without coupling hook ; endopod with plumose setae ; exopod round with 10 setae.

Pleopod 5 (Fig.6T). Basis small ; endopod lanceolate ; exopod with 2 bosses.

Uropod (Fig.6U) Endopod lanceolate with margins densely pubescent and with apex acute. ; exopod 80% as long as endopod, e with margins densely pubescent.

*Habitat* : These animal occurs only from the pure freshwater area, especially from the surface of stones and sand of stream, They do not occur from the estuary the brackish water influencing. These specimens were collected together with insects. *Epeorus curvatulus* and *Eubrianax* sp.

*Remarks* : this species most closely allied to *Gnorimosphaeroma naktongense* Kwon et Kim, reported from the mouth of Naktong River, South Korea. The former is separated from the latter in the following features (1) single coupling hook on the lateral border of maxilliped, (2) more numerous setae on maxilliped, (3) more numerous setae on merus of pereopod 1, (4) numerous flagellum of antenna, (5) more numerous setae on maxilla, (6) more pubescent inner margin of ischium, merus of pereopod 1, (7) stout body shape, (8) less numerous setae of second, (9) less numerous setae of second segment (10) less protruded inner margin of propodus of pereopod 2.

*Etymology* : The specific name derives from the type locality.

*Material examined* ; 18 ♂♂ (1 ♂ holotype, 7.7 mm in body length and 17 paratypes 4.1~5.2 mm in body length) and 18 ♀♀ (paratypes 2.8~4.6 mm in body length) Asu river, Izuhara, Tushima, Nagasaki Prefecture, Aug. 18, 1996 coll. Noboru Nunomura. Type series is deposited as follows : Holotype (TOYA Cr 12527) and 8 paratypes (TOYA Cr-12528~12535) at the Toyama Science Museum 6 paratypes (OMNH Ar 3975~3980) at the Osaka Museum of Natural History ; 6 paratypes (CBM-ZC-4081) at the Natural History Museum and Institute, Chiba.

### ***Gnorimosphaeroma rayi* Hoestlandt, 1969**

(Iso-Kotsubumushi)

(Fig.7)

*Gnorimosphaeroma rayi* Hoestlandt, 1969

For further synonymy, See Kim and Kwon, 1985.

*Description female from Atsumi, Yamagata.* Body ovate, 1.8 times as long as wide ; lateral margin subparallel. Dorsal surface smooth lateral margin subparallel, with scattered chromatophore ; maximum width at pereonite. Pereonite 1 protruded anteriorly, convex the lateral many of cephalon. Pleonite 2 with 2 pairs of incomplete suture lines, anterior one more approximately the middle line..

Antennule (Fig.7B), reaching pereonal somite, consists of 3 peduncular segments and 10~13 flagellar

segments. Antenna (Fig.7C), reaching the posterior half of the first pereonal somite, consists of 5 peduncular segments and 10~14 flagellar segments.

Right mandible (Fig.7D). Pars incisiva 4-headed ; lacinia mobilis 3-headed but not chitinized ; 7 setae behind lacinia ; mobilis processus molaris. Left mandible Pars incisiva 4-headed ; lacinia mobilis 3-headed but not chitinized ; 3~5 setae ; processus molaris wide. Palpal segment 2 with 8 setae ; segment 3 with 11 setae on inner margin.

Maxillula (Fig.7E). Endopod with 4 plumose setae ; exopod with 11 teeth at the tip of which 6 are serrate. Maxilla (Fig.7F) endopod with 12~15 plumose setae ; exopod with 11~12 pectinated spine on inner lobe and 11~12 pectinated spines on outer lobe. Maxilliped (Fig.7G) with a coupling hook ; palpal second 2 bearing 11 setae on inner margin and 5~8 long setae at outer-distal corner ; segment 3 with 15~16 seta on inner margin and 3 setae at outer-distal corner ; segment. 4 with 13 setae on inner margin and 3 setae in outer margin ; segment 5 with 15 setae around the margin.

Pereopod 1 (Fig.7H). Basis 2.5 times as long as wide with 7~8 long setae at inner distal corner ; ischium  $2/3$  times as long as basis with 6 setae on inner margin and 3 setae on outer margin ; merus with 2 setae on inner margin and 6~8 seta at outer distal corner ; carpus triangular with 3 setae on inner margin and propodus with a seta on inner margin ; dactylus bifid.

Pereopod 2 (Fig.7I). Basis 3.5 times as long as wide with 4 long setae at inner-distal corner ; ischium 0.7 time as long as wide with 4~5 setae on inner margin ; merus half length of ischium with 3 relatively long seta on inner margin and 3 setae at outer distal corner ; carpus rectangular with 6~7 setae on inner margin and 6~7 setae on distal margin ; propodus 4~6 setae on inner margin ; dactylus bifid.

Pereopod 3 (Fig. 7J). Basis long 4.5 times as long as wide ; ischium 55% as long as basis ; merus  $3/4$  as long as ischium, and ; carpus a little longer than merus with 6~7 setae on inner margin and 6~7 setae on distal margin ; propodus rectangular with 2-3 setae on inner margin ; dactylus bifid.

Pereopod 4 (Fig.7K). Basis with a seta at inner-distal corner ; ischium as long as basis ; merus with setae at outer-distal corner ; carpus with a seta at inner distal corner and a seta at outer-distal corner, densely pubescent along inner margin ; propodus densely pubescent along inner margin ; dactylus bifid.

Pereopod 5 (Fig.7L). Basis rectangular, 3.5 times as long as wide with ; ischium rectangular with 2 setae on inner margin ; merus pubescent on inner margin and with 2 seta outer distal corner ; carpus rectangular with 2 setae at outer distal corner propodus with 4 inner margin ; dactylus bifid.

Pereopod 6 (Fig.7M). Basis 3 times as long as wide, with a seta ; ischium  $4/5$  time ; merus half length as long as ischium, with 6~7 setae on distal margin densely pubescent along inner margin ; carpus as long as merus with 5~6 seta on distal margin ; propodus with 3 setae on inner margin and 2 setae at outer distal corner ; dactylus bifid.

Pereopod 7 (Fig.7N). Basis times as long as wide ; ischium a little shorter than basis with pubescent outer margin ; merus with 2 relatively long seta on inner margin and 2 setae at outer-distal corner ; carpus as long as merus, with 4 setae including distal 3 ones and 3 setae ; propodus relatively swollen with 4 seta on inner margin and 8~9 setae on outer margin. ; dactylus bifid.

Pleopod 1. Basis with 3 coupling hooks ; endopod with 20~22 plumose setae ; exopod with 22 plumose setae around the margin.

Pleopod 2. Basis rectangular, with 4 coupling hooks ; endopod with 31~33 setae plumose setae ; exopod with 50 plumose setae.

Pleopod 3 (Fig.7O). Basis with 3 coupling hooks ; endopod with 11~14 plumose setae ; exopod with 24-26 plumose setae.

Pleopod 4 (Fig.7P). Basis with 2 coupling hooks ; endopod with 6 setae ; exopod with 4 setae.

Pleopod 5. Basis ; endopod ; exopod with 2 bosses.

Uropod (Fig.7Q) endopod rectangular ; exopod 0.8 time as long as endopod.

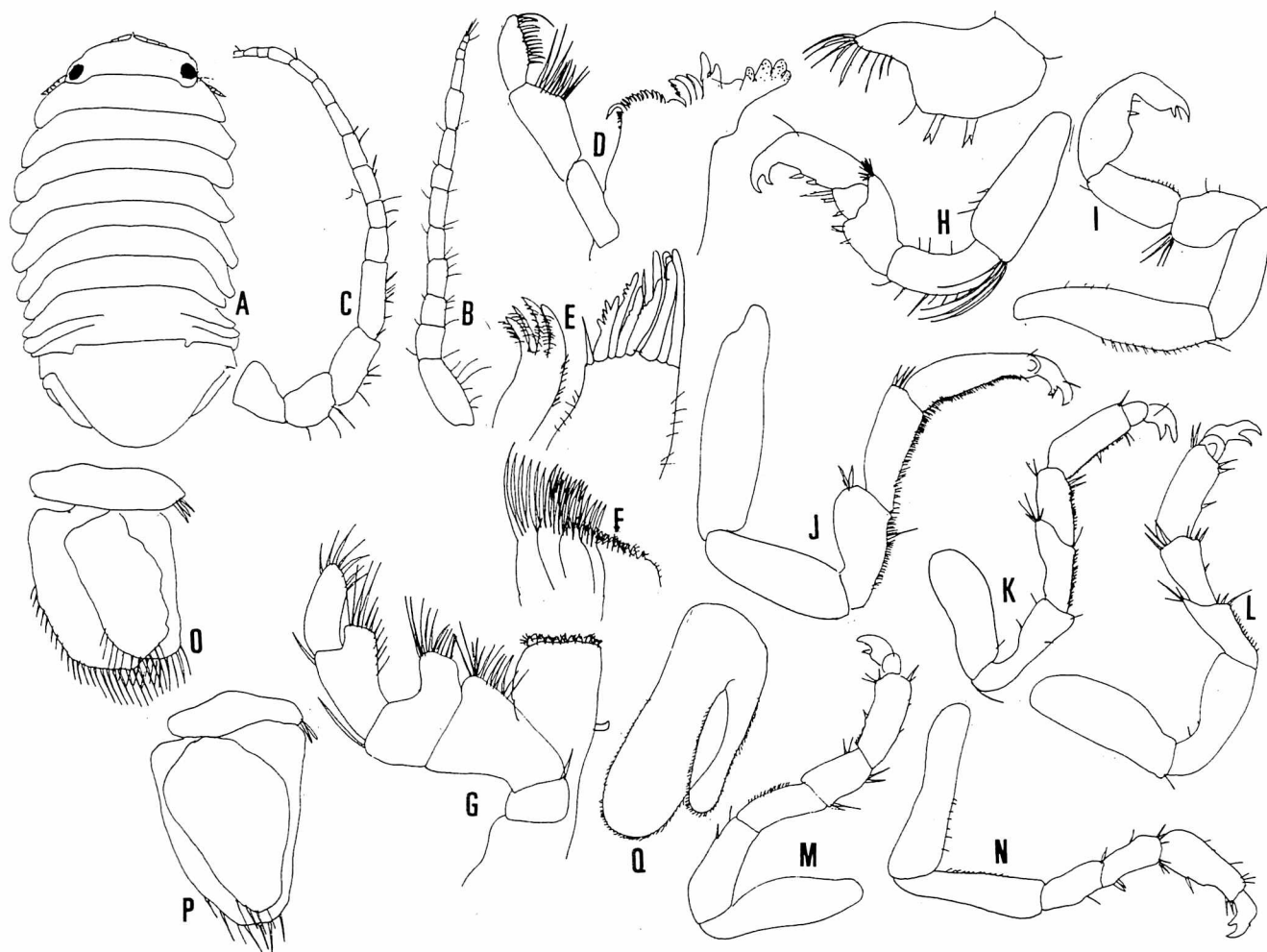


Fig.7. *Gnorimosphaeroma rayi* Hoestlandt, 1969

A. Dorsal view B. Antennule C. Antenna ; D. Right mandible ; E. Maxillula ; F. Maxilla ; G. Maxilliped ; H-N. Pereopods 1-7 ; O. Pleopod 1 ; P. Pleopod 4 ; Q. Uropod (All : Female from Nezugaseki, Yamagata Prefecture).

*Remarks* : These specimens agree with original description, Thomales Bay of California but differs from the following features (1) longer setae at inner distal corner of basis, (2) shorter setae at outer distal corner of merus, (3) less numerous setae on inner side of pereonal somite 1, (4) less numerous setae behind lacinia mobilis of mandible.

*Distribution* : Muroan, Hakodate, Awakominato, Misaki, Shimonoda, Sugasima, Hatakejima. Lake Nakaumi, Tomioka, Russia-Petrov Island, Korea, Thomales Bay (California) USA, Hawaii.

*Material examined* ; 45 ♀♀ (2.6~3.6 mm in body length), Nezugaseki, Atsumi-cho, Yamagata Pref. coll. Noboru Nunomura N Sep. 6, 1990 ; 1 ♂ (1 ♀ coll. Noboru Nunomura Emi, Kamogawa, City Chiba Pref and, 1 ♀ (8.1 mm in length) from Sakai-Minato Tottori Prefecture.

***Gnorimosphaeroma hoestlandti* Kim and Kwon, 1985**

(Jap. name : Futage-isokotusbumushi, new)

(Fig.8)

*Gnorimosphaeroma rayi* Hoestlandt 1969 (treated as group II)*Gnorimosphaeroma hoestlandti* Kwon et Kwon, 1985

*Description of male from Boso* : Body 1.7 times as long as wide, maximum width at 4th pereonal somite ; lateral margin subparallel. Clypeus and frontal lamina pentagonal. Color grayish brown. Eyes mediocre in size, each eye composed of 70-80 ommatidia. Dorsal surface smooth, with scattered chromatophore. Pereonal somite 1 protruded anteriorly, convex the lateral many of cephalon. Pleonite 2 with 2 pairs of incomplete suture lines, anterior one more approximately the middle line. Coxal plates not distinct and fused.

Antennule (Fig.8B), reaching 2nd pereonal somite, consists of 5 peduncular segments and 13 flagellar segments. Antenna (Fig.8C), relatively long and reaching the posterior half of pereonite 2, with flagellum consisting 13~15 segments.

Right mandible pars incisiva 4-headed ; lacinia mobilis 4-headed but not chitinized ; 3 setae behind lacinia mobilis ; processus molaris. Palpal segment 2 with 8~16 setae ; segment 3 with 6~18 setae ; Left mandible (Fig.8E) pars incisiva 4-headed ; lacinia mobilis 3-headed but not chitinized ; 3-setae processus molaris. Palpal segment 2 with 13~16 setae ; segment 3 with 15~20 setae. Maxillula (Fig.8F). Inner lobe with 4 plumose setae and exopod with 10 pectinated setae 6 of which serrated ones. Maxilla (Fig.8G) endopod with 12 plumose setae ; inner lobe of exopod with 11 pectinated setae and outer lobe with 11 setae. Maxilliped (Fig.8H) Endite with a coupling hook on inner border and 9~15 plumose setae on distal border ; Palpal segment 2 with 14~15 setae on inner margin and segment 3 with 10~12 setae on inner margin and a seta at outer distal corner ; segment 4 with 20~22 setae on inner margin ; segment 5 with 19~22 setae around the margin.

Pereopod 1 (Fig.8I). Basis rectangular, 3 times as long as wide with 3~4 short setae on outer margin with a relatively long seta at inner distal corner and several short seta on outer margin ; ischium  $2/3$  time as long as wide with 3 short setae on outer margin ; merus rectangular with 3 setae on inner margin and 7~8 setae at outer distal margin ; carpus triangular ; dactylus bifid.

Pereopod 2 (Fig.8J). Basis, 4.5 times as long as wide ; ischium half length of basis merus  $4/5$  as long as wide, with 2 seta at outer- distal corner ; merus a little shorter than merus with 3 setae at outer- distal corner propodus rectangular a long as merus with 2 setae at outer distal corner ; propodus a little longer than carpus with 3 spines ; dactylus bifid.

Pereopod 3 (Fig.8K). Basis ; long, 5 times as long as wide ; ischium half length of basis ; merus  $3/4$  time as long as wide, with 2 seta at outer- distal corner, and densely pubescent along inner margin ; carpus, as long as ischium with 2 seta at outer- distal corner, densely pubescent along inner margin ; propodus as long as wide ; densely pubescent along inner margin ; dactylus bifid.

Pereopod 4 (Fig.8L). Basis long, 5 times as long as wide ; ischium about half length of basis ; merus again half length of ischium, with 2 setae at outer- distal corner and with 2 setae on inner margin ; carpus rectangular with a seta at inner distal corner and a seta on outer distal corner ; propodus a little shorter than ischium with a seta outer distal corner and densely pubescent along inner margin ; dactylus bifid.

Pereopod 5 (Fig.8M). Basis 3.3 times as long as wide, with a seta at inner- distal corner ; ischium  $4/5$  time as long as basis ; merus  $2/3$  as long as ischium, with 2 setae at outer distal corner, densely pubescent along inner margin ; carpus  $2/3$  time as long as wide, with 2 setae at outer distal corner and on inner margin ; propodus with 2 setae on inner margin at outer distal corner ; dactylus bifid.

Pereopod 6 (Fig.8N). Basis 3 times as long as wide, with a seta on inner distal corner ; ischium  $4/5$  as long as basis ; merus half length as long as ischium, with 2 long setae at outer distal corner ; with 4 setae on inner margin and 2~3 setae at outer distal corner ; propodus relatively short ; dactylus bifid.

Pereopod 7 (Fig.8O). Basis 4.5 times as long as wide ; ischium 0.7 time as long basis with densely

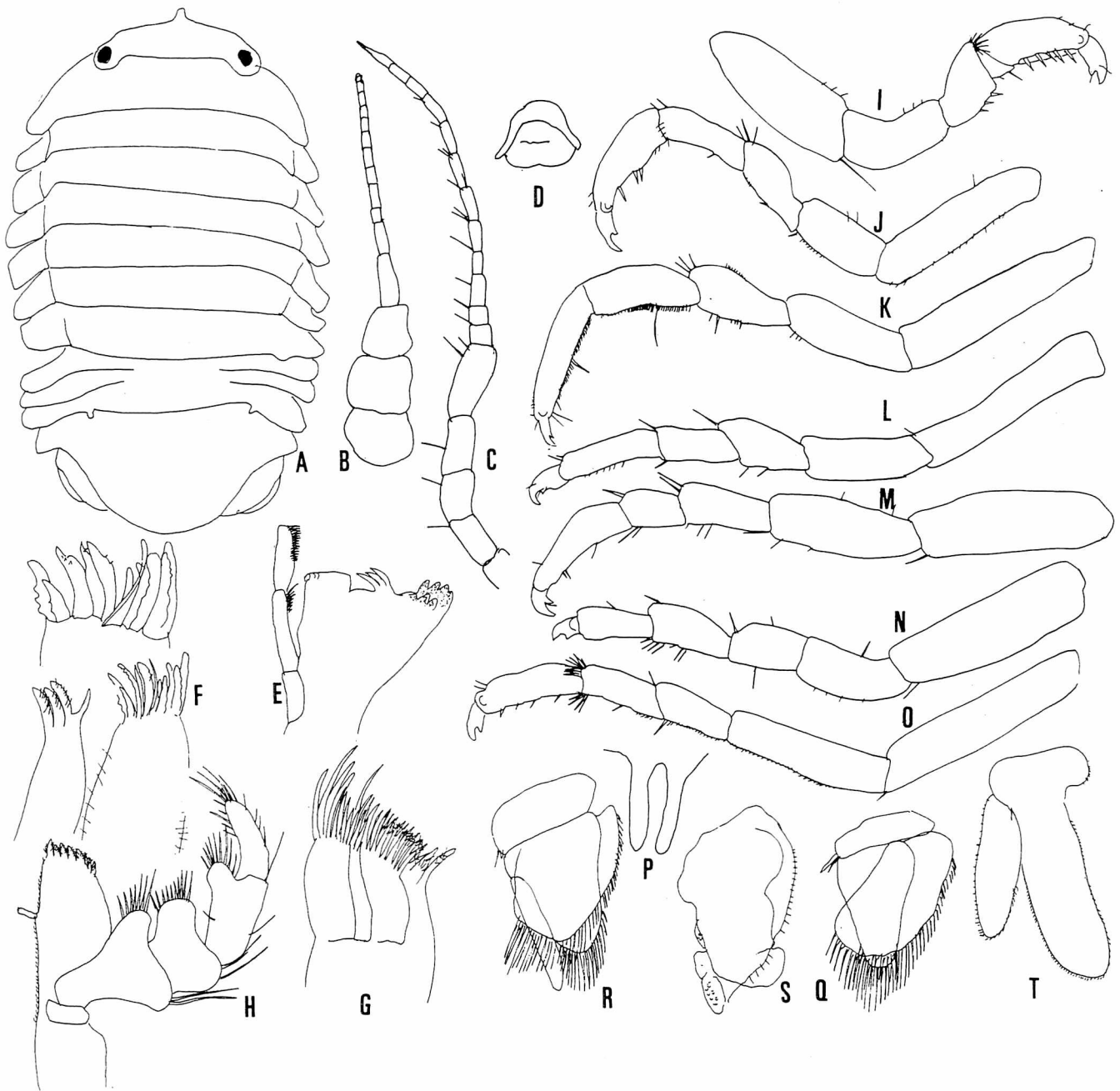


Fig.8 *Gnorimosphaeroma hoestlandti* Kim and Kwon, 1985

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Clypeus and frontal lamina ; E. Left mandible ; F. Maxillula ; G. Maxilla ; H. Maxilliped ; I. -O Pereopods 1-7 ; P. Penes ; Q. Pleopod 1 ; R. Pleopod 2 ; S. Pleopod 5 ; T. Uropod (All : Male from Chikura, Chiba).

pubescent along inner margin ; merus a long seta on inner margin and densely pubescent along inner margin ; carpus as long as merus with 15 setae on distal margin ; propodus with 2 setae on inner margin ; dactylus bifid.

Penes (Fig.8P) straight, each penis about 5 times as long as wide.

Pleopod 1 (Fig.8Q). Basis with 3 coupling hooks ; endopod with 36 setae ; exopod with about 20 setae around the margin.

Pleopod 2 (Fig.8R). Basis with 2 coupling hooks ; endopod lanceolate with 10~14 seta on inner margin ;

stylus fusiform ; exopod semicircular with 40 setae around the margin.

Pleopod 3. Basis with 3 coupling hooks ; endopod with 21~28 setae ; exopod with about 50 setae around the margin.

Pleopod 4. Basis small ; endopod with 6~7 setae around the margin ; exopod lanceolate.

Pleopod 5 (Fig.8S). Basis endopod with 3 bosses ; exopod with 10~13 short setae on outer margin.

Uropod 5 (Fig.8T) Basis small ; exopod 3 times as long as endopod with long setae around the margin.

*Remarks* : The specimens from Boso well agrees with the original description from Mokho, South Korea, but the following the differences are found : (1) shorter setae at outer distal corner of merus of pereopod 1, (2) less numerous setae on maxilliped and (3) less numerous flagellar segment of both antennae.

*Material examined* : 1 ♂ (up to 5.0 mm in body length) and 7 ♀ (up to 3.8 in body length), Yoshiura, Emi, Kamogawa City, Chiba Prefecture, Sep. 3, 1998, coll. Noboru Nunomura.) ; 4 ♀. Kou. Tateyama City, Chiba, coll. Noboru Nunomura, June 9, 1987 ; 10 ♀ (up to 9.2mm in body length), Lake Naka umi, Shimane Pref. Feb. 1998.

***Gnorimosphaeroma ovatum* (Gurjanova, 1933)**

(Jap. name : Maru-Kotsubumushi)

(Fig.9)

*Exosphaeroma oregonensis* Thielemann, 1990 : 51-53, fig, 141-47 (non Dana)

*Gnorimosphaeroma ovatum* Gurjanova, 1933

For further synonymy, see Kussakin (1979)

*Description* : of Female : Body 1.9 times as long as wide, Color dull yellow to grayish brown. Frontal lamina and clypeus pentagonal. Eyes mediocre in size, each eye composed of about 50 ommatidia Anterior suture line of pleonal somite 2 a little longer than the posterior one.

Antennule (Fig.9B), reaching the posterior half of cephalon, consists of 3 peduncular segments and 15 flagellar segments. Antenna (Fig.9C), relatively long and reaching the anterior part of pereonite 1, with 5 peduncular segments ; flagellum consisting 11 flagellum.

Right mandible pars incisiva 4-headed ; lacinia mobilis 2~3-headed but not chitinized ; 4~6 setae behind lacinia molaris ; processus molaris wide. Palpal segment 2 with 20 setae ; segment 3 with 20~21 setae. Left mandible (Fig.9D). Pars incisiva 4-headed ; lacinia mobilis 3-headed and chitinized 5~7 setae behind lacinia mobilis ; processus molaris wide. Palpal segment 2 with 6~8 setae ; segment 3 with 12~14 setae. Maxillula (Fig.9E). Inner lobe with 4 long plumose setae ; outer lobe with 11 pectinated setae, of 7 which are dantate. Maxilla (Fig.9F). Inner lobe with 15 setae ; Endopod of outer lobe 12~13 setae and exopod of inner lobe 20 setae. Maxilliped (Fig.9G). Endite with a coupling hook on inner margin with 6 stouter and 7 somewhat slenderer setae. Palp five-segmented ; second segment big and triangular with 6 setae and 2 longer setae on inner distal corner segment 3 square with a rounded protruded areas and 12 setae on inner margin and a seta at outer distal corner, with 4 long setae on outer margin ; fourth segment slender with 6 shorter setae ; fourth segment slender with 6 short setae on the basal area of inner margin, and a small protuberance at the distal area, with 7~8 setae and a long seta on outer distal area ; fifth segment with 12~13 setae on distal margin, especial a long seta at the tip.

Pereopod 1 (Fig.9H). Basis rectangular with 2 long setae on inner distal corner, ; ischium slender 2/3 as long as basis with 2 long setae on inner margin ; merus triangular with 6 setae on outer-distal corner ; carpus triangular with a long seta and 3~4 setae on inner margin ; propodus rectangular with 3 setae ; inner margin and stout setae outer distal margin ; dactylus bifid.

Pereopod 2 (Fig.9I). Basis long, its length 4.5 times as long as wide ; ischium 1.5 times as basis with 3~4 relatively long setae inner margin ; merus half the length of ischium, with 4 long setae inner margin and a seta at outer-distal corner ; carpus as long as merus with 3 setae inner margin on outer-distal corner ;



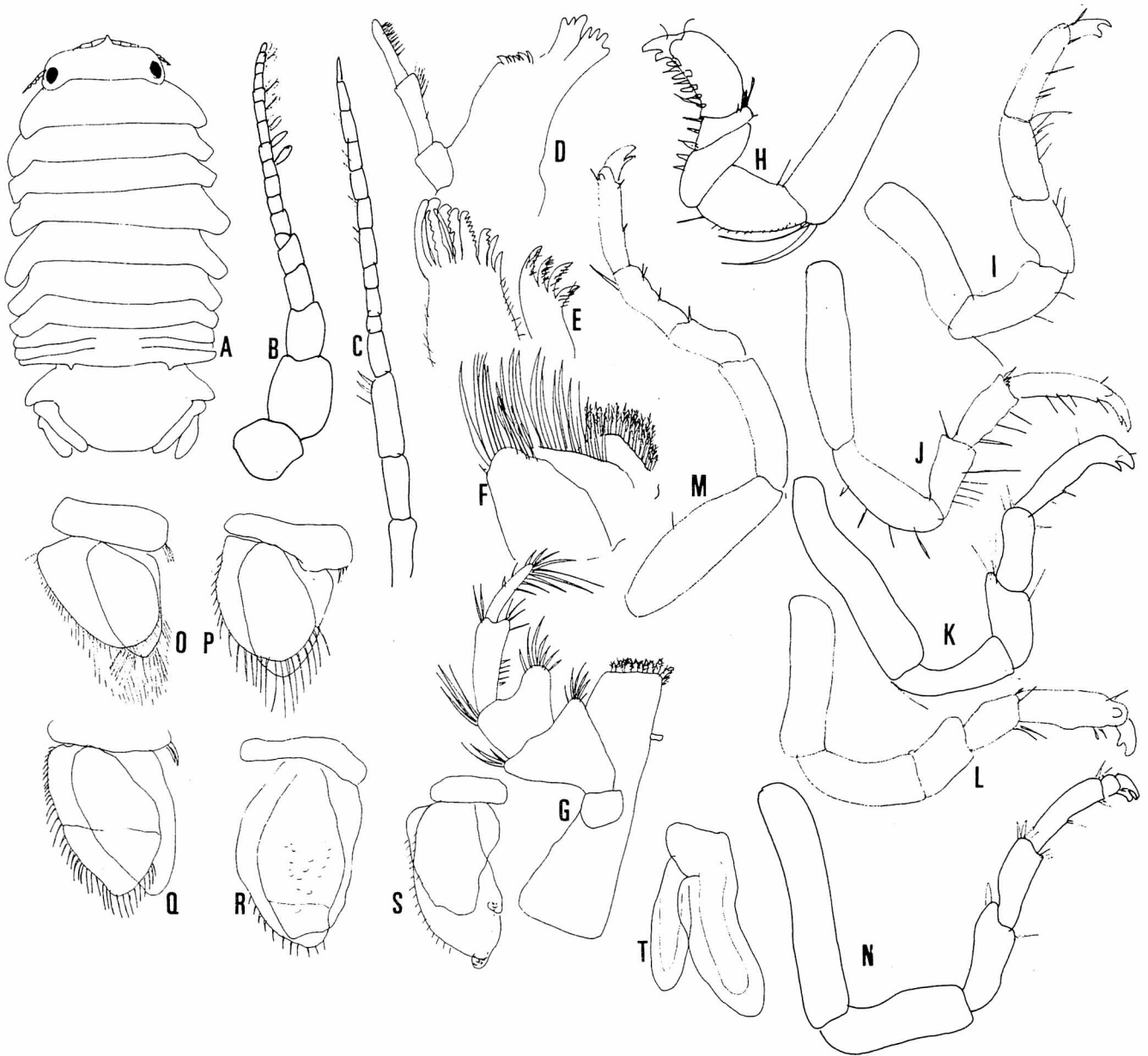


Fig.9 *Gnorimosphaeroma ovatum* (Gurjanova, 1933)

A. Dorsal view ; B. Antenule ; C. Antenna ; D. Left mandible ; E. Maxillula ; F. maxilla ; G. Maxiilliped ; H-N. Pleopods 1-7 ; O-S. Pleopods 1-5 ; T. Uropod (All : Female from Rishiri, Hokkaido).

propodus as long as ischium, with 4 stout setae on inner margin. ; dactylus bifid.

Pleopod 3 (Fig.9J) Basis long with a relatively long seta on inner distal margin ; ischium as long as basis with 2 relatively long setae on inner margin ; merus about half the length of ischium with 2 long setae ; carpus with 6 setae on inner margin ; propodus somewhat long with 3 setae on inner margin ; dactylus bifid.

Pereopod 4 (Fig.9K) as long as pereopod 3 ; basis long, 5 times as long as wide with a relatively long seta on inner distal corner ; ischium about half length of basis with a relatively short seta on inner distal corner ; merus about half the length with a long seta near the inner distal corner and 3 setae at ht outer distal corner ; carpus as long as merus with a seta and inner distal corner and a seta at outer distal corner ;

propodus a little longer than carpus with 2 setae on inner margin and seta on outer margin ; dactylus bifid.

Pereopod 5 (Fig.9L). Basis relatively short, 3.5 times as long as wide ; ischium a little shorter than basis ; merus about 60% as long as merus ; carpus a little shorter than merus, with 2 setae on outer margin and 2 setae on inner margin ; propodus a little shorter than ischium with 3 setae on its distal margin ; dactylus bifid.

Pereopod 6 (Fig.9M) a little longer than the fifth pereopod. Basis 4 times as long as wide ; ischium  $\frac{2}{3}$  length of basis ; merus half the length of ischium with a stout setae on inner margin ; carpus as long as merus, with 3 setae on inner margin and a seta on outer margin ; propodus somewhat long with 2 setae on inner margin and a seta at outer distal area ; dactylus bifid.

Pereopod 7 (Fig.9N) is a little longer than the preceding ones. Basis longer, 6 times as long wide ; ischium  $\frac{3}{4}$  as long as basis ; merus half the length of basis, with a seta on inner distal corner and a seta at outer distal corner ; carpus as long as merus, with 3 setae on inner distal corner and 5 setae on outer distal corner ; merus a little longer and a seta on middle part and distal end respectively and 2 setae at outer-distal corner ; dactylus bifid.

Pleopod 1 (Fig.9O). Basis with 4teeth ; endopod with 15 setae ; exopod with more than 50 setae.

Pleopod 2 (Fig.9P). Basis with 3 ; endopod with 20 setae ; exopod with more than 40 setae.

Pleopod 3 (Fig.9Q). Basis with 2 coupling hooks, endopod outer-distal corner with 40 setae.

Pleopod 4 (Fig.9R). Basis ; endopod with 3 setae ; exopod with 13 setae.

Pleopod 5 (Fig.9S) slender. basis short ; endopod with two bosses on its tip and inner side, with 13 ~ 19 short setae ; exopod small with 6 ~ 8 short setae.

Uropod (Fig.9T) basis square ; endopod 1.3 times as long as exopod.

*Remarks* : The original description of this species (Gurjanova, 1933) was very short and inadequately figured. Recently, Yun (1982), redescribed this species based on the full grown male specimens (9.3 mm) from South Korea. And Kim and Kwon (1985) also redescribed this species based upon the specimens from south Korea. The present specimens from Rishiri differs from Kim and Kwon's redescription : the former show some differences from the latter in the following features : (1) longer setae on the inner distal corner of basis of pereopod 1, (2) more numerous flagellum of antennule, (3) less numerous flagellum of antenna, (4) more numerous setae on maxilla (5) relatively longer exopod of uropod.

*Material examined* : 6 ♀ ♀, Senhousi, Rishiri Island, Hokkaido, coll. Noboru Nunomura, May 10, 1995 ; 28 exs, Nozuka, Rishiro Islands, Hokkaido, coll. Masahiko Sato, July 8, 1995 ; 33 exs, Porofunde, Rishiri Islands, Hokkaido, coll. Noboru Nunomura ; July 8, 1955 ; 5 exs, Cape Sukoton, Rebun Islands, coll. Noboru Nunomura, July 10, 1955 ; 25 exs, Rangohsi, Rishiri Island, Noboru Nunomura July 11, 1955 ; 17 exs, Sasitaji, Rebun Island, Hokkaido, coll. Noboru Nunomura, July 9, 1995 ; 28 exs. Rebun Island, Hokkaido, coll. Noboru Nunomura, July 10, 1995 ; 16 exs, Fujimi, Wakkanai City, Hokkaido, coll. Noboru Nunomura July 6, 1995 ; 5 ♀ ♀ Siretoko, Rebun Island, Hokkaido, coll. Noboru Nunomura, July 9, 1995 ; 1 ex, Kotto, Chikiura-cho, Chiba, coll. Noboru Nunomura, Sep. 4, 1997 ; 1 ♂ (10.8 mm in body length) and 3 ♀ ♀ (up to 10.8 mm in body length), Usujiri, Minamikayabe, Hokkaido, coll. Wataru Nunomura, May 3, 1980.

***Gnorimosphaeroma chinense* (Tattersall, 1921)**

(Sina-kotsubumushi, new)

(Fig.10)

*Exosphaeroma chinense* Tattersall 1921

*Gnorimosphaeroma chinense* (Tattersall 1921)

For further synonymy, see. Kwon (1990)

*Description of specimens from Hokkaido* : Body 1.8 times as long as wide. Color dull yellow to grayish brown. Body surface Clypeus and Frontal (Fig.10D) lamina pentagonal. Eyes mediocre in size, each eye composed

of 30~35 ommatidia. Pleonal somite 2 with 2 suture lines anterior one longer than the posterior one.

Antennule (Fig.10B). Peduncle 2-segmented. Flagellum seven-9 segmented. Antenna (Fig.10C), Peduncle 5-segmented. Flagellum 10~11 segmented

Right mandible. Pars incisiva 3-headed ; lacinia mobilis single-headed but not chitinized ; 2~3 setae behind lacinia mobilis ; processus molaris wide. Palpal segment 2 with 6 setae ; segment 3 with 10 setae. Left mandible (Fig.10E). Pars incisiva 3~6-headed ; lacinia mobilis 3-headed but not chitinized ; processus molaris wide, Palpal segment 2 with 4 setae ; segment 1 with 3 setae at distal part. Maxillula (Fig.10F) with endopod bearing 3 pectinated setae. Exopod bearing 8~9 setae. Maxilla (Fig.10G) with endopod bearing 4 plumose setae ; exopod bearing 3~4 curved spines on inner lobe and 2~3 curved spines. Maxilliped (Fig.10H) Endite with a coupling hook. Palpal segment 1 small ; segments 2 with 4 setae on inner margin ; segment 3 with 4 setae on inner margin ; segment 4 with 7~8 setae at the outer distal margin ; segment 5 with 9 setae around the margin.

Pereopod 1 (Fig.10I). Basis rectangular, 3 times as long as wide with a seta at outer distal corner ; ischium a little shorter than basis ; merus a long seta on outer margin, a seta at the inner distal corner, and a series of many short setae on inner margin ; carpus triangular with 3 setae on inner margin ; propodus 3 or more setae on inner margin. ; dactylus bifid.

Pereopod 2 (Fig.10J). Basis rectangular, 3 times as long as wide with a seta at inner distal corner ; ischium a little shorter than basis, densely pubescent along inner margin ; merus 2 long setae on outer margin, and a series of many short setae on inner margin ; carpus triangular with 2 setae on inner margin ; propodus 2 longer and many short setae on inner margin and many short setae on outer margin ; dactylus bifid.

Pereopod 3 (Fig.10K). Basis oblong, 4.5 times as long as wide ; ischium  $2/3$  time as long as basis, with pubescent inner margin ; merus almost half the length of ischium with 2 long setae on inner margin and 2 setae at outer distal corner ; carpus a little shorter than merus and with pubescent inner margin ; propodus with several setae on inner margin ; dactylus bifid.

Pereopod 4 (Fig.10L). Basis relatively short 3.7 times as long as wide with 2 setae at inner distal corner ; ischium a little shorter than basis, with sparse short setae on inner margin ; merus a little shorter than ischium with pubescent inner margin and 3 setae at outer distal corner ; carpus as long as merus with pubescent inner margin and 2 setae at outer distal corner ; propodus with 7~8 setae on inner margin ; dactylus bifid.

Pereopod 5 (Fig.10M). Basis rectangular, 4 times as long as wide with a long seta at inner distal corner ; ischium  $3/5$  time as long as basis ; merus  $2/3$  time shorter than isdiam, with 3 setae at outer distal corner ; merus half the length of ischium with 3 setae on outer distal corner ; carpus as long as merus with 2 setae at outer distal corner ; propodus rectangular with 5~6 setae on inner margin and 5~7 setae on outer margin ; dactylus bifid.

Pereopod 6 (Fig.10N). Basis rectangular with a long seta at inner distal corner ; ischium as long as basis ; merus a little shorter than ischium ; carpus as long as merus with 2 setae at outer distal corner ; propodus rectangular with 5~6 setae on inner margin and 5~7 setae on outer margin ; dactylus bifid.

Pereopod 7 (Fig.10O). Basis oblong, 4.5 times as long as wide ; ischium 55% as long as basis, with a seta near inner-distal corner ; merus 55% as long as ischium with 2~3 setae on inner margin and 2 setae at outer-distal corner ; carpus a little longer than merus with 6 setae on distal margin ; propodus as long as carpus with 2 setae on inner margin and a seta at outer-distal corner ; dactylus bifid.

Penes (Fig.10P) club-shaped. and apart from each other.

Pleopod 1 (Fig.10Q). Basis with 3 coupling hooks ; endopod with about 25 setae ; exopod with about 35 setae around the margin.

Pleopod 2 (Fig.10R). Basis with 2 coupling hooks ; endopod triangular with 11~14 plumose setae around the margin ; stylus club-shaped ; exopod rectangular with 24~27 plumose setae around the margin.

Pleopod 3. Basis with 2 coupling hooks ; endopod with 20 setae near the apical end ; exopod with 30 short

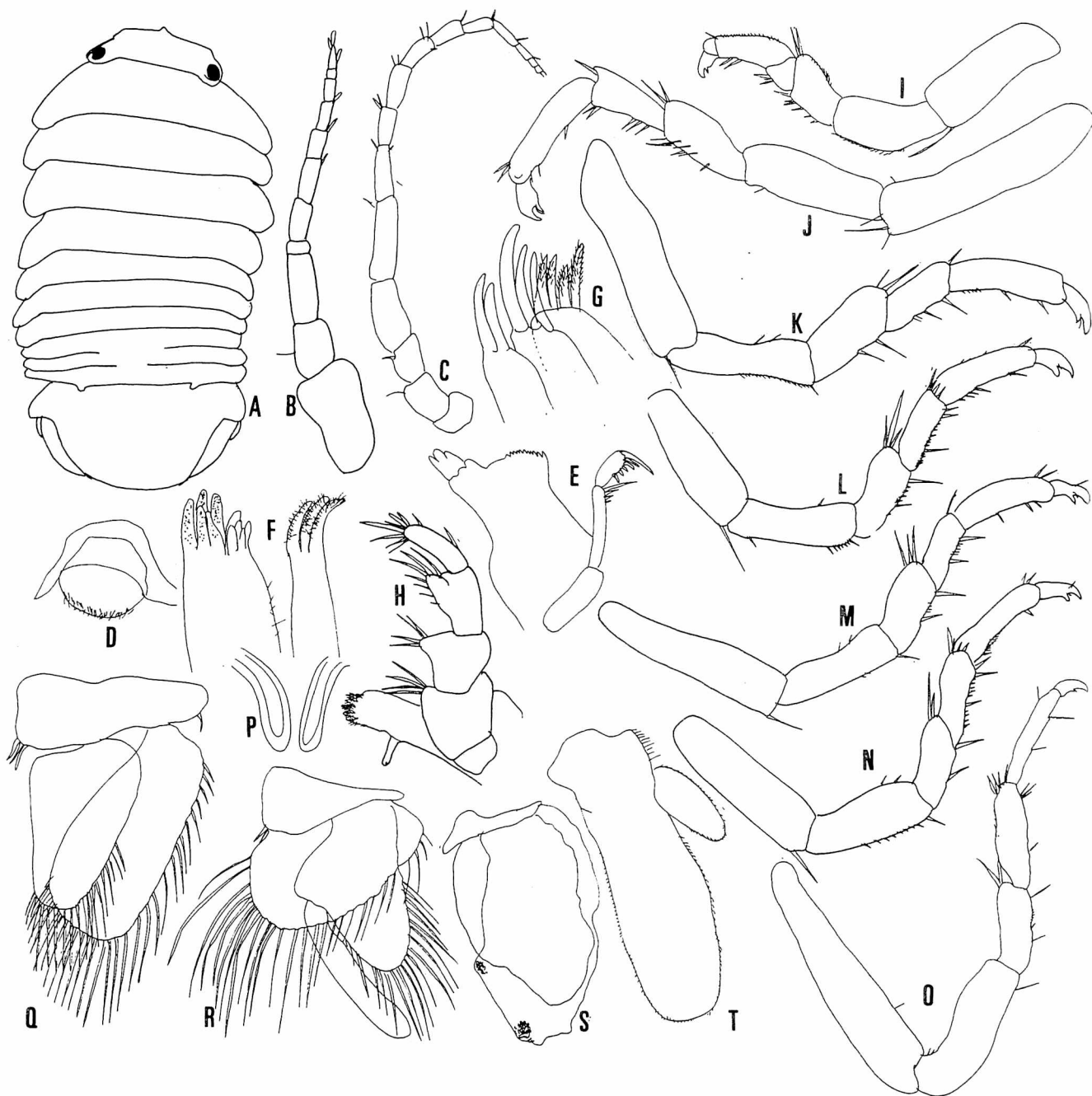


Fig.10. *Gnorimosphaeroma chinesisense* (Tattersall, 1921)

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Clypeus and frontal lamina ; E. Left Mandible ; F. Maxillula ; G. Maxilla ; H. Maxilliped ; I-O. Pereopods 1-7 ; P. Penes ; Q-R. Pleopods 1-2 ; S. Pleopod 5 ; T. Uropods (All : Male from Shubuto River, Hokkaido).

setae.

Pleopod 4. Basis with 2 coupling hooks ; endopod with 2 setae near the apical end ; exopod with 30 short setae.

Pleopod 5 (Fig.10S). Both rami quite devoid of setae.

Uropod (Fig.10T). Basis endopod rectangular, exopod small 47% as long as endopod

*Material examined* ; 7 ♂♂ (up to 5.1 mm in body length) and 3 ♀♀ (up to 4.8 in body length) Mouth of Shubuto River (Salinity in 2 ‰), Suttu, Hokkaido. coll. Noboru Nunomura, July 2, 1996.

*Remarks* : The specimens from Shubuto River, Hokkaido agrees the original description from Whanpoo River near Shanghai but the original description of this species (Tatterslall 1921) short.. Later Kim and Kwon (1985) redescribed this species based on the specimens from Kanghwado, South Korea. The present specimens from Hokkaido shows some differences from the Kim and Kwon's redescription : (1) less numerous teeth on maxilla, (2) smaller exopod of uropod, (3) less numerous setae on the margin of pereopod 1.

***Gnorimosphaeroma anchialos* Jang and Kwon, 1993**

(Jap.name : Migiwa-kotubumushi, new)

(Fig.11)

*Gnorimosphaeroma anchialos* Jang and Kwon, 1993.

*Description* : Body ovate, 1.9 times as long as wide. Lateral margins subparallel, dorsal surface smooth with scattered chromatophore. Eyes relatively small, each eye composed 60~75 of ommatidia. Frontal lamina and clypeus pentagonal. Pereonite I produces anteriorly, covering the lateral margin of cephalon. Pleonite 2 with two pairs complete suture line, anterior one shorter than the posterior one.

Antennule (Fig.11B) Peduncle composed of 3 segments. Flagellum with 8~9 segments.

Antenna (Fig.11C) Peduncle composed of 5 segment and Flagellum composed of 13~14 segments.

Right mandible (Fig.11E) pars incisiva 3~4 headed ; lacinia mobilis 2-headed but not chitinized ; 6 setae behind lacinia molaris ; processus molaris wide. Palpal segment 2 with 8~9 setae ; palpal segment 3 with 8~13 segments. Left mandible pars incisiva 3-4 headed ; lacinia mobilis 2~3 headed and chitinized ; about 10 setae behind lacinia molaris ; processus molaris Palpal segment 2 with 8~12 setae ; segment 3 with 11~13 setae. Maxillula (Fig.11F) with endopod bearing 4 pectinated setae ; exopod with 11 plumose setae ; Maxilla (Fig.11F) with endopod bearing 9~11 plumose setae ; Exopod bearing 10~12 curved spines on inner lobe and 12 curved spines on outer lobe. Maxilliped. (Fig.11G) Endite with 2 coupling hooks ; palpal segment 1 bearing a seta at inner distal corner ; segment 2 bearing 2 setae at outer distal corner and 15 setae on inner margin ; segment 3 with 3 setae at outer distal corner and 9~10 setae on inner margin ; segment 4 with 6 setae on inner margin and 7 setae on inner margin ; terminal segment rectangular 6~7 setae around the margin.

Pereopod 1 (Fig.11I) Basis rectangular with a relatively long seta at inner distal corner and 3 setae on outer margin ; ischium rectangular with a series of short hair on inner margin ; merus with 4 setae at outer distal corner and a long seta and a series of fine setae on inner margin ; carpus triangular with a seta near the distal end of inner margin ; propodus with 3 stout setae and 4 narrower setae on inner margin and 3 setae on outer margin ; dactylus bifid.

Pereopod 2 (Fig.11J) Basis relatively short, 1.6 times as long as wide, with a long setae at inner distal corner ; ischium with many fine setae on inner margin ; merus densely pubescent along inner margin, with 3 setae ; carpus as long as merus with 2 setae ; propodus with 2 setae and dorsal area swollen ; dactylus bifid.

Pereopod 3 (Fig.11K) basis 3 times as long as with a seta at inner- distal corner ; ischium a little shorter than basis with 4~5 short setae on both margins ; merus with a long seta on inner margin and a seta outer margin, densely pubescent along inner margin ; carpus 1.2 times as long as merus, inner margin densely pubescent along inner margin and 3 setae at outer- distal corner ; propodus as long as carpus, densely pubescent along inner margin and 2 setae near the inner-distal corner ; dactylus bifid.

Pereopod 4. Basis oblong, 3.1 times as long as wide ; ischium with 3 setae on inner margin ; merus with 3 setae at outer- distal corner ; carpus with 2 setae at outer- distal corner ; propodus rectangular with swollen area on inner margin. ; dactylus bifid.

Pereopod 5 (Fig.11L) basis long, 4 times as long as wide ; ischium 3/4 times as long as basis ; merus half length of ischium with 5 long seta in the outer distal area and a seta near the inner- distal corner carpus as long as merus, with a long seta at inner- distal corner, seta densely pubescent along inner margin, propodus 1.2 times as long as carps ; dactylus bifid.

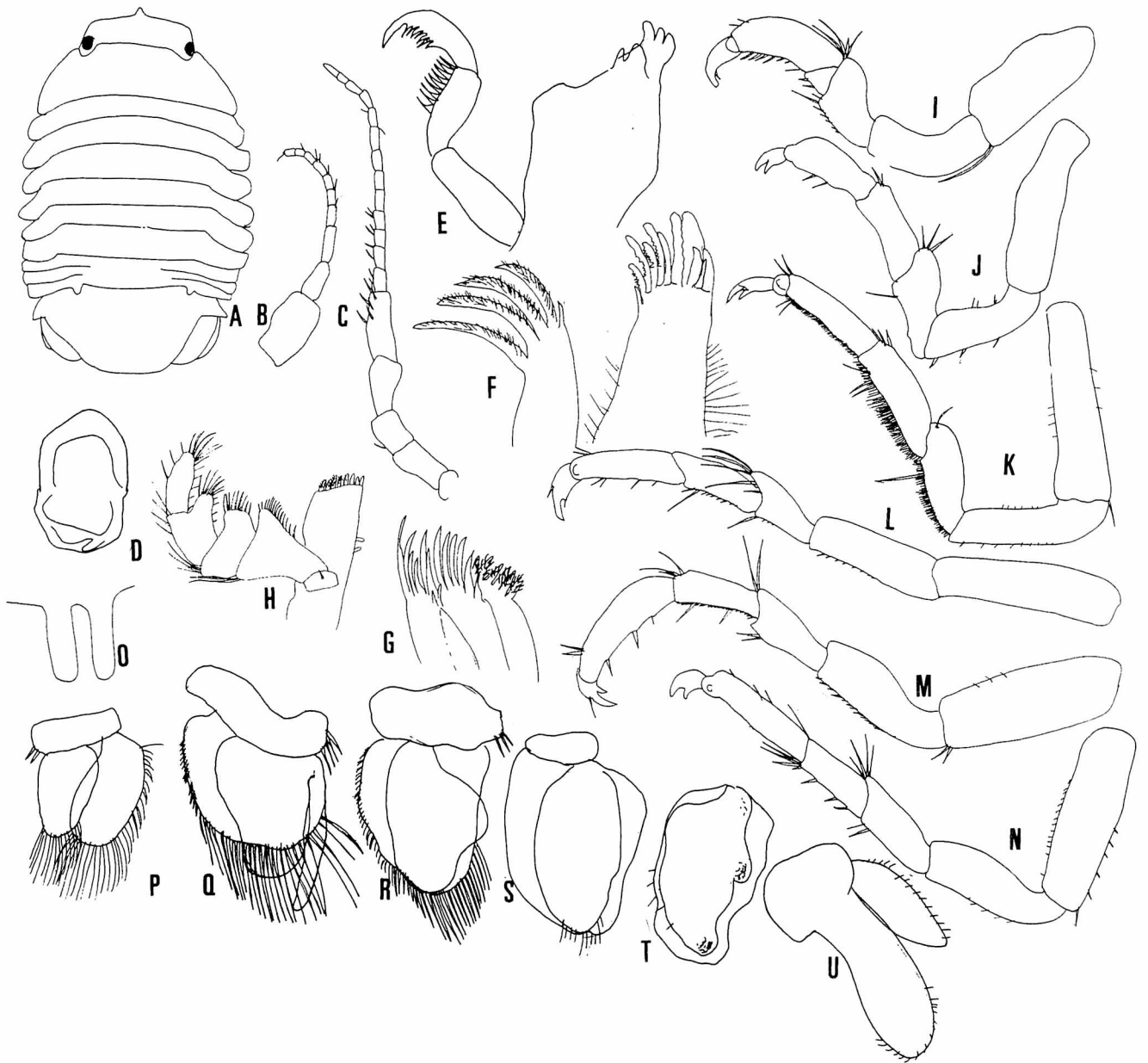


Fig.11. *Gnorimosphaeroma anchialos* Jang and Kwon, 1993

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Clypeus and frontal lamina ; E. Right mandible ; F. Maxillula ; G. Mmaxilla ; H. Maxilliped ; I-K, Pereopod 1-3 ; L-N. Pereopods 4-7 ; O. Penes ; P-T. Pleopods 1-5, U. Uropod (All : male from Yura, Wakayama).

Pereopod 6 (Fig.11M) Basis 2.5 times as long as wide, with 2 short setae at inner-distal corner ; ischium 0.7 time as long as wide ; merus half length of ischium with 2 long seta at outer-distal corner and 2 setae at inner-distal corner ; carpus densely pubescent along inner margin ; propodus with 2 stout setae on inner margin ; propodus bifid.

Pereopod 7 (Fig.11N) basis 3 times as long as wide with short setae with 5 setae on inner margin and fine setae on outer margin ; ischium ; merus a little shorter than ischium with 2 setae at inner distal corner and 3-4 long setae at outer distal corner ; carpus as long as merus with 3 short setae on inner margin and 5~6



setae on distal margin ; propodus long ; dactylus bifid.

Penes (Fig.11O) straight. Each penis 3 times as long as wide.

Pleopod 1 (Fig.11P) basis with 2 coupling hooks ; endopod with 27~30 plumose setae ; exopod with 23~26 plumose setae.

Pleopod 2 (Fig.11Q) Basis rectangular with 3 coupling hooks ; endopod lanceolate with about 20 plumose setae, stylus club-shaped slightly tapering toward the tip ; exopod semicircular with about 50 plumose setae.

Pleopod 3 (Fig.11R). Basis with 3 coupling hooks ; endopod with protruded area on inner margin and about 20 plumose setae endopod exopod with 33~34 plumose setae.

Pleopod 4 (Fig.11S). Endopod with 3 setae ; exopod with 5~6 setae.

Pleopod 5 (Fig.11T). Endopod with 2 bossed on inner margin and apical area ; exopod lanceolate.

Uropod (Fig.11U). Endopod long, 3 times as long as wide ; Exopod elliptical, 0.7 time as long as endopod.

*Remarks* : These specimens form Yura agrees with the original description from, but there are some differences (1)less numerous coupling hooks, (2) less numerous setae of maxilla, (3)straight penes.

*Material examined* ; 2 ♂♂ (6.1~6.5 mm in length) and 5 ♀♀ (3.7~4.8 mm in length), Mouth of Yura River, Yura-cho, Wakayama, Prefecture, coll. Motoshige Yoshida June 5, 1993.

### ***Gnorimosphaeroma naktongense* Kwon and Kim, 1987**

(Jap. Name : Chousen-kotusbumushi)

(Fig.12)

*Gnorimosphaeroma naktongense* Kwon et Kim, 1987

*Description of male collected from Murakami, Niigata* ; Body lanceolate, 2.0 times as long as wide. Lateral margins subparallel ; Dorsal surface smooth, with minute granules. Color of dorsal surface grayish brown. Eyes mediocre in size, each eye composed of about 50 ommatida, frontal lamina and clypeus pentagonal (Fig.12D) Pleonal somite 2 with 2 suture lines anterior one a little longer than the posterior one.

Antennule (Fig.12B), reaching pereonal somite. Peduncle 3-segmented. Flagellum composed of 10~11 segments Antenna (Fig.12C), reaching pereonal somite. Peduncle 5-segmented. Flagellum composed of 14 segments.

Right mandible pars incisiva 4-headed ; lacinia mobilis 3-headed but not chitinized ; 8~9 setae behind the lacinia mobilis ; processus molaris wide. Palpal segment 2 with 3 setae ; segment 3 with 15 setae. Left mandible (Fig.12E). Pars incisiva 4-headed ; lacinia mobilis 4-headed and chitinized ; 4 setae behind lacinia mobilis, processus molaris wide. Palpal segment 2 with 13 setae ; segment 3 with 15 setae. Maxillula (Fig.12F). Endopod bears 4 pectinated setae. Exopod with 8~9 spines, 6 of which are dentate, and a simple seta with an accessory setae. Maxilla (Fig.12G). Endopod with 2 plumose setae ; exopod with curved spines on inner lobe and curved spines on outer margin. Maxilliped (Fig.12H). Endite with a coupling hook on lateral margin and 14 plumose setae on distal margin ; palpal segment 1 small, without seta ; segment 2 with 13~15 setae on inner margin and with 2 setae at outer-distal corner ; segment 3 with 16~22 setae on inner margin and with 4 setae at outer-distal corner ; segment 4 with 17 on inner margin and with 4 setae at outer-distal corner ; segment 5 with more than 14 setae around the margin.

Pereopod 1 (Fig.12I). Basis 2.3 times as long as wide with a seta at inner-distal corner ; ischium with a both margins pubescent respectively ; merus 0.8 time as long as ischium, densely pubescent along the inner margin, with a serrated spines at inner-distal corner ; carpus short, densely pubescent along the inner margin, ; propodus with 7 spines in the inner margin, ; dactylus bifid.

Pereopod 2. (Fig.12J) Basis 2.8 times as long as wide, with 2~4 short setae on both margins, and a plumose seta at inner-distal corner ; ischium with a short seta at inner-distal corner ; merus as long as ischium, with 2 setae on inner margin and 3 setae at outer-distal corner ; carpus as long as merus with 2 outer-distal corner ; propodus swollen in basal half of inner margin, with 5 spines on inner margin and 2 setae at outer-distal corner. ; dactylus bifid.

Pereopod 3. Basis 3.2 times as long as wide ; ischium  $\frac{3}{5}$  time as long as basis ; merus a little shorter than ischium, densely pubescent along the inner margin with a seta at inner-distal corner ; carpus as long as merus, densely pubescent along the inner margin and a seta at outer-distal corner ; propodus densely pubescent

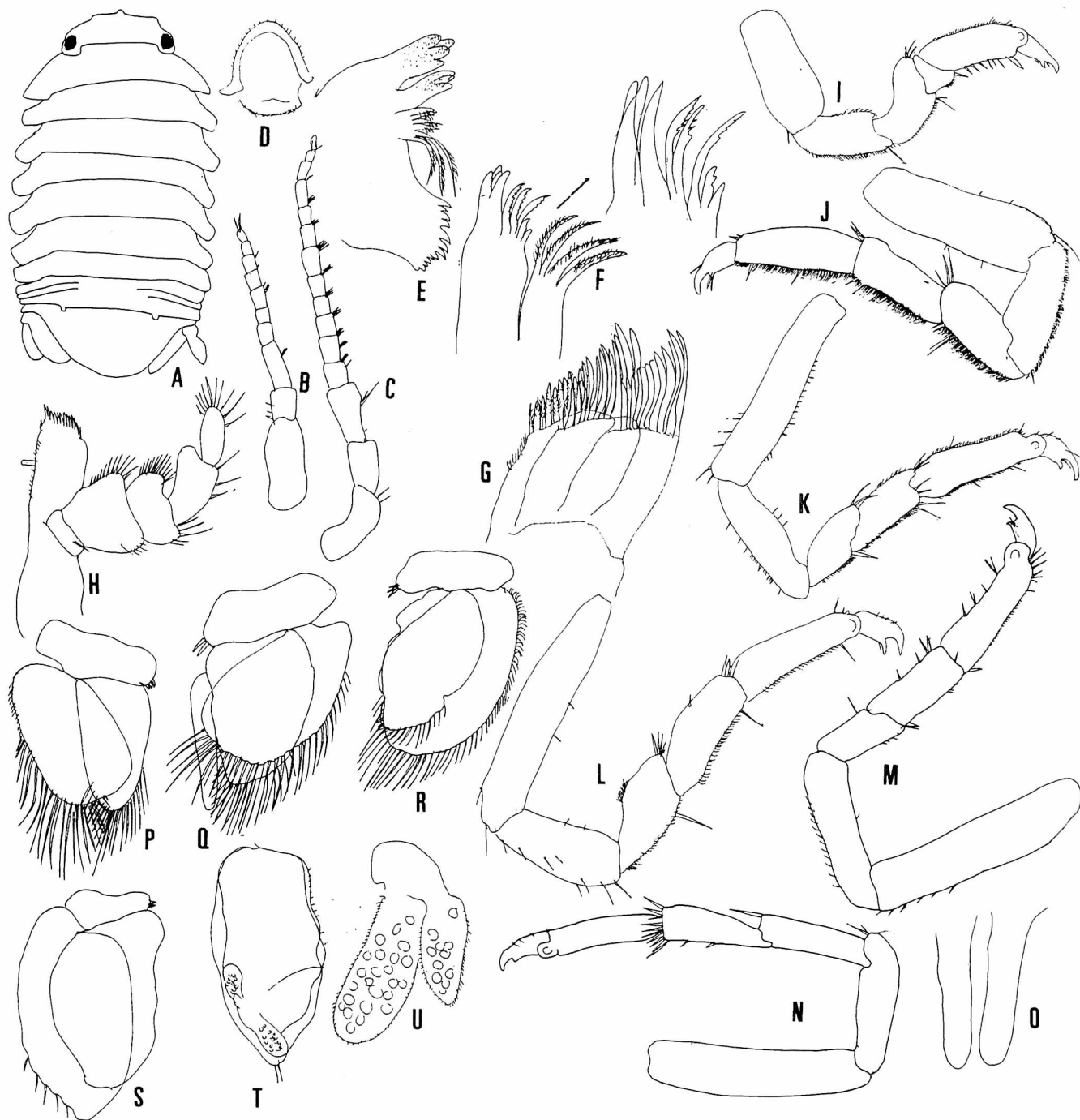


Fig.12. *Gnorimosphaeroma naktongense* Kwon and Kim, 1987

A. Dorsal view ; B. Antennule ; C. Antenna ; D. Clypeus and Frontal lamina ; E. Left mandible ; F. Maxillula ; G. maxilla ; H. Maxilliped ; I-J. Pereopods 1-2 ; K-N. Pereopods 4-7 ; O. Penes ; P-T. Pleopods 1-5 ; U. Uropod (All : Male specimen from Murakami, Niigata).

along the inner margin, ; dactylus bifid.

Pereopod 4 (Fig.12K). Basis 3.7 times as long as wide with a seta at inner distal corner ; ischium half length as long as basis ; merus  $2/3$  time as long as ischium ; carpus as long as merus ; propodus as long as ischium, ; dactylus bifid.

Pereopod 5 (Fig.12L). Basis 3.5 times as long as wide ; ischium 3.5 times as long as basis ; merus  $3/4$  times as long as ischium, densely pubescent along the inner margin and with a seta at outer- distal corner ; carpus 0.7 time as long as merus densely pubescent along the inner margin ; propodus 1.5 times as long as carpus and densely pubescent along the inner margin ; dactylus bifid.

Pereopod 6 (Fig.12M). Basis. 4 times as long as wide with 3~4 setae on inner margin ; ischium  $3/4$  time as long as wide with 4 setae on inner margin and 2 setae on outer margin ; merus  $2/3$  time as long as ischium, densely pubescent along the inner margin and with 2 long setae at outer- distal corner ; carpus as long as merus, densely pubescent along the inner margin ; propodus densely pubescent along the inner margin ; dactylus bifid.

Pereopod 7 (Fig.12N). Basis long, 4.2 times as long as wide ; ischium a little shorter than basis ; merus  $4/5$  time as long as ischium with a seta at inner- distal corner and 2 setae at outer- distal corner ; carpus as long as merus, with 3 short setae on inner margin and 10 setae on distal margin ; propodus a little longer than carpus ; dactylus bifid.

Penes (Fig.12O) club-shaped and straight. Each penis situated closely.

Pleopod 1 (Fig.12P). Basis with 3 coupling hooks ; endopod triangular with about 20 plumose setae ; exopod with about setae around the margin.

Pleopod 2 (Fig.12Q) lanceolate ; basis with 2~3 coupling hooks ; endopod with 36 plumose setae ; exopod with 18~19 plumose setae.

Pleopod 3 (Fig.12R). Basis with 3 coupling hooks ; endopod with more than 60 setae ; exopod with 17~19 plumose setae.

Pleopod 4 (Fig.12S). Basis with 2 couplin hooks ; endopod without setae ; exopod with 5~6 plumose setae.

Pleopod 5 (Fig.12T). Endopod lanceolate with 2 bosses ; exopod lanceolate.

Uropod (Fig.12U). Endopod 2.5 times as long as wide ; exopod  $2/3$  time as long as endopod.

*Remarks* : The present specimens collected from the freshwater of Niigata Prefecture agree with the original description, of which type specimens was collected from the Naktong River, South Korea, but the specimens from Niigata have the following differences from the original descriptions : (1) single coupling hook on endite of maxilliped, (2) less numerous setae on outer distal corner of merus of pereopod 1, and (3) less numerous flagellum of both antenna.

*Material examined* ; 2♂♂ (up to 7.8 in body length) and 10♀♀ (up to 7.6 in body length), Arakawa River, coll. Motoharu Togashi, Niigata Prefecture, Feb. 18. 1996 ; 5♀♀ (up to 8.6 in body length) Kano River Niigata Prefectur coll. Motoharu Togahi, Feb. 18. 1996.

#### Acknowledgements

I would like to express Dr. Saburo Nishiumura who kindly introduced me to the taxonomy and biogeography of isopod crustaceans, and gave me some important literatures. I am very grateful for facilities in my collecting materials and having chances to examine many important specimens to Prof. Nakao, Hokkaido, University. Prof. Susumu, Tanaka of the Toyama University. Dr. Teruo Irie, Dr. Kunanishi, of the Watural History of Muocum and Inatitute, Chiba. Dr. Akio Koizumi, Kyoto, Mr. Shigeharu Togashi of Niigata, Dr. Akira Tukagoshi, the Univercty of Tokyo, Dr. Motoshige Yoshida, Wakayama. Dr. Nambu of the Toyama Science Museum. Dr. Hisashi Negoro, of the Toyama Science Museum for identifying the insects collected together with the specimens. This study was supported by the Grant in aid No 08918012 for Monbusho Scientific Reserach Japan. 0 This work was alao partly supported by the fund of Rihsiri Town. Dr. Masahiro Sato, Rishiri Museum. This work was also

partly supported Sasagawa Scientific research Grant from The Japan

### References

- Gurjanova, E., 1933. Contribution to the Isopoda fauna of the Pacific Ocean. I. New species of valvifera and Flabellifera. Expl. Mers d' U. R. S. S. 17 : 87-106 (in Russian).
- Gurjanova, E., 1936. Beitrage zur Kenntnis der Isopoden fauna des Pazifischen Ozeans. IX. Neue Isopodenarten aus dem Japanischen und Bering Meer Zool Anz. 114 : 250-265.
- Jang K. and D. H. Kwon. 1993. A new Species of the Genus *Gnorimosphaeroma* (Crustacea, Isopoda, Sphaeromatidae) from a Brackishwater Lake in Korea. Korean J. Zool. 36 : 402-407.
- Hostlandt, H. 1968. Caractéristique morphologique d'une espèce nouvelle de la côte pacifique américaine (*Gnorimosphaeroma lutea*) C. R. Acad. Sci. Paris, (Sci. Nat), 267 : 1600-1601.
- Hoestlandt, H., 1969. Sur un Spherome nouveau de la côte pacifique américaine, *Gnorimosphaeroma rayi* n. sp (Isopode Flabellifere). C. R. Acad. Sci. Paris (Sci. Nat.) 268 : 325-327.
- Hoestlandt, H., 1975 Occurrence of the Isopoda Flabellifera, *Gnorimosphaeroma rayi* Hoestlandt on the coast of Japan, Eastern Siberia and Hawaii, with a brief note on its generic polychromatism. Publ. Seto Mar. Biol. Lab., 22 (1/4) : 31-46.
- Kim, H. S. and D. H. Kwon, 1985. The systematic study of the family Sphaeromatidae (Crustacea, Isopoda, Flabellifera) from Korea. Inje. (Inje Univ.) 1 : 143-165.
- Kim, H. S. and D. H. Kwon, 1988. Marine Isopod Crustaceans from Cheju Island, Korea.. Inje Jour. 4(1) : 195-220.
- Koizumi, A and Y. Ondo, 1975. Ecological studies on the Freshwater Isopod, *Gnorimosphaeroma oregonensis* DANA. 1. An Outline of Ecological Distribution in Tottori Prefecture. Bull Tottori Univ. (Fac. Edu) 26 (1/2) : 7-12.
- Koizumi, A H. Tahara and M. Isoe, 1987. Ecological studies on the Freshwater Isopod *Gnorimosphaeroma oregonensis* DANA. on the Habitats Confirmed in the Field survey from 1976 to 1986. Bull. Tottori Pref. Mus. 24. 11-17.
- Kussakin, O. G. 1979. Marine and brackish-water Crustacea (Isopoda) of cold and temperate waters of the Northern Hemisphere. Suborder Flabellifera. Akadmy of Science. U. S. S. R. Leningrad. 1-472 (in Russian).
- Kwon, D. H., 1990. A systematic study on the Korean marine isopod crustaceans. I. Flabellifera. Part. Family Sphaeromatidae. Inje J. (Inje Univ.) 6 : 151-192.
- Kwon, D H. and Y. Kwon, 1993. A new Species of the Genus *Gnorimosphaeroma* (Crustacea Isopoda, Sphaeromatidae) from a Brackish water lake in Korea. Korean J. Zool. 36 402-407.
- Kwon, D H. and H. S. Kim, 1987. A New species of the Genus *Gnorimosphaeroma* (Crustacea, Isopoda, Sphaeromatidae) from the Naktong River, with a Key to the Korean Species of the genus. The Korean Journal of Systematic Zoology. 3(1) : 51-56.
- Richardson, H., 1905. A monograph on the Isopods of North America Bull. U.S. Natn. Mus. 54 : 1-727.
- Tattersall, W. M., 1921. Zoological results of tour in the Far east.
- Thielemann, M., 1910. Beitrage zur Kenntnis der Isopodenfauna Ostasiens. Beitrage zur Naturgeschichte Ostasiens. heraus von D. F. Doflein. Abh. Bayer. Akad. Wiss. mathj-Phys Kl. K.. Suppl. 2 (3) : 1-109.
- Yun, S. G., 1982. Five Species of Sphaeromatid Isopods (Flabellifera : Southern Coast of Korea. Bull. Nat. Fish Univ. Busan, 22 (2) : 1-23.
- Van Name, W. G. 1940. A supplement to the American land and freshwater Isopod Crustacea. Bull. Am. Mus. Nat. Hist. 77 : 109-142.