

## Two New Species of Genus *Ligidium* (Crustacea, Isopoda, Oniscidea) from Taiwan

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臺灣産 멧강구屬 陸棲 等脚類(甲殼類)의 2 新種

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### 적 요

臺灣에서 채집된 멧강구屬에 속하는 陸棲 等脚類 2新種 *Ligidium* (*Nippoligidium*) *formosanum*, L. (*N.*) *acutitelson*을 記載한다. 또 1927년과 1952년 Arcangeli가 *L. japonicum* Verhoeff, 1918로 기록한 臺灣産 標本을 再觀察한 결과 이 표본이 *L. (N.) formosanum*, n. sp. 임을 確認하였다.

Key words: Terrestrial Isopoda, Oniscidea, Ligiidae, *Ligidium*, *Nippoligidium*, Taxonomy, Taiwan

### INTRODUCTION

The genus *Ligidium* Brandt, 1833 consists of about 40 species which are mainly Holarctic in distribution. Only three species, *L. burmanicum*, *L. denticulatum* and *L. ryukyuense*, occur along the northern boundary of the Oriental Region. Most species (over 25 species) populate the western Asia and eastern Europe.

Up till now eight species of *Ligidium* were described from the eastern Asia (Verhoeff, 1918,

1946; Shen, 1949; Flasarova, 1972; Nunomura, 1983). Arcangeli (1927, 1952) recorded *L. japonicum* from Japan, Korea China and Taiwan. Kwon (1993) considered the record of *L. japonicum* from Korea (Arcangeli, 1927, 1952) to be the misidentification of *L. koreanum* which was recently described by Flasarova (1972) from North Korea. Furthermore, Nunomura (1983) found that *L. koreanum* also populated Kyushu, while *L. japonicum* did Hokkaido, Honshu and Shikoku in Japan. Kwon & Taiti (1993) found that the record of *L. japonicum* from Yunnanfu, China also was incorrect after re-examination of the material studied by Arcangeli (1927, 1952). Re-examination of the Arcangeli's material from Taiwan shows that this specimen does not belong to *L. japonicum*, but a separate species which is described below as *L. formosanum*, n. sp.

This contribution deals with the descriptions of two new species of *Ligidium* from Taiwan. The material is deposited in the collection of the Dipartimento di Entomologia Agraria dell'Università, Portici, Italy (DEAP), the Department of Biology, Inje University, Kimhae, Korea (IJB), and the Taiwan Museum (TM).

## SYSTEMATIC ACCOUNT

Family Ligiidae Brandt, 1833

Genus *Ligidium* Brandt, 1833

### **Subgenus *Nippoligidium* Borutzky, 1950**

*Nippoligidium* Borutzky, 1950 (p. 77).

**Diagnosis.** Eyes large with about 150 ommatidia. Dorsum smooth. Pereonites 1 and 2 without "bristle field" on posterior margin of epimera. Antenna with flagellum of 10-17 articles. Uropodal protopod with inner-distal projection as long as or slightly longer than width of its base. (modified from Borutzky, 1950).

**Remarks.** Since Borutzky (1950) instituted the subgenus *Nippoligidium* to include *Ligidium japonicum* Verhoeff, 1918, the subdivision of the genus *Ligidium* has been given little attention. The subgenus *Nippoligidium* is distinguished from the subgenus *Ligidium*, s. str. by the preonites 1 and 2 lacking "bristle field" on posterior margin of the epimera, while *Ligidium*, s. str. has it in pereonite 1 (rarely in both pereonites 1 and 2). The latter has well developed inner-distal projection of uropodal protopod which is much longer than the width of its base. We consider *Nippoligidium* as a good subgenus which comprises seven species: *L. japonicum* from Japan (Hokkaido, Honshu, and Shikoku), *L. burmanicum* Verhoeff, 1946 from northern Myanmar (= Burma), *L. denticulatum* Shen, 1949 from Kunming, China, *L. koreanum* Flasarova, 1972 from Korea and Japan (Kyushu), *L. ryukyuense* Nunomura, 1983 from Japan (Ryukyu Islands), and two new species, which are described below, from Taiwan.

The other three species from Japan (*L. paulum* Nunomura, 1976, *L. kiyosumiense* Nunomura, 1983, and *L. iyoense* Nunomura, 1983) are a homogeneous group which differs from *Nippoligidium* in the granulated dorsum, the pereonite 1 with a "bristle field" on posterior margin of epimera, the small eye with less than 40 ommatidia, and the short antenna with flagellum of 6-8 articles.

***Ligidium (Nippoligidium) formosanum*, n. sp. (Figs. 1A-F, 2)**

*Ligidium japonicum* (non Verhoeff): Arcangeli, 1927 (p. 267); 1952 (p. 311). [in part, from Funkiko, Taiwan].

**Holotype.** Male, 5.8 mm long, Nantou Hsian, Meifeng, ca 2,200 m in altitude, 31 III 1993, leg. D. H. Kwon & C.-H. Wang (LJB). Paratypes: One male and 4 females, same data as holotype (TM); 1 male and 6 females, same data (LJB); 2 males and 2 females, Chia-i Hsian, Alishan, ca. 2,200 m in altitude, 24 IV 1992, leg. I.K. Jang (LJB); 1 male and 3 females, same data (TM); 1 female, Chia-i Hsian, Fenchihu, ca. 1,400 m in altitude, 24 IV 1992, leg. D.H. Kwon & D.S. Jeon (LJB).

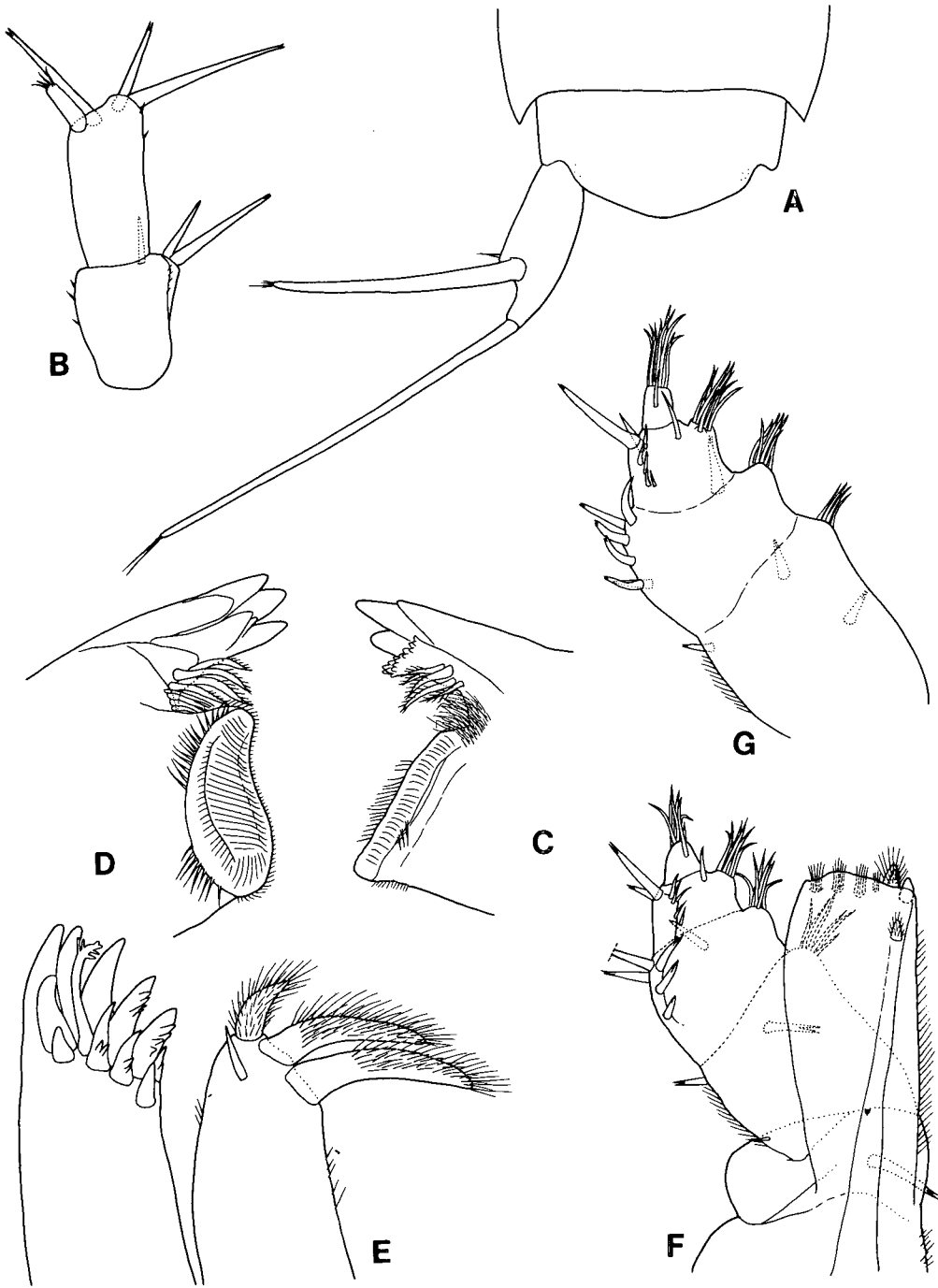
**Material re-examined.** One male, Funkiko (= Fenchihu), 17 XI 1924, leg. F. Silvestri (DEAP) [The specimen was identified as *Ligidium japonicum* by Arcangeli (1927, 1952)].

**Description.** Maximum length of male 6.5 mm, of female 8.3 mm. Color in alcohol brown with usual pale muscle spots; 1 dark longitudinal stripe in middle of pereon and pleon; 1 pale irregular spot at base of each pereonal epimera. Dorsum smooth. Eye with about 150 ommatidia. Pereonites 1 and 2 without "bristle field" on posterior margin of epimera. Telson (Fig. 1A) with posterior margin obtusely triangular with rounded apex. Antennule (Fig. 1B) with small third article, 0.35 length of second article. Antenna with flagellum of 11 (in small specimen, 4.3 mm long)—13 articles (in largest specimen). Right mandible (Fig. 1C) with 3-toothed incisor; lacinia mobilis quadrangular with about 15 denticles on distal margin; 5 penicils between lacinia mobilis and molar process. Left mandible (Fig. 1D) with 3-toothed incisor and lacinia mobilis of 3-spined tooth; 4 + 4 penicils between lacinia mobilis and molar process. Maxillular outer branch with 11 (5 cleft) teeth and a stout plumose seta on distal margin (Fig. 1E); inner branch with 3 stout penicils of unequal size and 1 subapical simple seta on distal margin. Maxillipedal endite quadrangular with 2 distal and 1 medial penicils and 1 tooth at medio-distal corner (Fig. 1F); palpal articles 3 and 4 with folded outer margin. All pereopods without sexual modifications. Uropodal protopod 2.5 times as long as broad (Fig. 2E and F); inner-distal projection of protopod as long as width of its base, with straight outer-proximal margin; endopod 1.6 times as long as exopod.

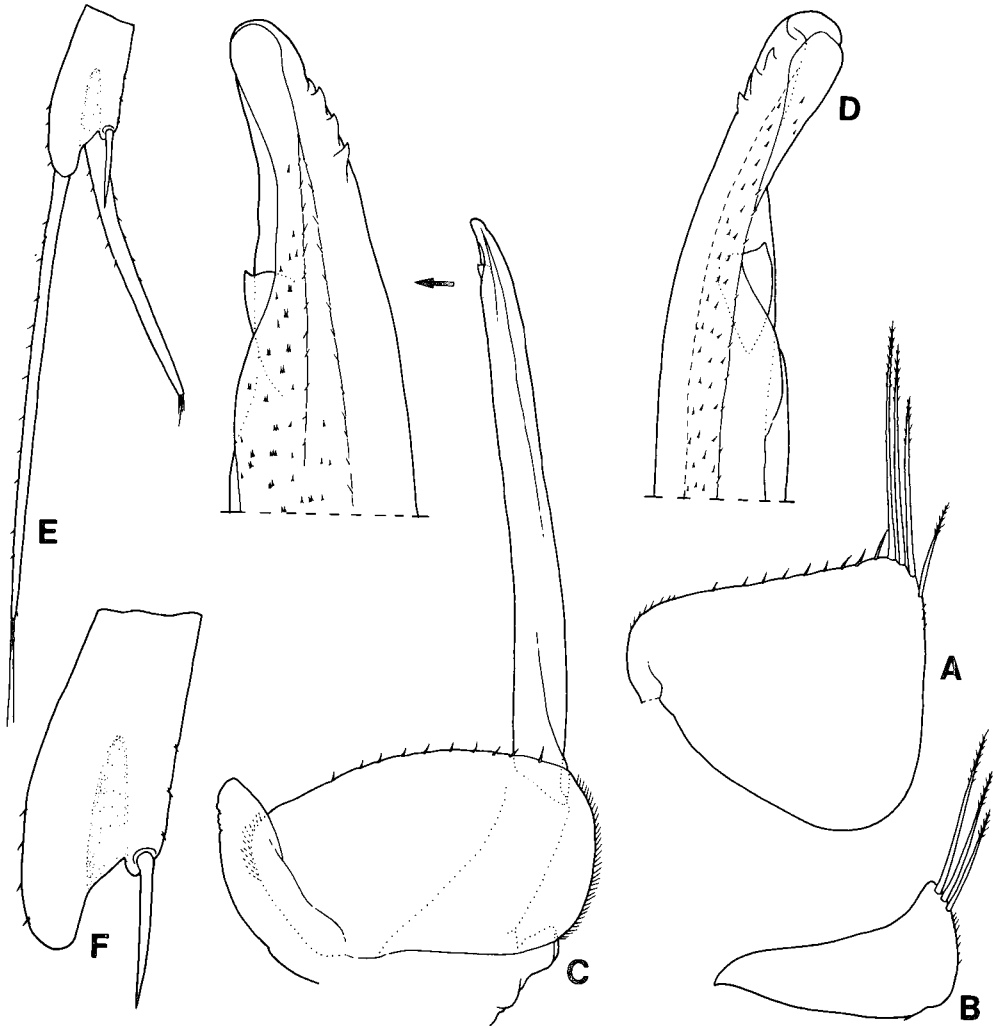
**Male.** Pleopod 1 exopod (Fig. 2A) triangular with 3 or 4 long setae along inner-distal margin; endopod (Fig. 2B) with triangular inner-distal projection bearing 4 (rarely 3) long setae on inner margin. Pleopod 2 exopod quadrangular as in Fig. 2C; endopod long, reaching or surpassing apex of pleopod 5; apical part (Figs. 2C and D) slightly bent outwards, folded over with rounded apex, inner margin evenly convex with 3 or 4 denticles, 1 beak-shaped dent on outer margin.

**Etymology.** The specific name is derived from Formosa (= Taiwan), to which the type locality belongs.

**Remarks.** The new species has close relationship with *Ligidium denticulatum*, *L. japonicum*, and *L. koreanum* in the shape of telson and the presence of a subapical beak-shaped dent on the outer margin of endopod of male pleopod 2. It is distinguished by the apical part of male pleopod 2 which has the evenly convex inner margin and rounded apex, while *L. denticulatum* has the truncate apex (cf. Fig. 26 in Kwon and Taiti, 1993) and the others have a concavity on inner margin (cf. Figs. 15-17 and 23 in Flasarova, 1972). Re-examination of the Taiwanese material which was formerly identified as *Ligidium japonicum* by Arcangeli (1927, 1952) proves that it fits, particularly in the morphology of the endopod of pleopod 2, well with and, thus, is considered to be conspecific with *L. formosanum*.



**Fig. 1.** A-F, *Ligidium (Nippoligidium) formosanum*, n. sp., paratype female from Meifeng. A, pleonite 5, telson and left uropod; B, antennule; C, right mandible; D, left mandible; E, maxillule; F, maxilliped. G, *Ligidium (Nippoligidium) acutitelson*, n. sp., palpal articles 2-5 of maxilliped.



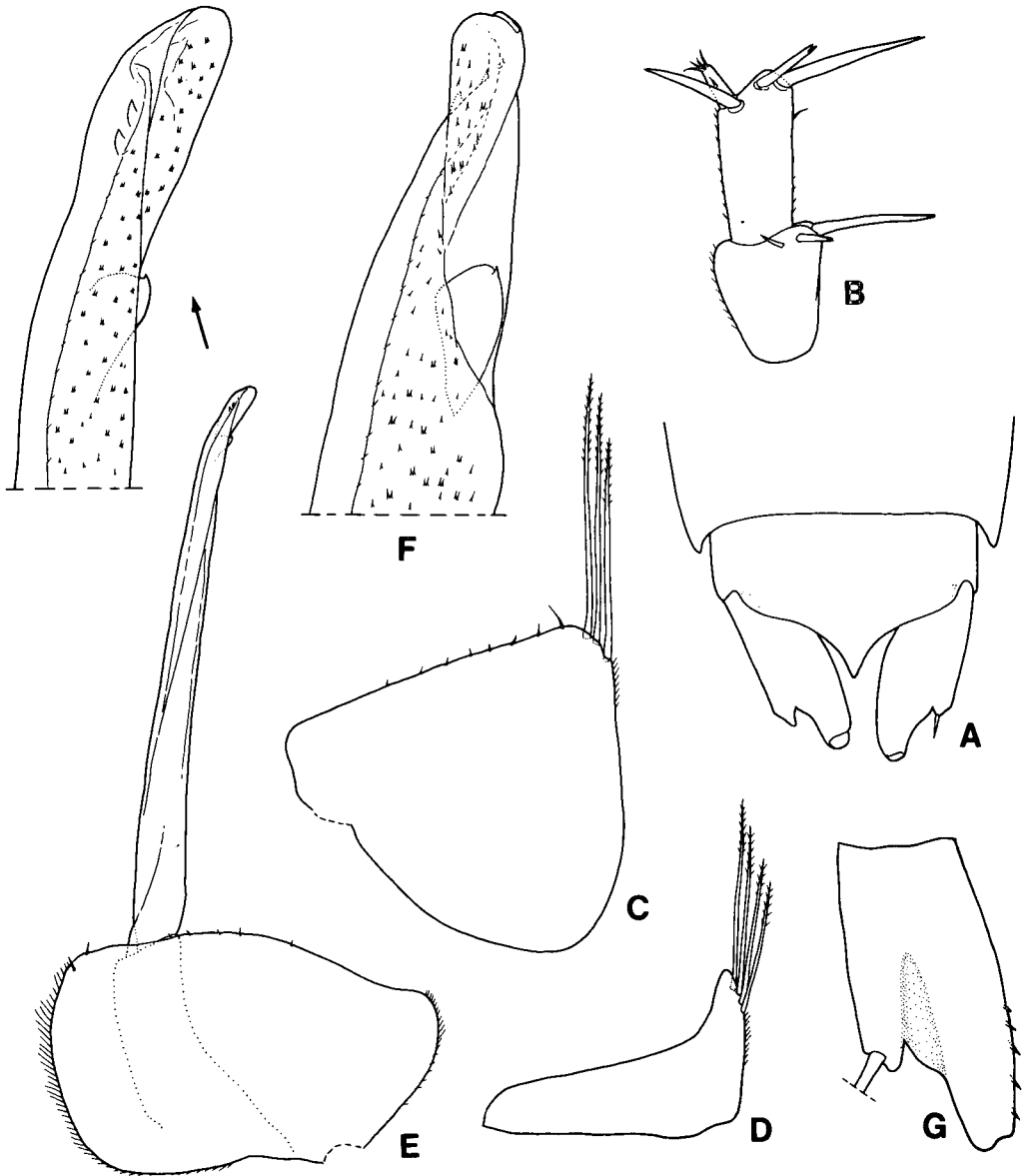
**Fig. 2.** *Ligidium (Nippoligidium) formosanum*, n. sp., A-C, holotype male, D, paratype male from Alishan, E & F, paratype female from Meifeng. A, pleopod 1 exopod; B, pleopod 1 endopod; C, pleopod 2; D, apical part of pleopod 2 endopodp; E, left uropod; F, protopod of left uropod.

One female from Alishan (5.7 mm long, 24. iv. 1992) has 10 embryos in marsupium, while the other females do not have marsupium. Only one female, out of ten, from Meifeng (8.3 mm long, 31. iii. 1993) has marsupium bearing 26 embryos.

***Ligidium (Nippoligidium) acutitelson*, n. sp. (Figs. 1G, 3)**

**Holotype.** Male, 6.7 mm, Chia-i Hsian, Fenchihu, ca. 1,400 m in altitude, 24 IV 1992, leg. D.H. Kwon & D.S. Jeon (IJB). **Paratypes:** 2 males and 3 females, same data as holotype (TM); 2 males and 5 females (IJB), same data.

**Description.** Maximum length of male 6.7 mm, of female 8.4 mm. Color in alcohol dark brown with usual pale muscle spots; 1 dark longitudinal stripe in middle of pereon and pleon; 1 large dark



**Fig. 3.** *Ligidium (Nippoligidium) acutitelson*, n. sp., paratype males. A, pleonite 5, telson and uropodal protopods; B, antennule; C, pleopod 1 exopod; D, pleopod 1 endopod; E, pleopod 2; F, apical part of pleopod 2 endopod (other specimen).

spot on lateral border of each pereonal tergum; epimera light with sparse pigmentation. Dorsum smooth. Eye with about 150 ommatidia. Pereonites 1 and 2 without "bristle field". Telson (Fig. 3A) with triangular distal part; apex elongated and acute. Antennule (Fig. 3B) with small third article, 0.25 length of second article. Antenna with flagellum of 14 articles. Buccal pieces as in *L. formosanum* except for maxillipedal palp (Fig. 1G) with outer margin of articles 4 and 5 not folded. All pereopods without sexual modifications. Uropodal protopod (Fig. 3G) twice as long as broad; inner-distal projection of protopod slightly longer than width of its base, with convex outer-proximal margin.

**Male.** Pleopod 1 exopod (Fig. 3C) triangular with 5 long setae along inner-distal margin; endopod (Fig. 3D) with slender inner-distal projection bearing 3 long setae on inner margin. Pleopod 2 exopod quadrangular as in Fig. 3E; endopod (Figs. 3E & F) long, reaching or surpassing apex of pleopod 5; apical part folded again (Fig. 3F), with rounded apex, outer margin with a beak-shaped dent, inner margin with 2-4 denticles.

**Etymology.** The specific name is derived from the acute apex of telson of the species.

**Remarks.** This species is easily distinguished from all the other members of the genus *Ligidium* by the acutely produced apex of the telson. Seven, out of nine, females have embryos of various stages in marsupium. Ovigereous females are 7.0-8.0 mm long and have 17-30 embryos.

### ABSTRACT

Two new species of the genus *Ligidium* from Taiwan, *L. (Nippoligidium) formosanum* and *L. (N.) acutitelson*, are described in detail. The specimen from Funkiko, Taiwan which was formerly identified as *L. japonicum* Verhoeff, 1918 by Arcangeli in 1927 and 1952 is considered, after re-examination, to belong to *L. (N.) formosanum*, n. sp..

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