

## Taxonomic Revision of the Genus *Paromius* Fieber from Korea

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### Abstract

The true bug genus *Paromius* from Korea is revised taxonomically. It comprises the following three species: *P. exiguus* (Distant, 1883), *P. jejunus* (Distant, 1883) and *P. gracilis* (Rambur, 1839). Among them, *P. jejunus* (Distant, 1883) is recorded for the first time in Korea. The pest bug injurious to rice culture, known as *P. exiguus* (Distant, 1883), has been recorded erroneously by the previous authors from Korea due to the misidentification, which is rectified here with the support of morphological evidence. All the species of this genus are classified with proper redescrptions, and an identification key to species is provided with illustrations.

**Keywords** : *Paromius*, Lygaeidae, Hemiptera, Korea

### Introduction

The genus *Paromius* Fieber (Heteroptera: Lygaeidae), one of the small group of true bugs, is distributed all over the world and currently listed with 14 species (Harrington 1980). The main features for distinguishing the members of this genus from other genera are an elongate and nearly parallel-sided body, comparatively long antennae, short head that is only slightly longer than wide, small compound eyes widely separated from each other, wide postocular space well constricted from behind, broad pronotal collar, less inflated anterior pronotal lobe distinctly lower than posterior one, reduced dark markings of hemelytra, moderately incrassate fore femora which are ventrally armed with two series of spines, and male genitalia with a pair of conjunctival processes.

While many publications by various authors have already focused on the classification of the genus *Paromius*, the species level taxa are frequently inconsistent. The genus *Senocoris* was first established by Rambur in 1839 with *Senocoris gracilis*, yet it was treated as a junior homonym of *Senocoris* Burmeister, 1839 (Heteroptera: Coreidae). Later, Fieber (1860) established a new genus *Paromius* based on the former species belonging to the tribe Myodochini under the subfamily Rhyparochrominae and family Lygaeidae.

*Paromius* bugs have attracted considerable attention from entomologists all over the world, as they are known as one of the serious agricultural pests, especially for rice culture in

Asia. Rambur (1839), Fieber (1860), Distant (1883), Costa (1864), Montrouzier (1865) and Walker (1872) provided early comprehensive taxonomic studies, and subsequent authors have classified these taxa in their regional fauna (Malipatil 1978; Carapezza et al. 1995; Harrington 1980; Tomokuni 1995; Kwon et al. 2001).

The members of this genus are very similar morphologically. Therefore, a few species have been mistakenly reported in East Asia due to confusing external features (Tomokuni 1995; Kwon et al. 2001).

In Korea, previously recorded species in the genus include *P. exiguus* (Distant, 1883) and *P. gracilis* (Rambur, 1839). Yet, *P. exiguus*, widely known as one of the serious pests on rice culture in the maritime areas of Korean peninsula, has been erroneously recorded in Korea since Miyamoto and Lee (1966), as its correct identification is *P. jejunus* (Distant, 1883), as rectified in the present study. *P. exiguus* was originally described by Distant (1883) as *Pamera exigua*. Later, Distant transferred this species into the genus *Paromius* as *Paromius exiguus*. In 1910, he also synonymized *P. robustior* Breddin, 1907 with *P. exiguus*. Meanwhile, in Japan, *P. exiguus* was mistakenly recorded as *P. piratoides* from 1976 to 1993, overlooking the original description of *P. piratoides* (Costa, 1864). Later, Tomokuni (1995) revised the Japanese species of this genus and finally identified it as *P. exiguus*.

The species *Pamera jejunus* Distant, 1883 was transferred to

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the genus *Paromius* as *Paromius jejunus* by Hasegawa (1954). Meanwhile, many Japanese authors (Hasegawa 1960; Tachikawa *et al.* 1976; Miyamoto and Yasunaga 1989; Tomokuni 1993) misidentified *P. exiguus* overlooking *P. jejunus*. Likewise in Korea, *P. jejunus* was also mistakenly treated as *P. exiguus* (Miyamoto and Lee 1966; Lee 1971; Lee and Kwon 1991; Lee *et al.* 1993; Lee and Kwon 1994; An 1995; Kim 1995; Kwon *et al.* 1996; Kwon *et al.* 2001).

While surveying on *Paromius* fauna from Korea, the current authors found that *P. jejunus* had been wrongly treated as *P. exiguus* in Korea since the first record made by Miyamoto and Lee (1966). Accordingly to correct the confusion, this study used morphological techniques to discriminate the species, as while they closely resemble each other externally, they can be readily distinguished based on their genital structures and other detailed morphological features.

As a result, this study revised the Korean fauna of the genus *Paromius*, including the addition of a newly recorded species, *P. jejunus* and some taxonomic correction of previous records in Korea. All the known species from Korea are redescribed with illustrations of the male genital structure to provide a correct identification procedure.

## Materials and methods

The present classification work was based on more than 1000 specimens of the genus *Paromius* collected from various domestic localities throughout Korea, and these specimens are now deposited at the Systematic Entomology Laboratory, Department of Agricultural Biology, Kyungpook National University (KNU), Daegu, Korea.

Numerous field collecting surveys were also made domestically using with sweeping or beating net methods. Many of specimens bear a minimum of collection data such as the locality and date. These basic and essential data made it possible for some species to compare structural variability and color patterns.

## Systematics

### Key to Korean *Paromius* species

1. Rostrum long, nearly reaching mid coxae .....  
..... *exiguus* (Distant)
- . Rostrum short, slightly exceeding fore coxae ..... 2
2. Posterior pronotal lobe usually with three dark stripes; vesica without membranous processes ..... *jejunus* (Distant)
- . Posterior pronotal lobe without dark stripes; vesica with a pair of membranous processes, the proximal one much shorter than the distal one ..... *gracilis* (Rambur)

### Genus *Paromius* Fieber, 1860

*Stenocoris* Rambur, 1839: 139.

*Paromius* Fieber, 1860, 45: 170.

Type species: *Stenocoris gracilis* Rambur, 1839.

The main features distinguishing the members of this genus from other genera are the elongate and nearly parallel-sided body, comparatively long antennae, short head only slightly longer than wide, small eyes widely separated from each other, wide postocular space well constricted from behind, broad pronotal collar, less inflated anterior pronotal lobe distinctly lower than posterior one, reduced dark markings of hemelytra, moderately incrassate fore femora which are ventrally armed with two series of spines, and male genitalia with a pair of conjunctival processes (Tomokuni 1995).

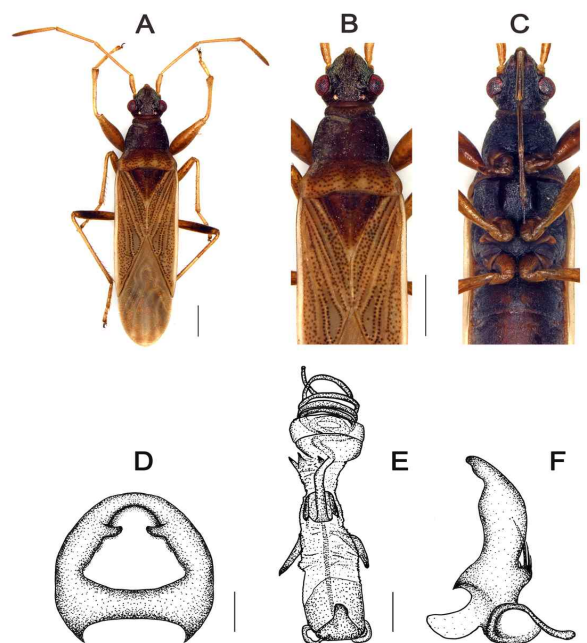
### *Paromius exiguus* (Distant, 1883)

*Pamera exigua* Distant, 1883: 434 (Type-locality: Japan).

*Paromius exiguus*. Distant 1904: 51; Tomokuni 1995: 811.

*Paromius robustior* Breddin, 1907: 204 (syn. by Distant 1910).

*Paromius piratooides* [nec Costa, 1864]: Tachikawa *et al.* 1976: 152; Tomokuni 1989: 191; Miyamoto and Yasunaga 1989: 177; Tomokuni *et al.* 1993: 193.



**Figure 1.** *Paromius exiguus*, male structure.

A: habitus; B: head and thorax, dorsal view; C: ditto, ventral view; D: pygophore dorsal view; E: paramere dorsal view; F: aedeagus dorsal view. Scale bar: A-C= 1.0 mm, D-F= 0.25 mm.

## Description.

Body elongate, nearly parallel-sided. Head slightly wider than long; vertex convex; proportion of antennal segments 1 to 4 as 1:2.2:2.0:2.4 in average; rostrum long, usually almost reaching mid coxae. Ground color of body opaque light brown or black. Head dark brown, with clypeus black or reddish brown. Body length 7.0-9.0; head width across eyes 1.0-1.2; pronotal length 1.3-1.9, width across humeri 1.4-1.9; antennal length 4.1-4.9, in mm (Figure 1A-C).

Male genital structure: Pygophore process with a pair of narrow lateral lobes and a large posterior process which is triangularly projected upward (Figure 1D). Paramere with short triangular dorsal lobe, narrow ventral lobe and well projected triangular process at the base of inner margin of blade; blade long and wide. Protruded dorsal lobe, well expended ventral lobe. Phallus well sclerotized; conjunctiva with a pair of narrow prolonged processes, and ventrally armed with a triangular flap-like membranous process between paired processes vesica with three of short triangular sclerotized processes near base; helicoid process well sclerotized, with about one and half turn; gonoporal process long, with about six turns (Figure 1E-F).

## Material examined.

4 ♂ ♀ Hankyeong-myeon, Jejudo, 25.vii.2004, YJ Kwon; 2 ♀ Songhae-myeon, Ganghwa-gun, Incheon-si, 26.viii.2004, YJ Kwon; 2 ♀ Mokpo Univ., 20.viii.2008, YJ Kwon; 18 ♂ 3 ♀ Geogumdo, Jeollanam-do, 3.ix.2011, YJ Kwon; 32 ♂ 9 ♀ same locality, 15.ix.2011, YJ Kwon; 52 ♂ 9 ♀ same locality, 16.ix.2011, YJ Kwon.

## Distribution.

Korea, Japan.

## Host.

*Echinochloa crusgalli*.

## Remarks.

In Korea, *P. jejunus* has been mistakenly recorded as *P. exiguus* since 1966, hitherto (Miyamoto and Lee 1966; Lee 1971; Kim and Nam 1978; Kim et al. 1978; Kim and Nam 1984; Lee et al. 1985; Kor. Soc. Plant Prot. 1986; Lee and Kwon 1991; Lee et al. 1993; Lee and Kwon 1994; An 1995; Kim 1995; Kwon et al. 1996; Kwon et al. 2001). Thus, all the previous records of *P. exiguus* widely known as the pest bug injurious to rice culture in Korea should be referred to *P. jejunus*.

The correct identification of *P. exiguus*, based on genital structures, has been provided as comparing with *P. jejunus* for the first time in Korea. In Japan, *P. exiguus* had been recorded mistakenly as *P. piratoides* by many Japanese authors from 1976 to 1993 overlooking the original description of *P. piratoides* (Costa, 1864). However, *P. exiguus* does not agree

with Usinger's (1946) and Barber's (1958) descriptions of *P. piratoides*, as the rostrum does not reach the hind coxa and the second antennal segment is not at least one-third longer than the fourth one. Later, Tomokuni (1995) already rectified and confirmed it as *P. exiguus*.

***Paromius gracilis* (Rambur, 1839)**

*Stenocoris gracilis* Rambur, 1839: 140 (Type-locality: Spain).

*Paromius gracilis*. Fieber 1861: 171; Tomokuni 1995: 812; Kwon et al. 2001: 283.

*Pamera gracilis*. Reuter 1882: 17.

*Plociomerus pallidus* Montrouzier, 1865: 229 (syn. by Malipatil 1978).

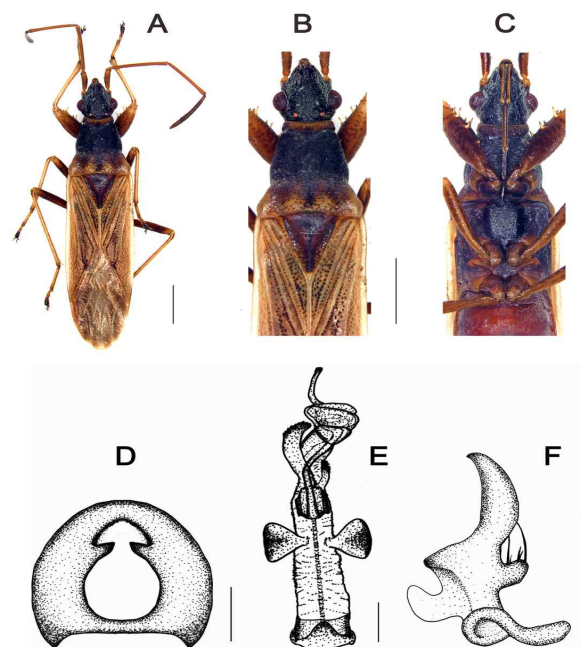
*Paromius pallidus*. Distant 1913: 556.

*Plociomerus seychellesus* Walker, 1872: 120 (syn. by China 1924).

*Paromius seychellesus*. Lethierry and Severin 1894: 189; Hasegawa 1954: 10; Miyamoto and Hidaka 1963: 79.

*Pamera ejuncida* Distant, 1883: 433 (syn. with *Plociomerus seychelles* Walker by Distant 1901).

*Paromius ejuncida*: Oshanin 1906: 304.



**Figure 2.** *Paromius gracilis*, male structure.

A: habitus; B: head and thorax, dorsal view; C: ditto, ventral view; D: pygophore dorsal view; E: paramere dorsal view; F: aedeagus dorsal view. Scale bar: A-C= 1.0 mm, D-F= 0.25 mm.

## Description.

Body elongate, nearly parallel-sided. Head nearly as long as wide; vertex clearly convex; proportion of antennal segments 1 to 4 as 1:2.3:2.0:2; rostrum projected behind a little beyond fore coxae, but not reaching middle of meso-sternum. Membrane opaque, extending to just before or a little beyond tip of abdomen. Ground color of body opaque light brown. Head black, with clypeus brown. Body length 6.2-8.0; head width across eyes 0.9-1.1; pronotal length 1.3-1.8, width across humeri 1.2-1.6; antennal length 3.8-4.6, in mm (Figure 2A-C).

Male genital structure: Pygophore weakly tuberculate postero-medially; pygophoral process with a pair of narrow lateral lobes projected behind, and with a large triangular upright posterior lobe (Figure 2D). Paramere with protruded dorsal lobe, well expended ventral lobe, and broad sickle-shaped blade. Phallus weakly sclerotized; conjucativa laterally with a pair of broad flap-like processes; vesica with a pair of membranous processes, the proximal one of which is much shorter than the distal one; helicoid process weakly sclerotized, with about two and half turn; gonoporal process short, with about three turns (Figure 2E-F).

## Material examined.

1 ♀ Jungmun, Jejudo, 11.viii.1984, YJ Kwon; 1 ♂ Baekhwasan, Chungcheongnam-do, 20.v.2001, YJ Kwon; 18 ♂ Gyeongseodong, Incheon-si, 22.viii.2005, YJ Kwon; 12 ♂ ♀ same locality, 24.ix.2005, YJ Kwon; 18 ♂ ♀ same locality, 18.viii.2006, YJ Kwon; 1 ♂ ♀ same locality, 29.ix.2006, YJ Kwon.

## Distribution.

Korea, Japan, Southern Palearctic, Oriental, Oceanian and Ethiopian Regions.

## Host.

*Ischaemum crassipes*, *I. anthephoroides*.

## Remarks.

While this species is closely related to *P. jejunus*, it can be distinguished based on the structure of its paramere which bears a broad sickle-shaped blade, and its vesica that includes a pair of membranous processes, where the proximal one is much shorter than the distal one.

***Paromius jejunus* (Distant, 1883)**

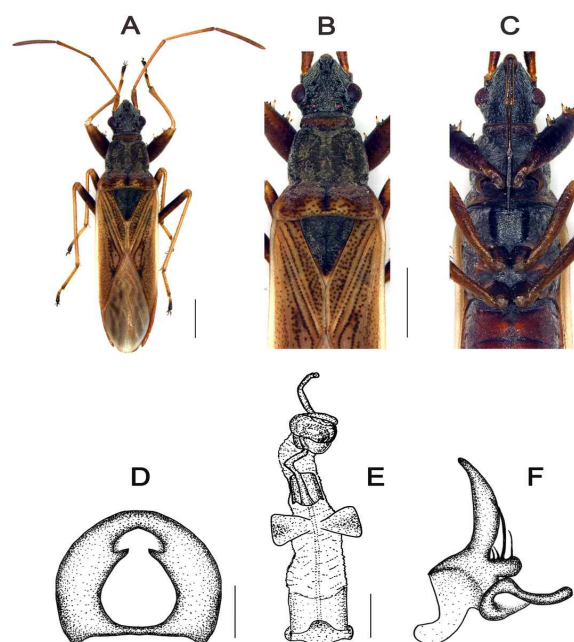
*Pamera jejuna* Distant, 1883: 434 (Type-locality: Japan).

*Paromius seychellesus* [nec. Walker, 1872]: Esaki 1950: 226.

*Paromius jejunus*. Hasegawa 1954: 10; Tomokuni 1995: 815.

*Paromius exiguus* [nec Distant, 1883]: Hasegawa 1960: 37; Miyamoto and Lee 1966: 349; Lee 1971: 24; Tachikawa et al, 1976: 152; Kim and Nam 1978: 129; Kim et al. 1978: 75; Kim and Nam 1984: 86; Lee et al. 1985: 362; Kor. Soc. Plant Prot. 1986: 149; Miyamoto and Yasunaga 1989: 177; Lee and Kwon 1991: 48; Tomokuni et al. 1993: 193; Lee et al. 1993:

33; Lee and Kwon 1994: 75; An 1995: 29; Kim 1995: 228; 1995: 817; Kwon et al. 1996: 115; Kwon et al. 2001: 283.



**Figure 3.** *Paromius jejunus*, male structure.

A: habitus; B: head and thorax, dorsal view; C: ditto, ventral view; D: pygophore dorsal view; E: paramere dorsal view; F: aedeagus dorsal view. Scale bar: A-C= 1.0 mm, D-F= 0.25 mm.

## Description.

Body elongate, nearly parallel-sided. Head nearly as long as wide; vertex clearly convex; proportion of antennal segments 1 to 4 as 1:2.2:2.0:2; rostrum projected behind a little beyond fore-coxae, but not reaching middle of meso-sternum. Membrane opaque, extending to just before or a little beyond tip of abdomen. Ground color of body opaque dark brown or black. Head black, with clypeus black. Posterior pronotal lobe usually with three dark stripe. Body length 6.1-8.0; head width across eyes 0.9-1.0; pronotal length 1.3-1.9, width across humeri 1.2-1.6; antennal length 3.7-4.8, in mm (Figure 3A-C).

Male genital structure: Pygophore weakly tuberculate postero-medially; pygophoral process with a pair of narrow lateral lobes which are projected behind, and with a large triangular upright posterior lobe (Figure 3D). Paramere with protruded dorsal lobe, well expended ventral lobe, and narrow sickle-shaped blade. Phallus weakly sclerotized; conjucativa laterally with a pair of broad flap-like processes; vesica without membranous processes; helicoid process weakly sclerotized, with about two and half turn; gonoporal process short, with about three turns (Figure 3E-F).



## Material examined.

10 ♂ 5 ♀ Gyeongseo-dong, Incheon, 22.viii.2005, YJ Kwon; 28 ♂ 6 ♀ same locality, 24.ix.2005, YJ Kwon; 1 ♂ same locality, 26.v.2006, YJ Kwon; 18 ♂ 2 ♀ same locality, 6.vii.2006, YJ Kwon; 4 ♂ ♀ same locality, 21.vii.2006, YJ Kwon; 5 ♂ 3 ♀ same locality, 18.viii.2006, YJ Kwon; 2 ♂ ♀ same locality, 1.ix.2006, YJ Kwon; 1 ♀ same locality, 19.ix.2006, YJ Kwon; 8 ♂ 3 ♀ same locality, 29.ix.2006, YJ Kwon; 3 ♂ ♀ same locality, 27.x.2006, YJ Kwon; 1 ♂ ♀ Geoje-do, Gyeongsangnam-do, 28.viii.2008, YJ Kwon; 1 ♂ Gasil-ri, Gyeonggi-do, 22.v.2011, YJ Kwon; 3 ♂ ♀ Geogumdo, Jeollanam-do, 7.v.2011, YJ Kwon; 3 ♂ ♀ same locality, 15.viii.2011, YJ Kwon; 1 ♂ ♀ Oenarodo, Jeollanam-do, 9.vi.2011, YJ Kwon; 2 ♂ 2 ♀ Sisan, Goheung-gun, Jeollanam-do, 18.vi.2011, YJ Kwon; 4 ♂ ♀ same locality, 20.viii.2011, YJ Kwon; 1 ♀ Goheung-eup, Goheung-gun, Jeollanam-do, 21.viii.2011, YJ Kwon; 9 ♂ 1 ♀ Eulsuk-do, Busan, 24.viii.2011, YJ Kwon.

## Distribution.

Korea (new record), Japan.

## Host.

*Ischaemum crassipes*, *I. anthephoroides*, *Oryza sativa*.

## Remarks.

Hitherto, this species was mistakenly treated as *P. exiguus* previously from Korea since Miyamoto and Lee (1966). This species is distinguished from the latter by the presence of short rostrum that exceeding slightly fore coxae (in the latter, rostrum long and reaching the mid coxae). In sense of correct identification and unavailability of previous records of this species, we consider this species as a newly recorded one rather than *P. exiguus* because that name has already been occupied in various scientific articles (Kwon et al. 2001).

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