Entomological Research

Entomological Research **47** (2017) 11–20

RESEARCH PAPER

First record of the tribe Trigonoderini (Hymenoptera: Pteromalidae) from South Korea with descriptions of two new species

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Received 24 December 2015;
accepted 4 July 2016.

doi: 10.1111/1748-5967.12188

Abstract

The tribe Trigonoderini (Hymenoptera: Pteromalidae) contains six genera (*Gastracanthus* Westwood, *Janssoniella* Kerrich, *Miscogasteriella* Girault, *Platygerrhus* Thomson, *Plutothrix* Förster and *Trigonoderus* Westwood). This tribe is recorded from South Korea for the first time. Two new species, *Janssoniella albiclava* Tselikh & Lee **sp. nov.** from South Korea and *J. magna* Tselikh & Lee **sp. nov.** from South Korea and the South Far East of Russia, are described. Eight species (*Gastracanthus acutus* (Kamijo), *G. nigrescens* Kamijo, *Janssoniella intermedia* Hedqvist, *Miscogasteriella sulcate* (Kamijo), *Plutothrix scrobicula* Kamijo, *P. trifasciata* (Thomson), *Trigonoderus fraxini* Yang and *T. nigrocephalus* Kamijo) are recorded from South Korea for the first time. The keys for identification of the Eastern–Palearctic species of *Janssoniella* and *Gastracanthus* are given and photos of diagnostic characters of the new species are provided.

Key words: new records, new species, Trigonoderini.

Introduction

Trigonoderini, a relatively large tribe of the family Pteromalidae, is composed of nine genera and 98 species occurring in the Holarctic, Oriental, Neotropical, Ethiopian and Australian regions (Heydon 1997; Noyes 2015). To date, only six genera (*Gastracanthus* Westwood, *Janssoniella* Kerrich, *Miscogasteriella* Girault, *Platygerrhus* Thomson, *Plutothrix* Förster and *Trigonoderus* Westwood) and 27 species are known from the Eastern Palearctic region (Masi 1927; Kamijo 1960, 1962, 2000, 2004; Yang 1996; Heydon 1997; Tselikh 2011, 2013; Noyes 2015).

The biological characters of this tribe have been poorly studied. Although Trigonoderini is rather common in forest environments, because it contains mostly parasitoids of wood-boring or fungus dwelling insects (Heydon 1997), in many cases, host–parasite associations are unknown or do not require verification.

In our study on materials from the collection of Yeungnam University, Gyeongsan, South Korea, and the Zoological Institute of the Russian Academy of Sciences, type materials from Hokkaido University and the Zoological Museum of Lund University, two new species of genus *Janssoniella* Kerrich, *J. albiclava* Tselikh & Lee **sp. nov.** from South Korea and *J. magna* Tselikh & Lee **sp. nov.** from South Korea and the South Far East of Russia were identified. In addition, tribe Trigonoderini (including five genera and eight species) is recorded for the first time for fauna of South Korea, and *J. intermedia* Hedqvist for the first time for fauna of the Eastern Palearctic. Differences between these genera of Trigonoderini are not presented in this paper since they are given in the keys of Heydon (1997) and Bouček and Rasplus (1991).

Materials and methods

This work is based on materials from the collection of Yeungnam University (YNU), Gyeongsan, South Korea, and the collection of Zoological Institute (ZIN), St. Petersburg,

Russia. The type materials used in this paper were selected from the Hymenoptera collection of the Entomological Laboratory of Hokkaido University (HU), Sapporo, Japan, and the Zoological Museum of Lund University, Lund, Sweden. New species were compared using these materials and numerous photos of type species of the Eastern Palearctic provided by Dr M Ohara (HU, Japan). All holotypes of the new species are kept at YNU and one paratype is kept at ZIN.

Morphological terminology, including sculpture and wing venation nomenclature, follows those of Gibson (1997) and Graham (1969). The following abbreviations are used for morphology: POL, posterior ocellar line, minimum distance between posterior ocelli; OOL, ocellocular line, minimum distance between posterior ocellus and compound eye; PS, parastigma; M, marginal vein; S, stigmal vein; P, postmarginal vein; F1–F6, funicular segments; T1–T7, gastral tergites, and for geographical territories: CB, Chungcheongbuk-do; CN, Chungcheongnam-do; GB, Gyeongsangbuk-do; GG, Gyeonggi-do; GW, Gangwon-do; JB, Jeollabuk-do.

For terms associated with type: TD, type depository; TL, type locality; TS, type species; Hedqvist Collection, Sweden (HC); Hokkaido University, Japan (HU); Zoological Museum of the Lund University, Sweden (LUZN); Northwestern College of Forestry, Yangling 712100, Shaanxi, China (NWCF); Yeungnam University, Gyeongsan, South Korea (YNU); Zoological Institute of the Russian Academy of Sciences, Russia (ZIN).

The scape was measured without the radicle; the pedicel was measured in lateral view. The distance between the clypeal margin and toruli was measured from the lower margins of the toruli. The mesosoma and metasoma were measured in lateral view, the latter without ovipositor sheaths. Specimen images were obtained using a Nikon SMZ745T plus camera Digital Sight PS-Fi2 and Axio Cam MRc5 camera attached to a stereomicroscope (Zeiss SteREO Discovery V20; Carl Zeiss, Göttingen, Germany), processed using Axio Vision SE64 software (Carl Zeiss) and optimized with a Delta imaging system (i-solution; IMT i-Solution Inc., Vancouver, BC, Canada).

Taxonomic accounts

Subfamily Pteromalinae Dalman, 1820

Tribe Trigonoderini Peck *et al.*, 1964

Genus *Gastracanthus* Westwood, 1833

Gastracanthus Westwood, 1833: 121; TS: *Gastracanthus pulcherrimus* Westwood, 1833, by monotypy.

Hetroxys Westwood, 1833: 495; replacement name for *Gastracanthus* Westwood, 1833.

Photismus Thomson, 1878: 15; TS: *Photismus nubilosus* Thomson, 1878, by monotypy.

Hebestephus Kamijo, 1960: 10; TS: *Hebestephus acutus* Kamijo, 1960, by monotypy.

Cleoblabena Szelényi, 1981: 404–405; TS: *Cleoblabena gracilis* Szelényi, 1981, by original designation and monotypy.

Diagnosis

Anterior margin of clypeus truncate or broadly convex; tentorial pits deep. Mandible formula 3:4 or 4:4. Last segment of clava with small ovate patch of micropilosity. Pronotum more than 0.5× as long as wide and usually about 0.7× length of mesoscutum; prepectus flat, uniformly reticulate; mesosternum with raised shield-shaped region behind forecoxae. Forewing hyaline or with two spots. Metasoma distinctly petiolate, male with petiole at least 0.5× as long as wide. Hind margin of T1 produced or emarginate (Kamijo 1960; Heydon 1997).

Key to East Palearctic species of *Gastracanthus* Westwood (females only)

1 Mandible formula 4:4 (Fig. 1H). Hind margin of T1–T3 emarginate; T7 1.1–1.3× longer than T6 (Fig. 1A). ……*G. acutus* (Kamijo)

– Mandible formula 3:4 (Fig. 1I). Hind margin of T1–T3 truncate; T7 short, in dorsal view 0.2–0.5× as long as T6 (Fig. 1B,C). ……2

2(1) Anterior margin of clypeus produced. Metasoma longer than combined length of head and mesosoma (Fig. 1B). Forewing with two fuscous clouds below M and P (Fig. 1G). Last segment of clava yellow or yellowish-brown (Fig. 1E). ……*G. nigrescens* Kamijo

– Anterior margin of clypeus subtruncate. Metasoma as long as combined length of head and mesosoma (Fig. 1C). Forewing hyaline (Fig. 1F). All segments of clava brown (Fig. 1D). ……*G. japonicus* Kamijo

Gastracanthus acutus (Kamijo, 1960)

Hebestephus acutus Kamijo, 1960: 106; Holotype, female; TD: HU; TL: Japan, Sapporo.

Material examined

JAPAN: Holotype, Hokkaido, Sapporo, 20.x.1959, K. Kamijo (HU), female. **SOUTH KOREA: GB:** Cheongdo-gun, Unmun-myeon, Ssalbawi, Mt. Unmun, 35°38’08"N, 129°01’27"E, 9–28.vi.2012, J.W.Lee, 2F, 1M; Yeongcheon-si, Sinnyeong-myeon, Chisan-ri, San 141-4, 36°01’12.55"N, 128°42’26.29E, 15.vii.–29.viii.2014, J.W.Lee, 1F; Bonghwa-gun, Jaesan-myeon, Galsan-ri, Irwolsan-gil, 36° 49’21.7"N, 129°05’05.3"N, 7.viii.2015, Tselikh, 1F; same locality, K.H.Ko, 1M; **GW**, Wonju-si, Socho-myeon,

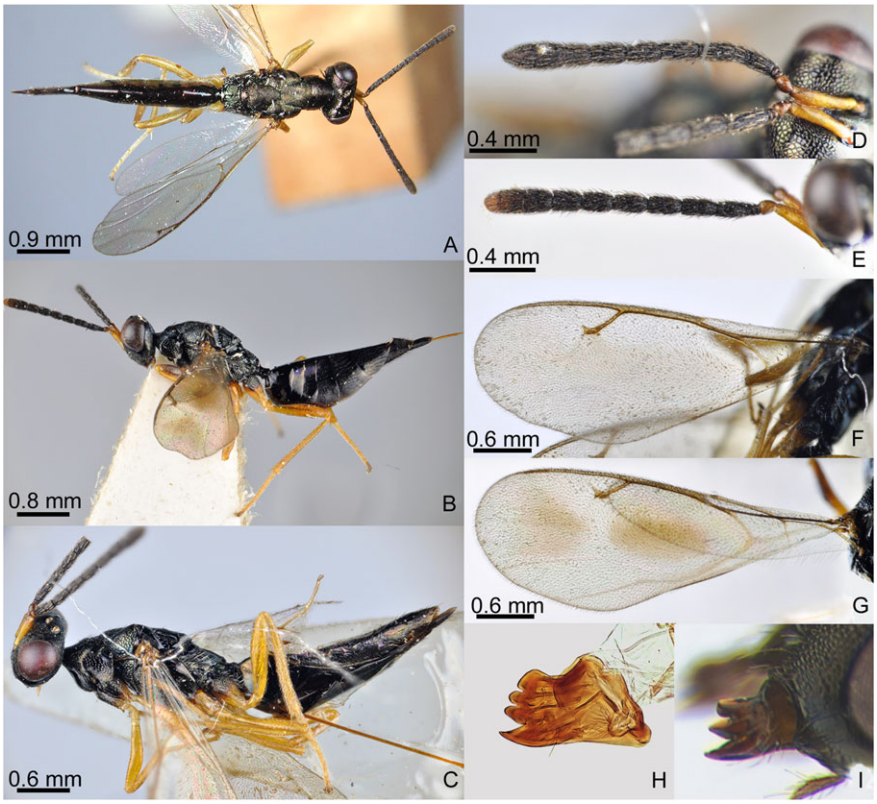

Figure 1 *Gastracanthus* spp. (**A, H**) *Gastracanthus acutus* (Kamijo) (female, paratype). (**A**) Habitus dorsal view; (**H**) Left mandible. (**B, E, G, I**) *Gastracanthus nigrescens* Kamijo. (**B**) Habitus lateral view; (**E**) Antenna; (**G**) Forewing; (**I**) Left mandible. (**C, D, F**) *Gastracanthus japonicus* Kamijo. (**C**) Habitus lateral view; (**D**) Antenna; (**F**) Forewing.

Hakgog-ri, Mt. Chiak, 37°22'18"N, 128°03'1.84"E, 28.viii.–16.ix.2013, J.W.Lee, 1F; **JB**: Jeongeup-si, Naejang-dong, Yeonja-sinseongbong, 35°29'26.65"N, 126°54'29.64"E, 20.v.2004, K.B.Kim, 1F; Buan-gun, Jinseo-myeon, Unho-ri, (host: hardwood tree), 14.v.–18.vi.2005, J.C.Jeong, 1F; (all from YNU).

Distribution
South Korea (new record), Japan, Russian Far East.

Biology
Unknown.

Remarks
Gastracanthus acutus (Kamijo) differs from all species of *Gastracanthus* in having a mandible formula 4:4; T1–T3 emarginate, T7 long, in dorsal view 1.1–1.3× longer than T6; separate first claval segment of male (Kamijo 1960).

Gastracanthus nigrescens Kamijo, 1960

Gastracanthus nigrescens Kamijo, 1960: 103; Holotype, female; TD: HU; TL: Japan, Hokkaido.

Material examined
JAPAN: Holotype, Mt. Apoi, Hokkaido, 22.vi.1959, K. Kamijo (HU), female; Miyanoura-dake, Yaku-shima, Kagoshima-ken, 18.vi.1980, K.Kusigemati, 1F, (both from EIHU). **SOUTH KOREA: CB**, Danyang-gun, Danyang-eup, Cheondong-ri, Cheondong valley, Mt. Sobaek, 36°57'N, 128°26'E, 10–18.x.2007, J.W.Lee, 1F; **GB:** Cheongdo-gun, Unmun-myeon, Ssalbawi, Mt. Unmun, 35°38'08"N, 129°01'27"E, 11.vii.–1.viii.2012, J.W.Lee, 1F; Cheongdo-gun, Unmun-myeon, Ssalbawi, Mt. Unmun, 35°38'08"N, 129°01'27"E, 13.vii.–16.viii.2013, J.W.Lee, 1F; Bonghwa-gun, Jaesan-myeon, Galsan-ri, Irwolsan-gil, 36°49'21.7"N, 129°05'05.3"E, 14.vii.2015, Tselikh, K.H.Ko, 1F; **GG**, Gapyeong-gun, Cheongpyeong-myeon, Goseong-ri, Mt. Homyeong, 37°43'16.3"N, 127°19'23.4"E, 27.v.–10.vi.2009, J.O.Lim, 1F; **GW**, Wonju-si, Socho-myeon, Hakgog-ri, Mt. Chiak, 37°22'18"N, 128°03'1.84"E, 20.vi.–19.vii.2013, J.W.Lee, 1F; (all from YNU).

Distribution
South Korea (new record), Japan, Russian Far East.

Biology
Unknown.

Remarks

Gastracanthus nigrescens Kamijo differs from all species of *Gastracanthus* in having a produced anterior margin of clypeus; T7 short, in dorsal view 0.3× longer than T6; forewing with two wide fuscous clouds below M and P; last segments of clava yellow or yellowish-brown, body usually black (Kamijo 1960).

Genus *Janssoniella* Kerrich, 1957

Janssoniella Kerrich, 1957: 303–304; TS: *Janssoniella caudata Kerrich*, 1957, by original designation.

Diagnosis

Anterior margin of clypeus slightly arched or broadly truncate; tentorial pits deep. Mandible formula 3:4. Last segment of clava without visible patch of micropilosity. Pronotum less than 0.5× as long as wide; prepectus flat, uniformly reticulate; mesosternum without raised shield-shaped region behind forecoxae. Both sexes with sessile metasoma, petiole transverse, at most 0.25× as long as wide; hind margin of T1 straight (Bouček & Rasplus 1991; Heydon 1997).

Key to East Palearctic species of *Janssoniella* Kerrich (females only)

1 Propodeum medially usually more than 0.45× as long as scutellum (Fig. 2H). Forewing with fuscous cloud below S (Fig. 2F). Scutellum about 1.25× longer than broad. Metasoma elongate, 2.2× longer than mesosoma, T7 1.7× longer than maximum width (Fig. 2G). Costal cell strongly hairy. ……. *J. notata* Kamijo

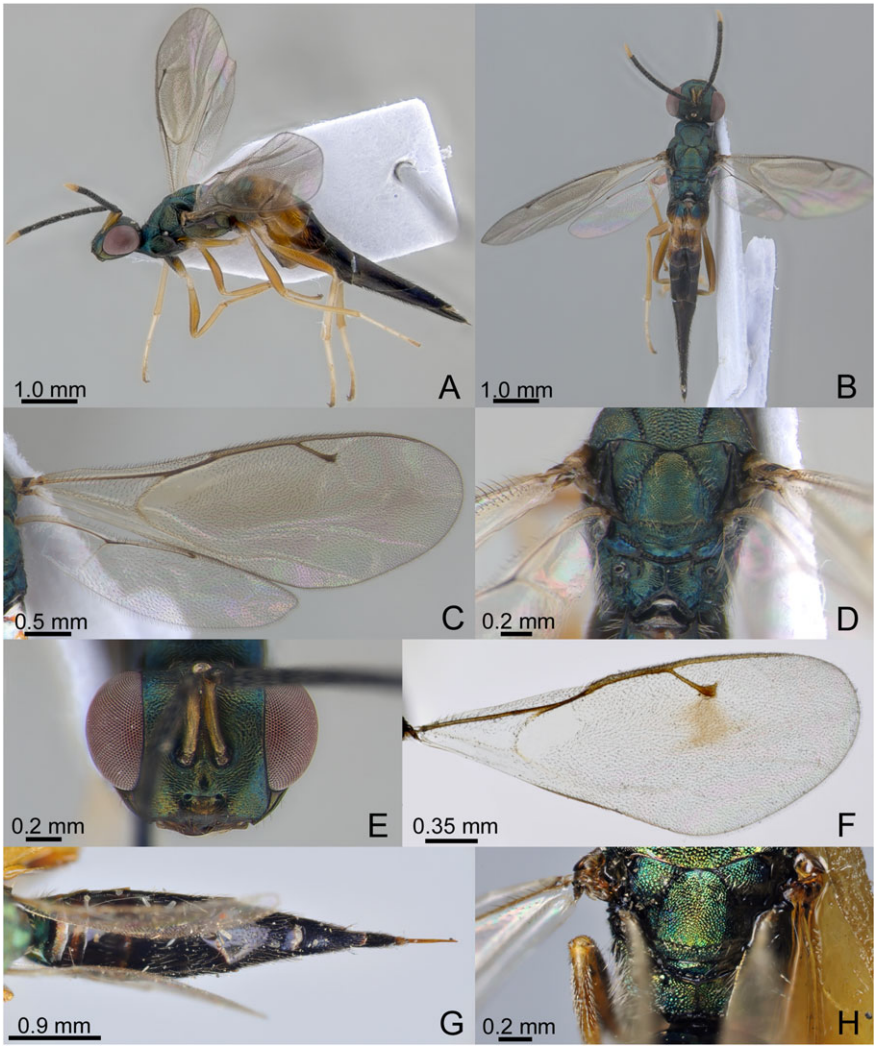

Figure 2 *Janssoniella* spp. (**A–E**) *Janssoniella albiclava* Tselikh *et* Lee sp. nov. (female, holotype). (**A**) Habitus lateral view; (**B**) Habitus dorsal view; (**C**) Wings; (**D**) Scutellum and propodeum; (**E**) Head frontal view. (**F–H**) *Janssoniella notata* Kamijo (female, paratype). (**F**) Forewing; (**G**) Metasoma; (**H**) Scutellum and propodeum.

– Propodeum medially at most 0.35× as long as scutellum (e.g. Figs 2D,3D). Forewing hyaline or with light brownish tint (e.g. Figs 2C,3C). ……..2

2(1) Antenna with clava yellow, funiculus black (Fig. 2A,B). T1 apically and T2 yellowish-brown (Fig. 2A,B). P 2.9× longer than S. Metasoma elongate 6.8× longer than broad, 2.3× longer than mesosoma, T7 3.7× longer than maximum width. …… *J. albiclava* Tselikh & Lee **sp. nov.**

– Antenna with clava and funiculus black or brown (e.g. Fig. 3F). All metasomal tergites with uniform coloration, usually dark metallic green (e.g. Fig. 3A,B). ……..3

3(2) Larger species, length 7.5–8.5 mm. Metasoma 2.7–2.8× longer than mesosoma (Fig. 3A), T7 strongly elongate, 3.6–5.7× longer than maximum width. …….. *J. magna* Tselikh & Lee **sp. nov.**

– Smaller species, length 3–4.5 mm. Metasoma 1.9–2.2× longer than mesosoma, T7 shorter, 2.4–2.6× longer than maximum width. ……4

4(3) Costal cell of forewing with one row of setae. F1–F3 with two regular rows of sensilla, combined length of pedicel and flagellum less than 2.0× breadth of head. …….. *J. caudata* Kerrich

– Costal cell of forewing with at least two rows of setae. F1–F3 with three irregular rows of sensilla, combined length of pedicel and flagellum more than 2.0× breadth of head. …… *J. intermedia* Hedqvist

Janssoniella albiclava Tselikh & Lee sp. nov. (Fig. 2A–E)

Description

Female. Body length 7.5 mm; forewing length 5.4 mm.

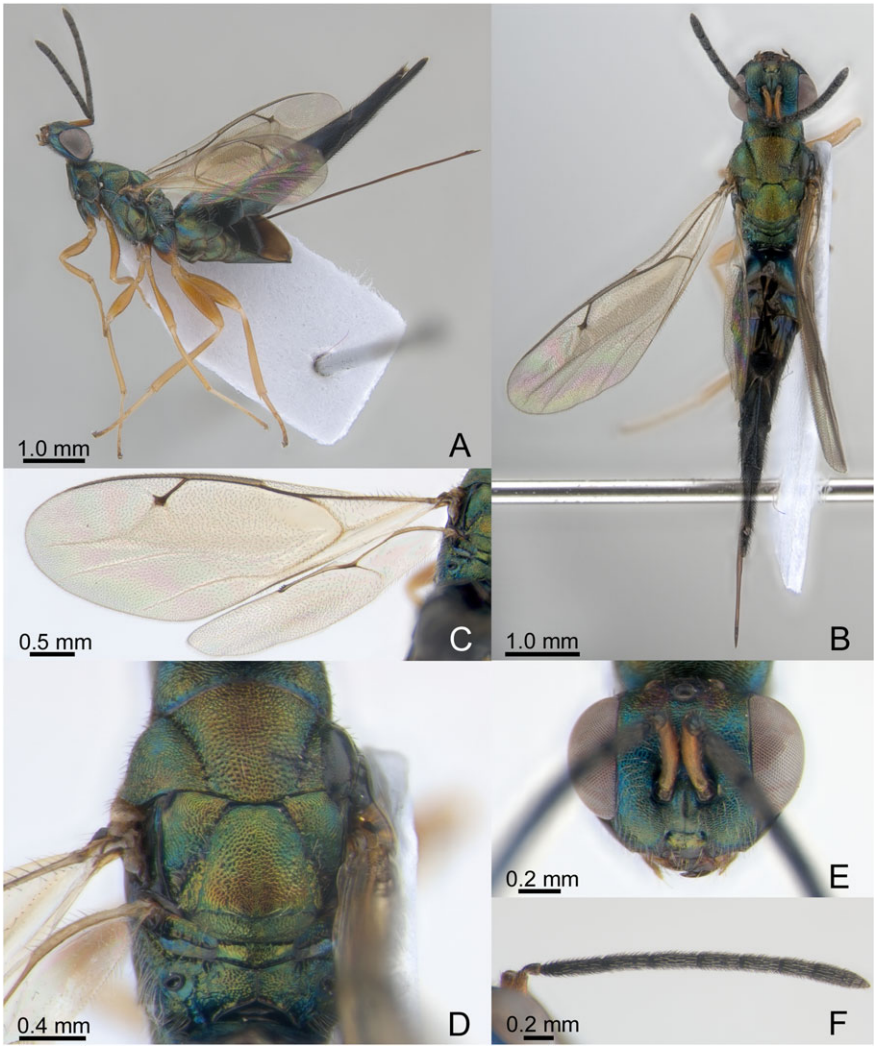

Figure 3 *Janssoniella magna* Tselikh *et* Lee sp. nov. (female, holotype). (**A**) Habitus lateral view; (**B**) Habitus dorsal view; (**C**) Wings; (**D**) Mesoscutum, scutellum and propodeum; (**E**) Head frontal view; (**F**) Antenna.

Color
Head and mesosoma dark metallic green and with diffuse coppery luster; antenna with scape and clava yellow, pedicel and flagellum black; all coxa basally metallic green; femur, tibia, and tarsus yellow, last segment of tarsus yellowish-brown; forewing with light brownish tint, venation yellowish-brown; T1 basally metallic green, apically yellowish-brown, T2 yellowish-brown, other tergites brown, ovipositor sheath black. Sculpture: head and median area of propodeum shallowly reticulate; mesoscutum and scutellum finely reticulate; clypeus and metasoma shallowly alutaceous.

Head in dorsal view 2.3× broader than length, 1.2× broader than mesoscutum. POL 1.2× OOL. Head in front view 1.4× broader than high. Eye height 1.3× eye length, 3.2× larger than malar space. Frons as long as eye height. Distance between antennal toruli and lower margin of clypeus 0.7× distance between antennal toruli and median ocellus. Clypeus slightly arched. Antenna with scape 0.7× as long as eye height, 0.9× as long as eye length and not reaching anterior edge of median ocellus. Pedicel 1.43× longer than broad and 0.34× as long as F1. Combined length of pedicel and flagellum 1.7× breadth of head. Anelli transverse. Flagellum almost filiform; F1 3.6× longer than broad, all funicular segment longer than broad, F1–F4 with four rows, F5–F6 with three rows of dense sensilla. Clava 3.0× longer than broad.

Mesosoma 1.9× longer than broad. Scutellum finely reticulate, about 1.05× longer than broad, with distinctly frenal line. Petiolar segment strongly transverse. Propodeum medially 0.3× as long as scutellum; median carina complete and straight, costula and nucha absent; hind femur 5.0 × longer than broad. Forewing 3.3× longer than maximum width. Basal cell pubescent; speculum closed. Forewing M 0.7 as long as P, 2.1× longer than S; P 2.9× longer than S.

Metasoma elongate, 6.8× longer than broad; 2.3× longer than mesosoma. T7 strongly elongate, 3.7× longer than maximum width. Ovipositor sheath 0.5× length of T7.

Male
Unknown.

Material examined
Holotype: 1F, **KOREA**: **GB**, Yeongyang-gun, Irwol-myeon, Mt. Irwol, 36°48’29’’N, 129°05’25’’E, 15.vii.–5.ix.2014, H. Y.Han, female (YNU).

Distribution
South Korea (new species).

Biology
Unknown.

Etymology
The name is derived from the Latin words albi, meaning “white”, and clava, meaning “club”, referring to the distinctive white antennal clava.

Remarks
This species is similar to *J. magna* Tselikh & Lee **sp. nov.**; differences between these species are shown in the key.

Janssoniella intermedia Hedqvist, 1968

Janssoniella intermedia Hedqvist, 1968: 58; Holotype, female; TD: HC; TL: Finland, Pylkönmäki.

Material examined
SOUTH KOREA: CB, Danyang-gun, Cheondong-ri, Mt. Sobaek, Temp. Bukbusa, 24.ix–14.x.2005, 1F; **GB,** Yeongyang-gun, Irwol-myeon, Mt. Ilwol, 36°48’29"N, 129° 05’25"E, 15.iv.–5.vii.2014, H.Y.Han, 1F; (both from YNU).

Distribution
South Korea (new record), Canada, Finland, Sweden.

Biology
Unknown.

Remarks
Janssoniella intermedia Hedqvist is very similar to *J. caudata* Kerrich; differences between these species are shown in the key.

Janssoniella magna Tselikh & Lee sp. nov. (Fig. 3)

Description
Female Body length 7.5–8.5 mm; forewing length 4.5–4.7 mm.

Color
Head, mesosoma, metasoma and coxa basally dark metallic green with diffuse coppery luster; antenna with scape yellowish-brown, pedicel and flagellum brown; all legs yellow, last segment of tarsus yellowish-brown; forewing with light brownish tint, venation yellowish-brown; ovipositor sheath black. Sculpture: head, scutellum and median area of propodeum shallowly reticulate; mesoscutum finely reticulate; clypeus smooth; metasoma shallowly alutaceous.

Head in dorsal view 2.0–2.1× broader than length, 1.0–1.06× broader than mesoscutum. POL 1.3–1.5× OOL. Head in front view 1.25–1.3× broader than high. Eye height 1.3–1.4× eye length, 2.8–3.0× larger than malar space. Frons 1.0–1.05× broader than eye height. Distance between antennal toruli and lower margin of clypeus 0.6–0.75× distance

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between antennal toruli and median ocellus. Clypeus slightly arched. Antenna with scape 0.7× as long as eye height, 0.9× as long as eye length and not reaching anterior edge of median ocellus. Pedicel 1.3× longer than broad and 0.3–0.36× as long as F1. Combined length of pedicel and flagellum 1.8–1.85× breadth of head. Anelli transverse, second anellus much thicker than first one. Flagellum almost filiform; all funicular segments longer than broad, F1 3.55–3.65× longer than broad, F1–F4 with four irregular rows, F5–F6 with three irregular rows of dense sensilla. Clava 3.0–3.1× longer than broad.

Mesosoma 1.65–1.8× longer than broad. Pronotum 1.7–1.8× broader than length. Scutellum finely reticulate, about 1.1–1.25× longer than broad, with distinctly frenal line. Petiolar segment strongly transverse. Propodeum medially 0.2× as long as scutellum; median carina complete and straight, costula and nucha absent; hind femur 4.0× longer than broad. Forewing 2.8–3.0× longer than maximum width. Basal cell pubescent in anterior half; speculum closed. Forewing M 0.6–0.7× as long as P, 1.9–2.0× longer than S; P 2.9–3.0× longer than S.

Metasoma elongate, 5.6–7.0× longer than broad; 2.7–2.8× longer than mesosoma. T7 strongly elongate, 4.6–5.7× longer than maximum width. Ovipositor sheath 0.34× length of T7.

Male

Unknown.

Material examined

Holotype: **KOREA: GG**, Pocheon-si, Soheur-eup, Jikdong-ri 51-7, Korea National Arboretum, 37°45’1.9’’N, 127° 08’34.4’’E 29.viii.–14.x.2013, I.G.Kim, female, (YNU). Paratype: **RUSSIA:** Primorskiy kray, 20 km SSE Partizansk, Ekaterinovka, 24.viii.2001, S.Belokobylskij, female, (ZIN).

Distribution

South Korea (new species), Russian Far East (new species).

Biology

Unknown.

Etymology

The name is derived from the Latin word magna, meaning “great”, referring to the large size of this species.

Remarks

This species is closely related to *Janssoniella notata* Kamijo, from which it may be distinguished by a shorter propodeum, medially at most 0.35× as long as scutellum, hyaline forewing, and more longer metasoma. This species is similar to *J. major* Kerrich, but differs in having more elongated F1 and metasoma, shorter M, and 1.9–2.0× longer than S.

Genus *Miscogasteriella* Girault, 1915

Miscogasteriella Girault, 1915: 196–197; TS: *Miscogasteriella longiventris* Girault, 1915, by original designation and monotypy.

Glyptosticha Masi, 1927: 348–349; TS: *Glyptosticha flavipes* Masi, 1927, by original designation.

Trigonoderoides Kamijo, 1962: 121; TS: *Glyptosticha nigricans* Masi, 1926, by original designation and monotypy.

Diagnosis

Anterior margin of clypeus sinuous or weakly emarginate; tentorial pits shallow. Mandible formula 3:4 or 4:4. Segments of clava with narrow line of dense micropilosity. Vertex of head smooth. Sides of pronotum (in dorsal view) converging posteriorly. Propodeum with median sulcus or posterior with median pit. Forewing without speculum (Kamijo 1962; Heydon 1997).

Miscogasteriella sulcata (Kamijo, 1962)

Glyptosticha sulcata Kamijo, 1962: 118; Holotype, female; TD: HU; TL: Japan, Kyushu.

Material examined

JAPAN: Holotype, Kyushu, 11.viii.1955, K.Nohara (HU), female. **SOUTH KOREA: Busan,** Gijang-gun, Jeonggwan-myeon, Gijang-cheongsonyeon-suryeonwon, 35° 18’52.24"N, 129°09’57"E, 22.v.–29.vi.2008, J.W.Lee, 2F; **CB**: Yeongdong-gun, Sangchon-myeon, Mulhan Valley, 35° 49’53"N, 128°32’28"E, 23.v.2002, J.W.Lee, 1F; Miwon-ri, Miwon-myeon, Cheongwon-gun, 15–22.vii.05, J.H.Han, 1F; Danyang-gun Cheondong-ri, Mt. Sobaek, Temp. Bukbusa, 7.vii.–2.viii.2005, J.W.Lee, 1F; Cheongwon-gun, Miwon-myeon, Miwon-ri, 9–16.ix.2005, J.H.Han, 3M; **GB**: Kyeongju-si, Hyeongok-myeon, Namsa-ri, 2–09.ix.2015, J. T.Mun, 1M; Cheongdo-gun, Unmun-myeon, Mt. Unmun, 35°38’9"N, 128°59’18"E, 23.v.2008, J.W.Lee, 1F; same locality, 15–29.ix.2005, J.O.Lim, 2F; same locality, 35° 38’9"N, 128°59’18"E, 23.v.2008, J.W.Lee, 1F; same locality, 35°38’19"N, 128°57’40"E, 5–15.v.2009, J.W.Lee, 2F; same locality, 30.v.–16.vi.2009, C.J.Kim, 2F; Yeongju-si, Punggi-eup, Jungnyeong, 35°53’42.7"N, 128°26’22.0"E, 20.viii.–5. ix.2009, J.W.Lee, 2F; Cheongdo-gun, Unmun-myeon, Haksodaepakpo, 35°38’15"N, 128°59’51"E, 2.vii.–16. viii.2013, J.W.Lee, 1F; Cheongdo-gun, Unmun-myeon, Ssalbawi, Mt. Unmun, 35°38’08"N, 129°01’27"E, 13.vii.–16.viii.2013, J.W.Lee, 2M; Chilgok-gun, Dongmyeong-myeon, Hakmyeong-ri, San, 36°01’53.45"N, 128° 33’46.93"E, 15.vii.–29.viii.2014, J.W.Lee, 6M; Yeongcheon-si, Sinnyeong-myeon, Chisan-ri, San 141-4, 36°01’12.55"N, 128°42’26.29"E, 15.vii.–29.viii.2014, J.W. Lee, 1F; Yeongcheon-si, Sinnyeong-myeon, Chisan-ri, San

141-4, 36°01'12.55"N, 128°42'26.29"E, 30.viii.–25.ix.2014, J.W.Lee, 1F; Bonghwa-gun, Myeongho-myeon, Gwanchang-ri, Mt. Cheongryang, 22.v.2015, J.W.Lee, 1F; Bonghwa-gun, Jaesan-myeon, Galsan-ri, Irwolsan-gil, 36° 49'21.7"N, 129°05'05.3"E, 7.viii.2015, Tselikh, K.H.Ko, 1F; **GG**: Anyang-si, Manan-gu, Gwanak Arboretum, 37° 18'5.3"N, 127°19'1.5"E, 5–19.vii.2007, J.O.Lim, 2M; Gapyeong-gun, Cheongpyeong-myeon, Mt. Homyeong, 1–26.v.2009, J.W.Lee, 3F, 1M; same locality, 37° 43'16.3"N, 127°19'23.4"E, 31.vii.–17.viii.2009, J.O.Lim, 1F; same locality, 27.v.–10.vi.2009, J.O.Lim, 2F, 2M; Namyangju-si, Choan-myeon, Songchon-ri, Mt. Ungil, 37° 34'43.3"N, 127°18'37.5"E, 26.vi.–16.vii.2009, J.O.Lim, 1M; same locality, 37°34'43.2"N, 127°18'40.1"E, 18.viii.–4. ix.2009, J.O.Lim, 1F, 22M; Pocheon-si, Soheur-eup, Jikdong-ri, 51-7, Korea National Arboretum, 37°45'1.9"N, 127°08'34.4"E, 29.viii.–14.x.2013, I.G.Kim, 2F, 1M; **GW**: Donghae-si, Samhwa-dong, Mureunggyegok, 2–10.x.2006, J.W.Lee, 1M; Wonju-si, Heungeop-myeon, Maeji-ri, 234, Yonsei University, 21.v.–27.vi.2014, H.Y.Han, 1F, 1M; (all from YNU).

Distribution
South Korea (new record), Japan.

Biology
Unknown.

Remarks
Miscogasteriella sulcata (Kamijo) is very similar to *M. flavipes* (Masi) from which it may be distinguished by a moderate depth scrobe of antenna, second and third segments of clava with narrow line of dense micropilosity; propodeum less elongate with deep sulcus; metasoma little longer than combined length of mesosoma and head (Kamijo 1962).

Genus *Plutothrix* Förster, 1856

Plutothrix Förster, 1856: 46; TS: *Plutothrix foersteri* Mayr, 1856, by subsequent monotypy.

Anoglyphis Förster, 1878: 49; TS: *Anoglyphis nubilosa* Förster, 1856, by original designation and monotypy.

Diagnosis
Anterior margin of clypeus with angular median tooth; tentorial pits shallow. Mandible formula 3:4. Last segment of clava without visible patch of micropilosity or with small narrow line or small oval patch of dense micropilosity. Prepectus shiny and bare, with distinct vertical carina. Forewing with speculum. Propodeum with distinct straight carina (Bouček & Rasplus 1991; Heydon 1997).

Key to South Korean species of *Plutothrix* Förster

1 Forewing hyaline. T1 with hind margin straight. Body blackish. ……*P. scrobicula* Kamijo
– Forewing with three fascia. T1 with hind margin deeply incised medially. Body dark metallic green with diffuse coppery luster. …….. *P. trifasciata* (Thomson)

Plutothrix scrobicula Kamijo, 2004

Plutothrix scrobicula Kamijo, 2004: 306-307; Holotype, female; TD:HU; TL: Japan, Ehime.

Material examined
JAPAN: Holotype, Ehime, Oda-cho, Oda-miyama, Koya-yama, Pref., Shikoku, 2.viii.1994, E.Yamamoto (HU), female. **SOUTH KOREA: GW**, Wonju-si, Socho-myeon, Hakgong-ri, Mt. Chiak, 37°22'18"N, 128°03'1.84"E, 20.vi.–19. vii.2013, J.W.Lee, 1F; (YNU)

Distribution
South Korea (new record), Japan, Russia.

Biology
Unknown.

Remarks
Plutothrix scrobicula Kamijo differs from all species of *Plutothrix* in having a blackish body; flagellum of antenna with long setae; scrobes shallow and short; shoulders of mesoscutum prominent; T1 with straight hind margin (Kamijo 2004).

Plutothrix trifasciata (Thomson, 1878)

Trigonoderus trifasciatus Thomson, 1878: 11; Lectotype, Female; TD: LUZN; TL: Sweden, Lund.

Material examined
SWEDEN: Lectotype, Fardhem, 3.vi.1941, G.J.Kerrich et M. W.Graham 1955, Type No. 134:1, female. **SOUTH KOREA:** GB: Dalseo-gu, Daegok-dong, Daegu Arboretum, 35°48'3.26"N, 128°31'15.3"E, 12.ix.–4.x.2012, S.G.Gang, 1F; Gyeongsan-si, Daehak-ro 280, Yeungnam Univ., 35° 49'30"N, 128°45'39"E, 30.vii.–25.x.2013, J.W.Lee, 1M; Cheongdo-gun, Gakbuk-myeon, Namsan-ri, 35°38'N, 128° 47'E, 15.ix.–21.x.2013, J.W.Lee, 1F; **GN**, Jinju-si, Ibanseong-myeon, Daecheon-ri, Gyeongsangnam-do, For. Env. Res. Inst., 35°9'39.7"N, 128°17'41.3"E, 16.ix.–1. x.2013, J.H.Hwang, 1F; **GW**, Wonju-si, Heungeop-myeon, Maeji-ri 234, Yonsei University, 5–26.ix.2014, H.Y.Han,

1F; **Seoul**, Dongdaemun-gu, Cheongnyangni-dong, 29.viii.–05.ix.2005, W.L.Choi, 1F; (all fromYNU)

Distribution
South Korea (new record), Russia, West and East Europa, Caucasus, Kazakhstan.

Biology
Unknown.

Remarks
Plutothrix trifasciata (Thomson) differs from all species of *Plutothrix* in having a forewing with three fascia; T1 with hind margin deeply incised medially. Flagellum of male with seven segments and scape about 4.0× longer than broad (Graham 1969).

Genus *Trigonoderus* Westwood, 1832

Trigonoderus Westwood, 1832: 127; TS: *Trigonoderus princeps* Westwood, 1848, by monotypy.

Pteromalus (*Pterolycus*) Ratzeburg, 1848: 208; TS: *Pteromalus brandtii* Ratzeburg, 1848, by subsequent designation of Gahan and Fagan (1923).

Diagnosis
Anterior margin of clypeus with angular median tooth; tentorial pits shallow. Mandible formula 3:4. Last segment of clava without visible patch of micropilosity or with small narrow line of dense micropilosity. Prepectus pilose and reticulate, with distinct vertical carina. Forewing without speculum. Propodeum with distinct straight carina (Bouček & Rasplus 1991; Heydon 1997).

Key to South Korean species of *Trigonoderus* Westwood

1 Flagellum slightly thickening distal. F6 1.4× longer than broad. All femora and tibia blackish. Head dark metallic green. ……..…*T. fraxini* Yang
– Flagellum distinctly thickening distal. F6 1.2–1.1× longer than broad. All femora and tibia yellowish-brown. Head black. ……..*T. nigrocephalus* Kamijo

Trigonoderus fraxini Yang, 1996

Trigonoderus fraxini Yang, 1996: 115–117; Holotype, female. TD: NWCF; TL: China, Harbin.

Material examined
SOUTH KOREA: CN, Geumsan-gun, Mt. Seodae, 24. v.2002, J.W.Lee, 1F, 1M; **GB**: Gyeongju-si Hyeongok-myeon Namsa-ri, 2–8.ix.2005, J.O.Lim, 1F; same locality, 15–29.ix.2005, J.O.Lim, 3F, 1M; **GG**, Pocheon-si, Soheur-eup, Jikdong-ri, 51-7, Korea National Arboretum, 37° 45'1.9"N, 127°08'34.4"E, 28.vi.–24.vii.2013, I.G.Kim, 1F; (all from YNU).

Distribution
South Korea (new record), Japan, China, Russia.

Biology
Primary parasitoid *Mesosa myops* (Dalman), *Psacothea hilaris* (Pascoe) (Cerambycidae) and *Hylesinus fraxini* (Panzer), *Xyleborus* sp. (Scolytidae).

Remarks
Trigonoderus fraxini Yang is similar to *T. pulcher* Walker and *T. dolichogaster* Kamijo, but differs from both species in having hairy dorsellum; gena with row setae; PS of forewing slightly longer than M; speculum absent; all femora and tibia blackish. This species is similar to *T. princeps* Westwood, but differs in having more hairy dorsellum and shorter metasoma (Yang 1996; Kamijo 2000).

Trigonoderus nigrocephalus Kamijo, 2000

Trigonoderus nigrocephalus Kamijo, 2000: 179–180; Holotype, female. TD: HU; TL: Japan, Sapporo.

Material examined
JAPAN: Holotype, Hokkaido, Sapporo, 25.v.1967, K.Kusig (HU), female. **SOUTH KOREA: CB**, Danyang-gun, Danyang-eup, Cheondong-ri, Cheondong valley Mt. Sobaek, 36°57'N, 128°26'E, 10–18.x.2007, J.W.Lee, 1F; **GB,** Mt. Pohyon, 29.v.1998, Y.Kwon, 1F; Cheongdo-gun, Unmun-myeon, Simsingyegok, 35°37'44"N, 128°59'01"E, 28. vi.2012, B.A.Park, 1F; Bonghwa-gun, Jaesan-myeon, Galsan-ri, Irwolsan-gil, 36°49'21.7"N, 129°05'05.3"E, 24. vii–7.viii.2015, Tselikh, 1F; same locality, K.H.Ko, 2M; **GG**, Yangpyeong-gun, Yongmun-myeon, Yeonsu-ri, Mt. Yongmun, 37°31'48.9"N, 127°34'23.8"E, 5–18.ix.2009, J. O. Lim, 1F.

Distribution
South Korea (new record), Japan, Russia.

Biology
Unknown.

Remarks
Trigonoderus nigrocephalus Kamijo is very similar to *T. yamamotoi* Kamijo, but may be distinguished by the hairy frenal area of scutellum; broader front (at least 1.4× broader

than high); all femora and tibia yellowish-brown, head black (Kamijo 2000).

Acknowledgments

We are very thankful to Dr M Ohara (HU) for providing type materials for this study and numerous photos of types of Pteromalidae described by Dr Kamijo. This work was supported in part by grants given by from the National Institute of Biological Resources (NIBR) funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201601207 and 201601203), the Russian Foundation for Basic Research (projects no. 16-04-00197 and 15-29-00197) and the Russian state research project no. 01201351189.

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