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Phaneroserphus coreanus, a new species of proctotrupid wasps (Hymenoptera: Proctotrupidae) from South Korea, Japan and Russian Far East with a key to the Palearctic species of *Phaneroserphus*

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ABSTRACT

A new species of proctotrupid wasps, *Phaneroserphus coreanus* sp. n., is described from South Korea, Japan and Russian Far East. An illustrated key to Palearctic *Phaneroserphus* Pschorn-Walcher species is provided.

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1. Introduction

Until now nine species of the genus *Phaneroserphus* Pschorn-Walcher (Hymenoptera: Proctotrupidae) were described (Townes and Townes, 1981; Fan and He, 1991; Liu et al., 2011) and the known species are distributed mostly in the Northern Hemisphere. The Palearctic species of *Phaneroserphus* are *P. calcar*, *P. cristatus* and *P. punctibasis*. The Nearctic region has two species: *P. brevistigma* and *P. longistigma* (Townes and Townes, 1981; Izadizadeh et al., 2015). Further, Fan and He (1991) and Liu et al. (2011) added *P. bui*, *P. yunnanensis*, *P. chaoi*, *P. nigriritibialis*, and *Ph. punctibasis* for the Oriental region.

The genus is morphologically clearly distinguishable from other proctotrupoid genera by the following characters: presence of vertical frontal carina between toruli and absence of pilosity from the lower half of lateral aspect of syntergite (Townes and Townes, 1981). The natural history of this genus is poorly known and Staphylinidae (Coleoptera) and Lithobiidae (Lithobiomorpha) were mentioned as hosts (Pschorn-Walcher, 1971; Townes and Townes, 1981). In this study, we provide a revised key for Palearctic *Phaneroserphus* species and describe a new species, *Phaneroserphus coreanus* sp. n. from South Korea, Japan and Far East Russia.

2. Materials and methods

Specimens used in this study were collected with Malaise traps and by sweeping and are deposited in the following institutions: YUGK –

Animal Systematic Laboratory of Yeungnam University, Gyeongsan, South Korea; CNCI – Canadian National Collection of Insects, Ottawa, Canada; ZISP – Zoological Institute, St. Petersburg, Russia; NMID – National Museum of Ireland, Dublin, Republic of Ireland; NHRS – Naturhistoriska Riksmuseet, Stockholm, Sweden; MNHN – Museum National d'Histoire Naturelle, Paris, France; HNHN – Hungarian Natural History Museum, Budapest, Hungary; WHPC – Collection of Wolter Hellén; AEIG – American Entomological Institute, Gainesville, USA. Question marks in material examined represent unknown collecting data. Bright filed photographs were taken with a Leica M125 stereomicroscope equipped with a Leica DFC450 camera. Images were produced using Helicon Focus 5.0. software.

2.1. Taxonomy

2.1.1. Genus *Phaneroserphus* Pschorn-Walcher

Phaneroserphus Pschorn-Walcher, 1958: 62.

Type species: *Proctotrupes calcar* Haliday (by original designation).

2.1.1.1. Description. Fore wing length 2.2 to 3.8 mm. Vertical frontal carina between toruli present. Lateral aspect of pronotum usually smooth with weak carina diverging from collar. Propodeum areolate-rugose. Median carina on dorsal area of propodeum present. Smooth area lateral to anterior portion of median carina present. Spur on tibia of hind leg in male curved, about 0.65–0.77 times as long as metabasitarsus. Spur on tibia of hind leg in female about 0.47–0.53 times as long as metabasitarsus. Costal margin of radial cell about 0.7–1.55 times as long as width of pterostigma. Pedicel about 1.1 times as long as wide. Pilosity on the lower half of lateral aspect of syntergite absent. Ovipositor sheath about

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0.25–0.35 times as long as hind tibia. Ovipositor sheath with sparse punctures, weakly curved, and tapered to a point.

2.1.2. Key to Palearctic species of *Phaneroserphus*

1. Vertical frontal carina between toruli strong (Fig. 1C, D), almost equal to maximum eye length (Fig. 2A, B, F), and with lateral carinae (Fig. 3D, E, F). Malar distance in males short, 0.25 times maximum eye length; longitudinal wrinkles in the middle of face absent (Fig. 10 D, E, F) – 2

– Vertical frontal carina between toruli weak (Fig. 1A, B), shorter than 0.67 times of maximum eye length (Fig. 2C, D, E), and without lateral carinae (Fig. 3A, B, C). Malar distance in male around of 0.4 times of maximum eye height; longitudinal wrinkles in the middle of face present (Fig. 10 A, B, C) – 4.

2. Smooth area on upper metapleuron large and 1.0–1.5 times as wide as tegula (Fig. 4E). Vertical frontal carina between toruli with two (or three) lateral carinae on each sides (Fig. 3E). Upper surface of propodeum with a pair of smooth areas (Fig. 5E). Large smooth area on outer side of petiole present (Fig. 8E). In female first flagellomere short, 2.0–2.2 times as long as wide (Figs. 6E, 7D). In male first flagellomere 4.0 times as long as wide (Fig. 12D) – *Phaneroserphus cristatus*.

– Smooth area on upper metapleuron small or absent (Fig. 4D, F). Vertical frontal carina between toruli with 4–6 lateral carinae on each side (Fig. 3D, F). Upper surface of propodeum without a pair of smooth areas (Fig. 5D, F). Large smooth area on outer side of petiole absent (Fig. 8D, F). In female first flagellomere long, 4.0 times as long as wide (Figs. 6A, F, 7E, F). In male first flagellomere 4.6 times as long as wide (Fig. 12A, F) – 3.

3. Propodeum with subapical transverse ridge (Figs. 4F, 5F). Petiole in dorsal view 2.0 times as long as wide (Fig. 9F) – *Phaneroserphus longistigma*.

– Propodeum without subapical transverse ridge (Figs. 4D, 5D). Petiole in dorsal view 1.0–1.2 times as long as wide (Fig. 9D) – *Phaneroserphus coreanus* sp. n.

4. Vertical frontal carina between toruli about 0.67 times maximum eye length (Figs. 2E, 3C). First flagellomere in male long, 3.5 times as long as wide. (Fig. 12E) – *Phaneroserphus brevistigma*.

– Vertical frontal carina between toruli less than 0.5 times maximum eye length (Figs. 2C, D, 3A, B). First flagellomere in male long, 4.0 times as long as wide (Fig. 12B, C) – 5.

5. Dorsal side of petiole with transverse rows of deep, closely spaced punctures (Fig. 9B). In female vertical frontal carina between toruli 2 times as long as shortest distance between toruli (Fig. 3B) – *Phaneroserphus punctibasis*.

– Dorsal side of petiole with transverse wrinkles (Fig. 9A). In female vertical frontal carina between toruli as long as shortest distance between toruli (Fig. 3A) – *Phaneroserphus calcar*.

2.1.3. *Phaneroserphus brevistigma* Townes

(Figs. 1B, 2E, 3C, 4C, 5C, 6C, 7C, 8C, 9C, 10C, 11C, 12E).

Phaneroserphus brevistigma Townes, 1981: 202.

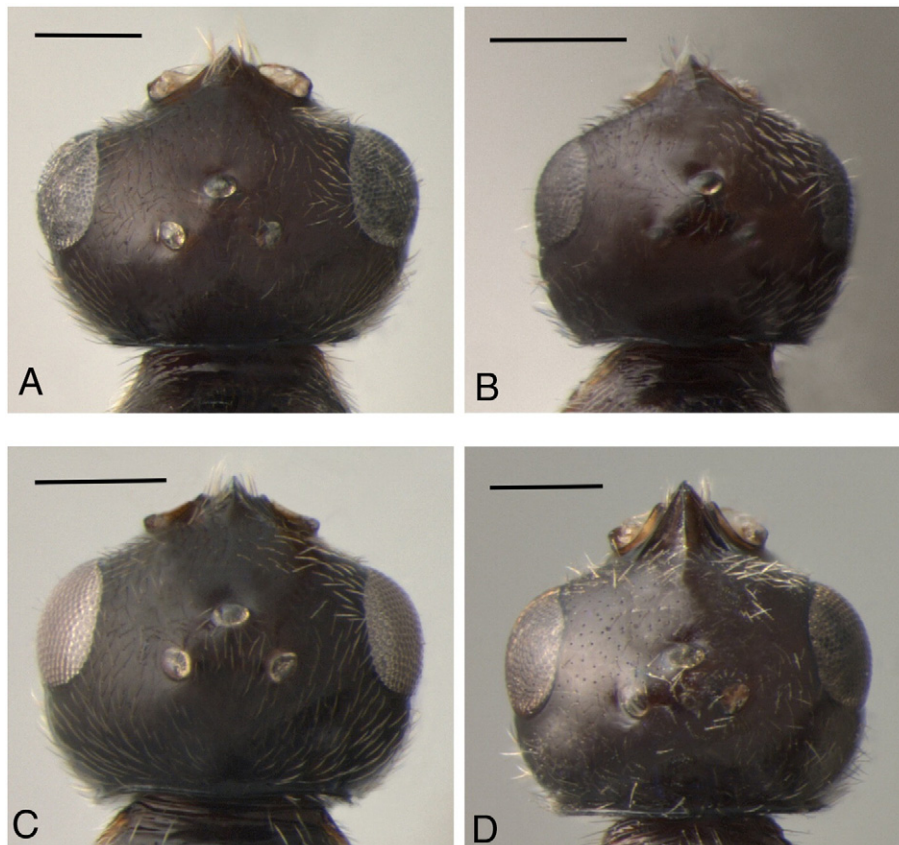


Fig. 1. Head, dorsal view (female): A: *Phaneroserphus calcar*, B: *P. brevistigma*, C: *P. coreanus* sp. n., D: *P. cristatus*. Scale bars: 0.2 mm.

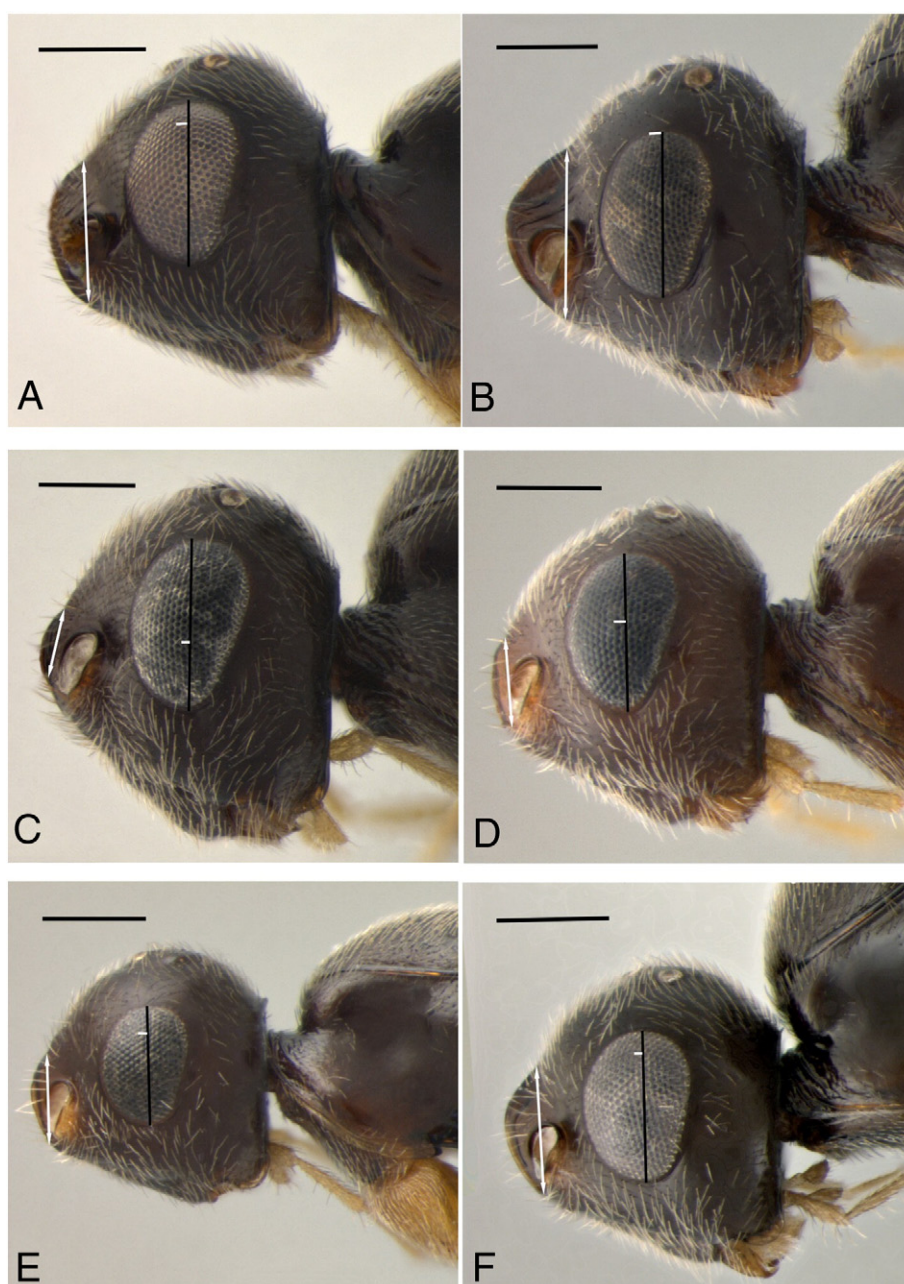


Fig. 2. Head, lateral view (female): A: *Phaneroserphus coreanus* sp. n., B: *P. cristatus*, C: *P. calcar*, D: *P. punctibasis*, E: *P. brevistigma*, F: *P. longistigma*. (The short white line represents the length of the frontal carina superimposed on the maximum eye length). Scale bars: 0.2 mm.

2.2. Type material examined

Holotype: male. **USA, Alaska:** Umiat, 12.viii.1959, R. Madge (CNCI).

Paratypes: **USA, Alaska:** Umiat, 3♂, 12.viii.1959, R. Madge (CNCI).

2.3. Material examined (non-type)

RUSSIA [Siberia], Evenkiya reg.: Centralsiberian N.-P., 1♀, 26.vii.2003, A. Kuvaev (ZISP). **Krasnoyarsk reg.:** Taimir peninsula, Kchatanga, Katuy River, 1♀, 24.vii.1971, I. Sukacheva and V. Zherichin (ZISP). **Buryatia reg.:** Kudara-Somon, 1♀, 8.viii.1970, D. Kasparjan (ZISP). **Chita reg.:** 12 km N kurgan Darasun, Tura river floodplain, 1♀, 2♂, 27.vi.1975, D. Kasparjan. 55 km W Chita, 1♂, 7.vii.1971, D. Kasparjan. Kholon, Kchilok river, 1♂, 14.viii.1987, A. Rasnitsin. Borzja distr., 18 km N Konduy, 1♂, 4.viii.1990, S. Kononova (ZISP). **Yakutia reg.:**

Lyapushka river mouth, 1♂, 22.viii.1975, I. Sukacheva (ZISP). **[Far East], Amur reg.:** Zeya town, 3♀, 1♂, 1.ix.1981, V. Alexseev (ZISP). **Khabarovsk reg.:** Amur river lower reaches, Udil like, 1♀, 2♂, 29–31.viii.1970, D. Kasparjan. Amurzet, 2♂, 16–18.vi.1985, D. Kasparjan (ZISP). **Primorsk reg.:** Shkotov distr., Peishmulla, 1♂, 5.vi.1972, Kuslitsky. Sudzuchinsky N.P., Ta-Changouz Bay, 2♂, 20.viii.1948, Gussakovsky, 1♂, 4.viii.1972, Kuslitsky, 2♂, 7–10.viii.1972, M. Kozlov. 15 km NE Artem, 1♀, 1♂, 6–7.ix.1988, S. Belokobylsky. Suchan River floodplain, Lazoviy st., 1♂, 2.vii.1972, Kuslitsky. Kedrovaya Pad N.P., 2♂, 21–23.ix.1978, Zinovjev, 3♂, 23–30.viii.1995, S. Belokobylsky. Barabash-Levada, 1♀, 22.vi.1972, M. Kozlov. Kchanka Like, Novokachalinsk, 1♂, 8.vi.1972, A. Rasnitsin, 1♂, 2–3.ix.1986, S. Kononova. 10 km E Partizansk, Frolovka, 1♂, 28.vi.1996, S. Belokobylsky. Khasan Like, 1♂, 26–29.viii.1988, S. Belokobylsky. 15 km S Slavyanka, Ryazonovka, 3♀, 1♂, 16.vi.1993, 1♀, 2♂, 14–29.ix.1995, S. Belokobylsky. Anisimovka, 1♀, 16–18.viii.1972, Kuslitsky, 3♂, 11–13.ix.1978, D. Kasparjan, 2♀,

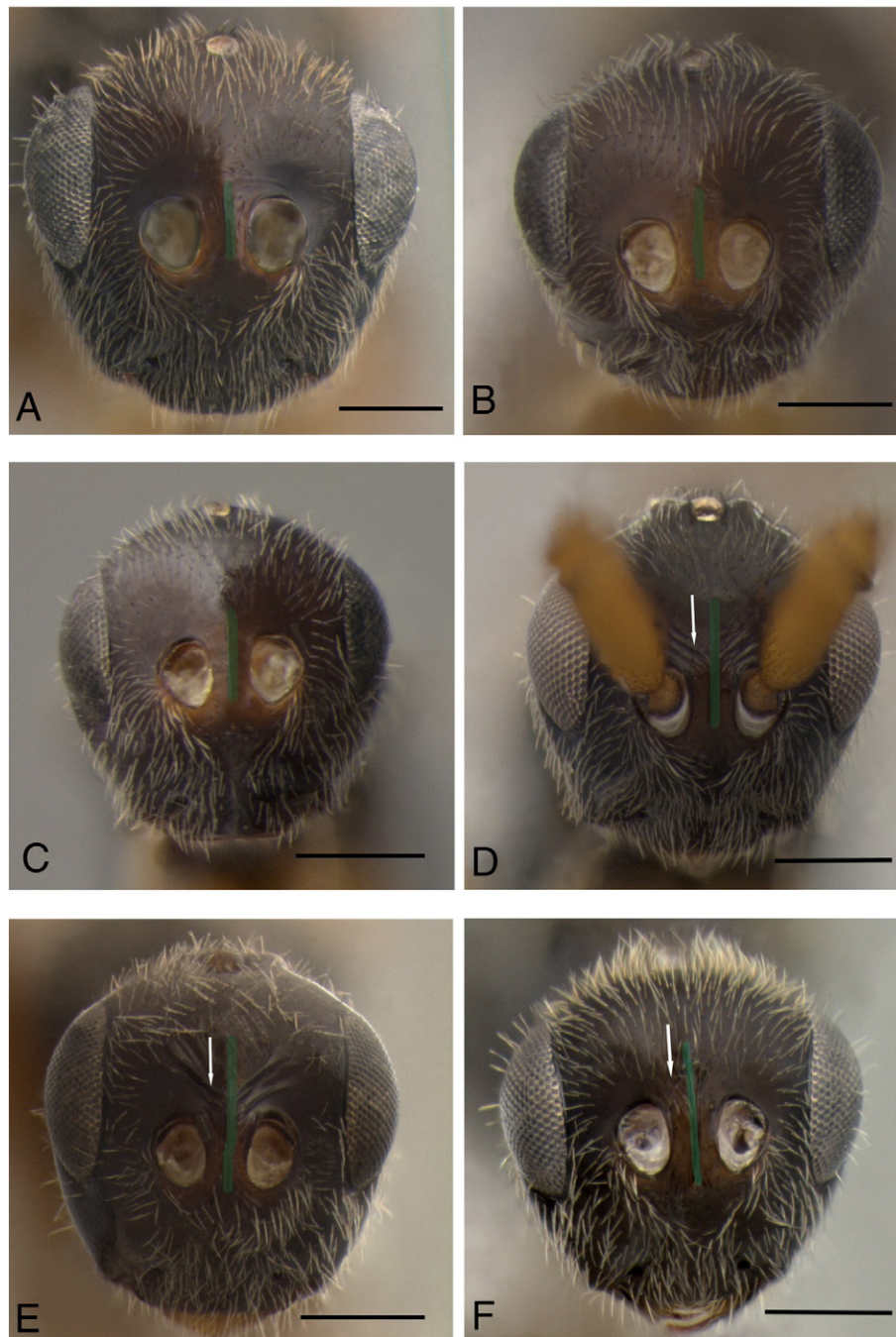


Fig. 3. Head, frontal view (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

1♂, 2–3.ix.1988, A. Kirejchuk. 1♂, 4–5.ix.1988, 1♂, 27.vi.1996, S. Belokobylsky. Suputinsky N.P., 1♀, 26–30.vii.1972, M. Kozlov, 1♀, 23.viii.1973, Shablievsky. Lazovsky distr., 2♀, 22–24.vii.1993, S. Belokobylsky. Dalnegorsky distr., Sichevka, 1♂, 28.ix.1984, A. Kirejchuk. 20 km SW Krounovka, 1♂, 2–5.viii.1993, S. Belokobylsky. Nadezhdinsky distr., 15 km SSW Nezhino, 1♀, 18–19.vii.1993, S. Belokobylsky. Vladivostok, 1♂, 19–21.vii.1972, Kuslitsky, 5♂, 2.ix.1982, 3♂, 12–13.ix.1982, 2♂, 29–30.viii.1985, 2♂, 4–5.ix.1985, V. Tobias, 1♀, 23.vi.1985, D. Kasparjan, 1♀, 8.viii.1991, S. Belokobylsky. Ussuriysk N.P., Kamenushka, 2♂, 9.ix.1987, S. Belokobylsky. Ussuriysk N.P., 2♀, 7♂, 27–29.viii.1982, V. Tobias. Ussuriysk, 1♂, 28–31.viii.1978, D. Kasparjan, 1♀, 1♂, 5.ix.1982, V. Tobias, 2♀, 27.viii.1987, A. Kirejchuk, 1♀, 1♂, 1–6.ix.1987, A. Antropov, 1♂, 15.vi.1993, 2♀, 18–26.vii.1996, S. Belokobylsky, 10♂, 17–23.vii.2003, M. Michailovskaya. Spassk, 1♂, 26–

27.vi.1985, D. Kasparjan, 1♂, 23.viii.1985, V. Tobias, 1♀, 10.ix.1981, 3♀, 2♂, 16–18.viii.1987, 4♀, 1♂, 20–22.ix.1988, 1♀, 1♂, 5–14.vi.1990, 3♀, 3♂, 19–27.viii.1991, 1♂, 10.ix.1991, 1♀, 17–21.vi.1996, S. Belokobylsky (ZISP). **Chukotka reg.:** Omolon river, 180 km under Omolon village, 1♂, 15–16.viii.1976, Marshakov (ZISP). **CANADA.** (YT), Mi 51 Dempster Hwy., 2♂, 4–6.viii.1973, G. & D.M. Wood. **JAPAN. Honshu:** Mt. Hayachine, Iwate, 400 m, 1♀, 15–20.viii.1989, H. Makihara & M. Sharkey (CNCI).

Distribution. USA (Townes and Townes, 1981), new to Russia, Japan and Canada.

2.3.1. *Phaneroserphus calcar* (Haliday)

(Figs. 1A, 2C, 3A, 4A, 5A, 6B, 7A, 8A, 9A, 10A, 11A, 12B, 13A).

Proctotrupes calcar Haliday, 1839: 12. Type: male, female, Locality: England (Dublin), Depository: NMID.

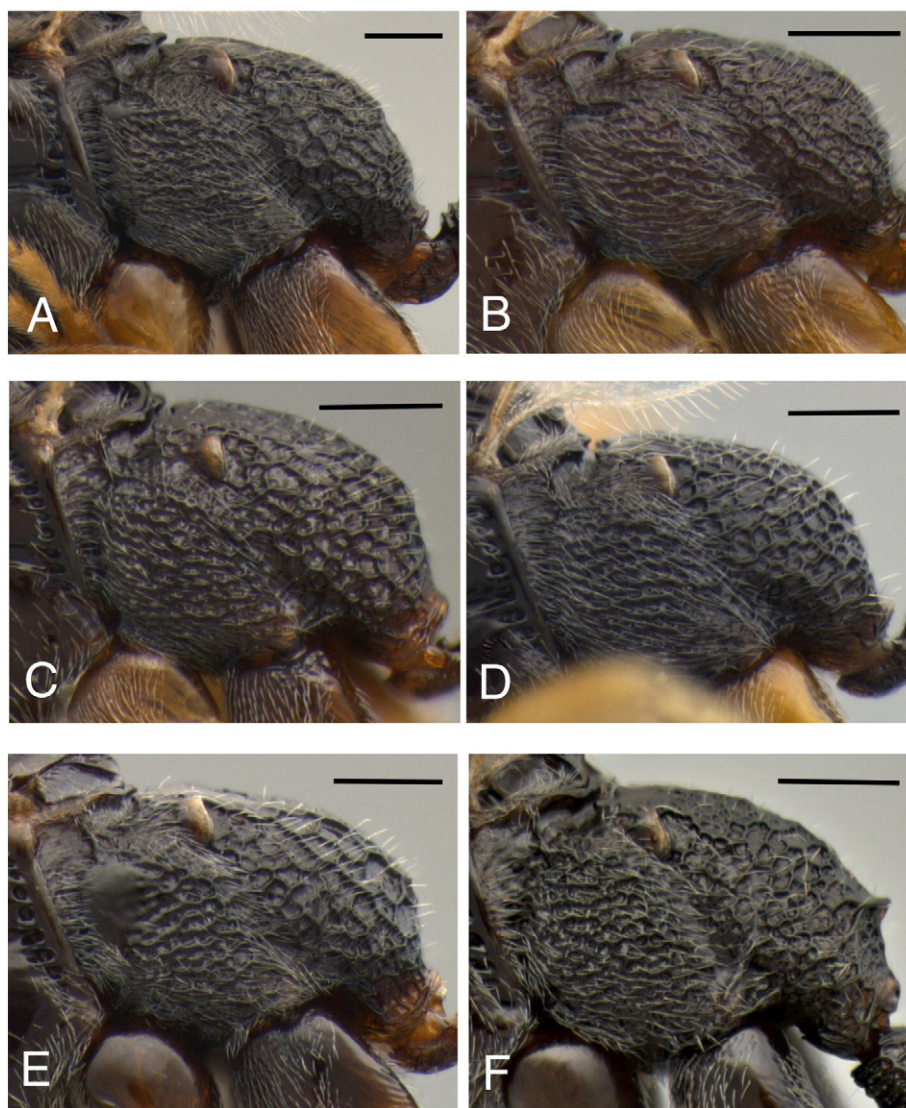


Fig. 4. Metapleuron and propodeum, lateral view (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

Proctotrupes calcaratus Thomson, 1858: 419. Type: male, Locality: Sweden (Stockholm), Depository: NHRS, synonymized by Kieffer (1908).

Proctotrupes seticornis Thomson, 1858: 419. Type: male, female, Locality: Sweden (Stockholm), Depository: NHRS, synonymized by Nixon (1938).

Serphus (*Phaenoserphus*) *calcar* var. *transversalis* Kieffer, 1908: 306. Type: female, Locality: France (Dieppe), Depository: Type lost.

Serphus (*Phaenoserphus*) *calcar* var. *areolatus* Kieffer, 1908: 306. Type: male, Locality: France (Maisons-Laffitte), Depository: MNHN.

Serphus (*Phaenoserphus*) *castaneus*, Kieffer, 1908: 307. Type: female, Locality: Czechoslovakia (Budapest), Depository: HNHN, synonymized by Townes, in Townes and Townes (1981).

Phaenoserphus calcar a. *nigrofemoratus* Hellén, 1941: 34. Type: male, Locality: Finland, Depository: WHPC.

2.4. Material examined (non-type)

RUSSIA [European part]: **Moscow reg.:** Stupino, 7♀, 20♂, 15.viii–10.ix.1994, V. Kolyada. Malachovka, 14♀, 34♂, vii–ix.1994, M. Mostovskii (ZISP). **Leningrad reg.:** Divenskaya vill., Sverskyi farm, 24♂, 9.ix.1967, D. Kasparjan. Semrino, 3♀, 5♂, 22.vii.1972, D. Kasparjan. Sosnovka, 4♀, 10♂, 17.ix.1972, D. Kasparjan (ZISP). **Novgorod reg.:** 20 km NW

Pestovo, Tichkino vill., 4♂, 6–10.viii.1990, V. Tobias (ZISP). **Murmansk reg.:** Murmansk, Lavna river, 4♂, 8.vii.1974, D. Kasparjan (ZISP). **Arkhangelsk reg.:** 20 km NE Onega, 4♂, 7.viii.1972, D. Kasparjan (ZISP). **Komi reg.:** Uchta, 1♂, 30.viii.1972, D. Kasparjan (ZISP). **Vladimir reg.:** Petushki, 1♂, 18.vi.1971, Grjaznov (ZISP). **Ryazan reg.:** R. N.P., 1♀, 26.ix.1995 (ZISP). **Voronezh reg.:** Chopersky N.P., 3♀, 29.vi–4.vii.1977, D. Kasparjan (ZISP). **Krasnodar reg.:** Lazarevskoe, 1♂, 18.iv.1975, 2♂, 2–28.v.1975, 8♂, 10–17.vi.1975, 3♂, 5–12.vii.1975, V. Tobias (ZISP). **Stavropol reg.:** Laba river, 1♂, 26.vi.1972, D. Kasparjan. Essentuki, 1♂, 1–5.x.1972, D. Kasparjan (ZISP). **Karachay-Cherkessia reg.,** Archiz, 1♂, 3–5.vii.1976, D. Kasparjan. Tiberda, 5♂, 10–15.vii.1976, D. Kasparjan (ZISP). **Krim reg.,** Karadag, 1♂, 10.v.1939, Lubischev. Peschanoye, 2♂, 5.vii.1994, V. Kolyada. Yalta, SBNG, 3♂, 14–16.vii.1994, V. Kolyada. Bakchisaray, 1♀, 18–28.ix.1986, D. Kasparjan (ZISP). **Kirov reg.:** Jug river, Bolsheromanovo, 4♂, 9–16.viii.1994, V. Kolyada (ZISP). **Chelyabinsk reg.:** near Zlatoust, Taganay mnt., 1♀, 18–24.vii.2008, K. Tomkovich (ZISP). [**Siberia**], **Krasnoyarsk reg.:** Stolbi N.P., 1♀, 14.viii.2003, A. Kuvaev (ZISP). **Buryatia reg.:** Barguzin N.P., 3♂, 3.viii.1990, Ananova. **CZECH.** Sudeten, Bukowka, 1♀, 3♂, 27.viii.1998 (ZISP). **ESTONIA.** Torma, 2♂, 13.vi.1988, Dlussky (ZISP). **BELORUSSIA.** Belovezhskaya Puscha N.P., 6–17.viii.1967, D. Kasparjan (ZISP). **UKRAINE.** Transkarpatia, Vinogradov, 4♀, 3–5.viii.1989, D.

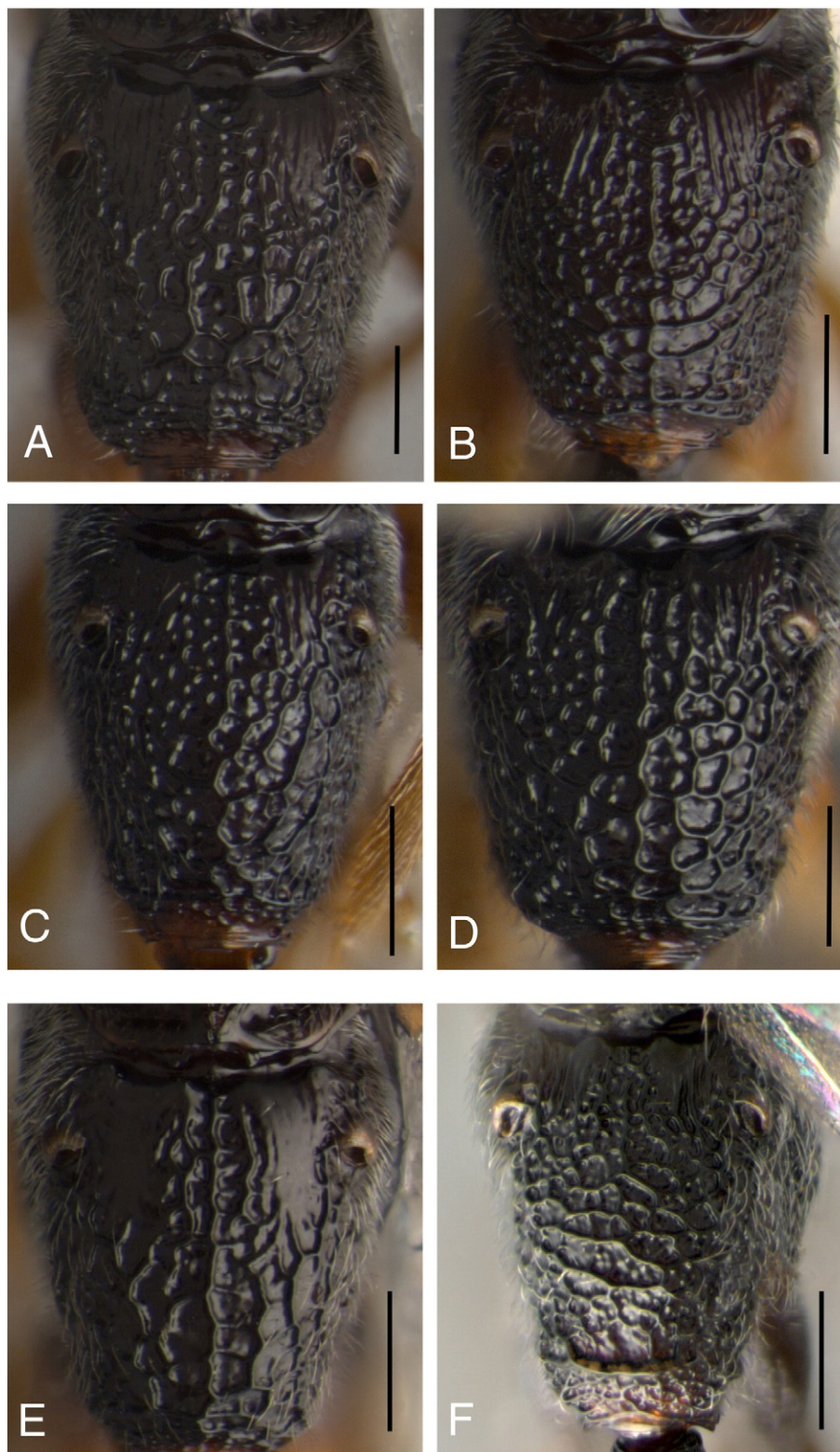


Fig. 5. Propodeum, dorsal view (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

Kasparjan. Kanev N.P., 3♂, 20–27.vii.65, 4♂, 21–22.v.1975, V. Tobias. Kcherson reg., Chernomorsky N.P., 2♀, 21.v.1974, Kostjukov, 1♂, 14–15.v.1965, V. Tobias (ZISP). **GEORGIA**. Adzharya, Batumi, 1♂, 18–21.vi.1974, V. Tobias. Borzhomi, 1♂, 13–18.viii.1981, Gurasashvili. Rustavi, 1♂, 25.viii.1981, V. Trjapitsin (ZISP). **AZERBAIDJAN**. Lerich, 1♂, 2.vii.1964, Zaguljaev. Cherchay, 1♂, 14.vii.1965, Aliev. 1♀, 29–30.iv.1971, V. Tobias. Lenkoran, 1♂, 3–7.v.1971, V. Tobias (ZISP).

KAZAKHSTAN. Karaganda reg., 80 km S Zhava-Arka, Aktau, 2♀, 1♂, 27.viii.1959, V. Tobias (ZISP). **TURKMENIA**. Babarab, 1♂, 18.x.1986, V. Tobias (ZISP). **ENGLAND**. Bucks. Burnham Beeches, 3♂, 26.viii.1984, L. Masner, Oxford, 5♂, ix.1981, Owen, (CNCI). **HOLLAND**. Wijster (Dr.) Biol.Station, 3♂, 6–vi, 21–viii.1976, K·Achterberg (CNCI). **MAROCOCO**. Quirgane, 1000 m, 2♂, N31°08' W08°05', 11–17.vi.1996, C·Kassebeer (CNCI). **ITALY**. Tyrol. nr. Trento, 1200 m, 4♂, 17–27.viii.1975,

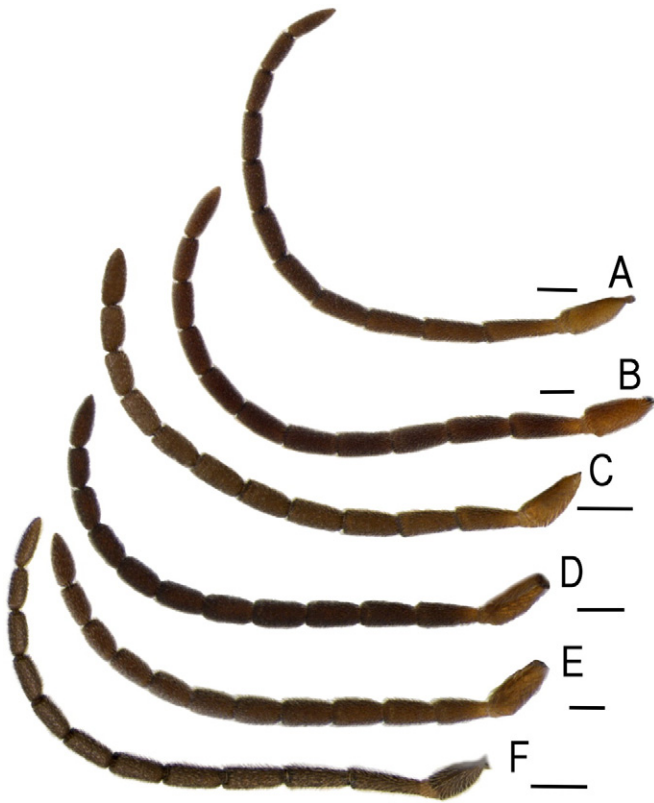


Fig. 6. Antennae, lateral view (female): A: *Phaneroserphus coreanus* sp. n., B: *P. calcar*, C: *P. brevistigma*, D: *P. punctibasis*, E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

G.N·Heinrich (CNCI). **POLAND.** Lomna, nr.Kampinos N.P., 20 km N·Warszawa, 4♂, 6–31.viii.1994 (CNCI). **TURKEY.** Ankara, Beynam, 4♂, 15–18.vi.1999, D.Quicke (CNCI).

Distribution. All Europe (Townes and Townes, 1981), Kazakhstan (Kolyada, 1998), new to Turkmenistan.

Hosts. *Bolitochara oblique* (Coleoptera: Staphylinidae), *Quedius simplicifrons* (Coleoptera: Staphylinidae), *Lithobius forficatus* (Lithobiomorpha: Lithobiidae) (Townes and Townes, 1981).

2.5. Remark

This species was recorded in Korea by Lee et al. (2008) but was reidentified as *P. coreanus* sp. n. in this study.

2.5.1. *Phaneroserphus cristatus* Townes

(Figs. 1D, 2B, 3E, 4E, 5E, 6E, 7D, 8E, 9E, 10E, 11E, 12D).

Phaneroserphus cristatus Townes, 1981: 201; Liu et al., 2011: 259.

2.6. Type material examined

Holotype: female. **JAPAN**, Kamikochi, 24.vii.1954, Townes family (CNCI).

Paratype: **JAPAN**. Kamikochi, 1♀, 23.vii.1954, Townes family (CNCI).

2.7. Material examined (non-type)

JAPAN. Hokkaido: Jozankei Nature village, N42°55'48.7" E141°9'10.1", 2♀, 2♂, 30.vi.2009, J.W. Lee (YUGK). Shiraai, Shiraai-river, N42°33'29.5" E141°20'5.4", 1♀, 4.vii.2009, J.W. Lee (YUGK). National Agricultural Experiment Station, Hitsujigaoka, Sapporo, N43°00'30" E141°24'47.9", 3♂, 30.vi–2.vii.2009, J.W. Lee (YUGK). Okusawa-Suigenchi, Otaru, N43°08'27" E140°56'14", 3♂, 1.vii.2009, J.W. Lee (YUGK). Jozankei, Kanipm-Zawa, Sapporo, N42°57'58.8" E141°16'

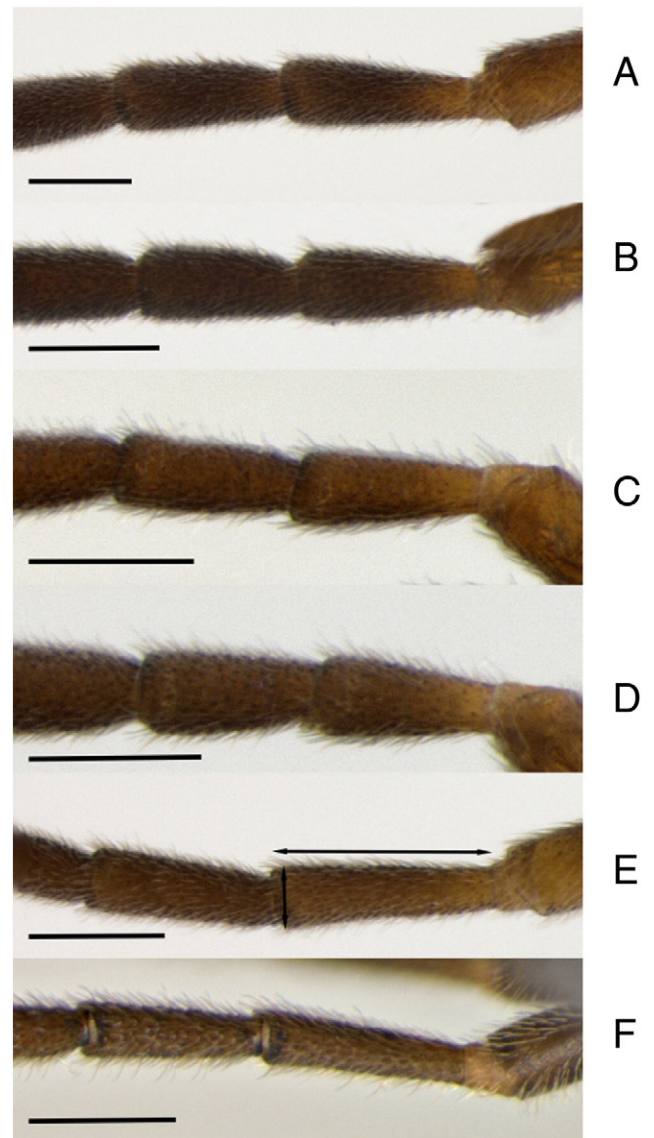


Fig. 7. Flagellomeres 1–2 (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. cristatus*, E: *P. coreanus* sp. n., F: *P. longistigma*. Scale bars: 0.2 mm.

8", 1♂, 30.vi.2009, J.W. Lee (YUGK). Jozankei, Sapporo, 5♂, 1♀, 30.vi–11.vii.1989; 4♂, 28.vii.1989; 9♂, 4♀, 20–31.vii.1989; 16♂, 10♀, 10–21.viii.1989; 16♂, 29.viii–12.x.1989; 12♂, 2♀, 12–21.ix.1989; 18♂, 13♀, ?viii.1989; 3♂, 1–10.x.1989; 7♂, 3♀, 21–29.viii.1989, M. Sharkey (CNCI). Hitsujigaoka, 1♂, 21–27.vii.1989, M. Sharkey (CNCI). Daizetsuran NP, Tennenkyo, 200 m, 1♂, 1♀, 10–14.vii.1989, MT, D.M. Wood (CNCI). Kamikawa, 500 m, 1♂, 4.vii.1989, M. Sharkey (CNCI). Nukabira, 600 m, 3♂, 6.vii.1989, M. Sharkey (CNCI). Horoka, 800 m, 1♀, 5.vii.1989, M. Sharkey (CNCI). Pirika, Imakane, Hiyama, 1♀, 30.vi.1992, Y. Sakamaki (CNCI). **Honshu:** Ohnuma Lk Shiobara, Tochigi Pref., 2♂, 1000 m, 10.viii.1989, M. Sharkey (CNCI). Hikinuma, Shiobara, 2♀, 2.x.1985, K. Takahashi (CNCI). Yaita, 18♂, 21♀, 8.ix.1989; 3♂, 22.viii–8.ix.1989; 1♀, 15–28.vii.1989; 1♂, 1♀, 28.vii.1989; 9♂, 2♀, 11–22.viii.1989, MT, K. Konishi (CNCI); Matsukusa, Iwate, 600 m, 2♂, 21.vi.1989, M. Sharkey (CNCI). Morioka Exp. Forest of Iwate Univ., Iwate, 400 m, 2♂, 1♀, 1–14.x.1989, H. Makihara & M. Sharkey (CNCI). Morioka area, Iwate, 400 m, 2♂, 4♀, 17–31.ix.1989, H. Makihara & M. Sharkey (CNCI). Mt. Hayachine, Iwate, 400 m, 2♂, 19–25.vii.1989; 3♂, 1♀, 27.vi–6.vii.1989; 1♂, 4♀, 20–27.vi.1989; 2♂, 2–8.viii.1989; 1♂, 1♀, 12–31.ix.1989; 1♂, 2♀, 8–15.viii.1989; 1♂, 1♀, 20.viii–3.ix.1989; 2♂, 16–20.viii.1989; 2♀, 5–11.vii.1989, H.

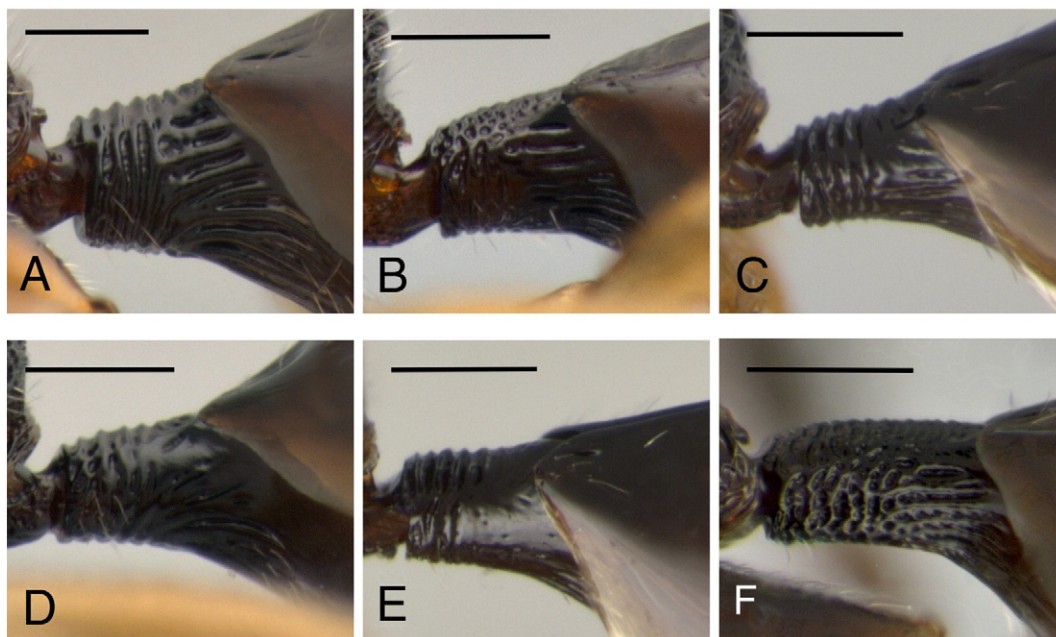


Fig. 8. Petiole, lateral view (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

Makihara & M. Sharkey (CNCI). Yoshibezawa, Kawai, Iwate, 1050 m, 2♂, 12–17.viii.1991, A. Smetana (CNCI). Mt. Tsukuba, Ibaraki, 800 m, 2♂, 1♀, 28.viii–6.ix.1989; 6♂, 6–11.x.1989; 5♂, 18.ix–2.x.1989; 8♂, 1♀, 2–26.x.1989; 1♂, 3–14.viii.1989; 1♂, 14–18.viii.1989; 1♀, 26.vi–10.vii.1989, M. Sharkey (CNCI). Shishizuka-Oike, Tsuchiura City,

Ibaraki, 1♂, 27.x–13.xi.1989, MT, M. Sharkey (CNCI). **Kyushu:** Mt. Hike, Fukuoka, 7♂, 2♀, 29.vi–10.vii.1989, MT; 700 m, 19♂, 3♀, 21–29.vii.1989, MT; 700 m, 9♂, 1♀, 18–25.viii.1989, MT; 11♂, 1♀, 11–18.viii.1989; 11♂, 2♀, 4–11.viii.1989; 6♂, 29.vii–4.viii.1989; 1♂, 1–15.xi.1989; 1♂, 11–18.ix.1989; 1♂, 10–21.vii.1989; 3♂, 19–29.vi.1989;

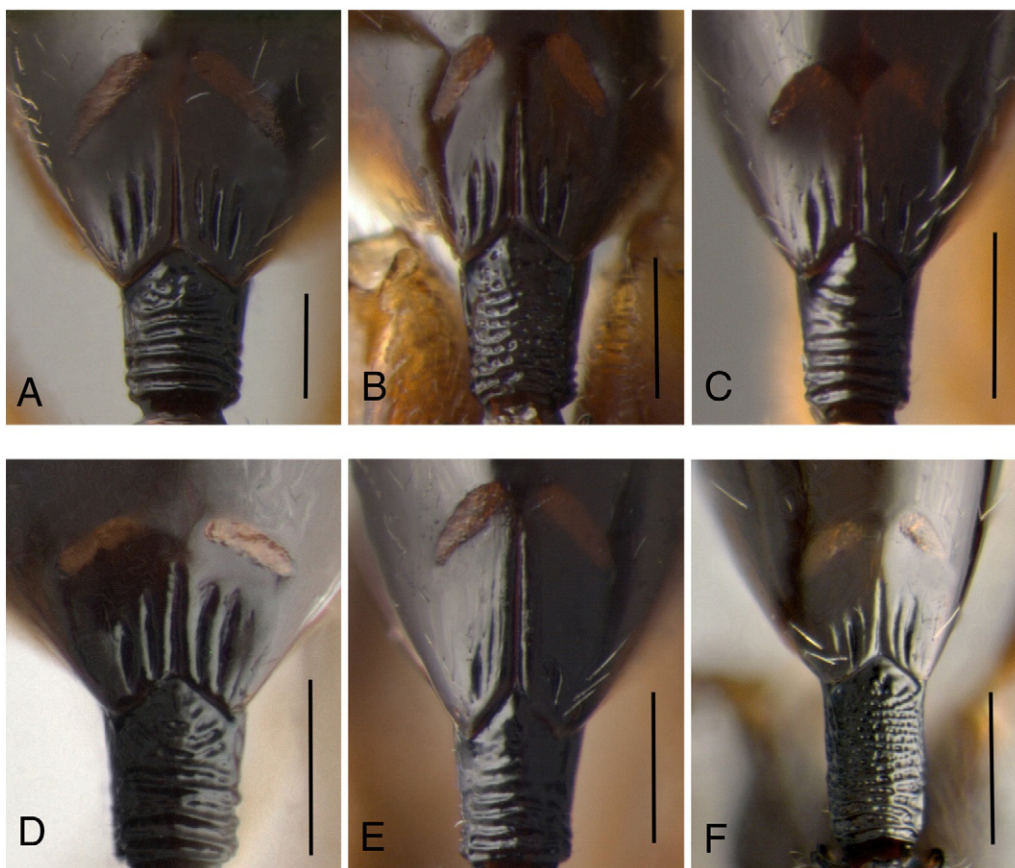


Fig. 9. Base of syntergite and petiole, dorsal view (female): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

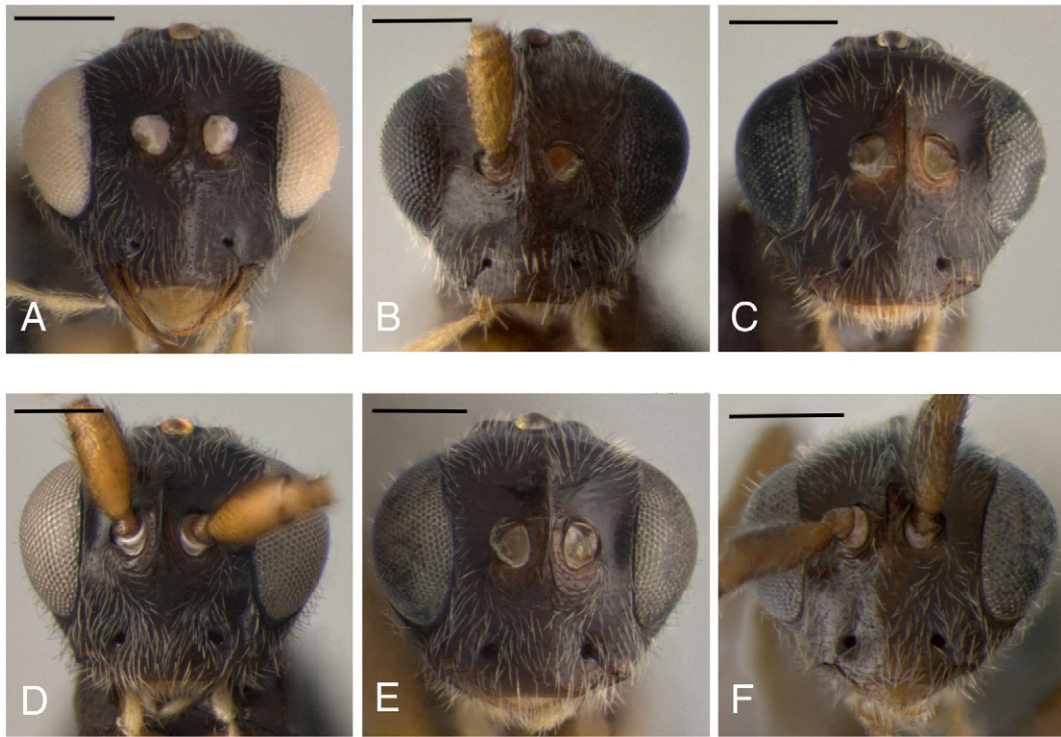


Fig. 10. Head, frontal view (male): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.

8♂, 2♀, viii–ix.1989, K. Takeno & M. Sharkey (CNCI). Mt. Niko, 700 m, 1♀, 24–31.x.1989, K. Takeno & M. Sharkey (CNCI). Aichi, Shitara, Uradani, 900 m, 1♂, 1♀, 18–24.vii.1994, K. Yamagishi (CNCI). Mt. N.P Omogo Valley, Ishizuchi, Snikoku, 700 m, 7♂, 1♀, 21.viii.1980. Tsuchigoia, 1400 m, 3♂, 11–18.viii.1980, S. Peck (CNCI). **RUSSIA. Primorsk reg.:** Kamen-Ribolov, Khanka Like, 1♀, 5.ix.1978, D. Kasparjan (ZISP). Ussuriysk N.P., Kamenushka, 2♀, 9.ix.1987, S. Belokobylsky (ZISP). 15 km NE Artem, 2♀, 6–7.ix.1988, S. Belokobylsky (ZISP). Suvorovo, 1♂, 9.vi.1972, A. Ponomarenko (ZISP). Suchan River floodplain, Lazoviy st., 1♀, 2♂,

2.vii.1972, Kuslitsky (ZISP). Partizansk, 1♂, 16–18.viii.1985, V. Tobias (ZISP). 10 km E Partizansk, Frolovka, 1♂, 21.vi.1990, S. Belokobylsky (ZISP). Khasan Like, 5♂, 26–29.viii.1988, S. Belokobylsky (ZISP). Kedrovaya Pad N.P., 2♀, 1♂, 23–30.viii.1995, S. Belokobylsky (ZISP). Vladivostok, 1♀, 10.vii.1972 (ZISP). Kuslitsky, 2♂, 11.ix.1982, V. Tobias, 2♂, 29–30.viii.1985, 1♂, 4–5.ix.1985, 1♂, 24.viii.1988, S. Belokobylsky (ZISP). Barabash-Levada, 3♀, 6♂, 2–4.ix.1978, D. Kasparjan (ZISP). Ussuriysk, 2♀, 28–31.viii.1978, D. Kasparjan, 1♀, 14.ix.1987, A. Antropov, 1♀, 31.vii.1991, 3♂, 2–3.viii.1991, S. Belokobylsky, 1♀, 1♂, 17–

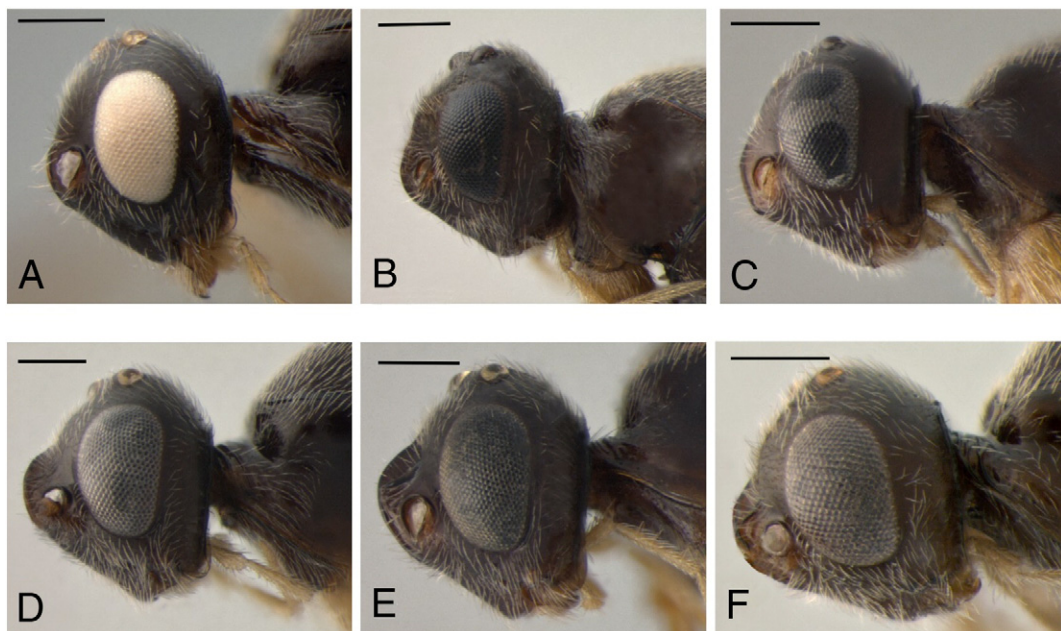


Fig. 11. Head, lateral view (male): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C: *P. brevistigma*, D: *P. coreanus* sp. n., E: *P. cristatus*, F: *P. longistigma*. Scale bars: 0.2 mm.



Fig. 12. Flagellomeres 1–3 (male): A: *Phaneroserphus coreanus* sp. n., B: *P. calcar*, C: *P. punctibasis*, D: *P. cristatus*, E: *P. brevistigma*, F: *P. longistigma*. Scale bars: 0.2 mm.

23.vii.2003, M. Michailovskaya (ZISP). Kchanka Like, Novokachalinsk, 4♀, 25–29.viii.1995, S. Belokobylsky (ZISP). 15 km Slavyanka, Ryazonovka, 5♀, 2♂, 3–6.ix.1987, 1♀, 1♂, 14–29.ix.1995, S. Belokobylsky (ZISP). Anisimovka, 1♀, 16–18.viii.1972, Kuslitsky, 1♂, 1.ix.1976, S. Zhiltsova, 2♀, 2♂, 11–13.ix.1978, D. Kasparjan, 3♀, 1♂, 4–5.ix.1988, 3♀, 2♂, 10.viii.1991, S. Belokobylsky (ZISP). Spassk, 1♂, 23.viii.1985, V. Tobias, 1♀, 2♂, 16–18.viii.1987, 3♀, 27.viii.1988, 1♀, 16.ix.1988, 10♀, 6♂, 17–18.viii.1991, S. Belokobylsky (ZISP). **Sakhalin reg.:** Novoalexandrovka, 1♀, 1♂, 7.ix.1973, D. Kasparjan (ZISP). Kuril Islands, Matua Is., 4♂, 14.viii.1996, A. Lelei (ZISP). Paramushir Is., 4 km NW Severokurilsk, 2♂, 1.viii.1996, Lelei, 1♂, 5.viii.1997, A. Lelei, S. Storozhenko (ZISP). Iturup Is., Kurilsk, 1♂, 11.vii.1976, B. Ermolenko (ZISP). 5 km N Reidovo, 2♀, 9♂, 30.vii.1997, A. Lelei, S. Storozhenko. Shikotan Is., Malokurilskoe, 1♂, 20–21.viii.1975, D. Kasparjan (ZISP). Kunashir Is., Mendeleevo volcano, 1♂, 2.viii.1981, S. Belokobylsky (ZISP). Yuzhnokurilsk, 1♂, 20.vii.1981, S. Belokobylsky (ZISP). Alekhino, 1♂, 27.vii–1.viii.1973, D. Kasparjan, 1♂, 20.vii.1981, S. Belokobylsky, 1♂, 11.viii.1988, Kotenko (ZISP). Dubovoe, 8♀, 20–22.vii.1973, D. Kasparjan (ZISP). Golovin volcano, 2♀, 8♂, 24–26.viii.1973, D. Kasparjan, 1♂, 1.viii.1989, A. Lelei (ZISP). Tretjakovo, 1♀, 1♂, 3–10.viii.1973, D. Kasparjan (ZISP). **MONGOLIA.** Eastern aimak, Kchalkin-Gol River, 13 km SE Kchalkin-Gol Somon, 1♂, 31.vii.1976, I. Kerzhner (ZISP).

Distribution. Japan (Townes and Townes, 1981), China (Jilin) (Liu et al., 2011), new to Russia (Far East) and Mongolia.

2.7.1. *Phaneroserphus longistigma* Townes, 1981
(Figs. 2F, 3F, 4F, 5F, 6F, 7F, 8F, 9F, 10F, 11F, 12F, 13E, F)
Phaneroserphus longistigma Townes, 1981: 201.

2.8. Type material examined

Holotype. Female. **CANADA.** B. C., Terrace, 15.vii.1960, 220 ft., B. Heming (CNCI).

2.9. Material examined (non-type)

JAPAN. Honshu: Morioka area, Iwate, 400 m, 1♀, ?; 2♂, 4♀, 17–31.ix.1989, H. Makihara & M. Sharkey (CNCI). Mt. Hayachine, Iwate, 400 m, 1♀, 15–20.viii.1989, H. Makihara & M. Sharkey (CNCI). Dogawa, Tenkawa, Nara, 1000 m, N34°15' E135°55', 2♂, 14–16.ix.1996, YPT, L. Masner (CNCI).

Distribution. Canada (Townes and Townes, 1981), new to Japan.

2.9.1. *Phaneroserphus punctibasis* Townes
(Figs. 2D, 3B, 4B, 5B, 6D, 7B, 8B, 9B, 10B, 11B, 12C, 13B)
Phaneroserphus punctibasis Townes, 1981: 202; Liu et al., 2011: 259.

2.10. Type material examined

Holotype: female. **JAPAN,** Mt. Norikura, 2000 m, 30.vii.1954. Townes and Townes, (AEIG).

2.11. Material examined (non-type)

JAPAN. Hokkaido: Jozankei, Sapporo, 350 m, 1♀, 1♂, ? .viii.1989, (CNCI). Forest Stn. Sapporo, 1♂, 28.vii.1989; 1♂, 20–31.vii.1989, M. Sharkey (CNCI). Horoka, 800 m, 2♂, 5.vii.1989, M. Sharkey (CNCI). **Honshu:** Morioka area, Iwate, 400 m, 2♀, 17–31.ix.1989, H. Makihara & M. Sharkey (CNCI). Mt. Hayachine, Iwate, 400 m, 2♀, 1♂, 2–8.viii.1989; 1♂, 20–27.vi.1989; 1♂, 12–31.ix.1989; 1♂, 15–20.viii.1989; 1♂, 25.vii–2.viii.1989; 3♂, 15–20.viii.1989, M. Sharkey (CNCI). 1♂, Matsukusa, Iwate, 600 m, 21.vi.1989, M. Sharkey (CNCI). Tochigi, 2♀, 1♂, ? (CNCI). Yaita, 22.viii–8.ix.1989, M. Konishi (CNCI). Shiobara, Tochigi, Pref. Hikinuma, 2♀, 21.xi.1985; 10.v.1985, K. Takahashi (CNCI). Shishizuka-Oika, Tsuchiura City, Ibaraki Pref., 1♂, 21–28.viii.1989, M. Sharkey (CNCI). Mt. Sanage-yama, Aichi Pref., 1♀, 25–31.vii.1989, A. Takano (CNCI). Shitara, Uradani, Aichi, 900 m, 2♀, 18–24.vii.1994, K. Yamagishi (CNCI). Mt. Ishizuci, Shikoku, Tsuchigoya, 1400 m, 1♂, 11–18.viii.1980, S. J. Peck (CNCI). **RUSSIA. Amur reg.:** Zeya N.P., 1♂, 24.viii.1981, V. Alexseev (ZISP). **Primorsk reg.:** Shkotov distr., Peishmulla, 1♂, 29.vii.1972, Kuslitsky. 40 km E Chuguev, Ussuriysk st., 1♂, 23–25.viii.1978, D. Kasparjan. Kchanka Like, 1♂, 22.viii.1985, V. Tobias. Anisimovka, 1♀, 1♂, 11–13.ix.1978, D. Kasparjan, 1♂, 5.ix.1982, V. Tobias. Sudzuchinsky N.P., Ta-Changouz Bay, 1♂, 16.ix.1948, Gussakovskiy, 3♂, 7–10.viii.1972, M. Kozlov (ZISP). **Sakhalin reg.:** Novoalexandrovka, 1♂, 7.ix.1973, D. Kasparjan. Naida River, 10 km upper Bikov, 1♂, 10–20.viii.1990, V. Zherikchin (ZISP). **Kamchatka reg.:** Kronotsky N.P., 1♀, 3.viii.1985, Danilovich. Kozirevsk, 1♂, 21–24.vii.1985, S. Belokobylsky (ZISP).

Distribution. Japan (Townes and Townes, 1981), China (Fujian) (Liu et al., 2011), Russian Far East (Kolyada, 1998), Iran (Izadzadeh et al., 2015).

Phaneroserphus coreanus Kolyada sp. n.

(Figs. 1C, 2A, 3D, 4D, 5D, 6A, 7E, 8D, 9D, 10D, 11D, 12A, 13C, D, 14).

2.12. Type material

Holotype: Female. **SOUTH KOREA. Gangwon-do:** Woljeongsa, Dongsan-ri, Odaesan, 19.vii–18.viii.2003; by Malaise trap, in Korean fir forest (CNCI).

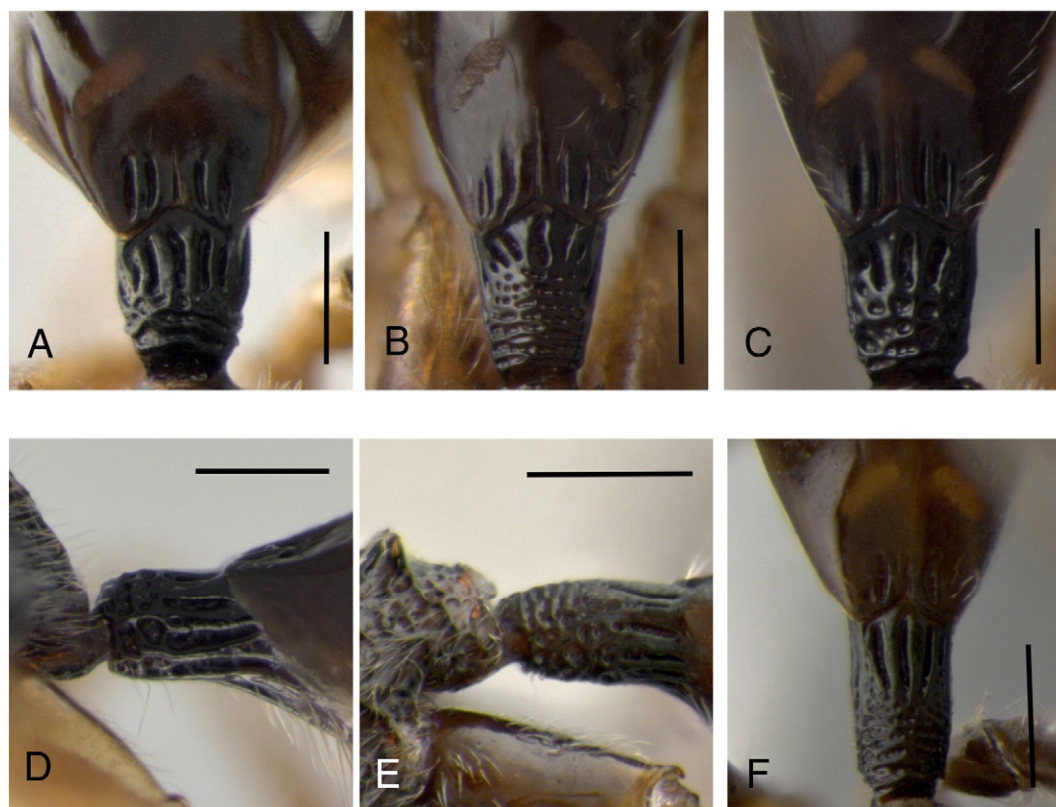


Fig. 13. Base of syntergite and petiole, dorsal view (A, B, C, F) and lateral view (D, E) (male): A: *Phaneroserphus calcar*, B: *P. punctibasis*, C, D: *P. coreanus* sp. n., E, F: *P. longistigma*. Scale bars: 0.2 mm.

Paratypes: SOUTH KOREA. Gangwon-do: Mureung valley, Samhwa-dong, Donghae-si, N37°27'52" E129°1'26", 1♀, 28.viii-10.ix.2006; 2♀, 9-17.viii.2005; 1♀, 29.vii-9.viii.2006; 1♀, 11-22.vi.2006; 1♀, 15.vii-1.viii.2005; 1♀, 3-16.vi.2007; 1♀, 10-20.ix.2006; 3♂, 13-20.v.2006; 2♂, 20.ix-2.x.2006, J.W. Lee (YUGK). Hudong-ri, Nam-myeon, Chuncheon-si, 1♂, 5.ix-20.x.2003, MT, P. Tripotin (CNCI). **Gyeongsangbuk-do:** Namsan3-ri, Gakbuk-myeon, Cheongdo-gun, N35°41'30" E128°33'55", 2♀, 15.x-4.xi.2007; 1♀, 21.ix-5.x.2008, J.W. Lee (YUGK). **Chungchongbuk-do:** Beopjusamaepyoso, Songnisan, Boeun-gun, N36°32'6" E127°49'40", 1♀, 12-21.vi.2007, J.W. Lee (YUGK). Bukbusa, Mt. Sobaek, Cheondong-ri, Danyang-gun, 1♀, 14.x-24.xi.2005, J.W. Lee (YUGK). **Chungchongnam-do:** Daejeon Univ., Dong-gu, Daejeon-si, N36°20'6" E127°27'38", 1♀, 1-22.vii.2006; 1♀, 1-17.v. 2006; 3♂, 1-17.vii.2006; 17♂, 15.viii-30.ix.2006; 4♂, 1-22.vii.2006; 1♂, 16.v-5.vi.2006; 4♂, 8.x-30.xi.2007, J.W. Lee (YUGK). Daejeon-si, Wa-dong, N36°24'01.19" E127°25'58.77", 2♀, 1♂, 16.vii-8.viii.2006, MT, P. Tripotin (CNCI). **Gyeonggi-do:** Kwanag, Manna-gu, Anyang-si, N37°25'21.6" E126°56'56.8", 1♀, 26.vii-7.viii.2008; 1♂, 6-24.ix.2008, J.O. Lim. (YUGK). Mt. Ungilsan, Songchon, Choan, Namyangju-si, N37°34'43.2" E127°18'40.1", 1♂, 17-30.viii.2009, J.O. Lim. (YUGK). **Jeonranam-do:** Wetland in Deungcheon-ri, Ibam-myeon, Jeongeup-si, 1♂, 30.viii.2005. K.B. Kim (YUGK). Baegyangsa, Naejangsan, Yaksu-ri, Bukha-myeon, Jangseong-gun, 1♂, 5-31.vii.2007, J.W. Lee (YUGK). **Gyeongsangnam-do:** Dapcheon-ri, Ibanseong-myeon, Jinju-si, 1♂, 27.vi-4.vii.2005, Y.D. Kwon (YUGK). Mt. Jirisan, Samjeong-ri, Macheon-myeon, Hamyang-gun, 700 m, N35°20'55" E127°38'21", 8♂, 15.ix-13.x.2002, MT in forest; 1♂, 24.viii-15.ix.2003; 3♂, 28.ix-26.x.2003, MT, P. Tripotin (CNCI). **JAPAN. Honshu:** Tsuchiura City, Ibaraki Pref., 1♀, 6-11.ix.1989, MT. Tsuchiura marsh, 3♂, 19.ix-2.x.1989; 1♂, 23.x-13.xi.1989; 1♂, 27.ix-3.x.1989, PT. Shishizuka-Oike, 2♂, 27.x-13.xi.1989, MT, M. Sharkey (CNCI). Tsucuba, Expo Site, Ibaraki Pref., 1♂, 31.v-8.vi.1989, PT; 1♀, 29.viii-15.ix.1989, MT, M. Sharkey (CNCI). Mt. Hayachine, Iwate, 400 m, 1♂, 25.vii-2.viii.1989; 1♂, 2-8.viii.1989, MT,

H. Makihara & M. Sharkey (CNCI). **RUSSIA. Primorsk reg.:** Kuril Is., Kunashir I., Grozovoye, Ivanovsk cape, N43°50'22.7" E185°24'39.9", 47 m, 3♂, 8-15.viii.2008, I. Melnik (ZISP).

Description. Female.

Body length 3.6–4.0 mm. Fore wing length 2.4–2.7 mm (Fig. 14).

Distance between anterior margin of cranium and anterior margin of compound eye 0.85 times maximum eye length in exact lateral view.

P. coreanus sp. n. (Holotype)



Fig. 14. Habitus of *Phaneroserphus coreanus* sp. n. (female holotype), lateral view. Scale bar: 1.0 mm.

(Fig. 2A). First flagellomere long, 3.8–4.0 times as long as wide (Fig. 7E). Vertical frontal carina between toruli with 5–6 lateral carinae dorsally on each side, carinae with equal length (Fig. 3D). Face with dense setae (Figs. 1C, 2A, 3D). Clypeus not separated from face by distinct groove. Apical margin of clypeus truncate (Fig. 3D). Mandible with one tooth. Malar sulcus absent. Occipital carina complete medially. Compound eye with sparse hairs (Figs. 2A, 3D).

Lateral side of pronotum smooth; anterior margin at dorsal edge and at hind corner setous, other pronotal regions glabrous. Mesoscutum with dense setae. Notaulus absent. Mesopleuron setous dorsally of median transverse groove and ventrally of tegula. Upper metapleuron completely sculptured or with a small bare area medially (Fig. 4D). Dorsal surface of propodeum without a pair of smooth areas or with a pair of small smooth areas anteriorly. Smooth areas about 0.05 or 0.1 times length of propodeum (Fig. 5D). Spur on tibia of hind leg about 0.47 times length of metabasitarsus. Tarsal claws without basal tooth.

Lateral side of petiole with basal longitudinal wrinkles (Fig. 8D). Petiole in dorsal view 1.2 times as long as wide posteriorly, with 3–4 weak, transverse carinae on basal 0.3 and with a few wrinkles on apical 0.7 (Fig. 9D). Petiole in lateral view 1.3 times as long as high, anterior 0.3 reticulately rugose and posterior 0.7 with three transverse carinae (Fig. 8D). Syntergite with short, proximomedian groove, not reaching first pair of thyridiae. Syntergite with 2–3 lateral grooves (Fig. 9D). Ovipositor sheath about 0.25 length of hind tibia, weakly curved (Fig. 14).

Cranium and mesosoma black. Antenna, mandible, hind coxa distally, mid and hind femora brown. Labrum, maxillary palpus, tegula, and legs light brown. Stigma and strong veins dark brown.

Male.

First flagellomere long, 4.6 times as long as wide distally (Fig. 12A). Malar distance about 0.25 times shortest distance between compound eyes (Fig. 10D). Vertical frontal carina between toruli about 0.68 times maximum eye length in exact lateral view (Fig. 11D). Petiole in dorsal view 1.1 times as long as wide posteriorly, reticulate-rugose on its basal 0.5, with six longitudinal carinae on apical half. Petiole in lateral

view 1.1 times as long as high, with basal half reticulate-rugose and apical half with four transverse ridges (Fig. 13 C, D).

Distribution. South Korea, Japan, Russia (Far East).

Acknowledgments

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