



Taxonomic Paper

New record of *Castanopsides falkovitshi* Kerzhner from Korea (Heteroptera: Miridae: Mirinae: Mirini)

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Academic editor: Guanyang Zhang

Received: 30 Mar 2017 | Accepted: 26 Apr 2017 | Published: 03 May 2017

Citation: Oh M, Lee S (2017) New record of *Castanopsides falkovitshi* Kerzhner from Korea (Heteroptera: Miridae: Mirinae: Mirini). Biodiversity Data Journal 5: e12982. <https://doi.org/10.3897/BDJ.5.e12982>

Abstract

Background

The genus *Castanopsides* Yasunaga, 1992 belongs to the subfamily Mirinae and comprises 11 species worldwide. Prior to this study, two species, *C. kerzhneri* Josifov and *C. potanini* Reuter has been recorded from the Korean Peninsula.

The genus *Castanopsides* Yasunaga, 1992 belongs to the subfamily Mirinae and comprises 11 species worldwide. Prior to this study, two species, *C. kerzhneri* Josifov and *C. potanini* Reuter has been recorded from the Korean Peninsula.

New information

In this paper, three species are recognized including a new record, *C. falkovitshi* (Kerzhner, 1979). Images of dorsal and ventral habitus, and male and genitalic structures are provided. A key to the Korean *Castanopsides* species is presented.

Keywords

Miridae, Mirinae, *Castanopsides*, new record, the Korean peninsula

Introduction

The genus *Castanopsides* Yasunaga, 1992 (Miridae: Mirinae: Mirini), comprises 11 species worldwide: The genus *Castanopsides* was erected by Yasunaga (1992) with a single species, *C. hasegawai*. Several years later, Yasunaga (1998) comprehensively revised East Asian *Castanopsides* which added eight species to the genus including four new species and four transferred from genus *Arbolygus* Kerzhner, 1979 (synonymized with *Philostephanus* Distant, 1909, by Yasunaga and Schwartz 2007). Additionally, Yasunaga and Duwal (2008) described two new species from Oriental region (Nepal).

In Korea, Josifov (1985) reported *C. kerzhneri* (Josifov, 1985) from Korean peninsula as a new species, with North Korea specimen. Subsequently, Lee and Kwon (1991) added *C. potanini* (Reuter, 1906) from central part of Korean peninsula, and Josifov (1992) reported this species at North Korea. Accordingly, two species of *Castanopsides* currently known from the Korean Peninsula.

In this paper, *C. falkovitshi* (Kerzhner, 1979) is reported for the first time in Korea. The dorsal habitus and genitalic structures of both sexes are provided, along with a key to Korean *Castanopsides* species.

Materials and methods

All specimens are deposited in the Insect Collection, Seoul National University (SNU), South Korea. Digital images of dorsal habitus are taken with a Canon EOS 70D, with a Canon MP-E 65-mm F2.8 1–5x macro lens. Genital structures are dissected and observed under a Leica DM 4000B microscope, and images are taken using a digital camera attached to the microscope (Lumenera Infinity 3). All measurements (mean and range) are provided in millimeters.

Terminology used to describe the male and female genitalia follows Yasunaga (1998) and Yasunaga and Schwartz (2007), and is indicated with the following abbreviations: IRL: interrampal lobe; LL: lateral lobe; DLP: dorsal labiate plate; DOS: dorsal sac; FP: fin-like process (of theca); LS: left lateral sclerite; MS: median sclerite; PB: Phallobase; PML: primary lobe; RM: ramus; RS: right lateral sclerite; SD: seminal duct; SGP: secondary gonopore; SP: spiculum; SPGC: sclerotized perimeter of genital chamber; SR: sclerotized ring; TH: phallosheca.

Taxon treatments

Castanopsides Yasunaga, 1992

Nomenclature

Castanopsides Yasunaga 1992: 45 (gen. nov.). Type species: *Castanopsides hasegawai* Yasunaga, 1992, monotypic; Schuh 1995: 737 (cat.); Yasunaga 1998: 100 (diag., key to eastern Asia spp.); Kerzhner and Josifov 1999: 81 (cat.); Kwon et al. 2001: 123 (cat.); Yasunaga et al. 2001: 226 (diag.); Schuh 2014: (cat.);

Diagnosis

Castanopsides in East Asia can be recognized by the following characters: Body elongate oval, moderate to large size; dorsum covered with pale sericeous setae; antennae slender, segment I and II incrassate apically; labium rather short, not over metacoxa; male endosoma membranous, with a sclerotized, elongated spiculum and thick-rimmed secondary gonopore; hypophysis of left paramere hooked, sensory lobe rather tumid, or with sparsely toothed process; right paramere elongate, apex of hypophysis crooked; sclerotized ring elongate ovoid, usually not adjacent each other. For detailed diagnostic characters, see Yasunaga (1998) and Yasunaga (2016).

Notes

This genus relate to five other genera which distributes at Palearctic and Oriental region; *Gotoshinomiris* Yasunaga, *Liocapsus* Poppius, *Mahania* Poppius, *Orientocapsus* Yasunaga & Schwartz, and *Philostephanus* Distant. Morphological charactier of them are superficially similar, so careful diagnosis is need. Yasunaga (2016) provide key for this allied genera, and discuss about their genitalic structure.

Castanopsides falkovitshi Kerzhner, 1979

Nomenclature

Lygocoris (*Arbolygus*) *falkovitshi* Kerzhner 1979: 28 (sp. nov.); Schuh 1995: 796 (cat.).

Arbolygus falkovitshi Zheng et al. 2004: 186 (diag.).

Castanopsides falkovitshi Yasunaga 1998: 114 (diag., disc, comb. n.); Kerzhner and Josifov 1999: 81 (cat.); Yasunaga et al. 2001: 226 (diag.); Yasunaga and Duwal 2008: 405 (cat.) Schuh 2014: (cat.).

Materials

- a. scientificName: *Castanopsides falkovitshi*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Girin-myeon, Hyeon-ri; eventDate: 2011-06-26;

individualCount: 11; sex: 6 males, 5 females; lifeStage: adult; recordedBy: S. H. Jung; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen

- b. scientificName: *Castanopsides falkovitshi*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Girin-myeon, Jindong-ri, Mt. Jumbong; samplingProtocol: light trap; eventDate: 2011-05-24; individualCount: 2; sex: 1 male, 1 female; lifeStage: adult; recordedBy: S. H. Jung; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- c. scientificName: *Castanopsides falkovitshi*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Nam-myeon, Namjeon-ri, 38°00'52"N, 128°08'05"E; samplingProtocol: light trap; eventDate: 2016-06-08; individualCount: 3; sex: 2 males, 1 female; lifeStage: adult; recordedBy: S. H. Lee; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen

Diagnosis

Recognized by its moderate size; dorsum dark brown to fuscous (in males), and paler (in females) and rather glabrous, covered with sericeous setae (Fig. 1 A, B); pronotum immaculate and glabrous, pale line transverse vertically along medial part of pronotum; cuneus pale, apex darkened; basal half of metafemur pale, distal half dark brown to fuscous; male genitalia as in Fig. 2 A, B and Fig. 3 C, D; spiculum distinctly long and slender (Fig. 2 B); sensory lobe of left paramere rather tumid; sclerotized ring small and ovate, semicircular (Fig. 4 A, B). For detailed diagnostic character, figures and description, see Yasunaga (1998).

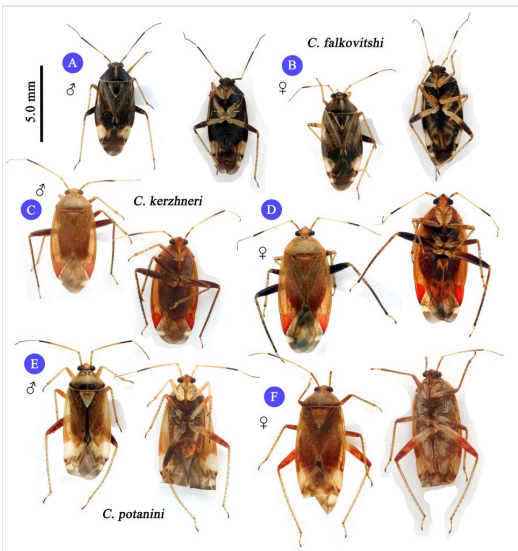


Figure 1.

Dorsal and ventral habitus of Korean *Castanopsides* species (A–B: *C. falkovitshi*; C–D: *C. kerzhneri*; E–F: *C. potanini*).

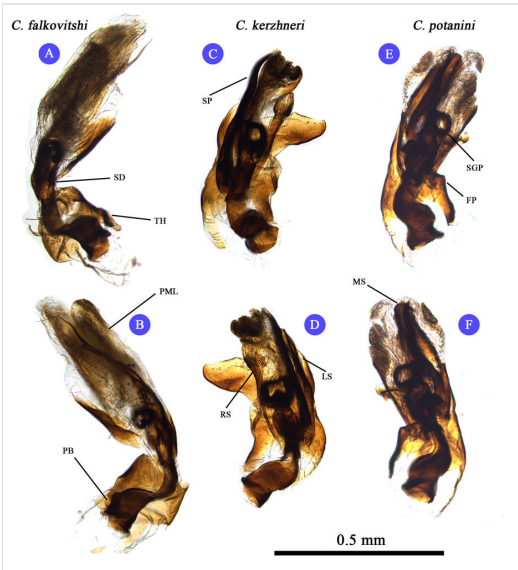


Figure 2.

Male genital structure (Endosoma) of Korean *Castanopsides* species (A–B: *C. falkovitshi*; C–D: *C. kerzhneri*; E–F: *C. potanini*).

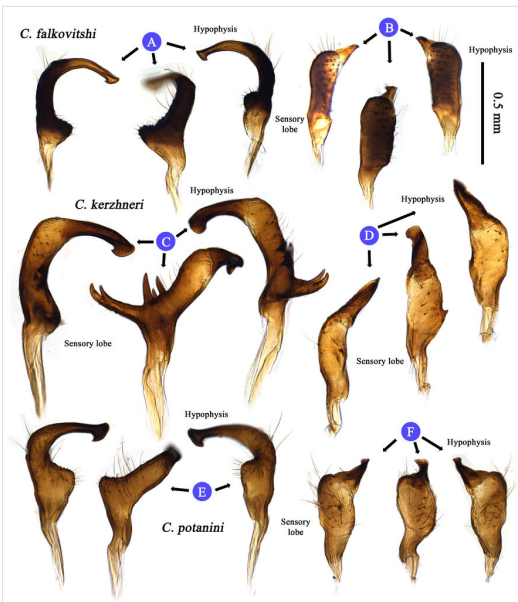


Figure 3.

Male genital structure (Parameres) of Korean *Castanopsides* species (A–B: *C. falkovitshi*; C–D: *C. kerzhneri*; E–F: *C. potanini*) – A, C, E: Left paramere. B, D, F: Right paramere.

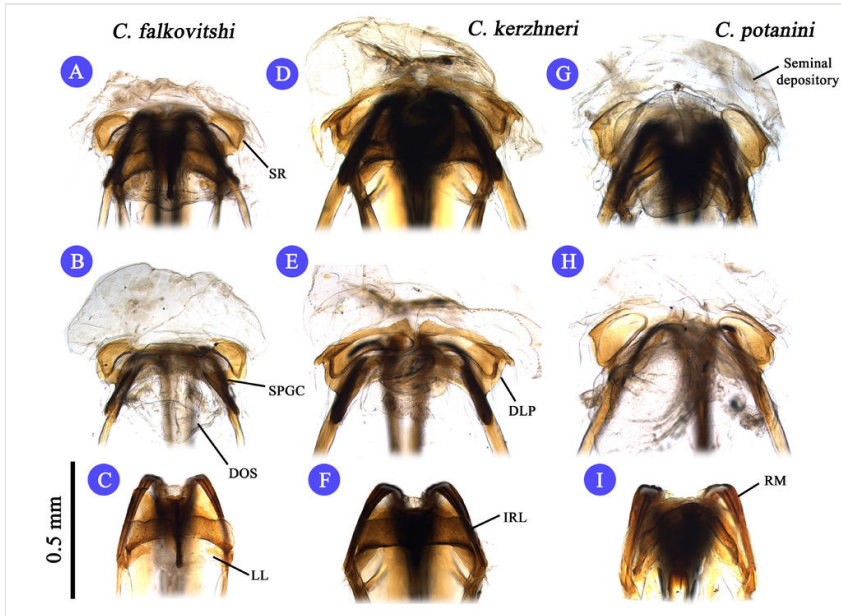


Figure 4.

Female genital structure of Korean *Castanopsides* species (A–C: *C. falkovitshi*; D–F: *C. kerzhneri*; G–I: *C. potanini*). A, D, G: Bursa copulatrix (Before dissect posterior wall); B, E, H: Bursa copulatrix; C, F, I: Posterior wall.

Measurements (σ/φ): Total body length 5.32–5.80/ 5.78–6.26; head width across eyes 0.99–1.03/ 1.03–1.06; vertex width 0.39–0.42/ 0.46–0.49; lengths of antennal segment I–IV 0.58–0.62, 1.66–1.88, 0.74–0.79, 0.39–0.41/ 0.60–0.64, 1.75–1.94, 0.68–0.88, 0.39–0.41; labial length 1.73–1.86/ 1.84–1.91; mesal pronotal length including collar 1.15–1.22/ 1.17–1.25; basal pronotal width 1.96–2.07/ 2.09–2.14; width across hemelytron 2.29–2.44/ 2.30–2.59; cuneal length 1.04–1.20/ 1.09–1.20; cuneal width 0.60–0.68/ 0.62–0.71; lengths of metafemur, tibia and tarsus 1.82–2.04, 2.67–2.90, 0.56–0.59/ 2.02–2.29, 2.81–3.04, 0.59–0.66.

Distribution

China (Fujian, Hebei, Sichuan) (Zheng et al. 2004), Japan (Hokkaido, Honshu), Far East Russia (S. Primorskij Prov.) (Yasunaga 1998), Korea (Central, New record).

Notes

This species is host specific to *Juglans* spp. and *Pterocarya rhoifolia* Siebold & Zucc. (Juglandaceae) (Yasunaga 1998). Yasunaga (1998) assumed Japanese *C. falkovitshi* invaded from Primorskij, Russia, via the Korean peninsula. Our record supports this hypothesis.

Castanopsides kerzhneri Josifov, 1985

Nomenclature

Lygocoris (Arbolygus) kerzhneri Josifov 1985: 91 (sp. nov.); Schuh 1995: 798 (cat.).

Castanopsides kerzhneri Yasunaga 1998: 112 (diag., disc, comb. n.); Kerzhner and Josifov 1999: 81 (cat.); Yasunaga et al. 2001: 227 (diag.); Kwon et al. 2001: 123; Zheng et al. 2004: 220 (diag.); Yasunaga and Duwal 2008: 405 (list); Schuh 2014: (cat.).

Materials

- a. scientificName: *Castanopsides kerzhneri*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Buk-myeon, Mt. Maebong, Yongdae NRC, 38°14'17"N, 128°20'35"E; samplingProtocol: light trap; eventDate: 2015-06-18; individualCount: 1; sex: female; lifeStage: adult; recordedBy: M. S. Oh; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- b. scientificName: *Castanopsides kerzhneri*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Girin-myeon, Jindong-ri, Mt. Jumbong, 38°02'18"N, 128°28'18"E; samplingProtocol: light trap; eventDate: 2015-07-15; individualCount: 1; sex: female; lifeStage: adult; recordedBy: M. S. Oh; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- c. scientificName: *Castanopsides kerzhneri*; country: South Korea; stateProvince: Gyeonggi-do; locality: Gwangju-si, Docheok-myeon, Sanglim-ri, Mt. Taehwa; samplingProtocol: light trap; eventDate: 2013-06-15; individualCount: 6; sex: 1 male, 5 females; lifeStage: adult; recordedBy: R. K. Duwal; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- d. scientificName: *Castanopsides kerzhneri*; country: South Korea; stateProvince: Gyeonggi-do; locality: Uiwang-si, Mt. bara, 37°22'18"N, 127°01'22"E; samplingProtocol: light trap; eventDate: 2016-06-03; individualCount: 4; sex: 1 male, 3 females; lifeStage: adult; recordedBy: M. S. Oh and S. H. Lee; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- e. scientificName: *Castanopsides kerzhneri*; country: South Korea; stateProvince: Jeollanam-do; locality: Jangsung-gun, Bugeui-myeon, Mt. Bangjang; samplingProtocol: light trap; eventDate: 2010-06-24; individualCount: 11; sex: 4 males, 7 females; lifeStage: adult; recordedBy: R. K. Duwal; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen

Diagnosis

Recognized by its moderate to large size; dorsum entirely pale reddish brown, covered with sericeous setae; pronotum punctate, pair of dark spot near calli; cuneus red, apex darkened; metafemur unicolorously chestnut brown to dark brown; male genitalia as in Fig. 2 C, D and Fig. 3 C, D, female genitalia as in Fig. 4 D, E, F; spiculum elongated, slightly curved apically; sensory lobe of left paramere highly modified, with several thorn-like processes (Fig. 15); sclerotized ring elongated horizontally, adjacent to each other (Fig. 4 D, E). For detailed diagnostic character, figures and description, see Yasunaga (1998).

Measurements (♂/♀): Total body length 6.38–6.78/ 6.80–7.66; head width across eyes 1.14–1.19/ 1.23–1.26; vertex width 0.45–0.48/ 0.50–0.53; lengths of antennal segment I–IV 0.85–0.89, 2.24–2.40, 0.97–1.07, 0.48–0.58/ 0.84–0.94, 2.38–2.52, 0.96–1.08, 0.50–0.57; labial length 2.30–2.40/ 2.59–2.64; mesal pronotal length including collar 1.30–1.41/ 1.39–1.53; basal pronotal width 2.23–2.39/ 2.43–2.62; width across hemelytron 2.73–2.99/ 3.04–3.36; cuneal length 1.19–1.29/ 1.29–1.36; cuneal width 0.70–0.74/ 0.72–0.81; lengths of metafemur, tibia and tarsus 2.49–2.63, 3.56–3.66, 0.73–0.78/ 2.75–2.92, 3.76–3.98, 0.78–0.85.

Distribution

China (Sichuan) (Zheng et al. 2004), Japan (Honshu, Shikoku, Kyushu, Tsushima Is.), Far East Russia (Primirskij Prov.) (Yasunaga 1998), Korea (South, Central) (Kwon et al. 2001).

Notes

This species associated with *Quercus* species. Nymph and adult of this species appear at *Quercus mongolica* Fisch. ex Ledeb. 1850, *Q. dentata* Thunb. 1784 not S. Watson 1873 nor W. Bartram 1794, and *Q. acutissima* Carruth. 1862 (Fagaceae) (Yasunaga 1998).

Castanopsides potanini (Reuter, 1904)

Nomenclature

Lygus potanini Reuter 1906: 26 (sp. nov.)

Calocoris amurensis Lindberg 1934: 17 (sp. nov., syn. by Kerzhner 1979 : 25)

Lygocoris (Arbolygus) potanini Kerzhner 1978: 39 (syn., list); Lee and Kwon 1991 (list): 29; Josifov 1992: 119 (list); Schuh 1995: 802 (cat.).

Castanopsides potanini Yasunaga 1998: 110 (diag., disc, comb. n.); Kerzhner and Josifov 1999: 81 (cat.); Yasunaga et al. 2001: 227 (diag.); Kwon et al. 2001: 123 (cat.); Zheng et al. 2004: 222 (diag.); Yasunaga and Duwal 2008: 405 (cat.); Schuh 2014: (cat.).

Materials

- a. scientificName: *Castanopsides potanini*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Buk-myeon, Mt. Maebong, Yongdae NRC, 38°14'17"N, 128°20'35"E; samplingProtocol: light trap; eventDate: 2015-06-18; individualCount: 3; sex: 2 males, 1 female; lifeStage: adult; recordedBy: M. S. Oh; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- b. scientificName: *Castanopsides potanini*; country: South Korea; stateProvince: Gangwon-do; locality: Inje-gun, Girin-myeon, Bangdong-ri, Mt. Bangtae NRC; samplingProtocol:

- light trap; eventDate: 2013-06-20; individualCount: 2; sex: male; lifeStage: adult; recordedBy: R. K. Duwal; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- c. scientificName: *Castanopsides potanini*; country: South Korea; stateProvince: Gangwon-do; locality: Yeongwol-gun, Sangdong-eup, Hambaeksan-ro, Jangsan condo, 37°08'24"N, 128°52'57"E; samplingProtocol: light trap; eventDate: 2015-07-02; individualCount: 4; sex: 1 male, 3 females; lifeStage: adult; recordedBy: M. S. Oh; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- d. scientificName: *Castanopsides potanini*; country: South Korea; stateProvince: Gyeonggi-do; locality: Gwangju-si, Docheok-myeon, Sanglim-ri, Mt. Taehwa; samplingProtocol: light trap; eventDate: 2013-06-15; individualCount: 4; sex: 3 males, 1 female; lifeStage: adult; recordedBy: R. K. Duwal; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen
- e. scientificName: *Castanopsides potanini*; country: South Korea; stateProvince: Jeju-do; locality: Seogwipo-si, Donnaeko-ro, Donnaeko; samplingProtocol: light trap; eventDate: 2015-07-10; individualCount: 1; sex: 1 female; lifeStage: adult; recordedBy: M. S. Oh; identifiedBy: Minsuk Oh; dateIdentified: 2016; language: en; institutionCode: SNU; basisOfRecord: PreservedSpecimen

Diagnosis

Recognized by its moderate to large size; dorsum entirely pale reddish brown, covered with sericeous setae; pronotum punctate, pair of dark spot near calli; cuneus pale, apex darkened; basal half of metafemur pale, distal half reddish. Male genitalia as in Fig. 2 E, F and Fig. 3 E, F, female genitalia as in Fig. 4 G, H, I; spiculum elongated and largely curved; sensory lobe of left paramere rather tumid; sclerotized ring ovate, elongated horizontally (Fig. 4 G, H). For more diagnostic character, figures and description, see Yasunaga (1998).

Measurements (σ^7/f): Total body length 6.96–7.34/ 7.42–7.92; head width across eyes 1.15–1.20/ 1.19–1.27; vertex width 0.42–0.45/ 0.45–0.50; lengths of antennal segment I–IV 0.85–0.89, 2.80–2.96, 1.19–1.36, 0.56–0.60/ 0.86–0.93, 2.78–2.91, 1.30–1.41, 0.51–0.59; labial length 2.47–2.62/ 2.65–2.74; mesal pronotal length including collar 1.26–1.38/ 1.40–1.55; basal pronotal width 2.17–2.36/ 2.34–2.57; width across hemelytron 2.56–2.89/ 2.93–3.23; cuneal length 1.32–1.46/ 1.38–1.50; cuneal width 0.75–0.79/ 0.72–0.87; lengths of metafemur, tibia and tarsus 2.91–3.04, 3.98–4.22, 0.81–0.88/ 2.93–3.30, 3.99–4.55, 0.81–0.90.

Distribution

China (Hebei, Hubei, Liaoning, Ningxia, Sichuan) (Zheng et al. 2004), Japan (Hokkaido, Honshu, Shikoku, Kyushu, Rishiri Is., Rebun Is., Yagishiri Is.), Far East Russia (Khabarovskij, Amur and Primorskij Provs., Sakhalin) (Yasunaga 1998), Korea (South, Central, North) (Kwon et al. 2001).

Notes

Host plants are *Quercus dentata*, *Q. mongolica* (Fagaceae) (Kerzhner 1988) and *Acer* spp. (Aseraceae), *Salix* spp. (Salicaceae), *Sorbus commixta* (Rosaceae) (Yasunaga 1998).

Identification keys

Key to the species of <i>Castanopsides</i> from Korean peninsula		
1	Dorsum rather dark or blakish, pronotum immaculate; small to moderate size, 5.5~6.0mm (Fig. 1 A, B)	<i>C. falkovitshi</i> (Kerzhner)
–	Dorsum reddish and paler coloration, pronotum with punctures; moderate to large size, 7.0~8.0mm	2
2	Cuneus entirely red except darkened apex; entire metafemora chestnut brown to fuscous (Fig. 2 C, D)	<i>C. kerzhneri</i> (Josifov)
–	Cuneus entirely pale except darkened apex; distal half of metafemur reddish, basal half pale yellow(Fig. 1 E, F)	<i>C. potanini</i> (Reuter)

Discussion

Previously, phylogenetic research on *Castanopsides* and allied genera has been conducted. Yasunaga (1998) discussed the phylogenetic relationship between *Castanopsides* species, based on morphological data. A superficially related genus, *Arbolygus*, was synonymized with *Philostephanus* and the phylogenetic relationships in the allied genera investigated, and genus *Mahania* was restored as a genus (Yasunaga and Schwartz 2007). Recently, closely related genus *Gotoshinomiris* Yasunaga, 2016 is newly erected, with discussion about male and female genitalia of allied six genera (Yasunaga 2016).

Although large amount of study have been conducted about their relationship, additional study for establish their cladistic relationship is still needed, with more comprehensive basis (Yasunaga 2016). Further molecular analysis and wider range of morphological study for *Castanopsides* and allied genus can complement previous studies.

Acknowledgements

We thank to Dr. Tomohide yasunaga (American Museum of Natural History), Dr. Ram Keshari Duwal (Kyushu University), Dr. Sora Kim (Seoul National University), and Dr. Guanyang Zhang (Arizona State University) for reviewing the manuscript with valueable comments and suggestions. This work was supported by a grant from the National Institute of Biological Resources (NIBR), funded by the Ministry of Environment (MOE) of the Republic of Korea (NIBR201601203).

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