

Braconid imagobionts from the tribe **Cosmophorini** (Hymenoptera, Braconidae, Euphorinae) in the fauna of South Korea

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Academic editor: Jose Fernandez-Triana | Received 31 January 2023 | Accepted 4 April 2023 | Published 19 April 2023

<https://zoobank.org/4D97E4BE-543C-4924-96F7-25ACE5132B42>

Citation: Belokobylskij SA, Ku D (2023) Braconid imagobionts from the tribe Cosmophorini (Hymenoptera, Braconidae, Euphorinae) in the fauna of South Korea. Journal of Hymenoptera Research 96: 129–154. <https://doi.org/10.3897/jhr.96.101287>

Abstract

Two euphorine taxa from the tribe Cosmophorini, the genus *Cryptoxilos* Viereck, 1911 and the subgenus *Eucosmophorus* Belokobylskij, 2000 (genus *Cosmophorus* Ratzeburg, 1848) are recorded for the first time for the Korean Peninsula. Three species from South Korea, *Cosmophorus* (*Eucosmophorus*) *jejuensis* **sp. nov.**, *C. (Eu.) wandoensis* **sp. nov.**, and *Cryptoxilos* (*Cryptoxiloides*) *ulleungus* **sp. nov.**, are described and illustrated. Keys to the described species of *Cosmophorus* (*Eucosmophorus*) and *Cryptoxilos* (*Cryptoxiloides*) are provided. Digital photographs of the type species of the subgenus *Eucosmophorus*, *Cosmophorus undulatus* Belokobylskij, 2000, are published for the first time.

Keywords

Cosmophorini, descriptions, diagnosis, Ichneumonoidea, Korean Peninsula, new records, new species, parasitoid

Introduction

For a long time, the euphorine tribe Cosmophorini Muesebeck & Walkley, 1951 of the braconid subfamily Euphorinae included only one morphologically distinctive genus, *Cosmophorus* Ratzeburg, 1848, whose distribution was restricted to the Palearctic and

Nearctic regions (Muesebeck and Walkley 1951; Čapek 1958; Shenefelt 1969). However, recent extensive collects along subtropical and tropical regions that were carried out with different techniques showed an almost worldwide distribution for this genus, with the apparent exception of the Neotropics. The genus *Cosmophorus* currently contains three subgenera, *Cosmophorus* s. str., *Eucosmophorus* Belokobylskij, 2000, and *Regiphorus* van Achterberg, 2000, and 39 valid species (van Achterberg and Quicke 2000; Yu et al. 2016).

The latest molecular phylogenetic study of the maximum possible genera of the subfamily Euphorinae (Stigenberg et al. 2015), which was based on four molecular markers, significantly redefined the composition of this tribe including five morphologically different genera, *Cosmophorus* (together with the subgenus *Eucosmophorus* Belokobylskij), *Cryptoxilos* Viereck, 1911, *Phynops* Shaw, 1996, *Ropalophorus* Curtis, 1837, and *Tuberidelus* Chen & van Achterberg, 1997.

The Cosmophorini taxa with known life history strategies are imagobionts (sensu Shaw, 2004), specifically koinobiont endoparasitoids of adult bark-beetles, (Coleoptera, Curculionidae, Scolytinae) (Čapek and Capecki 1979; Shaw 1985, 2004; Chen et al 2001; Yang et al. 2003; Yu et al. 2016). Females of *Cosmophorus*, and perhaps also those of other related genera, use their enlarged mandibles for seizure and fixation to the host adults for their infestation (Hedqvist, 1998).

Two species of the tribe Cosmophorini have been already found in the fauna of the Korean Peninsula, *Cosmophorus* (*Cosmophorus*) *cembrae* Ruschka, 1925 and *C. (C.) klugii* Ratzeburg, 1848 (Belokobylskij and Ku 1998; Ku et al. 2001; An et al. 2015). In this paper, the genus *Cryptoxilos* and subgenus *Cosmophorus* (*Eucosmophorus*) of this tribe are recorded for the first time in South Korea, and three new species belonging to these genera are described.

Materials and methods

The terminology employed for the morphological features, sculpture, and body measurements follows Belokobylskij and Maetô (2009). The wing venation nomenclature follows Belokobylskij and Maetô (2009), with the terminology of van Achterberg (1993) shown in parentheses. The specimens were examined using an Olympus SZ51 stereomicroscope. Photographs were taken with an Olympus OM-D E-M1 digital camera mounted on an Olympus SZX10 microscope (Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia). Image stacking was performed using Helicon Focus 5.0. The figures were produced using the Adobe Photoshop CS6 program. In the keys, additional features useful for separating species are listed after the dash (–).

The specimens examined in this study were deposited in the collections of the National Institute of Biological Resources (Incheon, Republic of Korea; **NIBR**) and the Science Museum of Natural Enemies (Geochang, Republic of Korea; **SMNE**).

Taxonomic part

Class Hexapoda Blainville, 1816

Order Hymenoptera Linnaeus, 1758

Family Braconidae Nees, 1811

Subfamily Euphorinae Foerster, 1863

Genus *Cosmophorus* Ratzeburg, 1848

Subgenus *Eucosmophorus* Belokobylskij, 2000

Cosmophorus (*Eucosmophorus*) Belokobylskij, 2000b: 372; Stigenberg et al. 2015: 583; Yu et al. 2016.

Sinuatophorus van Achterberg, in van Achterberg and Quicke 2000: 286 (Type species: *Sinuatophorus maximus* van Achterberg, 2000); Stigenberg et al. 2015: 583 (as synonym of *Eucosmophorus*); Yu et al. 2016.

Type species. *Cosmophorus* (*Eucosmophorus*) *undulatus* Belokobylskij, 2000.

The subgenus *Eucosmophorus* Belokobylskij of the genus *Cosmophorus* Ratzeburg is a small braconid taxon of the tribe Cosmophorini (Euphorinae) includes six East Asian (Palearctic-Oriental) species, *C. (Eu.) acutidentatus* (van Achterberg, 2000) (Indonesia), *C. (Eu.) breviceps* (Quicke & van Achterberg, 2000) (Malaysia: Sabah), *C. (Eu.) constrictus* (van Achterberg, 2000) (Malaysia: Sabah), *C. (Eu.) longiceps* (Quicke & van Achterberg, 2000) (Brunei), *C. (Eu.) maximus* (van Achterberg, 2000) (Indonesia), and *C. (Eu.) undulatus* (Belokobylskij, 2000) (Japan: Ryukyus) (Belokobylskij 2000a; van Achterberg and Quicke 2000). Most of species of this subgenus (five species) were described from the Greater Sunda Islands, and only a single species, *C. (Eu.) undulatus*, which previously had the northernmost distribution, was recorded from the Ryukyu Islands (Ishigaki I.) in Japan. Two additional new species of the subgenus *Eucosmophorus* were found in the south of the Korean Peninsula (Wando and Jeju Islands). Now these localities are the northernmost habitat of the *Eucosmophorus* species.

Key to described species of the subgenera *Eucosmophorus*

- 1 Mandible mainly horizontal, its second tooth situated at inner side of mandible and in same plane as apical (upper) tooth, small or obsolescent (Figs 1C, 3B, 5E). Ovipositor of female distinctly twice sinuate apically (Figs 1J, 3H, 5K). Posterior half of second metasomal tergite entirely or mainly sculptured and with complete lateral crease (Figs 2C, 4B, 6B). Anterior ocellus situated below level of posterior ocelli. – Vertex usually distinctly depressed medially and often with wide longitudinal medial groove (Figs 1D, 3C). POL 2.5–4.0 times diameter of posterior ocellus. Antenna with 19–23 segments. Third abscissa of costal vein (2-SC+R) of hind wing long (Figs 2B, 4A,

- 6A) **Subgenus *Eucosmophorus* Belokobylskij, 2000 (type species *Cosmophorus undulatus* Belokobylskij, 2000)**
- Mandible more vertical, its second tooth situated ventrally to apical tooth of mandible (not in same plane) and medium-sized or small. Ovipositor of female straight or sometimes somewhat curved apically. Posterior half of second tergite usually largely or entirely smooth, and without lateral crease. Anterior ocellus situated at same level as posterior ocelli **2**
 - 2 Vertex with deep median longitudinal groove. POL ~ 2.5 times diameter of posterior ocellus and at least twice distance between anterior and posterior ocelli. Third abscissa of costal vein (2-SC+R) of hind wing comparatively long.....
 - **Subgenus *Regiphorus* van Achterberg, 2000 (type species *Cosmophorus regius* Niezabitowski, 1910)**
 - Vertex without median longitudinal groove. POL 1.5–2.0 times diameter of ocellus and at most 1.5 times distance between anterior and posterior ocelli. Third abscissa of costal vein (2-SC+R) of hind wing variable, but usually medium-sized or short..... **Subgenus *Cosmophorus* Ratzeburg, 1848 (type species *Cosmophorus klugii* Ratzeburg, 1848)**

The hosts of this relatively rare subgenus are unknown. However, since members of the genus *Cormophorus* with known mode of life are endoparasitoids (imagobionts: Shaw 2004) of adults of bark-borer beetles (Curculionidae, Scolytinae), we presume that species of *Eucosmophorus* also attack imagoes of the same beetle group.

***Cosmophorus* (*Eucosmophorus*) *jejuensis* sp. nov.**

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Figs 1, 2

Type material. *Holotype*: female, “Korea (JJ), Muljangori, Bonggae-dong, Jeju-si, Jeju-do, VIII.12–VIII.29.2017 (Malaise Trap) [Hyung-Keun Lee leg.]” (NIBR).

***Paratypes*:** 1 female, “Korea (JJ), Mulyeongari, Sumang-ri, Namwon-up, Seogwipo-si, Jeju-do, VI.03–VI.17.2017 (Malaise Trap) [Hyung-Keun Lee leg.]” (SMNE).

Description. Female. Body length 2.4–3.0 mm; fore wing length 1.7–2.2 mm.

Head: Width of head 1.3–1.4 times its median length, equal to its maximum length, 1.35–1.45 times its maximum height (without mandible), 1.3 times width of mesoscutum. Vertex with wide and shallow medial longitudinal depression. Occiput strongly concave. Temples behind eyes weakly convex in anterior 1/2–3/5, than weakly and roundly narrowed, 1.1–1.3 times longer than transverse diameter of eye. Frons medially distinctly concave, with distinct, relatively low, but higher anteriorly, median longitudinal carinae, which distinctly divergent anteriorly at short distance on antennal sockets. Ocelli medium-sized, arranged in triangle with base 1.4–1.5 times its lateral sides; posterior margin of anterior ocellus placed weakly before line between anterior margins of lateral ocelli. POL 2.8–3.0 times Od, 1.3–1.4 times OOL. Eye subround, Eye with

rather sparse and short setae, 1.05–1.15 times as high as broad. Malar suture invisible. Malar space very narrow, 0.10–0.15 times height of eye, 0.1–0.2 times basal width of mandible. Antennal protuberances with one wide, relatively long and acuminate apical antero-medial tooth. Clypeus very narrow, almost straight ventrally. Upper tentorial pit rather distinct, situated between eye and antennal socket and almost connected with socket its outer border. Face 2.0–2.4 times wider than its medial height with antennal protuberances. Mandible wide, widened towards basal $3/5$ – $2/3$ and then strongly narrowed towards apex, with distinct submedial ventral corner and small tubercle on lower margin, with small but wide corner in upper margin, with two apical teeth, upper tooth short and obtuse, lower tooth longest and acuminate. Length of mandible 2.0 times its maximum submedial width. Occipital carina present only in ventral $1/3$, absent widely upper and upper-laterally, below fused with distinct hypostomal carina.

Antenna: Antenna slender, almost filiform, 18–20-segmented, flagellum weakly compressed and segment concave below (if antenna directed posteriorly). Scape subcylindrical, distinctly widened towards apex (lateral view), not depressed, with two distinct and acuminate teeth on its anterior apical side; length of scape 1.5–1.6 times its maximum width (lateral view), 1.3–1.5 times longer than rather narrow pedicel. First flagellar segment 3.3–3.8 times longer than its apical width, 1.1–1.3 times longer than widened second segment. Second flagellar segment 2.2 times longer than its maximum width. Length of penultimate segment 2.5–3.0 times its width, 1.2–1.3 times longer than shortened apical segment; the latter weakly acuminate or obtuse.

Mesosoma: Length of mesosoma 1.9–2.1 times its maximum height. Dorsal part of mesosoma weakly convex (lateral view). Oblique short and crenulate notauli present only on vertical part of mesoscutum, completely absent on its horizontal part. Prescutellar depression short, with six–seven carinae, smooth between carinae, 0.2–0.3 times as long as scutellum. Scutellum without posterior transverse depression, completely smooth. Subalar depression distinct but shallow, rather narrow, densely reticulate-rugose and sometimes with oblique striation. Precoxal sulcus distinct, long, narrow, crenulate-rugulose, strongly curved up in posterior $2/3$ and prolonged towards mesopleural pit and pleural suture. Prepectal carina present but fine.

Wings: Length of fore wing 2.6–2.9 times its width. Length of pterostigma 2.7–3.1 times its maximum width. Metacarp (1-R1) strongly desclerotised and lost distally. Radial (marginal) cell strongly shortened, open apically; anterior margin of radial (marginal) cell 0.9–1.0 times as long as pterostigma and 1.7–2.4 times as long as distance from apex of radial (marginal) cell to apex of wing. Radial vein (r) arising behind middle of pterostigma, its first abscissa (r) more or less distinctly thickened and short, 0.3–0.4 times as long as maximum width of pterostigma. Second abscissa of radial vein (3-SR + SR1) evenly regularly curved and transparent (discolored), absent apically at short distance. Parallel vein (CU1a) straight and unsclerotised, interstitial to mediocubital vein (2-CU1). Recurrent vein (m-cu) forming usually weak obtuse corner with first radiomedial vein (2-SR). Nervulus (cu-a) short and postfurcal, distance from basal vein (1-M) to nervulus (cu-a) almost equal to nervulus (cu-a) length. Hind wing 4.2–4.8 times longer than wide. Second abscissa of costal vein (1-SC+R)

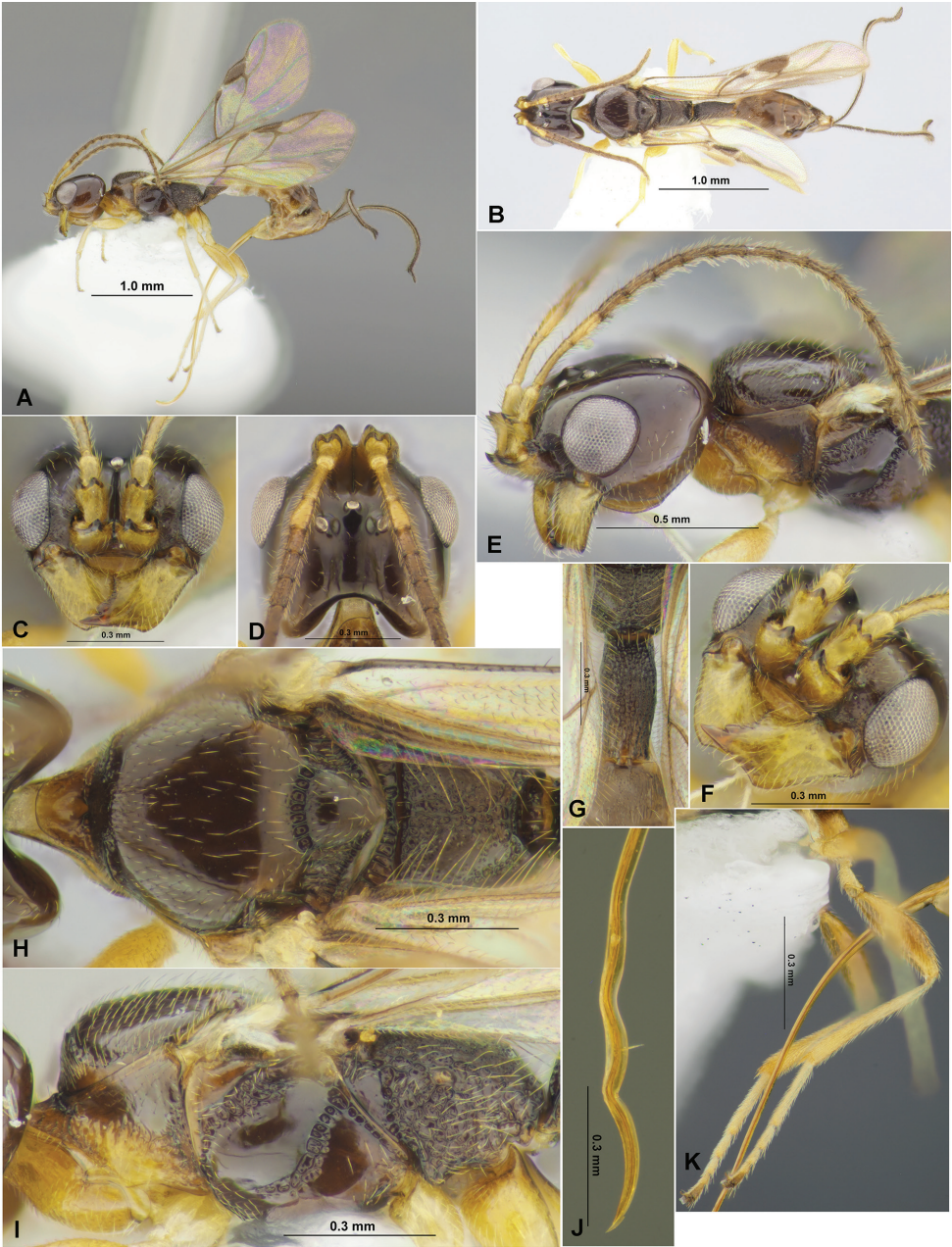


Figure 1. *Cosmophorus (Eucosmophorus) jejuensis* sp. nov. (female, holotype) **A** habitus, lateral view **B** habitus, dorsal view **C** head, front view **D** head, dorsal view **E** head and antenna, lateral view **F** face and mandible, front view **G** propodeum, first and second metasomal tergites, dorsal view **H** mesosoma, dorsal view **I** mesosoma, lateral view **J** tip of ovipositor, lateral view **K** hind leg.

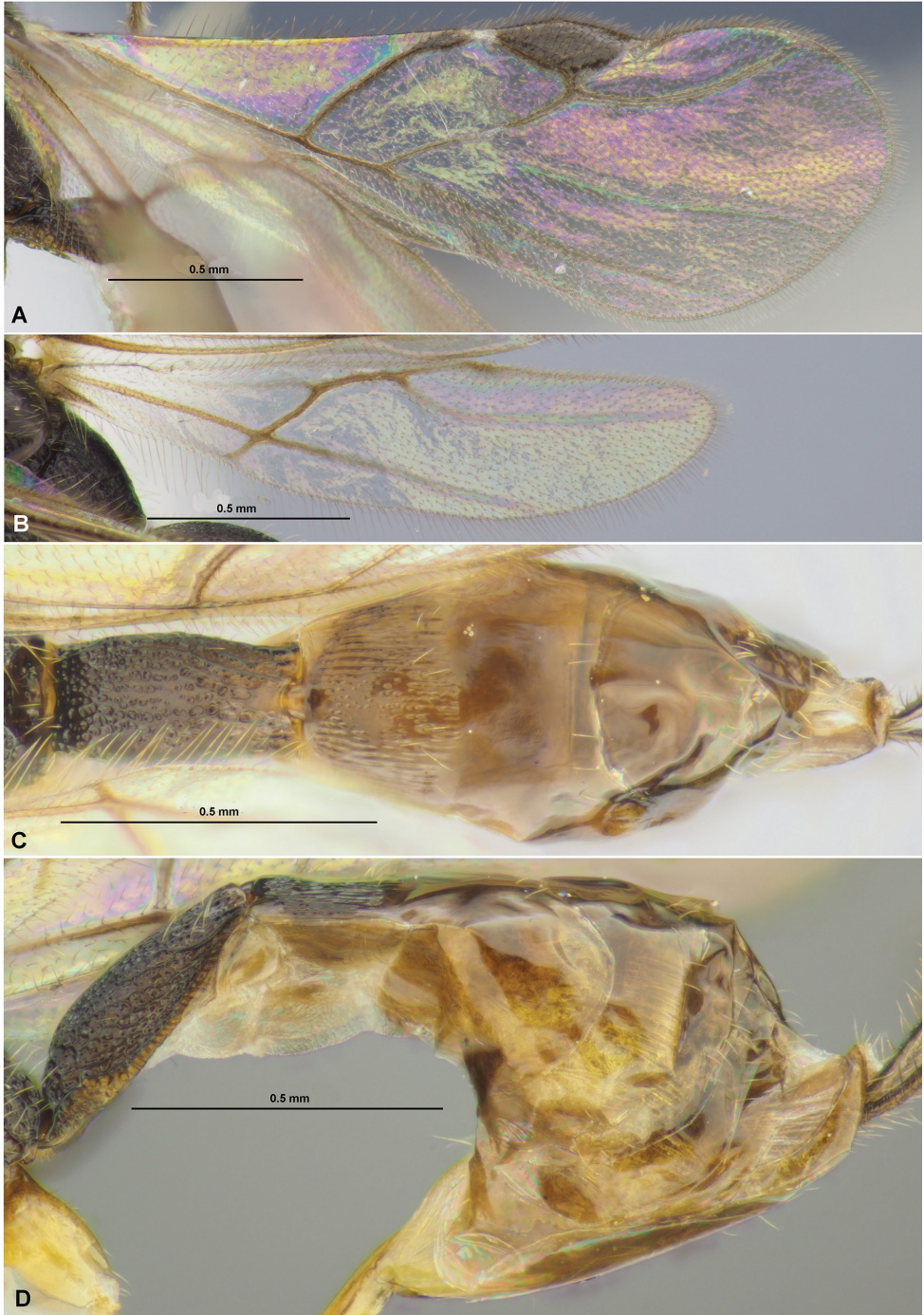


Figure 2. *Cosmophorus (Eucosmophorus) jejuensis* sp. nov. (female, holotype) **A** fore wing **B** hind wing **C** metasoma, dorsal view **D** metasoma, lateral view.

almost absent in basal 1/3 and present but strongly desclerotised in apical 2/3; fourth abscissa of costal vein (SC+R1) strongly desclerotised in distal 4/5. Submedial (sub-basal) cell distally open. Recurrent vein (m-cu) straight, sclerotised, mainly pigmented and almost interstitial.

Legs: Hind femur 3.2–3.3 times longer than wide. Hind tarsus almost equal to hind tibia, its second segment 0.4 times as long as first segment, approximately as long as fifth segment (without pretarsus).

Metasoma: First tergite of metasoma relatively long, weakly curvedly widened to middle and then narrowed (sometimes weakly) towards apex, spiracular tubercles absent, dorsope almost absent. Apical width of first tergite 0.85–0.90 times its maximum medial width, almost equal to or 1.2 times large than its minimum width, length 1.9–2.0 times its apical width and 1.2–1.4 times length of propodeum. Suture between second and third tergites present, but very shallow. Length of second tergite approximately equal to its basal width, 1.0–1.1 times length of third tergite. Ovipositor compressed, with 3 arcuate and not equivalent sections in apical 1/5 (missing in holotype), distal section longest and crescent. Ovipositor sheath not widened in apical quarter, approximately as long as metasoma, 1.5–1.7 times longer than mesosoma, 0.7 times as long as fore wing.

Sculpture and pubescence: Head entirely smooth. Sides of pronotum coarsely reticulate-rugose in lower half or medially and in posterior 1/5, smooth on remaining upper and lower parts. Mesoscutum finely and densely punctate on anterior vertical part, entirely smooth on posterior horizontal surface; scutellum entirely smooth. Mesopleuron mainly smooth. Propodeum entirely reticulate-rugulose or reticulate-punctate, with small and almost smooth areas latero-posteriorly or submedially, with longitudinal medial carina in basal 1/2–3/5 and almost semi-circular areola in posterior 2/5. Legs smooth. First metasomal tergite entirely densely reticulate-rugulose. Second tergite mainly longitudinally striate, with sparse fine punctation medially, sometimes almost smooth in small antero-lateral areas. Remaining tergites smooth. Vertex medially widely glabrous, laterally with sparse, short and semi-erect pale setae directed laterally; mesoscutum almost entirely with short and relatively densely white setae.

Colour: Body mainly dark reddish brown to dark brown, metasoma ventrally brown to partly pale brown; mandible, antennal socket (sometimes only their lower part) and lower half of prothorax yellow to yellowish brown. Antennae mainly dark brown to black, four basal segments yellow to brownish yellow. Palpi pale yellow. Legs yellow to pale brown, femora mainly brown or pale reddish brown. Ovipositor sheath dark brown to black. Wings very faintly evenly infuscate, subhyaline. Pterostigma dark brown, pale basally at short distance.

Male. Unknown.

Comparative diagnosis. The new species is similar to *C. (Eu.) constrictus* (van Achterberg, 2000) from Malaysia (Sabah) (van Achterberg and Quicke 2000) in their shape of the head in dorsal view and shape of the first metasomal tergite, but differ from each other by having the first flagellar segment 1.2 times longer than the second segment (1.6 times in *C. constrictus*), second flagellar segment in front view 2.5 times longer than its width and only weakly wider than the first segment (2.0 times longer

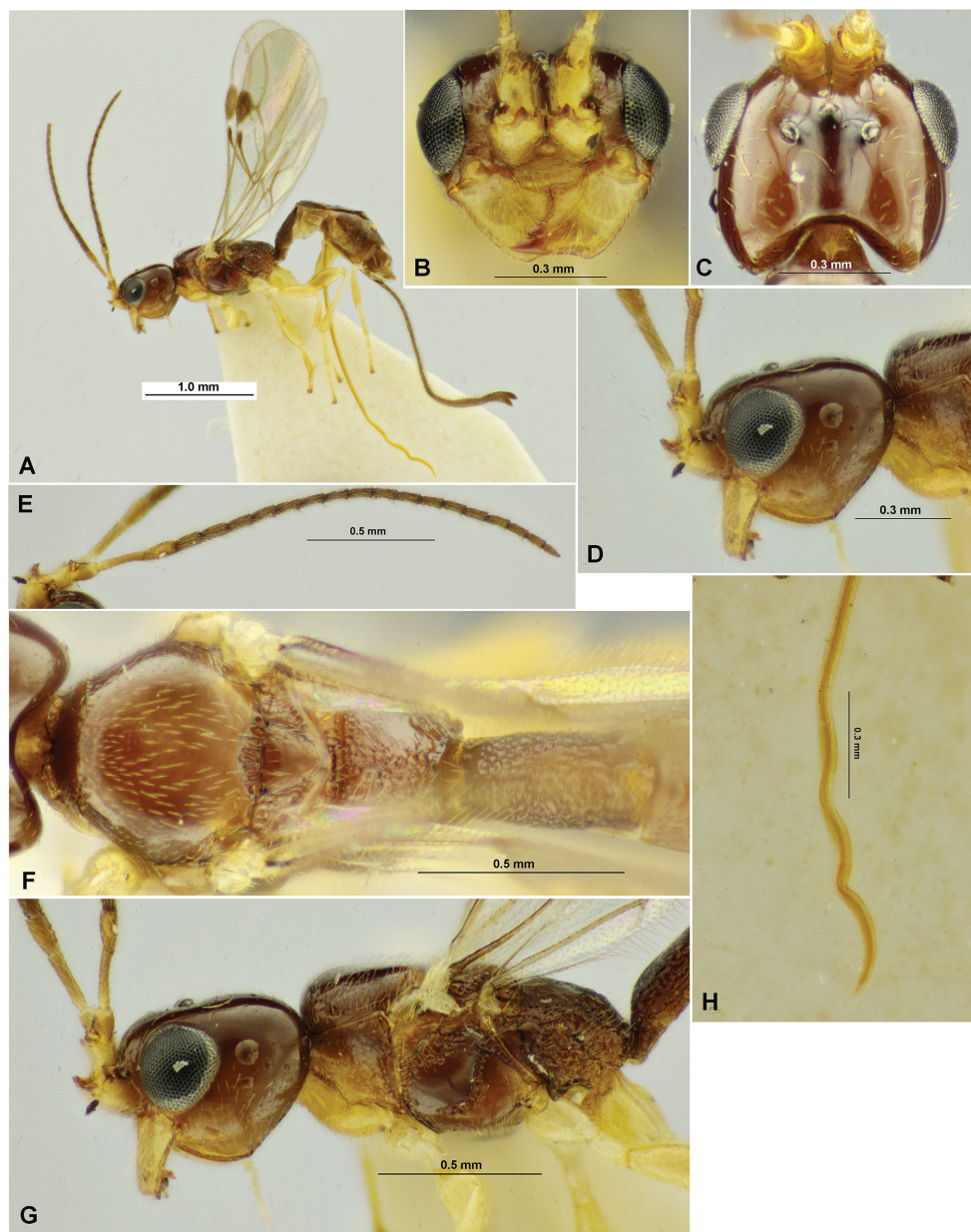


Figure 3. *Cosmophorus* (*Eucosmophorus*) *undulatus* (Belokobylskij, 2000) (female, holotype) **A** habitus, lateral view **B** head, front view **C** head, dorsal view **D** head, lateral view **E** antenna, lateral view **F** mesosoma and first tergite, dorsal view **G** head and mesosoma, lateral view **H** tip of ovipositor, lateral view.

and twice wider in *C. constrictus*), first and second flagellar segments yellow (dark brown in *C. constrictus*), upper teeth of the scape subpointed apically (obtusely apically in *C. constrictus*), mandible practically not twisted apically with the first tooth large



Figure 4. *Cosmophorus* (*Eucosmophorus*) *undulatus* (Belokobylskij, 2000) (female, holotype) **A** wings **B** metasoma, dorsal view **C** propodeum and metasoma, lateral view.

(strongly twisted apically and with a small first tooth in *C. constrictus*), mesosoma 2.1 times longer than the height (1.8 times in *C. constrictus*), precoxal sulcus distinctly crenulate (finely crenulate in *C. constrictus*), prescutellar depression distinctly crenulate

(finely crenulate in *C. constrictus*), radial vein (r) arising weakly behind the middle of pterostigma (weakly before middle in *C. constrictus*), and second metasomal tergite shorter, 1.1 times longer than anterior width (longer, 1.3 times longer in *C. constrictus*).

Cosmophorus (Eucosmophorus) jejuensis sp. nov. is also very similar to the South Japanese *C. (Eu.) undulatus* Belokobylskij, 2000 (Belokobylskij 2000a: 24; 2000b: 372; Yu et al. 2016) (Figs 3, 4), but differs from the latter species by having the first flagellar segment 1.1–1.3 times longer than the second segment (1.6 times in *C. undulatus*), the first tergite widened to its middle and then narrowed towards the apex, apical width of this tergite 1.05–1.20 times large than its minimum width (evenly widened towards apex, and its apical width 1.5 times large than its minimum width in *C. undulatus*), the ovipositor sheath 1.5–1.7 times longer than mesosoma and 0.7 times as long as the fore wing (1.2 and 0.9 times correspondingly in *C. undulatus*).

Etymology. This species is named after its type locality, Jeju Island

Distribution. Korean Peninsula (Jeju Island).

***Cosmophorus (Eucosmophorus) wandoensis* sp. nov.**

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Figs 5, 6

Type material. Holotype: female, “Korea (JN), Jangjoa-ri, Wando-eup, Wando-gun, VIII.29–IX.12.2020 (Malaise Trap), Ku Deokseo, Lee Jaehyeon “ (NIBR).

Description. Female. Body length 2.6 mm; fore wing length 2.0 mm.

Head: Width of head 1.8 times its median length, 1.5 times its maximum length, 1.6 times its height, 1.3 times width of mesoscutum. Vertex without medial longitudinal depression. Occiput distinctly concave. Temples behind eyes distinctly and roundly narrowed, ~1.2 times longer than transverse diameter of eye. Frons medially very weakly concave, with low double longitudinal carinae, which are fused medially and distinctly divergent anteriorly. Ocelli medium-sized, arranged in triangle with base 1.4 times its lateral sides; posterior margin of anterior ocellus placed distinctly before line between anterior margins of lateral ocelli. POL 2.0 times Od, 0.8 times OOL. Eye subround, without setae, 1.1 times as high as broad. Malar suture present and distinct. Malar space narrow, 0.2 times height of eye, 0.4 times basal width of mandible. Antennal protuberances with one wide and long acuminate apical anteromedial tooth. Clypeus narrow, straight ventrally. Upper tentorial pit distinct, situated between eye and antennal socket and connected with socket outer border. Face 2.3 times wider than its medial height. Mandible wide, widened towards subapex and then narrowed towards apex, with small but distinct ventral tubercle on lower margin, with two wide apical teeth, anterior (upper) tooth longest and acuminate, posterior (lower) tooth short and less acuminate. Length of mandible 2.7 times its maximum width. Occipital carina present only laterally, absent widely upper, below fused with hypostomal carina.

Antenna: Antenna weakly thickened, almost setiform, 21-segmented, flagellum not compressed. Scape subcylindrical, not depressed, without pointed apical teeth in anterior side; length of scape 1.1 times its maximum width, almost as long as pedicel. First flagellar

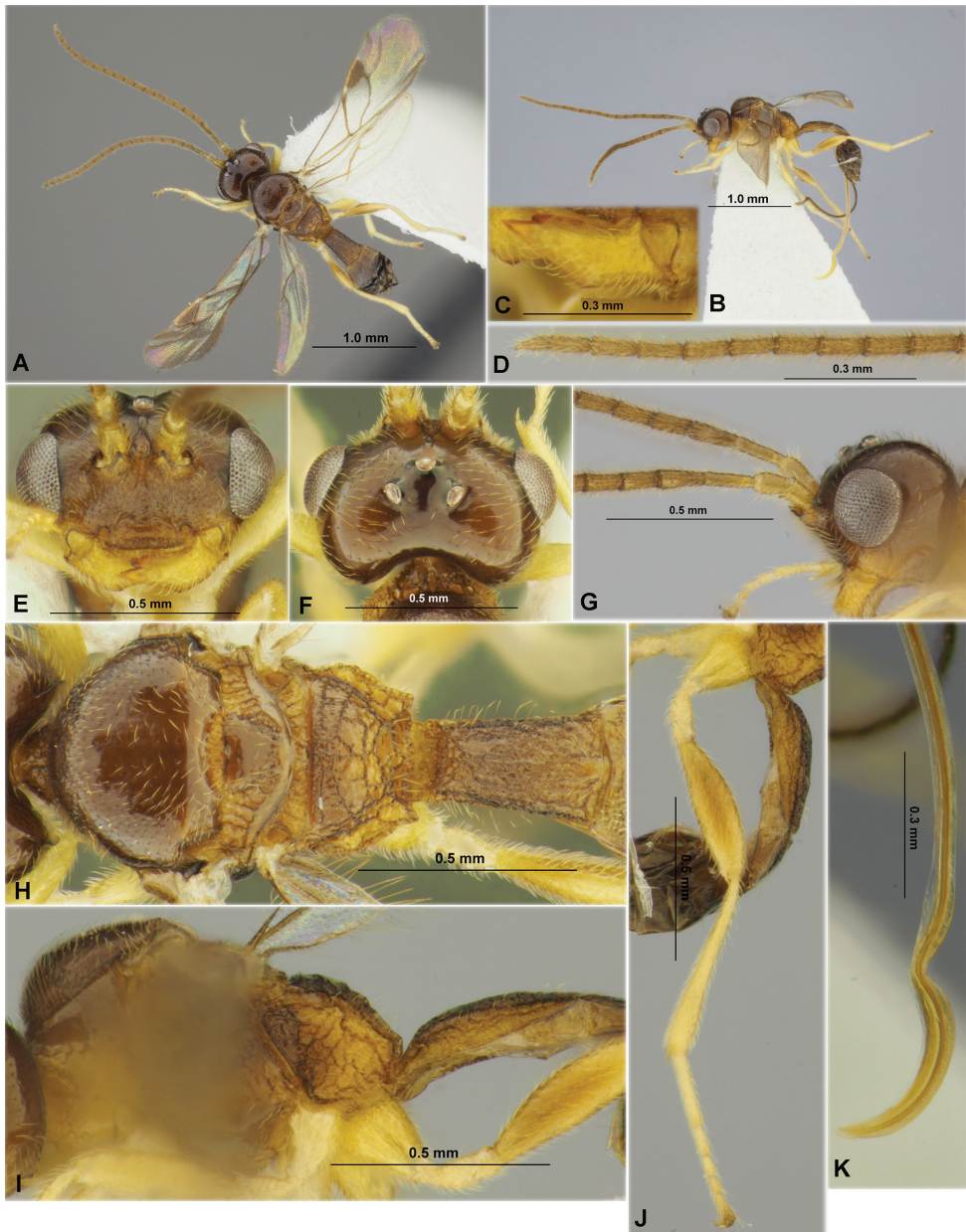


Figure 5. *Cosmophorus (Eucosmophorus) wandoensis* sp. nov. (female, holotype) **A** habitus, dorsal view **B** habitus, lateral view **C** mandible **D** apical segments of antenna **E** head, front view **F** head, dorsal view **G** head and basal segments of antenna, lateral view **H** mesosoma and first tergite, dorsal view **I** mesosoma and first tergite, lateral view **J** hind leg **K** tip of ovipositor, lateral view.

segment 3.7 times longer than its apical width, 0.9 times as long as second segment. Second flagellar segment 3.0 times longer than apical width. Length of penultimate segment 2.7 times its width, 1.1 times longer than apical segment; the latter weakly acuminate.



Figure 6. *Cosmophorus* (*Eucosmophorus*) *wandoensis* sp. nov. (female, holotype) **A** wings **B** propodeum and metasoma, dorsal view **C** propodeum and metasoma, lateral view.

Mesosoma: Length of mesosoma 1.6 times its maximum height. Dorsal part of mesosoma weakly convex. Notauli present on vertical part of mesoscutum only and crenulate, completely absent on its horizontal part. Prescutellar depression rather short, with four carinae, almost smooth between carinae, 0.3 times as long as scutellum. Scutellum without transverse posterior depression, weakly sculptured in posterior 1/3. Subalar depression shallow, wide and densely rugose-areolate. Precoxal sulcus distinct, long, rather wide, crenulate-rugulose, curved up posteriorly and prolonged towards mesopleural pit and pleural suture (fused with additional oblique crenulate furrow). Prepectal carina absent. Mesosternal furrow narrow and shallow, rugulose.

Wings: Length of fore wing 2.6 times its width. Length of pterostigma 2.3 times its maximum width. Metacarp (1-R1) strongly desclerotised and lost distally. Radial (marginal) cell strongly shortened, open apically; anterior margin of radial (marginal) cell 0.9 times as long as pterostigma and 2.5 times as long as distance from apex of radial (marginal) cell to apex of wing. Radial vein (r) arising slightly behind middle of pterostigma, its first abscissa (r) strongly thickened and very short, 0.2 times as long as maximum width of pterostigma. Second abscissa of radial vein (3-SR + SR1) evenly regularly curved and transparent, absent apically at short distance. Parallel vein (CU1a) almost straight and unsclerotised, subinterstitial to mediocubital vein (2-CU1). Recurrent vein (m-cu) forming weak obtuse corner with first radiomedial vein (2-SR). Nervulus (cu-a) short and strongly postfurcal, distance from basal vein (1-M) to nervulus (cu-a) twice nervulus (cu-a) length. Hind wing 4.7 times longer than wide. Second abscissa of costal vein (1-SC+R) completely absent; fourth abscissa of costal vein (SC+R1) almost absent in distal half. Medial (basal) cell antero-distally and submedial (subbasal) cell distally open. Recurrent vein (m-cu) sclerotised, pigmented and almost interstitial.

Legs: Hind femur 3.6 times longer than wide. Hind tarsus 0.9 times hind tibia, its second segment 0.4 times as long as first segment, 0.9 times as long as fifth segment (without pretarsus).

Metasoma: First tergite rather long, weakly and almost linearly widened posteriorly, spiracular tubercles absent, dorsope very small. Apical width of first tergite 1.7 times its minimum width, length approximately 1.6 times its apical width and length of propodeum. Suture between second and third tergites present, but fine, distinct medially and almost absent laterally. Length of second tergite almost equal to its basal width, 1.4 times length of third tergite. Ovipositor compressed, with three arcuate and not equivalent sections in its apical 1/3, distal section longest and crescent. Ovipositor sheath weakly widened to apical quarter, ~ 1.2 times longer than metasoma, 1.5 times longer than mesosoma, 0.7 times as long as fore wing.

Sculpture and pubescence: Head mainly smooth, face weakly rugulose-punctate. Sides of pronotum coarsely reticulate-areolate in lower half and in posterior quarter, mainly smooth on remaining part. Mesoscutum finely rugulose-granulate on anterior vertical part, entirely smooth on posterior horizontal surface; scutellum mainly smooth, rugulose in narrow posterior quarter. Mesopleuron smooth medially and below, rugulose-reticulate anteriorly and ventro-posteriorly. Propodeum entirely reticulate-areolate, areas enlarged posteriorly, without mediolateral areas and posterior transverse carina. Legs smooth. First metasomal tergite densely reticulate-rugulose. Second tergite mainly small reticulate-areolate, smooth on rather large latero-posterior areas. Remaining tergites smooth. Vertex entirely with relatively dense, short and semi-erect yellow setae directed laterally; mesoscutum almost entirely with short and rather densely yellowish setae.

Colour: Body reddish brown to dark reddish brown, metasoma in latero-posterior half almost black; propodeum dorsally and first metasomal tergite paler; mandible, lower median part of prothorax, and metapleuron yellow to yellowish brown. Antennae mainly brown to dark brown, three basal segments brownish-yellow. Palpi pale yellow. Legs yellow to pale brown, hind femur mainly brown. Ovipositor sheath dark brown to black. Wings faintly evenly infusate. Pterostigma dark brown, pale basally at very short distance.

Male. Unknown.

Comparative diagnosis. The new species is similar to *C. (Eu.) breviceps* (Quicke & van Achterberg, 2000), which was described from Malaysia (Sabah) (van Achterberg and Quicke 2000), but differs from the latter species by having the eye in dorsal view ~1.2 times longer than the temple (1.5 times in *C. breviceps*), temple distinctly convex in dorsal view (weakly convex in *C. breviceps*), teeth of the scape distinctly protruding dorsally (weakly protruding in *C. breviceps*), frons with distinct but not high carinae divergent anteriorly (without carinae in *C. breviceps*), mandible with two apical teeth (only with one tooth in *C. breviceps*), area below and behind the mandibular base smooth (rugose-striate in *C. breviceps*), and the second metasomal tergite densely reticulate-areolate (sparsely longitudinally rugose in *C. breviceps*).

Etymology. This species is named after its type locality, Wando Islands

Distribution. Korean Peninsula.

Key to the Asian species of the subgenus *Eucosmophorus*

(Transformed and update after van Achterberg and Quicke 2000)

- 1 Temple short and distinctly narrowed posteriorly in dorsal view; eye 1.2–1.5 times longer than temple (Fig. 5F). First metasomal tergite robust, its length ~ 1.6 times apical width (Fig. 6B). Depression of vertex shallow or very shallow (Fig. 5F).....**2**
- Temple long and weakly narrowed posteriorly in dorsal view; eye 0.6–1.0 times as long as temple (Figs 1D, 3C). First metasomal tergite slender, its length 2.4–2.7 times its apical width (Figs 2C, 3F). Depression of vertex deep (Figs 1D, 3C). – Area behind mandibular base largely smooth (Figs 1E, 3D)**3**
- 2 Eye in dorsal view 1.5 times longer than temple; temple weakly convex. Teeth of scape minute, slightly protruding dorsally. Frons without carinae. Mandible only with one tooth. Area behind and below mandibular base rugose-striate. Second tergite of metasoma sparsely longitudinally rugose. Body length 1.9 mm. Malaysia (Sabah)
..... ***Eu. breviceps* (Quicke & van Achterberg, 2000)**
- Eye in dorsal view 1.2 times longer than temple (Fig. 5F). Teeth of scape medium-sized, distinctly protruding dorsally (Fig. 5E). Frons with distinct but not high carinae divergent anteriorly (Fig. 5E). Mandible with two apical teeth (Fig. 5E). Area below and behind mandibular base smooth (Fig. 5G). Second tergite of metasoma densely reticulate-areolate (Fig. 6B). Body length 2.6 mm. South Korea
..... ***Eu. wandoensis* sp. nov.**
- 3 Head in dorsal view comparatively slender, rather distinctly flat in lateral view. Length of fore wing 1.5 mm. Shape of fused discoidal-radiomedial (disco-submarginal) cell of fore wing comparatively slender, parallel-sided. – Body brown. Body length 2.3 mm. Brunei ***Eu. longiceps* (Quicke & van Achterberg, 2000)**
- Head in dorsal view less slender, less flattened in lateral view (Figs 1E, 3D). Length of fore wing 1.8–2.5 mm. Shape of fused discoidal-radiomedial (disco-submarginal) cell of fore wing variable (Figs 2A, 4A) **4**

- 4 Scape with pair of minute teeth dorsally. Third antennal segment ~ 1.2 times longer than fourth segment. Antennal socket with relatively short acute tooth. Mandible comparatively slender. Mesoscutum largely glabrous medio-anteriorly. Mesosternal sulcus nearly smooth. Body length 2.7 mm. Indonesia (Sulawesi) ***Eu. acutidentatus* (van Achterberg, 2000)**
- Scape with pair of large lobe-shaped teeth dorsally (Figs 1C, 3B). Third antennal segment 1.4–1.6 times longer than fourth segment (except *C. jejuensis* sp. nov.) (Fig. 3E). Antennal socket with large lobe-shaped tooth (Figs 1C, 3B). Mandible wide (Figs 1C, 3B). Mesoscutum largely setose medio-anteriorly (Figs 1H, 3F). Mesosternal sulcus distinctly rugose-reticulate **5**
- 5 First metasomal tergite distinctly constricted posteriorly and comparatively short (Fig. 2C). Second costal vein (1-SC+R) of hind wing largely absent (Fig. 2B). Discoidal-radiomedial (disco-submarginal) cell of fore wing subparallel-sided (Fig. 2A). Antennal sockets brown (Fig. 1C) **6**
- First metasomal tergite almost parallel-sided or weakly widened posteriorly, not constricted posteriorly and comparatively long (Fig. 3F). Second costal vein (1-SC+R) of hind wing at least faintly pigmented (Fig. 4A). Discoidal-radiomedial (disco-submarginal) cell of fore wing more or less distinctly widened anteriorly (Fig. 4A). Antennal sockets mainly pale yellowish (Fig. 3B) **7**
- 6 Head rather bulbous above (lateral view). Upper teeth of scape obtuse apically. First flagellar segment 1.6 times longer than second segment. Second flagellar segment in front view 2.0 times longer than its width and on half wider than first segment. First and second flagellar segments dark brown. Mesosoma 1.8 times longer than its height. Prescutellar depression and precoxal sulcus finely crenulate. Radial vein (r) of fore wing arising weakly before middle of pterostigma. Second metasomal tergite longer, 1.3 times longer than anterior width. Body length 3.5 mm. Malaysia (Sabah) ***Eu. constrictus* (van Achterberg, 2000)**
- Head not distinctly bulbous above (lateral view). Upper teeth of scape subpointed apically (Fig. 1C, E). First flagellar segment 1.2 times longer than second segment (Fig. 1E). Second flagellar segment in front view 2.5 times longer than its width and only weakly wider than first segment (Fig. 1E). First and second flagellar segments yellow (Fig. 1E). Mesosoma 2.1 times longer than its height (Fig. 1I). Prescutellar depression and precoxal sulcus distinctly crenulate (Fig. 1H, I). Radial vein (r) of fore wing arising weakly behind middle of pterostigma (Fig. 2A). Second metasomal tergite shorter, 1.1 times longer than anterior width (Fig. 2C). Body length 3.0 mm. South Korea (Jeju) ***Eu. jejuensis* sp. nov.**
- 7 First flagellar segment in lateral view 4.7 times longer than its apical width. Apical teeth of scape long. Eye in dorsal view 0.6 times as long as temple. Length of mesosoma 1.5 times its height. Prescutellar depression entirely narrow. Areola of propodeum sub-conical-oval shape. First metasomal segment long, 2.7 times longer than distal width. Second metasomal segment 1.3 times longer than its basal width. Body mainly black. Body length 4.2 mm. Indonesia (Sumatra) ***Eu. maximus* (van Achterberg, 2000)**
- First flagellar segment in lateral view 3.5 times longer than its apical width (Fig. 3E). Apical teeth of scape relatively short (Fig. 3B). Eye in dorsal view 0.85 times

as long as temple (Fig. 3C). Length of mesosoma 1.9 times its height (Fig. 3G). Prescutellar depression wide medially and narrow laterally (Fig. 3F). Areola of propodeum semi-round shape. First metasomal segment short, 2.2 times longer than distal width (Fig. 3F). Second metasomal segment as long as its basal width (Fig. 4B). Body mainly brown to dark brown (Fig. 3A). Body length 3.1 mm. Japan (Ryukyus) *Eu. undulatus* (Belokobylskij, 2000)

Genus *Cryptoxilos* Viereck, 1911

Type species. *Cryptoxilos dichromorphus* Viereck, 1911.

This is a relatively small and rare euphorine genus that belong to the tribe Cosmophorini, and currently contains seven described species (Stigenberg et al. 2015; Yu et al. 2016). Members of *Cryptoxilos* are koinobiont endoparasitoids (imagobionts) of bark-boring beetle adults (Curculionidae, Scolytinae) (Shaw 1985; Yu et al. 2016). Species of this genus have been recorded in the Nearctic (2), Neotropical (1), Oceanic (Fiji) (1), Australasian (New Zealand) (1), and Palearctic (2) regions (Shaw 1985; Chen et al. 2001; Shaw and Berry 2005).

The two species of *Cryptoxilos* previously known for the Palearctic region belong to the Old World subgenus *Cryptoxiloides* Čapek & Capecki, 1979, and were described from Europe (Poland) and the Eastern Palearctic (China: Zhejiang) (Čapek and Capecki 1979; Chen et al. 2001). A third species of *Cryptoxilos* (*Cryptoxiloides*) is described here from South Korea (Ulleung Island), with the first record of this genus for the Korean Peninsula.

Cryptoxilos (*Cryptoxiloides*) *ulleungus* sp. nov.

<https://zoobank.org/9C12BF12-8214-4F16-B3FB-A04CEC609414>

Figs 7, 8

Type material. Holotype: female, “Korea (GB), Dosolam, Naesujeon-gil, Ulleung-up, Ulleung-gun, V.27.2017 (Sweeping), Ku Deokseo” (NIBR).

Paratype: 1 female, same label as in holotype (SMNE).

Description. Female. Length of body 1.6–1.8 mm, length of fore wing 1.4–1.6 mm.

Head: Width of head (dorsal view) 1.7–1.9 times its medial length, 1.1 times width of mesoscutum. Occipital carina complete and rather distinct, joining with hypostomal carina weakly upper base of mandible. Temple behind eyes (dorsal view) weakly convex in anterior 1/3–1/2, than distinctly evenly narrowed. Length of eye in dorsal view 1.3–1.4 times length of temple. Ocelli arranged in almost equilateral triangle; POL 1.4–1.6 times OD, 0.4 times OOL. Eye covered by rather long and dense setae. Face narrow and convex, its minimum width 0.6 times width at level of antennal sockets, almost equal to medial height (without clypeus). Clypeus narrow, its width 3.8 times maximum height; ventral margin of clypeus weakly concave. Distance between tentorial pits almost 8.0 times distance between pit and margin of eye. Malar

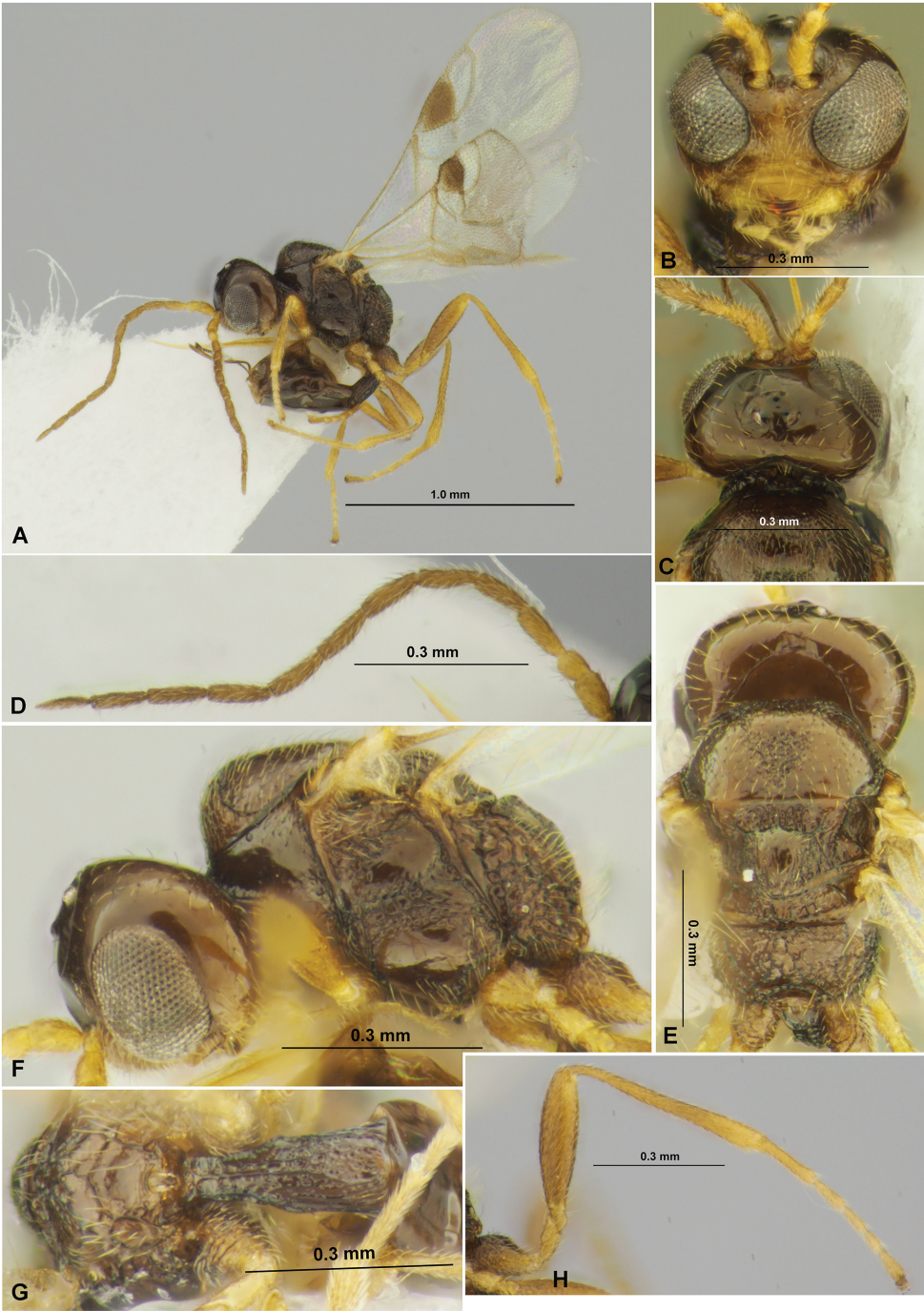


Figure 7. *Cryptoxilos (Cryptoxiloides) ulleungus* sp. nov. (female, holotype **A, C–H**; paratype **B**) **A** habitus, lateral view **B** head, front view **C** head, dorsal view **D** antenna, lateral view **E** mesosoma, dorsal view **F** head and mesosoma, lateral view **G** propodeum and first tergite of metasoma, dorsal view **H** hind leg.



Figure 8. *Cryptoxilos (Cryptoxiloides) ulleungus* sp. nov. (female, holotype) **A** wings **B** hind wing **C** body, lateral view **D** metasoma, lateral view **E** metasoma, dorsal view.

space 0.4 times basal width of mandible. Mandible relatively slender, distinctly twisted in apical half. Length of maxillary palp 0.8 times height of head; maxillary palp with 5 segments, third, fourth and fifth segments almost same length.

Antenna: Antenna 12-segmented, weakly thickened, weakly setiform, 0.7 times as long as body. Scape 1.4–1.5 times longer than wide, 1.3–1.5 times longer than pedicel. First flagellar segment 2.4–2.7 times longer than its maximum width, approximately as long as second segment and wider than it. Length of second flagellar segment 2.8–3.2 times its width. Penultimate segment 3.6–3.7 times longer than wide, almost as long as first and apical segments; apical segment slender and acuminate.

Mesosoma: Length of mesosoma 1.6 times its height. Mesoscutum transverse, weakly protruding anteriorly, 0.6 times as long as maximum width. Notauli distinct, complete, shallow, crenulate-rugulose. Prescutellar suture relatively wide, with six carinae and with dense and fine rugosity between carinae. Scutellum slightly convex, rugose laterally and posteriorly. Precoxal sulcus distinct, wide, long, weakly evenly curved or almost straight, posteriorly fused with mesopleural suture, entirely widely crenulate-rugose. Propodeum postero-medially weakly and widely concave.

Wings: Fore wing 2.6 times longer than wide. Pterostigma wide, 2.0–2.4 times longer than maximum width. Metacarp (1-R1) 0.5 times length of pterostigma. Radial vein (r) arising from middle of pterostigma. First radial abscissa (r) present but very short, first radiomedial vein (2-SR) arising from radial vein (r) closely to pterostigma. First radiomedial vein (2-SR) strongly desclerotised and mainly discolored, incomplete and visible in anterior half only. First abscissa of medial vein (1-SR+M) mainly discolored and curved. Mediocubital vein (M+CU1) sclerotized but distinctly discolored, strongly curved. Nervulus (cu-a) discolored, distinctly postfurcal. Recurrent (m-cu), cubital (1-CU1, 2-CU1, 3-CU1), parallel (CU1a) and second abscissa of longitudinal anal (2-1A) veins absent or strongly desclerotised. Hind wing 4.0–4.3 times longer than wide, its hind margin with long and dense setae. Second abscissa of costal vein (1-SC+R) practically absent. Radial vein (SR) discolored, distinctly curved basally; radial (marginal) cell narrowed distally.

Legs: Hind femur elongate-oval, 3.5–3.7 times longer than its maximum width. Hind tibia rather distinctly widened posteriorly. Hind tarsus almost as long as hind tibia. Basitarsus of hind leg 0.5–0.6 times as long as second to fifth segments combined; second segment 0.5–0.6 times as long as basitarsus, 0.9–1.0 times as long as fifth segment (without pretarsus).

Metasoma: First tergite of metasoma weakly widened distally, its ventral margins not connected below and with distinct gape, 2.3 times longer than its apical width, almost 2.0 times longer than propodeum; maximum apical width 2.0–2.3 times its minimum subbasal width; its spiracular tubercles weakly or distinctly protruding and situated submedially, dorsope and laterope absent. Suture between second and third tergites absent medially on wide distance, shortly present laterally. Combined second and third tergites large, almost complete or mostly covered all posterior tergites; medial length of these tergites 1.8–1.9 times basal width of second tergite, 1.3 times their

maximum width. Ovipositor weakly curved in posterior half, compressed, distinctly narrowed towards apex. Ovipositor sheath relatively long, covered by sparse, long and almost erect setae, 0.45–0.50 times as long as metasoma, 0.6 times as long as mesosoma, 0.25 times as long as fore wing.

Sculpture and pubescence: Temple, vertex and frons smooth, face finely and rather densely punctate. Side of pronotum almost smooth in upper half, remainder distinctly rugose. Mesoscutum densely punctate-granulate anteriorly on vertical surface, mainly smooth on horizontal surface, with wide and dense rugosity in subtriangular medio-posterior area. Scutellum widely smooth. Mesopleuron smooth in large oval upper area below rugose subalar depression and large area below precoxal sulcus. Propodeum entirely rugose-reticulate, sculpture weak in basolateral 1/3. Hind coxa dorsally distinctly coarsely rugose with transverse curved striation; hind femur smooth. First metasomal tergite longitudinally striate, with dense and coarse rugosity between striae; following tergites smooth and glabrous. Vertex almost entirely covered by rather dense, semi-erect pale setae directed in sides, usually glabrous medio-posteriorly. Mesoscutum entirely with dense, semi-erect pale setae. Fore wing entirely densely setose.

Colour: Body dark brown to black, face, clypeus, lower and lateral parts of head dark reddish brown. Palpi and ovipositor yellow. Antenna mainly brown to dark brown, basal three–four segments paler, reddish brown or brownish yellow. Fore and middle coxae yellowish brown, hind coxa dark reddish brown; all femora reddish brown or partly dark reddish brown and paler distally; tibiae and tarsi yellowish brown or pale brown. Wing membrane hyaline with dense dark setae; pterostigma brown or dark brown with short pale basal and apical areas; veins pale brown to nebulous. Ovipositor sheaths dark brown to black.

Male. Unknown.

Comparative diagnosis. This new species is similar to the Chinese *Cryptoxilos* (*Cryptoxiloides*) *pallipes* Chen, He, van Achterberg & Ma, 2001 (Chen et al. 2001), but differs from it by having the eye in dorsal view 1.3–1.4 times longer than the temple (1.8 times in *C. pallipes*), POL 1.4–1.6 times OD (equal to OD in *C. pallipes*), clypeus width 3.8 times its maximum height with its ventral margin weakly concave (only 2.8 times and with its ventral margin straight in *C. pallipes*), first flagellar segment 2.4–2.7 times longer than its maximum width and approximately as long as the second segment (4.0 times longer than its maximum width and 1.2 times longer than second segment in *C. pallipes*), prescutellar suture with dense rugosity between carinae (without rugosity in *C. pallipes*), first radial abscissa (r) of the fore wing present but very short and the first radiomedial vein (2-SR) arising from radial vein (r) very close to the pterostigma (first radial abscissa (r) not developed and the first radiomedial vein (2-SR) arising from pterostigma in *C. pallipes*), first metasomal tergite 2.3 times longer than its apical width (1.8 times in *C. pallipes*), and ovipositor weakly curved in posterior half (straight in *C. pallipes*).

Etymology. This species is named after its type locality, the Ulleung Island in the East Sea.

A key to known species of *Cryptoxilos* (*Cryptoxiloides*)

(Updated after Chen et al. 2001)

- 1 Face of female strongly narrowed submedially and with minimum distance between eyes less than distance between outer margins of antennal sockets. Metacarp (1-R1) of fore wing approximately as long as pterostigma. Shape of last abscissa of radial vein (SRI) of fore wing variable, often partly straight. New World, Australasia, Oceania **Subgenus *Cryptoxilos* Viereck, 1911 (type species: *C. dichromorphus* Viereck, 1911)**
- Face of female moderately narrowed submedially, and with minimum distance between eyes approximately equal to distance between outer margins of antennal sockets (Fig. 7B). Metacarp (1-R1) of fore wing 0.3–0.5 times length of pterostigma (Fig. 8A). Shape of last abscissa of radial vein (SRI) of fore wing distinctly evenly curved (Fig. 8A). Old World. (Subgenus *Cryptoxiloides* Čapek & Capecki, 1979) **2**
- 2 Anterior tentorial pits enlarged and oval. Mesoscutum without rugose subtriangular medio-posterior area. Mesopleuron largely smooth above and below precoxal sulcus. First radiomedial vein (2-SR) of fore wing far separated from base of radial vein (RS). Radial (RS) vein of hind wing less curved basally. Body length 1.7 mm. West Palaearctic (Poland) ***C. (C.) cracoviensis* (Čapek & Capecki, 1979)**
- Anterior tentorial pits normal and round (Fig. 7B). Mesoscutum with wide and densely rugose subtriangular medio-posterior area (Fig. 7E). Mesopleuron largely sculptured with narrow smooth areas above and below precoxal sulcus (Fig. 7F). First radiomedial vein (2-SR) of fore wing situated closely to base of radial vein (RS) or arising from developed first radial abscissa (r) (Fig. 8A). Radial (RS) vein of hind wing distinctly curved basally (Fig. 8B) **3**
- 3 Eye in dorsal view 1.8 times longer than temple. POL equal to OD. Width of clypeus 2.8 times its maximum height and its ventral margin straight. First flagellar segment 4.0 times longer than its maximum width, 1.2 times longer than second segment. First abscissa of radial vein (r) of fore wing not developed, first radiomedial vein (2-SR) arising from pterostigma. First metasomal tergite 1.8 times longer than its apical width. Body length 2.1 mm. East Palaearctic (China) ***C. (C.) pallipes* Chen, He, van Achterberg & Ma, 2001**
- Eye in dorsal view 1.3–1.4 times longer than temple (Fig. 7C). POL 1.4–1.6 times OD (Fig. 7C). Width of clypeus 3.8 times its maximum height, its ventral margin weakly concave (Fig. 7B). First flagellar segment 2.4–2.7 times longer than its maximum width, approximately as long as second segment (Fig. 7D). First abscissa of radial vein (r) of fore wing developed but short, first radiomedial vein (2-SR) arising from radial vein (r) closely to pterostigma (Fig. 8A). First metasomal tergite 2.3 times longer than its apical width (Fig. 7D). Body length 1.6–1.8 mm. East Palaearctic (Korea)..... ***C. (C.) ulleungus* sp. nov.**

Discussion

The cosmopolitan subfamily Euphorinae is one of the most morphologically diverse groups of koinobiont braconid parasitoids, which have a wide range of the host taxa and host developmental stages used for infestation (Tobias 1965, 1966; Shaw 1985; Stigenberg et al. 2015; Yu et al. 2016). The most recent molecular phylogenetic study this subfamily (Stigenberg et al. 2015) recognized 14 tribes in the Euphorinae, though the placement of the genera *Asiacentistes* Belokobylskij, 1995 and *Tainiterma* van Achterberg & Shaw, 2001 within this subfamily was not supported.

Despite the number of publications regarding the Euphorinae parasitoids of the Korean Peninsula (Papp 1990, 1992, 1994, 2003; Belokobylskij and Ku 1998a, 1998b; Belokobylskij 2000a, 2000b; Ku et al. 2001, 2020, An et al. 2014, 2015a, 2015b; Lee et al. 2016, 2018), the knowledge of the fauna of this group is incomplete and new euphorine records together with descriptions of the species new for science continue increasing regularly. Currently, the following tribes and genera were already recorded in the fauna of Korean Peninsula: Centistini (*Allurus* Foerster, 1863, *Asiacentistes* Belokobylskij, 1995 and *Centistes* Haliday, 1835); Cosmophorini (*Cosmophorus* Ratzeburg, 1848 and *Cryptoxilos* Viereck, 1911); Dinocampini (*Dinocampus* Foerster, 1863); Euphorini (*Euphorus* Nees, 1834, *Leiophron* Nees, 1819, *Mama* Belokobylskij, 2000 and *Peristenus* Foerster, 1863); Helorimorphini (*Aridelus* Marshall, 1887, *Chrysopophthorus* Goidanich, 1948 and *Wesmaelia* Foerster, 1863); Meteorini (*Meteorus* Haliday, 1835 and *Zele* Curtis, 1832); Myiocephalini (*Myiocephalus* Marshall, 1898); Neoneurini (*Neoneurus* Haliday, 1838); Perilitini (*Microctonus* Wesmael, 1835, *Orionis* Shaw, 1987, *Perilitus* Nees, 1819, *Rilipertus* Haeselbarth, 1996 and *Spathicopsis* van Achterberg, 1977); Pygostolini (*Pygostolus* Haliday, 1833), Syntretini (*Syntretus* Foerster, 1863), and Townesilitini (*Marshiella* Shaw, 1985, *Streblocera* Westwood, 1833 and *Townesilitus* Haeselbarth & Loan, 1983). On the other hand, some additional euphorine genera previously recorded in the faunas of the Russian Far East, Japan and China also could be found in the fauna of this peninsula, namely *Ropalophorus* Curtis, 1837 (Cosmophorini), *Centistina* Enderlein, 1912 (Dinocampini), *Holdawayella* Loan, 1967 (Helorimorphini), *Elasmosoma* Ruthe, 1858 (Neoneurini) and *Proclithrophorus* Tobias & Belokobylskij, 1981 (Townesilitini).

The current generic composition of the euphorine tribe Cosmophorini is very polymorphic and does not have the combined morphological criteria (diagnostic features) for tribe characteristic and delimitation. Currently, only molecular data (Stigenberg et al. 2015) has allowed union of the following genera, *Cosmophorus*, *Cryptoxilos*, *Plynops*, *Ropalophorus* and *Tuberidelus*, inside this morphologically diverse taxonomic group.

Acknowledgements

The authors are very thankful to Dr Alejandro Zaldívar-Riverón (México City, México) and Dr Konstantin G. Samartsev (St Petersburg, Russia) for their useful

suggestions and comments on the first version of the manuscript. We are grateful to Mrs. Kyoungim Kim, Ms Hyojin Jeong and Ms. Jaehyeon Lee for braconid specimens preparation.

This work was funded in part by the State Research Project No 122031100272-3 for SAB, and 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 (NIBR201701203, NIBR201801201, and NIBR 202300000) for DSK.

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