

***Lasioglossum (Acanthalictus) dybowskii* (Hymenoptera, Halictidae) newly recorded from South Korea, with a checklist of the genus *Lasioglossum* in Korean Peninsula**

Ryuki Murao¹, Heung-Sik Lee², Osamu Tadauchi¹

1 Department of Biological Sciences, Faculty of Sciences, Kyushu University, Fukuoka, 812–8581 Japan **2** Animal and Plant Quarantine Agency, 8 Jungang daero 30–gil, Junggu, Busan Metropolitan City, Korea 600–016

Corresponding author: Ryuki Murao (r.murao@mbr.nifty.com; murao.ryuki.969@m.kyushu-u.ac.jp)

Academic editor: S. Schmidt | Received 22 March 2014 | Accepted 24 April 2014 | Published 12 June 2014

<http://zoobank.org/6057F539-C5EF-4BCD-862C-2AF0AB4516BB>

Citation: Murao R, Lee H-S, Tadauchi O (2014) *Lasioglossum (Acanthalictus) dybowskii* (Hymenoptera, Halictidae) newly recorded from South Korea, with a checklist of the genus *Lasioglossum* in Korean Peninsula. Journal of Hymenoptera Research 38: 141–153. doi: [10.3897/JHR.38.7572](https://doi.org/10.3897/JHR.38.7572)

Abstract

Lasioglossum (Acanthalictus) dybowskii is recorded from South Korea for the first time. The species is re-described, and drawings and photographs of taxonomically important characters are added. Bionomical data such as flight and flower records and habitat are reported. A checklist of the genus *Lasioglossum* in the Korean Peninsula is presented.

Keywords

Hymenoptera, Halictidae, *Lasioglossum*, *Acanthalictus*, Korean Peninsula, checklist

Introduction

The halictine bee subgenus *Acanthalictus* Cockerell of the genus *Lasioglossum* Curtis (Halictidae, Halictinae) is a monotypic group and is known only from the Far East Asia (Michener 2007). It is also placed in the *Hemihalictus* series (weak-veined *Lasioglossum*) because of the weak second submarginal vein of the female fore wing. According to recent phylogenetic analyses based on molecular data, this informal group is monophyletic (Danforth et al. 2003; Gibbs et al. 2012). However, the systematics

in *Hemihalictus* series are not clear, due to lack of adequate study on the phylogenetic relationships and definition of each included subgenus.

First author, Murao, had the opportunity to examine specimens of *Acanthalictus* collected in Eastern Asia. In the course of his examination, he found *L. dybowskii* from South Korea, never before recorded from that area. In this paper, we report the new locality data of *L. dybowskii* in the Korean Peninsula, provide a redescription and some bionomical notes for the future reconstruction of systematic and phylogenetic analysis. We also give a checklist of Korean *Lasioglossum* that will be useful in promoting the study of Korean halictine bee fauna.

Material and methods

This study is based on the specimens deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan (ELKU), the late Dr. Shoichi F. Sakagami's collection deposited in the Museum of Nature and Human Activities, Hyogo, Japan (MNHAH), the Plant Quarantine Technology Center, Suwon, South Korea (QIA), and the first author's private collection (without abbreviation). Terminology used in the description follows Murao and Tadauchi (2007), partly Sakagami and Tadauchi (1995), and Gibbs (2010). Abbreviations used in the text are as follows: BL = body length; WL = wing length; HL = head length; HW = head width; IOD = interocular distance; OOD = ocellular distance; OCD = ocelloccipital distance; UOD = upper interorbital distance; MOD = maximum interorbital distance; LOD = lower interorbital distance; IAD = interantennal distance; AOD = antennocular distance; CAL = clypealveolar distance; CPL = clypeal length; EL = eye length; EW = eye width; GW = genal width; SPL = scape length; Fn = nth antennal flagellomere; FnL = length of nth flagellomere; FnW = width of nth flagellomere; MsW = mesosomal width; SCL = mesoscutellar length; MNL = metanotal length; MPL = metapostnotal length; MtW = metasomal width; Tn = nth metasomal tergum; Sn = nth metasomal sternum; IS = interspace between punctures (e.g., IS 0.5d means $\frac{1}{2}$ of the diameter of a puncture); PP = punctures. Body measurements are given in ranges followed by the average and standard deviation.

Taxonomy

The subgenus *Acanthalictus* Cockerell, 1924

Acanthalictus Cockerell, 1924: 184. Type species: *Halictus dybowskii* Radoszkowski, 1876, by original designation.

Evylaeus (*Acanthalictus*): Pesenko 2007a: 16–17.

Diagnosis. This subgenus is characterized in having the following features: 1) lower margin of clypeus reflected forward (Fig. 5); 2) female mandible with two apical teeth (Fig. 6); 3) basal elevation of male labrum high swelled, with longitudinal furrow

(Fig. 8); 4) male S2 gently swelled on apical part (Fig. 15); and 5) male S6 expanded apically as in Fig. 20 (Michener 2007; Pesenko 2007a). In this study, we noticed an additional apparently unique character, namely the female labrum lacking basal elevation (Fig. 7). The comparative morphological study of labrum has not been performed yet in the genus *Lasioglossum*, but this character state may be an autoapomorphy.

***Lasioglossum (Acanthalictus) dybowskii* (Radoszkowski, 1876)**

http://species-id.net/wiki/Lasioglossum_dybowskii

Figs 1–17, 19–25

Halictus dybowskii Radoszkowski, 1876: 110 [Lectotype: Institute of Systematic and Experimental Zoology, Polish Academy of Sciences, Krakow, Poland; ♀, Amur (Khabarovsk Terr., Russia designated by Pesenko 2007b: 107),]; Cockerell 1924: 582 [♂].

Halictus griseipennis Cockerell, 1924: 185 [Holotype: U. S. National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA; ♀, Kongaus (Primorsky Terr., Anisimovka, Russia). Synonymy by Ebmer (1978a).

Evyllaenus (Acanthalictus) dybowskii: Pesenko 2007b: 91 [in key], 107 [lectotype designated].

Lasioglossum (Evyllaenus) dybowskii: Ebmer 1978a: 209, 211; Ebmer 1996: 284–285; Ebmer 2006: 568.

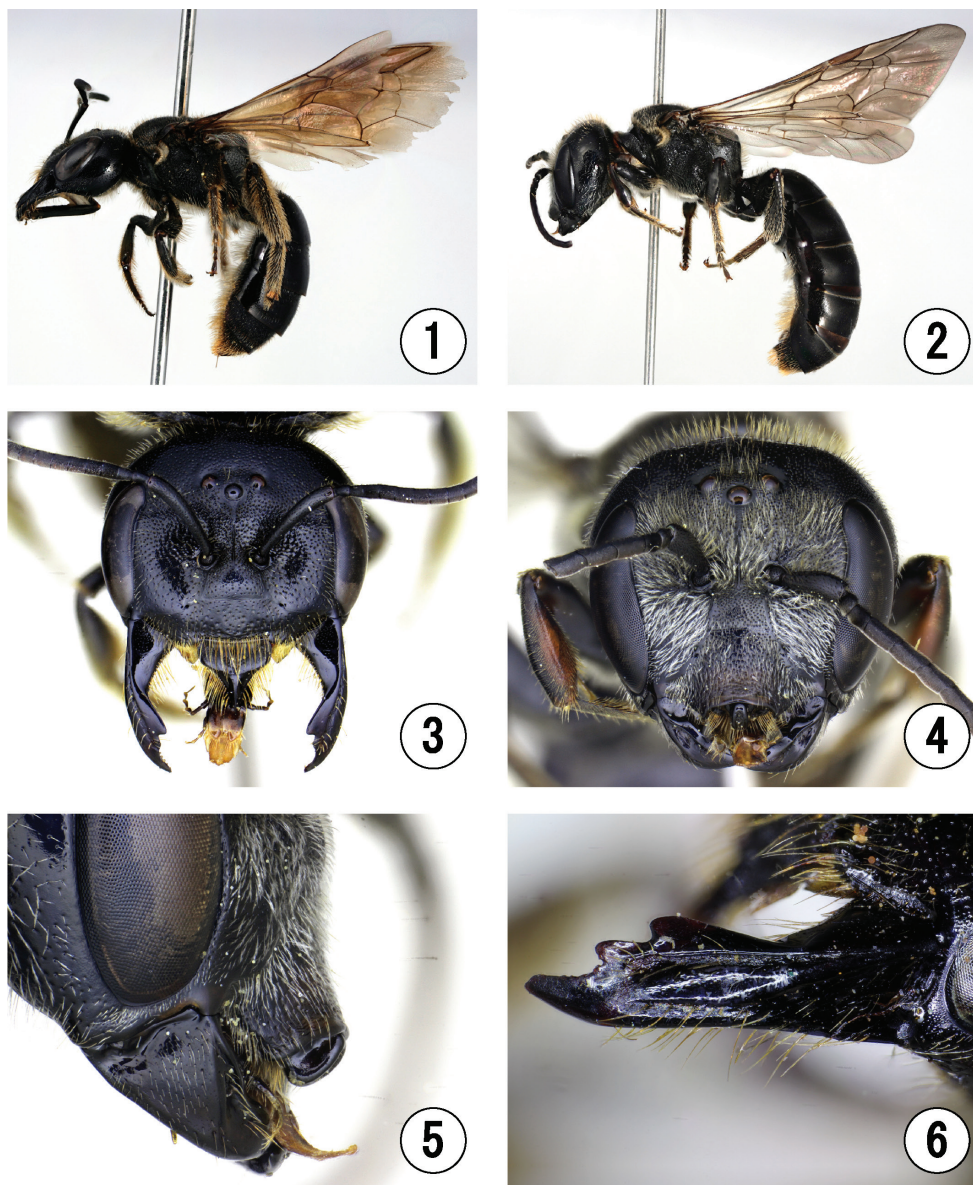
Specimens examined. [NORTH KOREA] **Gangwon-do:** 1 ♀, Mt. Kongôsan (= Mt. Kumgangsân), 8. ix. 1931 (C. Takeya, ELKU, illustrated in Fig. 6). [SOUTH KOREA] **Gangwon-do:** 2 ♀, Mt. Gariwangsan, alt. 1100m, Jeongseon-gun, N37°27'15", E128°1'10", 10. vi. 2013 (O. Tadauchi leg., ELKU); Mt. Gariwangsan, Jeongseon-gun, 3 ♀, 30. vii. 2013 (HS. Lee, QIA), 2 ♀ 1 ♂, 30. vii. 2013 (R. Murao, 1 ♀ illustrated in Figs 11, 13, 1 ♀ in Figs 1, 3, 9–10, 12–19, 1 ♂ in Figs 2, 4–5, 14–16, 20, 22–25); 1 ♀, Mt. Odaesan, alt. 900m, N37°47'0", E128°32'19", 9. vi. 2013 (O. Tadauchi, ELKU); 2 ♀, Jingogae, Mt. Odaesan, 27. vii. 2001 (HS. Lee, QIA); BougMyong-ri, DongSan-myon, ChunChon-gun, 1 ♀, 26. iv. 1992 (O. Tadauchi, ELKU), 1 ♀, 22. v. 1992 (O. Tadauchi, ELKU, illustrated in Fig. 7); 5 ♀, Hwangiri, Seo-myeon, Yangyang-gun, N37°56'25.8", E128°31'19.7", 29. iv. 2007 (HS. Lee, QIA); 2 ♀, Sangwonsa Temple, Mt. Chiaksan, Seongnam-ri, Sinlim-myeon, Wonju, 26. v. 2009 (HS. Lee, QIA). **Gyeonggi-do:** 3 ♀, KwangNung, Pochon-gun, 18. v. 1992 (O. Tadauchi, ELKU). [CHINA] 1 ♂, Mandschurei, Gaolinsza, 10–14. ix. 1953 (V. Alin, MNHAH, illustrated in Figs 8, 21).

Distribution. Russian Far East, northeastern China, Korean Peninsula (north, south= new record).

Published records for Korean Peninsula. North Korea: Ebmer (1996).

Flight period. Female: April to September. Male: July to September.

Flower records. This species visited the following 9 species in 7 families listed as follows. Apiaceae: *Angelica anomala*. Asteraceae: *Cirsium japonicum*, *Taraxacum* sp. Brassicaceae: *Sisymbrium luteum*. Caprifoliaceae: *Viburnum erosum*. Fabaceae: *Lespedeza* sp. Oleaceae: *Ligustrum japonicum*. Rosaceae: *Crataegus* sp., *Neillia incise*.



Figures 1–6. *Lasioglossum (Acanthalictus) dybowskii* (Radoszkowski). 1–2 lateral habitus 3–4 head in frontal view 5 clypeus in lateral view 6 teeth of mandible. 1, 3, 6 female; 2, 4, 5 male.

Habitat in South Korea. One of the collecting sites (Mt. Gariwangsan) for this species is shown in Fig. 18. This site is mountain covered by both broad-leaved and coniferous forests. This species was collected on the flower of *Angelica anomala* (Fig. 17) at the forest edge.

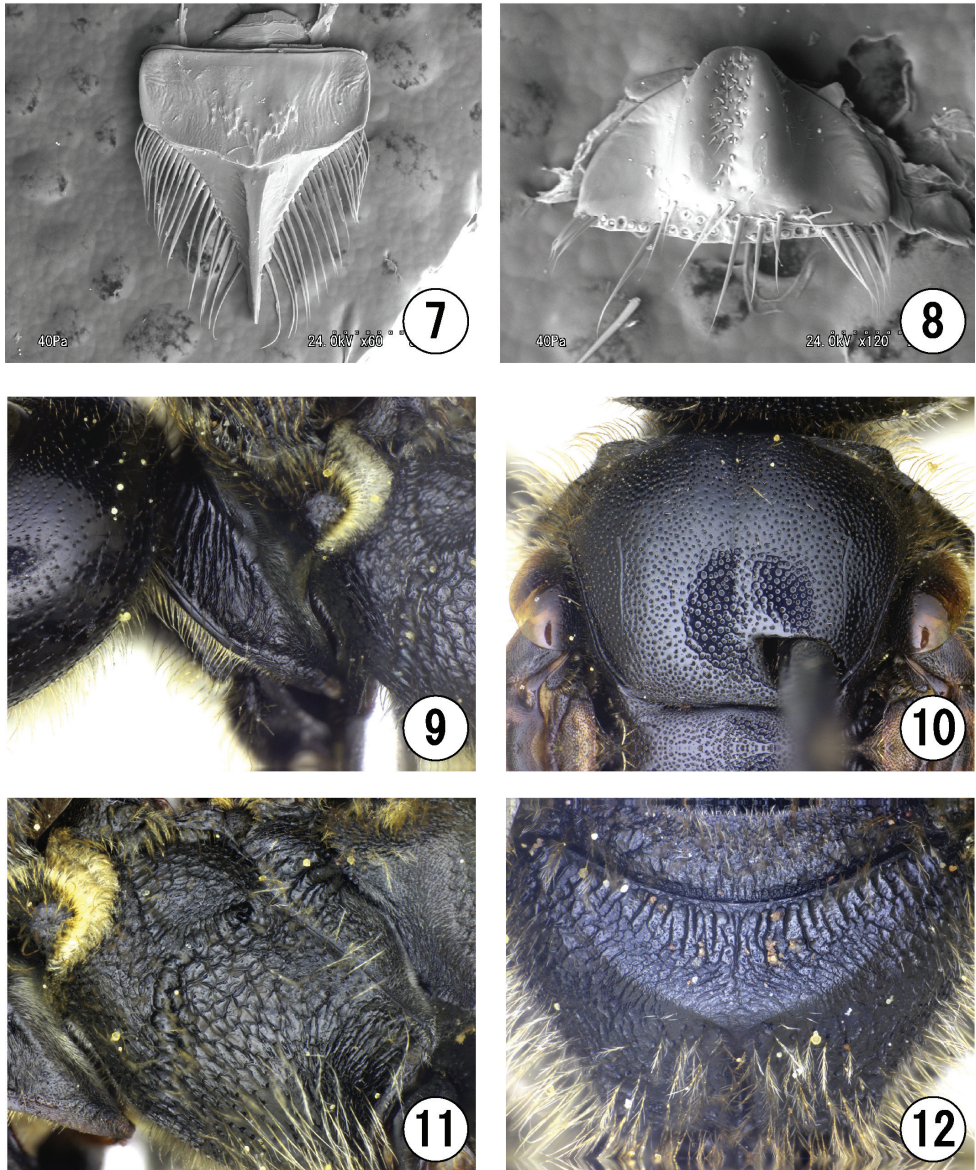
Redescription. Female. Coloration. Body black except for the following parts: flagellum dark brown or brown ventrally; tegula blackish brown, translucent; tibial spur yellow; wings transparent and dim, veins and stigma brown or blackish brown.

Pubescence. Body seta whitish to pale yellowish. Head with sparse erect setae. Mesosoma with sparse erect fine branched setae, and pronotum with thin tomentum marginally; hind trochanter to tibia with dense plumose or fine branched setae, forming scopa. T1 basally with sparse erect setae. T2–T3 basolateral with thin whitish appressed setae, forming basal setal bands. Discs of T2–T4 with sparse, short setae. Discs on S2–S5 with sparse semi-erect setae.

Measurements (n = 5): BL = 13.14–15.86 (14.06±1.09), WL = 11.43–13.00 (12.29±0.74); HL = 3.25–3.50 (3.32±0.12), HW = 3.80–4.40 (4.03±0.24), IOD = 0.48–0.55 (0.52±0.03), OOD = 0.80–1.00 (0.88±0.08), OCD = 1.15–1.40 (1.25±0.01), UOD = 2.55–2.90 (2.66±0.16), MOD = 2.90–3.35 (3.04±0.19), LOD = 2.93–3.38 (3.08±0.18), IAD = 0.40–0.55 (0.47±0.06), AOD = 0.95–1.15 (1.01±0.08), CAL = 0.42–0.48 (0.46±0.03), CPL = 0.61–0.66 (0.64±0.02), EL = 2.00–2.25 (2.09±0.10), EW = 0.75–0.85 (0.79±0.04), GW = 1.20–1.48 (1.28±0.12), SPL = 1.48–1.77 (1.60±0.11), F1L = 0.23 (0.23±0.00), F2L = 0.23 (0.23±0.00), F3L = 0.23 (0.23±0.00), F2W = 0.23–0.26 (0.23±0.01); MsW = 3.55–3.80 (3.71±0.12), SCL = 0.43–0.48 (0.45±0.02), MNL = 0.23–0.28 (0.25±0.02), MPL = 0.25–0.28 (0.26±0.01); MtW = 4.20–4.75 (4.44±0.22).

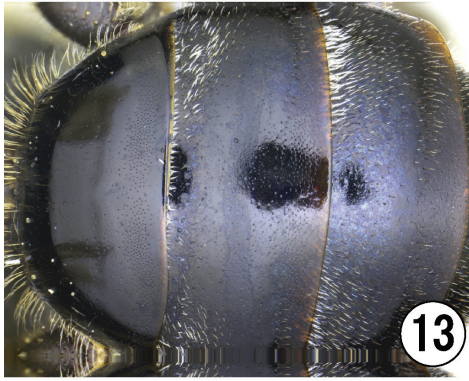
Structure and sculpture. Head wider than long; HW:HL = 1:0.82. Vertex flat in frontal view. MOD:UOD:LOD = 1:0.88:1.01. IOD:OOD:OCD = 1:1.69:2.40. IAD:AOD = 1:2.15. PP between ocellocular area and vertex moderately dense, IS smooth (IS = 1–3d). Paraocular area with moderately dense PP, IS smooth; PP on lower paraocular area sparser than on upper ones (IS = 1–1.5d in upper, = 1–3d in lower areas). Frons with dense PP, IS smooth (IS = 0.5–1.5d). Supraclypeus slightly convex, with PP becoming gradually sparse lower part, IS smooth. CPL:CAL = 1:0.72. Clypeus flat and inclined, with sparse PP, IS smooth (IS = 1.5–5d). EW:GW = 1:1.61. Genal area with moderately dense PP, IS smooth (IS = 1–3d). Malar space linear. Occiput not carinate. Postgena slanting, with sparse PP and weak tessellation. Hypostomal carinae nearly parallel. Mandible long, approximately 1.3 × as long as EL. Labrum (Fig. 7): basal area approximately 2 × wider than long; distal process approximately 1.4 × as long as basal area, triangular, and without lateral projection; distal keel narrow, pointed apically. Antenna short, not reaching metasoma. F1–F3L:F2W = 1:1.00:1.00:1.03.

Dorsolateral angle of pronotum obtuse; lateral surface with oblique ridges on anterior half (Fig. 9); lateral ridge absent; lateral lobe rounded. Mesoscutum (Fig. 10) with dense PP, but PP on disc sparser than laterally (IS = 1–2d on disc, = 0.5–1d in the remainder); mesoscutum anteriorly shallowly depressed along middle parapsidal line; parapsidal line a narrow groove. Mesoscutellum similarly sculptured as mesoscutum. Metanotum rugulose. Mesepisternum (Fig. 11) reticulate-rugulae over entire surface. SCL:MNL:MPL = 1:0.56:0.59. Propodeum: metapostnotum (Fig. 12) with



Figures 7–12. *Lasioglossum (Acanthalictus) dybowskii* (Radoszkowski). **7–8** labrum **9** lateral surface of pronotum **10** mesoscutum **11** mesepisternum **12** metapostnotum. **7, 9–12** female; **8** male.

longitudinal ridges that do not attain posterior margin, posteriorly weakly rugulose, posterior margin not carinate; dorsolateral slope with oblique ridges; lateral and posterior surfaces rugulose; posterior surface with lateral carinae on lower half, without oblique carina. Coxae of usual shape, without tubercle. Fore trochanter narrow, longer than wide. Basitibial plate of hind leg carinate marginally. Inner hind tibial spur serrate (Fig. 19). Fore wing with three submarginal cell.



Figures 13–18. *Lasioglossum (Acanthalictus) dybowskii* (Radoszkowski). **13–14** 1st to 3rd metasomal terga **15** 2nd metasomal sternite in lateral view (arrow indicate) **16** setae on metasomal sternite **17** female on the flower of *Angelica anomala* **18** collecting site at Mt. Gariwangsan, South Korea. **13, 17** female; **14–16** male.

T1–T3 as in Fig. 13: disc of T1 medially with sparse fine PP, apically with moderately dense fine PP, and without lineolation over entire surface; discs of T2–T3 basally with sparse fine PP, the remaining parts sculptured similarly to T1. Disc of T4 with

moderately dense PP and very weak tessellation over entire surface. Metasomal sterna not modified.

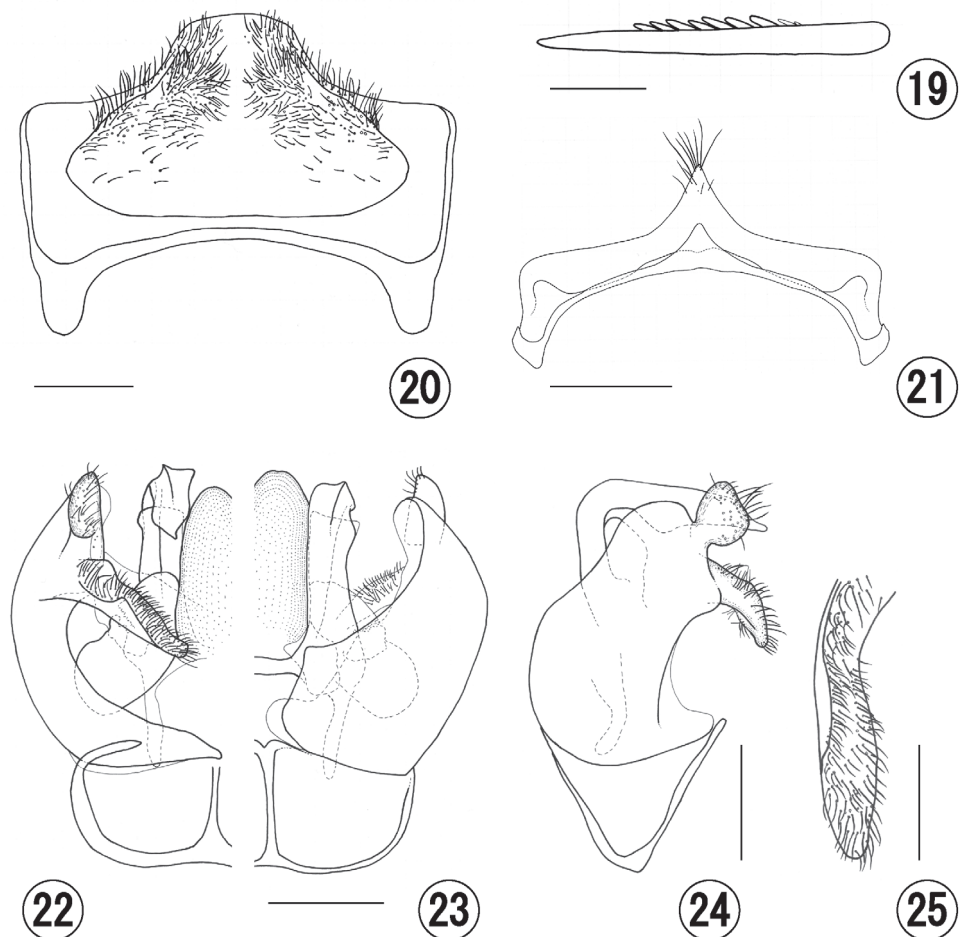
Male. Coloration. Body black except the following parts: clypeus slightly dark yellow on lower half; flagellum dark brown ventrally; pronotum anteriorly yellowish brown; tegula blackish brown, translucent; fore tibia reddish brown on outer surface; tibial spur yellow; wings transparent, veins and stigma pale brown.

Pubescence. Body setae whitish to pale yellowish. Head with sparse erect setae except for lower paraocular area that is covered with thin tomentum. Mesosoma with sparse erect fine branched setae, and pronotum with thin tomentum marginally. T1 basally with sparse erect setae. T2–T3 basolateral with thin whitish appressed setae. S2–S5 as in Fig. 16: S2 apicolaterally with sparse semi-erect fine branched setae; S3–S5 laterally with erect fine branched seta tufts; setae on S5 longer than on other sterna.

Measurements (n = 1, unit mm): BL = 17.14, WL = 13.14; HL = 3.70, HW = 3.75, IOD = 0.55, OOD = 0.85, OCD = 1.30, UOD = 2.50, MOD = 2.70, LOD = 2.25, IAD = 0.5, AOD = 0.7. CAL = 0.40, CPL = 0.94, EL = 2.40, EW = 0.85, GW = 1.25, SPL = 0.81, F1L = 0.26, F2L = 0.42, F3L = 0.42, F2W = 0.26; MsW = 3.70, SCL = 0.80, MNL = 0.50, MPL = 0.63; MtW = 3.85.

Structure and sculpture. Head as long as wide; HW:HL = 1:0.99. Vertex flat in frontal view. MOD:UOD:LOD = 1:0.93:0.83. IOD:OOD:OCD = 1:1.55:2.36. IAD:AOD = 1:1.4. PP between ocellocular area and vertex moderately dense, IS smooth (IS = 1–3d). Paraocular area with dense PP, IS smooth; PP on lower paraocular area sparser than on upper one (IS ≤ d in upper part, IS ≤ d or 0.5–2d in lower part). Frons with reticulate PP. Supraclypeus weakly convex with dense PP, IS smooth (IS = 1–1.5d). CPL:CAL = 1:0.43. Clypeus with dense PP, IS smooth (IS = 0.5–1.5d). EW:GW = 1:1.47. Malar space short, 0.19 × as long as mandible at base. Genal area sparsely punctuate, IS = 1–8d. Occiput not carinate. Postgena slanting, with sparse PP and weak tessellation. Hypostomal carinae nearly parallel. Mandible edentate (without subapical tooth) and robust. Labrum without distal process. Antenna short, not reaching metasoma. F1–F3L:F2W = 1:1.63:1.63:1.00, F2L:F2W = 1:0.62; flagellum nearly flattened ventrally.

Dorsolateral angle of pronotum obtuse; lateral surface with oblique ridges on anterior half; lateral ridge absent; lateral lobe rounded. Tegula ovoid, with shallow and moderately dense PP (IS = 1–2d) on anterior half. Mesoscutum and mesoscutellum with dense PP over entire surface, IS smooth (IS = 1–1.5d); mesoscutum anteriorly deeply depressed along middle parapsidal line; parapsidal line a narrow groove. Metanotum and mesepisternum reticulate-rugulose over entire surface. SCL:MNL:MPL = 1:0.63:0.78. Propodeum: metapostnotum with irregular sinuate ridges that not attain posterior margin, posteriorly weakly rugulose, posterior margin not carinate; dorsolateral slope and lateral surface reticulate-rugulose; posterior surface with lateral carinae on lower half, without oblique carina, and with many oblique ridges over entire surface. Fore trochanter rounded and narrow, longer than wide. Hind tibia without basitibial plate. Hind basitarsus slender, approximately 6 × as long as wide. Inner hind tibial spur finely serrate. Fore wing with three submarginal cell.



Figures 19–25. *Lasioglossum (Acanthalictus) dybowskii* (Radoszkowski). **19** inner hind tibial spur **20** 6th metasomal sternum **21** 7–8th metasomal sterna **22** genitalia in ventral view **23** genitalia in dorsal view **24** genitalia in lateral view **25** ventral retrorse lobe of genitalia, **19** female; **20–25** male. Scale bars: **19**, **25**= 0.25 mm; **20–24**= 0.5 mm.

T1–T4 (Fig. 14 in T1–T3): disc of T1 medially and apically with fine PP that become gradually denser toward apical part, without lineolation; T2–T4 similarly punctuate as T1 nearly over entire surface, IS smooth. S7–S8 (Fig. 21): S7 with short and triangular median process; median process of S8 triangular, with sparse simple setae.

Genitalia (Figs 22–25): gonobase flat at the bottom, ventral arms not connected with each other at upper ends; gonocoxite smooth, and inner dorsal margin angulate at the approximately basal one-third; gonostylus located at ventral side of gonocoxite, and with sparse short setae; ventral retrorse lobe slender, not reaching gonobase, rounded apically, and with dense short setae.

A checklist of the genus *Lasioglossum* in Korean Peninsula

Forty species of *Lasioglossum* in total have been recorded from the Korean Peninsula by various researchers (Ebmer 1978b, 1995, 1996, 2006; Ebmer et al. 2006; Lee et al. 1999; Murao 2011; Murao and Tadauchi 2007, 2008, 2011; Pesenko 2006, 2007b). *Lasioglossum problematicum* (Blüthgen) known from Far East Asia is also recorded from North Korea by Ebmer (1978b) based on female specimens. After that, Pesenko (2007b) regarded the continental records of *L. problematicum* as *L. virideglaucum* Ebmer and Sakagami. Females of *L. problematicum* and *L. virideglaucum* cannot be distinguished from each other (Ebmer 2006; Murao et al. 2006), and the distribution of these species should be verified based on male specimens or a DNA analysis. In the following list, *Lasioglossum nipponicola* Sakagami and Tadauchi, *L. gorkiense* (Blüthgen), and *L. koreanum* Ebmer are synonymized by Pesenko (2006) as follows: *L. nipponicola* = *L. agelastum* Fan & Ebmer, *L. gorkiense* = *L. scitulum* (Smith), and *L. koreanum* = *L. occidens* (Smith). However, these synonymies need to be revised in a future study.

Lasioglossum series (strong-veined *Lasioglossum*)

1. *Lasioglossum denticolle* (Morawitz, 1891): North Korea (Ebmer 1978b)
2. *Lasioglossum exiliceps* (Vachal, 1903): North Korea (Ebmer 1996)
3. *Lasioglossum formosae* (Strand, 1910): North Korea (Ebmer 1978b). Pesenko (2006) recorded it from “Chanpen, Korean Peninsula”.
4. *Lasioglossum gorkiense* (Blüthgen, 1931): North Korea (Ebmer 1978b)
5. *Lasioglossum kansuense* (Blüthgen, 1934): North Korea (Ebmer 1978b)
6. *Lasioglossum koreanum* Ebmer, 1978: North Korea (Ebmer 1978b)
7. *Lasioglossum nipponicola* Sakagami & Tadauchi, 1995: South Korea (Lee et al. 1999; Ebmer 2006)
8. *Lasioglossum primavera* Sakagami & Maeta, 1990: South Korea (Murao and Tadauchi 2011)
9. *Lasioglossum proximatum* (Smith, 1879): North Korea (Ebmer 1996)
10. *Lasioglossum subopacum subopacum* (Smith, 1853): South Korea (Murao 2011)
11. *Lasioglossum sutshanicum* Pesenko, 1986: North Korea (Ebmer 1996)
12. *Lasioglossum upinense* (Morawitz, 1890): North Korea (Ebmer 1996)

Hemihalictus series (weak-veined *Lasioglossum*)

13. *Lasioglossum affine* (Smith, 1853): North and South Korea (Ebmer 1978b; Murao and Tadauchi 2007; Pesenko 2007b)
14. *Lasioglossum albipes* (Fabricius, 1781): North Korea (Ebmer 1978b)
15. *Lasioglossum apristum* (Vachal, 1903): North and South Korea (Ebmer 1978b, 1995; Murao and Tadauchi 2007)
16. *Lasioglossum baleicum* (Cockerell, 1937): North and South Korea (Ebmer 1978b, 2006; Murao and Tadauchi 2007)
17. *Lasioglossum calceatum* (Scopoli, 1763): North Korea (Ebmer 1978b)
18. *Lasioglossum duplex* (Dalla Torre, 1896): South Korea (Murao and Tadauchi 2007)

19. *Lasioglossum dybowski* (Radoszkowski, 1876): North and South Korea (Ebmer 1996; present study)
20. *Lasioglossum ellipticeps* (Blüthgen, 1923): North Korea (Ebmer 1978b)
21. *Lasioglossum fratellum betulae* Ebmer, 1978: North Korea (Ebmer 1978b)
22. *Lasioglossum hoffmanni* (Strand, 1915): North and South Korea (Ebmer 1978b, 1995, as *L. vulsum*; Murao and Tadauchi 2007)
23. *Lasioglossum kankauchare* (Strand, 1914): North Korea (Ebmer 1978b)
24. *Lasioglossum kiautshouense* (Strand, 1910): North Korea (Ebmer 1978b, 1996)
25. *Lasioglossum nipponense* (Hirashima, 1953): South Korea (Ebmer 2006; Murao and Tadauchi 2007)
26. *Lasioglossum pallilomum* (Strand, 1914): North and South Korea (Ebmer 1996, 2006)
27. *Lasioglossum percrassiceps* (Cockerell, 1931): South Korea (Murao and Tadauchi 2007)
28. *Lasioglossum problematicum* (Blüthgen, 1923) or *Lasioglossum virideglaucum* Ebmer & Sakagami, 1994: North Korea (Ebmer 1978b)
29. *Lasioglossum rufitarse* (Zetterstedt, 1838): North Korea (Ebmer 1978b)
30. *Lasioglossum sakagami* Ebmer, 1978: North Korea (Ebmer 1978b)
31. *Lasioglossum sibiriacum* (Blüthgen, 1923): North and South Korea (Ebmer 1978b, 1995; Murao and Tadauchi 2007)
32. *Lasioglossum simplicior* (Cockerell, 1931): North Korea (Ebmer 1978b)
33. *Lasioglossum speculinum* (Cockerell, 1925): North Korea (Ebmer 1978b)
34. *Lasioglossum subfratellum* (Blüthgen, 1934): North Korea (Ebmer 1995)
35. *Lasioglossum subfulvicorne subfulvicorne* (Blüthgen, 1934): North Korea (Ebmer 1978b as *L. austriacum* Ebmer; Ebmer 1995)
36. *Lasioglossum taeniolellum* (Vachal, 1903): North Korea (Ebmer 1978b)
37. *Lasioglossum transpositum* (Cockerell, 1925): South Korea (Murao and Tadauchi 2008)
38. *Lasioglossum villosulum trichopse* (Strand, 1914): North Korea (Ebmer 1978b)
39. *Lasioglossum viridellum* (Cockerell, 1931): North Korea (Ebmer 1978b)
40. *Lasioglossum vulsum* (Vachal, 1903): North Korea (Ebmer 1995, as *L. trispine*; Ebmer et al. 2006)

Acknowledgements

We express our thanks to Dr. Layne Westover (Kyushu University) for his kindness in brushing up an early draft. Murao expresses his thanks to Dr. Maxim Yu. Proshchalykin (Institute of Biology and Soil Science, Far Eastern Branch of Russian Academy of Sciences, Vladivostok, Russia) for sending a valuable reference. This research was supported in part by the JSPS Institutional Program for Young Researcher Overseas Visits (to Murao), the Environment Research and Technology Development Fund (S-9-2(8)) of the Ministry of the Environment, Japan (to Tadauchi), and the Grant-in-Aid for Scientific Research (B) from the Japan Society for the Promotion of Science (No. 24405016) (Head Investigator: Tadauchi).

References

- Cockerell TDA (1924) Descriptions and records of bees—CI. Annals and Magazine of Natural History (9) 14: 179–185. doi: 10.1080/00222932408633105
- Danforth BN, Conway L, Ji S (2003) Phylogeny of eusocial *Lasioglossum* reveals multiple losses of eusociality within a primitively eusocial clade of bees (Hymenoptera: Halictidae). Systematic Biology 52: 23–36. doi: 10.1080/10635150390132687
- Ebmer AW (1978a) Die Halictidae der Mandschurei (Apoidea, Hymenoptera). Bonner zoologische Beiträge 29: 183–221.
- Ebmer AW (1978b) Die Bienen der Gattungen *Halictus* Latr., *Lasioglossum* Curt. und *Dufourea* Lep. (Hymenoptera, Halictidae) aus Korea. Annales Historico-Naturales Musei Nationalis Hungarici 70: 307–319.
- Ebmer AW (1995) Asiatische Halictidae, 3. Die Artengruppe der *Lasioglossum* carinate-*Evyllaesus* (Insecta: Hymenoptera: Apoidea: Halictidae: Halictinae). Linzer biologische Beiträge 27: 525–652.
- Ebmer AW (1996) Asiatische Halictidae, 5. Daten zur Aculeaten-Fauna der Ussuri-Region unter Berücksichtigung der angrenzenden Gebiete (Insecta: Hymenoptera: Apoidea: Halictidae: Halictinae). Linzer biologische Beiträge 28: 261–304.
- Ebmer AW (2006) Daten zur Aculeaten-Fauna der Ussuri-Region unter Berücksichtigung der angrenzenden Gebiete—2. Arten der Gattungen *Halictus*, *Lasioglossum*, *Dufourea*, *Macropis* aus dem Lazovski Zapovednik – Naturreservat Laso (Insecta: Hymenoptera: Apoidea: Halictidae: Halictinae, Melittidae). Linzer biologische Beiträge 38: 541–593.
- Ebmer AW, Murao R, Tadauchi O (2006) Taxonomic notes on *Lasioglossum* (*Evyllaesus*) *vulsum* (Vachal, 1903) (Hymenoptera, Halictidae). Esakia 46: 31–33.
- Gibbs J (2010) Revision of the metallic species of *Lasioglossum* (*Dialictus*) in Canada (Hymenoptera, Halictidae, Halictini). Zootaxa 2591: 1–382.
- Gibbs J, Brady SG, Kanda K, Danforth BN (2012) Phylogeny of halictine bees supports origin of eusociality for *Halictus* and *Lasioglossum* (Apoidea: Anthophila: Halictidae). Molecular Phylogenetics and Evolution 65: 926–939. doi: 10.1016/j.ympev.2012.08.013
- Lee HS, Kim HT, Woo KS (1999) One newly recorded species of the genus *Lasioglossum* Curtis (Hymenoptera: Halictidae). Korean Journal of Apiculture 14: 32–34.
- Michener CD (2007) The Bees of the World, 2nd ed. John Hopkins University Press, Baltimore, Maryland, xvi + [1] + 953pp.
- Murao R (2011) Taxonomic notes on *Lasioglossum* (*Lasioglossum*) *subopacum* (Smith) and *L.* (*L.*) *okinawa* Ebmer et Maeta (Hymenoptera, Halictidae) from Asia. Zookeys 143: 83–92. doi: 10.3897/zookeys.143.2077
- Murao R, Tadauchi O (2007) A revision of the subgenus *Evyllaesus* of the genus *Lasioglossum* in Japan (Hymenoptera, Halictidae) Part I. Esakia 47: 169–254.
- Murao R, Tadauchi O (2008) Taxonomic notes and floral associations of *Lasioglossum* (*Evyllaesus*) *transpositum* and *L.* (*E.*) *metis* (Hymenoptera, Halictidae). Japanese Journal of Systematic Entomology 14: 95–106.

- Murao R, Tadauchi O (2011) Occurrence of *Lasioglossum* (*Lasioglossum*) *primavera* (Hymenoptera, Halictidae) in Shikoku, Kyushu, and the Korean Peninsula. Japanese Journal of Systematic Entomology 17: 365–368.
- Murao R, Ebmer AW, Tadauchi O (2006) Three new species of the subgenus *Evylaeus* of the genus *Lasioglossum* from Eastern Asia (Hymenoptera, Halictidae). Esakia 46: 35–51.
- Pesenko YuA (2006) Contributions to the halictid fauna of the Eastern Palaearctic Region: genus *Lasioglossum* Curtis (Hymenoptera: Halictidae, Halictinae). Zoosystematica Rossica 15: 133–166.
- Pesenko YuA (2007a) Subgeneric classification of the Palaearctic bees of the genus *Evylaeus* Robertson (Hymenoptera: Halictidae). Zootaxa 1500: 1–54.
- Pesenko YuA (2007b) A taxonomic study of the bee genus *Evylaeus* Robertson of Eastern Siberia and the Far East Russia (Hymenoptera: Halictidae). Zoosystematica Rossica 16 (1): 79–123.
- Radoszkowski O (1876) Matériaux pour servir à une faune hyménoptérologique de la Russie. (Suite). Horae Societatis Entomologicae Rossicae 12(1): 82–110.
- Sakagami SF, Tadauchi O (1995) Taxonomic studies on the Halictine bees of *Lasioglossum* (*Evylaeus*) *lucidulum* subgroup in Japan with comparative notes on some Palaearctic species (Hymenoptera, Apoidea). Esakia 35: 141–176.