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A new species and two new records of the genus *Alysia* Latreille (Hymenoptera, Braconidae, Alysiinae) from South Korea

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Abstract

In the genus *Alysia* Latreille, 1804 (Braconidae: Alysiinae), a new species, *Alysia erecta* **sp. nov.**, and two new records, *Alysia hebeiensis* Zhu, van Achterberg & Chen, 2018 and *A. sirin* Belokobylskij, 1998, are described and illustrated. In addition, the DNA barcode region of the mitochondrial *subunit I* (*COI*) of these species have been sequenced. An identification key for all *Alysia* species officially recorded from Korea is provided.

Keywords

Alysiini, COI, Hymenoptera, new combination, new record, new species, taxonomy

Introduction

The subfamily Alysiinae is a large taxon of the family Braconidae, consisting of over 2,440 valid species worldwide (Yu et al. 2016). Among them, 180 species in 21 genera are recorded in Korea (NIBR 2021). Alysiinae is generally distinguished from other subfamilies morphologically by having the exodont (= non-overlapping in closed condition) mandibles. Alysiinae includes two tribes, Alysiini and Dacnusini, which are distinguishable each other in most cases by having vein r-m of fore wing present

(Alysiini) or absent (Dacnusini). Alysiinae belongs to the cyclostome clade, of which members are koinobiont endoparasitoids for dipterous larvae. They use the outward-curved teeth of the exodont mandibles to break out the host puparium (Docavo et al. 2002). Some species have been used for biological control (Ozawa et al. 2001; Chabert et al. 2012).

The genus *Alysia* Latreille, 1804, is a large group in the subfamily Alysiinae, including 125 species worldwide (Yu et al. 2016; Zhu et al. 2018). This genus can be diagnosed by having the first flagellomere longer than the second flagellomere (but not over 1.5 times), the comparatively short vein 3-SR of fore wing, the posterior position of vein r of fore wing, the propodeum more or less wrinkled or rugose and usually lacking an areola and vein m-cu of the hind wing distinct. According to Bartlett et al. (1978), *Alysia manducator* has been introduced to control the sheep blowfly, *Calliphora stygia* (Fabricius, 1781) in eastern Australia and New Zealand, but became established only in the latter country.

Comparatively, few papers are dealing with the eastern Palaearctic species: Two new species from Mongolia by Papp (1991); 14 new species from Far East Russia by Belokobylskij (1998); six new species from China by Zhu et al. (2018). Since seven species had been known in Korea, one species was recently transferred to the genus *Cratospila* (Sohn et al. 2022). Although Papp (1994) has been reported *A. brachycera*, *A. lucia*, *A. nigritarsis*, *A. sophia*, *A. tipulae* and *A. truncator* from Ryanggang, North Korea, the national checklist of South Korea (NIBR 2021) lists only two species (*A. sophia* and *A. tipulae*). Therefore, five species officially are recorded in South Korea from this study.

In this study, we present new morphological characters and the *COI* barcoding sequences of one new and two newly recorded species (*A. hebeiensis* and *A. sirin*). This study also provides descriptions, diagnosis, identification key and photographs of the diagnostic characters for the three species.

Materials and methods

Samples used in this study were collected with Malaise traps in South Korea at the Dodae-ri, buk-myeon, Gapyeong-gun, Gyeonggi-do. Sorting and preparation were done at the Animal Systematics Lab. (ASL), Department of Biological Science, Kunsan National University (KSNU). For morphological identification, Wharton et al. (1997) and Zhu et al. (2017) were used. Morphological characters were observed with a Leica M205C stereo microscope. The Taxapad database (Yu et al. 2016) was used for references. The terminology was followed of Wharton (2002) and van Achterberg (1993). The holotype of new species is deposited in the NIBR (National Institute of Biological Resources, Incheon) collection.

A Leica DMC2900 digital camera and a Leica M205 C microscope (Leica Geosystems AG, Mannheim, Germany) were used for photography; several pictures were taken for each final photo using multi-focusing technology. LAS V4.11 (Leica

Geosystems AG, St. Gallen, Switzerland) and HeliconFocus 7 (Helicon Soft, Kharkiv, Ukraine) software were used for stacking the photos. The final illustrations were created using Adobe Photoshop CS6.

Extraction of DNA was done in ASL, KSNU. Whole genomic DNA was extracted from the specimens by using a Labopass Tissue kit (COSMOgenetech, Daejeon, Korea) following the manufacturer's protocol. In order to conserve morphologically complete voucher specimens, DNA extraction method was used slightly modified from 'non-destructive method' by Favret (2005) and 'freezing method' by Yaakop et al. (2009). In the original protocol, the sample was crushed or wounded, and then soaked with 180 µl of buffer ATL + 20 µl of proteinase, following by three hours over incubation at 55 °C. In the slightly modified DNA extraction methods, samples were soaked with 180 µl of buffer ATL + 20 µl of proteinase K without destroying the sample, followed by 10 minutes incubation at 55 °C and then kept in a freezer at -22 °C overnight. After that the general protocol was used for the remaining steps. The primer set of LCO-1490 (5'-GGTCAACAAATCATAAAGATATTGG-3') and HCO-2198 (5'-TAAACTTCAGGGTGACCAAAAAATCA-3') was used to amplify approximately 658 bp as the partial front region of the *COI*. The polymerase chain reaction (PCR) products were amplified by using AccuPowerH PCR PreMix (BIONEER, Corp., Daejeon, Korea) in 20 µl reaction mixtures containing 0.4 µM of each primer, 20 µM of the dNTPs, 20 µM of the $MgCl_2$, and 0.05 µg of the genomic DNA template. PCR amplification was performed using a GS1 thermo-cycler (Gene Technologies, Ltd., Somerset, U.K) according to the following procedure: initial denaturation at 95 °C for 5 min, followed by 34 cycles at 94 °C for 35 sec; an annealing temperature of 48 °C for 25 sec; an extension at 72 °C for 45 sec, and a final extension at 72 °C for 5 min. The PCR products were visualized by electrophoresis on a 1.5% agarose gel. A single band was observed and then sequenced using an automated sequencer (ABI Prism 3730 XL DNA Analyzer, California, USA) at Macrogen Inc. (Seoul, South Korea).

Sequence alignment was performed in MEGA version 7 (Kumar et al. 2016) with ClustalW method. To estimate the pairwise genetic distances, the *P*-distance model was conducted using MEGA version 7.

Results and discussion

A total of 621 bp of the *COI* barcode region were sequenced for *Alysia erecta* sp. nov. (GenBank accession no. OP391515), *A. hebeiensis* Zhu & van Achterberg, 2018 (GenBank accession no. OP391514), and *A. sirin* Belokobylskij, 1998 (GenBank accession no. OP391516) Pairwise genetic distances were calculated by using '*P*-distance' model with option for pairwise deletion; *A. erecta* differed by 6% from *A. hebeiensis* and by 9% from *A. sirin*; *A. hebeiensis* 10% from *A. sirin*.

Taxonomy

Alysia Latreille, 1804

Figs 1–3

Alysia Latreille, 1804: 173–174; Shenefelt 1974: 939; Wharton 1980: 458; Chen and Wu 1994: 28; Belokobylskij 1998: 170; Zhu et al. 2018: 2. Type species: *Ichneumon manducator* Panzer, 1799.

Cechenus Illiger, 1807: 54; Type species: *Ichneumon manducator* Panzer, 1799. Synonymized by Curtis 1826.

Bassus Nees, 1812: 201; Type species: *Ichneumon manducator* Panzer, 1799. Synonymized by Nees 1819.

Anarcha Foerster, 1863: 265; Ashmead 1900: 105; Baltazar 1962: 759. Type species: *Anaraha notabilis* Foerster, 1863. Synonymized by Fischer 1971.

Goniarcha Foerster, 1863: 265; Marshall 1872: 125; Ashmead 1900: 105. Type species: *Alysia lucicola* Haliday, 1838. Synonymized by Marshall 1894.

Strophaea Foerster, 1863: 265; Marshall 1872: 127; Ashmead 1900: 105. Type species: *Alysia rufidens* Nees, 1834. Synonymized by Marshall 1894.

Diagnosis. First flagellomere longer than second (Figs 1B, J, 2B, J, 3B, J), not over 1.6 times, face granulate (Figs 1E, 2E, 3E) or largely smooth, eye slightly oval, clypeus triangularly shaped, wide and protruding anteriorly (Figs 1E, 2E, 3E); mandible (Figs 1K, L, 2K, L, 3K, L) with 3 teeth, third mostly lobe-shaped. second tooth narrow and sharp; pronope absent, notauli present, precoxal sulcus distinct, medially deeply impressed (Figs 1G, 2G, 3G), scutellar sulcus distinct, propodeum more or less rugose and usually without areola, sometimes with enlarged spiracles; pterostigma robust, fore wing (Figs 1C, 2C, 3C) vein 2-SR slightly bent, first discal cell shorter than wide in median length. vein 3-SR usually shorter than vein 2-SR; veins 2-SR+M and r-m not sclerotized, hind wing vein 1r-m shorter than vein M+CU, vein m-cu distinct; first tergite with dorsope (Figs 1H, 2H, 3H).

Biology. Endoparasitoids of larval Calliphoridae, Sarcophagidae, Tephritidae, Anthomyiidae, Agromyzidae and Mycetophylidae (Yu et al. 2016).

Distribution. Cosmopolitan, but most *Alysia* species occur in the northern part of the Northern Hemisphere and many are Holarctic. About 70% of the species have most or all of their range within the boreal coniferous biome (Wharton 1986).

Key to species of *Alysia* Latreille from South Korea

1 Antenna with 5–10 white segments subapically (Fig. 3B); first metasomal tergite 2.4–3.0 times longer than its apical width (Fig. 3H) ..... ***A. sirin* Belokobylskij, 1998**

– Antenna without white segments (Fig. 2B); first tergite 1.0–1.7 times longer than its apical width (Fig. 2H) **2**

2 First flagellomere about 1.5 times longer than second; setose part of ovipositor sheath 1.6–1.7 times longer than hind tibia; eye in dorsal view 1.1–1.2 times as long as temple.....***A. tipulae* (Scopoli, 1763)**

– First flagellomere 1.2–1.3 times longer than second; setose part of ovipositor sheath 0.5–1.3 times as long as hind tibia; eye in dorsal view 1.2–1.4 times as long as temple.....**3**

3 Setose part of ovipositor sheath 1.2 times longer than hind tibia (Fig. 2A); hind femur 4.4–4.6 times longer than its maximum width..... ..... ***A. hebeiensis* Zhu, van Achterberg & Chen, 2018**

– Setose part of ovipositor sheath 0.5–0.7 times as long as hind tibia; hind femur 3.9–4.0 times longer than its maximum width.....**4**

4 First antennal flagellomere about 2.5 times longer than wide (Fig. 2J); mandible 1.2 times longer than its maximum width (Fig. 1K); pterostigma dark brown; metasoma after first tergite dark brown (Fig. 1A) ....***A. erecta* sp. nov.**

– First flagellomere about 3.5 times longer than wide; mandible 1.6–1.7 times longer than its maximum width; pterostigma pale yellowish brown to brown; metasoma after first tergite usually yellow or orange..... .....***A. sophia* (Haliday, 1838)**

***Alysia erecta* Sohn & van Achterberg, sp. nov.**

https://zoobank.org/78EBA32D-8A2D-4D4E-8C95-904A7289EA87

Fig. 1A–L

Type material. ***Holotype***, ♀ (NIBR), **South Korea**, Dodae-ri, buk-myeon, Gapyeong-gun, Gyeonggi-do, 37°56'11.8"N, 127°28'50.2"E, 05.IV.2018, Sohn. GenBank accession no. OP391515.

Comparative diagnosis. The new species is recognizable by its comparatively short ovipositor sheath (setose part 0.6 times longer than mesosoma *versus* 1.0–1.7 times in other S Korean species), the short first flagellomere (2.5 times longer than wide versus 3.0–4.5 times) and robust mandible (1.2 times longer than wide *versus* 1.4–1.7 times). The new species runs in the key by Zhu et al. (2018) to *A. hebeiensis* Zhu & van Achterberg, 2018 and differs from this species by having the first flagellomere less slender (2.5 times *versus* 3.8–4.0 times in *A. hebeiensis*) and the first metasomal tergite shorter (1.1 times longer than its apical length *versus* 1.2–1.7 times).

The new species runs in the key by Belokobylskij (1998) to *A. masneri* Wharton, 1988 based on the colour of the clypeus, but to *A. vladik* Belokobylskij, 1998 if only morphological characters are used. The new species differs from *A. masneri* by the robust first tergite (1.1 times longer than its apical width *versus* 1.6 times in *A. masneri*), the shorter antenna (0.9 times as long as body *versus* distinctly longer than body) and the shorter ovipositor sheath (0.6 times as long as mesosoma *versus* 0.9 times). The new species differs from *A. vladik* by having the first flagellomere less slender (2.5 times versus 4.0 times in *A. vladik*), the hind femur less slender (3.9 times *versus* 4.3 times), the first

metasomal tergite shorter (1.1 times longer than its apical width *versus* 1.2–1.3 times), the clypeus black (similar to colour of face *versus* yellowish, contrasting with black face).

According to the key by Wharton (1986) the new species belongs to his *Alysia tipulae* group of the subgenus *Anarcha* Foerster. It runs in the key by Wharton (1988) to *A. umbrata* Stelfox, 1941 and differs by having the mandible less slender (1.2 times versus 1.6–1.7 times in *A. umbrata*).

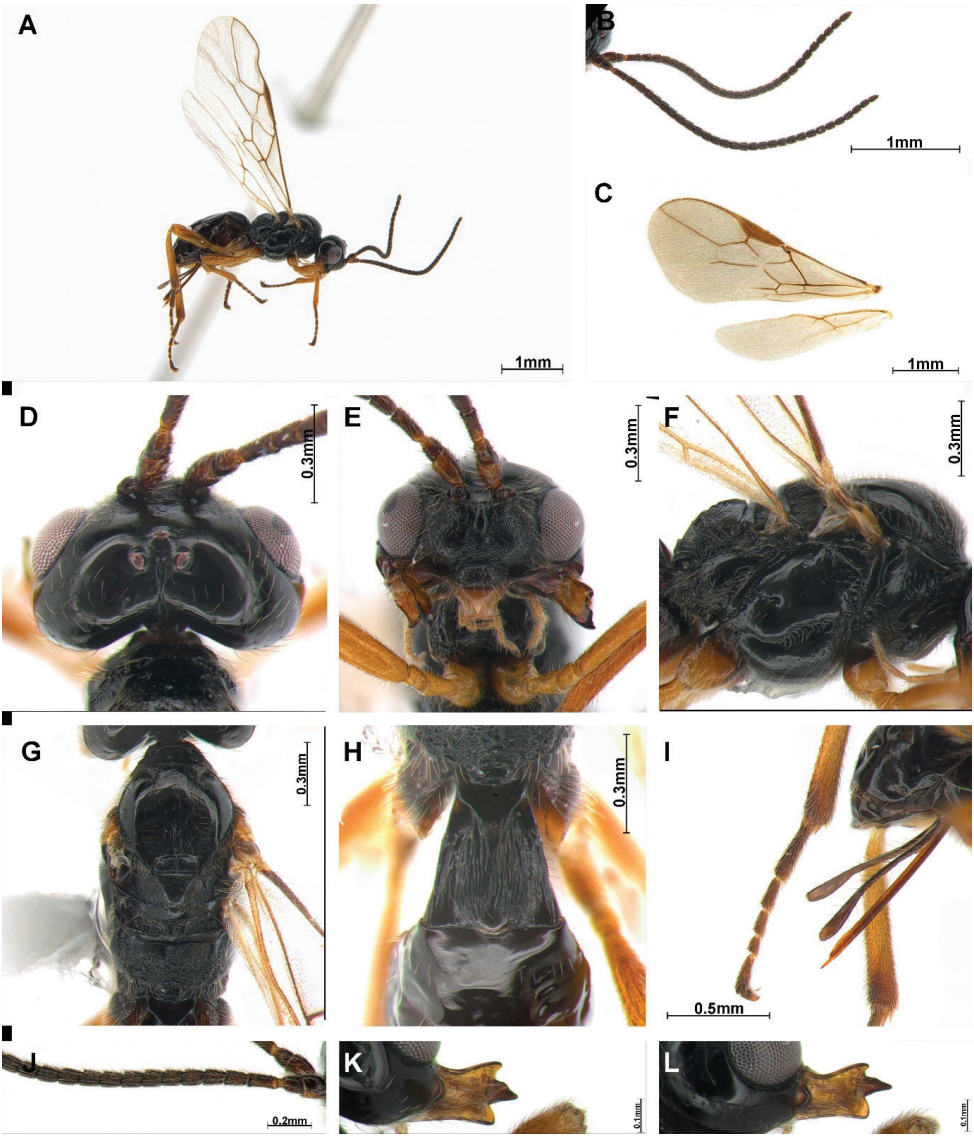

Figure 1. A–L *Alysia erecta* sp. nov., ♀ **A** habitus, lateral view **B** antennae **C** wings **D** head, dorsal view **E** head, front view **F** mesosoma, dorsal view **G** mesosoma, lateral view **H** anterior half of metasoma, dorsal view **I** ovipositor sheath, lateral view **J** basal part of antenna **K, L** mandible.

Description. Holotype, ♀, length of body 3.1 mm in lateral view, length of antenna 3.0 mm and of fore wing 3.6 mm.

***Colour*:** Body (Fig. 1A) black, first tergite and mesonotum entirely reddish brown; antenna dark brown; mandible pale yellow; leg yellowish brown basally, tarsus brown.

***Head* (Fig. 1D):** Width of head 1.9 times its median length in dorsal view. Antenna 0.9 times longer than body, 31 segmented. First flagellomere 1.3 times longer than second and 2.5 times longer than wide. Compounded eye slightly oval, in lateral view 1.6 times as long as wide. Minimum width of face (Fig. 1E) 1.6 times its height (measured from ventral rim of antennal sockets to upper margin of clypeus); face setose, wrinkled and rather mat. Eye in dorsal view 1.4 times as long as temple. Frons nearly entirely glabrous. Ocello-ocular line (OOL) 4.1 times longer than diameter of anterior ocellus; OOL: antero-posterior ocellar line (AOL): postero-ocellar line (POL) = 24 : 7 : 10. Stemmaticum with deep and long median groove. Vertex smooth and with sparse setae. Mandible 1.2 times longer than wide, with three teeth; first tooth curved, with distinct incision between first and second tooth; second tooth reddish brown, narrow and sculptured; second tooth 1.5 times longer than first tooth. Maxillary palp pale yellow and 0.4 times longer than mesosoma.

***Mesosoma*:** In dorsal view mesosoma 1.9 times longer than wide, 1.4 times longer than wide in lateral view. Mesoscutum (Fig. 1G) with oval medio-posterior depression and with setae; notauli impressed anteriorly, not reaching medio-posterior depression; anterior mesosoma crenulated; scutellar sulcus with two carinae; in lateral view, apical part of mesopleuron and metapleuron with long setae. metanotum sculptured. Propodeum (Fig. 1G) entirely wrinkled, 0.4 times longer than wide in maximum length; precoxal sulcus (Fig. 1F) deep and distinct, occupying entire length of mesopleuron; propodeum curved dorsally in lateral view. Fore wing (Fig. 1C) 2.3 times as long as wide in maximum length; pterostigma 3.9 times as long as wide; vein r of fore wing 2.6 times longer than wide and issued from distal third of pterostigma; vein 2-SR slightly bent; vein 3-SR 1.1 times longer than vein 2-SR ; vein 2-SR+M and r-m not sclerotized; 2-SR: r : 3-SR = 28: 5: 25; first discal cell of fore wing approx. 0.8 times longer than wide in median length; first subdiscal cell of fore wing approx. 3.4 times as long as wide in median length. Hind wing vein M+CU: vein 1r-m = 9: 7.

***Leg*:** Hind coxa reddish brown apically, compressed and 1.1 times longer than hind trochanter; hind femur brownish yellow, 3.9 times as long as wide and 0.7 times longer than hind tibia; hind tibia as long as hind tarsus.

***Metasoma*:** First tergite (Fig. 1H) striate, 1.1 times longer than its apical width and blackish. Setose part of ovipositor sheath (Fig. 1I) 0.6 times as long as mesosoma and 0.5 times as long as hind tibia. Ovipositor without subapical dorsal notch (Fig. 1I).

Male. Unknown.

Distribution. South Korea.

Etymology. Named after the erect setae on the flagellomeres: "*erecta*" is Latin for erect.

***Alysia hebeiensis* Zhu, van Achterberg & Chen, 2018**
Fig. 2A–L

Alysia hebeiensis Zhu, van Achterberg & Chen, 2018: 4

Material. 1♀ (NIBR), **South Korea**, Dodae-ri, buk-myeon, Gapyeong-gun, Gyeonggi-do, 37°56'11.8"N, 127°28'50.2"E, 04.IV.2018, Sohn. GenBank accession no. OP391514.

Redescription. ♀, length of body in lateral view 3.4 mm, length of antenna 4.0 mm and of fore wing 4.1 mm.

***Colour*:** Body (Fig. 2A) black, but metasoma entirely reddish brown; antenna dark brown basally, leg yellowish brown basally, tarsus brown.

***Head* (Fig. 2D):** Width of head 2.0 times its median length in dorsal view. Antenna 1.2 times longer than body, 38 segmented. First flagellomere 1.2 times longer than second and 3.8 times longer than wide. Compounded eye slightly oval, in lateral view 1.4 times as long as wide. Minimum width of face (Fig. 2E) 1.8 times its height (measured from ventral rim of antennal sockets to upper margin of clypeus); face wrinkled with long setae. Eye in dorsal view 1.3 times as long as temple. Ocello-ocular line (OOL) 6.1 times longer than diameter of anterior ocellus; OOL: antero-posterior ocellar line (AOL) : postero-ocellar line (POL) = 23 : 6 : 7. Vertex smooth and with sparse long setae. Mandible 1.4 times longer than wide, with three teeth; first tooth lobe–shaped; second tooth reddish brown, wide and sculptured; second tooth 1.3 times longer than first tooth. Maxillary palp pale yellow and 0.5 times longer than mesosoma.

***Mesosoma*:** In dorsal view mesosoma 2.0 times longer than wide, 1.6 times longer than wide in lateral view. Mesoscutum (Fig. 2G) with oval medio-posterior depression and long setae; notauli impressed anteriorly, not reaching medio-posterior depression; anteriorly mesosoma crenulated widely; scutellar sulcus with four carinae; in lateral view, mesopleuron and metapleuron with long setae. Metanotum sculptured. Propodeum (Fig. 2G) entirely wrinkled, 0.5 times longer than wide in maximum length; precoxal sulcus (Fig. 2F) distinct, without setae, occupying entire length of mesopleuron; propodeum curved dorsally in lateral view. Fore wing (Fig. 2C) 2.2 times as long as wide in maximum length; pterostigma 3.4 times as long as wide; vein r of fore wing 2.1 times longer than wide; vein 2-SR slightly bent; vein 2-SR+M and r-m not sclerotized; 2-SR: r : 3-SR = 6: 1: 5; first discal cell of fore wing approx. 0.8 times longer than wide in median length; first subdiscal cell of fore wing approx. 3.6 times as long as wide in median length. Hind wing vein M+CU: vein 1r-m = 4: 1.

***Leg*:** Hind coxa apically pale yellow and 1.2 times longer than hind trochanter; hind femur 4.4 times as long as wide and 0.7 times longer than hind tibia; hind tibia 1.2 times longer than hind tarsus.

***Metasoma*:** First tergite striate and narrow, 1.7 times longer than its apical width and dark brown. Setose part of ovipositor sheath (Fig. 2I) 1.2 times longer than mesosoma and 1.2 times longer than hind tibia.

Male. Unknown.

Distribution. China (Zhu et al. 2018), South Korea (new record).

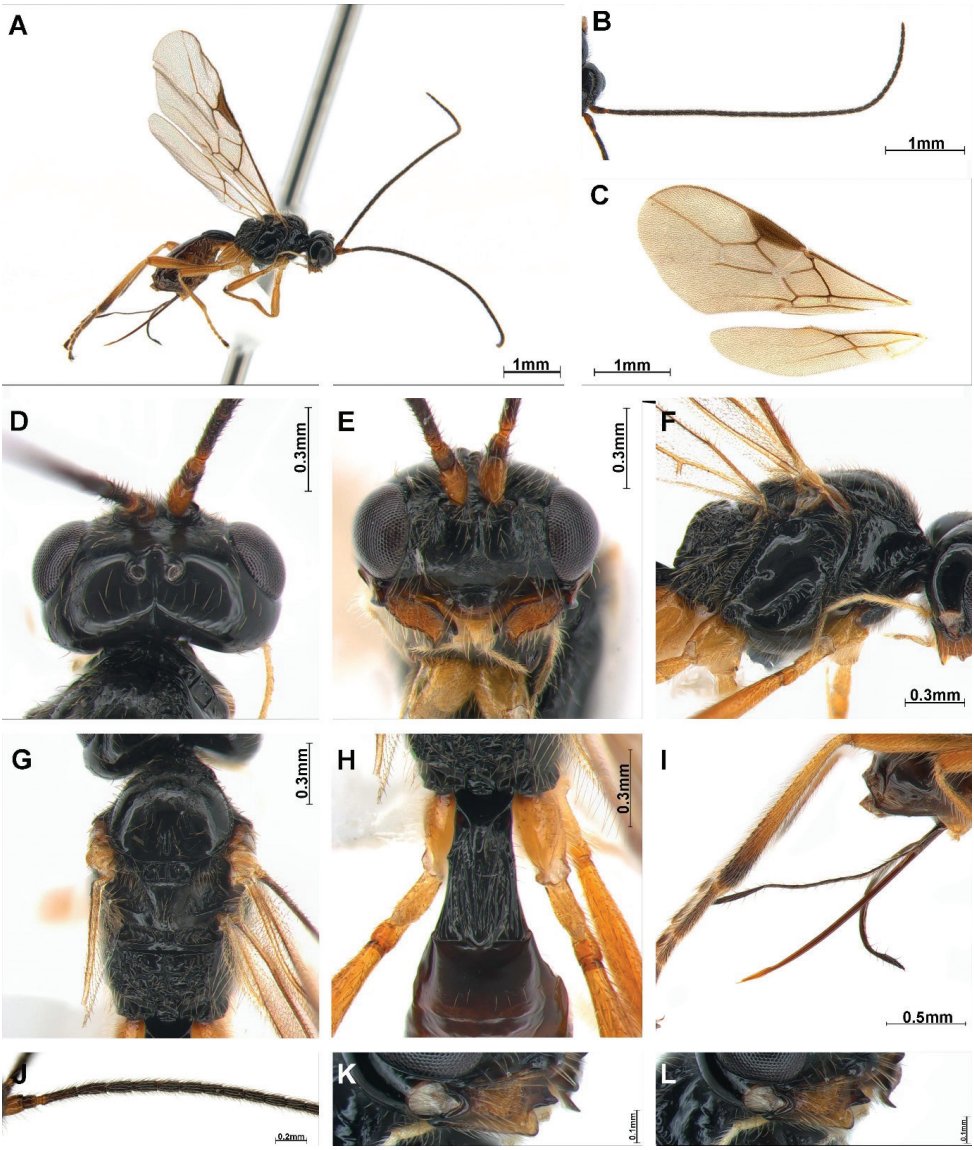

Figure 2.A–L *Alysia hebeiensis* Zhu, van Achterberg & Chen, 2018 ♀ **A** habitus, lateral view **B** antennae **C** wings **D** head, dorsal view **E** head, front view **F** mesosoma, dorsal view **G** mesosoma, lateral view **H** anterior half of metasoma, dorsal view **I** ovipositor sheath, lateral view **J** basal part of antenna **K, L** mandible.

Table 1. COI pairwise genetic distances between the three *Alysia* spp. from South Korea.

	A. erecta	*A. hebeiensis*	*A. sirin*
A. erecta	0.000		
A. hebeiensis	0.061	0.000	
A. sirin	0.094	0.098	0.000

***Alysia sirin* Belokobylskij, 1998**
Fig. 3A–L

Alysia sirin Belokobylskij, 1998: 178.

Material. 1♀ (NIBR), **South Korea**, Dodae-ri, buk-myeon, Gapyeong-gun, Gyeonggi-do, 37°56'11.8"N, 127°28'50.2"E, 05.IV.2018, Sohn. GenBank accession no. OP391516.

Description. ♀, length of body in lateral view 3.9 mm, length of antenna 4.0 mm and of fore wing 3.5 mm.

***Colour*:** Body (Fig. 3A) black, but metasoma entirely pale yellow; antenna dark brown basally, apical parts pale yellow (two apical segments missing); hind leg basally tri-coloured, coxa pale yellow, apical part of hind femur and hind tibia yellowish brown, posterior part of hind femur, hind tibia and hind tarsus reddish brown.

***Head* (Fig. 3D):** Width of head 2.1 times its median length in dorsal view. Antenna incomplete, remaining part as long as body and 29 segmented. First flagellomere 1.4 times longer than second and 4.4 times longer than wide. Compounded eye slightly oval, in lateral view 1.2 times as long as wide. Minimum width of face (Fig. 3E) 1.8 times its height (measured from ventral rim of antennal sockets to upper margin of clypeus); face granulate and with long setae; labrum wrinkled. Eye in dorsal view 2.4 times as long as temple. Ocello-ocular line (OOL) 5.4 times longer than diameter of anterior ocellus; OOL: antero-posterior ocellar line (AOL): postero-ocellar line (POL) = 22: 5: 7. Vertex with long setae. Mandible 1.6 times longer than wide, first tooth with setae; first tooth lobe–shaped; second tooth reddish brown, narrow and sharp; second tooth 1.5 times longer than first tooth; apical part of third tooth reddish brown, short and flat. Maxillary palp pale yellow and 0.8 times longer than mesosoma.

***Mesosoma*:** In dorsal view mesosoma 1.9 times longer than wide, 1.4 times longer than wide in lateral view. Mesoscutum (Fig. 3G) with slightly oval medio-posterior depression and long setae; notauli impressed anteriorly, not reaching medio-posterior depression; mesosoma crenulated anteriorly; scutellar sulcus with four carinae; in lateral view, apical part of mesopleuron and metapleuron with long setae. Metanotum rugose. Propodeum (Fig. 3G) entirely rugose, 0.4 times longer than wide in maximum length; precoxal sulcus (Fig. 3F) distinct, apical part with setae, occupying entire length of mesopleuron; propodeum curved dorsally in lateral view. Fore wing (Fig. 3C) 2.2 times as long as wide in maximum length; pterostigma 3.3 times as long as wide; vein r of fore wing 3.6 times longer than wide; vein 2-SR slightly bent; vein 2-SR+M and r-m not sclerotized; 2-SR: r : 3-SR = 10: 2: 7; first discal cell of fore wing approx. 0.9 times longer than wide in median length; first subdiscal cell of fore wing approx. 4.1 times longer than wide medially. Hind wing vein M+CU: vein 1r-m = 16: 5.

***Leg*:** Hind coxa apically pale yellow; hind coxa 1.2 times longer than hind trochanter; hind femur 4.6 times as long as wide and 0.7 times longer than hind tibia; hind tibia as long as hind tarsus.

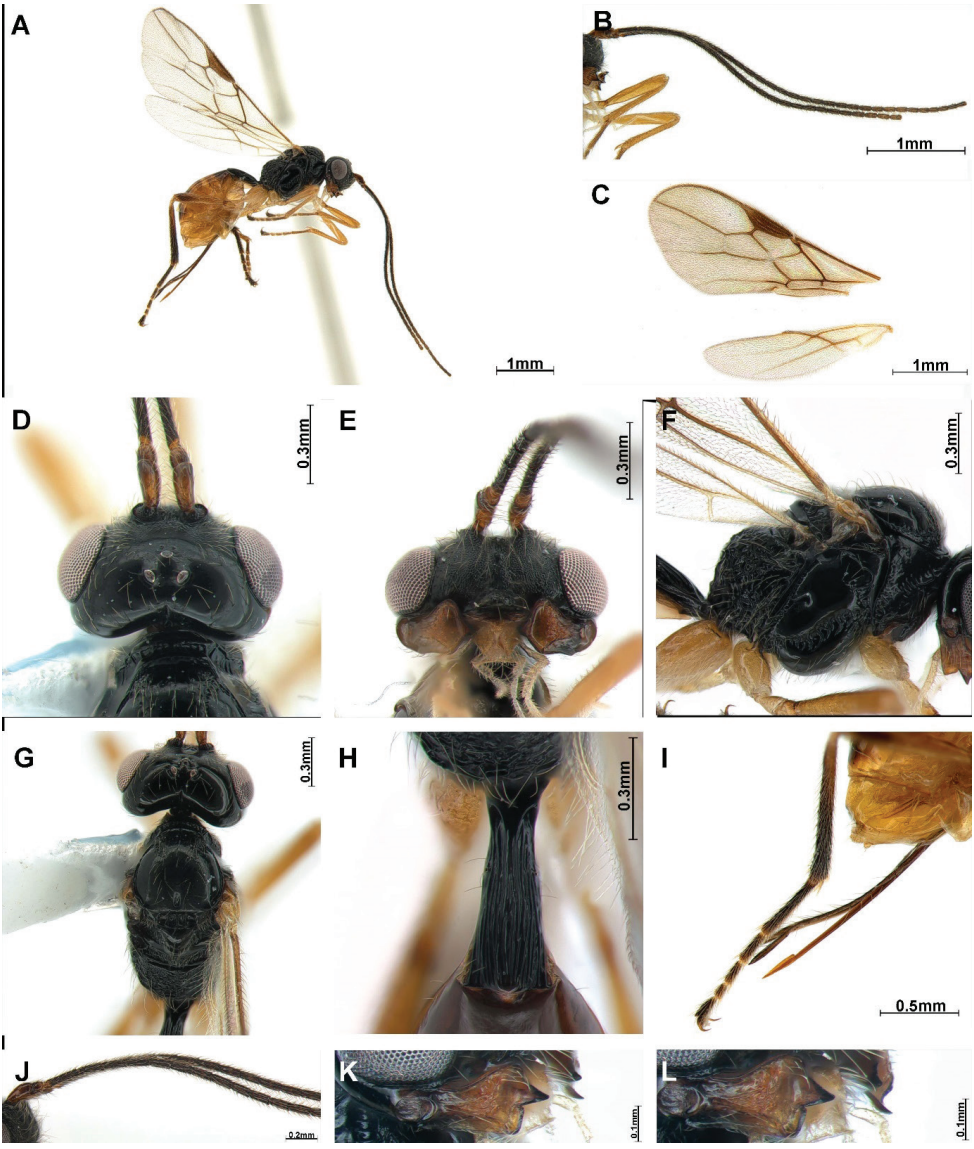

Figure 3. A–L *Alysia sirin* Belokobylskij, 1998♀ **A** habitus, lateral view **B** antennae **C** wings **D** head, dorsal view **E** head, front view **F** mesosoma, dorsal view **G** mesosoma, lateral view **H** anterior half of metasoma, dorsal view **I** ovipositor sheath, lateral view **J** basal part of antenna **K, L** mandible.

***Metasoma*:** First tergite striate and narrow, 2.5 times longer than its apical width and dark brown. Setose part of ovipositor sheath (Fig. 3I) 1.3 times longer than mesosoma and 1.3 times longer than hind tibia.

Male. Unknown.

Distribution. Eastern Palaearctic, Japan, Russia (Yu et al. 2016), South Korea (new record).

Acknowledgements

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