

First Record of the Awl Fly Genus *Xylophagus* (Diptera: Xylophagidae) from Korea

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ABSTRACT

Xylophagids are a small group of dipterans with 133 known species worldwide except for in the Afrotropical region; they are composed of three subfamilies: Coenomyiinae, Rachicerinae and Xylophaginae. Their larvae are predatory and tend to be found under bark, soil or decaying wood. Hitherto, the following five species in three genera of Xylophagidae have been recorded in Korea: *Anacanthaspis japonica* Shiraki, *Arthropeas sachalinensis* Matsumura, *Ar. sibirica* Loew, *Odontosabula czerskii* (Pleske) and *O. gloriosa* Matsumura. In this paper, the awl fly genus *Xylophagus* Meigen, 1803 is reported from the Korean peninsula for the first time, based on the discovery of a newly recorded species, *Xylophagus matsumurai* Miyatake, 1965. Descriptions, illustrations of this previously unrecorded species and a key to the Korean species are provided herein.

Keywords: new record, *Xylophagus matsumurai*, Xylophagidae, Insecta, Korea

INTRODUCTION

Xylophagidae is a comparatively small family of brachyurous flies that is widely distributed in most zoogeographical areas except for the Afrotropical region (Fachin, 2016). They are commonly known as awl flies, with the name being derived from the sharp shape (awl-like) of the female ovipositor. Adults normally appear in wooded areas or herbaceous vegetation and are known as nectar, sap or honeydew feeders. The larvae of Xylophagid species are found under the bark of logs, rotten wood or decomposing plants. Although the larvae appear to be xylophagous based on their habitat, they actually act as predators of soft-bodied invertebrates (Nagatomi and Rozkosný, 1998).

According to the world catalog (Woodley, 2011), xylophagids include about 133 species in nine genera. Among these genera, *Xylophagus* contains 24 known species worldwide. Members of this genus are usually found in the highlands of mountains and are considered fairly uncommon. Their body shape is long and slender, i.e., somewhat morphologically similar to the ichneumon flies of Hymenoptera (Narchuk, 1988; Krivosheina and Krivosheina, 2000).

To date, five species belonging to three genera of Xylo-

phagidae have officially been listed in Korean fauna in accordance with latest checklist published by National Institute of Biological Resources (2019) and Woodley (2011). The first record of Korean Xylophagidae was completed by a Russian entomologist, Pleske (1925). He listed Korea within the distributional range of *Stratioleptis czerskii* (= *Odontosabula czerskii*) in his revisionary study (Nagatomi, 1987). Subsequently, Doi (1938) reported two species as members of the family Erinnidae (currently treated as a junior synonym of Xylophagidae), namely *Arthropeas sachalinensis* Matsumura, 1916 and *Odontosabula gloriosa* Matsumura, 1905. Afterwards, Ôuchi (1943) added another one palearctic species, *Arthropeas sibirica* Loew, 1850 from Fusen reservoir in North Korea (Nagatomi and Nagatomi, 1988). Kim (1971) recorded one additional species, *Anacanthaspis bifasciata japonica* (= *Anacanthaspis japonica* Shiraki, 1932) in the family Coenomyiidae (currently treated as subfamily rank, Coenomyiinae).

Here, an additional genus, *Xylophagus* Meigen, is reported for the first time in Korea based on the identification of *Xylophagus matsumurai* Miyatake, 1965 from Pyeongchang-gun, Gangwon-do province. Therefore, six Xylophagidae species belonging to four genera are now known to be distributed in

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Korea. A general description and photographs of this newly recorded species are presented in this paper.

The external features of specimens were observed in detail through a compound microscope (Olympus SZ 51, Japan). For analysis of wing venation and pattern, the wing segment was carefully separated using a pair of minute insect pins and immersed in distilled water in a test tube. This tube was then heated on a hotplate for 5–10 min to eliminate impurities. The wing was slide-mounted and examined using either a stereoscopic microscope (Olympus SZX 16) or a compound microscope (Olympus BX50). Several partially focused images of specimens were captured using a microscopic camera (Olympus DP 27) and stacked to produce a single fully-focused figure via Helicon Focus (7.0.2) software. The figures were then edited using Adobe Photoshop (21.2.0) software for plate composition and scale bars (Lee and Suh, 2020; Bae and Suh, 2021). The terminology used to describe morphology mainly follows Cumming and Wood (2017). The observed voucher specimen for the present research has been housed in the collection of the School of Applied Biosciences, Kyungpook National University (KNU), Daegu, Korea (Son and Suh, 2019).

SYSTEMATIC ACCOUNTS

Order Diptera Linnaeus, 1758
Family Xylophagidae Fallén, 1810

¹*Genus *Xylophagus* Meigen, 1803

Xylophagus Meigen, 1803: 266 (type-species: *Nemotelus cinctus* De Geer, 1776).

Erinna Meigen, 1800: 21. Suppressed by International Commission on Zoological Nomenclature (1963: 339).

Pachystomus Latreille, 1809: 286 (type-species: *Rhagio syrphoides* Panzer, 1800).

Archimyia Enderlein, 1920: 281 (type-species: *Xylophagus ater* Meigen, 1804).

Anaxylophagus Malloch, 1931: 216 (type-species: *Xylophagus nitidus* Adams, 1904).

Diagnosis. Body usually ichneumonid-like shaped. Compound eye dichoptic in both sexes; frons and occiput shiny, bare or pruinose; maxillary palpus bisegmented; scape cylindrical or stout, pedicel short, flagellum long and slender with eight flagellomeres (not aristate or stylate). Scutum dark brown to black, glossy or covered with pollens. Tibial spurs formula 1 : 2 : 2; empodium and pulvillus well-developed. Wing mainly patterned; anal cell mainly closed before wing margin; vein R₄ sinuated. Abdomen elongate, tapered apically

(Nagatomi and Saigusa, 1968; Webb, 1979).

²**Xylophagus matsumurai* Miyatake, 1965 (Fig. 1)

Xylophagus matsumurai Miyatake, 1965: 105 (type-locality: Honshu, Japan).

Xylophagus maculatus Matsumura, 1916: 360 (type-locality: Honshu, Japan) (junior homonym of *Xylophagus maculatus* Meigen, 1804: 154).

Xylophagus omogensis Miyatake, 1965: 106 (type-locality: Shikoku, Japan).

Xylophagus matsumurae (sic): Krivosheina and Krivosheina, 2000: 1223.

Material examined. 1♀, Korea: Gangwon-do: Pyeongchang-gun, Jinbu-myeon, Jangjeon-ri, Mt. Gariwangsan, 22 May 2021, Suh SJ Coll (KNU).

Description. Female: Head. Elliptical shaped in anterior view. Compound eye dichoptic, very short pale hairs present. Upper half of frons pale gray pollinose, extending to posterior edge of lateral ocellus; lower frons glossy black. Area around antennal socket pale gray pollinose, extending to inner margin of compound eye and upper face. Ocellar tubercle and occiput shiny black; median occipital region not pruinose. Postocular area to gena with moderate black hairs. Distance between median ocellus to scape in frontal view 1.25 times as long as width of face just below antennal socket. Maxillary palpus black, two segmented, mixed with pale, and black hairs. Proboscis dark brown with brown hairs. Antenna black; scape slender and cylindrical shaped with few black hairs, four times as long as wide; pedicel short, practically five times shorter than scape; flagellum long, eight-segmented, nearly 1.6 times as long as length of scape and pedicel combined (Fig. 1B–D).

Thorax. Black and lustrous, clothed with short recumbent black hairs. Mesoscutum, except lateral margin and anterior margin of scutellum, distinctly pale gray and pruinose. Postpronotal lobe and area below wing base tinged with yellowish brown. Proepisternum with few black hairs; meron glossy and glabrous; laterotergite not pruinose. Haltere knob yellow, base, and stem darkened.

Leg. Mainly dark brown to black. Extreme apex of coxa and femur, extreme base of fore and mid femur, and tibial spurs tinged with yellowish brown; base of fore and mid tibia and extreme base of hind tibia to hind second tarsomere tinged with pale yellow; fore tibia and tarsus nearly pale brown. Fore coxa pollinose with black hairs; mid coxa with pale hairs; hind coxa without distinct anterior tubercle. Fore tibia with one spur; mid and hind tibia with two spurs, respectively. Empodium and pulvillus well-developed, yellowish brown (Fig. 1A).

Korean name: ¹*맵시밀들이파리매속 (신칭), ²*맵시밀들이파리매 (신칭)

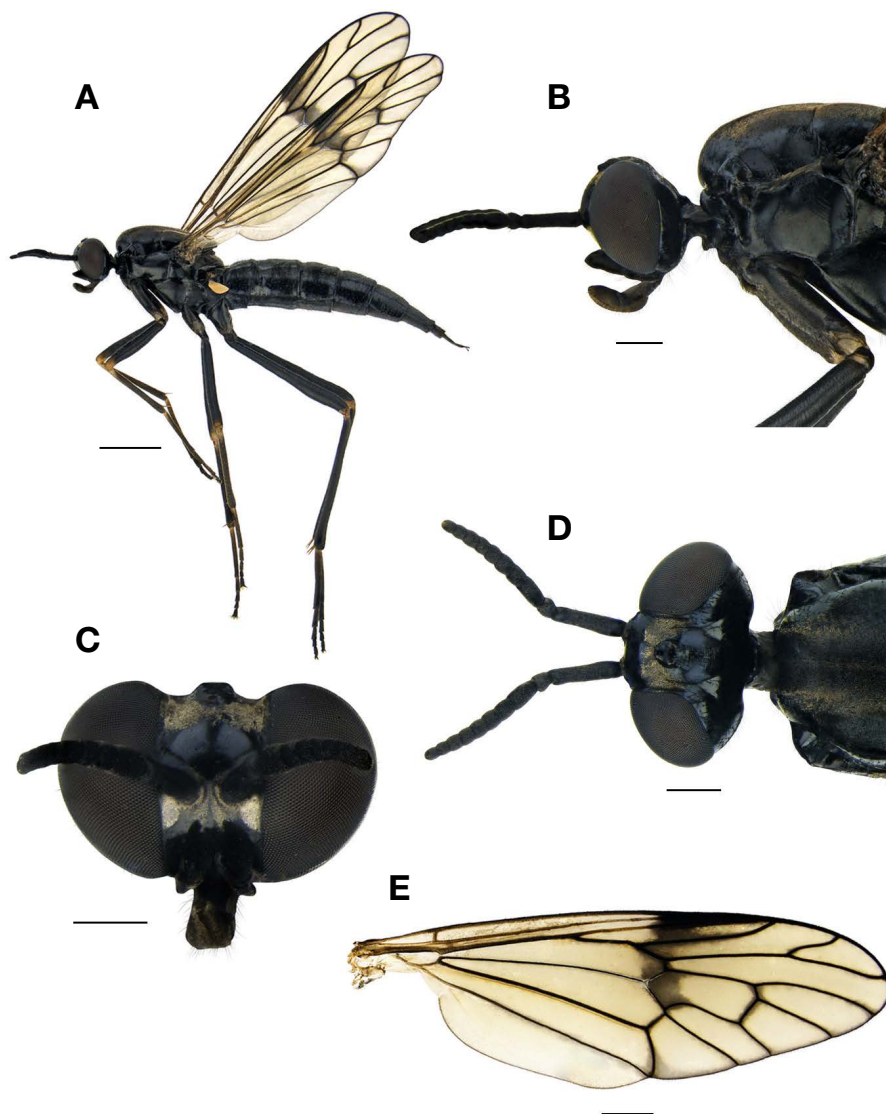


Fig. 1. *Xylophagus matsumurai* Miyatake, 1965, female. A, Habitus, lateral view; B, Head, lateral view; C, Head, anterior view; D, Head, dorsal view; E, Wing. Scale bars: A=2.0 mm, B-D=0.5 mm, E=1.0 mm.

Wing. Membrane tinged with yellowish brown but following parts prominently infuscate to black: stigma, middle part of cell r_1 , base of cell r_{2+3} , apex of first basal cell, extreme base of cell r_5 , base and extreme apex of discal cell, and extreme base of cell m_1 – m_3 . Posterior margin of wing and area around crossvein m - cu slightly tinged with brown (Fig. 1E).

Abdomen. Glossy black, elongate and tapered distally; generally covered with short semierect black hairs; tergites 7–8 nearly rectangular shaped, significantly smaller than tergites 1–6; mid part of sternites 2–6 slightly pale gray and pruinose.

Body length: female: 16.2 mm.

Wing length: female: 13.0 mm.

Distribution. Korea (new record: Central), Japan (Hokkaido,

Honshu, Shikoku, and Kyushu), Russia (Far East), and Europe.

Variation. This species has substantial intraspecific variation, depending on the distributional range, mainly associated with wing patterns and the color of leg segments. The single available female specimen from Korea differs from the Japanese form by several features as follows: the fore basitarsus is pale brown, the base of the hind femur is without a brownish tinge, the base of the hind basitarsus is pale yellow, and all knees (base of the tibia) are paler (Nagatomi and Saigusa, 1968). Furthermore, the patterns and color of the wing from the Korean specimen resemble those in figure 16 in Nagatomi and Saigusa (1968), whereas the apical margin of the wing is more

infusate and the border of crossvein m-m, R₄, R₅, and M₁-M₄ is more clearly tinged with brown. The Korean material also differs from the Russian specimen, e.g., the apex of the coxa and femur are yellowish brown, the fore tibia is pale brown but the base is yellowish, only the base of the mid tibia is pale yellow, the base of both the basitarsus and tarsomere 2 are pale yellow, and the apical margin of the wing is darker brown (Krivosheina and Krivosheina, 2000). However, this individual from Korea agrees well with the main diagnostic characteristics of *X. matsumurai*, i.e., the laterotergite is not pollinose, the abdomen is black-haired, and the length of the base of the scape to the median ocellus is shorter than the scape (Kuroda, 2019).

Remarks. Initially, this species was described as new to science under the name *Xylophagus maculatus* from Japan by Matsumura (1916). Unfortunately, this scientific name had been preoccupied by Meigen (1804), who described *X. maculatus* (i.e., *Xylomya maculata*, currently placed in the family Xylomyidae) from France. Subsequently, Miyatake (1965) suggested a new replacement name for *X. maculatus* Matsumura, 1916, i.e., *X. matsumurai* Miyatake, 1965. At the same time, Miyatake (1965) reported another new species, *Xylophagus omogensis*. Nagatomi and Saigusa (1968) treated *X. omogensis* as a junior synonym of *X. matsumurai*, based on intra-specific variation (Kuroda, 2020). After then, Krivosheina and Krivosheina (2000) mentioned this species as *Xylophagus matsumurae* and described one new subspecies, *X. matsumurae inermis*, in their Russian *Xylophagus* paper. However, the former was corrected to *X. matsumurai* and the latter was elevated to the species level (*X. inermis*) by Woodley (2011) (Kahanpää et al., 2014).

Key to the Xylophagidae species from Korea

1. Antennal scape conspicuously longer than wide; scape and pedicel combined longer than half of flagellum 2
 - Antennal scape as long as wide; scape and pedicel combined shorter than half of flagellum 3
2. Head distinctly narrower than thorax in dorsal view; compound eye holoptic in males, dichoptic in females; scape approximately subequal with length of pedicel; last flagellomere pointed; mesoscutum yellow with three dark longitudinal stripes; abdomen broad and robust (Genus *Anacanthaspis*) *An. japonica* Shiraki
 - Head as long as wider than thorax in dorsal view; compound eye clearly separated in both sexes; scape approximately 4.5 times as long as pedicel; last flagellomere blunt; mesoscutum black without longitudinal stripe; abdomen elongate and slender (Genus *Xylophagus*) *X. matsumurai* Miyatake
3. Scutellum with spines on posterior margin; hind femur ob-

- viously longer than mesoscutum and scutellum combined (Genus *Odontosabula*) 4
- Scutellum without spines on posterior margin; hind femur not longer than mesoscutum and scutellum combined (Genus *Arthropeas*) 5
- 4. Mesoscutum covered with golden gray pollens; fore basitarsus and hind tibia mainly dark brown to black *O. czerskii* (Pleske)
- Mesoscutum covered with pale gray pollens; fore basitarsus and hind tibia mainly yellow brown *O. gloriosa* Matsumura
- 5. In female, all coxae and trochanters, and postpronotal lobe yellow brown *Ar. sachalinensis* Matsumura
- In female, all coxae and trochanters, and postpronotal lobe dark brown to black *Ar. sibirica* Loew

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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