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A taxonomic review of *Brachypalpus* Macquart and *Chalcosyrphus* Curran (Insecta: Diptera: Syrphidae) in Korea

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ABSTRACT

Members of the syrphid subtribe Xylotina generally resemble sawflies in their appearance and behavior. In Korea, seven species of this subtribe have been recognized so far (three *Xylota* spp., one *Brachypalpus* sp., and three *Chalcosyrphus* spp.). In the process of reviewing the species of Xylotina in Korea, we found new species records for the country. The largest genus of this subtribe, *Xylota*, is not discussed here but will be detailed in a future publication. We found that previous Korean records of *B. laphriformis* were actually misidentifications of *B. nipponicus*. For the genus *Chalcosyrphus*, we recognized the following nine species including six species new to Korean syrphid fauna (asterisks for new records): *C. carbonus**, *C. femoratus*, *C. laterimaculatus* (new name), *C. longus*, *C. nemorum**, *C. nitidus**, *C. piger**, *C. rufipes**, and *C. unicus**. Among these species, we still have not found any specimens of *C. longus*, which was recorded in North Korea by Doi (1938). In addition, we rename *C. frontalis* (Shiraki and Edashige) to *C. laterimaculatus* due to homonymy. We also provide an identification key, diagnoses, and descriptions with color photographs of the inclusive species.

Introduction

The family Syrphidae (Insecta: Diptera) is a relatively large fly family including over 6000 species worldwide (Pape and Thompson, 2013). Our study investigates the Korean members of the subtribe Xylotina, specifically focusing on the genera *Brachypalpus* and *Chalcosyrphus* in the present study. According to the latest classification by Thompson and Vockeroth (1989), this subtribe belongs to the subfamily Eristalinae and tribe Milesiini.

According to current knowledge, members of the subtribe Xylotina are saprophagous in the larval stage and their feeding habitats are associated with wood (Rotheray, 1993). Unlike most other flower-visiting syrphid flies, xylotine species are most frequently found in and around the edge of forests, feeding on pollen (Rotheray and Gilbert, 2011). They generally resemble sawflies (*Tenthredo* spp., Tenthredinidae, Hymenoptera) in their appearance and behavior.

Shannon (1922) was the first to recognize a taxon (as subfamily Xylotinae) comparable to the modern concept of the sutribe Xylotina (sensu Hippa, 1978; Thompson and Vockeroth, 1989). The demarcation of Shannon's Xylotinae is similar to a combined concept of the tribes Millesiini and Xylotini of Williston (1886). Hull (1949) used the tribal name, Xylotini, but without listing the inclusive genera. Thompson (1975) listed *Brachypalpus*, Macquart, 1834, *Chalcosyrphus*, Curran, 1925, *Hadromyia*, Williston, 1882, *Macrometopia*, Philippi, 1865, *Pocota*, Lepeletier and Serville, 1828, and *Xylota*, Meigen, 1822 in the *Xylota* genus-group of the tribe Milesiini. More recently, Hippa (1978) redefined this group, and called it as the tribe Xylotini, including the following 16 genera (taxa with asterisks are currently treated as subgenera; Pape and Thompson, 2013): *Xylota*, *Hovaxylota** Keiser, 1971, *Ameroxylota** Hippa, 1978, *Sterphoides* Hippa, 1978, *Brachypalpoides** Hippa, 1978, *Brachypalpus*, *Crioprora** Osten-Sacken, 1878, *Sterphus* Philippi, 1865, *Ceriogaster** Williston, 1888, *Mutillimyia** Hull, 1943, *Hadromyia*, *Chrysosomidia** Curran, 1934, *Chalcosyrphus*, *Neplas** Porter, 1927, *Neploneura** Hippa, 1978, and *Hardimyia** Ferguson, 1926. For the Palaearctic Xylotina, Peck (1988) listed four genera, *Brachypalpoides*, *Brachypalpus*, *Chalcosyrphus*, and *Xylota*. Thompson and Vockeroth (1989) classified his *Xylota* group (Thompson, 1975) as the subtribe Xylotina of the tribe Milesiini. In Northeast Asia, 34 species are reported in Japan (Ohara et al., 2014), 36 species in Palaearctic China (Huang and Cheng, 2012), and 49 species in Russian Far East (Mutin and Barkalov, 1999). However, only seven species of the genera *Brachypalpus*, *Chalcosyrphus*, and *Xylota* are currently known in Korean fauna (Han et al., 2014).

As a result of our on-going study of the Korean Xylotina, we have found a number of additional species in this country. In the present study, we report one *Brachypalpus* and nine *Chalcosyrphus* species, but

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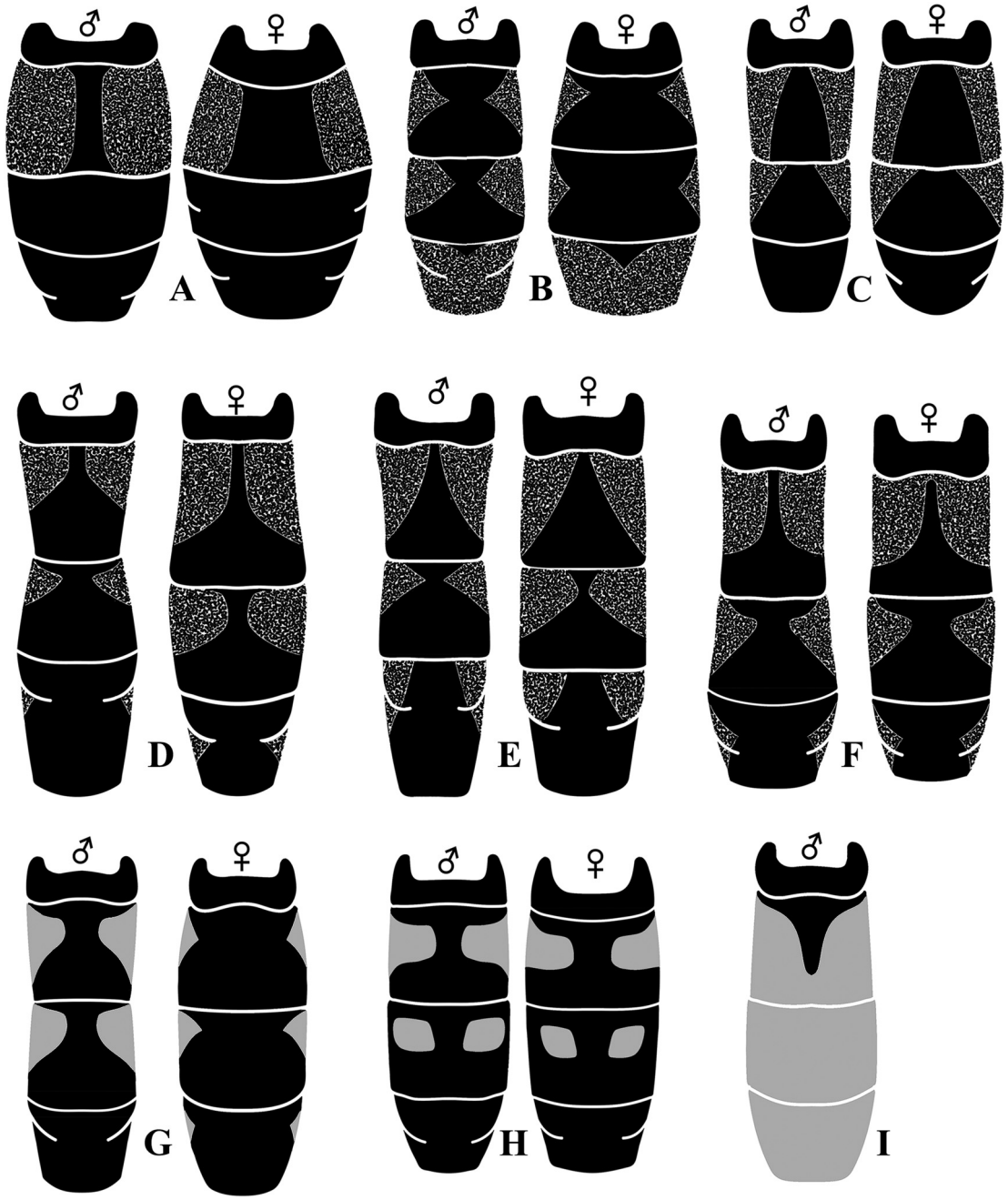

Fig. 1. Abdominal tergum patterns of Korean *Brachypalpus* and *Chalcosyrphus* spp. (A) *B. nipponicus*, (B) *C. carbonus*, (C) *C. nitidus*, (D) *C. femoratus*, (E) *C. rufipes*, (F) *C. unicus*, (G) *C. laterimaculatus*, (H) *C. nemorum*, (I) *C. piger*. (A–F) Grainy areas represent same colored patterns that can be distinguished by having pile of differently oriented microtrichiae. These patterns can be best viewed by turning a specimen under a microscope. (G-I) Lighter areas represent lighter colored patterns.

exclude the largest genus *Xylota*, which will be discussed in a future publication (Jeong and Han, in preparation). Of the nine *Chalcosyrphus* species reported here, six are new to Korean fauna. We provide an identification key, diagnoses, and descriptions with color photographs for identification of the inclusive species.

Materials and methods

The morphological terminology and interpretations mainly followed Thompson (1999), but we also followed Hippa (1978) for some genitalic terminology not described by Thompson. For synonymy, we followed Huang and Cheng (2012), Pape and Thompson (2013), and Ohara et al. (2014). We used the following ratios modified from Han and Norrbom (2005): face-head ratio (width of face/width of head in dorsal view); eye ratio (shortest eye diameter/longest eye diameter in lateral view); gena-eye ratio (genal height/longest eye diameter in lateral view; where genal height is the distance between the ventral eye margin and the ventral genal margin under eye); arista-antenna ratio (length of arista/length of antenna excluding arista); flagellomere-pedicel ratio (basoflagellomere length/pedicel length); wing-mesonotum ratio (wing length/mesonotum length in dorsal view; where wing length is measured between tegula and apex of wing); vein R_{4+5} ratio (length between basal node and r-m/length between r-m and apical node); vein M ratio (length between bm-cu and r-m/length between r-m and dm-cu).

Consecutive digital images in different focal planes (usually 20 or more shots per specimen) were taken with a Panasonic (Osaka, Japan) DMC FZ50 camera and the images were stacked using Helicon Focus