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Authors: Piwowarczyk, Renata, and Mielczarek, Łukasz

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First report of *Eumerus mucidus* (Diptera: Syrphidae) on *Cistanche armena* (Orobanchaceae) and from Armenia

Renata Piwowarczyk^{1,*}, and Łukasz Mielczarek²

The genus *Eumerus* Meigen (Diptera: Syrphidae) is one of the largest syrphid genera, with over 300 valid species restricted to the Old World (Doczkal 1996), mainly in the Palearctic region. Some species of *Eumerus* were introduced recently into the Nearctic and Neotropical regions (Marinoni & Morales 2007). However, information about their morphology, biology, and ecology is still lacking (Pérez-Bañón & Marcos-García 1998). Larvae of *Eumerus* spp. are known to be destructive pests on host plants of a large number of plant families (e.g., Amaranthaceae, Liliaceae, Iridaceae, Apiaceae, Solanaceae, or Asteraceae) (Ricarte et al. 2017), attacking mainly the bulbs, stems, roots, or tubers of these plants. Furthermore, the larvae of some species (*E. amophilus* Paramonov, *E. arnoldii* Stackelberg, *E. cistanchei* Efflatoun, *E. compertus* Villeneuve, *E. mucidus* Bezzi [Stackelberg 1961; Shaumar & Kamal 1978]) have been found in the tubers and shoots of holoparasitic plants of the family Orobanchaceae, such as *Cistanche phelypaea* (L.) Cout. (as *C. tinctoria* (Forssk.) G. Beck), or *C. lutea* (Desf.) Hoffm. & Link, in Iraq and Egypt (Waitzbauer 1976; Al-Khezraji et al. 1987; Shaumar & Kamal 1978).

Holoparasitic plants from the genus *Cistanche* Hoffm. & Link (Orobanchaceae) include 20 to 25 species. *Cistanche* spp. occur in arid and semi-arid habitats across Eurasia and North Africa, and mainly parasitize the roots of plants in the family Chenopodiaceae (e.g., Moreno Moral et al. 2018). The habit of these species is very peculiar because of their adaptations to the parasitic lifestyle, including greatly reduced, achlorophyllous, vegetative organs, and colorful dense inflorescences with zygomorphic flowers on fleshy stems (Piwowarczyk et al. 2016). Several species are used commercially, especially in Chinese traditional medicine.

Field surveys conducted in southern Armenia in May 2016 and Jun 2017 revealed infestations of *Cistanche armena* (K. Koch) M.V. Agab. with the larvae of *Eumerus mucidus* in 1 locality in Ararat province, near Khor Virap (39.8833°N, 44.5666°E, 818 masl). *Cistanche armena* is known as a very rare species, occurring only in the Ararat province in Armenia at the foot of Mount Ararat, parasitizing shrubs from the genera *Salsola* L. (Chenopodiaceae) and *Alhagi* Gagnebin (Fabaceae) (Piwowarczyk et al. 2017). The 3 ha of semi-desert is dominated by halophytic vegetation and cultivated areas with irrigation ditches. The infestation was observed in the shoots as well as in the tubers, and was confirmed by digging selected plants from the soil and taking a cross-section of the shoots. The larvae bored channels in the fresh tubers and shoots, causing damage and breakage (Fig. 1) that may threaten the survival of the plant. One *Cistanche* plant was found to be parasitized by several *Eumerus* larvae, and 20 to 30% of the total population of plants infested. An adult male of *E. mucidus* was identified using Stackelberg's key to Palearctic *Eumerus* (1961). The main features of

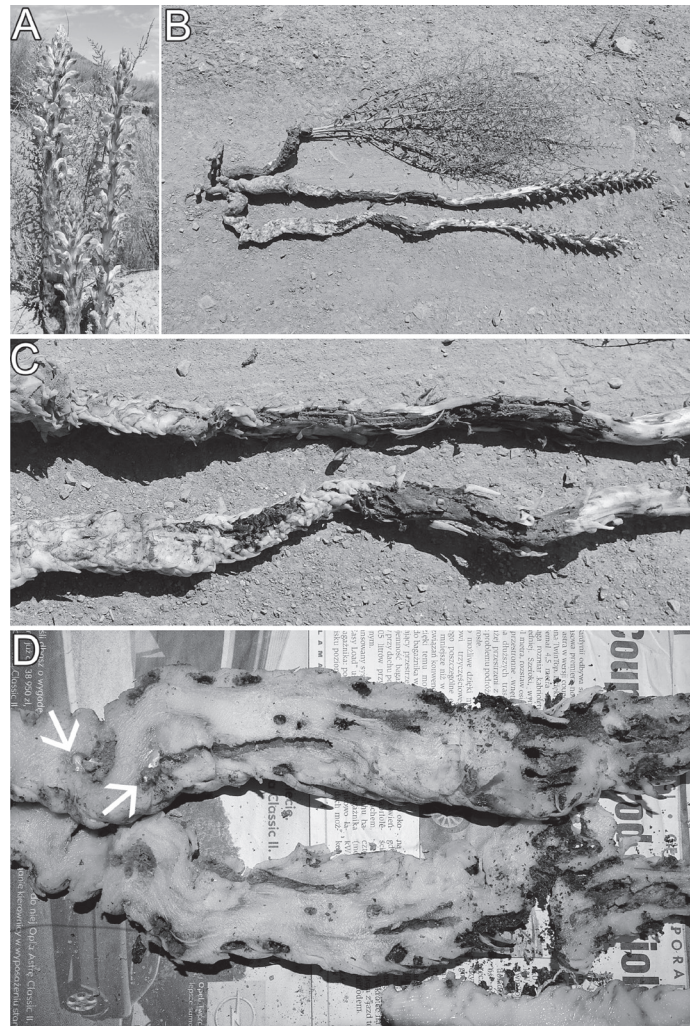


Fig. 1. General habit of the holoparasitic plant *Cistanche armena* (A) including the parasitic association with leguminous plant *Alhagi maurorum* (B), damaged shoots (C), and the mining channels of *Eumerus mucidus* larvae in shoots and tuber. Arrows indicate larvae (D).

E. mucidus are as follows: (a) eyes in the male connected closely, (b) reddish-yellow antennae, (c) a black abdomen with large red spots on tergites 2 and 3, (d) legs predominantly black, (e) eyes covered with long and dense hairs, (f) body length 8.5 to 12.5 mm (Fig. 2). *Eumerus*

¹Jan Kochanowski University, Institute of Biology, Department of Botany, Świątokrzyska St. 15, PL-25-406 Kielce, Poland; E-mail: renka76@wp.pl (R. P.)

²Agricultural University, Department of Pomology and Apiculture, 29 Listopada St. 54, PL-31-425 Kraków, Poland; E-mail: lukasz@insects.pl (Ł. M.)

*Corresponding author; E-mail: renka76@wp.pl

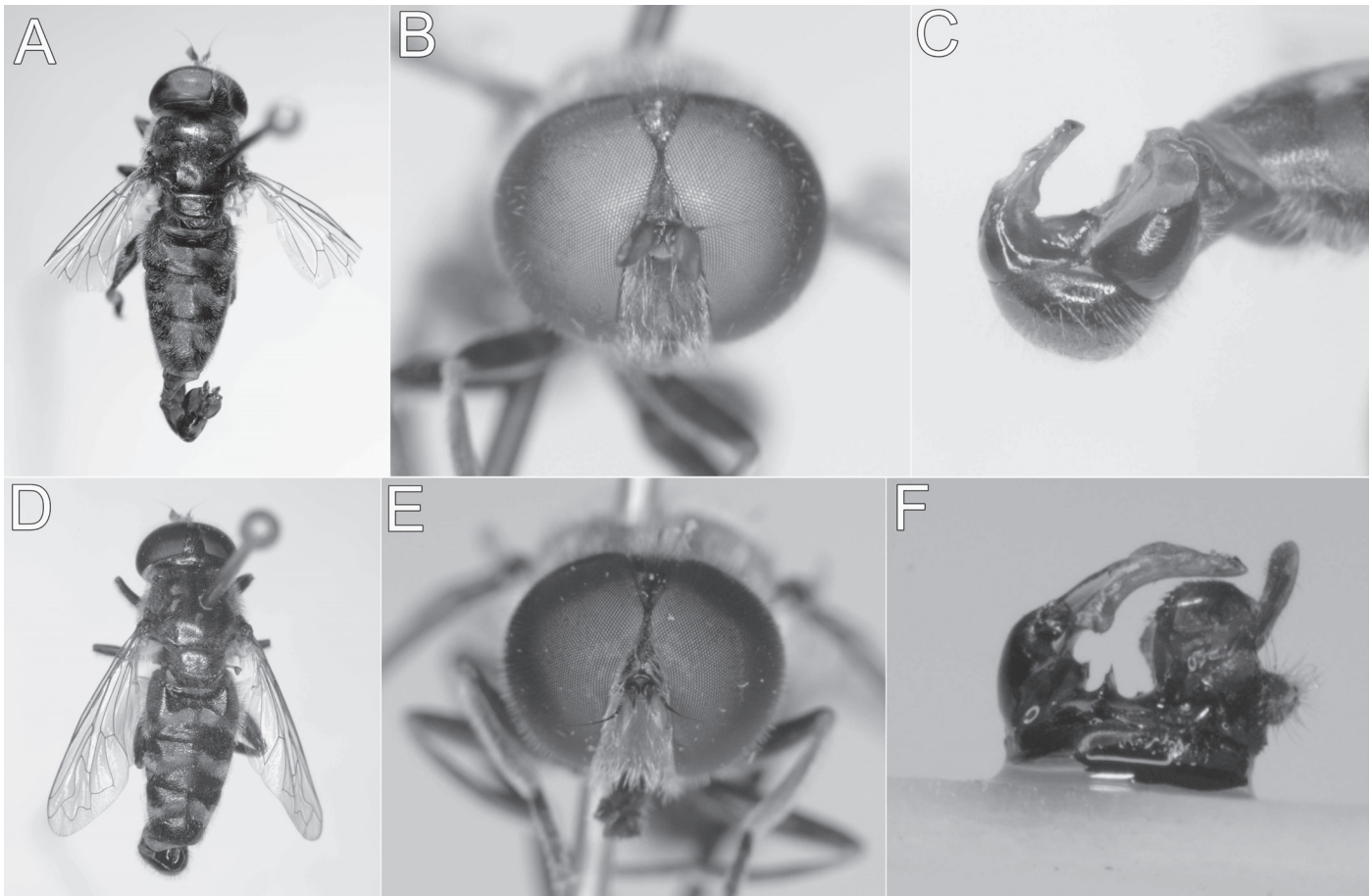


Fig. 2. Male of *Eumerus mucidus* (A-C) and *E. compertus* (D-F): general appearance – dorsal view (A), head – frontal view (B), genitalia – lateral view (C).

mucidus can be confused with *E. compertus*, from which it can be discerned by the light hairs on the hypopygium, which are black in the latter (Fig. 2). There has not been a recent revision of *Eumerus* species related to *E. mucidus*, and careful examination of a larger number of specimens, especially with focus on the characteristics of male genitalia, may result in description of new species.

Until now, *E. mucidus* has been known as a species that develops on the shoots and tubers of *Cistanche phelypaea* (as *C. lutea*) from Egypt (Shaumar & Kamal 1978). Outside Egypt, *E. mucidus* has been noted only in Israel (Kaplan 1974). To the best of our knowledge, this is the first report of *E. mucidus* parasitizing *C. armena*, as well as the first report of its occurrence in Armenia.

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Summary

Larvae of *Eumerus mucidus* (Diptera: Syrphidae) are reported for the first time as boring channels in the fresh tubers and shoots of the holoparasitic plant *Cistanche armena* (K. Koch) M.V. Agab. (Orobanchaceae), causing damage and breakage. Field surveys conducted in southern Armenia in May 2016 and Jun 2017 revealed infestations of *C. armena* with the larvae of *E. mucidus* in 1 locality in Ararat prov-

ince, near Khor Virap, in semi-desert habitats. A single *Cistanche* plant was parasitized by several *Eumerus* larvae, and 20 to 30% of the total population was infested. This is the first record of *E. mucidus* outside Egypt and Israel.

Key Words: hoverflies; broomrape; holoparasitic plant

Sumario

Se informan por primera vez las larvas de *Eumerus mucidus* (Diptera: Syrphidae) como barrenadores que hacen canales en los tubérculos frescos y brotes de la planta holoparasitaria *Cistanche armena* (K. Koch) M.V. Agab. (Orobanchaceae), causando daño y rotura. Los sondeos de campo realizados en el sur de Armenia en may del 2016 y jun del 2017 revelaron infestaciones de *C. armena* con larvas de *E. mucidus* en 1 localidad de la provincia de Ararat, cerca de Khor Virap, en hábitats semidesérticos. Una sola planta de *Cistanche* fue parasitada por varias larvas de *Eumerus* y el 20 para 30% del total de la población estaba infestada. Este es el primer registro de *E. mucidus* fuera de Egipto e Israel.

Palabras Clave: mosca de las flores; *Cistanche*; planta holoparasitaria

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