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Detection of *Perillus bioculatus* (F.) (Heteroplera: Pentatomidae) on a New Host in Anatolia

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Abstract **– *Perillus bioculatus* (F.) (Heteroptera: Pentato--midae), a predator of North American (Nearctic) origin, was recently found in the European side of Turkey. This species is mainly a predator that is the natural enemy of chrysomelids. It is known that this species has a significant potential in the biological control of *Leptinotarsa decemlineata* (Say) (Coleoptera: Chrysomelidae). In a survey conducted in Sivaslı district of Usak Province in 2017, *P. bioculatus* individuals were detected for the first time in Anatolian side. The individuals were collected on the poplar plant. In later observations, it has been seen that some individuals are fed on larvae of Poplar leaf beetle, *Chrysomela populi* L. (Coleoptera: Chrysomelidae), which is harmful to the poplar plant. Thus, for the first time, Poplar leaf beetle was added among the hosts of this predator.**

Keywords **– New record, *Perillus bioculatus*, Poplar, Usak**

I. Introduction

Solanum tuberosum L. (Solanaceae), an American origin plant, is an important vegetable in human nutrition. It has been brought to the European continent and successfully produced in many countries. There are many harmful insects that cause significant damage in production areas. Among them, Colarado potato beetle, *Leptinotarsa decemlineata* (Say) (Coleoptera: Chrysomelidae) is eco--nomically destructive pest of potato worldwide. Two-spotted stink bug, *Perillus bioculatus* (F.) (Heteroptera: Pentatomidae) is known one of the most important natural enemies of this pest in the Nearctic region. It is a predator in the family Pentatomidae and known to be a native of North America and spread from Mexico to Canada (Froeschner, 1988).

Both the nymph and adult stages are the specialized predators of egg masses, larvae and adults of field populations of *L. decemlineata*. This predator has effectively controlled the Colorado potato beetle in small-scale release trials and in cage studies, both in different European countries and in the United States (Hough-Goldstein *et al.,* 1996). For this purpose, this species has been introduced into various parts of Europe continent since 1966 (e.g., Belgium, Czechoslovakia, France, Germany, Hungary, Italy, Poland, Russia, Slovakia, Ukraine, former Yugoslavia) and Asia to control the *L. decemlineata* with varying success (Briand, 1936; Lipa, 1976; Tamaki and Butt, 1978; Jermy, 1980; Gusev, 1991; De Clercq, 2000; Rabitsch, 2008). This predator was introduced in many countries but it did not become established (Szmidt and Wegorek, 1967; Jermy, 1980). After its unsuccessful introduction, it was only cited as an alien species in Europe (Rabitsch, 2008; Protic and Nebojsa, 2012). However, it was reported that this species recently found in many European countries and North India (Derjanschi and Elisoveţcaia, 2014; Prasad and Pal, 2015; Elisoveţcaia and Derjanschi, 2016). One of these countries is Turkey, but there is no work on the release of this predator in there. *Perillus bioculatus* was first reported by Kivan (2004) in Thrace in the province of Tekirdag. Later, Fent and Aktaç (2007) reported that this species was found in insect specimens collected in the same region between 1992 and 2003. This predator was not detected despite repeated search in the Asian part of Turkey (Onder *et al.,* 2006; Fent and Aktaç, 2007). With this study, it has been reported for the first time that *P. bioculatus* species is fed on poplar leaf beetle larvae, *Chrysomela populi* L. (Coleoptera: Chry--somelidae) in the Asian side (Anatolia) of Turkey.

The purpose of this study was to report that *P. bioculatus* was found first time in Turkey's Anatolian side and *C. populi* was a new host species for this predator.

II. Material and Methods

During the current survey, the specimens of Pentatomidae were detected while feeding on larva of *C. populi* on poplar leaves (Fig. 1) in Usak Province (38º 29' 17" N, 29º 40' 42" E, 924 m) on August 19, 2017. The insects were collected and brought to the laboratory in a plastic bag. They were killed, using killing jars, and were subsequently pinned and then used for identification. The taxonomic distinction of species was completed. Diagnostic characters and key to the species of *Perillus* were provided by Paiero *et al.* (2013) and Thomas (1992). Thus, the identification was done with the help of available literatures. The specimens of chrysomelid were identified as *C. populi* by Dr. A. N. Ekiz (Department of Biology, Faculty of Arts and Science, Usak University, Usak, Turkey). The images were acquired by using Olympus SZX10 microscope with an integrated Olympus SC30 camera. The specimens' material for this record were stored in the collection of the Insect Museum of the Plant Protection Department, Faculty of Agriculture and Natural Sciences, Usak University, Usak, Turkey.

Fig. 1 Adult of *Perillus bioculatus* attacking *Chrysomela populi* larva.

III. Results and Discussion

A predatory pentatomid bug *P. bioculatus* has been found for the first time in Turkey's Anatolian side. During the survey it has been seen that adult of *P. bioculatus* is feeding on the larvae of *C. populi*, which is harmful to the poplar plant. Thus, for the first time, Poplar leaf beetle was added among the hosts of this predator. During a survey, *P. bioculatus,* recorded on the different crops, were found while feeding on the grubs of *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae) on *Parthenium* from Meerut (U.P.) North India (Prasad and Pal, 2015). In the laboratory, tests have shown that *P. bioculatus* has not monophag lives. According to some authors, *P. bioculatus* is a monophag species that feeds exclusively on the Colorado potato beetle (Knight, 1952; Lipa, 1985; Hough-Goldstein and Mcpherson, 1996). However, in European laboratory experiments on nutritional choices, it has been shown that the species is also found on larvae of *Gastroidea viridula* Deg., *Chrysomela sanguinolenta* L., *Gastroidea polygoni* L., *Phytodecta fornicata* Brügm., *Cassida nebulosa* L., *Galeruca pomonae* Scop. (Coleoptera: Chrysomelidae), *Subcoccinela 24- punctata* L. (Coleoptera: Coccinellidae), *Athalia rosae* L. (Hymenoptera: Tenthredi--nidae) and *Polia oleracea* L. (Lepidoptera: Noctuidae) (Jermy, 1980) and on the eggs and larvae of *Henosepila--chna elaterii* Ros. (Coleoptera: Coccinellidae) can be feed (Kivan, 2004). As seen here, some alternative host foods have been used in laboratory conditions. Determining the production possibilities of this species by using the larvae of the *C. populi* will contribute to mass production in the future. Augmentative releases of *P. bioculatus* can result in control of first and second generation eggs and larvae of field populations of Colorado potato beetle (Hough-Goldstein and Whalen, 1993; Cloutier and Bauduin, 1995; Poprawski *et al*., 1997).

IV. Conclusion

Perillus bioculatus, an important predator of the Colorado potato beetle, was firstly found in Anatolia. It has been reported that this natural enemy feeds on the larvae of *C. populi*, an important pest in the poplar trees. In the coming years, more research is needed to aid our understanding of biology, distribution, ecological relation--ships, populations and its natural enemies of this species under natural condition.

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