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Undetected for a century: Palaearctic *Agrilus ribesi* Schaefer (Coleoptera: Buprestidae) on currant in North America, with adult morphology, larval biology and DNA barcode

EDUARD JENDEK¹, VASILY V. GREBENNIKOV² & LADISLAV BOCAK³

¹Ottawa Plant Laboratory, Canadian Food Inspection Agency, Building 18, 960 Carling Avenue, Ottawa, ON K1A 0Y9, Canada.

E-mail: eduard.jendek@inspection.gc.ca

²Ottawa Plant Laboratory, Canadian Food Inspection Agency, K.W. Neatby Building, 960 Carling Avenue, Ottawa, ON K1A 0Y9, Canada. E-mail: vasily.grebennikov@inspection.gc.ca

³Department of Zoology, Faculty of Science UP, Olomouc, Czech Republic. E-mail: ladislav.bocak@gmail.com

Abstract

We report the Eurasian species *Agrilus ribesi* Schaefer, 1946, for the first time from North America and propose that the damage to currants (*Ribes* spp.) in Ontario prior to 1940 and ascribed to *A. cuprescens* were caused by this species. We provide morphological diagnostic characters for *A. ribesi* and closely related *A. cuprescens* and we complement this information with DNA barcodes from four alien *Agrilus* species established in North America (i.e., *A. ribesi* Schaefer, *A. cuprescens* (Ménétriés), *A. planipennis* Fairmaire and *A. sulcicollis* Lacordaire) to enable DNA-based identification of these invasive species. Additionally, published information on *A. ribesi* is summarized and new data are provided on the host plants and biology of larva in North America. The distribution of *A. ribesi* is mapped, both in its native Palaearctic region and in Canada and the USA, together with the range of its potential host plants in North America. *A. ribesi* was recovered as a sister-species of *A. cuprescens* on the neighbor joining DNA barcoding tree and low genetic variability of North American populations may indicate a single introduction to North America for each of these species.

Key words: *Agrilus ribesi*, pest, introduction, COI, DNA barcode, *Ribes*

Introduction

The globally distributed genus *Agrilus* Curtis with over 3,000 valid species is the largest genus of the Animal Kingdom (Jendek & Grebennikov 2011). It is infamous for harbouring *A. planipennis* Fairmaire, the Emerald Ash Borer (EAB), “the most destructive and economically costly forest insect to ever invade North America” (Herms & McCullough 2014). Besides EAB, eight other exotic *Agrilus* species are known to have established widespread populations in the USA and Canada, only one of which was intentionally introduced as a biological control agent (Jendek & Grebennikov 2009). The accidentally introduced species, especially when invading distant regions, can be easily misidentified because taxonomic expertise is limited and local specialists seldom have knowledge on the worldwide alpha-taxonomic diversity. Here, we use the barcode approach (Hebert *et al.* 2003) in combination with morphology-based taxonomy and detailed information on biology to identify an alien species of a wood-boring plant pest. We advocate usage of modern taxonomic methods by linking DNA-sequences with additional information to create a strong tool for identification of alien species from such mega-diverse lineages as *Agrilus*.

In this paper, we report yet another, the tenth invasive *Agrilus* established in the USA and Canada, developing in *Ribes* and till now unrecognized in North America. Our discovery was triggered by Richard Westcott, who during preparation of his recent paper (Westcott *et al.* 2015) called our attention to Garlick’s record (1940) of black currant, red currant and gooseberry as host plants of *A. cuprescens* in Ontario, Canada. These plants were not included in the list of verified hosts of *A. cuprescens* (Jendek 2003; Jendek & Poláková 2014). The taxonomic concept of *A. cuprescens* was unclear at the time of its introduction to the American continent (Weiss 1914, as *A. politus*). Furthermore, biology of this notorious pest of *Rubus* and *Rosa* is well documented, while its development