

**ON THE DISTRIBUTION OF A NEW INVASIVE WEEVIL
BEETLE *PSEUDOCNEORHINUS OBESUS* (ROELOFS, 1873)
(COLEOPTERA: CURCULIONIDAE: ENTIMINAE)
IN THE NEARCTIC REGION**

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ABSTRACT: In this paper, new data on the distribution of a new invasive weevil beetle *P. obesus* (Coleoptera, Curculionidae, Entiminae) in the Nearctic Region and the first documented record of this species in the State of New York are reported. Combined with the new data presented here, *P. obesus* is currently known in the United States from the states of New York, New Jersey, Pennsylvania, Kentucky, Georgia, Virginia, and the District of Columbia. *P. obesus* is the second reported species of the genus *Pseudocneorhinus* introduced into the Nearctic Region. The first one, *P. bifasciatus*, has widely spread across the United States and is currently designated as a species of high economic concern. *P. obesus* can also be a potentially dangerous pest of deciduous plants in the United States.

KEY WORDS: Coleoptera, Entiminae, Nearctic Region, *Pseudocneorhinus obesus*, the United States

The genus *Pseudocneorhinus* Roelofs, 1873 belongs to the tribe Trachyphloeini Gistel, 1848 in the subfamily Entiminae Schoenherr, 1823 and to date comprises 14 species distributed in the eastern part of the Palaearctic Region (Alonso-Zarazaga et al., 2017). The natural range of the genus covers the Russian Far East, China, Mongolia, Japan and the Korean Peninsula (Borovec, 2009; Alonso-Zarazaga et al., 2017). *Pseudocneorhinus obesus* Roelofs, 1873 has recently been reported to have been introduced into the United States (Yunakov, 2015). In the present paper, I report new data on the distribution of this new invasive species in the Nearctic Region and the first documented record of this species in the State of New York.

MATERIALS AND METHODS

The study material is deposited in the I. V. Kizub's private collection (Kyiv, Ukraine and Ossining, New York, the United States). The photographs were taken using CoolingTech USB Digital Microscope S02 500X. The nomenclature of the taxa and synonymy for the species names are given according to The Cooperative Catalogue of Palaearctic Coleoptera Curculionoidea (Alonso-Zarazaga et al., 2017).

RESULTS AND DISCUSSION

***Pseudocneorhinus obesus* Roelofs, 1873** (Figs. 1-5, 11-17)

= *trifasciatus* Voss, 1958

Material examined: 6 females, the United States, New York, Westchester County, Ossining, 41°09'54"N 73°51'52"W, 01.07. – 31.09.2014, Kizub I. V. leg.; 1 female, idem, 29.05.2018, Kizub I. V. leg.

***Pseudocneorhinus bifasciatus* Roelofs, 1880** (Figs. 6-10, 17)

Material examined: 6 females, the United States, New York, Westchester County, Ossining, 41°09'54"N 73°51'52"W, 01.07. – 31.09.2014, Kizub I. V. leg.; 14 females, the United States, New York, Westchester County, Valhalla, 41°04'56.2"N 73°48'35.9"W, 01 – 31.08.2018, Kizub I. V. leg.; 1 females, idem, 01.09. – 04.10.2018, Kizub I. V. leg.; 2 females, the United States, New York, Westchester County, Millwood, 41°11'44.9"N 73°47'37.7"W, 02.09.2018, Kizub I. V. leg.

Geographical distribution

The natural range of *P. obesus* covers the Russian Far East, Northern and Central-Eastern China, Japan and the Korean Peninsula (Zherikhin, 1972; Takenouchi, 1976, 1982; Egorov, 1977; Ler, 1996; Han et al., 2000; Kojima & Morimoto, 2004; Borovec, 2009; Legalov, 2009, 2010; Kojima, 2012; Alonso-Zarazaga et al., 2017). Several races or subspecies of *P. obesus* likely exist, with distinct geographical distributions within the natural range, in particular among populations from Northern Japan and the South of the Kuril Islands (Kunashir Island) (Takenouchi, 1976, 1982; Ler, 1996).

In 1914 J. G. Sanders, an agent and expert of the United States Department of Agriculture Bureau of Entomology, in his letter to Dr. L. O. Howard, Head of the Bureau, reported that "*An undetermined weevil similar in appearance to Pseudocneorhinus obesus* (auct. *H. Barber*) was found" feeding on flowering cherry trees from Japan in Washington, the District of Columbia. This letter was only published in 1977 (Jefferson & Fusonie, 1977). The presence of *P. obesus* in the United States was only confirmed 100 years later, in 2015, when 1 female specimen was found in Georgia (Yunakov, 2015). Since the report by Yunakov of 2015, the species has never been reported from the United States. Meanwhile, the first photographs of *P. obesus* were taken in Virginia in 2006 and published under the name *P. bifasciatus* (BugGuide..., 2007). Then photographs of a clearly recognizable *P. obesus* were taken by different naturalists in Georgia in 2012 (Newton, 2012) (Fig. 11), New Jersey in 2012 (Stuart, 2012) (Fig. 12) and 2015 (Christensen, 2015), Kentucky in 2013 (Hoyer, 2013) (Figs. 13, 14), New York in 2013 (Dankowicz, 2015) (Fig. 15) and 2018 (Klein, 2018), and Pennsylvania in 2016 (Ausubel, 2016) (Fig. 16) and 2018 (Coulter, 2018), and published under the name *P. bifasciatus*, following misidentification. Based on my data and the above-mentioned observations, a map of the current *P. obesus* distribution in the Nearctic Region is presented in Fig. 17. To date, the species is known in the United States from the states of New York, New Jersey, Virginia, Pennsylvania, Kentucky, Georgia, and the District of Columbia.

P. obesus is the second reported species of the genus *Pseudocneorhinus* introduced in the Nearctic Region. The first one, *P. bifasciatus* (common economic name in the United States is a Twobanded Japanese Weevil), has already widely spread over the territory of the United States. For the first time *P. bifasciatus* was collected in Pennsylvania in 1914, however it was officially reported only 10 years later, in 1924, from Connecticut as *Pseudocneorhinus setosus* Roelofs, 1879 (Buchanan, 1946). For more than 20 years the species was treated as *P. setosus* and was recognized in the United States as *P. bifasciatus* only in 1946 (Buchanan, 1946). The present range of *P. bifasciatus* in the United States includes 29 states and one district: Alabama, Arkansas, Connecticut, District of Columbia, Delaware, Florida, Georgia, Iowa, Illinois, Indiana, Kentucky, Massachusetts, Maryland, Maine, Michigan, North Carolina, Nebraska,

New Hampshire, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Virginia, Vermont, Wisconsin, and West Virginia (Buchanan, 1946; Werner et al., 1954; Hamilton 1957; Allen, 1959; O'Brien & Wibmer, 1982; Maier, 1986; Sikes, 2003; Thomas, 2005; Wheeler & Boyd, 2005; Grantham & Rebek, 2008; Cottrell & Horton, 2013; Texas Invasive Species, 2014; Gyeltshen & Hodges, 2015; Liesch, 2016; Boone, 2018; Dmitriev, 2019) (Fig. 17). The natural range of *P. bifasciatus* slightly narrower, but mostly overlaps that of *P. obesus* and covers the Russian Far East, Northern and Central-Eastern China, Japan, as well as North and South Korea (Marshall, 1934; Zherikhin, 1972; Takenouchi, 1976; Egorov, 1977; Morimoto, 1994; Ler, 1996; Han et al., 2000; Kojima & Morimoto, 2004; Borovec, 2009; Legalov, 2009, 2010; Kojima, 2012; Alonso-Zarazaga et al., 2017; Yu & Wang, 2017).

Presently it's unclear whether the United States population of *P. obesus* began in Washington, D. C., 100 years ago brought with cherry trees from Japan (Jefferson & Fusonie, 1977). In such case, *P. obesus* should have spread out far throughout the eastern United States and would have been known from there for a long time – a scenario that happened to *P. bifasciatus*, which was first found in the United States in the same 1914 (Buchanan, 1946). By contrast, *P. obesus* could have been reintroduced (if the Sanders' report of 1914 related to *P. obesus*) into the United States in more recent times.

Morphological notes

P. obesus is very similar in appearance to *P. bifasciatus* but can be easily distinguished from the latter by the characters listed in Table 1. Additionally, *P. obesus* is also characterized by a slightly smaller size of rounded scales covering the body than in *P. bifasciatus*, longer and slender tibia and the funicle of the antennae, and relatively smaller eyes and broader frons between them (Figs. 1-10). Noteworthy that Roelofs, when describing *P. obesus*, decided that specimens of *P. bifasciatus* are males of *P. obesus* (Roelofs, 1873). Only six years later (reported at a meeting in April 1879) he came to a conclusion that there were two distinct species (Roelofs, 1880).

Biological notes

Both species, *P. obesus* and *P. bifasciatus*, are wingless and reproduce parthenogenetically (Takenouchi, 1976, 1981, 1982; Takenouchi et al., 1983; Maier, 1983; Morimoto & Lee, 1992; Morimoto, 1994; Wheeler & Boyd, 2005). This high reproductive capacity allows them to spread widely into new territories. Within the natural range of *P. obesus*, several polyploid forms (3x, 4x, and 6x) are known that reproduce by thelytoky, a form of parthenogenesis whereby females are produced from unfertilized egg (Takenouchi, 1976, 1982; Gregory, 2005). 3x, 4x and 5x polyploid forms are also known for *P. bifasciatus* (Takenouchi, 1981, 1982; Takenouchi et al., 1983; Gregory, 2005). Males of *P. obesus* and *P. bifasciatus* are also known from their natural ranges (Takenouchi, 1982; Borovec, 2009). Males of *P. bifasciatus* are not encountered in the United States (Wheeler & Boyd, 2005). The duration of life cycle and seasonal activity of *P. obesus* is probably similar to that of *P. bifasciatus*. In the northeastern United States, *P. bifasciatus* hibernate as adults, eggs or young larvae, and are a univoltine (single brood per season) species (Allen, 1959; Thomas, 2005). In the spring, adults begin feeding and laying eggs, while other stages continue their development. The overwintering weevils resume feeding on the first hot days of spring, and continue to feed and oviposit throughout the summer. Eggs of *P. bifasciatus* are laid from the middle of May through October, the peak period for oviposition begin from

September through early October. Oviposition stops by November (Zepp, 1978; Marrone & Zepp, 1979; Thomas, 2005). The newly hatched larvae burrow into the soil to feed on roots and pupation begins in early June (Allen, 1959; Marrone & Zepp, 1979). In the northeastern United States, adults of *P. bifasciatus* emerge from late June through early July and eventually outnumber the overwintering population and cause extensive damage to foliage (Allen, 1959).

Pest alert

Similarly to *P. bifasciatus*, *P. obesus* can be a potentially dangerous pest of deciduous plants in the United States. Imagoes of both species are leaf feeders and when abundant can cause significant damage. *P. bifasciatus* is highly polyphagous and is known as a pest of various cultivated and ornamental plants including citrus trees. Both adults and larvae cause plant damage. Adults cause defoliation, whereas the larvae destroy the roots. In Japan and the United States this species has been reported to feed on more than 100 species of plants from more than 25 families (Hamilton 1957; Allen, 1959; Marrone & Zepp, 1979; Maier, 1983, 1986; Staines & Staines, 1988; Boyd & Wheeler, 2004; Thomas, 2005; Japanese Society..., 2006; Zoology, 2006; Cottrell & Horton, 2013; Day, 2014; Gyeltshen & Hodges, 2015). Hosts of *P. obesus* in the United States have not been studied so far. The species has been found by Yunakov on *Quercus* sp. (Yunakov, 2015) and by the author on *Acer* sp. leaves. Currently *P. bifasciatus* is treated in the United States and Japan as a species of high economic concern (Bouchard et al., 2017), which could be anticipated for *P. obesus* in the United States as well. Because *P. obesus* is flightless, just like *P. bifasciatus*, its range expansion can probably be through human-mediated jump dispersal such as spread via domestic shipments of infested plant material (Boyd & Wheeler, 2004).

In conclusion, the author hopes that the present paper will inspire scientists and naturalists in the United States to review collections and records in order to reconstruct the history of invasion and determine the present range of the new invasive weevil beetle *P. obesus* in the Nearctic Region.

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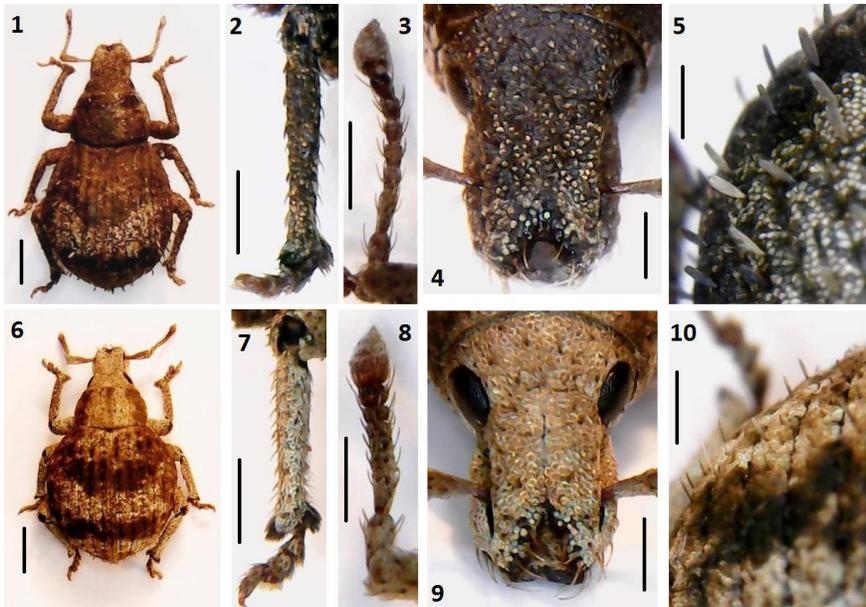
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Table 1. Morphological characters discriminating *P. obesus* from *P. bifasciatus*.

	<i>P. obesus</i>	<i>P. bifasciatus</i>
Shape of elytra	Elytra pear-shaped, widest at the middle (Fig. 1)	Elytra almost globe-shaped, angularly widened behind the shoulders and widest anteriorly of the middle (Fig. 6)
Metatibia	Inner edge of metatibia without or with 2 small and 1-2 tiny teeth (Fig. 2)	Inner edge of metatibia with 4-5 big and 2-4 small teeth (Fig. 7)
Antennal funicle	Segments 3-6 of antennal funicle longer than width (Fig. 3)	Segments 3-6 of antennal funicle transverse (Fig. 8)
Postepistomal area	Postepistomal area short, far from reaching the level of antennae attachment (Fig. 4)	Postepistomal area of rostrum long, almost reaching the level of antennae attachment (Fig. 9)
Elytral scales	Piliform scales on intervals of elytra long, broad, and leaf-shaped (Fig. 5)	Elytral piliform scales short, slender, needle- or stick-shaped, scarcely dilated distally (Fig. 10)



Figures 1-10. Weevils of the genus *Pseudocneorhinus* from the Nearctic Region, females. *P. obesus*: 1) general view dorsally; 2) metatibia; 3) elytral surface in front-dorsal view; 4) antennal funicle; 5) rostrum dorsally. *P. bifasciatus*: 6) general view dorsally; 7) metatibia; 8) elytral surface in front-dorsal view; 9) antennal funicle; 10) rostrum dorsally. Scale bars in 1 and 6: 1 mm; scale bars in 2-5 and 7-10: 0.5 mm.

