

## SCIENTIFIC NOTE

# FIRST REPORT OF THE PALEARCTIC FLEA BEETLE *NEOCREPIDODERA FERRUGINEA* (SCOPOLI, 1763) (COLEOPTERA: CHRYSOMELIDAE: GALERUCINAE: ALTICINI) FOR THE UNITED STATES OF AMERICA

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In material collected in 2017 in Antrim County, Michigan, USA, were three specimens of a flea beetle species misidentified at the time as belonging to the genus *Crepidodera* Chevrolat in Dejean, 1836 (Haack and Ruesink 2020). A recent reexamination of those specimens revealed that they actually belong to the genus *Neocrepidodera* Heikertinger, 1911.

Our three specimens of *Neocrepidodera* were all collected by sweep net during a study conducted to document the coleopterous fauna of the Grass River Natural Area, a 1,492-acre (603-ha) preserve ca. 7 km south of the village of Bellaire, Michigan. One specimen was found in the “grasslands” site (44.9100°N, 85.2333°W) on 19 June 2017, and two individuals were from the “pines” site (44.9050°N, 85.2223°W) on 15 July 2017. Both sites consisted of mixed herbaceous, mostly native vegetation surrounded by forest. The grasslands site had ca. 5 ha

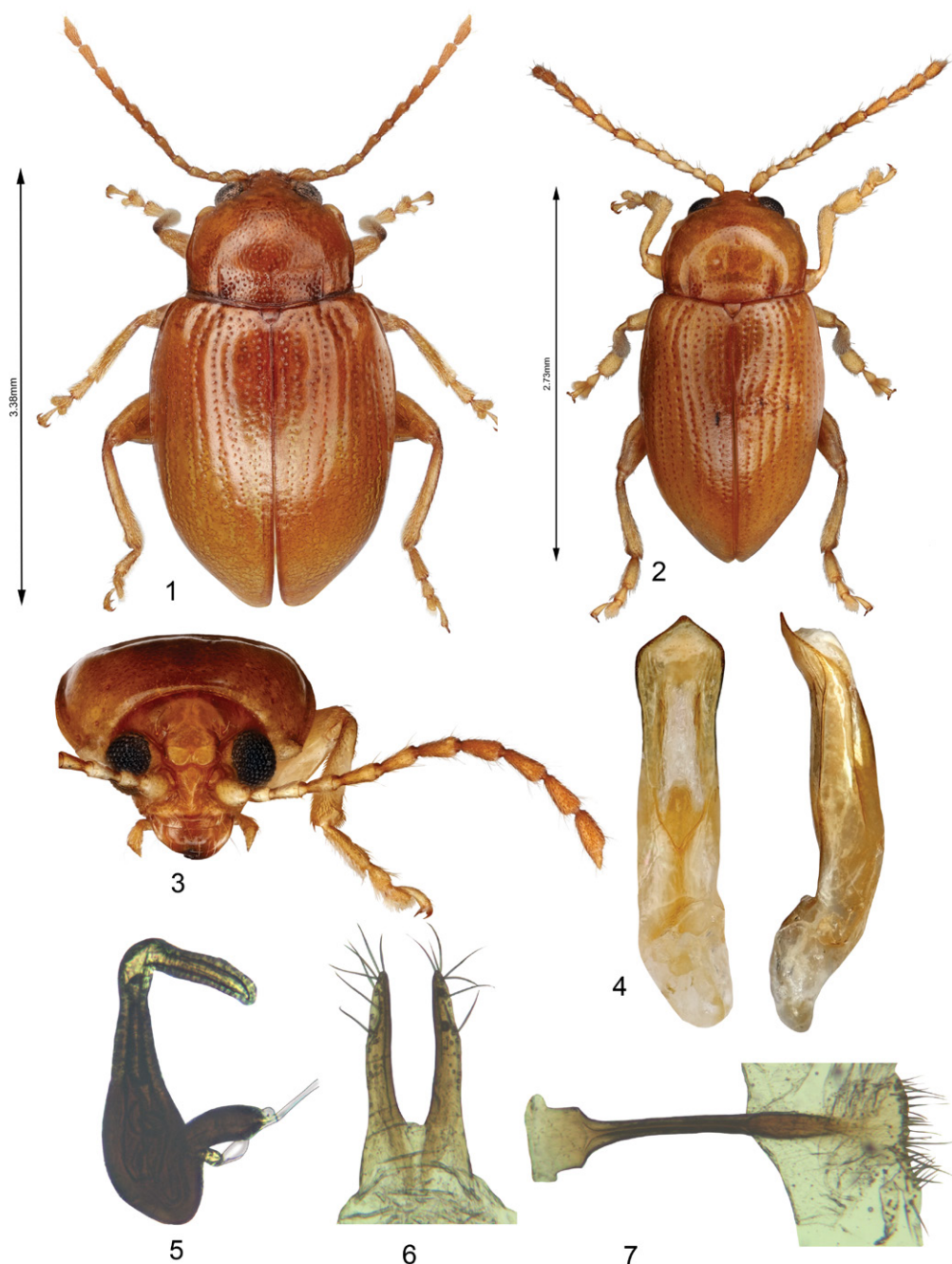
of open area surrounded mostly by northern hardwoods, whereas the pines site had approximately 0.3 ha of open area surrounded mostly by red pine, *Pinus resinosa* Sol. ex Aiton (Pinaceae). See Haack and Ruesink (2020) for a more detailed description of the study area.

Because the 2017 specimens are all female, the first two authors returned to Grass River Natural Area in 2022 and attempted to collect additional specimens. On 15 June, two specimens, one male and one female, were collected along the Rail Trail (44.9076°N, 85.2197°W) and immediately placed in 95% ethyl alcohol. Although sweeps were repeated weekly until mid-August, no more specimens were taken. The male specimen was sent to the National Museum of Natural History, Washington, DC (USNM) for dissection, and the female specimen was sent to Michigan State University for DNA analysis. Both were

confirmed to be *Neocrepidodera ferruginea* (Scopoli, 1763). Genitalia dissections and observations were made according to Konstantinov (1998).

*Neocrepidodera* adults may be recognized among other flea beetle genera occurring in the USA by the

combination of the following characters: entire body light brown to yellowish in color (Figs. 1, 2); head (Fig. 3) with a full set of sulci around antennal calli, except the supracallinal sulci are absent; antenna with 11 antennomeres; pronotum (Figs. 1, 2) with



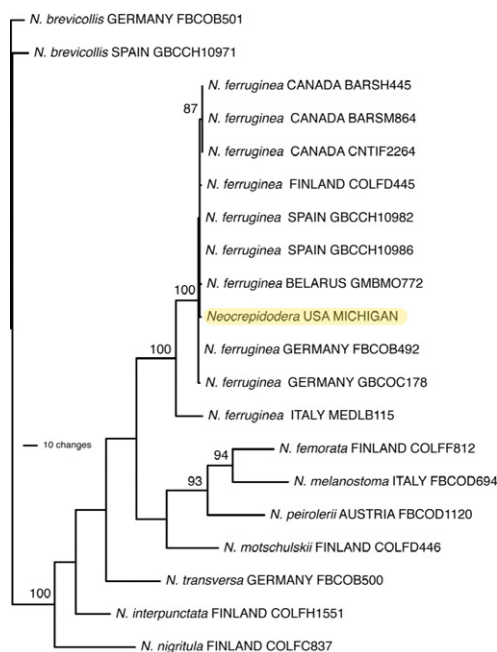
**Figs. 1–7.** *Neocrepidodera ferruginea*. 1) Dorsal habitus, female; 2) Dorsal habitus, male; 3) Frontal habitus, male; 4) Median lobe of aedeagus (ventral and lateral views); 5) Spermatheca; 6) Vaginal palpi; 7) Tignum.

two long longitudinal antebasal grooves and relatively shallow transverse groove; procoxal cavities closed behind; first protarsomere in males much larger than in females (Figs. 1, 2); fourth visible metatarsomere not inflated (Figs. 1, 2); spermatheca with receptacle and canal situated in planes perpendicular to each other (Fig. 5); and vaginal palpi connected along apical one-third, each with seven long setae apically (Fig. 6), tignum with anterior sclerotization as wide as posterior sclerotization (Fig. 7).

There are two native species of *Neocrepidodera* in the USA: *Neocrepidodera pallida* (Fall) and *Neocrepidodera robusta* (LeConte) (Konstantinov 1995). *Neocrepidodera ferruginea* may be separated from these by an obvious character: the second antennomere is shorter than the third. In native North American species of *Neocrepidodera*, the second antennomere is as long as or a bit longer than the third. Among the Palearctic species of the genus (Baselga and Novoa 2005), *N. ferruginea* may be identified by having: elytral striae nearly completely regular (Fig. 2); relatively coarse punctures of pronotal disc (Fig. 1); base of sixth elytral stria moderately impressed, as deep as the other striae; sides of pronotum not constricted basally (Figs. 1, 2); median lobe of aedeagus short, produced apically into a rounded denticle in ventral view, in lateral view straight in middle, abruptly angled ventrally both apically and basally (Fig. 4); vaginal palpus parallel sided along middle one-third, sides converging posteriorly (Fig. 6).

DNA was extracted from the female specimen and an ~650 base pair section of the 5' end of mitochondrial cytochrome oxidase I was amplified via PCR and sequenced with primers LCO1490 5'GGTCAACAAATCATAAAGATATTGG 3' and HCO2198 5'TAAACTTCAGGGTGACCAAAAAA TCA 3' following established protocols (Hebert *et al.* 2003; Smith and Cognato 2022). This sequence and an additional 19 *Neocrepidodera* sequences representing nine Eurasian species downloaded from the BOLD public database (<http://v3.boldsystems.org>) were assembled into a NEXUS file for phylogenetic analysis. Using PAUP\* version 4.0a build 169 software (Swofford 2002), one most parsimonious tree resulted from a heuristic search with 100 random stepwise additions (Fig. 8). *Neocrepidodera ferruginea* was monophyletic and had a 100% bootstrap value. The USA specimen represented a unique haplotype which differed from the Canadian and European specimens by 0.15–0.54% (uncorrected “p”) except for the Italian specimen which differed from all *N. ferruginea* by 5.2–6.1%.

*Neocrepidodera ferruginea* is a Palearctic species recently reported as new to North America by LeSage and Savard (2012) but until now known only from Canada. In Europe, this species is the most



**Fig. 8.** One most parsimonious unrooted tree of selected *Neocrepidodera* species inferred from COI DNA sequences; *N. ferruginea* from Michigan, USA is highlighted. Specimen labels = species/origin of specimen/BOLD #. Numbers at nodes are bootstrap proportions generated with 500 pseudo replications with simple addition (< 50% not shown).

widespread among other Western Palearctic species of the genus (LeSage and Savard 2012), being common in northern and central Europe but uncommon to rare in southern areas of Europe (GBIF 2022). In the Asian part of the Palearctic, it is known to occur in Azerbaijan, Georgia, Iran, southern Siberia, and Turkey (Döberl 2010). In Canada, it has been found from Niagara Falls, Ontario, in the south (1977) and Crapaud, Prince Edward Island, in the east (2011) to Sault-Sainte-Marie, Ontario, in the northwest (1998) (Klimaszewski *et al.* 2020; LeSage and Savard 2012). The latter site is ca. 200 km NNE of where we found our specimens in northwestern Lower Michigan. It is possible that the Michigan specimens represent an introduction separate from the origin of the Canadian populations, given the unique Michigan haplotype. Alternatively, the Michigan specimen could have been part of a large initial North American introduction. Testing this hypothesis requires a larger sample of individuals across northeastern North America.

Adults of *N. ferruginea* are polyphagous, and larvae feed primarily on roots of thistles and related plants (Asteraceae), although several cultivated

cereals (Poaceae) have been reported as hosts in Europe. The biology has not been studied in North America, but the insects are apparently of little or no economic importance there at present (LeSage and Savard 2012). See LeSage and Savard (2012) for additional information regarding the biology.

**Vouchers:** The male from 2022 and a female from 2017 are deposited in the USNM collection with the following labels: 1) MI: Antrim Co. Grass River Natural Area, 15 July 2017, W.G. Ruesink coll.; 2) 4628; 3) IGR P; 4) *Neocrepidodera ferruginea* (Scopoli) Det. W. Ruesink 2022 (female). 1) MI: Antrim Co. Grass River Nat. Area, 23 Jun 2022, W.G. Ruesink/R.A. Haack; 2) 4629; 3) Images taken, A. Konstantinov 2022; 4) *Neocrepidodera ferruginea* (Scop.) det. A. Konstantinov, 2022 (male). The remains of the 2022 female used for DNA analysis were pinned and vouchered at the A. J. Cook Arthropod Research Collection at Michigan State University (MSU-ARC). The resulting sequence was deposited in GenBank (#OP351512). The two other female specimens collected in 2017 are also deposited in the MSU-ARC with labels: 1) Michigan: Antrim Co. Grass River Natural Area, 19 June 2017, W.G. Ruesink coll.; 2) *Neocrepidodera ferruginea* (Scopoli) Det. W. Ruesink 2022, and 1) Michigan: Antrim Co. Grass River Natural Area, 15 July 2017, W.G. Ruesink coll.; 2) *Neocrepidodera ferruginea* (Scopoli) Det. W. Ruesink 2022.

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Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the USDA (or by any other organization); the USDA is an equal opportunity provider and employer.

#### REFERENCES CITED

- Baselga, A., and F. Novoa. 2005. The Western Palearctic *Neocrepidodera* (Coleoptera: Chrysomelidae) of the *N. impressa* and *N. ferruginea* species groups. *Annals of the Entomological Society of America* 98(6): 896–907. doi.org/10.1603/0013-8746(2005)098[0896:TWPNNCC]2.0.CO;2.
- Döberl, M. 2010. Chrysomelidae: Alticinae [pp. 491–663]. In: *Catalogue of Palaearctic Coleoptera*. Volume 6. Chrysomeloidea (I. Löbl and A. Smetana, editors). Apollo Books, Stenstrup, 924 pp.
- GBIF (Global Biodiversity Information Facility). 2022. *Neocrepidodera ferruginea* (Scopoli, 1763) in GBIF Secretariat. www.gbif.org/species/4462178 (accessed 30 August 2022).
- Haack, R. A., and W. G. Ruesink. 2020. Coleoptera collected using three trapping methods at Grass River Natural Area, Antrim County, Michigan. *The Great Lakes Entomologist* 53(3–4): 136–167.
- Hebert, P. D., A. Cywinska, S. L. Ball, and J. R. deWaard. 2003. Biological identifications through DNA barcodes. *Philosophical Transactions of the Royal Society B* 270(1512): 313–321. doi.org/10.1098/rspb.2002.2218.
- Klimaszewski, J., E. R. Hoebeke, D. W. Langor, H. B. Douglas, L. Borowiec, H. E. J. Hammond, A. Davies, C. Bourdon, and K. Savard. 2020. Synopsis of adventive species of Coleoptera (Insecta) recorded from Canada. Part 5: Chrysomeloidea (Cerambycidae, Chrysomelidae, and Megalopodidae). *Pensoft Series Faunistica* No. 119, 175 pp. doi.org/10.3897/ab.e50613.
- Konstantinov, A. S. 1995. *Orestioides* Hatch, a new synonym of *Asiolestia* Jacobson (Coleoptera: Chrysomelidae: Alticinae). *The Coleopterists Bulletin* 49(1): 73–76.
- Konstantinov, A. S. 1998. Revision of the Palearctic species of *Aphthona* Chevrolat and cladistic classification of the Aphthonini (Coleoptera: Chrysomelidae: Alticinae). *Memoirs on Entomology, International* 11: 1–429.
- LeSage, L., and K. Savard. 2012. First record of the European rusted flea beetle, *Neocrepidodera ferruginea* (Scopoli, 1763), in North America (Coleoptera: Chrysomelidae: Galerucinae: Alticini). *Psyche* 2012, 387564. doi.org/10.1155/2012/387564.
- Smith, S. M., and A. I. Cognato. 2022. New non-native pseudocryptic *Cyclorhpidion* species (Coleoptera: Curculionidae: Scolytinae: Xyleborini) found in the United States as revealed in a multigene phylogeny. *Insect Systematics and Diversity* 6(4), 2. doi.org/10.1093/isd/ixac014.
- Swofford, D. L. 2002. PAUP\*. Phylogenetic Analysis Using Parsimony (\*and Other Methods). Version 4. Sinauer Associates, Sunderland, MA.

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