

NEW RECORDS OF EUROPEAN WIREWORM PESTS AND OTHER CLICK BEETLES (COLEOPTERA: ELATERIDAE) IN CANADA AND USA

H. DOUGLAS

Entomology, Ottawa Plant Laboratories, Canadian Food Inspection Agency, Building 18,
960 Carling Avenue, Ottawa, ON, Canada K1A 0C6
email: hume.douglas@inspection.gc.ca

Abstract

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The predatory wireworm *Hemicrepidius niger* (L.) is newly reported from North America (Canada: Ontario and New Brunswick). The agricultural pest species *Athous haemorrhoidalis* (Fabricius) is newly recorded from North America (Canada: Ontario and USA: Massachusetts). New provincial and state records are reported for the Palaearctic agricultural pest species *Agriotes lineatus* (L.) (USA: Massachusetts and Canada: Prince Edward Island) and *Agriotes obscurus* (L.) (Canada: Prince Edward Island). New national, provincial or state records are listed for 14 native North American species.

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Introduction

North America is home to about 1000 described species of Elateridae (Johnson 2002), which include important invasive alien crop pests. Of nine species listed as introduced into USA (Johnson 2002) and Canada (Majka and Johnson 2008), six are known pests, namely: *Agriotes lineatus* (L.), the Lined Click Beetle (Gratwick 1992; Traugott et al. 2008); *A. obscurus* (L.), the Dusky Wireworm (Gratwick 1992; Traugott et al. 2008); *A. sputator* (L.) (Gratwick 1992; Traugott et al. 2008); *Conoderus amplicollis* (Gyllenhal), the Gulf Wireworm (Stone 1975); *C. falli* (Lane), the Potato Wireworm (Dobrovsky 1953); and *C. exsul* Sharp, the Sugarcane Wireworm (Williams 1931). This work presents the discovery of two additional species of adventive Elateridae in North America, one of which can be considered a pest species, and new findings of established pest species in Massachusetts and Prince Edward Island. New provincial and state records are provided for 13 native species. Specimens are deposited in the Canadian National Collection of Insects, Arachnids and Nematodes (CNCI), Ottawa, and other collections or with collectors, as indicated under each species.

Results

First records of new exotic species in North America

Hemicrepidius niger (L.)

In 2008 a single specimen of the Eurasian elaterid *Hemicrepidius niger* (L.) was collected from Claireville Conservation Area near Brampton Ontario, during the Canadian Food Inspection Agency's (CFIA) trapping survey for invasive alien pests. Confirmation of the identity of this specimen was made by S. Laplante and H. Mendel. Finding this species, a putative crop pest wireworm, in North America caused initial concern that it might become an agricultural pest.

Subsequent fieldwork was conducted in June 2009 to assess the presence, abundance, and geographical extent of the population at the site. A collecting effort of 22 person-hours of beating and sweeping, plus five blacklight-traps (set for one night) was conducted over two days within three km of the original detection site. This effort yielded two additional specimens of *H. niger*. Conditions were sunny with high temperatures of 30–32°C, preceded by 1–2 weeks of cooler rainy weather. Insect catches were generally low. Finding these three specimens within a one-km radius over two years suggests the existence of a reproducing population of *H. niger*. In 2010, two additional specimens of this species were recovered from CFIA traps near St. John, New Brunswick. The findings in New Brunswick were 21 km from each other and 1100 km from the Ontario site, suggesting that *H. niger* is established in at least two separate agricultural regions of Canada.

The larval stage of *H. niger* was thought to be a root pest of vegetables, grains, forage crops, and possibly tree seedlings. However, recent stable-isotope analysis of this species at 11 sites in Austria and Germany indicates that it acts as a predator in its native range (Traugott et al. 2008), and is therefore likely beneficial or not important to plant production. This suggests that *H. niger* will not become a crop pest in North America, but it is unknown what impact this predator could have on soil-dwelling animals.

Label data.¹: “Canada, ON, Toronto,/ Claireville CA. 17T/ 0608674W 4844539N/ 23.vi.[20]08 funnel nr. *Populus*/ Chin & Fok CFIA08-3149”; “Canada, ON, Brampton,/ Claireville CA. 43.754° N 79.64° W 22.vi. [20]09 beating/ *Salix* H.Douglas”; and “Canada, ON, Brampton,/ Claireville CA. 43.747° N 79.646° W 23.vi. [20]09 AM on *Asclepias* H.Douglas”; “Canada, NB,/ Quispamsis, 45.467°N/ -65.937°W 16.vii.2010./ EAB sticky./ K.L.Richard CFIA10-02200”; and “Canada, NB, Rockwood/ Pk. campground,/ 45.292°N -66.050°W/ 16.vii.2010. EAB sticky./ K.L.Richard CFIA10-02201”.

Recognition. *Hemicrepidius niger* is a shiny, black or brown elaterid, 10–13 mm long with long pale pubescence dorsally. This species can be distinguished from all North American *Hemicrepidius* by the lack of posterior emarginations of the hypomera (that of *H. niger* resembles Fig. 8 in Johnson 2002). Because of this difference, identification of *H. niger* specimens using Johnson's (2002) key to North American genera of Elateridae should lead readers to genus *Athous*. This apparent error is because Johnson's key was not designed to diagnose non-North American members of these morphologically similar genera.

¹ A ‘/’ in quoted label data indicates a line break.

Individuals attempting to identify specimens of *H. niger* and *A. haemorrhoidalis* using Becker's (1979) key to North American *Athous* will follow the path from couplet 1 directly to couplet 35. This is because these two species lack the triangular frontal depression (i.e., posterior to the supra-antennal carina) that would lead users to couplet 2. Otherwise the somewhat elevated frontal carina (supra-antennal carina) of *A. haemorrhoidalis* and moderately long antennomere 2 of both species would make interpretation of couplet ambiguous. At couplet 35, both can be distinguished from all subsequent species by the following combination of characters: elytral colour uniform (patterned in some species), and lobes of 3rd tarsal segments reaching to apical half of 4th tarsal segments (not reaching as far in any of the other species [Becker 1979, Leseigneur 1972]). The supra-antennal carina of *A. haemorrhoidalis* is also straight across the head in anteroventral view (this carina is depressed medially in most other species beyond couplet 35). *Hemicrepidius niger* can be distinguished from *A. haemorrhoidalis* by its broad antennomere 3, which is most similar in shape and rough texture to antennomere 4 (most like the shape and smoothness of antennomere 2 in *A. haemorrhoidalis*). Additionally, the apices of the aedeagal parameres are pointed in *H. niger* and rounded in *A. haemorrhoidalis*.

Detailed, illustrated taxonomic information is available in Jagemann (1955), Leseigneur (1972), and Platia (1994).

***Athous haemorrhoidalis* (Fabricius)**

The author examined two specimens of the European species *Athous haemorrhoidalis* (Fabricius), identified by Serge Laplante. A third specimen of this species was found in CFIA insect survey material. These three Ontario specimens represent the first records from Canada. This species is an apparent pest of below-ground parts of crop and forage plants in its native range (Gratwick 1992), indicating that it could also become a pest in North America.

Detailed images of additional specimens of *A. haemorrhoidalis* were found on the internet (Harvard University 2010). A specimen from Boston Harbour Islands National Recreation Area in Massachusetts represents the first record of this pest species from USA. The specimen shown on this website bears an identification label by Serge Laplante, and the diagnostic characters of *A. haemorrhoidalis* were clearly visible in the photographs. Although this record is publicly available on the internet, this paper represents the first published record of *A. haemorrhoidalis* from USA in the scientific literature. The presence of specimens of *A. haemorrhoidalis* at four sites in each of three regions separated from each other by 400 to 700 km suggests that reproducing populations of this species may be established in North America.

Label data. "ONT. Ottawa/ 6.vi.2003/ J. R. Vockeroth"; "Damp second/ growth *Acer-/ Betula* wood"; same data except date is: 8.vi.2003; "Canada, ON, Toronto,/ Sunnybrook Park 17T 0632469/ E 4842151 N 4.vi.2007. funnel./ Harvey & Chin CFIA07-1246"; "USA: MA, Plymouth, World's/ End, (WE-MAL-1 11.06)/ (42°15'39.7"N, 70°52'14.5"W/ 6-13 vi 2006, malaise trap/ coll. J. Rykken". In addition to the World's End Island record, the same database reports additional specimens from nearby Ragged Island, with four specimens recorded in total.

Recognition. *Athous haemorrhoidalis* is a shiny, black or brown elaterid, 10–15 mm long with pale pubescence dorsally. Diagnostic characters are described above in the treatment

of *H. niger*. Detailed, illustrated taxonomic information can be found in Leseigneur (1972) and Platia (1994).

Additional records of exotic species already known from North America

***Agriotes lineatus* (L.)**

Agriotes lineatus is an important crop pest in Europe (Gratwick 1992; Traugott et al. 2008), and is a probable pest in western Canada (Vernon and Päts 1997). The known distribution of this species in North America is Canada: British Columbia, Newfoundland, Nova Scotia (Becker 1956), Prince Edward Island (present study) and USA: Massachusetts (present study), Washington, and Oregon (LeGasa et al. 2006).

Label data. “USA: MA, Suffolk, Thompson/ Island, (TH-BLITZ 10.06)/ 42°19’2”N, 71°0’31”W/ 10 vi 2006/ BLITZ # 185-1” (det. by S. Laplante). Identity verified through photographs on internet (Harvard University 2010). In addition to the Thompson Island record, the same database reports additional specimens from nearby Bumpkin Island, Calf Island, and Snake Island (ten specimens). “CANADA, PE,/ Hazelbrook, 6 June 2007, C. Noronha”; “CANADA, PE,/ Crossroads, 11 July 2007, C. Noronha”; “CANADA, PE,/ China Point, 27 June 2007,/ C. Noronha”; “CANADA, PE,/ Mermaid, 20 June 2007,/ C. Noronha” (17 specimens, 2 in CNCI, remainder returned to C. Noronha).

***Agriotes obscurus* (L.)**

This species has been found to be a plant pest affecting a wide variety of crops in its native range (Traugott et al. 2008). It is native to much of Northern Eurasia and was first collected in North America in Nova Scotia ca. 1859 (Becker 1956). Newly recorded here for Prince Edward Island.

Label data. “CANADA, PE,/ Crossroads, 6 June 2007,/ C. Noronha”; “CANADA, PE,/ Lake Verde, 12 June 2007,/ C. Noronha”; “CANADA, PE,/ Hazelbrook, 4 July 2007,/ C. Noronha”; “CANADA, PE,/ Victoria, 12 June 2007,/ C. Noronha” (10 specimens, 2 in CNCI, remainder returned to C. Noronha)..

New records of native North American species

Agriotes collaris (LeConte). New to Colorado and West Virginia (2 specimens, Colorado State University Collection): “Pike Co. CO/ 26 May 1996/ B. Kondratieff/ Kleinhans Cr./ Cypress Lane”; “Pocahontas Co. WV/ 24 May 1994/ Kondratieff & Fitzgerald, headwaters/ Sugar Cr., FS Rd. 76”.

Agriotes fucosus (LeConte). New to Colorado and Nebraska (4 specimens, Colorado State University Collection): “Blaine Co., NE/ 13 June 2000/ B. Kondratieff/ & R. Zuellig/ N. Loup R., CR1”; “Ft. Collins Col.. 6/4/[18]99”; “Colo/ 1887”; “Ft. Collins/ Col 5-13-[19]10”.

Ampedus rubricollis (Herbst). New to Louisiana (1 specimen at CNCI, 2 returned to N. Schiff): 1X “LA: Grant Parish,/ Iatt Lake Bottomlands/ 30 Mi. N. of Alexandria/ 1-15 May 1998/ A. Brazel, N. Schiff” and 2X LA: “Grant Parish,/ Iatt Lake Bottomlands/ 30 Mi. N. of Alexandria/ 15 April-May 7 1998/ A. Brazel, N. Schiff”. New to Missouri (2 specimens, returned to N. Schiff): “MO: Reynolds Co./ Deer Run State Forest/ Intersect Rd. 1 and Rd 9/ 30 May 30 June 2006/ R.J. Marquis, N. Schiff”.

- Ampedus sayi* (LeConte). New to Missouri (1 specimen, returned to N. Schiff): “MO: Reynolds Co./ Deer Run State Forest/ Intersect Rd. 1 and Rd 9/ 30 May-30 June 2006/ R.J. Marquis, N. Schiff”.
- Athous aterrimus* Fall. New to Canada and Alberta (5 specimens, CNCI): “Canada, AB, Ft. McMurray,/ tar sands, A site, 7.vii.[20]05, Lindgren w./ UHR EtOH & conophthorin. Trap 16./ CFIA 05-3121 Alejos & Solomone”. This is a surprising extension because *A. aterrimus* was previously only known from Oregon and California (Giant Forest). The specimens from Alberta match the diagnostic characters for this species (Becker 1979) and specimens at CNCI. The most distinctive observed shared characteristics include a pair of pubescence convergence points on the male abdominal ventrite 5 and aedeagal morphology (long phallobase; and short broad paramere blades apical to abrupt emarginations). The only observed difference between the Alberta series and the CNCI *A. aterrimus* specimens is the shape of the paramere blades (convex throughout vs. concave in the midsection, respectively). Until further taxonomic research is done, it seems best to consider these specimens as belonging to *A. aterrimus*.
- Athous ornatipennis* (LeConte). New to Missouri (1 specimen, CNCI): “MO: St. Louis Co./ Tyson Research Station/ W. Ridge Rd., Eureka/ 38.31°N, 90.33°W/ 1-10 April 2007 MT/ R. Marquis, N. Schiff”.
- Athous productus* (Randall). New to Alberta (2 specimens, CNCI): “Canada, AB, Ft./ McMurray, tar sands,/ Syncrude, 23.vi.[20]05,/ Lindgren w. UHR EtOH &/ alpha pinene. Trap 14./ 05-2033. Alejos &/ Solomone” and “Canada, AB, Ft./ McMurray, tar sands, Suncor, 9.VI.[20]05, Lindgren/ w. ipsenol & ipsdienol./ Trap 6. Alejos and/ Saomone”.
- Esthesopus claricollis* (Say). New to Canada (Ontario) (1 specimen, University of Guelph Insect Collection): “ONT: Kent Co., Rondeau P./ P., Group Campground, / 42°17'35"N 81°50'52"W/ Carol forest malaise/black light, 20-22 Jul 2004, S.M. Paiero, DEBU01140539”.
- Hypnoidus rivularius* (Gyll.). New to Alberta (2 specimens, CNCI): “Canada, AB, Ft./ McMurray, tar sands,/ Suncor, 9.VI.[20]05, Lindgren/ w. UHR EtOH &/ salicylaldehyde. Trap 1./ Alejos and Saomone”; and “Canada, AB, Ft./ McMurray, tar sands, B/ site, 9.VI.[05], Lindgren w./ UHR EtOH &/ Salicylaldehyde. Trap 4./ Alejos and Saomone”.
- Lacon auroratus* (Say). New to Nova Scotia (2 specimens, CNCI): “Canada, NS, Pictou Co./ Folly Mountain, 20T 458454E 5031889N/ 16.vii.2007. funnel./ McDonald & Linds/ CFIA07-4328” and “Canada, NS, Colchester Co./ E. Folly Mt. 20T 458554E/ 5031889N 30.vii.2007./ funnel. McDonald & Linds/ CFIA07-5516”.
- Limonium basilaris* (Say). New to Louisiana (1 specimen returned to N. Schiff): “LA: St. Tammany Parish/ Covington, 19 April-13 May/ 2001. M. Devall, N. Schiff”.
- Pityobius anguinus* LeConte (Say). New to Louisiana (1 specimen returned to N. Schiff): “LA: St. Tammany Parish/ Covington Malaise Trap/ 25 May-6 June 1998. M. Devall, N. Schiff”.
- Pseudanostirus nigricollis* (Bland). New to New Brunswick (2 specimens, CNCI): “Canada, NB, 19T /0637197 5244649/ 3.vii.2007. funnel./ A.Couturier CFIA07-/2749” and

“Canada, NB, Scott Siding./ 19T E613389 N5085445/ 30vi.2008. funnel α -pinene,/ trans verbenol A.McIntosh/ CFIA 08-5108”.

Discussion

A series of Canadian Department of Agriculture interceptions of exotic species suggests that some of above-mentioned introductions may have been a result of intercontinental trade in woody plants rooted in soil during the early 1960s, before such movement was prohibited. The CNCI has 14 larval specimens of *A. haemeroidalis* intercepted in shipments of *Azalea*, *Pinus*, *Juniperus* and *Taxus* with soil to Canadian ports including Montreal, St. John, and Toronto from Belgium and Holland between 1961 and 1963. The same material also contained a larval specimen identified as possibly *Athous niger* (L.) (= *Hemicrepidius niger*) intercepted in Ontario in 1962 from Holland. Other exotic species intercepted in this trade included *Athous vittatus* (Fabricius) (not known from North America), *Actenicerus sjaelandicus* (Müller) (not known from North America, Majka and Johnson 2008), *Dalopius marginatus* Esch. (not known from North America) and *Agriotes* spp. These interception records not only suggest possible origins of the known introduced species presented here, but also that populations of several additional species may exist undetected in North America. The history of any such elaterid interceptions in USA from Europe may also be useful to examine.

The additional records of native species presented here extend, or fill in gaps in, known distributions. While this is a potentially endless process of adding geographic detail at an increasingly fine scale, such records are useful for other reasons. Beyond telling us where species occur, having such information may indicate ecological change or help detect newly introduced species. For example, a finding that a putatively native species has rapidly increased its range may indicate that it is not native at after all, or that it has been confused with a newly arrived, morphologically similar, non-native species.

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