First Record of the Palearctic Root Weevil *Otiorhynchus porcatus* (Herbst) (Coleoptera: Curculionidae: Entiminae) in The United States and Additional Records of Other Adventive Weevils Occurring on the Isles of Shoals (Maine and New Hampshire)

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First Record of the Palearctic Root Weevil *Otiorhynchus porcatus* (Herbst) (Coleoptera: Curculionidae: Entiminae) in the United States and Additional Records of Other Adventive Weevils Occurring on the Isles of Shoals (Maine and New Hampshire)

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Abstract

The Palearctic root weevil *Otiorhynchus porcatus* (Herbst) (Curculionidae: Entiminae) is recorded for the first time in the United States on Appledore Island, Isles of Shoals, Maine. A summary of other published North American records of this immigrant species is given. Also included are distribution records for 16 other adventive weevils collected on five of the nine islands comprising the Isles of Shoals. These 16 species are *Perapion curtirostre* (Germar), *Cosmobaris scolopacea* Germar, *Ceutorhynchus erysimi* (Fabricius), *Ceutorhynchus obstrictus* (Marsham), *Ceutorhynchus pallidactylus* (Marsham), *Rhinoncus pericarpius* (Linnaeus), *Tychius meliloti* Stephens, *Tychius stephensi* Schönherr, *Barypeithes pellucidus* (Boheman), *Otiorhynchus sulcatus* (Fabricius), *Trachyphloeus bifoveolatus* (Beck), *Donus zoilus* (Scopoli), *Hypera meles* (Fabricius), *Hypera rumicis* (Linnaeus), *Larinus planus* (Fabricius), and *Magdalis barbicornis* Latreille.

Key Words: Curculionoidea, non-native species, new records, distribution, Nearctic

A survey of Coleopteran diversity and species distribution in 2008 on the Isles of Shoals, an archipelago of nine islands and numerous smaller rocky tidal ledges located in the Gulf of Maine about 10 km east of the coast of Maine and New Hampshire (Nichols and Nichols 2008), yielded a number of interesting distribution records of non-native weevils. Few entomological surveys have been conducted on the islands, though some preliminary studies had been done previously at the Shoals Marine Laboratory on Appledore Island, operated cooperatively by Cornell University and the University of New Hampshire.

Given herein is the first United States record of the Palearctic root weevil *Otiorhynchus porcatus* (Herbst), as well as records of an additional 16 species of adventive weevils from the Isles of Shoals. For each species, collection data are given followed by a brief synopsis of the North American distribution and host plant preferences.

Material and Methods

Although nine islands comprise the Isles of Shoals, only five islands were available for sampling in 2008: Appledore, Lunging, Smuttynose (including Malaga Island), Star, and White islands. The islands range in size from the largest - Appledore at 39.46 hectares - to the smallest – White at 1.31 hectares. The Isles of Shoals contain a wide range of natural communities and disturbed areas and are home to a surprisingly species-rich flora of both native and naturalized vascular plants (Boden 1977; Nichols and Nichols 2008; Eastwood *et al*. 2009).

Sampling was conducted between 9 June 2008 and 1 July 2008 (by SRG) and consisted of general sweeping of vegetation with heavy sweep nets and passive sampling using pitfall traps. Pitfall traps were placed at numerous locations on the islands, and each consisted of a 454-g (16-oz) plastic cup sunk into the ground with the top opening at ground level. Three to four centimeters of water and dish detergent were poured into each trap, and square wooden covers (roughly 127 × 127 mm) were placed 2.5–5.0 cm above the traps to prevent rain water from inundating the trap. Traps were checked every three to five days. At the end of the sampling period, all specimens of Coleoptera were pinned and labeled. Among the numerous Coleoptera collected, the following 17 species of adventive weevils (Brentidae and Curculionidae) were identified and recorded from the Isles of Shoals.

Voucher specimens of all weevils examined are deposited in the Cornell University Insect Collection, Ithaca, New York. Dates listed below are for 2008 collections. The number of specimens examined is indicated in parentheses. GPS coordinates (in decimal degrees) of collection sites for each of the surveyed islands are provided only once under specimens examined below.

Results and Discussion

Otiorhynchus porcatus (Herbst, 1795)
(Curculionidae: Entiminae)
(Fig. 1)

Specimens Examined. MAINE: Appledore Island (42.989167°, −70.6144°), 12 June (1), 22 June (2). **New country record.** Specimens were taken from pitfall traps.

Remarks. *Otiorhynchus porcatus* is one of 14 non-native root weevils of the genus *Otiorhynchus* Germar established in North America (Bright and Bouchard 2008). It is widespread across much of central and northern Europe (Alonso-Zarazaga 2013; Majka and MacIvor 2009). In North America, *O. porcatus* is known from eastern Canada: Ontario (Killarney), Québec (Montréal), Newfoundland (Conception Bay and St. John's, Avalon Peninsula), and Nova Scotia (Halifax) (Bright and Bouchard 2008; Majka and MacIvor 2009). An online image of *O. porcatus* (bugguide.net/node/view/474181; accessed 5 August 2015) from Coquitlam, British Columbia, photographed in 2010, represents the first Pacific Northwest record.

Among all other immigrant species of *Otiorhynchus* established in North America, *O. porcatus* (Fig. 1) is uniquely characterized by the strongly elevated and tuberculate alternate elytral interstriae and by the strongly tuberculate pronotum (Bright and Bouchard 2008).

Majka and MacIvor (2009) reported *O. porcatus* as a component of the insect fauna of green roof sites and adjacent areas in Halifax, Nova Scotia, on two collection dates in June and October 2009. Potential host plants likely include *Solidago canadensis* L. and *Solidago rugosa* Mill. (Asteraceae), *Lonicera canadensis* W. Bartrum ex Marshall (Caprifoliaceae), and *Lysimachia punctata* L. (Primulaceae) at these sites. In Europe, *O. porcatus* is polyphagous on plants of several families, including Asteraceae, Rosaceae, and Saxifragaceae. The phenology of *O. porcatus* in Halifax, Nova Scotia is illustrated by Majka and MacIvor (2009).

Perapion curtirostre (Germar, 1817)
(Brentidae: Apioninae)

Specimens Examined. MAINE: Appledore Island, 11 June (1); Malaga Island (42.9822°, −70.6075°), 14 June (3); Smuttynose Island (42.98222°, −70.6075°), 11 June (1), 14 June (4), 26 June (1), 29 June (1). NEW HAMPSHIRE: Lunging Island (42.977167°, −70.626933°), 21 June (2); Star Island (42.975°, −70.6144°), 19 June (4). Specimens were taken from sweep samples.

Remarks. Native to Europe, *P. curtirostre* is currently known from only a few states in the northeastern US (Maine, New York) and from the provinces of the Canadian Maritimes (New Brunswick, Nova Scotia, Prince Edward Island) (O'Brien and Wibmer 1982; Majka *et al.* 2007a, 2011). First collected and confirmed near Bar Harbor, Maine in 1968 (Whitehead 1980), it is associated with various species of *Rumex* L. (Polygonaceae) including the noxious weed curly dock, *Rumex crispus* L. Specimens also have been collected in Truro, Nova Scotia in 2003 (unpublished data, E. R. Hoebeke), and there are also photographic records of this species posted on BugGuide (www.bugguide.net; accessed 1 June 2015) from Coos County, New Hampshire and Worcester County, Massachusetts in 2009, and from St. Johns, Newfoundland, in 2014.

Cosmobaris scolopacea Germar, 1824
(Curculionidae: Baridinae)

Cosmobaris americana Casey, 1920 (synonym)

Specimens Examined. MAINE: Appledore Island, 25 June (1); Smuttynose Island, 26 June (1). Specimens were taken from sweep samples.

Remarks. *Cosmobaris scolopacea*, known as the "beet petiole borer" in North America (cited as *C. americana*), is widespread across the continent (O'Brien and Wibmer 1982; Douglas *et al.* 2013). Majka *et al.* (2011) reported it from Connecticut, Massachusetts, Maine, New Brunswick, New Hampshire, New York, Ontario, Québec, and Rhode Island. Douglas *et al.* (2013) recorded it for the first time from Manitoba. It is associated with species of *Ambrosia* L. (Asteraceae) and *Chenopodium* L. (Chenopodiaceae) (Ciegler 2010).

Ceutorhynchus erysimi (Fabricius, 1787)
(Curculionidae: Ceutorhynchinae)

Specimen Examined. MAINE: Appledore Island, 10 June (1). Specimen taken from a sweep sample.

Remarks. *Ceutorhynchus erysimi*, native to Europe, ranges widely throughout Canada and the United States. In Canada, it occurs from British Columbia east to Nova Scotia and Prince Edward Island (McNamara 1991; Majka *et al.* 2007b, c). It is widely distributed in the United States (O'Brien and Wibmer 1982), mostly from the eastern states to Minnesota and Missouri, but it also occurs in Oregon (Ciegler 2010). This immigrant species was first

Fig. 1. *Otiorhynchus porcatus.* Dorsal (above) and lateral (below) habitus (collection data: Maine: Appledore Island, 12 June 2008, S. R. Griffin, ex pitfall trap). Scale bar = 2 mm.

recorded in North America in Ohio in 1922 (Sleeper 1953) and is associated with the mustard *Capsella bursa-pastoris* (L.) Medik. (Brassicaceae).

***Ceutorhynchus obstrictus* (Marsham, 1802)**
(Curculionidae: Ceutorhynchinae)

Ceutorhynchus assimilis of authors, not Paykull, 1792 (synonym)

Specimens Examined. MAINE: Appledore Island, 9 June (3), 10 June (4), 22 June (3); Smuttynose Island, 14 June (4), 26 June (2); Malaga Island, 14 June (2). Specimens were taken from sweep samples.

Remarks. *Ceutorhynchus obstrictus*, the "cabbage seedpod weevil" in the economic literature, was accidentally introduced into North America from Europe over 70 years ago (see references in Webster *et al*. 2012). Found across much of Europe, it was first recorded (cited incorrectly as *C. assimilis*) in Canada in 1931 (McLeod 1962) and has been established since then in British Columbia (Carcamo *et al*. 2001) and Alberta (Butts and Byers 1996). The first record for the USA was in Washington in 1936, and it is now found across much of the USA (Harmon and McCaffrey 1997; Brodeur *et al*. 2001). It is associated exclusively with a variety of weedy and cultivated species of the mustard family Brassicaceae. All previous references to *C. assimilis* in the North American literature refer to *C. obstrictus*. *Ceutorhynchus assimilis* is also native to Europe and western Asia, but to date it is not known to occur in North America.

***Ceutorhynchus pallidactylus* (Marsham, 1802)**
(Curculionidae: Ceutorhynchinae)

Ceutorhynchus quadridens (Panzer, 1795) (synonym)

Specimen Examined. MAINE: Smuttynose Island, 29 June (1). Specimen taken from a sweep sample.

Remarks. *Ceutorhynchus pallidactylus* is widely distributed in Europe and Asia; it is also adventive and widespread in South Africa (Alonso-Zarazaga 2013). It is presently documented in North America from Massachusetts, Nova Scotia, Rhode Island, Connecticut, and New York (O'Brien and Wibmer 1982; Majka *et al*. 2007c). It was first collected in North America in 1895 from Massachusetts (Nantucket) and from Long Island (Cutchogue) (cited as *C. quadridens*; Chittenden 1900) and is associated with cruciferous hosts, such as species of *Brassica* L., and *Sinapis arvensis* L., *Sinapsis alba* L., *Raphanus raphanistrum* L., and *Sisymbrium officinale* (L.) Scop. (Brassicaceae) (Hoffmann 1954), and also species of Resedaceae, and occasionally *Cannabis sativa* L. (Cannabaceae) (Colonnelli 2004).

***Rhinoncus pericarpius* (Linnaeus, 1758)**
(Curculionidae: Ceutorhynchinae)

Specimens Examined. MAINE: Appledore Island, 9 June (2), 10 June (6), 22 June (2); Smuttynose Island, 14 June (1), 21 June (1). Specimens were taken from sweep samples.

Remarks. Native to Eurasia, *R. pericarpius* is recorded in Canada from British Columbia, Alberta, Ontario, Québec, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland (O'Brien and Wibmer 1982; McNamara 1991; Majka *et a*l. 2007b, c). In the United States, it is reported in Connecticut, District of Columbia, Massachusetts, New Jersey, New York, Pennsylvania, and Rhode Island (O'Brien and Wibmer 1982) and has been known in the Pacific Northwest (Washington) at least since 1935 (Hatch 1971). Hoebeke and Whitehead (1980) reported the earliest records of this species in North America from Massachusetts in 1928 and from New York in 1929. Hosts of this weevil include members of the knotweed family Polygonaceae, especially species of *Rumex*.

***Tychius meliloti* Stephens, 1831**
(Curculionidae: Curculioninae)

Specimen Examined. MAINE: Malaga Island, 14 June (1). Specimen taken from a sweep sample.

Remarks. *Tychius meliloti*, the "sweet clover weevil" of the economic literature, is native to Europe, and has been recorded from scattered localities in the Canadian provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Québec, Ontario, New Brunswick, Nova Scotia (including Cape Breton Island), and Prince Edward Island (Anderson and Howden 1994; McCorquodale *et al*. 2005; Majka *et al*. 2007b). It also has spread to adjacent US states (Massachusetts, Montana) (Rolston *et al*. 2002; Global Biodiversity Information Facility 2014). First found in North America in Québec in 1975, it is associated with various species of *Melilotus* L. (Fabaceae) (Anderson and Howden 1994).

***Tychius stephensi* Schönherr, 1836**
(Curculionidae: Curculioninae)

Specimens Examined. MAINE: Smuttynose Island, 14 June (4), 21 June (2), and 29 June (1); Appledore Island, 10 June (3), 25 June (1). NEW HAMPSHIRE: Star Island, 17 June (2), 19 June (2). Specimens were taken from sweep samples.

Remarks. Referred to as the "red clover seed weevil" in the economic literature, *T. stephensi* is a native of Europe, but it is also widely distributed in North America. It has been taken throughout Canada and the northeastern, north-central, and western USA (O'Brien and Wibmer 1982; Anderson and Howden 1994). Majka *et al*. (2007b, 2011) recorded

it in eastern North America from Connecticut, Massachusetts, Maine, New Brunswick, New Hampshire, New York, Nova Scotia, Ontario, Prince Edward Island, and Québec. First found in North America in 1913 in Connecticut (Clark 1971), it is associated with *Trifolium pratense* L. (Fabaceae).

***Barypeithes pellucidus* (Boheman, 1834)**
(Curculionidae: Entiminae)

Specimens Examined. MAINE: Appledore Island, 16 June (4), 22 June (1); Smuttynose Island, 26 June (1). NEW HAMPSHIRE: Star Island, 19 June (1). Specimens were taken from pitfall trap samples, except one from a sweep sample.

Remarks. *Barypeithes pellucidus* is widely distributed throughout northern and central Europe. Considered by some as a Holarctic species (Balsbaugh 1988), it is generally widespread throughout the United States, but more prevalent in the northeastern states and adjacent southeastern Canada, including the Maritime Provinces and Newfoundland; it is also found in California and the Pacific Northwest (Oregon, Washington, and British Columbia) (Majka *et al*. 2007b). It was first taken in North America in 1886 on Staten Island, New York (Weeks 1888) and first recognized in the Pacific Northwest in 1931 in Seattle, Washington (Hatch 1971). Adults attack foliage of a wide variety of plants in the families Anacardiaceae, Asteraceae, Fagaceae, Rosaceae, and Ulmaceae (Galford 1987; Majka *et al.* 2007b).

***Otiorhynchus sulcatus* (Fabricius, 1775)**
(Curculionidae: Entiminae)

Specimen Examined. MAINE: Appledore Island, 25 June (1). Specimen taken from a sweep sample.

Remarks. In the Palearctic Region, *O. sulcatus* is known as the "black vine weevil" in the economic literature and is widely distributed across much of northern and central Europe (Bright and Bouchard 2008); it is also recorded from Australia, New Zealand, and Tasmania. It has been known to occur in North America since about 1831, when it was first reported from Massachusetts (as "*Curculio apiculatus*") (Warner and Negley 1976). Presently, it is known to occur throughout much of Canada and the United States, where it is a species of significant economic importance, attacking over 150 species of host plants (Warner and Negley 1976) including greenhouse, nursery, and other horticultural plants (Bright and Bouchard 2008).

***Trachyphloeus bifoveolatus* (Beck, 1817)**
(Curculionidae: Entiminae)

Specimens Examined. MAINE: Smuttynose Island, 26 June (2). Specimen taken from a pitfall trap sample.

Remarks. *Trachyphloeus bifoveolatus*, native to Europe and the Canary Islands, occurs across Canada and the United States (Newfoundland and Nova Scotia west to British Columbia, and south to New York and Oregon) (Bright and Bouchard 2008). It is believed to have been accidentally introduced on multiple occasions in the East and West (Brown 1965). A summary of early detections in North America can be found in Bright and Bouchard (2008).

***Donus zoilus* (Scopoli, 1763)**
(Curculionidae: Hyperinae)

Hypera punctata (Fabricius, 1775) (synonym)

Specimen Examined. MAINE: Smuttynose Island, 14 June (1). Specimen taken from a sweep sample.

Remarks. *Donus zoilus* is best known by its junior synonym (*H. punctata*) and is referred to as the "clover leaf weevil" in the economic literature. It is native to Eurasia, but now also occurs throughout much of North America, wherever clover and alfalfa are grown. In Canada, it has been recorded from British Columbia and Ontario, Nova Scotia, and Prince Edward Island to Newfoundland (McNamara 1991; Majka *et al*. 2007b, c). In the United States, it is widely distributed (O'Brien and Wibmer 1982). Majka *et al*. (2011) reported it from throughout the Northeast. It was first found in North America in Québec in 1853 (Brown 1940). Adults are associated with various plants in the family Fabaceae (Hoffmann 1954), and the larvae feed principally on species of *Trifolium* L. and *Medicago* L.

***Hypera meles* (Fabricius, 1792)**
(Curculionidae: Hyperinae)

Specimen Examined. MAINE: Smuttynose Island, 14 June (1). Specimen taken from a sweep sample.

Remarks. The Palearctic *H. meles* is also called the "clover head weevil" in the economic literature and is presently recorded across Canada (Alberta, Saskatchewan, Ontario, Québec, New Brunswick, Nova Scotia, and Prince Edward Island) and much of the eastern United States (Arkansas, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Mississippi, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, South Carolina, Tennessee, Utah, Virginia, West Virginia) (Titus 1911; O'Brien and Wibmer 1982; McNamara 1991; Majka *et al*. 2007b, c, 2011). It was first recorded in North America from New York in 1907 (Brown 1940) and is associated with species

of *Trifolium*, *Medicago*, and *Lotus* L. (Fabaceae) (Hoffmann 1954).

Hypera rumicis (Linnaeus, 1758)
(Curculionidae: Hyperinae)

Specimens Examined. MAINE: Malaga Island, 14 June (1); Smuttynose Island, 14 June (1). NEW HAMPSHIRE: Lunging Island, 21 June (4). Specimens were taken from sweep samples.

Remarks. The Palearctic *H. rumicis* was first reported in the United States as early as 1914 on the West Coast (several locations in Oregon) and in North Dakota in 1912, Iowa City, Iowa in 1917, and in Edmonton, Alberta, Canada in 1919 (Buchanan 1923). O'Brien and Wibmer (1982) and Majka *et al*. (2011) also reported it from Connecticut, Massachusetts, Maine, New Hampshire, and Ontario. It is associated with various species of dock (*Rumex*), especially *Rumex obtusifolius* L. and *Rumex crispus* L. (Polygonaceae).

Larinus planus (Fabricius, 1792)
(Curculionidae: Lixinae)

Specimens Examined. MAINE: Smuttynose Island, 11 June (3), 14 June (9). Specimens were taken from sweep samples.

Remarks. *Larinus planus*, native to Europe, was apparently accidentally introduced during the 1960s into the Northeast where it is now widespread in Maryland, New York, Ohio, and Pennsylvania (cited as *Larinus carlinae* Olivier; Wheeler and Whitehead 1985). In Canada, it is presently known from Alberta, British Columbia, Nova Scotia, Ontario, and Québec (Douglas *et al*. 2013). The first published North American record is from Maryland in 1971 (White 1972). It has been subsequently released and redistributed in the Great Plains and western states (Louda and O'Brien 2002) as a biological control agent of thistles (*Carduus* L. and *Cirsium* Mill.) (Asteraceae).

Magdalis barbicornis (Latreille, 1804)
(Curculionidae: Mesoptiliinae)

Specimens Examined. MAINE: Smuttynose Island, 14 June (1), 26 June (1). Specimens were taken from sweep samples.

Remarks. *Magdalis barbicornis* is native to and commonly encountered throughout Europe. Few US records of this species exist in the literature, and some cannot be verified. Nonetheless, it is recorded in the northeastern United States (Connecticut, Massachusetts, New York, Pennsylvania,) (O'Brien and Wibmer 1982; Anderson and Cline 2011) and California (San Mateo and Alameda Counties) (Anderson and Cline 2011). It is apparently associated with various woody rosaceous hosts, such as species of *Crataegus* Tourn. *ex* L., *Prunus* L., and *Malus* Mill. (Hoffmann 1954).

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