

**INTRODUCED LEAF BEETLES OF THE MARITIME PROVINCES, 4:
CHRYSOLINA STAPHYLAEA (LINNAEUS)
(COLEOPTERA: CHRYSOMELIDAE)**

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Abstract.—The origins and status of *Chrysolina staphylaea* (Linnaeus), first recorded in North America in Halifax, Nova Scotia, Canada in 1897, is reviewed. Additional records from Nova Scotia and Newfoundland are reported which establish that the species is more widely distributed than has hitherto been known. The status of the species on the continent is discussed, as are possible modes of introduction, dispersal, and potential host plants.

Key Words: Chrysomelidae, *Chrysolina staphylaea*, Atlantic Canada, adventive species, introduced Coleoptera

The flightless Palearctic chrysomelid *Chrysolina staphylaea* (Linnaeus 1758) was first recorded in North America by Evans (1899) from a specimen he collected in June 1897 in Halifax, Nova Scotia, Canada while attending the annual meeting of the Royal Society of Canada. Knab (1911a, b) subsequently turned his attention to the species since Evans (1899) remarked on differences between the specimen he collected and those from Europe, and consequently there was some question as to its identity. Knab (1911a) examined three specimens collected by Joseph Perrin on 18 June 1910 and 5 August 1910 on McNabs Island (located in Halifax Harbour) and confirmed the determination. Brown (1950) reported further specimens from across the harbour in Dartmouth, Nova Scotia, restricted to an area of meadows that he estimated to be 25 square miles.

Knab (1911b: 184) wrote that at a meeting of the Entomological Society of Washington, “Mr. Schwarz said that this occurrence (i.e., of *C. staphylaea*) was known by the early Massachusetts entomologists, but has been lost sight of.” He was referring to Eugene A. Schwarz (1844–1928), a German entomologist who came to the Museum of Comparative Zoology in 1872, subsequently became one of the founders of the Cambridge Entomological Club, and was then with U.S. Department of Agriculture in Washington (Matthews 1974). There is, unfortunately, no further information provided, nor are there published records or specimens from Massachusetts so this account cannot be further validated.

Chrysolina staphylaea was subsequently reported from St John’s, Newfoundland by Brown (1962) (apparently from specimens collected by Lindroth in 1949)

as well as Lunenburg and Liverpool in Nova Scotia. Brown (1962) stated that the species is restricted to very small areas in the vicinity of these seaports. Chantal (1972) then reported it in Lévis, near Québec City from specimens collected in 1965. Since the species is flightless, Brown (1962) and Chantal (1972) concluded that the distribution indicated several independent introductions.

In the Old World, *C. staphylaea* has a boreo-alpine distribution which ranges from Iceland and the Faeroes, east to Ireland, Great Britain, and Fennoscandia, south to France, northern Spain, and Italy, thence eastward across Siberia south to central Turkey, the Caucasus, Kazakhstan, and northwestern Mongolia. In the Far East it is found in Kamchatka, and the Kurile Islands (Jolivet 1990), with an isolated population on the island of Cheju-Do in Korea (Jolivet 1975).

Clark et al. (2004) listed a large number of plants on which *Chrysolina staphylaea* had been recorded including species in the Asteraceae, Betulaceae, Clusiaceae, Lamiaceae, Lythraceae, Plantaginaceae, Ranunculaceae, and Scrophulariaceae. According to Jolivet (1990) several of these records are probably in error, the true hosts being restricted to Lamiaceae, Plantaginaceae and Ranunculaceae, with preferences for *Plantago* spp. and *Ranunculus* spp. Later, Jolivet (1991) reinterpreted these data and stated that the Ranunculaceae are probably the first choice of *C. staphylaea*, others representing a secondary adaptation.

Direct observation of the feeding of the adults is difficult because they feed at dusk or at night (Jolivet 1990) or hide at the base of plants (Read 1984). Drummond (1952) collected *C. staphylaea*, on *Centaurea nigra* L., *Hypericum quadrangulum* L., *Plantago lanceolata* L., and *Ranunculus repens* L. in Askham Bog. In a subsequent experiment only *R. repens*

was eaten and used for oviposition. The larvae described by Marshall (1979) were reared on *Achillea* sp. and *Ranunculus repens* L. The plants reported by Read (1984) can be considered true hosts since both adults and larvae were found on *Plantago lanceolata* L., *P. maritima* L., and *Aster tripolium* L. Very little is known with respect to the biology of *Chrysolina staphylaea* in North America except that it prefers moist open habitats and is primarily nocturnal.

In the following account, we present additional records of *C. staphylaea* that indicate that its distribution is greater than previously supposed, in addition to further considering its possible origins on the continent.

IDENTIFICATION

Chrysolina staphylaea is one of 17 species in the genus *Chrysolina* Motschulsky, 1860 that have been recorded in North America (Riley et al. 2003). However, only four are known to occur in Eastern Canada, three of these being introduced Palearctic species (LeSage 1991). It is the only North American representative in the nominate subgenus, *Chrysolina* Motschulsky which was characterized in detail by Bechyné (1950).

Chrysolina staphylaea is a large (6.2–8.1 mm long) and distinctive leaf beetle that is readily identified by its entirely reddish-brown body with paler appendages (Fig. 1). In the Maritime Provinces, the native *C. hudsonica* Brown is dark brown, whereas the introduced St. John's wort leaf beetles, *C. hyperici* (Forster) and *C. quadrigemina* (Suffrian) are coppery, metallic green, or metallic blue. The pronotal sulci are strongly impressed in *C. staphylaea* and the elytra are not striate, but some elytral punctures are often arranged in more or less regular series (Fig. 1). In the male, the apex of the aedeagus is broadly rounded, the angle of each being obtuse, and the



Fig. 1. Habitus photograph of *Chrysolina staphylaea*.

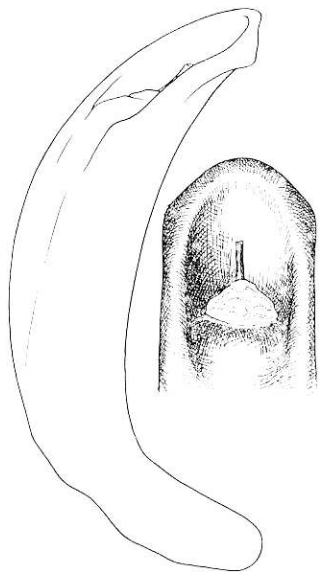


Fig. 2. Aedeagus of *Chrysolina staphylaea*.

flagellum is slightly exposed (Fig. 2). The adults can be identified by employing the keys in Brown (1962), Wilcox (1972), Downie and Arnett (1996), and Riley et al. (2002).

Although *Chrysolina staphylaea* was described by Linnaeus in 1758, the egg and the pupa are still unknown and only the egg bursters of the first larval instar (Cox 1988), and the claw of the mature larva (Marshall 1979) have been illustrated.

METHODS AND CONVENTIONS

Codens (following Evenhuis, 2007) of collections referred to in this study are:

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| CBU | Cape Breton University, Sydney, Nova Scotia, Canada | MUNC | Memorial University of Newfoundland collection, Edmonton, Alberta, Canada |
| CNC | Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada | NSAC | Nova Scotia Agricultural College, Bible Hill, Nova Scotia, Canada |
| CUIC | Cornell University Insect Collection, Ithaca, New York, USA | NSMC | Nova Scotia Museum Collection, Halifax, Nova Scotia, Canada |
| JOC | Jeffrey Ogden Collection, Truro, Nova Scotia, Canada | USNM | National Museum of Natural History, Smithsonian Institution, Washington, DC, USA. |

The number of specimens is indicated in parentheses together with the collection coden.

RESULTS

Records of this species in Atlantic Canada are compiled below. The present distribution is based on records of 116 specimens. The following list also includes records from the literature.

NEWFOUNDLAND: Burin Peninsula, Burin, 12.IV.1996, (1, MUNC); Harbour Grace, 11.VII.2004, E.R. Hoebeke and A.G. Wheeler, *Chrysanthemum* flowers, (1, CUC); Logy Bay, 11.VI.1984, D. Larson, (1, MUNC); Northern Bay, IX–X.2000, (2, MUNC); Portugal Cove, 24.VI.1975, G.D. Fenwick, grassy hillside, (1, MUNC); St. John's, 4.VI.1949 and 30.VIII.1949, C.W. Lindroth, (3, CNC); St. John's, Brown (1962: 71); St. John's, 27.VI.1965, W.J. Brown, (25, CNC); St. John's, 11.VII.2004, E.R. Hoebeke and A.G. Wheeler, (1, CUC); St. John's, 1978–2001, (22, MUNC); Seal Cove, 14.XI.1980, J. Sinois, (1, MUNC); Topsail, 2.VII.1965, W.J. Brown, (3, CNC). **NOVA SCOTIA:** *Cape Breton Co.:* Christmas Island, 10.V.1978, B. Wright, (1, NSMC); Georges River, 25.IV.1995, D.B. McCorquodale, (1, CBU); Georges River, 14.IV.1995, D.B. McCorquodale, (1, CBU); Fortress of Louisbourg, 16.VI.1999, Schrage and Roach, woodpile, (1, CBU); *Colchester Co.:* Shubenacadie, 21.IX.2000. J. Og-

den, (1, JOC); *Halifax Co.*: Armdale, 26.IV.1943, D.C. Ferguson, (1, NSMC); Armdale, 8.V.1945, D.C. Ferguson, (1, NSMC); Cow Bay, 7.VI.1947 and 12.VI.1947, W.J. Brown, (8, CNC); Cow Bay, 18.VI.1961, C.J.S. Fox, (1, ACNS); Cow Bay, 18.VI.1947, W.J. Brown, (2, USNM); Dartmouth, Brown (1962: 71); Dartmouth, 3.VI.1947, 5.VI.1947, 9.VI.1947, W.J. Brown, (8, CNC); Eastern Passage, 2.VI.1947 and 22.VI.1947, W.J. Brown, (5, CNC); Halifax, June 1897, J.D. Evans, (Evans 1899: 321); Halifax, 4.VI.1915 and 19.VI.1915, J. Perrin (2, CNC); Halifax, 26.VIII.1945, D.C. Ferguson, (1, NSMC); Halifax, 18.X.1985, C. Cooke, (1, NSMC); Halifax, no date indicated, (1, NSMC); McNab's Island, 18.VI.1910 and 5.VIII.1910, J. Perrin, Knab (1911a: 306); McNab's Island, 21.VI.2001, J. Ogden, (1, JOC); McNab's Island, 18.VI.1911, 24.VI.1911, and 5.VIII.1911, no collector indicated, (5, USNM); *Lunenburg Co.*: Chester, 16.VI.1966, B. Wright, (1, NSMC); Lunenburg, Brown (1962: 71); Mahone Bay, 13.VI.1950, D. Eidt, (1, NSAC); *Queens Co.*: Caledonia, 1.VI.1953, D.C. Ferguson, (1, NSMC); Liverpool, Brown (1962: 71); no locality given, 9.VIII.1906, W.P. Henderson (2, USNM); *Shelburne Co.*: Lydgate, 2.VI.1968 and 30.VI.1968, P. Doleman, (2, NSMC).

The North American distribution of the species is given in Fig. 3.

DISCUSSION

In Nova Scotia and Newfoundland *C. staphylaea* is clearly well established and the above records indicate that it is more widely distributed than has hitherto been known. Since it is flightless, Brown (1962) and Chantal (1972) both concluded that the Canadian distribution represented several independent introductions. Most collection sites in both provinces are at coastal sites (i.e., Burin, Harbour Grace, Northern Bay, Portugal

Cove, St. John's, Topsail, Louisbourg, Halifax, Dartmouth, Eastern Passage, Chester, Lunenburg, Mahone Bay, Liverpool, and Lydgate) (Fig. 3). Many of these are seaports with a considerable maritime history which could have provided introduction opportunities.

In Nova Scotia, there are collections from Christmas Island (in the Bras d'Or Lakes), Shubenacadie, and Caledonia that are a considerable distance from the seacoast and may indicate secondary, human-assisted transport. How many independent introductions the current distribution represents is subject to question. The species is now clustered into four areas: a) along the south shore of Nova Scotia; b) in the southern portion of Cape Breton Island; c) on the Burin peninsula; and d) on the north portion of the Avalon peninsula (Fig. 1). Although being flightless would doubtless provide limitations to the dispersion of *C. staphylaea*, this in itself is not a determinate of dispersal ability. For instance, in the Maritime Provinces the flightless, brachypterous carabids, *Carabus granulatus hibernicus* Lindroth and *C. nemoralis* Müller, have become very widely distributed throughout the region (Majka et al. 2006 and unpublished data).

Chrysolina staphylaea is a hydrophilous species of open habitats. Drummond (1952) collected many specimens in Askham Bog. Brown (1962) stated that, near Dartmouth (Nova Scotia) and southeastwards, it was restricted to meadows. Chantal (1972) found many specimens under pieces of wood lying over moist soil. European observations would indicate that there is likely only one generation per year in the Maritime Provinces.

Within the families identified by Jolivet (1990) as principal host plants, there are many representatives in Nova Scotia including *Ranunculus* (ten species, six adventive including *R. cymbalaria* Pursh,

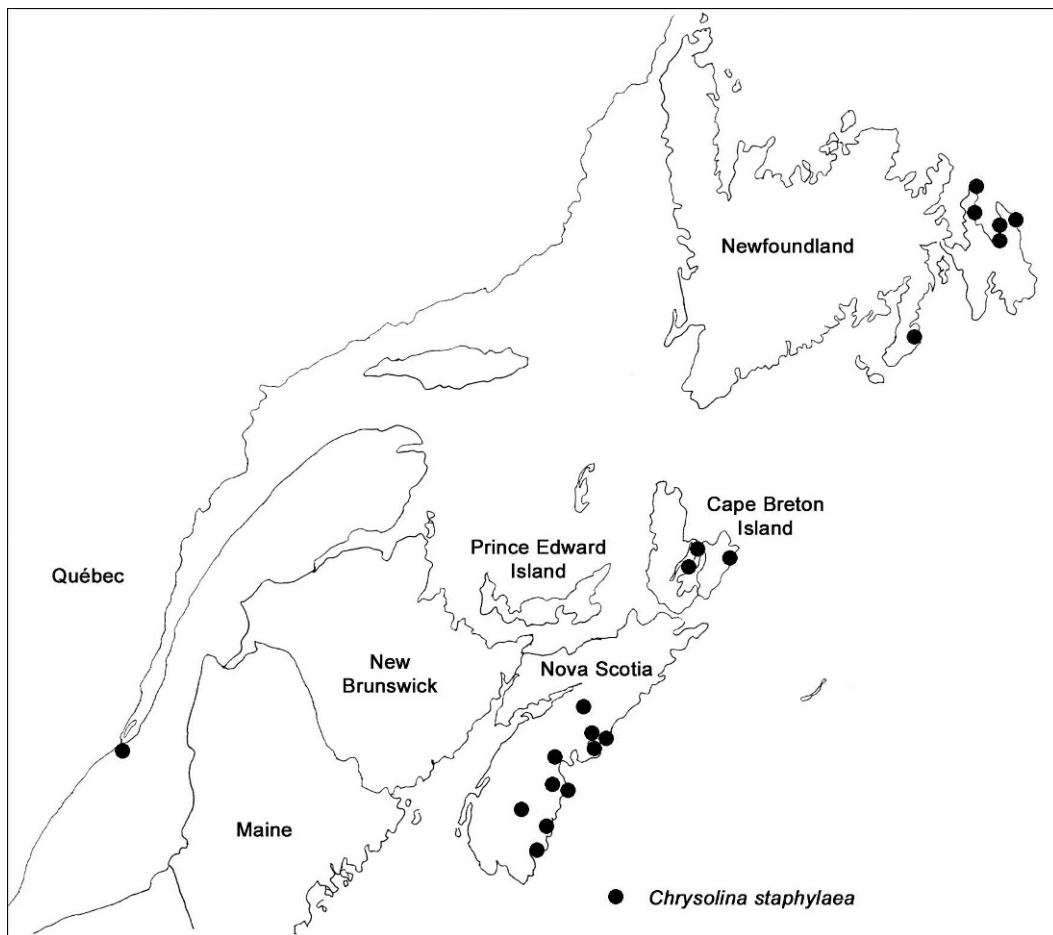


Fig. 3. Distribution of *Chrysolina staphylaea* in Atlantic Canada.

R. flammula L., *R. gmelini* DC, *R. scleratus* L., *R. acris* L., and *R. bulbosus* L.) (Ranunculaceae), *Mentha arvensis* L., *M. aquatica* L., *M. spicata* L., and *M. longifolia* L., *Lamium purpureum* L., *L. amplexicaule* L., *Galeopsis tetrahit* L., *Prunella vulgaris* L., (Lamiaceae), and *Plantago* (six species, five adventive or Holarctic including *P. maritima* L., *P. lanceolata* L., *P. major* L., and *P. rugellii* Decne, and *P. psyllium* L.) (Roland 1998). There are also 18 native species of *Aster* (as per Read 1984) and *Achillea ptarmica* L. and *A. millefolium* L. (as per Marshall 1979). All this indicates that there are large number of possible hosts for *C. staphylaea* in the region.

Lindroth (1957) collected *Achillea millefolium*, *Artemisia vulgaris* L., *Plantago lanceolata* L., *P. major* L., *Ranunculus repens* L., and *Ballota nigra* L., – all associated with *C. staphylaea* – from all seven principal quarries in southern England where dry-ballast destined for Atlantic Canada originated, a possible indication that *C. staphylaea* could have been introduced to North America via this mechanism. Brown (1940, 1950) and Lindroth (1957) both proposed that the transport of dry ballast (bulky rock, sand, and soil) in trans-Atlantic shipping was responsible for the introduction of many species of adventive Coleoptera. Brown (1950) noted that large quantities

were unloaded at ports in Atlantic Canada during the Napoleonic Wars (1799–1815) by British vessels in search of lumber.

Alternatively, plants such as *Artemisia*, *Inula*, and *Veronica* are grown as bedding plants, while *Achillea* and *Mentha* are cultivated as garden herbs; so, it is possible that *C. staphylaea* could have been accidentally introduced in association with horticultural practices and the importation of bedding stock.

Chrysolina staphylaea is most frequently found in moist, coastal meadows similar to those reported for it in Iceland by Larsson and Giga (1959). Although established in Atlantic Canada it remains an uncommon species. Jolivet (1990) regarded its distribution in Eurasia as boreo-alpine and it remains to be determined how suitable the habitats and environmental regimen of Atlantic Canada are for it. Continuing to monitor the species in North America would be desirable to ascertain how this population will fare.

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