

**NEW RECORDS OF INTRODUCED SPECIES OF *QUEDIUS* STEPHENS, 1829
(COLEOPTERA: STAPHYLINIDAE) FROM THE MARITIME PROVINCES
OF CANADA**

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Abstract.—*Quedius fuliginosus* (Gravenhorst) is newly recorded in North America; *Quedius curtipennis* Bernhauer is newly recorded in eastern North America; and *Quedius mesomelinus* (Marsham) is newly recorded in New Brunswick. All three are introduced, Palearctic species of rove beetles. A key to differentiate *Q. fuliginosus* from the related and similar *Q. curtipennis* is provided. Possible modes of introduction of the species are discussed, focusing on historical transport of dry ballast in the maritime trade.

Key Words: Coleoptera, Staphylinidae, *Quedius*, Canada, Maritime Provinces, introduced species, new records, biodiversity

Brown (1940, 1950, 1967) and Lindroth (1957, 1963) were among the pioneers in drawing attention to the large number of species of Coleoptera introduced to North America through ports in Atlantic Canada. One of the pathways of entry they highlighted was the use of dry ballast (bulky rock, sand, and soil) in trans-Atlantic shipping. Brown (1950) noted that large quantities were unloaded at Maritime ports during the Napoleonic Wars (1799–1815) by British vessels in search of timber at a time when Baltic ports were closed to Britain. Lindroth (1957) investigated this topic further, conducting vegetational and faunal surveys in sites in Great Britain known to have been sources of ballast in the trans-Atlantic shipping trade.

There are many species of introduced Staphylinidae found in Atlantic Canada in general, and Nova Scotia in particu-

lar. In the first paper to discuss Coleoptera in the province, Kirby (1837) noted the presence of the Palearctic *Philonthus politus* (Linnaeus, 1758) and *Creophilus maxillosus* (Linnaeus, 1758). Subsequently, authors such as Lindroth (1957) added two species, Campbell (1976) three species, Smetana (1982) two species, Klimaszewski (1984) three species, Smetana (1995) 11 species, Hoebeke (1995) one species, Majka and Klimaszewski (2004) two species, Majka et al. (2006) one species, and Klimaszewski et al. (in press) three species. These are 30 of the 68 species of introduced, Palearctic rove beetles found in Nova Scotia. Introduced staphylinids comprise 16% of the province's rove beetle fauna (C. Majka, unpublished data).

Within the subtribe *Quediina* Kraatz, five introduced species have been re-

ported in North America, all in the genus *Quedius* Stephens: *Q. fulgidus* (Fabricius, 1793), *Q. mesomelinus* (Marsham, 1802), *Q. curtipennis* Bernhauer, 1908, *Q. molochinus* (Gravenhorst, 1806), and *Q. cinctus* (Paykull, 1790) (Smetana 1971). Examination of specimens in collections in the Maritime Provinces of Canada has yielded additional records of introduced species of *Quedius*.

CONVENTIONS

Abbreviations of collections referred to in this study are:

CBU	Cape Breton University, Sydney, Nova Scotia.
CGMC	Christopher G. Majka collection, Halifax, Nova Scotia.
CNC	Canadian National Collection, Ottawa, Ontario.
DHWC	David H. Webster collection, Kentville, Nova Scotia.
NBM	New Brunswick Museum, Saint John, New Brunswick.
NSMC	Nova Scotia Museum, Halifax, Nova Scotia.
NSNR	Nova Scotia Dept of Natural Resources, Shubenacadie, Nova Scotia.
STFX	St. Francis Xavier University, Antigonish, Nova Scotia.

RESULTS

Quedius (Quedius) fuliginosus (Gravenhorst, 1802)

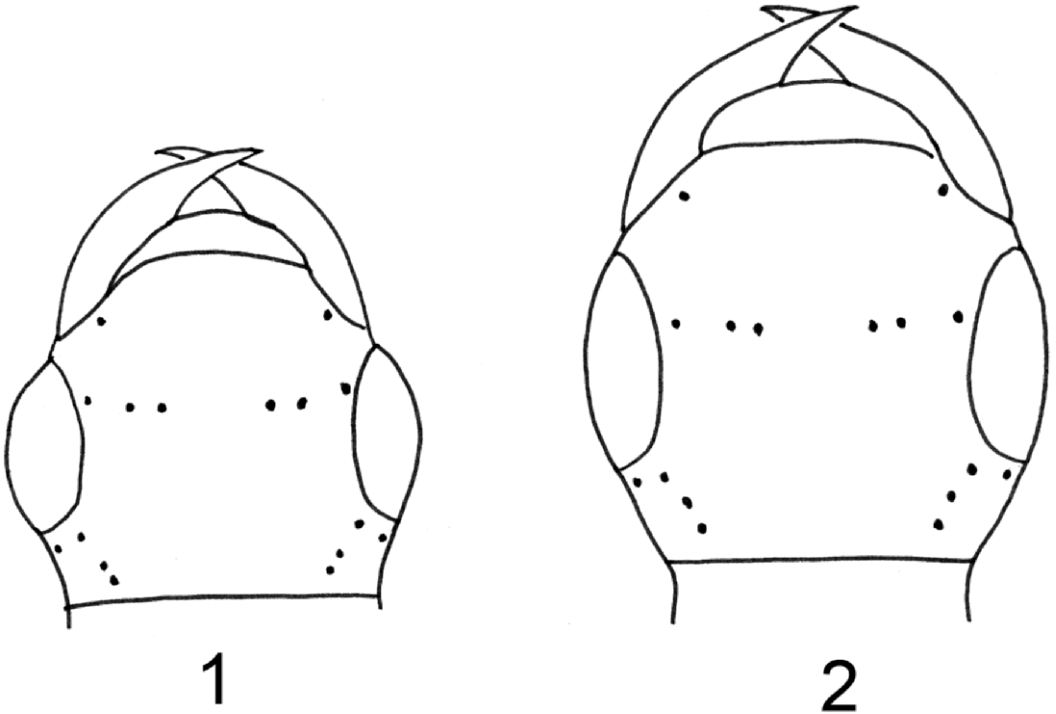
Two specimens of *Quedius fuliginosus* were collected by S. D. Boudreau on 15 May 2001 in St. Andrews, Antigonish County, Nova Scotia (STFX) (Fig. 5). Three specimens were collected by C. G. Majka (18 May 2001, 6 June 2001, and 20 October 2001) in Point Pleasant Park, Halifax Country, NS (CGMC). One specimen was collected by L. A. Hudson (5–11 June 1996) in Irish Cove, Richmond Country, NS (CBU). These reports represent the first record of this

species in North America. It closely resembles the Palearctic *Quedius curtipennis* (to where it keys out to in Smetana (1971)) from which it can be separated by characters in the following key:

1. Sensory peg setae on underside of paramere posteriorly distinctly removed from lateral margins toward middle of paramere (Fig. 3). First antennomere at least dorsally, and antennomeres 2 and 3 entirely, piceous to piceous-black. Eyes markedly, evenly convex (Fig. 1)
 . . . *Quedius (Quedius) fuliginosus* (Gravenhorst)
- Sensory peg setae on underside of paramere along entire length situated close to lateral margins (Fig. 4). Antennomeres 1–3 entirely testaceo-brunneous. Eyes less convex, especially posteriorly (Fig. 2)
 *Quedius (Quedius) curtipennis* Bernhauer

Quedius fuliginosus, a widely distributed Palearctic species, is found throughout Europe (including Great Britain and Ireland) from Fennoscandia in the north, across Russia, south to Azerbaijan, the Caucasus and Turkey, and west to Tunisia and Algeria in North Africa. It is also known from many islands including Crete and Corsica in the Mediterranean, and the Azores, Faeroe, and Orkney Islands in the Atlantic (Herman 2001; Smetana 2004).

In Europe *Q. fuliginosus* inhabits moist to wet habitats such as moss, leaf litter, decaying plant material, etc. in forests and open areas; less frequently it is found under bark and under stones (Burakowski et al. 1980), in mole nests (Osella and Zanetti 1975), or even in caves (Jeannel and Jarrige 1949). It shows a distinct affinity to bogs, particularly (in Middle Europe) sphagnum bogs (Smetana 1964). In Northern Ireland, it is typically found in sphagnum on cutover bogs, inter-drumlin fen, and similar wetland types (Anderson 1997). It is found throughout the year, in the spring from March to May and in the fall from September to November (Horion 1965).



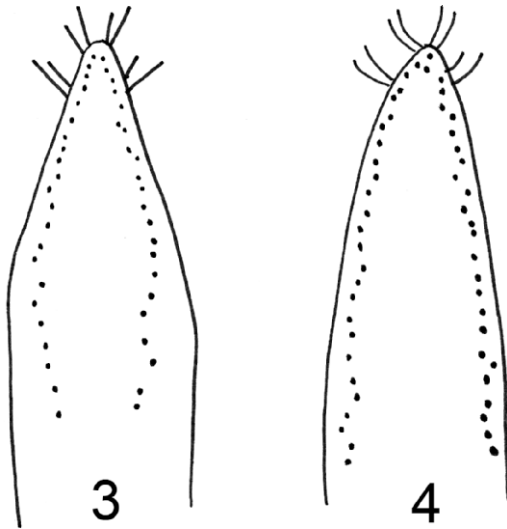
Figs. 1–2. Profile of eyes. 1, *Quedius fuliginosus*. 2, *Q. curtipennis* (adapted from Szujecki 1980).

Quedius (Quedius) curtipennis
Bernhauer, 1908

Quedius curtipennis was previously known in North America solely from

British Columbia, Washington, and Oregon from as early as 1939 (Smetana 1971). It now has been found at a number of localities in the Maritime Provinces, the first records from eastern North America (Fig. 5).

Records.—NEW BRUNSWICK: *Albert Co.*: Mary’s Point, 9 August 2002, C.G. Majka, CGMC. NOVA SCOTIA: *Halifax Co.*: Big St. Margaret’s Bay, 14 May–2 June 1997, D.J. Bishop, NSMC; McNab’s Island, 17 June 2001, J. Ogden, NSNR; Pogwa Lake, 2–15 June 1997, D.J. Bishop, NSMC; *Hants Co.*: Leminister, 2–15 June 1997, D.J. Bishop, NSMC; Smileys Park, 9 June 2005, J. Gordon, NSNR; *Kings Co.*: North Alton, 20 May 2004, D.H. Webster, DHWC.



Figs. 3–4. Paramere. 3, *Quedius fuliginosus*. 4, *Q. curtipennis* (adapted from Szujecki 1980).

In North America, this species is found near settlements in various debris, under stones, in greenhouses, etc. Some specimens also have been found in more natural situations away from settlements

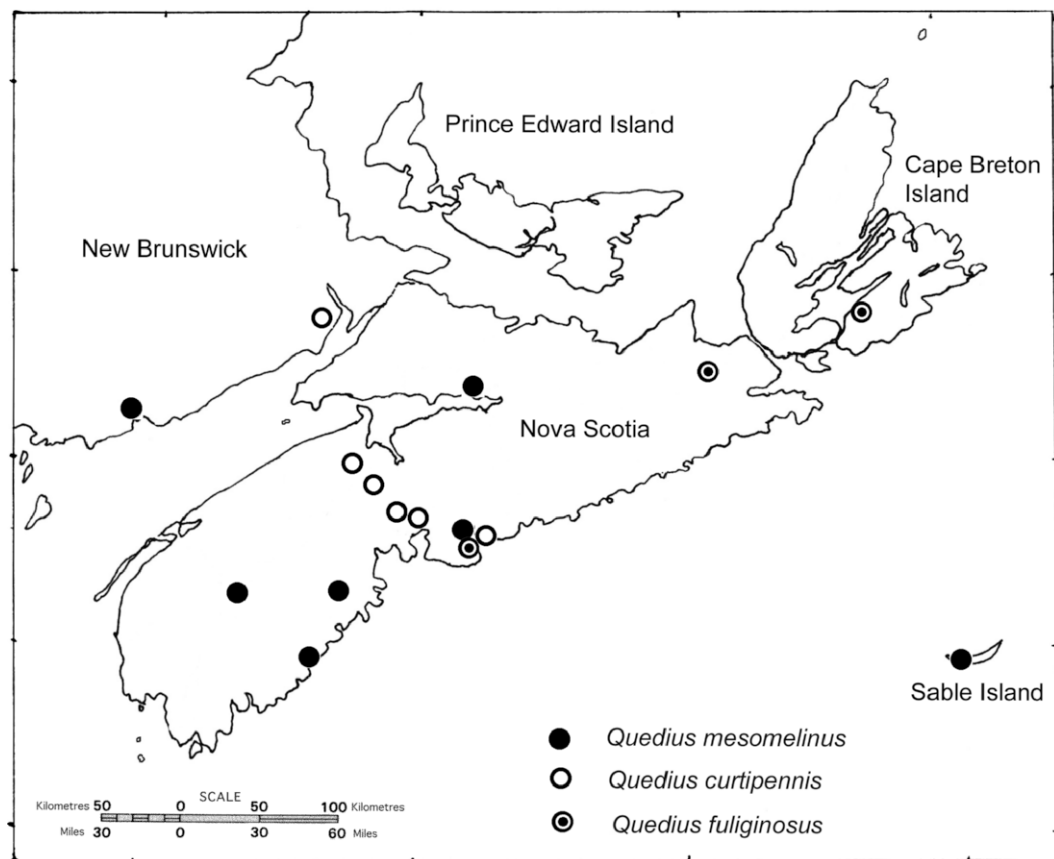


Fig. 5. Distribution of introduced *Quedius* species in the Maritime Provinces of Canada.

in moss, under leaf litter, etc. (Smetana 1971). In the Palearctic region it is found throughout Europe east through Turkey to Uzbekistan, as well as in Morocco and on the Azores (Herman 2001, Smetana 2004).

Quedius (Microsaurus) mesomelinus
(Marsham, 1802)

Although Smetana (1971) reported the earliest North American museum specimens of *Quedius mesomelinus* from specimens collected in 1886 in Massachusetts, Bain (1998) found preserved specimens in a seventeenth century latrine in Boston, Massachusetts which dated from 1670, and Prévost and Bain (in press) found preserved remains of this species in a latrine in Ferryland, Newfoundland

which date from prior to 1620. It is now widely distributed from Newfoundland south to Florida, west to Nevada and northern California and north to the Alaska Panhandle and along the Aleutian Islands (Smetana 1971). It is found throughout Europe and eastward through western and eastern Siberia to the Russian Far East. It has been unintentionally introduced to Australia, New Zealand, Peru, Tristan da Cunha, and Greenland (Herman 2001, Smetana 2004).

Smetana (1971) recorded it from Sable Island, NS (1 July 1967, H.F. Howden and J.E.H. Martin, 4 specimens, CNC) and Liverpool, NS (24 May 1910, A. Halkett, CNC); however, there are additional records that indicate that the

species is more widely distributed in the region and it is newly recorded in New Brunswick (Fig. 5).

Records.—NEW BRUNSWICK: *Saint John Co.*: Saint John, 19 August 1907, G. Morrissey, NBM. NOVA SCOTIA: *Colchester Co.*: Masstown, 6 May 1993, C.J. McPhee, NSNR; Masstown, 14 May 1993, J. Ogden, NSNR; *Halifax Co.*: Armdale, 19 May 1950, D.C. Ferguson, NSMC; Armdale, 31 May 1952, D.C. Ferguson, NSMC; Halifax, January 27 1971, B. Wright, 2 specimens (indoors), NSMC; Halifax, 1 August 1990, M. Leblanc, NSNR; Point Pleasant Park, 15 August 2000, C.G. Majka, CGMC; *Hants Co.*: Hantsport, 17 June 2004, P. Kenrick, NSNR; *Lunenburg Co.*: Bridgewater, 30 June 1965, B. Wright, NSMC; *Pictou Co.*: Pictou, 7 June 2005, A. Jackson, 2 specimens, NSNR; *Queens Co.*: Kejimikujik National Park, 24 August–2 September 1994, B. Wright, 4 specimens, NSMC; Kejimikujik National Park, 21 September–19 October 1994, B. Wright, NSMC; Kejimikujik National Park, 19 September 2001, B. Wright, 2 specimens, NSMC.

In Europe, the species is often found in synanthropic situations in cellars, stables, barns, storehouses, and other farm buildings in various debris and decaying organic matter, especially compost heaps. It is also reported from mammal burrows, tree cavities, and caves, and other similar environments as well as in debris, leaf litter, moss, old mushrooms, etc. in all biotopes (Smetana 1971). In Nova Scotia, most specimens were collected in pitfall traps set in both coniferous and deciduous forests, although some have also been collected in synanthropic situations.

DISCUSSION

These three *Quedius* species join a lengthy list of rove beetles known to have been unintentionally introduced to the Maritime Provinces. The 70 species of introduced Staphylinidae known to

occur in Nova Scotia comprise 20% of the 347 species of introduced Coleoptera found in the province (C. G. Majka, unpublished data). The question arises as to how and when these *Quedius* species may have been introduced.

Brown (1950) and Lindroth (1957) drew attention to the importance of the transport of dry ballast in the introduction of many ground-dwelling Coleoptera, particularly those that occur in coastal areas in Great Britain where the preponderance of such materials (bulky rock, sand, and soil) originated. Lindroth (1957) collected *Q. fuliginosus* at the Appledore rock quarry on the River Torridge in North Devon, England – one of eight sites investigated by him as principal sources of trans-Atlantic dry ballast. Lindroth characterized both *Q. fuliginosus* and *Q. curtipennis* as terricolous, mesophilous, occurring on waste ground, polyphagous, and brachypterous – all characteristics favouring the transport of species via such mechanisms.

Brown (1950) and Lindroth (1957, 1963) discussed many species for which they believed there existed strong evidence indicating such transport to Atlantic Canada. Majka (2005) examined the distribution of *Amara communis* (Panzer) in the Maritime Provinces, which is predominantly clustered in coastal locations with a history of maritime commerce. He proposed that this species, whilst only having been discovered relatively recently (in 1988), might nonetheless represent a series of historical introductions via the marine trade.

The town of St. Andrews, where the specimens of *Q. fuliginosus* were collected, was settled in the 1770's by Scottish farmers fleeing the Highland clearances. This site is located along the South River approximately 5.5 km from the head of Antigonish Harbour. Antigonish was itself first settled by Irish Loyalists in

1784 and subsequently grew to become an important community on the Gulf of St. Lawrence shore of Nova Scotia (MacLean 1976). These waves of human settlement, and the associated shipping and nautical trade, could have provided many opportunities for the introduction of *Q. fuliginosus* since the latter part of the eighteenth century.

Similarly, the port of Halifax, where three specimens were collected, has been an important center for trans-Atlantic commerce since 1749 and is a documented center for the introduction of many Palearctic beetles (Majka and Klimaszewski 2004). The collection locale at Irish Cove in Richmond County, on the other hand, is located in a hardwood forest adjacent to a long-term EMAN (Ecological Monitoring and Assessment Network) site which has been undisturbed for over 100 years.

Although *Q. fuliginosus* has only been found in only one area of Nova Scotia, *Q. curtipennis* has been recorded from a number of sites in Nova Scotia and New Brunswick (Fig. 5) indicating that it may have either arrived earlier and had time to expand its distribution, or that it was introduced at multiple locations, or both. The introductions in the Maritime Provinces clearly represent separate introduction events from those on the Pacific coast of the continent.

Mary's Point in New Brunswick, where *Q. curtipennis* has been collected, was first settled by Acadians in the 1740's and later by British Loyalists in the 1780's. It was an important quarry throughout the 19th century with stone being exported to many localities, and a shipbuilding site from the 1850's until 1899. These successive waves of settlement and the extensive maritime traffic at the locality could have provided opportunities for the introduction of *Q. curtipennis*. North Alton, NS, where *Q. curtipennis* has been found, is in an agricultural area where considerable

importation of nursery stock has taken place over an extended period of time. Spence and Spence (1988) discuss the importation of nursery stock as a vector for the introduction of exotic ground beetles, a scenario which could also apply in this instance.

The widespread distribution (Fig. 5) of *Quedius mesomelinus* in Nova Scotia and New Brunswick as well as its early records (1907 in New Brunswick and 1910 in Nova Scotia) indicate that this species has been present in the Maritime Provinces for a considerable time. Some records (i.e., Halifax, Liverpool, St. John) are from prominent seaports while others (i.e., Kejimikujik National Park) are from relatively undisturbed sites indicating that the species has been able to successfully colonize native environments, a situation also seen with the introduced *Atheta (Datomicra) celata* (Majka et al. 2006). The specimens from Sable Island, situated on the edge of the continental shelf, 160 km from the nearest land, are particularly noteworthy. The island has, however, been sporadically inhabited during the 1600's and 1700's, and continuously since 1801 (Campbell 1974). During this time period there has been considerable commerce to the island from European ports and those in Atlantic Canada allowing for many opportunities for introduction of introduced species. Forty-five of the 148 (30%) species of beetles recorded on Sable Island are introduced, more than twice the provincial percentage (C. G. Majka, unpublished data).

Additional fieldwork would be desirable to ascertain the range of these species and whether their distribution is changing. Given current concerns with respect to introduced and invasive species, monitoring populations of introduced invertebrates would appear to be a desirable goal given that the effect of introductions on native species and environments is frequently unknown.

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