

**NOTE****New Records of Tiger Beetles (Coleoptera: Carabidae: Cicindelinae) in Nova Scotia**

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Tiger beetles (Carabidae: Cicindelinae) are prominent and showy ground beetles that are important predators in many sandy and open environments. Adults are quick runners and agile fliers with excellent vision; larvae inhabit burrows in the substrate. Both are active and voracious predators of insects and other invertebrates. They are found throughout much of the world except for the Antarctic (Pearson 1988). Worldwide, over 2,600 species and subspecies are known, 109 of which have been found in North America, and 27 of which have been recorded in Canada (Bousquet 1991; Pearson et al. 2006).

In the first compendium of Canadian tiger beetles, Wallis (1961) reported six species and one additional subspecies from the Maritime Provinces, including, *Cicindela duodecimguttata* Dejean, 1825, *C. hirticollis rhodensis* Calder, 1916, *C. limbalis* Klug, 1834, *C. repanda repanda* Dejean, 1825, *C. repanda novascotiae* Vaurie, 1951, *C. sexguttata sexguttata* Fabricius, 1755, and *C. tranquebarica tranquebarica* Herbst, 1806. Wallis (1961) was evidently unaware of Lindroth (1954), a paper on the Carabidae of Nova Scotia which, in addition to these species, had already recorded *C. longilabris longilabris* Say, 1824 from Nova Scotia, writing, "Widely distributed; north to North Sydney on Cape Breton Island (several collectors)." (Lindroth 1954).

Larochelle (1980), erroneously following Wallis (1961), added *C. purpurea purpurea* Olivier, 1790 to the Nova Scotia fauna, further contributing records that were based on misidentified specimens of *C. limbalis* (Majka et al. 2007). Larochelle (1980) did correctly add *C. l. longilabris* to the faunal lists of New Brunswick and Prince Edward Island. Bousquet (1991), and Bousquet and Larochelle (1993) subsequently reported *C. punctulata punctulata* Olivier, 1790, from New Brunswick. This composition of the region's fauna is that found in Leonard and Bell (1999) and Acorn (2001), however, Freitag (1999) did not include *C. p. purpurea* and *C. p. punctulata*. Subsequently Majka et al. (2007) removed *C. p. purpurea* from the Nova Scotia (and hence Maritime) fauna since no voucher specimens or verifiable published records could be located, and previous reports were apparently made on the basis of misidentifications. Recently Sabine (2004) added *Cicindela marginipennis* Dejean, 1831 from collections made in New Brunswick bringing the recorded fauna of tiger beetles in the Maritime Provinces to nine species and one subspecies.

In Nova Scotia, the earliest published record of tiger beetles are from Fletcher (1905) who reported *C. t. tranquebarica* from the province; Harris (1911) who added *C. limbalis* from Cape Breton Island; and Brown (1930) who reported *C. s. sexguttata* from the Nova Scotia mainland. These records, and others collected by D.C. Ferguson at the Nova Scotia Museum in 1951-52 and by Lindroth in 1951, were reported by Lindroth (1954). Except for the subsequent addition and removal of *C. p. purpurea*, the Nova Scotia tiger beetle faunal list has remained unchanged since Lindroth (1954). Consequently the discovery of two new species of tiger beetles in Nova Scotia is noteworthy.

In 2004, a study to examine the distribution, life histories, and bionomics of Nova Scotian tiger beetles was undertaken. Collecting was conducted from mid-April to mid-September at numerous localities throughout mainland Nova Scotia and southern Cape Breton Island. Adult tiger beetles were collected with a net, pitfall traps, and when attracted to lights at night (see Leonard and Bell 1999; Pearson et al. 2006). Voucher specimens collected

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are retained in the collection of the senior author.

In addition to species previously recorded from Nova Scotia two new species previously unrecorded from the Maritime Provinces were found. A specimen of *Cicindela formosa generosa* was collected in a sandpit in Kentville, Kings County, Nova Scotia (45°03.901' N; 64°28.589' W) on 16 June 2004 (Fig. 1). Several other specimens were observed at the site but not collected. The specimens of *C. f. generosa* were flying in the company of the more common *C. t. tranquebarica* but could be easily separated from the latter species by their larger size, different flight pattern, and complete maculation pattern in which the lunules and marginal band are all connected along the outer margin of the elytra. The flight pattern of *C. f. generosa* was more erratic and individuals flew longer distances than *C. t. tranquebarica*.

A second species, *Cicindela marginata*, was collected at Delhaven, Kings County, Nova Scotia, (45° 12.040' N; 64° 22.870' W) on 12 August 2004 (Fig. 2). A single specimen was collected on the edge of a broad mudflat/

Fig. 1. Dorsal habitus of adult *Cicindela formosa generosa* collected in Kentville, Nova Scotia. Photo: C. Majka, Nova Scotia Museum.



salt marsh. With its slender form and diffuse middle maculation on the elytra, *C. marginata* can be confused with no other Nova Scotia tiger beetle. Both sites were surveyed only once during the course of the field work, so it was not possible to gather additional data.

Cicindela f. generosa is a widely distributed species in North America, found from Quebec west to southern Alberta, south to New Mexico and Texas, but absent from the southeastern United States. It is found throughout New England ranging north to central Maine and southern

Fig. 2. Dorsal habitus of adult *Cicindela marginata* collected in Delhaven, Nova Scotia. Photo: C. Majka, Nova Scotia Museum.



Québec. It is a dry-habitat species found in sand dunes, road cuts, sand pits, and pine barrens, in areas where there is no standing water, on yellow to white shifting sand with sparse vegetation. Adults are active from April to July and from August to October (Leonard and Bell 1999; Pearson et al. 2006). The Nova Scotia site is an open sandpit surrounded on three sides by mixed forest. The sand pit itself is sparsely vegetated with various grasses. The presence of several individuals indicates

that a colony is established at this locality and that *C. f. generosa* may occur in similar habitats in central portions of the Annapolis Valley and coastal areas where sparsely vegetated sand dunes and sandy beaches are present.

Cicindela marginata is found from the Gulf coast of Florida north to southern Maine. Adults can be collected from late July to mid-September. It is a coastal species restricted to habitats such as mudflats, sandy ocean beaches, shores of salt marshes, and mouths of streams emptying into the ocean. In New England, it has been extirpated from all but a few protected areas (Leonard and Bell 1999; Pearson et al. 2006). As only a single specimen was collected in Nova Scotia, it is difficult to ascertain without further survey work whether this specimen represents a windblown stray or if this species is established in the province.

Coastal habitats such as mudflats, salt marshes, and ocean beaches are vulnerable environments. In Atlantic Canada a number of coastline-inhabiting beetles have recently been recorded, some of which are potentially endemic to the region; others represent range extensions of Atlantic coastal species; while still others are isolated and disjunct populations of species found in New England (Klimaszewski et al. 2006; Majka and McCorquodale 2006; Klimaszewski and Majka 2007). *Cicindela marginata* may be a member of this suite of beetles.

In this context it is worth drawing attention to the fact that coastline beetles inhabit an environment that has been much diminished and is vulnerable to disturbance. Of the estimated 35,700 hectares of coastal marshes present in the Bay of Fundy at the time of European colonization, only 5,000-6,000 (~ 16%) are still extant. Fifty-seven percent of large and medium-sized rivers that flow into the Bay of Fundy have dams, causeways, and other forms of tidal restrictions and coastal wetlands have experienced various other forms of environmental degradation (Percy 1996; 1999). Such developments are of potential conservation concern should a population of *C. marginata* be established in Nova Scotia.

Finally, it is clear from the discovery of these two species in Nova Scotia that even with respect to tiger beetles, which are probably the best known members of the Maritime Provinces beetle fauna, much still remains to be discovered.

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