

***HYPERASPIS BRUNNESCENS* DOBZHANSKY
(COLEOPTERA: COCCINELLIDAE) NEWLY RECORDED
IN CANADA FROM SCATARIE ISLAND, NOVA SCOTIA**

Christopher Majka,² Kathleen R. Aikens,³ A. Andrew MacDonald,³ Sheena M. Townsend,³
and David B. McCorquodale²

ABSTRACT: *Hyperaspis brunnescens* Dobzhansky is newly recorded in Canada and eastern North America from a storm-petrel burrow on Scatarie Island, Nova Scotia. This record extends the range of the species 2,100 km to the east. Hypotheses with respect to the ecology of the species are discussed, as are possible zoogeographic scenarios that might account for its presence in Nova Scotia.

KEY WORDS: *Hyperaspis brunnescens*, Coccinellidae, Scymninae, Hyperaspidini, range extensions

Hyperaspis brunnescens Dobzhansky, 1941 is a rare and little-known lady beetle (Coccinellidae) described from specimens collected in Illinois. Gordon (1985) reported a specimen from Iowa, and Fauske et al. (2003) found it in Minnesota. Only 19 individuals have previously been collected. Consequently, it was of some interest when a specimen of *H. brunnescens* was discovered in Nova Scotia, Canada, circa 2,100 kilometers east of the previously reported range.

SITE DESCRIPTION, METHODS, AND CONVENTIONS

Scatarie is a small (1,497 ha) island located approximately two km off the eastern shore of Cape Breton Island, Nova Scotia, near Main-à-Dieu. Cool ocean waters and salt spray result in vegetation with boreal characteristics; dense stands of black spruce, *Picea mariana* (Mill.), and balsam fir, *Abies balsamea* (L.) Mill (Pinaceae), dominate much of the island (Davis and Browne 1997). Poor drainage contributes to extensive peatlands and small ponds, including coastal barrachois. The headlands in the east are heath barrens characterized by *Empetrum nigrum* L. (Empetraceae), *Cornus canadensis* L. (Cornaceae), and *Vaccinium* spp. (Ericaceae). The shoreline is mostly rocky, with a few small sand and pebble beaches, often with abundant beach wrack accumulation and back-shore zones of dune grasses, e.g. *Elymus mollis* Trin., *Ammophila brevifulata* Fern. (Poaceae), and beach pea, *Lathyrus maritimus* (L.) (Fabaceae). Thousands, likely tens of thousands, of Leach's Storm-petrels (*Oceanodroma leucorhoa* (Vieillot)) (Procellariidae) dig nest burrows on the island, primarily among roots of spruces, but also in heath barrens.

¹ Received on June 29, 2006. Accepted on July 8, 2006.

² Nova Scotia Museum, 1747 Summer Street, Halifax, Nova Scotia, Canada B3H 3A6. E-mail: c.majka@ns.sympatico.ca. Corresponding author.

³ Cape Breton University, Department of Biology, 1250 Grand Lake Rd., Sydney, Nova Scotia, Canada B1P 6L2. E-mails: (KA) kathleen_aikens@hotmail.com, (AM) andrew@yahoo.com, (SMT) sheenatown@gmail.com, and (DBM) david_mccorquodale@capebretonu.ca.

Although the island is now uninhabited and protected under Nova Scotia's Wilderness Protection Act, several dwellings remain on the eastern end of the island (Cameron 2004). European fishers have periodically used the island since the 15th century. During the 19th and 20th centuries, however, permanent residences and communities were established on the island (Chrestien 2001). In areas where land was cleared, paper birch, *Betula papyrifera* Marshall (Betulaceae), and white spruce, *Picea glauca* (Moench) Voss (Pinaceae), are prominent.

A team of researchers visited Scatarie Island from 8-11 August 2005 to document the island's biodiversity. Insects were collected by sweep-netting, pitfall and bowl trapping, and hand collection.

Abbreviations of collections referred to in this study are, as follows: **CASC**, California Academy of Sciences, San Francisco, California, USA; **INHS**, Illinois Natural History Survey, Champaign, Illinois, USA; **NSDU**, North Dakota State University, Fargo, North Dakota, USA; **NSMC**, Nova Scotia Museum, Halifax, Nova Scotia, Canada; **USNM**, United States National Museum, Washington, DC, USA.

RESULTS

On 9 August 2005, Aikens and MacDonald were examining a Leach's Storm-petrel (*Oceanodroma leucorhoa*) burrow at Tin Cove, on the southern coast of Scatarie Island (46° 00.181' N, 59° 43.679' W) when they discovered a specimen of *Hyperaspis brunnescens*. C.G. Majka made the species determination after consulting with R. Gordon and N. Vandenberg. The strongly alutaceous dorsum of the specimen and the vittate colour pattern of the elytra separate the specimen from *H. quadrivittata* LeConte, 1852, the only similar species of *Hyperaspis* (Dobzhansky 1941, Gordon 1985).

The burrow was located in a salt-spray barren dominated by (in decreasing order of abundance) *Empetrum nigrum*, *Juniperus communis* L. (Cupressaceae), and *Potentilla tridentata* Ait. (Rosaceae). The burrow was located about 50 m from the rocky edge of the seashore and about equally distant from a dense coniferous forest. The entrance of the burrow dropped approximately 10 cm before turning sharply to run parallel with the ground surface. The beetle was located near its mouth.

The specimen represents the first record of *H. brunnescens* in Canada and northeastern North America. It will be deposited for reference in the Nova Scotia Museum collection.

Previous records are: **Illinois**: state record, Hubbard and Schwartz, male, USNM; northern Illinois, Peabody, 3 males & 6 females, USNM, INHS, & C.W. Leng collection; Edgebrook, Cook Co., 2 males & 3 females, CASC. **Iowa**: Iowa Experimental Station, Clarke Co., February 1934, little bluestem grass [*Schizachyrium scoparium* (Michx.) Nash (Poaceae)], USNM. **Minnesota**: Clay

Co., 2.5 mi. SSE of Felton, 9 September 1997, P. Tinerella and G. Fauske, pitfall, NDSU; Clay Co., 2.5 mi. SSE of Felton, 24 September 1997, P. Tinerella, pitfall, NDSU; Clay Co., 2.5 mi. SSE of Felton, 13 August 1997, P. Tinerella and A. Abbott, NDSU.

The following year on July 15-16, 2006, on a second excursion to Scatarie Island, efforts were made to locate additional specimens of *H. brunnescens*, however, they were not successful.

DISCUSSION

The surprising discovery of this species on Scatarie Island, Nova Scotia, raises several questions. In Minnesota, *H. brunnescens* has been found in dry prairie and dry mesic prairie habitats (G. Fauske, pers. comm.), quite different from the salt-spray barren environment where the Nova Scotia specimen was collected. Both, however, are open habitats. Two of the three specimens in Minnesota were captured in pitfall traps (G. Fauske, pers. comm.), and the Nova Scotia specimen was in the mouth of a subterranean burrow suggesting that the species is regularly found on, in, or near the ground. Adults and larvae of *Hyperaspis* are predators of scale insects and mealybugs (Homoptera: Coccoidea) (McClanahan 1970; Booth et al., 1995; Stäubli Dreyer et al., 1997; Vandenberg 2002). Some larvae burrow into the egg sacks of female scales and approach a parasitic mode of existence (Vandenberg 2002). Some species of scales are subterranean, raising the possibility that the larvae of *H. brunnescens* could be specialist feeders on such insects, perhaps accounting for the scarcity of this species in collections. Another possibility might be that *H. brunnescens* could be myrmecophilous. Chapin (1966) described *Hyperaspis acanthicola* Chapin from the nests of *Pseudomyrmex* ants in Mexico and *Hyperaspis reppensis* (Herbst) is found in Europe in association with nests of *Tapinoma erraticum* var. *nigerrimum* Nylander (Chapin 1966).

The presence of *H. brunnescens* on a remote, uninhabited island approximately 2,100 km northeast of its previously known range also raises perplexing questions. Given the rarity of the species and distance from previously known populations in the American Midwest, an arrival by accidental or anthropochorous means seems unlikely. We therefore conclude that the specimen does represent an indigenous population. If that is the case, is there a disjunct or relict population in Nova Scotia, or has the species been overlooked in intervening regions?

Recently Majka and McCorquodale (2006) surveyed the Coccinellidae of the Maritime Provinces of Canada and drew attention to species with apparently isolated or disjunct populations in Nova Scotia. These include *Stethorus punctum punctum* (LeConte, 1852), *Scymnus caudalis* LeConte, 1850, *Diomus amabilis* (LeConte, 1852), *Hyperaspis troglodytes* Mulsant, 1853, *Naemia seriata seriata* Melsheimer, 1847, and *Cycloneda munda* (Say, 1835) – all of which have not otherwise been recorded in Atlantic Canada. Two of these, *D. amabilis* and

N. s. seriata, are known in Canada solely from Nova Scotia. *Diomus amabilis*, *H. troglodytes*, and *N. s. seriata* are Atlantic coastal plain species whose distribution extends to Nova Scotia, whereas *S. p. punctum*, *S. caudalis*, and *C. munda* are found broadly in the central and eastern parts of the continent. None are as widely disjunct as *H. brunnescens* appears to be, however, Nova Scotia does support a coccinellid fauna composed of a variety of zoogeographic elements, some of which exist as disjunct populations.

If *H. brunnescens* is a relict species, the postglacial climatic history of Nova Scotia may have provided colonization opportunities. Miller and Elias (2000) interpret post-glacial fossil beetle assemblages (from ~ 12,600 years BP to the present) in the Maritime Provinces as illustrating four historical phases of colonization, each indicative of a different climatic regimen. Miller (1997) found specimens of the coccinellid, *Nephus flavifrons* (Melsheimer, 1847), a more southern species not currently found in Atlantic Canada, in peat deposits dating from circa 12,300 years BP on Cape Breton Island – an illustration of historical colonization by a species that has subsequently disappeared from the region.

Scatarie Island represents part of the southern edge of the range of several northern plants including *Cornus suecica* L. (Cornaceae), *Vaccinium uliginosum* L. (Ericaceae), *Prenanthes nana* (Bigel) Torr. (Asteraceae) (Pronych and Wilson 1993), and *Carex rariflora* (Wahlenb.) J. E. Smith (Cyperaceae) (Roland 1998). The same coastal influence that results in cool summers causes a long frost-free season compared to nearby areas only a few kilometers from the coast. Much of the vegetation, however, is similar to that encountered in other coastal headland environments on Cape Breton Island and other parts of Nova Scotia. Consequently it would be worth investigating neighbouring areas to ascertain if *H. brunnescens* occurs more widely in the province.

Although this discovery raises more questions than it answers, it emphasizes how much remains to be learned about the biodiversity of the Coleoptera of Nova Scotia. Majka and McCorquodale's (2006) recent survey of the Coccinellidae of the region had scarcely appeared when yet another species was discovered.

ACKNOWLEDGMENTS

Thanks to Max Barclay (The Natural History Museum, London), Gerald Fauske (North Dakota State University), Robert Gordon (Northern Plains Entomology), Natalia Vandenberg (Systematic Entomology Laboratory, USDA), Alex Wilson (Nova Scotia Museum of Natural History), and Mary (Pixie) Williams for their assistance. Donna Giberson (University of Prince Edward Island), Doug Strongman (St. Mary's University), and three anonymous reviewers read earlier versions of the manuscript and contributed many constructive suggestions. C. G. Majka thanks David Christianson, Calum Ewing, and Andrew Hebda, for continuing support and encouragement. This work was assisted by research grants from Cape Breton University and the Board of Governors of the Nova Scotia Museum. We all thank Rob Cameron, Nova Scotia Department of Environment and Labour for organizing the collecting trip to Scatarie Island.

LITERATURE CITED

- Booth, R. G., A. E. Cross, S. V. Fowler, and R. H. Shaw. 1995. The biology and taxonomy of *Hyperaspis pantherina* (Coleoptera: Coccinellidae) and the classical biological control of its

- prey, *Orthezia insignis* (Homoptera: Ortheziidae). Bulletin of Entomological Research 85: 307-314.
- Cameron, R. P.** 2004. Resources guide and ecological atlas for conducting research in Nova Scotia's wilderness areas and nature reserves. Protected Areas Branch, Nova Scotia Environment and Labour Technical Report 0401.
- Chapin, E. A.** 1966. A new species of myrmecophilous Coccinellidae, with notes on other Hyperaspini (Coleoptera). Psyche 73: 278-282.
- Chrestien, J-P.** 2001. Archaeological survey and testing of eighteenth-century fishing properties on Scatarie Island (Nova Scotia). Canadian Museum of Civilization, Ottawa, Ontario.
- Davis, D. S. and S. Browne.** 1997. Natural history of Nova Scotia. Vol. 2. Theme regions. Nimbus Publishing and Nova Scotia Museum. Halifax, Nova Scotia. 304 pp.
- Dobzhansky, T.** 1941. Beetles of the genus *Hyperaspis* inhabiting the United States. Smithsonian Miscellaneous Collections 101(6): 1-94.
- Fauske, G. M., P. P. Tinerella, and D. A. Rider.** 2003. A list of the lady beetles (Coleoptera: Coccinellidae) of North Dakota with new records from North Dakota and Minnesota. Journal of the Kansas Entomological Society 76(1): 38-46.
- Gordon, R. D.** 1985. The Coccinellidae (Coleoptera) of America north of Mexico. Journal of the New York Entomological Society 93: 1-912.
- Majka, C. G. and D. B. McCorquodale.** 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. Zootaxa 1154: 49-68.
- McClanahan, R. J.** 1970. Cottony maple scale and its natural control. Entomophaga 15: 287-289.
- Miller, R. F.** 1997. Late-glacial (Allerød - Younger Dryas) Coleoptera from central Cape Breton Island, Nova Scotia, Canada. Canadian Journal of Earth Sciences 34: 247-259.
- Miller, R. F. and S. A. Elias.** 2000. Late-glacial climate in the Maritimes Region, Canada, reconstructed from mutual climatic range analysis of fossil Coleoptera. Boreas 29: 79-88.
- Pronych, G. and A. Wilson.** 1993. Atlas of rare vascular plants in Nova Scotia. Volumes 1 and 2. Nova Scotia Museum of Natural History, Halifax, Nova Scotia. Curatorial Report 78: 1-331.
- Roland, A. E.** 1998. Roland's Flora of Nova Scotia; revised by Marian Zinck. Nimbus Publishing and the Nova Scotia Museum, Halifax, Nova Scotia. 1297 pp.
- Stäubli Dreyer, B., J. Baumgärtner, P. Neuenschwander, and S. Dorn.** 1997. The functional responses of two *Hyperaspis notata* strains to their prey, the cassava mealybug *Phenacoccus manihoti*. Bulletin de la Société Entomologique Suisse 70: 21-28.
- Vandenberg, N. J.** 2002. Coccinellidae Latreille 1807. pp. 371-389. In, American Beetles, Volume 2: Polyphaga: Scarabaeoidea through Curculionoidea. (R. H. Arnett Jr., M. C. Thomas, P. E. Skelley, and J. H. Frank, editors.) CRC Press. Boca Raton, Florida, USA. 861 pp.