



NEW RECORDS

The stag beetles of the Maritime Provinces of Canada (Coleoptera: Lucanidae)

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ABSTRACT

Four species of Lucanidae are now known to occur in the Maritime Provinces. *Platycerus depressus* is added to the faunal list of Nova Scotia, and *Platycerus virescens*, *Nicagus obscurus*, and *Ceruchus piceus* are added to the faunal list of New Brunswick. *Nicagus obscurus* is also newly recorded in Maine and in the Maritime Provinces as a whole. *Platycerus marginalis* is removed from the faunal list of both New Brunswick and Nova Scotia. The composition and distribution of lucanids in the region is discussed, including their apparent absence on Prince Edward Island. Their particular association with hardwoods is noted as a potentially useful indicator in relation to the health and biodiversity of deciduous forests that have historically been affected by forest management practices and disease.

RÉSUMÉ

On reconnaît désormais que quatre espèces de Lucanidés se retrouvent dans les provinces maritimes. *Platycerus depressus* est ajouté à la liste faunistique de la Nouvelle-Écosse, et *Platycerus virescens*, *Nicagus obscurus*, ainsi que *Ceruchus piceus* sont ajoutés à la liste faunistique du Nouveau-Brunswick. *Nicagus obscurus* est aussi nouvellement recensé dans le Maine et l'ensemble des provinces maritimes. *Platycerus marginalis* est retiré des listes faunistiques de la Nouvelle-Écosse et du Nouveau-Brunswick. La composition et la distribution des Lucanidés dans la région sont discutées, de même que leur apparente absence sur l'Île-du-Prince-Édouard. Leur association particulière aux feuillus est notée en tant qu'indicateur potentiel de la santé et de la biodiversité des forêts décidues affectées historiquement par les pratiques d'aménagement forestier et les maladies.

INTRODUCTION

The stag beetles (Coleoptera: Lucanidae) are showy and prominent beetles much favoured by many insect collectors. The males of many species have prominent enlarged mandibles that are used in competition for females. Ratcliffe (2002) reported 24 species in North America and one new North American species has been described since (Paulsen and Smith 2005). Of the 25 North American lucanids, 14 have been recorded in Canada (McNamara 1991). Adult lucanids lay eggs in crevices in bark or logs and the larvae develop in such habitats, feeding on decaying wood. Adults are also customarily found in saproxylic environments (Ratcliffe 2002).

There has been a considerable degree of recent interest in saproxylic insects since Speight (1989) drew attention to the importance of this trophic group in the dynamics of forest ecosystems. In general, upwards of 30% of plant biomass produced annually in forests is in the form of woody tissue and the quantity of plant nutrients recycled annually by saproxylic species in forests is roughly 50% of that recycled from the annual leaf fall (Speight 1989). Recent studies

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have found that 42-56% of all forest-dwelling beetles can be considered saproxylic (Köhler 2000; Martikainen et al. 2000). In the Maritime Provinces, in three studies of forest beetles referred to in Majka and Pollock (2006), 243, 259, and 286 species of saproxylic beetles were found, in one instance comprising 54% of the forest beetle fauna.

There are also continuing concerns in relation to the apparent scarcity of many of these forest beetles. Majka (2006) drew attention to 59 species of saproxylic beetles from 14 families that have been recorded in the region from five or fewer specimens (representing $\leq 0.005\%$ of specimens examined from the region). These 59 “apparently rare” species comprised 20.8% of the 283 species of saproxylic beetles examined in the study. Majka (2006) noted that the apparent scarcity of such species could be indicative of a diminution of habitat as a result of forest management practices. For instance, in Nova Scotia although 78% of the land base is forested less than 1% of that land is comprised of old-growth forests (Loo and Ives 2003). Consequently there is ongoing interest in terms of documenting the biodiversity of saproxylic beetles in the region, determining their abundance and distribution, and assessing their potential vulnerability to disturbance. In that context, the present study take the opportunity to examine recent collections of lucanids in the region as well as voucher specimens deposited in reference collections, to present the first survey of the Lucanidae in the Maritime Provinces.

METHODS AND CONVENTIONS

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

- ACNS Agriculture and Agri-Food Canada, Kentville, Nova Scotia, Canada
- CBU Cape Breton University, Sydney, Nova Scotia, Canada
- CGMC Christopher G. Majka collection, Halifax, Nova Scotia, Canada
- CMN Canadian Museum of Nature, Ottawa, Ontario, Canada
- CNC Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada
- JOC Jeff Ogden Collection, Truro, Nova Scotia, Canada
- NBM New Brunswick Museum, Saint John, New Brunswick, Canada
- KSEM Kansas Snow Entomological Museum, University of Kansas, Lawrence, Kansas, USA

- NSAC Nova Scotia Agricultural College, Bible Hill, Nova Scotia, Canada
- NSMC Nova Scotia Museum, Halifax, Nova Scotia, Canada
- RWC Reginald Webster Collection, Charters Settlement, New Brunswick, Canada
- UMNB Université de Moncton, Moncton, New Brunswick, Canada
- UNH University of New Hampshire, Durham, New Hampshire, USA

The systematics and taxonomy follow Paulsen (2005).

KEY TO MARITIME PROVINCES LUCANIDAE*

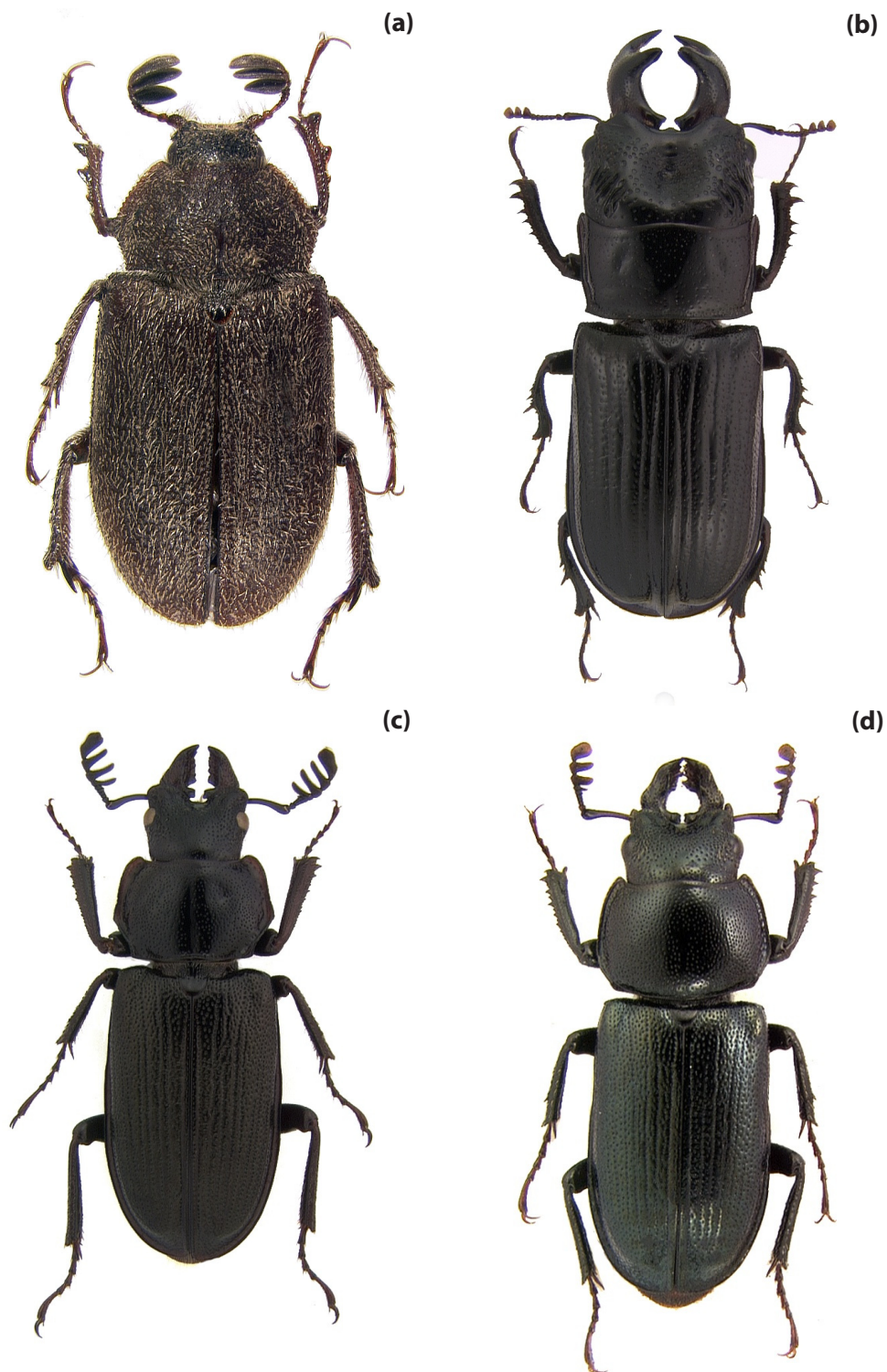
1. Antennae geniculate (elbowed); body form elongate and weakly flattened; prosternal process broad; procoxae distinctly separated3
 - Antennae straight; body form oval or cylindrical; prosternal process narrow; procoxae almost contiguous2
- 2 (1). Form short, oval, and convex; elytra coarsely punctate with conspicuous bristles (Fig 1a); antennal club distinctly lamellate*Nicagus obscurus* LeConte
 - Form elongate and cylindrical; elytra striate and almost glabrous (Fig. 1b); antennal club weakly lamellate*Ceruchus piceus* (Weber)
- 3 (1). Colour black; occasionally obscurely bronzed (Fig. 1c); segments of antennal club with long, slender lobes (Fig. 2a)*Platycerus depressus* LeConte
 - Colour black, rufo-piceous, or rufous with bluish, greenish, or bronze luster (Fig. 1d); segments of antennal club with stout, blunt lobes (Fig. 2b)*Platycerus virescens* (Fabricius)

* Adapted from Ratcliffe (2002) and Benesh (1946).

RESULTS

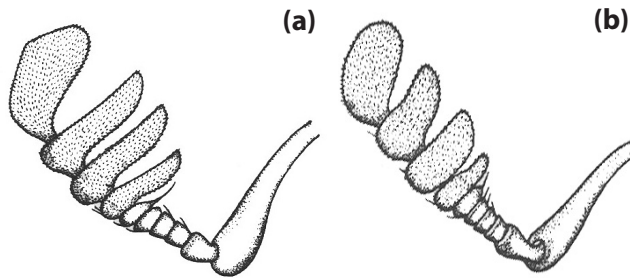
Four species of Lucanids are now known to occur in the Maritime Provinces (Fig. 3). *Platycerus depressus* is added to the faunal list of Nova Scotia, and *Platycerus virescens*, *Nicagus obscurus*, and *Ceruchus piceus* are added to the faunal list of New Brunswick. *Nicagus obscurus* is newly recorded in the Maritime Provinces as a whole. *Platycerus marginalis* is removed from the

Fig. 1. Dorsal habitus photographs of male *Nicagus obscurus* LeConte (a); *Ceruchus piceus* (Weber) (b); *Platycerus depressus* LeConte (c); and, *P. virescens* (d). Photo credit : M.J. Paulsen, University of Nebraska State Museum.



faunal list of New Brunswick, Nova Scotia, and the Maritime Provinces as a whole. Specific details follow.

Fig. 2. Antenna of *Platycerus depressus* (a) and *P. virescens* (b) adapted from Benesh (1946).



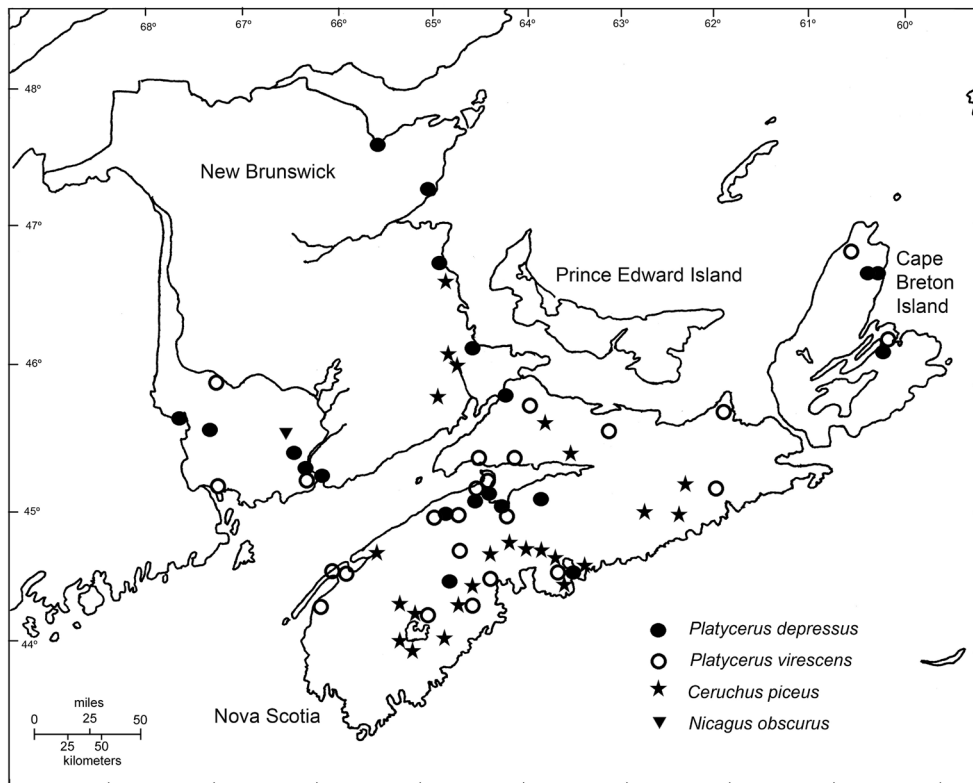
Aesalinae

Nicagus obscurus LeConte, 1847

MAINE: York Co.: West Lebanon, 5-9.vii.1980, D.W. Barry, uvlight trap, UNH. **NEW BRUNSWICK: Kings Co.:** Nerepis River near Lyons Bridge, 30.v.2001, D.F. McAlpine, NBM.

Nicagus obscurus (Fig. 1a) is newly recorded in New Brunswick and in the Maritime Provinces as a whole. It has previously been reported in eastern North America from northern Georgia north to Massachusetts, New Hampshire, and southern Québec, and west to Minnesota and Iowa (Paulsen and Smith 2005). It has also herein newly reported from Maine (above). Adults are found in sandy areas near large bodies of freshwater such as rivers and lakes (Paulsen and Smith 2005). Adults are frequently encountered under driftwood and debris along the shore and flying over sandbars in the late afternoon. Larvae have been reared from aspen driftwood (*Populus* sp.) (Katovich and Kriska 2002). “In Indiana these beetles are found under wood and other debris on the sandy banks of creeks in early spring. On warm days

Fig. 3. The distribution of *Platycerus depressus*, *P. virescens*, *Nicagus obscurus*, and *Ceruchus piceus* in the Maritime Provinces of Canada.



they may be seen buzzing about the willows along the banks of these streams," (Downie and Arnett 1996: 631).

Platycerinae

Platycerus depressus LeConte, 1850

NOVA SCOTIA: Cape Breton Co.: 16-18.vi.2004, C.W. D'Orsay, CBU; **Cumberland Co.:** Amherst, 17.vi.1990, J. Ogden, JOC; **Halifax Co.:** Armdale, 16.vi.1941, D.C. Ferguson, NSMC; Halifax, 18.vi.1979, F.W. Scott, NSMC; **Kings Co.:** Avonport, v-xii.1991, I. Pearsell, apple orchard, NSMC; Canard, 14.vi.1950, H.T. Stultz, ACNS; Sheffield Mills, 11.vi.1998, (2), ACNS; West Black Rock, 13.vi.2003, C. Sheffield, apple orchard, (3), ACNS; Wolfville, v-xii.1991, I. Pearsell, apple orchard, (2), NSMC; **Lunenburg Co.:** New Germany, 14.vi.1950, D.C. Eidt, NSAC; **Victoria Co.:** Ingonish, Cape Breton Highlands National Park, 4.viii.1949, D.C. Ferguson, NSMC; Clyburn Brook, Cape Breton Highlands National Park, 22.vi.1987, D.B. Brzoska, KSEM.

Platycerus depressus (Fig. 1c) is newly recorded in Nova Scotia. The species is found from Newfoundland and the Maritime Provinces west to British Columbia, the Yukon and Northwest Territories, south to Maryland in the east and in the Rocky Mountains to Oregon and Idaho in the west (McNamara 1991; Downie and Arnett 1996). The larvae of *Platycerus* species (which are univoltine) feed in the decomposing logs of several species of soft-wooded deciduous trees (Benesh 1946). It is widely distributed in both New Brunswick and Nova Scotia including Cape Breton Island (Fig. 3). Following Benesh (1946) this species has for many years been referred to as *Platycerus piceus* (Kirby, 1837), however, Paulsen (2005) indicates that *Lucanus piceus* Kirby, 1837 is an unavailable name being based on a misidentification of *C. piceus* (Weber) (Article 49, ICZN 1999). In a forthcoming paper Paulsen will be revising the nomenclature of the Platycerini.

Platycerus marginalis Casey, 1897

McNamara (1991) recorded this species from both New Brunswick and Nova Scotia. Benesh's (1946) review of the genus *Platycerus* in North America, however, recorded this species exclusively from western North America (California, Idaho, Nevada, Oregon, Utah, Washington, and British Columbia), making records from eastern North America very improbable. S. Laplante (Canadian National Collection of Insects, Arachnids and Nematodes, personal communication) was able to

check the collections at the CNC and was able to verify that a specimen there from Tabusintac, New Brunswick, and one labeled "Shediac, Nova Scotia" which had been identified as *P. marginalis*, were, in fact, misidentified specimens of *P. depressus*. Consequently, *P. marginalis* is removed from the faunal lists of New Brunswick, Nova Scotia, and the Maritime provinces as a whole.

Platycerus virescens (Fabricius, 1775)

NEW BRUNSWICK: Charlotte Co.: St. Andrews, Gibson Lake, 1.vi.1978, S.A. Marshall, CMN; **Saint John Co.:** Saint John, 9.vi.1901, W. McIntosh, NBM; **York Co.:** Prince William, 20.vi.1991, R.P. Webster, RWC.

Platycerus virescens (Fig. 1d) is newly recorded in New Brunswick. It is found from the Maritime Provinces south to Pennsylvania and West to Ontario and Illinois (McNamara 1991; Downie and Arnett 1996). The larvae of *Platycerus* species (which are univoltine) feed in the decomposing logs of several species of soft-wooded deciduous trees (Benesh 1946). Dillon and Dillon (1961) reported them beneath bark and in logs of decaying oak (*Quercus* sp.). Adults have been observed feeding on the shoots and buds of pear trees (*Pyrus communis* L., (Rosaceae)) (Riley 1870). It is widely distributed in both New Brunswick and Nova Scotia including Cape Breton Island although records from northern New Brunswick are lacking (Fig. 1).

Syndesinae

Ceruchus piceus (Weber, 1801)

NEW BRUNSWICK: Albert Co.: Caledonia Mountain, 1965-1971, C.G. Majka, CGMC; **Kent Co.:** St. Louis de Kent, 28.viii.1994, M. Mazerolla, UMN; St. Louis de Kent, 22.x.1994, C. Daigle, UMN; **Westmorland Co.:** Magnetic Hill, 15.x.1976, A. Belanger, UMN; Moncton, 22.ix.1976, C. Bourgoin, UMN, Moncton, 24.ix.1976, L. Frechette & D. Lebreux, UMN.

Ceruchus piceus (Fig. 1b) is newly recorded in New Brunswick. It is widely distributed on the Nova Scotia mainland and in southeastern New Brunswick, but has not been found on Cape Breton Island (Fig. 3). In North America it is found from the Maritime Provinces west to Manitoba and south to Nebraska, Indiana, and Maryland (McNamara 1991; Downie and Arnett 1996; Paulsen 2005). It has reported in decaying beech (*Fagus* sp.), birch (*Betula* sp.), black cherry (*Prunus serotina* Ehrh., (Rosaceae)), chestnut (*Castanea* sp.), elm (*Ulmus*

sp.), red pine (*Pinus resinosa* Ait., (Pinaceae)), oak (*Quercus* sp.), willow (*Salix* sp.) logs (Ratcliffe 1991).

DISCUSSION

As a result of the present investigations it is apparent that *P. depressus*, *P. virescens*, and *C. piceus* are widely distributed throughout New Brunswick and Nova Scotia. *Ceruchus piceus* has not been found on Cape Breton Island, although further collecting there is required to determine if it is really absent. In comparison, only one lucanid, *P. depressus*, has been recorded on insular Newfoundland (McNamara 1991). Records (21 specimens) for all three species in New Brunswick are fewer than in Nova Scotia (93 specimens), however, this is the result of a lesser collection effort in the former province. *Nicagus obscurus* is newly recorded in New Brunswick, Maine and in the region as a whole. Further collecting in appropriate riparian habitats in New Brunswick should be undertaken to better discern its distribution in the province. Additional fieldwork in New Brunswick would also be useful to determine if other species of lucanids, such as *Dorcus parallelus* (Say, 1823) which has been collected in neighbouring Québec, may be present. All four lucanids found in the region are variously associated with deciduous trees, particularly soft-wooded ones. *Nicagus obscurus* appears to specialize in driftwood found along watercourses.

No lucanids have been found on Prince Edward Island. It could be the case that the Northumberland Strait has proved to be an obstacle to their dispersal (although all four species found in the region are macropterous and are capable of flight). Collecting effort on Prince Edward Island, particularly for forest and saproxylic species, has been less than in other areas of the Maritimes, which could also account for the lack of records there. However, the forests of Prince Edward Island have also been subject to the most intensive and extensive clearing of any region in Atlantic Canada. By early in the eighteenth century significant cutting of the forest had started and large areas of the island were burnt. Seventy percent of the island's forests were cleared during the twentieth century (Loo and Ives 2003). In 1960, 60% of the land on the island was devoted to agriculture and a further 8% was otherwise open (unimproved waste land, marsh, barren, etc.) leaving only 32% as forest (Erskine 1960). Where land has not been completely cleared, the best trees have been removed for generations, leaving a generally impoverished forest, both in terms of genetic quality and of species diversity (Loo and Ives 2003). Only small relicts of the original vegetation of the island still exist. A projection

by Sobey and Glen (2004) of the pre-European settlement forest of Prince Edward Island indicates that the island was mostly covered by upland hardwood forest, a stand type that occurs on only 21.7 % of the forested area of the island today. The cumulative effect of this history of forest management may have disturbed the PEI forest environment so that lucanids are no longer present, or exist only in diminished numbers in relict areas.

Although with only four species present in the region the Lucanidae are a small component of the beetle biodiversity of the region, they are nonetheless of considerable interest as members of the saproxylic invertebrate community. Since they are associated exclusively with deciduous trees they bear some similarity to the Eucnemidae (false click beetles). There are ten species of eucnemids present in the Maritime Provinces, nine of which are associated exclusively with deciduous trees. *Epiphaniis cornutus* (Eschscholtz), the only eucnemid associated with coniferous trees, is also the only commonly collected species in the region (Majka 2007). Majka (2007) suggested that the apparent scarcity of many of the deciduous-associated eucnemids may be related to the impact that both forest management and disease have had on the deciduous forests in the region. Dutch elm disease has had a major impact on elm (*Ulmus americana* L. (Ulmaceae)) populations in the region. Sugar maple (*Acer saccharum* Marsh. (Sapindaceae)) and birch (*Betula* spp.) decline, two poorly understood phenomena in the latter half of the 20th century, have also caused widespread mortality. Beech bark disease has swept through the entire region except for the northern third of New Brunswick, greatly affecting beech (*Fagus grandifolia* Ehrh. (Fagaceae)) forests. "Considering that beech was one of the most common species in the region, the impact of the disease has been significant for the ecology of the Maritimes forests," (Loo and Ives 2003). In that context families such as the Lucanidae, which are particularly associated with hardwoods, may be useful indicators in relation to the health and diversity of invertebrate communities associated with such forest types, and hence of the forests themselves.

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