The extirpation, and possible extinction, of *R. americanus*  

**DOES IT MAKE SCENTS? A CASE FOR THE EXTRIPATION, AND POSSIBLE EXTINCTION, OF THE NATIVE STINK BUG**  

*RHACOGNATHUS AMERICANUS*  
(PENTATOMIDAE: ASOPINAE)  

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Abstract  

The known natural history and distribution of the native stink bug *Rhacognathus americanus* (Stål) and its disappearance in North America are reviewed. Direct and indirect sampling efforts to document its occurrence are discussed, and a case to consider it locally extirpated from southern Ontario, and perhaps its possible extinction, is made.  

Introduction  

*Rhacognathus americanus* (Stål, 1890) is a large predaceous stink bug (Pentatomidae: Asopinae) (Fig. 1) native to North America, and is recorded from the Northwest Territories to New Jersey, south into Indiana and Nebraska (Maw et al. 2000, Froeschner 1988). A recent review of the Ontario Pentatomidae (Paiero et al. 2013) noted that this species, despite its relatively large size (9–11 mm), has not been documented in Ontario since 1962. Although several other recent reviews of regional pentatomid faunas in the U.S.A. have suggested that *R. americanus* should be found in their respective states (Rider 2012; O’Donnell and Schaefer 2012), there is an absence of any recent material. To fully document the known distribution and natural history of this species, the available literature and specimen records are provided, and the possibility that *R. americanus* has become regionally extirpated, if not extinct, is discussed.  

Materials and methods  

The literature and regional insect collections within the known distribution of *R. americanus* were examined to accumulate all known records for *R. americanus*. The major collections within the known distribution of *R. americanus* were contacted as these collections were the most likely to have locally collected material. Collections contacted,
including those with online specimen holdings, include (listed alphabetically): Academy of Natural Sciences (Philadelphia, Pennsylvania); Albert J. Cook Arthropod Research Collection, Michigan State University (East Lansing, Michigan); American Museum of Natural History (New York, New York); Canadian National Collection of Insects (Ottawa, Ontario); Cornell University Insect Collection (Ithaca, New York); Field Museum of Natural History (Chicago, Illinois); Frost Entomological Museum (State College, Pennsylvania); Great Lakes Forestry Centre (Sault St. Marie, Ontario); Lethbridge Research and Development Centre collection (Lethbridge, Alberta); Lyman Entomological Museum (Ste-Anne-de-Bellevue, Quebec); Montreal Insectarium (Montreal, Quebec); North Dakota State Insect Reference Collection (Fargo, North Dakota); Northern Forestry Insect Collection (Edmonton, Alberta); Purdue Entomological Research Collection (West Lafayette, Indiana); Royal Alberta Museum (Edmonton, Alberta); Royal Ontario Museum (Toronto, Ontario); Royal Saskatchewan Museum (Regina, Saskatchewan); Triplehorn Insect Collection, Ohio State University (Columbus, Ohio); United States National Museum (Washington, D.C.); University of Delaware Insect Collection (Newark, Delaware); University of Guelph Insect Collection (Guelph, Ontario); University of Minnesota Insect Collection (St. Paul, Minnesota); University of Michigan Museum of Zoology (Ann Arbor, Michigan); Wallis-Roughley Museum of Entomology (Winnipeg, Manitoba). Global Biodiversity Information Facility (https://www.gbif.org), iNaturalist (https://inaturalist.ca), the Barcode Of Life Database (http://www.boldsystems.org/) and BugGuide (https://bugguide.net) were also examined for possible unpublished records. Full specimen data are available from Paiero (2018).

FIGURE 1. Habitus of *Rhacognathus americanus* (Stål) (dorsal, left; ventral, right). The left antenna is missing the apical segment.
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**Occurrence**

A total of 39 unique collection records of *R. americanus* were compiled (Paiero 2018) from available specimen data and those noted in the literature (Stål 1870; Uhler 1876; Osborn 1901; Van Duzee 1904; Parshley 1917; Hart 1919; Stoner 1921; Hussey 1922; Blatchley 1926; Steyskal 1938; Furth 1974; McPherson 1982; Roch 2008). Localities and collections were georeferenced using Google Earth and mapped (Fig. 2) using SimpleMappr (Shorthouse 2010). Vague localities or broad geographic regions were excluded from the map (e.g., “Northern Illinois”) and county-based localities were only included (as a central record) if there was no other locality within that county. The global Index of Area of Occupancy (112 km$^2$) and Extent of Occurrence (3,146,006 km$^2$) were calculated from GeoCat (Bachman et al. 2011) based on locality data provided in Paiero (2018), including the Quebec record, for future consideration.

**Results and discussion**

**Distribution and habitat**

With the exception of one specimen, there are no confirmed records of this species (specimen or photo) anywhere from the past 50 years. The only ‘modern’ record of *R. americanus* was recorded in Quebec (Roch 2008; Entomofaune de Quebec Inc. 2019) and is based on correspondence regarding a single specimen that was deposited in a private collection. This collection was later deposited, in part, at several collections, including the Canadian National Collection (Ottawa, Ontario) and the Montreal Insectarium (Montreal, Canada).
Quebec), but some material may have been lost when the collectors’ private residence was damaged by fire. At present, no specimens of *R. americanus* can be found at either collection, and it may have been a misidentified specimen of another genus. With no means of confirming the identity of this specimen, this is treated as a dubious record, making the most recent record of *R. americanus* from 1966 in Manitoba.

Very little is known about the natural history of *R. americanus* besides what can be inferred from label data and the few published accounts. The adult flight period ranges from 23 May to 17 August. A predaceous stink bug (Asopinae), this species likely feeds on a variety of other insects but has only been documented “sucking on a *Lina* sp.”, which may have been a misidentification of a *Plagiodera versicolora* Laicharting, 1781 (Coleoptera: Chrysomelidae). Four *R. americanus* specimens were collected in wetland/grassland communities (dunes, marshes, beaches and spruce-sand communities; Paiero 2018), which is consistent with its European congener, *R. punctatus* (Linnaeus, 1758). *Rhacognathus punctatus* (also known as the heather bug) has been recorded from “high quality wetlands” in Wales (Ramsay 2013), dry heaths (Hawkins 2003), from moss in heaths (Roche 1965), and “heathland and moorland, although occasionally recorded from dune slacks and commons in the absence of *Calluna* [Ericaceae]” in the United Kingdom (Bantock and Botting 2013). Like *R. americanus*, *R. punctatus* is apparently widely distributed but is “always scarce and found at low densities” (Bantock and Botting 2013). Peiricart (2010) suggested *R. punctatus* feeds only on chrysomelid larvae.

**Collection effort**

While there have been no large scale directed efforts to find *R. americanus*, several recent projects and efforts may have indirectly sampled for it, including specimen-based studies and photo vouchers. The most important efforts to document *R. americanus* are the various regional reviews of the stink bug fauna. These reviews identified and re-examined specimen records collected from the area and provided updated keys, distributions, and checklists. A number of reviews of the stink bug fauna in the past decade (O’Donnell and Schaefer 2012; Rider 2012; Swanson 2012; Paiero et al. 2013; Koch et al. 2014) found no new collections of *R. americanus*, with the exception of Roch (2008). BugGuide and iNaturalist websites also lack any recent records for *R. americanus* despite the proliferation of contributors to both sites. *Rhacognathus americanus* is a relatively large stink bug well within the size range for even basic photography systems, but only an image of a single historical specimen is available (see bugguide.net/node/view/716152 and bugguide.net/node/view/716154). While it could be argued that its cryptic appearance makes it less likely to be encountered, other similarly sized and coloured stink bug species in the genus *Brochymena* Amyot and Audinet-Serville, 1843 are arguably more cryptic but are represented by at least 1,064 photographs on BugGuide and 2,275 records on iNaturalist in North America (as of 22 June 2019). The extensive efforts throughout the United States and Canada to document the spread of *Halyomorpha halys* (Stål, 1855) (the brown marmorated stink bug) (e.g., Leskey et al. 2012; Gariepy et al. 2014) were never meant to sample for *R. americanus*, but similar off-target brown stink bugs were collected, and it would seem likely that *R. americanus* would have been collected if it were encountered. *Rhacognathus americanus* is superficially similar to *H. halys* with general colouration, pale bands on the tibiae, alternating dark-light
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markings on the connexivum, and smooth anterolateral pronotal margins, although it is slightly smaller in size than *H. halys* (9–11 mm versus 12–17 mm, respectively). Although the two species are thought to occur in different habitats, the raised interest in *H. halys* still increased sampling for stink bugs and no additional records have emerged.

Insect surveys and ‘bioblitzes’ are sampling efforts that were also considered in regards to search effort for *R. americanus*. Several funded terrestrial insect surveys in southern Ontario sites by personnel at the University of Guelph Insect Collection, including several with wetland and grassland habitat (e.g., Blades and Marshall 1994, Paiero et al. 2008), extensively sampled the fauna (with a sampling bias towards Hemiptera due to interest of some of the personnel). Opportunistic efforts were also made to document the provincial bug fauna at other sites in southern Ontario, with an interest in relocating this species. Various ‘bioblitzes’, including several at sites with both wetlands and grasslands such as Point Pelee National Park, Credit River watershed and Ojibway Prairie Provincial Nature Reserve, have also taken place in southern Ontario and include both specimens and photo vouchers posted on iNaturalist. The Barcode Institute of Ontario’s Malaise and ‘BioBus’ sampling programs have sampled over 1 million specimens from Ontario Parks and 755,000 from Canadian National Parks (Centre for Biodiversity Genomics 2017), with partial cytochrome c oxidase subunit 1 (CO1) sequences for *R. americanus* and a BIN for *R. punctatus* (BOLD:ABU5656) on file for comparison. all of these efforts have failed to document a single *R. americanus*, despite relatively large insects such as stink bugs usually being conspicuous targets for both naturalists and entomologists.

**Conclusion**

There are other cases of relatively large insects that have been reported as extirpated in Ontario (including butterflies, lacewings and beetles), and there are also several that have since been relocated. The spider wasp *Ceropales bipunctata* Say, 1824 (Hymenoptera: Pompilidae) was considered extirpated by the absence of records in the previous 45 years (Godsoe 2003), but this was explained by a lack of directed collecting effort for spider wasps, with recent collections in Ontario establishing its presence and providing insight into why it was previously overlooked (Klymko et al. 2017). McCorquodale et al. (2007) listed 20 long-horned beetles (Coleoptera: Cerambycidae) that had not been collected in Ontario since 1950, but they noted that this may be an artifact of diminished sampling effort and not actually represent disappearances; at least two of these species have since been recollected in Ontario. For *R. americanus*, there has been substantial sampling effort, both direct and indirect, that indicates it is no longer in Ontario. The scattered historical records from throughout the range of *R. americanus* suggests that it was already a rarely encountered species. Even so, the absence of any record in the past 52 years suggests that, at the very least, it has declined in parts of its range, especially southern Ontario. The general interest in stink bugs by amateur and professional entomologists suggests that at least one specimen would have been found and recognized over the past few decades if it was still present, especially given the increased sampling efforts in the past two decades. The availability of taxonomic keys, proliferation of online postings, and regional reviews continue to draw interest to this group, but still no modern records have emerged. Although very little about its natural history is known, what can be drawn from historical material and
associations of congener suggests that *R. americanus* should be found in various wetlands and grasslands. No specific cause for its apparent decline is known, but potential causes for the decline of other Ontario species include light pollution (Marshall 1996), decline in quality and quantity of habitat or resources (Packer 1994; Marshall 1996; Sikes and Raithel 2002; McCorquodale et al. 2007; Colla and Dumesh 2010), and the introduction of predators or parasites (Wagner 2012; Harmon et al. 2007). Despite the lack of any evidence that shows that it still persists, at least at the provincial level, it is hoped that *R. americanus* might still be found in small localized pockets of specific habitat (such as bogs), or in northern parts of Ontario and the prairies where active sampling efforts are comparatively limited, and that this study will inspire increased efforts to relocate it.

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