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RESEARCH ARTICLE

THE GEADEPHAGA (COLEOPTERA: CARABIDAE AND RHYSODIDAE) OF THE SMITHSONIAN ENVIRONMENTAL RESEARCH CENTER, MARYLAND

C. L. STAINES AND S. L. STAINES

Smithsonian Environmental Research Center, 647 Contees Wharf Road, Edgewater, Maryland 21037, USA

Corresponding author: C. L. Staines (stainesc@si.edu)

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ABSTRACT

An inventory of the Geadephaga (Coleoptera) at the Smithsonian Environmental Research Center, Anne Arundel County, Maryland is being conducted. Pitfall traps were placed and monitored from 2015 to 2018. From 2017 to 2020 directed collecting efforts were made to document the Geadephaga of the facility. A total of 111 Geadephaga species was collected: Carabidae- 110, Rhysodidae- 1.

Keywords: Biodiversity, insects, Maryland.

INTRODUCTION

The Adephaga is the second largest suborder of Coleoptera with an estimated 39,300 species described as of 2005 (Bousquet, 2012). The extant Geadephaga includes the Trachypachidae (six species from Eurasia, South America, and the western United States), the Rhysodidae (about 355 species), and the Carabidae, including the cicindelids (about 33,905 species) (Bousquet, 2012).

The Carabidae (ground beetles) in temperate areas are commonly found in leaf litter, under stones or bark or running over the ground. Ground inhabitants are found on the shores of streams and ponds, sunlit marshes, swamp forests, wet or dry forests, wet meadows, dry grasslands, and exposed sandy areas. Some species live in trees or shrubs and may be taken by beating or sweeping foliage (Larochelle & Larivière, 2003).

Most carabids are opportunistic omnivores, eating dead and dying arthropods, or are specialist predators feeding on mollusks (Mollusca), millipedes (Diplopoda), or various insect (Insecta) groups. Some species are day-active, relying on eyesight primarily to capture prey while others are nocturnal, locating prey by chemical means. Other carabids are plant feeders, especially on seeds. A few species are ant nest associates, feeding on ants and debris from the nest (Laroche & Larivière, 2003).

Many carabids are strongly attracted to artificial lights and can be collected this way. Using a head lamp at night particularly along forest trails can be very productive. Unbaited and baited pitfall traps are another effective method of collecting these beetles as is peeling bark. Malaise traps, flight-intercept traps, and Berlese funnel samples capture numerous species. The 2551 North American species are fairly well-studied (Ball & Bousquet, 2001; Bousquet, 2012), but a few genera need revision.

The carabid fauna of Maryland includes 423 confirmed species (Bousquet, 2012; Staines & Staines, 2012; Steury & Messer, 2017; Harden, 2018). Very little has been published on Maryland carabids. Glaser (1976, 1986, 1992, 1995) reported on various Cicindelini and Staines (2005[2006]) reported that *Cicindela hirticollis hirticollis* Say colonized a restored beach. Staines (1994) surveyed the genus *Calosoma* using black lights and also (Staines, 1985) discussed the biology and distribution of the genus *Omophron* in the state. Bailey et al. (1994) reported on carabids collected in pitfall traps in western Maryland and Dively (2005) used this sampling method to study the impact of transgenic corn on carabid diversity and abundance. Glaser (1996) discussed the ten Cychrini species found in Maryland and Clark et al. (2006) compared the carabid faunas in two tillage systems. More recently, Evans (2009) listed 46 species of carabids found at Maryland sites during the Potomac Gorge Bioblitz. Guarnieri (2009) published some observations on *Cicindela unipunctata* Fabricius in Worcester County, Maryland. Guarnieri (2015), Guarnieri & Harden (2017), and Harden & Guarnieri (2017) reported on the distribution and population status of the genus *Scaphinotus* in the mid-Atlantic region.

There are four published inventories of the carabid fauna of Maryland locations. Erwin (1981) and Stork (1984) reported 214 species from Plummers Island, Montgomery County collected over an 80-year period, but only 117 of these species were taken from 1970 to 1984. Fritzler & Strazanac (2012) reported 67 species of carabids from Catoctin Mountain Park in Frederick County. Staines & Staines (2012) found 80 species of carabids on Eastern Neck National Wildlife Refuge in Kent County. Steury & Messer (2017) reported 69 species of carabids at Cove Point in Calvert County.

Rhysodidae (wrinkled bark beetles) has sometimes been included within the family Carabidae but has been treated as a separate family by some authors in recent years. Adults and larvae live in dead, damp wood. Adults do not make burrows, instead squeeze between the cell layers of the decomposed wood, generally leaving no visible trace of their passage. Adults are most often collected just under the bark but have been found in the center of the wood (Ball, 1970).

MATERIALS AND METHODS

The Smithsonian Environmental Research Center (SERC) [38°33'17.57"N; 76°33'14.29"W] consists of approximately 1,477 ha of hardwood-dominated forest, ponds, creeks, rivers, tidal marshes, and 19.3 km of shoreline along the Rhode River and upper Chesapeake Bay in Anne Arundel County, Maryland (SERC, 2018). Forests on the main campus of SERC can be broadly classified into three main types: (1) the majority (~85%) is a tulip-poplar (*Liriodendron*

tulipifera L., Magnoliaceae) association; (2) a moist lowland assemblage, comprised of American sycamore (*Platanus occidentalis* L., Platanaceae), ash (*Fraxinus* spp., Oleaceae), elms (*Ulmus* spp., Ulmaceae), river birch (*Betula nigra* L., Betulaceae), and other woody vegetation along freshwater streams; and (3) a semi-xeric assemblage that fringes tidal marshes, consisting of chestnut oak (*Quercus prinus* L.), white oak (*Quercus alba* L.) (Fagaceae), black gum (*Nyssa sylvatica* Marshall, Nyssaceae), mountain laurel (*Kalmia latifolia* L.), blueberries (*Vaccinium* spp.) (Ericaceae), beech (*Fagus grandifolia* Ehrh., Fagaceae), and other woody vegetation. Like much of the eastern United States, SERC's forest age and structure reflect historical agricultural activities and local history. SERC's main campus was mostly fallow from the end of the Civil War (1865) to approximately 1915, when it was used as a dairy farm with grazing pastures and fields for feed production until 1945. Thus, the majority of SERC's contemporary forests are from 70-150 years old (Higman et al., 2016; McMahon et al., 2010).

Freshwater inputs into the Rhode River are primarily from the North Fork Muddy Creek, South Fork Muddy Creek, Sellman Creek, and their lower order streams. These streams are associated with several swamps, beaver impoundments, and seasonal wetlands which range from small, tannin-rich, ephemeral wetlands, to larger and clear-water permanent ponds.

On the south side of the Rhode River the BiodiversiTREE plots are about 30 acres containing 24,000 trees of 16 species of ecologically important deciduous trees planted in 75 plots. Established in 2013, the trees in these plots are rather stunted probably due to deer (*Odocoileus virginianus* (Zimmermann), Mammalia: Cervidae) browse and poor soil nutrients (SERC, 2018). In the annotated species list this area is referred to as Zones 5 and 6.

The goal of this project is to inventory the Coleoptera of the SERC. Collecting techniques for terrestrial species were visual survey followed by sweeping or beating the vegetation of the area. Other collecting techniques used were pitfall traps (both baited and unbaited), carrion traps using fresh and desiccated carcasses of various vertebrate species, head lamping, black lighting, and checking lights around buildings on the main campus.

Directed field work was conducted from 11 May to 24 October 2018, 30 March to 23 October 2019, 19-20 March 2020, and 26 August to 30 October 2020. Two Malaise traps were operated for 72 hour periods in May and June 2020. Mounted specimens from the directed field work were identified by the senior author using Ciegler (2000) and Bousquet (2010). Voucher specimens are deposited in the SERC collection. Duplicate specimens are deposited in the Department of Entomology Collection, Natural History Museum, Smithsonian Institution.

SERC is part of the National Ecological Observatory Network (NEON). Part of the NEON protocol is a series of pitfall traps which are monitored biweekly. There are ten trap clusters (a total of 40 pitfall traps) at SERC. The sampling plan is described in detail in Hoekman et al. (2017). Specimens from the NEON project were processed and identified under the NEON protocol and specimens collected through 2018 are deposited in the Carnegie Museum of Natural History, Pittsburgh, and from 2019 mostly at Arizona State University, with select specimens remaining at Carnegie Museum. A selection of NEON material was identified by Robert L. Davidson at Carnegie Museum as part of the official protocol; the remainder by local NEON staff, mostly Curt Harden.

The annotated list of species follows the classification and nomenclature of Bousquet (2012).

RESULTS

Family Carabidae

Tribe Bembidiini

Bembidion affine Say, 1823 is commonly found in a variety of habitats characterized by open or slightly shady ground covered with moderate to dense vegetation. Adults are active for the entire season and are the overwintering stage. They have been collected at lights (Blatchley, 1910; Lindroth, 1963; Erwin, 1981; Ciegler, 2000). Specimens were taken on 27 May 2019 on the Connector Trail at black light; a single specimen was taken from an unidentified mushroom on 14 September 2020 in the woods opposite Sellman House. NEON pitfall traps 007 and 010 captured specimens in April, May, and June of 2015, from 10–24 August 2017, and from 20 September to 4 October 2018.

Bembidion americanum Dejean, 1831 is found on wet sand and mud with little vegetation. Adults are attracted to lights (Löding, 1945; Kirk, 1969; Ciegler, 2000). SERC specimens were taken by visual survey on 30 April 2019 in Zone 6.

Bembidion confusum Haywood, 1897 is found on bare, clay-mixed sand near water of both rivers and lakes. The adults feed on dead and dying arthropods that are washed up on shore (Lindroth, 1963; Kirk, 1975; Kaufmann, 1986). SERC specimens were taken on 20 May 2019 at Frog Haven at black light.

Bembidion nigrum Say, 1823 has been found in gravel and sand mixed with clay, along the margin of small rivers and quiet small brooks, on barren soil, usually gravel mixed with sand and clay, on river banks, in crevices of steep banks, and under stones (Lindroth, 1963; Laroche, 1974a). A single SERC specimen was taken by visual survey on 19 March 2020 in the meadow in front of Mathias Lab.

Bembidion quadrimaculatum oppositum Say, 1823 is found on relatively moist fine sand or clay at the upper edge of the primary floodplain of rivers and upper parts of lake shores, and often in cultivated fields. Adults feed on root maggot larvae (*Delia* spp., Diptera: Anthomyiidae), weevil immatures (Coleoptera: Curculionidae), and other prey. They are collected in pitfall traps and by sweeping vegetation (Lindroth, 1963; Hsin et al., 1979; Grafius & Warner, 1989; Baines et al., 1990). SERC specimens were taken at black light on 20 May 2019 at Frog Haven, on 25 May 2019 and 12 August 2019 along Back Road.

Bembidion rapidum (LeConte, 1848) is usually found along lake shores, the banks of rivers, streams, ponds, and pools, at light, in orchards, and cultivated fields. The species prefers open wet or moist ground with some vegetation. Adults are nocturnal and shelter in cracks in the soil or under dead leaves or stones during the day. They feed on immature Lepidoptera and Diptera (Lindroth, 1963; Kirk, 1975; Erwin, 1981; Ciegler, 2000). SERC specimens were taken in a Malaise trap along the woods margin in the grassy field opposite Sellman House from 30 May–2 June 2020.

Bembidion versicolor (LeConte, 1847) is found along the margins of ponds, marshes, and pools, in floodplain forests, and moist meadows. Adults feed on eggs and larvae of *Erioschia brassicae* (Bouche) [Diptera: Anthomyiidae]. They are collected in pitfall traps and at lights (Lindroth, 1963; Frank, 1971; Kirk, 1975). SERC specimens were taken under bark on 17 May 2019 along Back Road.

Elaphropus incurvus (Say, 1830) is found in a variety of habitats on different substrates. They feed on ants (Hymenoptera: Formicidae). Adults are collected in ant nests, under stones, and in pitfall traps (Schwarz, 1890; Blatchley, 1910; Lindroth, 1966; Erwin, 1981). NEON pitfall traps 002 and 007 captured specimens from 15 April to 15 May 2015, 16-30 June 2015, 29 June to 13 July 2017, and 9-23 August 2018.

Elaphropus xanthopus (Dejean, 1831) is found on riverbanks, margins of woodland pools, and mud flats. Adults have been collected at lights (Ciegler, 2000; Laroche & Larivière, 2003). NEON pitfall trap 007 captured specimens from 15 April to 19 May 2015, 30 June to 14 July 2016, 15 June to 17 July 2017, and 9-23 August 2018.

Mioptachys flavicauda (Say, 1823) is found commonly under the bark of dead and dying hardwood trees and sometimes on carrion. They prey upon small arthropods (and probably their eggs) in the wood and under bark. Adults are collected under bark and in carrion traps (Lindroth, 1966; Erwin, 1981). SERC specimens were taken under bark on 9 April 2019 along Java History Trail and on 10 April 2019 on Hog Island.

Polyderis laeva (Say, 1823) is found in pastures, meadows, on the banks of lakes, marshes, and streams. They feed on grasshoppers (Orthoptera: Acrididae). Adults are collected in ant nests, under stones and debris, and at lights (Lindroth, 1966; Kirk, 1970; Erwin, 1981; Nelson, 1991). NEON pitfall traps 001, 003, 007, 009, 010, 016, 021, and 022 captured specimens from 15 April to 30 June 2015, 19 May to 14 July 2016, 6 April to 21 September 2017, and 31 May to 14 June 2018.

Tachys potomaca (Erwin, 1981) is found in low damp places on the secondary floodplain, on sand mixed with clay where there is prostrate vegetation, and in leaf litter at the margins of ponds (Erwin, 1981). NEON pitfall traps 001, 002, and 003 captured specimens from 15 April to 15 May 2015, 16-30 June 2015, and 11-25 August 2016.

Tachys pumilus (Dejean, 1831) has been taken at lights (Ciegler, 2000). NEON pitfall trap 010 captured a single specimen from 4-18 May 2017.

Tachyta inornata (Say, 1823) is found under the bark of a variety of host trees (*Abies*, *Pinus* (Pinaceae), *Quercus*, *Ulmus*, and *Celtis* (Cannabaceae)) where they prey on small arthropods (Erwin, 1975, 1981). SERC specimens were taken on 10 April 2019 under bark on Hog Island, on 16-17 April 2019 in horse dung-baited pitfall traps near the water tower, on 30 April 2019 in Zone 6 sweeping vegetation, on 10-11 May 2019 in horse dung-baited pitfall traps near Mathias Lab, and on 20 May 2019 at Frog Haven at black light.

Tribe Brachinini

Brachinus alternans Dejean, 1825 is found along riverbanks, in swamps, low forests, and cultivated fields. They are collected in pitfall traps, at fruit bait, and at lights (Erwin, 1970; Ciegler, 2000). NEON pitfall traps 001 and 003 captured specimens from 16-30 June 2015, 30 June to 14 July 2016, and 29 June to 13 July 2017.

Brachinus fumans (Fabricius, 1781) is the most widespread bombardier beetle species in the Nearctic Region and is found near all sorts of water bodies, alkaline or fresh, and in gravel and stony places. During the day they hide under stones, logs, debris, and come out to forage at night. The adults are general scavengers on dead and dying arthropods; the larvae are probably ectoparasitoids on water beetle (Coleoptera) pupae. These beetles are collected in pitfall traps, under debris, and at lights (Erwin, 1970, 1981). NEON pitfall traps 001, 009, and 022 captured specimens from 18 May to 17 July 2017 and 14-28 June 2018.

Brachinus tenuicollis LeConte, 1844 is found along the margins of rivers, ponds, pools, reservoirs, and marshes. Adults are nocturnal and are found on open or half-shaded ground. The larvae are ectoparasites of Hydrophilidae larvae (Coleoptera). Adults are collected in pitfall traps, under stones, and at lights (Lindroth, 1969; Erwin, 1970; Laroche, 1974a). SERC specimens were taken by head lamp on 25 May 2019 along Back Road.

Tribe Carabini

Calosoma sayi Dejean, 1826 is found in a wide diversity of habitats. Adults are mostly active at sunset and sunrise, and feed on immatures of Hemiptera, Lepidoptera, and Coleoptera. Adults are collected in pitfall traps, under logs, and at lights (Burgess & Collins, 1917; Kirk, 1969, 1970; Young, 1984; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 16-30 June 2015 and 7-21 September 2017.

Carabus goryi Dejean, 1831 is found on shaded ground in a wide variety of habitats. Adults are nocturnal and gregarious; they feed on soft-bodied insect larvae. They are taken in pitfall traps and in leaf litter (Blatchley, 1910; Liebherr & Mahar, 1979; Erwin, 1981). SERC specimens were taken by head lamp along the Connector Trail on 27 May 2019. NEON pitfall traps 006, 009, 016, 021, and 022 captured specimens from 15 April to 19 May 2015, 16-30 June 2015, 19 May to 16 June 2016, 8-22 September 2016, 18 May to 13 July 2017, and 5 April to 23 May 2018.

Carabus sylvosus Say, 1823 is found in leaf litter, under the bark of fallen logs, in forests near water, and under rocks (Lindroth, 1961; Ciegler, 2000). SERC specimens were collected at light on 20 March 2020 around Mathias Lab.

Carabus vinctus (Weber, 1801) is found in leaf litter, under the bark of fallen logs, and in forests near water. Adults feed on soft-bodied insects and carrion. They are collected in pitfall traps, at fruit baits, and at lights (Blatchley, 1910; Frost, 1929; Lindroth, 1961). SERC specimens were collected in unbaited pitfall traps along the Connector Trail on 10-11 April 2019 and by visual survey on 10 April 2019 near Mathias Lab. NEON pitfall traps 003, 006, 010, 016, and 022

captured specimens from 15 April to 19 May 2015, 19 May to 12 August 2016, 18 May to 12 August 2017, and 5 April to 23 August 2018.

Tribe Chlaeniini

Chlaenius aestivus Say, 1823 is found in shaded moist habitats well away from open water. Adults are nocturnal and gregarious. Eggs are laid in mud or clay cells placed on dead twigs, leaves, plant stems, and trunks of trees and shrubs. Adults are collected in pitfall traps, under logs, and with head lamps (King, 1919; Lindroth, 1969; Erwin, 1981). SERC specimens were taken under bark on 10 April 2019 at Fox Point and on 12 April 2019 along Back Road. NEON pitfall traps 001, 002, 003, 009, 010, 015, 016, 021, and 022 captured specimens from 15 April to 19 May 2015, 16-30 June 2015, 28 July to 6 October 2016, 29 June to 5 October 2017, and 5 April to 4 October 2018.

Chlaenius emarginatus Say, 1823 is found under stones and logs in moist areas in forests. They feed on soft-bodied insects. Adults are collected in pitfall traps, under stones and logs, and at lights (Bell, 1960; Erwin, 1981; Anderson et al., 1995). SERC specimens were taken at light on 20 March 2020 around Mathias Lab. NEON pitfall traps 001, 002, 006, 015, and 021 captured specimens from 16-30 June 2015, 28 July to 11 August 2016, 1-15 June 2017, and 26 July to 23 August 2018.

Chlaenius impunctifrons Say, 1823 is found under stones on floodplains (Erwin 1981). They feed on various seeds and insects. Adults are collected in pitfall traps, in debris, sweeping vegetation, and at lights (Claassen, 1919; King, 1919; Bell, 1960; Laroche, 1974a). SERC specimens were taken by head lamp on 26 July 2019 along Java History Trail. NEON pitfall traps 001 and 010 captured specimens from 16-30 June 2015 and 2-16 June 2016.

Chlaenius lithophilus Say, 1823 is found on the borders of lakes, ponds, and pools. They feed on seeds and earthworms. Adults are collected under stones and at lights (Blatchley, 1910; Bell, 1960; Laroche, 1974a). SERC specimens were taken on 25 May 2019 at black light along Back Road.

Chlaenius nemoralis Say, 1823 is found under cover near river banks (Lindroth, 1969). Bell (1960) reported it in yards and gardens. Adults are attracted to lights (Erwin, 1981). A single specimen was taken in NEON pitfall trap 010 from 5-19 May 2015.

Chlaenius prasinus Dejean, 1826 is found on sandy shores of large rivers, the edges of marshes and swamps, and on open moist ground. They feed on various insects. Adults are collected in pitfall traps and under debris (Bell, 1960; Laroche, 1974a; Thompson & Allen, 1974). SERC specimens were taken throughout the main campus from May to July at lights, black light, and by head lamp.

Chlaenius tomentosus (Say, 1823) is found in dry disturbed areas, such as gravel pits, in open hilly fields with more or less low vegetation, and under stones. They feed on various insects. Adults are collected in pitfall traps, under debris, and at lights (Forbes, 1883; Blatchley, 1910; Bell, 1960; Lindroth, 1969; Laroche, 1974a, 1974c). SERC specimens were taken at lights around Mathias Lab on 25 May 2019. NEON pitfall trap 007 captured a single specimen from 14-28 July 2016.

Chlaenius tricolor tricolor Dejean, 1826 is found in a wide variety of habitats. Adults are nocturnal and gregarious in the winter. They feed on Lepidoptera larvae and slugs (Gastropoda). Adults are collected at lights, in pitfall traps, and sweeping vegetation (Blatchley, 1910; King, 1919; Bell, 1960; Lindroth, 1969). NEON pitfall traps 006, 007, 010, and 021 captured specimens from 15 April to 5 May 2015, 19 May to 14 July 2016, 6 April to 15 June 2017, and 19 April to 28 June 2018.

Tribe Cicindelini

Cicindela punctulata punctulata Olivier, 1790 occurs in a wide variety of habitats but is usually found in open areas or areas with sparse vegetation, and in old fields. Adults and larvae feed on a variety of small arthropods. They are often taken at lights (Erwin, 1981; Knisley & Schultz, 1997; Ciegler, 2000; Young, 2011). NEON pitfall trap 007 captured specimens from 15 June to 13 July 2017.

Cicindela sexguttata Fabricius, 1775 is found in forested areas and open areas adjacent to woodlands. Adults feed on small spiders (Arachnida: Araneae), Lepidoptera larvae, gnats (Diptera), beetles (Coleoptera), and ants (Hymenoptera: Formicidae). Adults are collected by visual survey and pitfall traps (Erwin, 1981; Knisley & Schultz, 1997; Staines & Staines, 2012). SERC specimens were taken by visual survey and at black light from April to June in 2018 and 2019 throughout the main campus and in Zone 6; in Malaise traps in the grassy field opposite Sellman House from 1-3 May 2020 and 10-13 May 2020. NEON pitfall traps 003, 006, 010, and 022 captured specimens from 15 April to 30 June 2015, 19 May to 30 June 2016, and 1-29 June 2017.

Tetracha virginica (Linnaeus, 1767) is found under cover during the day or out running at night on wet silt flats or in stream cuts where there are wet banks. They are attracted to lights. Their diet is quite varied and consists of moths (Lepidoptera), beetles (Coleoptera), other insects, and worms (Annelida) (Laroche, 1974b; Erwin, 1981). SERC specimens were taken at lights near Mathias Lab on 25 July 2019. NEON pitfall trap 007 captured specimens from 30 June to 11 August 2016.

Tribe Clivinini

Clivina impressifrons LeConte, 1844 is found on river banks some distance from the water on sandy clay. The adults are partly carnivorous and also eat germinating seed corn (*Zea mays* L., Poaceae). They are collected in pitfall traps, under debris, and at lights (Webster, 1906; Phillips, 1909; Lindroth, 1961; Bell, 1971; Sechriest et al., 1971). NEON pitfall trap 007 captured a single specimen from 13-27 July 2017.

Paraclivina bipustulata (Fabricius, 1798) is found in open ground in a wide variety of habitats. Adults are nocturnal and spend the day in burrows dug in the soil. They are associated with Staphylinidae (Coleoptera) and Formicidae (Hymenoptera). Adults are collected in pitfall traps, at sugar baits, and at lights (Leng, 1915; Lindroth, 1961; Kirk, 1969; Erwin, 1981). SERC specimens were taken at black light 26 June 2019 near Sellman House and at black light on 12 August 2019 along Back Road. NEON pitfall trap 002 captured a single specimen from 1-15 June 2017.

Paraclivina sulcipennis (Putzeys, 1867) is a lowland species which is attracted to lights (Laroche & Larivière, 2003). SERC specimens were taken at black light on 26 May 2019 at Frog Haven.

Tribe Cychrini

Sphaeroderus stenostomus stenostomus (Weber, 1801) is found mostly on shaded ground in deciduous forests and along the borders of marshes. Adults are mostly nocturnal and feed on slugs and snails (Gastropoda). They are captured in pitfall traps and at lights (Ulke, 1902; Erwin, 1981; Anderson et al., 1995). NEON pitfall traps 002, 010, 016, 021, and 022 captured specimens from 16-30 June 2015, 16-30 June 2016, 6 April to 27 July 2017, and 5 April to 23 May 2018.

Tribe Dyschiriini

Dyschirius pumilus (Dejean, 1825) is found in salt marshes, shores of lakes, pool margins, and river banks. Adults are collected by sweeping vegetation and at lights (Ulke, 1902; Leng, 1915). SERC specimens were taken at black light on 12 August 2019 along Back Road.

Tribe Galeritini

Galerita bicolor (Drury, 1773) is found on shaded ground mostly in deciduous forests. Adults are nocturnal and feed on a variety of insects and on carrion. They are collected in pitfall traps, at lights, and on carrion (Blatchley, 1910; King, 1919; Erwin, 1981; Ball & Nimmo, 1983). SERC specimens were taken under bark on 9 April 2019 opposite the Java House ruins; on 12 April 2019 along Back Road; at black light on 12 August 2019 along Back Road; by head lamp on 27 June 2019 along Back Road and on 26 July along Java History Trail. NEON pitfall traps 002, 003, 009, 010, 016, and 021 captured specimens from 15 April to 30 June 2015, 19 May to 8 September 2016, 1 June to 27 July 2017, and 14-28 June 2018.

Tribe Harpalini

Acupalpus indistinctus Dejean, 1831 is found in poorly-drained, muddy soil with some vegetation, the borders of lakes, ponds, and streams. Adults are attracted to lights (Lindroth, 1968; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 14 July to 11 August 2015.

Acupalpus pauperculus Dejean, 1829 is found on primary floodplains in buried mats of leaf litter layered with silt, the borders of pools, ponds, and swamps. Adults are attracted to lights (Lindroth, 1968; Erwin 1981; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 1-19 July 2015.

Acupalpus testaceus Dejean, 1829 is found along the edges of small bodies of standing water and in leaf litter. Adults are attracted to lights (Lindroth, 1968; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 12 July to 11 August 2015.

Agonoleptus conjunctus (Say, 1823) is found in grasslands, meadows, pastures, cultivated fields, and old fields. They feed on Coccinellidae (Coleoptera). Adults are collected in pitfall traps, in

leaf litter, under stones, and at lights (Blatchley, 1910; Lindroth, 1968). NEON pitfall trap 007 captured a single specimen from 12-19 July 2018.

Agonoleptus rotundatus (LeConte, 1863) is found in pastures, cultivated fields, old fields, and river banks. They are collected in pitfall traps and under plant debris (Lavigne, 1979). NEON pitfall trap 007 captured specimens from 16-30 June 2015.

Agonoleptus thoracicus Casey, 1914 has no published biological or ecological information. It was recently removed from synonymy with *Agonoleptus conjunctus* so some of the information on *A. conjunctus* may refer to *A. thoracicus* (Bousquet, 2012). NEON pitfall trap 003 captured specimens from 15 April to 15 May 2015.

Amphasia sericea (Harris, 1828) is found in grasslands, meadows, pastures, cultivated fields, and open ground. Adults feed on grass seeds (Poaceae) and insects. They are collected in pitfall traps, leaf litter, sweeping vegetation, and at lights (Forbes, 1883; Webster, 1900; Blatchley, 1910; Lindroth, 1968; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 21 April to 5 May 2015 and 3 May to 28 June 2018.

Anisodactylus caenus (Say, 1823) is found on shaded ground, moist soils, and deciduous forests. Adults are collected in pitfall traps and at lights (Allen & Thompson, 1977). NEON pitfall trap 007 captured specimens from 16-30 June 2015 and 14-28 June 2018.

Anisodactylus dulcicollis (LaFerté-Sénéctère, 1841) is found in pastures, cultivated fields, open forests, and sandy areas. Adults are collected in pitfall traps, at lights, in leaf litter, and under stones (Ciegler, 2000; Larochelle & Larivière, 2003). NEON pitfall traps 003 and 007 captured specimens from 16-30 June 2015, 16 April to 5 October 2017, and 9-23 August 2018.

Anisodactylus melanopus (Haldeman, 1843) is found along the borders of marshes, ponds, streams, lakes, and swamps. Adults have been collected in debris and at lights (Noonan, 1996; Ciegler, 2000). NEON pitfall trap 003 captured a single specimen from 28 July to 11 August 2015.

Anisodactylus nigerrimus (Dejean, 1831) is found in old gravel pits with rich vegetation, in open, very dry, sandy ground, with scattered vegetation, in pastures, cultivated fields, forest edges, and clearings. Adults have been collected in pitfall traps and under stones (Lindroth, 1968; Larochelle, 1974a). NEON pitfall traps 001, 002, 009, and 010 captured specimens from 15 April to 30 June 2015, 19 May to 11 August 2016, 4 April to 5 October 2017, and 3-17 May 2018.

Anisodactylus ovularis (Casey, 1914) is found in pastures, grasslands, meadows, cultivated fields, and open forests. Adults have been collected in pitfall traps and at lights (Kirk, 1975; Anderson et al., 1995). NEON pitfall trap 007 captured a single specimen from 15-29 June 2017.

Anisodactylus rusticus (Say, 1823) is found on dry, sandy soil in fields with sparse and sometimes high vegetation; adults hide under plants in the daytime. They feed on grass seed and fungi. Adults have been collected in pitfall traps, at lights, and beating trees (Forbes, 1883; Lindroth, 1968; Johnson & Cameron, 1969; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 15

April to 30 June 2015, 30 June to 22 September 2016, 15 June to 27 July 2017, and 14 June to 23 August 2018.

Bradycellus rupestris (Say, 1823) is found on open ground in a wide variety of habitats. Adults feed on small worms (Annelida). They have been collected in pitfall traps and at sugar baits (Lindroth, 1968; Kirk, 1969; Erwin, 1981). NEON pitfall trap 007 captured specimens from 15 April to 19 May 2015.

Bradycellus tantillus (Dejean, 1829) is found on the borders of marshes, ponds, lakes, and streams. Adults have been collected at lights, beating vegetation, and at sugar baits (Kirk, 1970; Ciegler, 2000). SERC specimens were taken at black light on 26 June 2019 near Sellman House.

Harpalus caliginosus (Fabricius, 1775) is found on open ground in a wide variety of habitats. Adults are both diurnal and nocturnal and feed on seeds, plant pollen, and a variety of insects. They have been collected at lights, in pitfall traps, and by sweeping or beating vegetation (Forbes, 1883; Blatchley, 1910; Bryson, 1939; McCullough, 1966; Lindroth, 1968; Allen 1979; Erwin, 1981; Noonan, 1991). NEON pitfall trap 007 captured specimens from 14-28 July 2016 and 20 September to 4 October 2018.

Harpalus compar LeConte, 1847 is found in grasslands, pastures, cultivated fields, and pine forest floors. They feed on seeds and carrion. Adults have been collected in pitfall traps, under debris, and at lights (Ball & Anderson, 1962; Rivard, 1964; Johnson & Cameron, 1969). NEON pitfall traps 007 and 010 captured specimens from 16-30 June 2015 and 20 September to 4 October 2018.

Harpalus erythropus Dejean, 1829 is found on open ground in a wide variety of habitats. Adults are nocturnal and feed on beetle larvae (Coleoptera). They have been collected in pitfall traps, under debris, and at lights (Blatchley, 1910; Ball & Anderson, 1962; Lindroth, 1968; Erwin, 1981). SERC specimens were taken at black light on 27 June 2019 on Back Road opposite the NEON tower, on 26 June 2019 near Sellman House; at lights on 19 June 2019 near Mathias lab, on 26 September 2019 along Dock Road; and by head lamp on 26 June 2019 along Contees Wharf Road. NEON pitfall traps 001 and 007 captured specimens from 16-30 June 2015 and 30 June to 22 September 2016.

Harpalus katieae Battoni, 1985 is found in fields, sand dunes, and sandy alluvial habitats. Adults have been collected at lights (Will, 1997). Two SERC specimens were taken in an unbaited pitfall trap on 23-24 October 2018 along Contee Watershed Trail.

Harpalus pensylvanicus (DeGeer, 1774) is found on open ground in a wide variety of habitats. Adults are mostly nocturnal and feed on plant seeds, plant tissue, pollen, carrion, and a wide variety of insects. They are collected at lights, in pitfall traps, under debris, sweeping or beating vegetation, at carrion, and by visual survey (Forbes, 1883; Webster, 1900; Blatchley, 1910; Shough, 1940; Lindroth, 1968; Erwin, 1981; Staines & Staines, 2012). SERC specimens were taken on 16 June 2018 near Mathias Lab by visual survey. NEON pitfall traps 002, 003, 007, and 016 captured specimens from 16-30 June 2015, 30 June to 6 October 2016, 29 June to 5 October 2017, and 26 July to 4 October 2018.

Harpalus vagans LeConte, 1865 has an unknown biology and ecology. NEON pitfall trap 007 captured a single specimen from 24 August to 7 September 2017.

Harpalus sp. NEON pitfall trap 007 captured a single specimen from 11–25 August 2015 which could not be identified to species.

Selenophorus opalinus (LeConte, 1863) is found on dry ground and in drift, and on open dry hills, on sandy soil, with scarce vegetation, under stones in leaf litter, by soil sifting, and at light (Lindroth, 1968; Laroche, 1974a; Ciegler, 2000). A single SERC specimen was taken in a Malaise trap in a grassy field opposite Sellman House from 10–13 May 2020.

Stenolophus comma (Fabricius, 1775) is found on open ground in a wide variety of habitats. They are mostly nocturnal and feed on a variety of insects. Adults are collected in pitfall traps, sweeping vegetation, under debris, and at lights (Johnson, 1949; Lindroth, 1968; Tomlin, 1975; Hsin et al., 1979; Erwin 1981). SERC specimens were taken at black light on 26 June 2019 near Sellman House. NEON pitfall trap 007 captured specimens from 14 July to 9 September 2015.

Stenolophus dissimilis Dejean, 1829 is found on wet, muddy soil along lake shores. They have been collected in pitfall traps (Laroche & Larivière, 2003). SERC specimens were taken at black light on 26 June 2019 on the top of the grassy hill near Sellman House.

Stenolophus ochropezus (Say, 1823) is found in a variety of habitats associated with water. They are nocturnal and feed on seeds. Adults are collected under debris, in pitfall traps, sweeping vegetation, and at lights (Blatchley, 1910; Leng, 1915; Lindroth, 1968; Erwin, 1981). SERC specimens were taken throughout the main campus and in Zone 6 at black light and by sweeping vegetation from March to September; in Malaise traps in the grassy field opposite Sellman House from 1–3 May 2020; and in NEON pitfall trap 007 from 16–30 June 2015, 30 June to 14 July 2016, 15 June to 7 September 2017, and 14 June to 23 August 2018.

Trichotichnus autumnalis (Say, 1823) is found in leaf litter in floodplain forests. Adults have been collected in pitfall traps and leaf litter (Blatchley, 1910; Lindroth, 1968; Erwin, 1981; Anderson et al., 1995). NEON pitfall traps 009, 021, and 022 captured specimens from 16–30 June 2015, 14–28 July 2016, 18 May to 1 June 2017, and 5–19 April 2018.

Trichotichnus fulgens (Csiki, 1932) is found on open and shaded ground in a wide variety of habitats. They are mostly diurnal and fly readily. Adults have been collected in pitfall traps, in leaf litter, and at lights (Erwin, 1981; Noonan, 1991; Anderson et al., 1995). NEON pitfall traps 001 and 007 captured specimens from 15 April to 19 May 2015 and 18 May to 1 June 2017.

Tribe Helliunini

Helluomorphoides clairvillei (Dejean, 1831) has been taken at lights (Ciegler 2000). Other members of this genus feed on ants (Hymenoptera: Formicidae) (Laroche, 1990). A single SERC specimen was taken in a Malaise trap along the woods margin in the grassy field opposite Sellman House from 30 May–2 June 2020.

Tribe Lebiini

Calleida viridipennis (Say, 1823) is found in open forests, swamps, and under bark. Adults are mostly diurnal and feed on Lepidoptera larvae. They are collected by sweeping and beating vegetation and at light (Leng, 1915; Erwin, 1981; Braun et al., 1990; Ciegler, 2000; Staines & Staines, 2012). SERC specimens were taken at black light along Back Road on 25 May 2019 and on 12 August 2019.

Lebia analis Dejean, 1825 is found on open ground in a variety of habitats. Adults are mostly diurnal and feed on a wide variety of insects. They are collected in pitfall traps, sweeping or beating vegetation, and at lights (Blatchley, 1910; Whitcomb & Bell, 1960; Lindroth, 1971; Erwin, 1981). SERC specimens were taken at black light on 26 June 2019 near Sellman House.

Lebia pectita Horn, 1885 is found on clay soil in open ground. They are collected by sweeping vegetation (Lovell, 1915; Erwin, 1981). SERC specimens were taken sweeping vegetation at Frog Haven on 6 June 2018.

Lebia viridis Say, 1823 is found on open or slightly shaded ground in a wide variety of habitats. Adults are mostly diurnal and feed on the immature stages of Chrysomelidae (Coleoptera). They are collected by sweeping or beating vegetation, in Malaise traps, at lights, and by visual surveys (Blatchley, 1910; Lovell, 1915; Hemenway & Whitcomb, 1967; Lindroth, 1969; Capogreco, 1989; Erwin, 1981; Staines & Staines, 2012). SERC specimens were taken sweeping vegetation in Zone 6 on 30 April 2019 and in a Malaise trap along the woods margin in the grassy field opposite Sellman House from 12-15 June 2020.

Tribe Licinini

Badister notatus Haldeman, 1843 is found on open ground in disturbed habitats and forest clearings. Adults are collected in pitfall traps and at light (Lindroth, 1969; Laroche, 1974a; Kirk, 1975; Erwin, 1981). NEON pitfall traps 002 and 016 captured specimens from 15 April to 19 May 2015 and 19 May to 2 June 2016.

Dicaelus ambiguus LaFerté-Sénéctère, 1841 is commonly found under stones in mixed forests and cultivated fields. They are collected in pitfall traps (Erwin, 1981; Laroche & Larivière, 2003). NEON pitfall traps 001, 002, 006, 010, and 021 captured specimens from 15 April to 30 June 2015, 10-24 August 2017, and 19 April to 3 May 2018.

Dicaelus dilatatus dilatatus Say, 1823 is found under cover in open fields, along stream margins, in deciduous forests, and under bark. They feed on snails (Gastropoda), Lepidoptera larvae, and Scarabaeidae (Coleoptera) larvae. Adults are collected in pitfall traps, under logs and stones, and at lights (Ball, 1959; McCullough, 1967; Anderson et al., 1995). NEON pitfall traps 003, 006, 009, 010, 012, 021, and 022 captured specimens from 5 May to 30 June 2015, 28 June to 12 July 2015, 19 May to 12 August 2016, 6 April to 24 August 2017, and 3 May to 9 August 2018.

Dicaelus elongatus Bonelli, 1813 is found on shaded ground mostly in deciduous forests. Adults are nocturnal and feed on Lepidoptera larvae. They have been collected in pitfall traps, under

stones, and by sweeping vegetation (Ball, 1959; Lindroth, 1969; Kirk, 1970, 1975; Erwin, 1981; Anderson et al., 1995). SERC specimens were taken by head lamp on 26 July 2019 along Java History Trail and at lights at the Reed Education Center on 26 July 2019. NEON pitfall traps 003, 006, 009, 010, 012, 021, and 022 captured specimens from 5 May to 30 June 2015, 19 May to 14 July 2016, 18 May to 24 August 2017, and 14–28 June 2018.

Dicaelus furvus furvus Dejean, 1831 is found in open, river bottom woods. Adults have been collected in pitfall traps, under logs and stones, and at lights (Ball, 1959; Erwin, 1981; Larochelle & Larivière, 2003). NEON pitfall traps 001, 003, 006, 009, 010, 015, 016, 021 captured specimens from 5 May to 30 June 2015, 19 May to 12 August 2016, 6 April to 24 August 2017, and 3 May to 23 August 2018.

Dicaelus politus Dejean, 1826 is found on shaded ground in deciduous and mixed forests. Adults are nocturnal and feed on Lepidoptera larvae. They have been collected in pitfall traps and under logs and stones (Gilbert, 1957; Ball, 1959; Lindroth, 1969; Erwin, 1981; Anderson et al., 1995). SERC specimens were taken at black light on 12 August 2019 along Back Road. NEON pitfall traps 002, 009, 016, and 021 captured specimens from 16–30 June 2015, 19 May to 2 June 2016, 1–29 June 2017, and 3–31 May 2018.

Dicaelus purpuratus purpuratus Bonelli, 1813 has been reported feeding on snails (Gastropoda) (Lindroth, 1969). NEON pitfall trap 003 captured two specimens from 27 July to 10 August 2017 and 19 April to 3 May 2018.

Notiophilus aeneus (Herbst, 1806) is found on shaded ground in various forest habitats and in leaf litter. Adults are mostly diurnal and feed on Lepidoptera larvae. They have been collected in pitfall traps, leaf litter, and beating trees (Lindroth, 1961; Erwin, 1981; Reeves et al., 1983; Levesque & Levesque, 1986). NEON pitfall traps 009, 010, and 021 captured specimens from 15 April to 19 May 2015, 6–20 April 2017, and 19 April to 23 May 2018.

Tribe Oodini

Oodes americanus Dejean, 1826 is found on shaded soft, muddy soil covered with dead leaves and some vegetation. Adults are nocturnal and are found visually (Bousquet, 1996). SERC specimens were taken at black light on 20 May 2019 at Frog Haven and on 12 August 2019 along Back Road.

Oodes brevis Lindroth, 1957 is found in swamps, floodplain forests, and leaf litter (Lindroth, 1957). Adults are collected by head lamping, in pitfall traps, and at lights (Lindroth 1969; Anderson et al. 1995). NEON pitfall traps 006 and 010 captured specimens from 15 May to 29 June 2017.

Oodes fluvialis LeConte, 1863 has been taken treading vegetation in marshes (Bousquet, 1996). NEON pitfall trap 010 captured a single specimen from 30 June to 14 July 2016.

Tribe Panagaeini

Panagaeus cruciger Say, 1823 is found on open ground often near saline water. Adults have been collected in ant nests in winter, in pitfall traps, and at lights (Schwarz, 1890; Laroche & Larivière, 2003). A single SERC specimen was taken along Java History Trail on 1 June 2019 by visual survey.

Tribe Patrobini

Patrobis longicornis (Say, 1823) is found in a variety of habitats- under stones, in leaf litter at the edge of ponds, in meadows, in light deciduous forest, on cultivated ground with rich vegetation, usually on clayish soil, often near margin of lakes and rivers but not really hygrophilous, and under bark. They feed on animal food, vegetable matter, caterpillars (Lepidoptera), aphids (Hemiptera: Aphidoidea), and grass. Adults have been collected in pitfall traps and under logs and stones (Forbes, 1883; Lindroth, 1961; Carter, 1981; Erwin, 1981; Ciegler, 2000). NEON pitfall traps 007 and 010 captured specimens from 16-30 June 2015, 25 August to 8 September 2016, and 19 September to 5 October 2017.

Tribe Platynini

Agonum aeruginosum Dejean, 1828 is found very close to the water on soft, muddy soil with rich vegetation and in the shade of willows (*Salix* spp., Salicaceae). Adults are attracted to lights (Blatchley, 1910; Lindroth, 1966; Ciegler, 2000). SERC specimens were taken in unbaited pitfall traps near Mathias Lab on 29-30 March 2019 and sweeping vegetation at Frog Haven on 23 April 2019.

Agonum collare (Say, 1830) is found in wet soil covered with dense vegetation and along the margins of marshes. Adults have been collected in pitfall traps, sweeping vegetation, and at lights (Ciegler, 2000; Laroche & Larivière, 2003). SERC specimens were taken at black light at Frog Haven on 20 May 2019.

Agonum ferreum Haldeman, 1843 is found commonly at the edge of ponds in wet, partially decaying leaf litter. Adults have been collected in pitfall traps and beating vegetation (Blatchley, 1910; Lindroth, 1966; Kirk, 1969; Erwin, 1981). NEON pitfall trap 007 captured specimens from 7 September to 5 October 2017.

Agonum galvestonicum (Casey, 1920) is found on the shores of lakes and ponds and moist soil with dense vegetation. Adults have been collected on broom sedge (*Andropogon virginicus* L., Poaceae) and *Typha latifolia* L. (Typhaceae) (Lindroth, 1966; Davidson, 1988; Ciegler, 2000). SERC specimens were taken at black light along the Connector Trail on 23 May 2019.

Agonum octopunctatum (Fabricius, 1798) is found on open, moist ground usually close to water. Adults are mostly nocturnal and feed on Lepidoptera larvae. They have been collected in pitfall traps and at lights (Blatchley, 1910; Lindroth, 1966; Kirk, 1969; Erwin, 1981; Ciegler, 2000). NEON pitfall traps 007 and 009 captured specimens from 15 April to 30 June 2015 and 3 May to 4 October 2018.

Agonum punctiforme (Say, 1823) is found in leaf litter, under rocks and logs, and on broom sedge (*Andropogon virginicus*). They feed on Lepidoptera larvae and insect fragments. Adults are attracted to lights (Lindroth, 1966; Allen, 1979; Riddick & Mills, 1995; Chen & Wilson, 1996; Ciegler, 2000). NEON pitfall trap 007 captured specimens from 15 April to 19 May 2015, 22 September to 6 October 2016, 7 September to 5 October 2017, and 5 April to 17 May 2018.

Platynus angustatus Dejean, 1828 is found in low forests often along streams. Adults have been collected in pitfall traps, with head lamps, and by sweeping or beating vegetation (Liebherr, 1988; Laroche & Larivière, 2003). SERC specimens were taken at black light on 27 May 2019 along the Connector Trail.

Platynus parmarginatus Hamilton, 1893 is found in deciduous and coniferous forests and along streams. They feed on Lepidoptera larvae. Adults have been collected in pitfall traps, beating trees, by head lamp, and at lights (Erwin, 1981; Krinsky & Oliver, 1988; Krinsky, 1989). SERC specimens were taken at black light on 20 May 2019 at Frog Haven.

Tribe Pterostichini

Cyclotrachelus sigillatus (Say, 1823) is found in leaf litter in the deciduous and mixed forests and under cover in pastures. Adults have been collected in pitfall traps, under logs and stones, and at lights (Blatchley, 1910; Freitag, 1969; Allen & Thompson, 1977; Ciegler, 2000). NEON pitfall traps 002, 003, 006, 007, 009, 010, 021, and 022 captured specimens from 16-30 June 2015, 25 August to 22 September 2016, 26 June to 5 October 2017, and 26 July to 23 August 2018.

Myas coracinus (Say, 1823) is found on shaded ground in deciduous forests. Adults are nocturnal and shelter under dead leaves, logs, and stones. They have been collected in pitfall traps and in leaf litter (Blatchley, 1910; Lindroth, 1966; Erwin, 1981). NEON pitfall traps 001, 002, 003, 006, and 021 captured specimens from 16-30 June 2015, 22 September to 6 October 2016, 24 August to 5 October 2017, and 20 September to 4 October 2018.

Poecilus chalcites (Say, 1823) is found in open fields and in open woods on damp soil, usually near water. Adults feed on June beetles (Scarabaeidae), *Diabrotica baltaeata* LeConte (Chrysomelidae), Lepidoptera larvae, and insect fragments. They have been collected in pitfall traps, under debris, with head lamps, and at lights (Seaton, 1939; Lindroth, 1966; Allen, 1979; Hsin et al., 1979; Best et al., 1981; Los & Allen, 1983). NEON pitfall trap 007 captured specimens from 15 April to 30 June 2015, 3 June to 12 August 2016, 15 June to 5 October 2017, and 3 May to 25 August 2018.

Poecilus lucublandus lucublandus (Say, 1823) is found on open or slightly shaded ground in a wide variety of habitats but seems to prefer oak (*Quercus*) forests. Adults are mostly nocturnal and may be active at low temperatures under the snow. There are two generations a year. They feed on a wide variety of insects, plant material, and fungi. Adults have been collected in pitfall traps, under logs or stones, sweeping vegetation, and at lights (Forbes, 1883; Blatchley, 1910; Lindroth, 1966; Barlow, 1970; Erwin, 1981; Ciegler, 2000; Bergmann et al., 2012). NEON pitfall traps 001, 009, 010, 015, 021, and 022 captured specimens from 15 April to 30 June 2015, 19 May to 14 July 2017, and 29 June to 13 July 2017.

Pterostichus sculptus LeConte, 1853 is found in deciduous and coniferous forests, cultivated fields, grasslands, and pastures. Adults feed on Lepidoptera larvae. They have been collected in pitfall traps and under logs or stones (Kirk, 1970; Morrill, 1992). SERC specimens were taken by head lamp on 26 July 2019 along Java History Trail and on an unidentified mushroom in the woods along Fox Point Road below Discovery Trail on 20 October 2020. NEON pitfall traps 002 and 021 captured specimens from 22 September to 6 October 2016, 18 May to 21 September 2017, and 14 June to 4 October 2018.

Pterostichus stygicus (Say, 1823) is found under bark, in logs, and under logs and branches in hardwood forests and in adjoining meadows with high vegetation. Adults feed on insects and plants. They have been collected in pitfall traps, under logs or stones, and with head lamps (Blatchley, 1910; Gilbert, 1957; Lindroth, 1966; Bousquet, 1986). NEON pitfall traps 002, 003, 006, 007, 009, 010, 015, 016, 021, and 022 captured specimens from 15 April to 30 June 2015, 19 May to 22 September 2016, 1 June to 5 October 2017, and 3 May to 4 October 2018.

Pterostichus tristis (Dejean, 1828) is found under logs, branches on the forest floor, and under bark of fallen hardwood trees. They feed on Lepidoptera larvae. Adults have been collected in pitfall traps (Perrault, 1973; Erwin, 1981; Reeves et al., 1983; Bousquet, 1986). NEON pitfall trap 016 captured specimens from 22 September to 6 October 2016 and 24 August to 7 September 2017.

Pterostichus (Abacidus) sp. NEON pitfall traps 001, 002, 003, 006, 007, 009, 010, 015, 016, 021, and 022 captured specimens from 19 May to 6 October 2016, 1 June to 5 October 2017, and 14 June to 4 October 2018. This species appears to be new to science (Robert Davidson, per. comm.).

Pterostichus sp. NEON pitfall traps 001, 003, 006, and 010 captured specimens from 15 April to 30 June 2015 and 25 August to 22 September 2016. Many *Pterostichus* from early NEON work were only identified to genus (Andrew Johnston, per. comm.).

Tribe Scaritini

Scarites quadriceps Chaudoir, 1843 is found in cultivated fields, pastures, forests, and margins of ponds. They feed on Lepidoptera larvae. Adults have been collected in pitfall traps, under logs or stones, and at lights (Leng, 1915; Best et al., 1981; Nichols, 1988). A single SERC specimen was taken at light on 26 September 2019 along Dock Road.

Scarites subterraneus Fabricius, 1775 is found on open ground in a wide variety of habitats, where it is subfossorial. Adults burrow during the day and often deeper in the litter at night. They are nocturnal and feed on a wide variety of insects. Adults have been collected in pitfall traps, under logs or stones, and at lights (Blatchley, 1910; Leng, 1915; Lindroth, 1961; Erwin, 1981; Ciegler, 2000). SERC specimens were taken by visual survey near Mathias Lab on 18 June 2018 and 7 May 2019. NEON pitfall traps 001, 002, 003, 006, 007, and 021 captured specimens from 15 April to 30 June 2015, 19 May to 6 October 2016, 15 June to 5 October 2017, and 5 April to 4 October 2018.

Tribe Sphodrini

Synuchus impunctatus (Say, 1823) is found in open country and light forests, on dry ground (usually moraine), often among leaves under *Rubus* (Rosaceae) and other bushes. Adults feed on Lepidoptera immatures and plant seeds. They have been collected in pitfall traps and leaf litter (Lindroth, 1966; Frank, 1971; Bousquet & Pilon, 1977; Liebherr & Mahar, 1979). NEON pitfall traps 002, 009, 010, and 021 captured specimens from 16-30 June 2015, 14 July to 22 September 2016, 24 August to 21 September 2017, and 9-23 August 2018.

Tribe Zabryini

Amara aenea (DeGeer, 1774), an introduced species, is found on open ground in a wide variety of habitats. Adults are mostly diurnal and feed on a wide variety of insects and seeds. They have been collected in pitfall traps, at lights, and sweeping or beating vegetation (Forbes, 1883; Lindroth, 1968; Erwin, 1981; Laroche & Larivière, 2003). SERC specimens were taken in horse dung-baited pitfall traps 17-18 April 2019 near the water tower. NEON pitfall traps 001, 007, 010, and 016 captured specimens from 15 April to 19 May 2015, 15-29 June 2017, and 5 April to 17 May 2018.

Amara impuncticollis (Say, 1823) is found under drift, in moderately dry country with rich mixed vegetation usually of a weedy character, and especially around human habitation. They feed on vegetation, seeds, fungi, and Lepidoptera larvae (Lindroth, 1968; Erwin, 1981; Ferguson & McPherson, 1985). SERC specimens were taken at black light on the Connector Trail on 27 May 2019. NEON pitfall trap 007 captured specimens from 15 April to 19 May 2015 and 3-17 May 2018.

Amara littoralis Dejean, 1828 is found in grasslands, meadows, pastures, cultivated fields, roadsides, fencerows, open forests, and in dry open areas. They feed on grasshopper eggs (Orthoptera; Acrididae). Adults have been collected in pitfall traps and leaf litter (Lindroth, 1968; Frank, 1971; Kirk, 1975; Ciegler, 2000). NEON pitfall trap 010 captured a single specimen from 5-19 April 2018.

Amara obesa (Say, 1823) is found in meadows, pastures, cultivated fields, and roadsides. They have been reared on grasshopper (Orthoptera; Acrididae) eggs. Adults have been collected in pitfall traps and under stones (Rivard, 1964; Kirk, 1975; Ciegler, 2000). SERC specimens were taken by visual survey on 1 June 2019 near the Reed Education Center.

Amara pennsylvanica Hayward, 1908 is found in cultivated fields, pastures, old fields, and forested areas. Adults have been collected in pitfall traps, under stones, and sweeping vegetation (Blatchley, 1910; Herne, 1963; Lindroth, 1968; Ciegler, 2000). SERC specimens were taken by visual survey on the beach along Java History Trail on 22 April 2019.

Amara volatilis (Casey, 1918) is a lowland species. The biology and ecology are unknown (Hieke, 1993, 2000). SERC specimens were taken by visual survey on 25 April 2019 near Sellman House; at black light on 20 May 2019 at Frog Haven and on 27 May 2019 along Connector Trail.

Family Rhysodidae

Tribe Omoglymmini

Omoglymnius americanus (Laporte, 1836) occurs in a wide range of host trees including maple, oak, and elm (*Acer*, *Quercus*, *Ulmus*) (Bell, 1970). Choate (2004) found that this species preferred fairly firm oak logs (*Quercus* sp.) found in moist habitats. SERC specimens were collected under the loose bark of fallen oak trees on 17 May 2019 along Back Road.

DISCUSSION

The 111 species found at SERC compare favorably with the 114 species found at Quantico Marine Corps Base in Virginia (Anderson et al., 1995; Hoffman, 2010) and the 117 species collected within the last fifty years at Plummers Island (Erwin, 1981; Stork, 1984). The only site with substantially more species is the George Washington Memorial Parkway (Virginia) with 184 species (Steury & Messer, 2014).

The five inventory projects conducted in the mid-Atlantic revealed some of the weaknesses of using one collection technique to determine carabid diversity at a locality. At Quantico, black lights collected 36 species (32% of the total fauna) not found in pitfall traps (Anderson et al., 1995; Hoffman, 2010). At Eastern Neck, black lights collected 40 species (50% of the total fauna) not found in pitfall traps (Staines & Staines, 2012). Three additional species (4% of the fauna) only were collected at SERC during visual encounter surveys. Even at well-collected sites like Plummers Island, the use of black lights for only four nights yielded 11 species not previously documented on the island (Stork, 1984).

We found that 60 species (54%) were collected only in pitfall traps. Sixteen species (14.4%) were collected only at black lights. Five species (4.5%) were collected only by visual and an additional five (4.5%) only in Malaise traps. Three species (2.7%) were found only on the ground at night by head lamp. The other 23 species (20.7%) were collected by multiple methods. This indicates that a variety of techniques is needed to obtain a good overview of the carabid fauna and that no one technique is the best for all sites.

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