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RESEARCH ARTICLE

AN ANNOTATED CHECKLIST OF THE COLEOPTERA OF THE SMITHSONIAN ENVIRONMENTAL RESEARCH CENTER: THE TENEBRIONOIDEA

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

The Tenebrionoidea of the Smithsonian Environmental Research Center, Edgewater, Maryland were inventoried over a three year period. Ten families and 49 species were collected: Anthicidae- 1, Ciidae- 2, Melandryidae- 3, Meloidae- 3, Mordellidae- 10, Mycetophagidae- 2, Pyrochroidae- 2, Synchronidae-1, Tenebrionidae- 22, and Tetratomidae- 3. Only one of the 49 species collected was non-native.

Keywords: Biodiversity, insects, Maryland.

INTRODUCTION

Tenebrionoidea is a very large and diverse superfamily of beetles. It contains: Aderidae (ant-like leaf beetles), Anthicidae (ant-like flower beetles), Archeocrypticidae, Boridae, Chalcodryidae, Ciidae (minute tree-fungus beetles), Melandryidae (false darkling beetles), Meloidae (blister beetles), Mordellidae (tumbling flower beetles), Mycetophagidae (hairy fungus beetles), Mycteridae, Oedemeridae (false blister beetles), Perimylopidae, Prostomidae, Pterogeniidae, Pyrochroidae (fire-colored beetles), Pythidae, Ripiphoridae (wedge-shaped beetles), Salpingidae (narrowwaisted bark beetles), Scaptiidae (false flower beetles), Stenotrachelidae (false long-horned beetles), Synchronidae, Tenebrionidae (darkling beetles), Tetratomidae, Trachelostenidae, Trictenotomidae, Ulodidae, and Zopheridae (ironclad beetles) (Matthews et al., 2010).

Many species of Anthicidae resemble ants and they are sometimes called ant-like flower beetles or ant-like beetles. Adults are omnivorous, being known to consume small arthropods, pollen, fungi, and whatever else they can find. Some species are of interest as biological control agents, as they can eat the eggs or larvae of pests. Larvae are either omnivorous, predators, or fungus-eaters. Many anthicid species are attracted to cantharidin, a complex compound that is highly toxic to many animals. Anthicids have been hypothesized to accumulate the compound to deter possible predators. The family comprises over 3500 species in about 100 genera; there are 231 species in North America. (Chandler, 2002). The Maryland Biodiversity Project (MBP, 2020) reports 13 species from Maryland.

Ciidae, minute tree-fungus beetles, are a sizeable group of beetles that inhabit Polyporales, bracket fungi (Corticaceae) or coarse woody debris. Ciids are most numerous in warmer regions, but are widespread, with 550 described species. The larvae as well as the adults burrow inside fungi, often choosing old specimens or old tissue. The whole development, from egg to adult, often takes as little as two months; some are parthenogenetic (Lawrence, 1967a, 1971, 1973). There are 84 species known from North America (Lawrence, 1967b, 1982). The Maryland Biodiversity Project (MBP, 2020) reports 24 species from Maryland.

Melandryidae, false darkling beetles, is a small family with at least 40 genera and 430 described species. The biology is unknown for most species. The habits of those species that are known are varied; some are found in dry, seasoned wood, some under bark, some in decayed logs usually associated with wood-decaying fungi, some in dry shelf fungi, and some in tree stumps (Peterson, 1951; Blatchley, 1910). There are 60 species in North America (Pollock, 2002). The Maryland Biodiversity Project (MBP, 2020) reports six species from Maryland.

Meloidae, blister beetles, are known for their defensive secretion of a blistering agent, cantharidin. Many are conspicuous and some are aposematically colored, announcing their toxicity to would-be predators. Adult meloids are phytophagous and feed on leaves and flowers of several families of plants, particularly Asteraceae, Leguminosae, and Solanaceae; only a few specialized species do not feed. Larvae exhibit complex feeding and development strategies except in the Eleticinae which are presumed to be subcorticolous predators. Larvae of some groups develop on the provisions and immature stages of wild bees (Hymenoptera) and the eggs of grasshoppers (Orthoptera: Acrididae). There currently are 120 genera and about 2500 species worldwide. Approximately 410 species are known from North America (Pinto & Bologna, 2002). There are 25 species known from Maryland (Staines, 1983 (1985)).

Species of Mordellidae are commonly known as tumbling flower beetles for the irregular movements they make when attempting to escape predators, or as pintail beetles due to their abdominal tip which aids them in performing these tumbling movements. Adults are wedge-shaped and are typically found on various of flowers. Larvae are carnivorous, borers into rotting wood, and leaf and stem miners. Worldwide, there are about 1500 species. There are about 209 species known from North America (Jackman & Lu, 2002; Steury & Steiner, 2020) with 43 reported from Maryland (Bright, 1986). The Maryland Biodiversity Project (MBP, 2020) reports 36 species from Maryland.

Mycetophagidae, hairy fungus beetles, includes small to medium sized beetles 1.0-6.5 mm in length. The larvae and adults live in decaying leaf litter, fungi, and under bark. Most species feed on fungi. Worldwide, the 18 genera contain around 200 species. There are 26 species known in North America (Young, 2002a). The Maryland Biodiversity Project (MBP, 2020) reports nine species from Maryland.

Larvae of Pyrochroidae, fire-colored beetles, occur under bark and to some extent within decaying wood of dead deciduous and coniferous trees where they feed on fungi and wood. They are often found under bark of recently killed trees. Adults of most Pyrochroinae are nocturnal, can be found on foliage, and have been collected at light and fermenting baits. Adults of Pedilinae are commonly collected on flowers or beaten from foliage, sometimes in large numbers. There are more than 300 species world-wide and 50 species in North America (Young, 2002b). The Maryland Biodiversity Project (MBP, 2020) reports five species from Maryland.

Synchroidae is a small family of beetles with no common name, though recent authors have coined the name synchroa bark beetles. The family consists of nine species with one species in North America (Hsaio et al., 2017).

Tenebrionidae, darkling beetles, have more than 20,000 described species and the family is cosmopolitan in distribution. Tenebrionid beetles occupy ecological niches in deserts and forests as plant scavengers. Most species are generalist omnivores, and feed on decaying leaves, rotting wood, fresh plant matter, dead insects, and fungi as larvae and adults. Several genera are specialized fungivores which feed on polypores. Many of the larger species are flightless, and those that are capable, e.g. *Tenebrio molitor* L., only do so when necessary, such as when dispersing or malnourished (Matthews et al., 2010). There are 1303 species in North America and 128 reported from Maryland (Aalbu et al., 2002; Steiner, 2008).

Tetratomidae is a small family of beetles sometimes called polypore fungus beetles. The family consists of several genera, most of which used to be classified in the family Melandryidae. Their food consists of fruiting bodies of hymenomycete fungi especially Polyporaceae and Tricholomataceae. They are most commonly found under bark and in softer shelf fungi. Adults of several species are commonly encountered at night. There are about 155 species worldwide and 26 in North America (Young & Pollock, 2002). The Maryland Biodiversity Project (MBP, 2020) reports five species from Maryland.

There has been little inventory work on the Tenebrionoidea of the Middle Atlantic States. Evans (2008) reported 49 species from a 30-hour bioblitz at Potomac Gorge (Maryland and Virginia): Anthicidae- 5, Melandryidae- 2, Mordellidae- 13, Mycetophagidae- 1, Synchroidae- 1, Tenebrionidae- 24, and Tetratomidae- 3.

The best studied family is Tenebrionidae with 128 species reported from Maryland (Steiner, 2008). There are 62 species reported from Plummers Island (Montgomery County) with 37 species collected from 1976 to 2006 (Steiner, 2008). Fritzler & Strazanac (2012) reported nine species taken in pitfall traps at Catoctin Mountain Park (Frederick County).

There are 13 species of Anthicidae reported from the George Washington Memorial Parkway (Virginia) (Steury et al., 2013; Steury, 2017; 2018b). Steury (2018a) reported four Tetratomidae from George Washington Memorial Parkway in a 19-year inventory.

Guarnieri (2010) reported nine species of Tenebrionoidea from a three-year survey of the Pocomoke River State Park (Worcester County).

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 protected 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 somewhat dry-mesic 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., Ericaceae), blueberries (*Vaccinium* spp., Ericaceae) and other woody vegetation.

Like much of the eastern U.S., 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 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; McMahan et al., 2010).

Freshwater inputs into the Rhode River are primarily from the North Fork Muddy Creek, South Fork Muddy 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 opposite 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. These plots were established over 30 years ago (SERC, 2018). In the annotated species list this area is referred to as Zones 5 and 6.

The goal of this project was to inventory the Coleoptera of the SERC. There has been no previous work on the Coleoptera fauna of SERC. Collecting techniques include visual survey followed by sweeping or beating the vegetation of the area. Other collecting techniques used were pitfall traps (both baited and unbaited), head lamping, black lighting, and checking lights around buildings on the main campus.

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. Voucher specimens are deposited in the SERC and the Department of Entomology Collection, Natural History Museum, Smithsonian Institution.

RESULTS

Family Anthicidae

Anthicus cervinus LaFerté-Sénectère has been found in soybean (*Glycine max* (L.) Merr., Fabaceae) fields (Bechinski & Pedigo, 1982), sunflower (*Helianthus*, Asteraceae) fields (Royer & Walgenbach, 1991), asparagus (*Asparagus officinalis* L., Asparagaceae) fields (Latta, 1928), salt marshes (Cameron, 1972), freshwater marshes (Williams et al., 1995), cobble beaches (Eastwood et al., 2009), grasslands (Bulan & Barrett, 1971), bat guano (Whitaker et al., 1991), and occasionally associated with stored grain (Bousquet, 1990); along the shore of a lake and on a coastal beach (Majka, 2011). Specimens were taken sweeping vegetation near the Reed Education Center on 26 August 2020, and from 30 May-2 June 2020 in a Malaise trap in the grassy field opposite Sellman House.

Family Ciidae

Ceracis thoracicornis (Ziegler) has been reported to feed on the fungi *Trichaptum pargamenum* (Fr.) Bondartsev & Singer, *T. abietinus* (Pers. ex J. F. Gmel.) Donk., *T. sector* (Ehrenb.) Kreisel (family Incerte sedis), *Lenzites betulina* (L.) Fr., *L. elegans* (Spreng.) Pat., *Coriolus versicolor* (L.) Lloyd (Polyporaceae), *Fomitella supina* (Sw.) Murrill (Fomitopsidaceae), *Bjerkandera adusta* (Willd.) P. Karst. (Meruliaceae), and various other Basidiomycetes (Weiss & West, 1920; Lawrence, 1967b, 1973; Ackerman & Shenefelt, 1973). Specimens were taken on 17 May 2019 in an unidentified fungus along Back Road.

Cis fuscipes Millié is a widespread and common species in most of the United States and Canada as well as Australia, the Caribbean, Europe, and Oceania. The species probably originated in Europe but spread naturally into North America via the Bering Strait (Lawrence, 1967a). It feeds on *Coriolus versicolor*, *C. hirsutus* (Wulfen) QuéL., *C. conchifer* (Schwein.) G. Cunn., *C. pubescens* (Schumach.) Pilát, *Lenzites betulina*, various other Polyporaceae (Basidiomycetes) (Weiss & West, 1920; Lawrence, 1967a, 1971, 1973; Ackerman & Shenefelt, 1973). Specimens were taken sweeping vegetation on 11 May 2019 at Sellman House.

Family Melandryidae

Anisoxya glaucula LeConte is a widespread eastern United States species with no published biological notes (Pollock, 2002). Specimens were taken on 19 April 2019 under bark along Fox Point Road.

Dircaea liturata LeConte has been taken in flight intercept traps (Chandler, 1991); collected on fallen trunks of *Acer rubrum* L., *A. saccharum* Marshall (Aceraceae), *Tilia americana* L. (Malvaceae), *Quercus rubra* L., and *Fagus grandifolia* Ehrh. (Fagaceae) (Laliberté 1965); collected in both deciduous (*Acer* spp., *Betula* spp. (Betulaceae), and *Q. rubra*) and coniferous (*Picea rubens* Sarg., *P. mariana* (Mill.) Britton, Sterns & Poggenburg, and *Tsuga canadensis* (L.) Carrière, Pinaceae) forests (Bouchard & Pollack, 2006). Specimens were taken at black light on 25 May 2019 at the intersection of Back Road and 11-6 and on 27 June 2019 on Back Road opposite the NEON tower.

Microtonus sericans LeConte has been reared from oak (*Quercus*) twig bundles (Ferro et al., 2009; Ferro & Gimmel, 2014); found on *Abies balsamea* (L.) Mill. (Pinaceae) (Dearborn & Donahue, 1993); beating dead *Crataegus* (Rosaceae), in *Picea rubens* or *Tsuga canadensis* forests (Bouchard & Pollack, 2006). Specimens were taken sweeping vegetation along Contee Watershed Trail on 24 May 2018.

Family Meloidae

Epicauta pestifera Werner larvae develop on egg masses of: *Melanoplus differentialis* (Thomas) and *M. bivittatus* (Say) (Orthoptera: Acrididae) (Horsfall, 1943). Adults have been collected from *Solanum tuberosum* L., *Lycopersicon esculentum* L. (Solanaceae); *Medicago sativa* L., *Trifolium* sp., *Lupinus* sp. (Fabaceae); *Brassica oleracea* L. (Brassicaceae); *Beta vulgaris* L. (Chenopodiaceae); *Amaranthus* sp. (Amaranthaceae); *Cucurbita* sp. (Cucurbitaceae); *Aster* sp.,

and *Helianthus annuus* L. (Asteraceae) (Werner, 1945). A single specimen was taken on 19 July 2019 sweeping vegetation in field opposite Sellman House.

Meloe angusticollis Say adults are active in the spring and feed on: *Arisaema triphyllum* L. (Araceae); *Carex pensylvanica* Lam. (Cyperaceae); *Elymus villosus* Muhl. (Poaceae); *Taraxacum officinale* Wiggers (Asteraceae); *Galium aparine* L., *G. triflorum* Michx. (Rubiaceae); *Chaerophyllum procumbens* L. (Apiaceae); *Ulmus rubra* Muhl. (Ulmaceae); fallen fruits; *Claytonia virginica* L. (Portulacaceae); and *Ranunculus* spp. (Ranunculaceae). Triungulin are active when the first woodland plants begin to flower. Feeding behavior of larvae is unknown. Pinto & Selander (1970) report collecting the following Hymenoptera with attached triungulin: *Andrena carlini* Cockerell, *A. cressoni* Robertson, *A. distans* Provancher, *A. sayi* Robertson, *A. violae* Robertson (Andrenidae); *Anthophora terminalis* Cresson (Anthophoridae); *Colletes inaequalis* Say (Colletidae); *Agapostemon radiatus* Say, *Evylaeus cinctipes* Provancher, *E. macoupinensis* Robertson, *Nomada* sp. (Halticidae); and *Certina calcarata* Robertson (Xylocopidae). A single specimen was taken on 16-17 April 2019 in a horse dung baited pitfall trap near the water tower.

Meloe impressus Kirby adult food plants are: *Ranunculus* spp., *Clematis* spp., *Hepatica* sp., *Anemone hupehensis* var. *japonica* Thunb. (Ranunculaceae); *Brassica rapa* L. (Brassicaceae); *Impatiens aurea* Wats., *I. biflora* Walt. (Balsaminaceae); and *Solanum tuberosum* (Solanaceae). Larval feeding habits are unknown. Pinto & Selander (1970) report collecting the following Hymenoptera with attached triungulin: *Andrena carlini*, *A. mandibularis* Robertson (Andrenidae); *Apis mellifera* L. (Apidae); and *Colletes inaequalis* (Colletidae). Specimens were taken head lamping on 20 March 2020 around Mathias Lab.

Family Mordellidae

Glipa oculata (Say) has been collected on *Ambrosia* (Asteraceae) (Liljebald, 1945); collected from forests (Lisberg & Young, 2003a). Specimens were taken sweeping vegetation on 19 June 2019 in field at the intersection of Contees Wharf and Dock Roads.

Hoshihananomia octopunctata (Fabricius) adults are common on flowers of many species (Liljebald, 1945); larvae have been reared from *Fagus grandifolia* (Ford & Jackman, 1996); adults have been collected on the flowers of *Daucus carota* L. (Apiaceae), *Monarda* sp. (Lamiaceae), and *Ceanothus* sp. (Rhamnaceae); also collected by hand, using sweep nets, and in flight intercept, Malaise, and yellow pan traps in oak savannas, oak barrens, and prairie-forest ecotones (Lisberg & Young, 2003a). Specimens were taken sweeping vegetation in the field opposite Sellman House on 26 June 2019 and in a Malaise trap along the woods margin in the field opposite Sellman House from 12-15 June 2020.

Mordella atrata Melsheimer adults occur on flowers of many species (Liljebald, 1945); adults have been hand collected from the flowers of *Amorpha canescens* Pursh, *Trifolium repens* L. (Fabaceae), *Anemone canadensis* L. (Ranunculaceae), *Coreopsis lanceolata* L., *Erigeron annuus* L., *Eupatorium perfoliatum* L. (Asteraceae), *Cornus racemosa* Lamarck (Cornaceae); *Opuntia compressa* Salisbury (Cactaceae), *Rosa carolina* L., *Spiraea alba* DuRoi (Rosaceae), they are also recorded from barrier pitfall, flight intercept, Malaise, and yellow pan traps and sweep nets in prairies, prairie remnants, and occasionally oak savannas, sand barrens and oak barrens (Lisberg

& Young, 2003a). Specimens were taken sweeping vegetation in the forest plots in Zone 6, on 23 August 2018, near the Reed Education Center on 15 June 2019, and in Malaise traps in the field opposite Sellman House from 30 May–2 June 2020 and 12–15 June 2020.

Mordella marginata Melsheimer has been collected from flowers of *Amorpha canescens* Pursh, *Trifolium pratense* L. (Fabaceae), *Anemone canadensis* L. (Ranunculaceae), *Berteroa incana* L. (Brassicaceae), *Cornus racemosa* Lamarck (Cornaceae), *Daucus carota* L. (Apiaceae), *Eupatorium maculatum* L., *Parthenium integrifolium* L. (Asteraceae), *Euphorbia corollata* L. (Euphorbiaceae), *Physocarpus opulifolius* L., *Spiraea alba* Du Roi (Rosaceae), *Rhus glabra* L. (Anacardiaceae), *Sambucus canadensis* L., *Viburnum opulus* L. (Caprifoliaceae), orange milkweed (*Asclepias*, Apocynaceae), daisy, daisy fleabane (Asteraceae), wild rose (*Rosa*), and one specimen was found on a *Cirsium altissimum* L. (Asteraceae) stem; sweep nets and flight intercept, Malaise, and yellow pan traps (Lisberg & Young, 2003a). Specimens were taken in Malaise traps in the field opposite Sellman House from 30 May–2 June 2020 and 12–15 June 2020.

Mordellistena cervicalis LeConte has been reared from *Achillea millefolium* L. and *Erigeron* sp. (Asteraceae); at flowers of *Heracleum maximum* Bartram (Apiaceae), *Prunus* sp. (Rosaceae), and *Daucus carota*, as well as leaves of birch (*Betula*) and cranberry (*Vaccinium*, Ericaceae); from sweep nets and flight intercept and Malaise traps in southern-mesic forests, northern dry-mesic forests, and sandy oak barrens (Lisberg & Young, 2003a). Specimens were taken sweeping vegetation in the forest plots in Zone 6 on 23 August 2018 and on 12 July 2019 along Java History Trail.

Mordellistena convicta LeConte larvae have been reared from *Ambrosia artemisiifolia* L., *Aster vimineus* Lam., from galls on *Solidago canadensis* L., *Xanthium strumarium* Britt. (Asteraceae), and *Eurosta solidaginis* (Fitch) (Diptera: Tephritidae) (Ford & Jackman, 1996); reared from *Helenium autumnale* L., *Silphium perfoliatum* L., and *Solidago gigantea* Ait. (Asteraceae). Adults have been collected from prairies and mesic oak forests using sweep nets, flight intercept traps, and Malaise traps (Lisberg and Young, 2003a). Specimens were taken sweeping vegetation around the pond in the main parking lot on 6 June 2018, at Frog Haven on 6 June 2018, and along Contee Watershed Trail on 24 May 2018.

Mordellistena pustulata (Melsheimer) adults and larvae were reported from *Veronica interior* Small (Plantaginaceae) in Kansas (Schwitzgebel & Wilbur, 1942); larvae have been reared from *Ambrosia trifida* L. (Liljeblad, 1945), *Aster vimineus* Lam., *Chrysopsis* sp., *Cirsium vulgare* Savi. (Ten.), *Elephantopus carolinianus* Willd., *Erigeron canadensis* L., *Eupatorium serotinum* Michx., *Helianthus tuberosus* L., *Iva ciliata* Willd., and *Vernonia altissima* Nutt. (Asteraceae) (Ford & Jackman, 1996). Adults were swept from foliage along a river margin, in a regenerating (20-year-old) mixed forest, and along a power-line right-of-way through a mixed forest; adults swept from flowers of bristly sarsaparilla (*Aralia hispida* Vent., Araliaceae) in a small old field within a regenerating (20-year-old) mixed forest (Majka & Jackman, 2006); collected from prairies using barrier pitfall, flight intercept, light, and Malaise traps and by sweeping (Lisberg & Young, 2003a). Larvae have been reared from stems of *Gentiana andrewsii* Griseb. (Gentianaceae), and *Veronia altissima* Nutt. (Scrophulariaceae) (Lisberg & Young, 2003b). Specimens were taken sweeping vegetation around the pond in the main parking lot on 6 June 2018.

Mordellistena trifasciata (Say) adults have been collected on the flowers of *Ambrosia* and *Aralia* (Liljebald, 1945); adults have been collected from red buckeye *Aesculus pavia* L. (Hippocastanaceae) and sparkleberry *Vaccinium arboreum* Marshall (Lu, 1997); collected in oak (*Quercus* spp.) barrens and savannas and mixed deciduous forests (Lisberg & Young, 2003a); found in young red spruce (*Picea rubens*), black spruce (*Picea mariana* (Mill.) Britton, Sterns & Poggenburg), and white pine (*Pinus strobus* L.; Pinaceae) forests as well as on coastal barrens; adults are primarily collected using Malaise traps; a single specimen was collected in a barrier pitfall trap; from sandy oak barrens, sand prairie/oak savanna ecotones, and mixed deciduous hardwood forests (Lisberg & Young, 2003a). Specimens were taken sweeping vegetation at Frog Haven on 6 June 2018, around the Reed Education Center on 26 August 2020, and from 12-15 June 2020 in a Malaise trap along woods margin opposite Sellman House.

Mordellochroa scapularis (Say) is common on flowers (Liljebald, 1945); at flowers of *Heracleum maximum* Bartram, *Prunus* sp., and *Daucus carota*, as well as leaves of birch (*Betula*) and cranberry (*Vaccinium*); from sweep nets and flight intercept and Malaise traps in southern-mesic forests, northern dry-mesic forests, and sandy oak barrens (Lisberg & Young, 2003a). Specimens were taken sweeping vegetation in the field opposite Sellman House on 25 April 2019.

Tomoxia lineella LeConte has been collected from dead trees, such as elm (*Ulmus*), linden (*Tilia*), ash (*Fraxinus*), beech (*Fagus*), and hickory (*Carya*) (Liljebald, 1945). Larvae have been reared from standing dead *Populus grandidentata* Michaux (Salicaceae) (Lisberg & Young, 2003b). Specimens were taken sweeping vegetation in the forest plots of Zone 6 on 9 July 2018.

Family Mycetophagidae

Litargus tetraspilotus LeConte has been reported from deciduous, coniferous, and mixed forests, seashores, coastal and sandy pine barrens, and old fields and grasslands (Majka, 2010). Adults were collected from foliage of a variety of coniferous and deciduous tree species, herbaceous vegetation and rotting mushrooms. In New Brunswick, one adult was collected from a decaying mushroom in a conifer forest with white pine (*Pinus strobus*) and spruce (*Picea*), another in a Lindgren funnel trap deployed in an old red oak (*Quercus rubra*) forest (Webster et al., 2012). Specimens were taken along Contees Wharf Road on 16 May 2019 and in a Malaise trap along the woods margin opposite Sellman House from 1-3 May 2020.

Mycetophagus flexuosus Say were found in hardwood forests with sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*), an old red oak (*Quercus rubra*) forest, mixed forests, and an old (180-year-old) red pine (*Pinus resinosa* Ait.) forest. This species was found in partially dried *Pleurotus* (Pleurotaceae) species on dead, standing sugar maples (*Acer saccharum*), on a dead, standing trembling aspen (*Populus tremuloides* Michx.), in a decayed log covered with gilled mushrooms and polypore fungi, in a pile of moldy corncobs and cornhusks, and at an ultraviolet light. Specimens were also captured in Lindgren funnel traps at several localities (Webster et al., 2012); associated with *Pleurotus ostreatus* Fries (Cline & Leschen, 2005). Specimens were taken from unidentified shelf fungi at the intersection of Back Road and 11-6 on 12 April 2019, along Java History Trail on 9 May 2019, and in the woods along Fox Point Road below the intersection with Discovery Trail on 28 September 2020.

Family Pyrochroidae

Neopyrochroa flabellata (Fabricius) adults occur on foliage in open woodlands and beneath bark scales (Dillon & Dillon, 1961). Larvae are found under bark of decaying trees, most commonly on the underside of prostrate logs adjacent to or partially buried in the soil, adults are attracted to lights, fermenting baits, and cantharidin (Young, 1975, 1984). Specimens were taken at black light on 27 May 2019 on Connector Trail between Fox Point Road and Java History Trail and on 27 June 2019 on Back Road opposite the NEON tower.

Pedilus lugubris (Say) larvae live in decaying woody roots and buried twigs; adults are common on flowers and foliage (Young, per. comm.); males are highly attracted to cantharidin and on the blister beetles that produce it (LeSage & Bousquet, 1983; Butler, 1984; Williams & Young, 1999; Saul-Gershenz & Heddle, 2004). Specimens were taken sweeping vegetation along Contee Watershed Trail on 24 May 2018, in Zone 5 on 23 April 2019, in the field opposite Sellman House on 25 April 2019, and in a Malaise trap along the woods margin opposite Sellman House from 1–3 May 2020.

Family Synchronoidae

Synchroa punctata Newman has been found in both coniferous and deciduous forests, collected with flight-intercept traps (Bouchard & Pollock, 2006); found on *Abies balsamea* (Dearborn & Donahue, 1993). Larvae feed on fungal material and rotting wood (Payne, 1931). Specimens were taken by head lamping and at black light on 25 May 2019 at the intersection of Back Road and 11-6, on 27 June 2019 at Back Road opposite the NEON tower, and on 26 July 2019 at Java History Trail and the boardwalk.

Family Tenebrionidae

Alobates barbatus (Knoch) has been taken beneath the bark of *Populus grandidentata* (Dunford & Young, 2004). Specimens were taken head lamping along Back Road on 25 May 2019.

Alobates pennsylvanica (DeGeer) has been taken on fungi, under bark, at UV light, in deciduous forest, oak savanna, and oak barrens (Dunford & Young, 2004). Specimens were taken under bark on 12 April 2018 along Java History Trail, head lamping at the intersection of Back Road and 11-6 on 12 April 2019, and in a Malaise trap opposite Sellman House from 30 May–2 June 2020.

Alphitobius diaperinus (Panzer), an introduced species, has been associated with *Pleurotus ostreatus* (Cline & Leschen, 2005). Specimens were taken at black light on 27 June 2019 at Back Road opposite the NEON tower.

Arthromacra aenea (Say) adults have been beaten from foliage of shrubs and trees, usually along the borders of marshes (Blatchley, 1910); they have also been found on plant foliage. Larvae feed on plant debris and are found under bark and in stumps (Majka et al., 2008). Specimens were taken at black light on 27 June 2019 at Back Road opposite the NEON tower.

Blapstinus fortis LeConte has been taken at light (Bousquet et al., 2018). Specimens were taken head lamping in the meadow in front of Mathais Lab on 26 September 2019.

Bolitotherus cornutus (Fabricius) feeds on tissue and spores of various shelf fungi (*Ganoderma applanatum* (Persoon) Patouillard, *G. tsugae* Murrill, *Fomes fomentarius* (L.) J. J. Kickz [Basidiomycetes: Polyporaceae]) (Liles, 1956; Pace, 1967). A single female was taken on *Fomes fomentarius* in the woods along the road to the canoe shed on 28 September 2020.

Capnochroa fuliginosa (Melsheimer) larvae have been found living in decaying environments in tree holes (Park & Auerbach, 1954). Adults have been collected on moss covered logs, under debris and driftwood, diurnally on grasses, at blacklight, in flight intercept trap, in Lindgren funnel traps, oak savanna, and deciduous forest (Dunford & Young, 2004). Specimens were taken at black light at Back Road opposite the NEON tower on 27 June 2019.

Centronopus calcaratus (Fabricius) has been collected on black oak, red cedar, other rotting tree debris, in flight intercept trap, oak savanna, oak barrens (Spilman, 1962); associated with *Pleurotus ostreatus* (Cline & Leschen, 2005). Specimens were taken under bark on 10 April 2019 along Connector Trail between Java History Trail and Fox Point Road.

Diaperis maculata Olivier has been collected on fungi, under bark, in red-rot of oak logs, at blacklight, and from flight intercept trap in deciduous forests, oak savannas, and prairies (Triplehorn, 1965); and associated with *Pleurotus ostreatus* (Cline & Leschen, 2005). Specimens were taken under bark on 17 May 2019 along Back Road.

Isomira sericea (Say) has been taken diurnally on flowers of New Jersey tea (*Ceanothus americanus* L., Rhamnaceae) and common milkweed (*Asclepias*), on red (*Quercus rubra*) and black oak (*Q. nigra*), at blacklight, in sweep net, flight intercept trap, Lindgren funnel trap, and Malaise trap (Blatchley, 1910; Majka et al., 2008). Adults have also been taken in oak savanna and deciduous forest (Marshall, 1970). Specimens were taken sweeping vegetation on 6 June 2018 at Frog Haven.

Lobopoda erythrocnemis (Germar) has been collected under the bark of pine and on dead standing pine (*Pinus*); taken by beating the lower dead limbs of *Quercus marilandica* Muenchh. and *Q. stellata* Wangenh.; often found at lights; taken from fruit fly traps in Florida (Campbell, 1966). Specimens were taken at black light on 27 May 2019 along Connector Trail between Java History Trail and Fox Point Road.

Mycetochara haldemani (LeConte) other members of this genus feed on fungi and are found under bark (Blatchley, 1910). Two specimens were taken in a Malaise trap along the woods margin opposite Sellman House from 30 May-2 June 2020.

Neomida bicornis (Fabricius) has been collected on fungi, under bark, at UV light, in deciduous forest, pine plantation, sand prairie (Triplehorn, 1965); associated with *Pleurotus ostreatus* (Cline & Leschen, 2005); and *Trametes* sp. (Epps & Arnold, 2010). Specimens were taken at black light on 20 March 2020 at Mathais Lab and in unidentified mushrooms on 2 September 2020 in the woods at the intersections of Back Road and 11-6.

Platydema erythrocerum Laporte & Brullé has been associated with *Pleurotus ostreatus* (Cline & Leschen, 2005). Specimens were taken by visual survey on 9 May 2019 along Java History Trail and at black light on 27 May 2019 along Connector Trail between Java History Trail and Fox Point Road.

Platydema ruficorne (Sturm) has been collected in stored products, under logs and stumps, under bark, at UV light, and in oak savanna (Triplehorn, 1965). Specimens were taken under bark on 9 April 2019 along Java History Trail, at black light on 12 August 2019 along Back Road, in unidentified mushrooms on 31 August 2020 along Contee Watershed Trail, on 2 September 2020 at the intersection of Back Road and 11-6, and in a Malaise trap in the field opposite Sellman House from 1-3 May 2020.

Platydema subcostatum Castelnau & Brullé has been collected in fungus, under bark, from lichens on standing dead trees, in Lindgren funnel trap, at UV light, deciduous forest, oak barrens, oak savanna, pine plantation (Triplehorn, 1965); associated with *Pleurotus ostreatus* (Cline & Leschen, 2005). Specimens were taken head lamping along Back Road on 27 June 2019.

Statira basalis Horn has been beaten from flowers of *Quercus* and *Crataegus* (Parsons, 1965). Specimens were taken at black light on 27 May 2019 along Connector Trail between Java History Trail and Fox Point Road.

Strongylium terminatum (Say) has been taken in Lindgren funnel traps (Dunford & Young, 2004). Specimens were taken at black light along Back Road on 27 June 2019.

Tarpela micans (Fabricius) occurs gregariously beneath loose bark of old snags, especially those of red and black oak (Blatchley, 1910). Specimens were taken in Malaise traps in the field opposite Sellman House from 10-13 May 2020 and 30 May-2 June 2020.

Tarpela undulata (LeConte) is found beneath loose bark (Blatchley, 1910). Specimens were taken on an unidentified shelf fungus on Hog Island on 2 May 2019.

Uloma imberis LeConte has an unknown biology. Specimens were taken under bark on 12 April 2019 at the intersection of Back Road and 11-6.

Uloma impressa Melsheimer has been collected under bark of rotting oak logs, oak savanna (Blatchley, 1910). Specimens were taken under bark on Hog Island on 7 September 2019.

Family Tetratomidae

Eustrophopsis bicolor (Fabricius) has been collected on the underside of fungus, dead log at night, on a piece of cut wood at night, fungusy stump of *Acer negundo* L., bracket fungus, in rotting *Pleurotus*, on trunk of dead *Ulmus americana* L., under bark of dead maple, under bark of rotting trunk of *Pinus eliottii* Engelm., with polypore fungi, ex *Fomes* (Polyporaceae) on *Salix* (Salicaceae), under bark of *Fagus*, *Trametes versicolor* (L.) Lloyd (Polyporaceae), *Meripilus giganteus* (Pers.) Karst. (Meripilaceae), polypore tree fungus, under rotting oak bark, in litter at base of dying *Ailanthus* (Simaroubaceae), large orange polypore shelf fungus [? *Laetiporus*

(=*Polyporus*) *sulphureus* (Bull.) Murrill (Polyporaceae)] on standing tree trunk, *Omphalotus olearius* (DC) Sing. (Marasmiaceae), under bark shelf fungi, *Griffolia* fungus (probably *Grifola*, Meripilaceae), *Polyporus hypnoides* Fr., under bark of dead pine, hibernating under bark, under bands of tar paper on apple (*Malus*, Rosaceae) trees, *Armillariella mellea* (Vahl) P. Kumm. (Physalacriaceae), *Pleurotus ostreatus* (Jacq. ex Fr.) P. Kumm., on shelf fungi, in sweetgum (*Liquidambar styraciflua* L., Altingiaceae) stump, *Polyporus adustus* (Willd.) Fr., *Panus rudis* Fr. (Polyporaceae), under bark of dead *Pinus virginiana* Mill., under bark dead standing *Quercus* (Fagaceae), in *Peromyscus* (Mammalia: Cricetidae) nest debris under bark dead standing *Liriodendron* (Magnoliaceae), under bark of stump of *Prunus serotina* Ehrh. (Rosaceae), fungus on bark, injured cypress, oak, under bark dead standing pine, under oak bark, in mushroom, *Trametes hispida* (Baglietto) Fries, under hardwood bark, ex fungus on *Mimosa* (Fabaceae) stump, on polypore on dead *Quercus*, polypore fungus, *Cerioporus* (= *Polyporus*) *squamosus* (Huds.) Quélet, under poplar bark (Pollock, 2012). Weiss & West (1920) recorded it from *Pleurotus*, *Polyporus*, *Poria* (Polyporaceae), *Lentinus* (Polyporaceae), and *Daedalia* (Fomitopsidaceae). Chantal (1985) provided some details on fungal habitats concerning where adults were collected: *Pleurotus pulmonarius* (= *sapidus*) (Fr.) Quélet, *Cerioporus* (= *Polyporus*) *squamosus*, *Fomitopsis* (= *Polyporus*) *betulinus* (Bull.) B. K. Cui, M. L. Han & Y. C. Dai, *Trametes* (= *Polyporus*) *versicolor*, *Daedaleopsis* (= *Polyporus*) *confragosa* (Bolton) J. Schröt. Chantal (1985) and Pollock (2008) observed that individuals of this species are often collected together with adults of *Synstrophus repandus* (Horn) [Coleoptera: Tetratomidae] in the same microhabitats. Steury (2018a) reported the species under the bark of a dead standing *Carya tomentosa* (Lam.) Nutt. (Juglandaceae). Specimens were taken at black light on 27 May 2019 along Connector Trail between Java History Trail and Fox Point Road and on 17 June 2019 along Java History Trail.

Holostrophus bifasciatus (Say) has been collected in association with dead logs and/or associated fungi: *Laetiporus sulphureus*; ex polypore in pine logs; *Trametes versicolor*; *Schizopora paradoxa* (Schrad.) Donk. (Polyporaceae); black light trap; ex polypore on cherry (*Prunus*) tree; under loose pine bark; under pine bark; Malaise trap; oak log; sugar trap ultraviolet light flight trap (Pollock, 2012). Chantal (1985) stated that specimens were collected from under bark of fallen *Pinus strobus* L., on which polypores were growing; also, specimens are known from *Fomitopsis* (= *Polyporus*) *betulinus*. Specimens were taken by visual inspection on 17 May 2019 along Back Road.

Penthe obliquata (Fabricius) has been found in mature hardwood forests with American beech (*Fagus grandiflora*) and sugar maple (*Acer saccharum*), an old-growth northern hardwood forest, a floodplain forest with black ash (*Fraxinus nigra* Marsh., Oleaceae), butternut, and red maple (*Acer rubrum*), an old red oak (*Quercus*) forest, a red oak (*Quercus*) and red maple stand, a silver maple (*Acer saccharinum* L.) swamp, a mature (110-year-old) red spruce (*Picea rubens*) stand, an old (180-year-old) red pine forest, an old eastern white cedar (*Thuja occidentalis* L. Cupressaceae) forest, and in mixed forests. Many adults were captured in Lindgren funnel traps deployed in the above forest types. Adults with specific collection data were collected from polypore fungi (bracket fungi) on standing dead American beech trees and poplar logs, in fleshy polypore fungi on a dead, standing red oak and on a stump, from a woody polypore on a dead, standing balsam fir, from *Polyporus varius* Fr. on a dead, standing sugar maple, and from under bark of a spruce log (Webster et al., 2012); under bark of a variety of conifer species in Nova Scotia (Bouchard & Pollock, 2006). Specimens were taken by head lamping on 12 August 2019 along Back Road.

DISCUSSION

The 49 Tenebrionoidea species found at SERC is lower than expected. The habitat of the main campus is suitable for many species. The obvious explanation is that much of the SERC campus was farmed from the 1600s until the end of World War II. Much of the surrounding area was farmed until the 1980s or is still farmed. Additional collecting techniques (litter sifting, Malaise traps, flight intercept traps, etc.) and additional black light trapping and head lamping should add many species.

Another observation was the relative dearth of insects on roadside and meadow flowering plants. This would explain the lack of diversity and abundance of certain families, especially Anthicidae, Mordellidae, and Meloidae. It was surprising not to find the families Aderidae, Ripiphoridae, and Scaptiidae, several species are widespread and abundant in the Middle Atlantic States. We are unable to suggest a reason for their absence in this inventory.

Overall, the results of this inventory show a healthy but not hyperdiverse Tenebrionoidea fauna. *Alphitobius diaperinus* is the only non-native species collected. Hopefully this will provide a baseline for additional monitoring in the future.

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