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MARYLAND ENTOMOLOGICAL SOCIETY
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The Maryland Entomological Society (MES) was founded in November 1971, to promote the science of entomology in all its sub-disciplines; to provide a common meeting venue for professional and amateur entomologists residing in Maryland, the District of Columbia, and nearby areas; to issue a periodical and other publications dealing with entomology; and to facilitate the exchange of ideas and information through its meetings and publications. The MES was incorporated in April 1982 and is a 501(c)(3) non-profit, scientific organization.

The MES logo features an illustration of ***Euphydryas phaëton*** (Drury) (Lepidoptera: Nymphalidae), the Baltimore Checkerspot, with its generic name above and its specific epithet below (both in capital letters), all on a pale green field; all these are within a yellow ring double-bordered by red, bearing the message "● Maryland Entomological Society ● 1971 ●". All of this is positioned above the Shield of the State of Maryland. In 1973, the Baltimore Checkerspot was named the official insect of the State of Maryland through the efforts of many MES members.

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Editor's Note

The 2021 issue of *The Maryland Entomologist* features the George Washington Memorial Parkway of Virginia, Maryland, and the District of Columbia. Brent W. Steury, Natural Resources Program Manager at the Parkway, has either authored or coauthored all of the manuscripts. First there is a brief introductory note about the Parkway. This is followed by an article on the Parkway's grasshoppers, crickets, and katydids (Orthoptera). This is followed by three Coleoptera articles. The first article discusses the reticulated beetles (Cupedidae) and the net-winged beetles (Lycidae). The second article discusses the rare click beetles (Cerophytidae), the click beetles (Elateridae), the false click beetles (Eucnemidae), and the throscid beetles (Throscidae). Lastly, the third article discusses the tumbling flower beetles (Mordellidae). These articles offer an exceptional visit with the insect fauna of the George Washington Memorial Parkway.

As always, please consider submitting your findings to *The Maryland Entomologist*. Authors are the lifeblood of the journal. Thank you.

Eugene J. Scarpulla
Editor

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The George Washington Memorial Parkway, Virginia, Maryland, and the District of Columbia, USA: An Overview

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George Washington Memorial Parkway (GWMP) (Figures 1 and 2) is an administrative unit of the National Park Service that occupies more than 7,300 acres (2,954 hectares) of land in Virginia (Fairfax and Arlington Counties and the City of Alexandria), Maryland (Montgomery County), and the District of Columbia (D.C.). The Parkway connects several important natural areas, historic sites, memorials, and scenic areas in the Washington, D.C., metropolitan area. The GWMP (including Great Falls Park) was established by Congress on 29 May 1930, through the Capper-Cramton Act (Public Law 71-284). The first section of the Parkway, then known as Mount Vernon Memorial Highway, opened in 1932 as a Bicentennial Celebration of the birth of George Washington. This section was constructed from Arlington Memorial Bridge in Washington, D.C., to Mount Vernon, in Fairfax County, Virginia. The northern section of the Parkway on the Virginia side of the Potomac River from Arlington Memorial Bridge to I-495 was built in stages starting in the 1940s, completing the 28-mile-long (45-kilometer-long) Parkway in 1962. The northern portion of GWMP running along the Maryland side of the Potomac River between MacArthur Boulevard and Glen Echo was completed in 1965 and the southern portion from the Maryland/District of Columbia line to Chain Bridge was completed in 1970. In 1989, the Maryland portion of the road was renamed Clara Barton Parkway in honor of the founder of the American Red Cross, whose home is preserved near the Parkway.

Today, GWMP is composed of 22 associated park sites. Four of these have their own enabling legislation: Arlington House (The Robert E. Lee Memorial) in Virginia; Clara Barton National Historic Site in Maryland; and Lyndon Baines Johnson Memorial Grove on the Potomac, and Theodore Roosevelt Island in Washington, D.C. Other park sites within the GWMP include, in Virginia: Arlington Ridge Park (Netherlands Carillon and U.S. Marine Corps War Memorial), Belle Haven Park and Marina, Collingwood Picnic Area, Daingerfield Island, Dyke Marsh Wildlife Preserve, Fort Hunt Park, Fort Marcy, Glen Echo Park, Gravelly Point, Great Falls Park, Jones Point Park and Lighthouse, Mount Vernon Trail, Riverside Park, Roaches Run Waterfowl Sanctuary, and Turkey Run Park (including the area formerly called Claude Moore Colonial Farm), and in Washington, D.C.: Arlington Memorial Bridge, Lady Bird Johnson Park, and Navy and Merchant Marine Memorial.

Figure 1. George Washington Memorial Parkway. Red-tailed Hawk (*Buteo jamaicensis*) perched atop the Parkway Headquarters sign at Turkey Run Park.

Significant natural areas are located at Daingerfield Island, Dyke Marsh Wildlife Preserve, Fort Hunt Park, Fort Marcy, Great Falls Park, Jones Point Park, Roaches Run Waterfowl Sanctuary, Turkey Run Park, and the woodlands between Little Hunting Creek and Mount Vernon. The 15-mile-long Potomac Gorge, which extends from above Great Falls south to Theodore Roosevelt Island, is one of the country's most biologically diverse areas and contains endemic and globally rare plant communities. In Great Falls Park, it narrows into a steeply sided 1.9-mile-long (3-kilometer-long) channel named Mather Gorge in honor of the first National Park Service director, Stephen T. Mather (Figure 3). The bedrock of the Gorge consists of the Mather Gorge Formation in the upper part and the Sykesville Formation in the downstream portion beginning near Turkey Run Park. Recent studies have documented 1,541 plant species from GWMP, despite some non-vascular groups remaining little-known. Dyke Marsh Wildlife Preserve is the remnant of a once much grander freshwater, tidal marsh that was mined for sand and gravel between 1940 and 1970. However, despite its lesser extent, this 40-acre (16-hectare) marsh and associated inland fringe of tidal swamp have produced recently discovered beetle species new to Virginia and species new to science, including the tumbling flower beetle *Mordellina washingtonensis* Steury and Steiner (Coleoptera: Mordellidae), a species named in honor of GWMP. Dyke Marsh Wildlife Preserve is also a haven for vertebrate animals and provides habitat for some of the rarer of the 293 species of birds, 62 fish, 46 amphibians and reptiles, and 32 mammals known from the Parkway. The woodlands south of Little Hunting Creek contain oak trees over 200 years old, perhaps protected by their proximity to Mount Vernon.

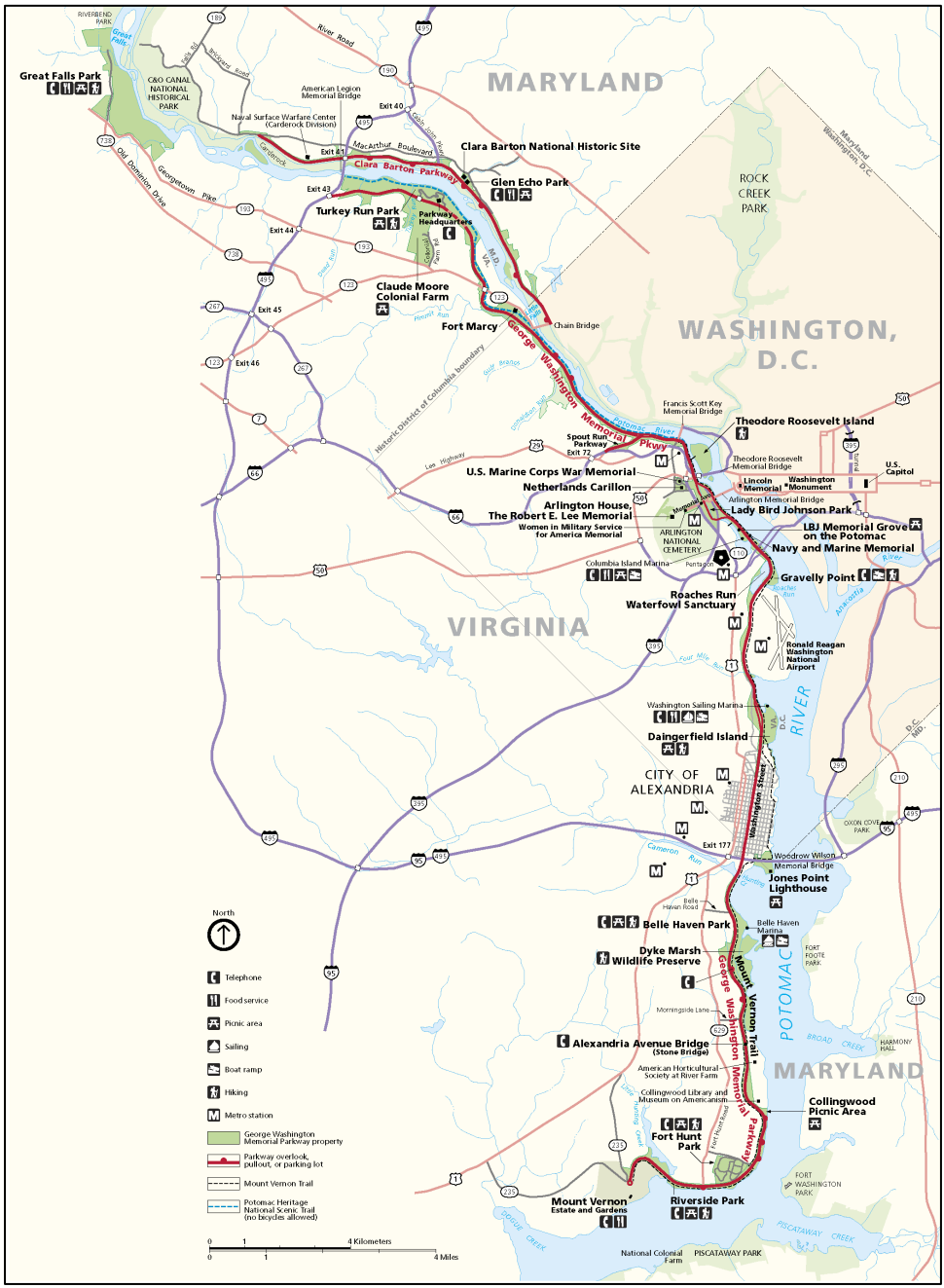

Figure 2. George Washington Memorial Parkway, Virginia, Maryland, and the District of Columbia. (U.S. Department of the Interior, National Park Service)

Despite the Parkway's documented biodiversity and rare plants and animals (including 245 species unknown from Virginia at the time of their discovery, 108 species state-listed for rarity, and the discovery of now-named species new to science, including a crustacean, a caddisfly, a sawfly, beetles, and flies, plus 37 springtails and 30 nematodes possibly new to science that are still waiting to be described), its habitats remain threatened. The Parkway hosts over one million visitors a year and biotic stresses undermine the viability of its natural systems. Other natural areas of GWMP have recently succumbed to development by private interest groups, such as woodlands converted to an asphalt parking lot near Mount Vernon, a woodland at Arlington House converted to grave sites, a new Metro station being built near Daingerfield Island, and most recently, the proposed changes to the American Legion Bridge in the Potomac Gorge, all of which reduce habitat for plants and animals.

Figure 3. Mather Gorge, Great Falls Park. Maryland shore (left) and Virginia shore (right); named in honor of the first director of the National Park Service, Stephen T. Mather.

The GWMP has been conducting an All Taxa Biodiversity Inventory (ATBI) for 17 years. The ATBI is a long-term inventory process, aiming to catalog all biodiversity within the park. From these data, the Parkway has been able to compare the number of species per square mile tracked by the Commonwealth of Virginia as rare, threatened, or endangered to the number of these species per square mile found at the Parkway. These calculations have shown that the Commonwealth as a whole has 0.0478 rare species per square mile while the Parkway has 17.4194, or 364.4 times the density of rare species than the rest of the Commonwealth of Virginia. This estimate does not account for species new to Virginia found at the Parkway that are not as yet on the Virginia list of rare plants or animals, or species new to science from the Parkway that have been recently described.

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Annotated List of Species of the Grasshoppers, Crickets, and Katydids (Orthoptera) of the George Washington Memorial Parkway, Virginia, USA

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Abstract: During field surveys conducted in 2019, supplemented by Malaise trap captures dating back to 1998, we documented 50 species of Orthoptera from eight sites in the George Washington Memorial Parkway in northeastern Virginia. *Anaxipha vernalis* Walker and Funk and *A. tinnulacita* Walker and Funk were collected for the first time from Virginia. *Neoconocephalus nebrascensis* (Bruner) and *N. lyristes* (Rehn and Hebard) were documented for the first time from the same East Coast site in Great Falls Park. A slight range extension was documented for *Gryllus pennsylvanicus* Burmeister and *N. nebrascensis*. The most commonly collected species were *Anaxipha exigua* (Say), *Tettigidea armata* Morse, *Hapithus* (*Orocharis*) *saltator* (Uhler), *H. agitator* Uhler, and *Amblycorypha oblongifolia* (De Geer). Sweep netting was the most productive capture method. One non-native (adventive) species, *Velarifictorus micado* (Saussure), was documented from the study area. Two arboreal katydids, *Pterophylla camellifolia* (Fabricius) and *Microcentrum rhombifolium* (Saussure), were heard, but not collected. Our results provide baseline information on the species of Orthoptera occurring in this heavily trafficked national park.

Keywords: biodiversity, Caelifera, Ensifera, insects, Malaise trap, Potomac Gorge, Virginia.

INTRODUCTION

Measuring and understanding the biodiversity of an area is important because it provides basic information on a community's ecology. Knowing the species composition in an area and examining how that composition changes over time is also important for measuring the impacts that humans have on the environment. As part of a larger inventory of organisms within the national park system (All Taxa Biodiversity Inventory), surveys of various taxa dating back to 1998 have been conducted in the George Washington Memorial Parkway (GWMP). Arthropod taxa that have been inventoried in GWMP include Collembola, Ephemeroptera, Odonata, Plecoptera,

Heteroptera, Hymenoptera, Coleoptera, Neuroptera, Megaloptera, Trichoptera, Lepidoptera, Diptera, and Mecoptera (Steury 2014).

In this paper, we describe the results of an inventory of Orthoptera collected at eight sites within GWMP. Orthoptera is a well-known taxon that includes robust insects characterized by their saltatorial hindlegs. The taxon is diverse with more than 28,000 species worldwide (Cigliano et al. 2020). Most species also have tegmina and are herbivorous, including some that are economically important crop pests. Some species are threatened because they are confined to small geographic ranges and are impacted by anthropogenic activity (Samways and Lockwood 1998). The purpose of our study was to determine the orthopteran species present in GWMP, which is a relatively small, highly trafficked national park near Washington, District of Columbia.

STUDY SITES

The study sites are in Virginia (Fairfax County and the City of Alexandria) and include lands managed by the National Park Service as units of GWMP. Park sites that were inventoried included Collingwood Picnic Area, Dyke Marsh Wildlife Preserve, Great Falls Park, Langley Fork Park, Little Hunting Creek, Mount Vernon Trail, and Turkey Run Park, in Fairfax County; and Daingerfield Island, in the City of Alexandria. These sites cover approximately 897 ha (2,217 ac). A map of the project area can be found in Steury (2011). Langley Fork, Great Falls, and Turkey Run Parks fall within the Piedmont physiographic province, while all other collection sites are on the Coastal Plain. Most sites are situated along the shore of the Potomac River, and Great Falls and Turkey Run Parks border the Potomac Gorge, an area known for high species richness of plants and animals (Brown 2008). Turkey Run Park and Great Falls Park are dominated by maturing, second growth, primarily upland, rich, deciduous woodlands. The woodlands at Little Hunting Creek are drier, sandier, and have more pine and ericaceous shrubs. More open herbaceous habitats are found in moist, narrow bands along the shore of Potomac River and in the emergent, freshwater, tidal marshes dominated by narrowleaf cattail, *Typha angustifolia* L. (Typhaceae), at Dyke Marsh Wildlife Preserve and along the fringe of Little Hunting Creek. Collingwood Picnic Area contains seasonally mowed turf grass with scattered large trees. The area surveyed at Langley Fork Park focused on the edge of a drought drawn-down stormwater pond. Daingerfield Island contains mowed turf grass, freshwater marsh, and deciduous woodland.

MATERIALS AND METHODS

We sampled Orthoptera using two main techniques: sweep netting and Malaise traps. Collecting with sweep nets occurred in 2019 on 20–22 May, 25–28 June, 4–6 August, and 5 September at Dyke Marsh Wildlife Preserve, Little Hunting Creek, Turkey Run Park, and Great Falls Park. During each day of sampling, we spent approximately 5 hours sampling vegetation and ground cover with sweep nets. Additional daytime sweep netting was done for 1 to 2 hours at Dyke Marsh Wildlife Preserve (11 and 26 September), at Collingwood Picnic Area (26 September), and at Langley Fork Park (27 October). We also collected by headlight at night with surveys lasting 2 to 4 hours starting at dusk on

20–21 May, 25–27 June, and 4–5 August at Dyke Marsh Wildlife Preserve, Turkey Run Park, and Great Falls Park.

Many Orthoptera (e.g., crickets and katydids) stridulate to produce loud, species-specific acoustic signals (calling songs) that function in long-range communication. A trained observer can use the signal to identify individuals at a distance and as an aid in locating and collecting calling insects. During evening surveys, in addition to sweep nets, we used calling songs to help identify and locate individuals. We also recorded some of the collected orthopterans to confirm identifications.

The 2019 sweep net collection was supplemented by examining all orthopteran specimens stored in alcohol that had been captured in Malaise traps set at Dyke Marsh in 1998 and 1999, Great Falls and Turkey Run Parks from 2006 through 2009, and Little Hunting Creek in 2017 and 2018 (see Steury [2018] for further details concerning this Malaise trap sampling effort). A subset of all species found in Malaise trap samples that were not captured through netting efforts in 2019 was pinned and labeled (along with a few species previously documented by netting). A tally was kept of the total number of each species found in Malaise trap samples. Two additional species, *Neocurtilla hexadactyla* (Perty) and *Syrbula admirabilis* (Uhler), from older collections at other sites in GWMP were also added to the list. The collection is maintained at the Turkey Run Park Headquarters in McLean, Virginia.

RESULTS

A total of 597 specimens were collected by netting and Malaise traps (including 32 juvenile *Anaxipha* Saussure that were not identified to species). Ten families containing 35 genera and 50 species were documented from the GWMP. These included 15 species of grasshoppers (suborder Caelifera: families Acrididae, Tetrigidae, and Tridactylidae) and 35 species of crickets and katydids (suborder Ensifera: families Gryllacrididae, Gryllidae, Gryllotalpidae, Mogoplistidae, Rhaphidophoridae, Tettigoniidae, and Trigonidiidae). The most captured species in the study area were *Anaxipha exigua* (Say) (n=67), *Tettigidea armata* Morse (59), *Hapithus* (*Orocharis*) *saltator* (Uhler) (53), *H. agitator* Uhler (39), and *Amblycorypha oblongifolia* (De Geer) (36). The most common genera were *Neoconocephalus* Karny (n=5), and *Anaxipha* and *Conocephalus* Thunberg (3 each). Sweep netting was more productive at sampling orthopterans compared to Malaise traps, a finding supported by other studies (Massa et al. 2010). A total of 44 species were collected by sweep netting (labeled “ne” in Table 1), including 21 species captured only by this method. Only 26 species were captured in Malaise traps (Table 1, labeled “mt”), including 3 species captured only by this method, despite Malaise traps being used for eight years and intensive sweep netting only on 14 days during 2019. We were only interested in documenting the species in the GWMP and once a species was netted, collected, and identified, additional individuals were ignored. Therefore, counts of netted species could have been higher than indicated. Also, we included two additional species in the list that were recorded but never collected. These were the arboreal species *Microcentrum rhombifolium* (Saussure), which was heard on a single occasion at Dyke

Marsh, and *Pterophylla camellifolia* (Fabricius), which was very common and heard at all sites where night surveys were conducted.

Although documented previously from songs recorded in Virginia (Walker and Funk 2014), specimens of *Anaxipha vernalis* Walker and Funk and *A. tinnulacita* Walker and Funk were collected for the first time from Virginia during our study. *Neoconocephalus nebrascensis* (Bruner) and *N. lyristes* (Rehn and Hebard) (Figure 3) were documented for the first time from the same East Coast site (Great Falls Park, Virginia) (Capinera et al. 2004). An eastward range extension of 33 km (21 mi) was documented for *N. nebrascensis* and 30 km (19 mi) for *Gryllus pennsylvanicus* Burmeister based on the range maps provided in Capinera et al. (2004) and SINA (2020). One non-native (adventive) species, *Velarifictorus micado* (Saussure), was documented from the study area.

Other studies have inventoried Orthoptera from Virginia, although most of the previous sampling occurred near Charlottesville and surrounding areas (Fox 1917, Davis 1926) or in the Appalachian Mountains of Virginia (Hebard 1945). Fox (1917) sampled Orthoptera mainly around Charlottesville, Virginia, with additional collecting trips that included all the physiographic provinces across Virginia. Our study documented 29 of the 99 species noted by Fox (1917) (see Table 1). Davis (1926) collected 71 species near Wingina, Virginia, and 29 of those were also collected during our inventory of the GWMP (Table 1). We collected only 15 of the 70 species identified by Hebard (1945) from the mountain regions of Virginia. Table 1 shows that eleven of our study's species were common across all four of the previous Virginia studies: (*Arphia sulphurea* (Fabricius), *Conocephalus brevipennis* (Scudder), *Chortophaga viridifasciata* (De Geer), *Dissosteira carolina* (Linnaeus), *Microcentrum retinerve* (Burmeister), *M. rhombifolium*, *Oecanthus latipennis* Riley, *O. niveus* (De Geer), *Orchelimum vulgare* Harris, *Scudderia furcata* Brunner von Wattenwyl, and *Tettigidea lateralis* (Say). We collected 10 species that were absent from the other four Virginia studies: *Anaxipha tinnulacita*, *A. vernalis*, *Cycloptilum trigonipalpum* (Rehn and Hebard), *Gryllus pennsylvanicus*, *Gryllus rubens* Scudder, *Melanoplus differentialis* (Thomas), *M. sanguinipes* (Fabricius), *Neoconocephalus nebrascensis*, *Orchelimum pulchellum* Davis, and *Velarifictorus micado*.

The number of species we documented from GWMP is less than the 90 species collected by McAtee and Caudell (1917) on Plummers Island, Maryland, in the Potomac Gorge (also listed in Brown 2008). Eleven species we collected at Great Falls Park and Turkey Run Park, sites which are adjacent to the gorge, were not in McAtee and Caudell's (1917) collection (Table 1, species marked with an exclamation point), increasing the number of Orthoptera documented from the Potomac Gorge to 100 species; assuming that only *Allonemobius socius* (Scudder) and not *A. fasciatus* (De Geer) occur in the gorge. See discussion under *A. socius* in the list of species below.

Table 1. Orthoptera from surveys previously conducted in the Potomac Gorge (McAtee and Caudell 1917), in Virginia (Fox 1917, Davis 1926, Hebard 1945), and our study. *Includes collection sites ([CP] Collingwood Picnic Area, [DI] Daingerfield Island, [DM] Dyke Marsh Wildlife Preserve, [GF] Great Falls Park, [LF] Langley Fork Park, [LH] Little Hunting Creek, [MV] Mount Vernon Trail, or [TR] Turkey Run Park); collection method (Malaise trap [mt] or sweep net [ne]); and (!) not previously found in Potomac Gorge.

Species	McAtee and Caudell 1917	Fox 1917	Davis 1926	Hebard 1945	Our Study*
CAELIFERA (grasshoppers)					
Amblytropidia mysteca (Saussure)		x			
Appalachia hebardi Rehn and Rehn				x	
Arphia sulphurea (Fabricius)	x	x	x	x	GF: mt, ne
Arphia xanthoptera (Burmeister)	x	x	x	x	
Booneacris glacialis amplicerca (Caudell)				x	
Camnula pellucida (Scudder)		x		x	
Chloealtis conspersa (Harris)	x	x		x	
Chortophaga viridifasciata (De Geer)	x	x	x	x	GF: ne
Dendrotettix australis (Morse)		x			
Dichromorpha elegans (Morse)		x			
Dichromorpha viridis (Scudder)	x	x	x		GF: ne
Dissosteira carolina (Linnaeus)	x	x	x	x	GF: mt, ne
Ellipes minuta (Scudder)	x		x		GF: ne
Encoptolophus sordidus (Burmeister)	x	x		x	
Eritettix simplex (Scudder)	x	x	x		
Hippiscus ocelote (Saussure)		x	x	x	
Leptysma marginicollis (Serville)		x			DM: ne
Melanoplus atlanis (Riley)[a]	x	x	x		
Melanoplus bivittatus (Say)	x	x	x	x	
Melanoplus celatus Morse		x			
Melanoplus confusus Scudder		x	x	x	
Melanoplus devius Morse		x	x		
Melanoplus differentialis (Thomas)					DM, GF: ne!
Melanoplus eurycercus Hebard				x	
Melanoplus fasciatus (Walker)				x	
Melanoplus femurrubrum (De Geer)	x	x		x	
Melanoplus gracilis (Bruner)		x		x	
Melanoplus hubbelli Hebard				x	
Melanoplus impudicus Scudder				x	
Melanoplus islandicus Blatchley				x	
Melanoplus keeleri Thomas	x	x		x	
Melanoplus luridus (Dodge)[b]		x	x		
Melanoplus mancus (Smith)				x	
Melanoplus mexicanus (Saussure)				x	
Melanoplus punctulatus (Uhler)	x		x		
Melanoplus sanguinipes (Fabricius)					CP: ne
Melanoplus scudderi (Uhler)	x	x	x		
Melanoplus similis Morse				x	
Melanoplus tribulus Morse	x		x	x	
Melanoplus walshii Scudder		x	x	x	
Mermiria intertexta Scudder		x			
Metaleptea brevicornis (Johannson)	x	x	x		DM: ne
Neotettix femoratus (Scudder)	x	x	x	x	

Species	McAtee and Caudell 1917	Fox 1917	Davis 1926	Hebard 1945	Our Study*
Nomotettix cristatus (Scudder)				x	
Nomotettix cristatus compressus Morse	x		x		
Orphulella pelidna (Burmeister)	x	x	x		
Orphulella speciosa (Scudder)	x	x		x	
Paratettix cucullatus (Burmeister)	x		x		DM, GF, TR: mt, ne
Paratylotropidia beutenmuelleri Morse				x	
Pardalophora apiculata (Harris)	x	x		x	
Pardalophora phoenicoptera (Burmeister)	x	x	x	x	
Paroxya atlantica Scudder	x				
Paroxya clavuliger (Serville)	x	x	x		DM, LH: mt, ne
Pseudochorthippus curtipennis (Harris)		x			
Pseudochorthippus montanus (Charpentier)				x	
Psinidia fenestralis (Serville)		x			
Schistocerca alutacea (Harris)		x	x	x	
Schistocerca americana (Drury)			x		
Schistocerca damnifica (Saussure)	x	x	x		
Schistocerca obscura (Fabricius)		x			DM: ne
Schistocerca rubiginosa (Harris)	x	x			
Schistocerca serialis (Thunberg)	x	x			
Spharagemon bolli Scudder	x	x	x	x	
Spharagemon collare (Scudder)	x				
Spharagemon saxatile Morse		x		x	
Syrbula admirabilis (Uhler)	x	x	x		DI: ne
Tetrix arenosa angusta (Hancock)	x	x	x	x	
Tetrix ornata (Say)	x		x	x	
Tettigidea armata Morse	x				DM, LH: mt, ne
Tettigidea lateralis (Say)	x	x	x	x	GF, TR: mt, ne
Trimerotropis maritima (Harris)		x	x		
ENSIFERA (crickets and katydids)					
Allonemobius fasciatus (De Geer)	?	x	x	x	
Allonemobius maculatus (Blatchley)		x			
Allonemobius socius (Scudder)	?		x		DM, GF, LF: ne!
Amblycorypha longinicta T.J. Walker	x	x	x		
Amblycorypha carinata Rehn and Hebard		x	x		
Amblycorypha oblongifolia (De Geer)	x	x	x		DM, GF, TR: mt, ne
Amblycorypha rotundifolia (Scudder)	x	x	x	x	
Anaxipha exigua (Say)	x	x	x		DM, GF: mt, ne
Anaxipha tinnulacita Walker and Funk					DM, GF: ne!
Anaxipha vernalis Walker and Funk					DM, GF, LH: ne!
Anurogryllus muticus (De Geer)		x			
Atlanticus americanus (Saussure)	x	x			LH: mt
Atlanticus davisi Rehn and Hebard	x	x	x	x	
Atlanticus testaceus (Scudder)	x	x			
Bucrates malivolans (Scudder)		x			
Camptonotus carolinensis (Gerstaecker)	x	x	x		DM, TR: mt, ne
Ceuthophilus brevipes Scudder				x	
Ceuthophilus gracilipes (Haldeman)	x		x	x	
Ceuthophilus guttulosus F. Walker	x				
Ceuthophilus latens Scudder	x				LH: mt
Ceuthophilus nigricans Scudder[c]			x	x	
Ceuthophilus pallidipes E.M. Walker				x	
Ceuthophilus spinosus Scudder	x				
Ceuthophilus uhleri Scudder	x				
Conocephalus brevipennis (Scudder)	x	x	x	x	GF: ne
Conocephalus fasciatus (De Geer)		x		x	DM, GF: ne!

Species	McAtee and Caudell 1917	Fox 1917	Davis 1926	Hebard 1945	Our Study*
Conocephalus nemoralis (Scudder)	x	x			
Conocephalus nigropleuroides Fox		x			
Conocephalus saltans (Scudder)	x	x			
Conocephalus spartinae (Fox)		x			DM: mt
Conocephalus stictomerus Rehn and Hebard		x			
Conocephalus strictus (Scudder)	x	x	x	x	
Cycloptilum trigonipalpum (Rehn and Hebard)					DM: mt, ne
Cyrtoxipha columbiana Caudell	x		x		DM, GF, TR: mt, ne
Euhadenoecus puteanus (Scudder)				x	
Eunemobius carolinus (Scudder)	x			x	GF, TR: mt, ne
Eunemobius confusus (Blatchley)	x		x		
Falcicula hebardi Rehn	x				
Gryllus assimilis (Fabricius)	x	x	x	x	
Gryllus pennsylvanicus Burmeister					GF: ne!
Gryllus rubens Scudder					DM, GF, LH: mt, ne!
Hapithus agitator Uhler	x	x	x		DM, GF, LH: mt, ne
Hapithus (*Orocharis*) *saltator* (Uhler)	x	x	x		DM, GF, TR: mt, ne
Microcentrum retinerve (Burmeister)	x	x	x	x	DM, GF, TR: mt, ne
Microcentrum rhombifolium (Saussure)	x	x	x	x	DM
Miogryllus verticalis (Serville)	x	x	x		
Montezumina modesta (Brunner von Wattenwyl)			x		GF, TR: mt, ne!
Myrmecophilus pergandei Bruner	x			x	
Neoconocephalus ensiger (Harris)	x	x		x	
Neoconocephalus exiliscanorus (Davis)	x	x	x		GF: ne
Neoconocephalus lyristes (Rehn and Hebard)		x			GF: mt, ne!
Neoconocephalus melanorhinus (Rehn and Hebard)		x			
Neoconocephalus nebrascensis (Bruner)					GF: ne!
Neoconocephalus palustris (Blatchley)	x	x			GF, LH: mt, ne
Neoconocephalus retusus (Scudder)	x	x			DM, GF: mt, ne
Neoconocephalus robustus (Scudder)	x	x	x		
Neoconocephalus triops (Linnaeus)	x	x			
Neocurtilla hexadactyla (Perty)	x		x	x	MV
Neonemobius cubensis (Saussure)	x	x			
Neonemobius palustris (Blatchley)	x				
Neonemobius variegatus (Bruner)	x				
Neotridactylus apicialis (Say)	x		x		
Neoxabea bipunctata (De Geer)	x		x	x	
Oecanthus exclamationis Davis	x		x	x	
Oecanthus latipennis Riley	x	x	x	x	DM: ne
Oecanthus nigricornis F. Walker		x		x	
Oecanthus niveus (De Geer)	x	x	x	x	DM, GF, TR: ne
Oecanthus pini Beutenmuller			x		
Oecanthus quadripunctatus Beutenmuller	x	x	x	x	
Orchelimum agile (De Geer)	x	x	x		
Orchelimum concinnum Scudder		x			
Orchelimum fidicinium Rehn and Hebard		x			
Orchelimum laticauda (Redtenbacher)	x	x			
Orchelimum minor Bruner	x	x			
Orchelimum pulchellum Davis					DM, LH: mt, ne
Orchelimum superbum Rehn and Hebard		x			
Orchelimum vulgare Harris	x	x	x	x	DM: ne
Phyllopalpus pulchellus Uhler	x		x		DM: mt, ne
Pterophylla camellifolia (Fabricius)	x		x	x	DM, GF, TR
Scudderia cuneata Morse		x			
Scudderia curvicauda (De Geer)	x	x	x	x	
Scudderia fasciata Beutenmuller		x		x	
Scudderia furcata Brunner von Wattenwyl	x	x	x	x	GF: mt, ne

Species	McAtee and Caudell 1917	Fox 1917	Davis 1926	Hebard 1945	Our Study*
Scudderia pistillata Brunner von Wattenwyl		x		x	
Scudderia septentrionalis (Serville)				x	
Scudderia texensis Saussure and Pictet	x	x		x	
Velarifictorus micado (Saussure)					LF, TR: ne!

[a]Current taxonomy: *Melanoplus sanguinipes atlanis* (Riley) (Cigliano et al. 2020).
[b]Current taxonomy: *Melanoplus keeleri luridus* (Dodge) (Cigliano et al. 2020).
[c]Current taxonomy: *Ceuthophilus guttulosus nigricans* Scudder (Cigliano et al. 2020).

LIST OF SPECIES

Taxa are listed alphabetically within suborders, families, and subfamilies following the nomenclature used by Cigliano et al. (2020). Common names follow Capinera et al. (2004), to the extent possible. Species new to the Potomac Gorge are marked by an exclamation point (!). The number of pinned specimens maintained in the GWMP collection is indicated in parentheses after each taxon. Sites where specimens were collected are given or are described in detail (see Table 1 for site codes used). Dates of capture are provided for specimens in the GWMP collection, indicating periods of mature adult activity. Dates separated by an en dash (–) indicate that the taxon was documented on at least one day during each month within this continuum of months, whereas dates separated by a comma represent individual observation dates. For Malaise traps set over multiple weeks, the first day of the set is used as the earliest date and the last day of the set as the latest date. Collection methods are listed as either sweep netting (ne) or Malaise trap (mt) and the numbers of specimens captured using each method are given if specimens were captured using both methods. Habitat associations and notes on the species natural history are given for some taxa.

ORDER ORTHOPTERA (grasshoppers, crickets, katydids, and relatives)

SUBORDER CAELIFERA (grasshoppers)

Family **ACRIDIDAE** (short-horned grasshoppers)
Subfamily **Acridinae** (silent slant-faced grasshoppers)
Metaleptea brevicornis (Johannson) (Clipped-wing Grasshopper) – (6); DM; 6 Aug–11 Sep; ne. Far from silent, this species crepitates when it flies. The common name of this small subfamily stems from its lack of stridulatory pegs on the hind femora. This species, the only one within the subfamily occurring in North America, ranges throughout the eastern United States, south to coastal Texas, eastern Mexico, and parts of Central and South America (Capinera et al. 2004). It was recently confirmed as an introduced species in India (northern Kerala) (Muhammedali et al. 2018). Once thought to contain two subspecies, *M. b. adspersa* Rehn of South America was recently determined to be a distinct species (Donato and Cigliano 2000).

Subfamily **Cyrtacanthacridinae** (migratory bird locusts)
Schistocerca obscura (Fabricius) (Obscure Bird Grasshopper) – (1); DM; 26 Sep; ne. This specimen measured 6 cm (2.4 in) long with a wingspan of 10 cm (3.9 in) and is

the largest grasshopper in the study area. Capinera et al. (2004) stated that this species prefers fields and open woodlands, but in the study area, it was found in a cattail marsh. The second author has also observed this species in similar habitat in Calvert County, Maryland.

Subfamily **Gomphocerinae** (stridulating slant-faced grasshoppers)
Dichromorpha viridis (Scudder) (Short-winged Green Grasshopper) – (11); GF; 5 Aug; ne.
Syrbula admirabilis (Uhler) (Handsome Grasshopper) – (1); DI; 2 Sep; ne.

Subfamily **Leptysminae** (spur-throated toothpick grasshoppers)
Leptysma marginicollis (Serville) (Cattail Toothpick Grasshopper) – (1); DM; 26 Sep; ne. This species reaches the northern limits of its East Coast distribution in southern Pennsylvania and southern New Jersey (Capinera et al. 2004). Hoffman and Roble (2012) did not cite any records of this species from Fairfax County; however, a point is plotted that is probably within the county in their mapped distribution of the species in Virginia, presumably based on the reference in Rehn and Hebard (1916) that it occurs "northward only to the vicinity of Washington, District of Columbia." Capinera et al. (2004) indicated it is found throughout Virginia; however, Hoffman and Roble (2012) documented that it is predominately a species of the Virginia Coastal Plain, with only a few inland populations known.

Subfamily **Melanoplinae** (spur-throated grasshoppers)
! *Melanoplus differentialis* (Thomas) (Differential Grasshopper) – (6); DM, GF; 5 Aug–26 Sep; ne. In Virginia, this species is limited to the western and northern fringes of the Commonwealth (Capinera et al. 2004). It was recently found in California tar pits dating from 12,000 to 120,000 years old (Heads and Wang 2013).
Melanoplus sanguinipes (Fabricius) (Migratory Grasshopper) – (2); CP; 26 Sep; ne. These two specimens were captured in a dry, open, upland area with tall, unmowed grass and herbs.
Paroxya clavuliger (Serville) (Olive-green Swamp Grasshopper) – (11); DM, LH; 26 Jun–26 Sep; mt (1), ne (10). This is a common species in the narrowleaf cattail, *Typha angustifolia* L. (Typhaceae), dominated, freshwater, tidal marshes, of the Dyke Marsh Wildlife Preserve.

Subfamily **Oedipodinae** (band-winged grasshoppers)
Arphia sulphurea (Fabricius) (Sulphur-winged Grasshopper) – (5); GF; 20–21 May; mt (1), ne (4).
Chortophaga viridifasciata (De Geer) (Northern Green-striped Grasshopper) – (3); GF; 20–21 May; 27 Jun; ne.
Dissosteira carolina (Linnaeus) (Carolina Grasshopper) – (6); GF; 27 Jun, 5 Aug; mt (1), ne (5).

Family **TETRIGIDAE** (pygmy grasshoppers)
Subfamily **Batrachideinae** (pygmy grasshoppers)
Tettigidea armata Morse (Armored Pygmy Grasshopper) – (59); DM, LH; 1 Aug–18 Sep; mt (56), ne (3).

Tettigidea lateralis (Say) (Black-sided Pygmy Grasshopper) – (33); 20–22 May; GF, TR; mt (17), ne (16). *Tettigidea lateralis* is the most encountered grasshopper along the shoreline of the Potomac River in the Potomac Gorge area of Great Falls and Turkey Run Parks. It is often found with the following species, *Paratettix cucullatus*.

Subfamily **Tetriginae** (groundhoppers)
Paratettix cucullatus (Burmeister) (Hooded Grouse Locust) – (27); DM, GF, TR; 20 May–26 Jun; mt (18), ne (9).

Family **TRIDACTYLIDAE** (pygmy mole crickets)
Subfamily **Tridactylinae**
Ellipes minuta (Scudder) (Smaller Sand Cricket) – (Figure 1); (31); GF; 20–21 May; ne. Although broadly distributed across North America, from California to Michigan and Pennsylvania, south through Mexico and Central America (Capinera et al. 2004), this species is rarely observed due to its sandy, subterranean habitat where it feeds on algae and plant roots. It can be collected near the shores of rivers or lakes during periods of high water when it is flushed from underground and climbs up herbaceous vegetation to avoid rising waters. All 31 specimens were swept from low vegetation on a broad, sandy shoreline of the Potomac River within a few days of a high-water event. Despite their common name, they are grasshoppers with front legs adapted for digging and hind legs adapted for jumping from the surface tension of water. When their long hind legs hit the surface of the water a series of flattened paddles flare outwards, hugely increasing the surface area of the leg. This larger surface can push a great amount of water, propelling the insect out of the water at over 2 m (6.6 ft) per second. Once airborne, their paddles are pulled back toward the legs by elastic hinges, streamlining their takeoff (Burrows and Picker 2010).

Figure 1. *Ellipes minuta* (Scudder) collected at Great Falls Park, Fairfax County, Virginia, on 21 May 2019.

SUBORDER ENSIFERA (crickets and katydids)

Family **GRYLLACRIDIDAE** (raspy crickets)
Subfamily **Gryllacridinae**
Camptonotus carolinensis (Gerstaecker) (Carolina Leaf-roller) – (13); DM, TR; 26 Jun–4 Aug; mt (10), ne (3). This species is the only representative of this family in the United States. It reaches its northern range limit near the study site. During the day, they shelter in leaf tubes created by cutting a flap from the edge of a leaf, folding it over their body, and holding it down with silk spun from glands on their mouthparts.

Family **GRYLLIDAE** (true crickets)
Subfamily **Gryllinae** (field crickets)
! *Gryllus pennsylvanicus* Burmeister (Fall Field Cricket) – (2); GF; 5 Aug; ne. According to the range maps in Capinera et al. (2004) and (SINA 2020), these two specimens document an eastward range extension of approximately 30 km (18.6 mi) for this species.
! *Gryllus rubens* Scudder (Southeastern Field Cricket) – (3); DM, GF, LH; 20 May, 5–28 Aug; mt (1), ne (2). The study site is very near the northern range limit for this species.
! *Velarifictorus micado* (Saussure) (Japanese Burrowing Cricket) – (2); LF, TR; 5 Sep–27 Oct; ne. This Japanese species was first detected in North America in Alabama in 1959 and has since spread northward to southeastern Pennsylvania (Capinera et al. 2004).

Subfamily **Hapithinae** (bush crickets)
Hapithus agitator Uhler (Restless Bush Cricket) – (39); DM, GF, LH; 25–26 Jun; 5–6 Aug; mt (27), ne (12).
Hapithus (*Orocharis*) *saltator* (Uhler) (Jumping Bush Cricket) – (53); DM, GF, TR; 4–6 Aug; mt (38), ne (15). A sonogram of this species is shown in Figure 2.

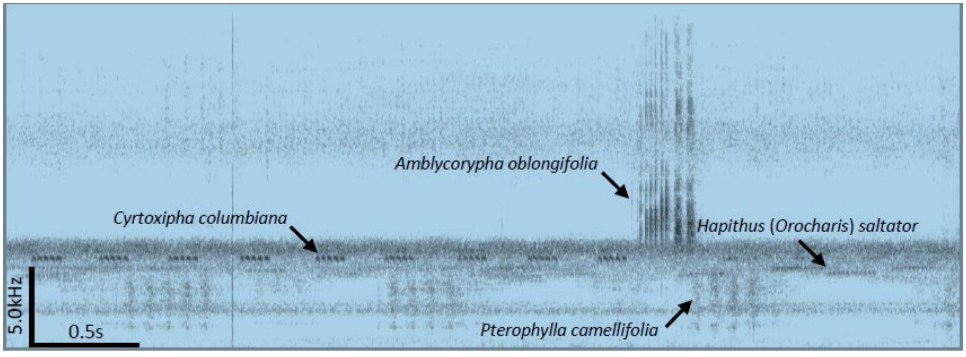

Figure 2. Sonogram of *Cyrtoxipha columbiana* Caudell, *Amblycorypha oblongifolia* (De Geer), *Hapithus* (*Orocharis*) *saltator* (Uhler), and *Pterophylla camellifolia* (Fabricius) recorded at Dyke Marsh Wildlife Preserve on 4 August 2019.

Subfamily **Oecanthinae** (tree crickets)
Oecanthus latipennis Riley (Broad-winged Tree Cricket) – (2); DM; 4 Aug; ne.
Oecanthus niveus (De Geer) (Narrow-winged Tree Cricket) – (6); DM, GF, TR; 4–6 Aug; ne.

Family **GRYLLOTALPIDAE** (mole crickets)
Subfamily **Gryllotalpinae** (mole crickets)
Neocurtilla hexadactyla (Perty) (Northern Mole Cricket) – (1); Mount Vernon Trail, 1 km (0.6 mi) north of Mount Vernon; 8 Jul; found dead on a trail.

Family **MOGOPLISTIDAE** (scaly crickets)
Subfamily **Mogoplistinae** (scaly crickets)
Cycloptilum trigonipalpum (Rehn and Hebard) (Forest Scaly Cricket) – (16); DM; 26 Sep–20 Oct; mt (13), ne (3).

Family **RHAPHIDOPHORIDAE** (camel crickets, cave crickets)
Subfamily **Ceuthophilinae**
Ceuthophilus latens Scudder (Black-sided Camel Cricket) – (1); LH; 15–31 May; mt. This is a common species that ranges from New England south along the Coastal Plain and Piedmont to Virginia and western Indiana and Tennessee (Hebard 1934, Hubbell 1936).

Family **TETTIGONIIDAE** (katydids)
Subfamily **Conocephalinae** (meadow katydids)
Conocephalus brevipennis (Scudder) (Short-winged Meadow Katydid) – (12); GF; 5 Aug; ne. In addition to the two following species, three other *Conocephalus* spp.—*C. saltans* (Scudder) (Prairie Meadow Katydid), *C. stictomerus* Rehn and Hebard (Spot-legged Meadow Katydid), and *C. strictus* (Scudder) (Straight-lanced Meadow Katydid)—have known ranges that fall well within the study area (SINA 2020) but were not documented during our study.
! *Conocephalus fasciatus* (De Geer) (Slender Meadow Katydid) – (7); DM, GF; 26 Jun, 5 Aug; ne.
Conocephalus spartinae (H. Fox) (Saltmarsh Meadow Katydid) – (3); DM; 11–26 Sep; mt. This is one of three additional species of *Conocephalus* that have narrow ranges along the Atlantic and/or Gulf coasts. SINA (2020) documents only two other records of *C. spartinae* in Virginia, one near the study area and one from the extreme southeastern corner of the state. Since *C. spartinae* was found at Dyke Marsh, it seems possible that two other species *C. aigialus* Rehn and Hebard (Seashore Meadow Katydid) and *C. nigropleuroides* Fox (Tidewater Meadow Katydid) could also possibly be found in the study area.
Neoconocephalus exiliscanorus (Davis) (Slightly Musical Conehead) – (2); GF; 5 Aug; ne.
! *Neoconocephalus lyristes* (Rehn and Hebard) (Slender Conehead) – (Figure 3); (2); GF; 27 Jun; mt (1), ne (1). *Neoconocephalus lyristes* has a disjunct geographical distribution with populations around the Great Lakes being separated from Atlantic Coast populations by nearly 650 km (403.9 mi). It is thought that during the last glacial period a corridor of suitable habitat may have connected the two regions via

the Hudson and Mohawk River valleys. One specimen collected in July 2020 by students of the first author along the New River in Giles County, Virginia, suggests that other river valleys may provide habitat suitable for *N. lyristes*. The Atlantic Coast populations of *N. lyristes* exceed those of the Midwest in average body length and cone length.

! *Neoconocephalus nebrascensis* (Bruner) (Nebraska Conehead) – (Figure 3); (1); GF; 5 Aug; ne. The eastern edge of this species range extends north to central Pennsylvania and, from there, south to Mississippi and eastern Texas. The only previous records from near the study site are more westerly, in the area of Catoctin Mountain, Maryland (Capinera et al. 2004). Several males were heard calling in Great Falls Park.

Neoconocephalus palustris (Blatchley) (Marsh Conehead) – (2); GF, LH; 5–28 Aug; mt (1), ne (1).

Neoconocephalus retusus (Scudder) (Round-tipped Conehead) – (7); DM, GF; 4 Aug–26 Sep; mt (2), ne (5).

Orchelimum pulchellum Davis (Handsome Meadow Katydid) – (13); DM, LH; 4 Aug–26 Sep; mt (1), ne (12). This is probably the most common katydid species found in the freshwater, tidal, *Typha angustifolia* marshes at Dyke Marsh Wildlife Preserve. In addition to the following species, at least seven other *Orchelimum* species could potentially occur in the area of the study site (SINA 2020).

Orchelimum vulgare Harris (Common Meadow Katydid) – (1); DM; 26 Jun; ne.

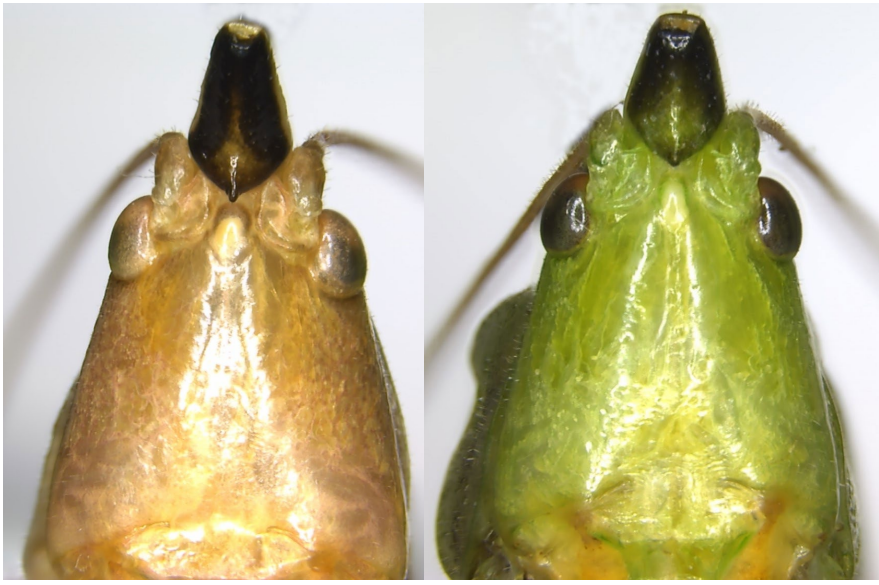

Figure 3. Left, face of *Neoconocephalus lyristes* (Rehn and Hebard) (female) collected at Great Falls Park, Fairfax County, Virginia, on 27 June 2019; right, face of *Neoconocephalus nebrascensis* (Bruner) (male) collected at the same location on 5 August 2019.

Subfamily **Phaneropterinae** (false katydids, also known as bush katydids or leaf katydids)

Amblycorypha oblongifolia (De Geer) (Oblong-winged Katydid) – (36); DM, GF, TR; 28 Jun–5 Aug; mt (21), ne (15). This was the most encountered katydid in the study area. Although it is generally an all green species (as in these 36 specimens), entirely pink forms have been reported (Capinera et al. 2004). A male was recorded at Dyke Marsh Wildlife Preserve (Figure 2).

Microcentrum retinerve (Burmeister) (Lesser Angle-wing) – (10); DM, GF, TR; 4–6 Aug; mt (5), ne (5).

Microcentrum rhombifolium (Saussure) (Greater Angle-wing) – DM; 4 Aug; recorded. The distinctive calling song of this species was heard at Dyke Marsh on 4 August 2019, but no individuals were captured during field surveys.

! *Montezumina modesta* (Brunner von Wattenwyl) (Modest Katydid) – (5); GF, TR; 16 Jul–5 Aug; mt (2), ne (3). This is the only species in this genus in the United States. It reaches the northern limits of its range at the study site.

Scudderia furcata Brunner von Wattenwyl (Fork-tailed Bush Katydid) – (7); GF; 5 Aug; mt (2), ne (5). At least two other species in this genus (*S. texensis* Saussure and Pictet [Texas Bush Kaydid] and *S. curvicauda* (De Geer) [Curve-tailed Bush Katydid]) likely occur in the study area because they have been collected nearby in the Potomac Gorge (Table 1).

Subfamily **Pseudophyllinae** (true katydids)

Pterophylla camellifolia (Fabricius) (Common True Katydid) – DM, GF, TR; 4–6 Aug; recorded. This arboreal species was heard at three sites and recorded at Dyke Marsh Wildlife Preserve on 4 August 2019 (Figure 2).

Subfamily **Tettigoniinae** (shield-backed katydids)

Atlanticus americanus (Saussure) (American Shieldback) – (9); LH; 30 Jun–14 Jul; mt. This is the only species of shieldback katydid (*Atlanticus* spp.) we found in the study area. Two other species, the larger *A. testaceous* (Scudder) (Protean Shieldback) and the smaller *A. monticola* Davis (Least Shieldback), could also occur in the GWMP but were not documented. All *Atlanticus* are flightless and characterized by an elongated pronotum that covers all or most of the short tegmina and vestigial metathoracic wings.

Family **TRIGONIDIIDAE**

Subfamily **Nemobiinae** (ground crickets)

! *Allonemobius socius* (Scudder) (Southern Ground Cricket) – (14); DM, GF, LF; 26 Jun, 5 Aug–27 Oct; ne. *Allonemobius socius* and *A. fasciatus* (De Geer) (Striped Ground Cricket) have no identifying morphological features, nor can males be distinguished by their calling songs. The two species were originally distinguished by allozyme assay (Howard 1983) and in those areas where both species occur, allozyme assay remains the only way to tell them apart. However, studies in the eastern states have shown that *A. socius* and *A. fasciatus* are southern and northern species respectively, which overlap in their distributions narrowly in Illinois and New Jersey and broadly in West Virginia (Howard and Waring 1991). The record of *A. fasciatus* from the

Potomac Gorge reported by McAtee and Caudell (1917) is likely based on mistaken identification of *A. socius*.

Eunemobius carolinus (Scudder) (Carolina Ground Cricket) – (2); GF, TR; 26 Jun–4 Aug; mt, ne. This species is not included in Capinera et al. (2004). According to the mapped range provided by SINA (2020), these two specimens represent the first records for the Virginia Coastal Plain and the second record from the Commonwealth, although records exist from coastal Maryland and Delaware. It has likely been overlooked in Virginia.

Subfamily **Trigonidiinae** (sword-tail crickets)

Anaxipha exigua (Say) (Say's Trig) – (67); DM, GF; 4–5 Aug; mt (59), ne (8). Capinera et al. (2004) did not include any species of *Anaxipha* in their field guide. According to data in Walker and Funk (2014), these 67 specimens of *A. exigua* represent the second record for Virginia. The other record is of two males collected in 1932 from Princess Anne County in the extreme southeastern corner of the Commonwealth. *Anaxipha exigua* ranges over most of the eastern United States except peninsular Florida and coastal Georgia and South Carolina.

! *Anaxipha tinnulacita* Walker & Funk (Fast-tinkling Trig) – (2); DM, GF; 4–5 Aug; ne. Walker and Funk (2014) provide one Northampton County, Virginia record of a male singing in the northern tip of the Commonwealth. The species ranges north to southern Pennsylvania and Massachusetts, south through Florida and west to Alabama. Calling songs are the best character to identify species of *Anaxipha*. As the common name implies, *A. tinnulacita* songs are 'tinkling' single pulses (wing strokes) produced at ~13 sec^{-1} at 7.2 kHz @ 25 °C.

! Anaxipha vernalis Walker & Funk (Spring Trig) – (10); DM, GF, LH; 20 May–27 Jun; ne. Before this study, *A. vernalis* was only known by song records from two localities in Fairfax and Norfolk Counties, Virginia (Walker and Funk 2014). Its documented range extends from southern New Jersey, south to northern South Carolina, and west to Missouri and Arkansas. It can be distinguished from other *Anaxipha* by a combination of characters that include spines of hind tibia fringed with hairs, hind femur without a dark stripe on the lateral face, stridulatory file with 102–112 teeth, and the ratio of the hind femur to ovipositor length range of 2.8–3.1. Male calling songs are the best way to distinguish *Anaxipha*. The song of *A. vernalis* is a continuous trill (pulse rate ~45 sec^{-1} at 5.6 kHz @ 25 °C) that is one of the first to be heard in the spring. Numerous males were heard calling, but they were difficult to collect.

Cyrtoxipha columbiana Caudell (Columbian Trig) – (5); DM, GF, TR; 16 Jul–5 Aug; mt (2), ne (3). This species is widespread throughout the park. Although the songs of hundreds of males were heard, only three specimens were collected by intensively sweeping the trees where they sang. A sonogram of this species is shown in Figure 2.

Phyllopalpus pulchellus Uhler (Handsome Trig) – (7); DM; 6 Aug; mt (1), ne (6).

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The Reticulated Beetles and Net-winged Beetles (Coleoptera: Cupedidae and Lycidae) of the George Washington Memorial Parkway, Virginia, USA

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Abstract: Eight years of Malaise trap sampling between 1998 and 2019 at four sites in a national park (George Washington Memorial Parkway) in northern Virginia captured 184 cupedid and lycid specimens. These specimens represent two cupedid species and 16 lycid species. A literature review uncovered two additional species of lycid beetles previously captured in the park that were not documented during this survey. A list of all cupedid and lycid beetle species documented from Virginia is given. Six species of lycid beetles, *Calopteron terminale* (Say), *Eropterus arculus* Green, *Greenarus thoracicus* (Randall), *Leptoceletes basalis* (LeConte), *Lopheros crenatus* (Germar), and *Punicealis munda* (Say) are reported for the first time from the Commonwealth of Virginia. Periods of adult activity, based on dates of capture, are given for each species. Relative abundance is noted for each species based on the number of captures. Images of *Punicealis munda* and *Lopheros crenatus* are provided.

Keywords: Archostemata, biodiversity, Elateroidea, national park, new state records, Potomac Gorge, Virginia.

INTRODUCTION

Family CUPEDIDAE (reticulated beetles)

Reticulated beetles are believed to belong to one of the most ancient lineage families of beetles in North America where only four species have been documented, with two of these occurring in eastern North America. They are slender, parallel-sided, and flattened, with elytra containing rows of ridged, square punctures and scale-like setae. The head possesses large dorsal warts. The antennae are 11-segmented and situated dorsally on elevated antennal tubercles. The legs can be inserted into grooves. Tarsal formula is 5-5-5 and claws are simple. Adults and larvae inhabit fungus infested wood (Young 2001, Evans 2014).

Family LYCIDAE (net-winged beetles)

Net-winged beetles have soft, flexible, elytra often strikingly reticulate with this pattern forming uniform cells, but for some groups the cells are asymmetric, or the elytra may be flat. The haemolymph passing through the centers of these ridges is noxious and is released when broken or by exudation from leg joints which deters attacking predators. Adults often display bright black and orange warning coloration, exhibit languid behavior, and fly slowly. Due to their unpalatability they are known to participate in mimicry rings, where some participants such as other beetles and moths lack protective chemicals. The tarsal formula is 5-5-5 and the claws are usually simple. Adults may attend flowers to feed on nectar. Lycid larvae are associated with rotting wood where most are believed to feed on fermenting juices but have also been reported to feed on slime molds and substrates softened by fungal compounds. Seventy-six species in 19 genera have been reported from North America, with 37 species in 12 genera found east of the Rocky Mountains (Miller 2002, Bocak and Bocakova 2010, Evans 2014).

STUDY SITE

The study site is located in Fairfax County, Virginia, and includes lands managed by the National Park Service as units of the George Washington Memorial Parkway (GWMP). Park sites that received inventory effort included Dyke Marsh Wildlife Preserve, Great Falls Park, Little Hunting Creek, and Turkey Run Park. This area covers approximately 897 ha (2216.5 ac). A map of these sites is provided in Steury (2011). The area is located between latitudes 38.985° and 38.717° and longitudes -77.246° and -77.078°. Great Falls Park and Turkey Run Park occur within the Piedmont Plateau physiographic province while all other collection sites are on the Coastal Plain. Most sites are situated along the shore of the Potomac River, and Great Falls and Turkey Run Parks border the Potomac Gorge, an area known for high species richness of plants and animals (Brown 2008). Turkey Run Park and Great Falls Park are dominated by maturing, second growth (although some trees are over 200 years old), primarily upland, rich, deciduous woodlands. The woodlands at Little Hunting Creek are drier, sandier, and have more pine and ericaceous shrubs. More open herbaceous habitats can be found in moist, narrow bands along the shore of Potomac River and in the emergent, freshwater, tidal marshes at Dyke Marsh Wildlife Preserve. The vascular flora of the GWMP is diverse, with more than 1,313 taxa recorded, 1,020 from Great Falls Park alone (Steury et al. 2008, Steury 2011).

MATERIALS AND METHODS

The current list of 20 species of cupedid and lycid beetles is compiled based on Malaise trap captures at Dyke Marsh (1998–1999), Great Falls and Turkey Run Parks (2006–2008), Little Hunting Creek (2017–2018), and Turkey Run Park (2019) and a review of the literature. A few other collection methods were occasionally used resulting in the capture of nine additional specimens of six species as follows: *Eros humeralis* (Fabricius) and *Plateros peregrinus* Green (both Lycidae), and *Tenomerga cinerea* (Say) (Cupedidae) were collected by John W. Brown as bycatch during moth surveys of Great Falls using black light (UV) bucket traps; *Calopteron reticulatum* (Fabricius) and

Dictyoptera aurora (Herbst) (both Lycidae) were hand-picked by the first author; two specimens of *D. aurora* were captured in pit-fall traps set up by Arthur V. Evans in Turkey Run and Great Falls Parks; the specimen of *Cupes capitata* Fabricius (Cupedidae) was collected by Warren E. Steiner and Jil M. Swearingen at a black light sheet in Turkey Run Park; and a specimen of *T. cinerea* was collected at Great Falls Park by Arthur V. Evans using a beating sheet. Malaise traps were set up by Edward M. Barrows (Dyke Marsh Wildlife Preserve, 1998 and 1999), Dave R. Smith (Turkey Run and Great Falls Parks, 2006–2008), Christopher Acosta, Colin Davis, and Brent W. Steury (Little Hunting Creek, 2017 and 2018), and Brent W. Steury and Mireya P. Stirzaker (Turkey Run Park, 2019). Specimens were pinned and labeled and deposited in the collections maintained at the George Washington Memorial Parkway, Turkey Run Park Headquarters in McLean, Virginia. Two species, *Caenia dimidiata* (Fabricius) and *Plateros modestus* (Say) (both Lycidae), were documented from within the study site at Great Falls Park, based on a review of the literature (Green 1952, 1953). New Virginia records were determined based on reviews of the literature provided in the literature cited. The total number of each species was recorded in order to present information on relative abundances. Records of *Eropterus* Green spp. and *Plateros* Bourgeois spp. (both Lycidae) are based on examination of the genitalia of dissected males.

For genera where the male genitalia must be examined to provide accurate determinations, the specimens were sexed by determining if a small median, apical sternite 9 (= ventrite 8) was present (male) or lacking (female). The abdomen was removed from male specimens by holding the pin with the pinned or pointed specimen in the left hand and using a pair of fine-tip forceps, the abdomen was gently moved up and down until it broke free of the metathorax at the abdominal hinge. In order to soften the tissues, the freed abdomen was placed in a vial holding water and heated until the vial was hot to the touch. The abdomen was removed from the vial and placed into a U.S. Bureau of Plant Industry miniature (25 mm [1 in] diameter) nematode watch glass holding 70% ethanol. Using a pair of fine-tip forceps to grasp the abdomen, a #1 insect pin was used to carefully separate the abdominal tergites from the ventrites at the lateral margin of the abdomen, and a second pair of forceps was then used to gently grasp and pull the male genitalia from the abdominal cavity. The male genitalia are well-sclerotized and easily cleaned of soft tissues, but when necessary to further remove soft tissues to see the genitalia clearly the male genitalia were placed into small cups holding 10% KOH. These cups were placed in Petri dishes and warmed until the soft tissues were macerated, with the genitalia then removed and placed in water for a minute, and then placed in a nematode watch glass for viewing in 70% ethanol. Once identification was completed through use of the relevant keys, the abdomen and male genitalia were fixed to the point (for pointed specimens) or to a separate card placed beneath the pinned specimens using a water-soluble glue.

RESULTS

One-hundred and nine cupedid and lycid specimens were identified to species during the study. Additionally, 66 undermined female *Plateros* and nine undetermined female *Eropterus* were collected. The 17 cupedid specimens consisted of one subfamily containing two genera and two species. The 92 lycid specimens were comprised of two

subfamilies represented by four tribes, 11 genera, and 16 species. Three species (one cupedid and two lycids), 16.7% of the total number documented by this study, are represented by only one or two specimens. Six lycid species (see list of species) are reported as new records for Virginia. The GWMP sites with the highest species richness were Turkey Run Park (12, 2 unique to this site), Little Hunting Creek (10, 4 unique), Great Falls Park (11, none unique), and Dyke Marsh Wildlife Preserve (3, none unique). The most abundant genera were *Plateros* (86 specimens, including 66 unidentified females), *Eropterus* (24 specimens, including nine unidentified females), *Tenomerga* Neboiss (16) and *Calopteron* Laporte (15). The only cupedid or lycid species recorded from the Potomac Gorge by Brown (2008) is the cupedid beetle *Tenomerga cinerea*. Thus, all 13 lycid species and the cupedid beetle *Cupes capitata* recorded from Great Falls or Turkey Run Parks in the list of species, are first records for the Potomac Gorge.

Of the lycid species known to occur in Virginia, only six species were not found: *Plateros centralis* Green (Green 1953 [Clifton, Falls Church], Downie and Arnett 1996); *P. floralis* (Melsheimer) (Green 1953 [east Falls Church], Downie and Arnett 1996); *P. sollicitus* (LeConte) (Green 1953 [Vienna], Downie and Arnett 1996); *Lyconotus lateralis* (Melsheimer) (Downie and Arnett 1996); *Calochromus perfacetus* (Say) (Horn 1868–1869 [southwestern Virginia], Downie and Arnett 1996); and *Lopheros fraternus* (Randall) (Downie and Arnett 1996).

LIST OF SPECIES

Taxa are listed alphabetically within families, tribes, and subtribes following the nomenclature and taxonomic order used by Bouchard et al. (2011). Six lycid species new to the Commonwealth of Virginia are marked by an exclamation point (!). The number of identified specimens in the collection is indicated in parentheses after each taxon. Sites where specimens were collected are given for Fairfax County: Dyke Marsh Wildlife Preserve (DM), Great Falls Park (GF), Little Hunting Creek (LH), and Turkey Run Park (TR). The periods of adult activity are given based on dates when taxa have been documented in the park. Dates separated by an en-dash (–) indicate that the taxon was documented on at least one day during each month within this continuum of months, whereas dates separated by a comma (,) represent a gap in observation dates. For traps set over multiple weeks, the first day of the set is used as the earliest date and the last day of the set as the latest date.

Family CUPEDIDAE (reticulated beetles)

Subfamily CUPEDINAE

Cupes capitata Fabricius – (1); TR; 9 Jul. Downie and Arnett (1996) recorded this beetle from Virginia.

Tenomerga cinerea (Say) – (16); DM, GF, TR; 24 Jun–9 Aug. Downie and Arnett (1996) recorded this species from Virginia.

Family LYCIDAE (net-winged beetles)

Subfamily DICTYOPTERINAE

Tribe Dictyopterini
Subtribe Dictyopterina

Dictyoptera aurora (Herbst) – (6); GF, LH, TR; 15 Mar–15 Jul, 24 Sep–6 Oct.

! *Greenarus thoracicus* (Randall) – (3); GF, TR; 1 Jun–26 Jul. Although recorded from the adjacent states of Maryland and North Carolina (Green 1951), it has not previously been documented in the literature from Virginia. It ranges across southern Canada from British Columbia to New Brunswick and in the United States south to Florida and west to Texas and California (Green 1951, Downie and Arnett 1996, Bousquet et al. 2013).

! *Punicealis munda* (Say) – (Figure 1); (10); DM, LH; 23 Apr–28 May. This rarely collected species is reported from eight other states: Arizona, Georgia, Illinois, Indiana, Kentucky, Louisiana, North Carolina, and Pennsylvania (Green 1951, Downie and Arnett 1996).

Subfamily LYCINAE

Tribe Calopterini

Caenia dimidiata (Fabricius) – Although not collected during this inventory, *C. dimidiata* was reported from the study area (Great Falls, Virginia) by Green (1952).

Calopteron discrepans (Newman) – (4); GF, TR; 22 Jun–21 Jul. Reported from Virginia by Green (1952) from Petersburg, Fredericksburg, and Great Falls.

Calopteron reticulatum (Fabricius) – (8); GF, LH, TR; 20 Jun–17 Aug. Reported from Virginia by Horn (1868–1869) from "southwestern Virginia" under the synonym *Calopteron typicum* (Newman).

! *Calopteron terminale* (Say) – (3); GF, TR; 22 Jun–21 Sep. This species has been recorded from the adjacent states of North Carolina and West Virginia (Green 1952). Its range extends from Manitoba to New Brunswick, Canada, and south to Florida and west to Colorado in the United States (Downie and Arnett 1996, Bousquet et al. 2013).

! *Leptoceletes basalis* (LeConte) – (7); LH; 1–30 Jun. This species has been recorded from the adjacent states of Maryland and North Carolina (Green 1952) but has not been documented in the literature from Virginia. Its range extends from Saskatchewan to Nova Scotia, Canada, and south to Florida and west to Arkansas and South Dakota in the United States (Green 1952, Downie and Arnett 1996, Bousquet et al. 2013).

Tribe Erotini

! *Eropterus arculus* Green – (1♂); LH; 30 Jun–17 Jul. This species has been reported from only five other states: Maine, Pennsylvania, West Virginia, Tennessee, and North Carolina (Green 1951, Downie and Arnett 1996). It is also recorded from Ontario to New Brunswick, Canada (Bousquet et al. 2013).

Eropterus trilineatus (Melsheimer) – (14♂); DM, GF; 10–30 Apr, 30 Jun–30 Jul. Horn (1868–1869) first documented this species in the Commonwealth from "southwestern Virginia."

Figure 1. *Punicealis munda* (Say). Left, dorsal habitus; right, ventral view. New state record. Little Hunting Creek, Fairfax County, Virginia, Malaise trap, 23 April–17 May 2017. Collected by Brent W. Steury, Christopher Acosta, and Colin Davis. Body length 5.5 mm (0.2 in).

Figure 2. *Lopheros crenatus* (Germar). Left, dorsal habitus; right, ventral view. New state record. Turkey Run Park, Fairfax County, Virginia, Malaise trap, 1–17 June 2019. Collected by Brent W. Steury. Body length 8.8 mm (0.3 in).

Eros humeralis (Fabricius) – (11); GF, LH, TR; 23 Apr–21 Jul. Recorded for Virginia by Green (1951) and Downie and Arnett (1996).

Erotides sculptilis (Say) – (4); GF, LH, TR; 7 Jun–6 Jul. Documented from Virginia by Green (1951) and by Downie and Arnett (1996) from "Mt. Vernon" which is adjacent to the study site.

! *Lopheros crenatus* (Germar) – (Figure 2); (1); TR; 1–17 Jun. This rarely collected species has been reported from only four other states (New Hampshire, New York, Michigan, and North Carolina), as well as from Manitoba to New Brunswick, Canada (Green 1951, Downie and Arnett 1996, Bousquet et al. 2013).

Tribe Platerodini

Plateros bispiculatus Green – (5♂); GF, LH, TR; 1 Jun–30 Jul. This species was reported from Vienna, Virginia, by Green (1953).

Plateros flavoscutellatus Blatchley – (5♂); LH; 1–20 Jun. Green (1953) reported this species from Norfolk, Roanoke, and Fredericksburg, Virginia.

Plateros lictor (Newman) – (8♂); LH; 1 Jun–17 Jul. This species was reported for Virginia by Green (1953) from Dismal Swamp, Falls Church, Mountain Lake, Richmond, and Roanoke.

Plateros modestus (Say) – Although not collected during this inventory, *P. modestus* was reported from the study area (Great Falls, Virginia) by Green (1953). It was also reported from Alexandria, Glencarlyn, Falls Church, and Rosslyn (Green 1953) and from southwestern Virginia by Horn (1868–1869).

Plateros peregrinus Green – (2♂); GF, TR; 1–20 Jun. Green (1953) recorded this species from Falls Church, Virginia.

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The Elateroid Beetles of the George Washington Memorial Parkway, Virginia, USA, including New State Records

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Abstract: Field surveys utilizing nine collection methods over a 22-year period rendered a total of 112 elateroid species (Coleoptera: Elateroidea) in four families (Cerophytidae Latreille, Elateridae Leach, Eucnemidae Eschscholtz, and Throscidae Laporte). Eleven species are reported for the first time in Virginia. Periods of adult activity, based on dates of capture, are given for each species. Relative abundance is noted for each species based on the number of specimens retained in the pinned collection. Images of seven species, including six new to Virginia, are provided. Two non-native species, *Monocrepidius exsul* (Sharp) and *Dirrhagofarsus modestus* (Fleutiaux), were documented from Virginia for the first time. *Aeolus pseudothoracicus* Lin and Johnson, **new name** is adopted as a replacement for *A. thoracicus* (Schaeffer), a junior homonym of *A. thoracicus* Candèze. Morphological variation is briefly discussed for some species.

Keywords: click beetles, Elateroidea, false click beetles, national park, new state records, Potomac Gorge, rare click beetles, throscid beetles

INTRODUCTION

Beetles of the superfamily Elateroidea (Insecta: Coleoptera), or elateroids, include some of the more conspicuous and recognizable insects in the region such as the large black-and-white Eyed Click Beetle (Eastern Eyed Elater), *Alaus oculatus* (Linnaeus) as well as the very small plain brown and inconspicuous throscids, such as *Trixagus chevrolati* (Bonvouloir). In the strictest sense of the family level taxonomy of beetles, the elateroids are beetles of the families Cerophytidae, Elateridae, Eucnemidae, and Throscidae. In a broader phylogenetic sense, some authors now include the soft-winged beetles formerly known as cantharoids in the Elateroidea. This study is focused on the hard-winged, strict-sense group of families that were collected during arthropod surveys of the George Washington Memorial Parkway (GWMP), Virginia.

Of the four families treated here, the more taxonomically and ecologically diverse Elateridae include species that primarily feed as larvae on other invertebrates, but also fungi, slime molds, bacteria, and vascular plant roots and sprouting seeds. Adult beetles

either do not feed or are opportunistic on flower parts, pollen, nectar, exudates from extra-floral nectaries, wounds, weeps, ripe and decaying fruit, and small invertebrates, often at night (Kirmse and Johnson 2020). Due to floral visitations and their pubescence, many click beetles are incidental pollinators of trees, shrubs and herbs. Larvae of most species of click beetle develop within decaying wood or humic layers of forest soils and duff, but some are found in meadows and field soils, or are riparian. In contrast, Cerophytidae, Eucnemidae, and Throscidae have larvae that feed on ligniphilic or mycorrhizal fungi in decaying wood or humic soils. Adult activity is poorly known for most species of any of these families, but most seem to be non-feeders, or feed on plant surface microfungi or on floral parts, especially pollen.

The first records of elateroid beetles from the study area were provided by Evans (2008), who documented six species of elaterid beetles from the GWMP. However, the specimen of *Aeolus scutellatus* (Schaeffer) reported by Evans (2008) is reported here as *Aeolus pseudothoracicus* Lin and Johnson. The current tally of elateroid beetles from GWMP documents 112 species.

STUDY SITE

The study sites include lands managed by the National Park Service as units of the GWMP in northern Virginia (Fairfax and Arlington Counties and the City of Alexandria). All sites are within 20 km (12.4 mi) west of the center of Washington, District of Columbia. Park sites that received inventory effort included: in Fairfax County: Dyke Marsh Wildlife Preserve, Collingwood Picnic Area, Fort Marcy, Great Falls Park, Little Hunting Creek, and Turkey Run Park; in Arlington County: Arlington Woods (at Arlington House) and Roaches Run Waterfowl Sanctuary. This area covers approximately 927 ha (2,290 ac). A map of these sites was provided in Steury (2011). Great Falls and Turkey Run Parks and Fort Marcy fall within the Piedmont Plateau physiographic province while all other collection sites are on the Coastal Plain. Most sites are situated along the shore of the Potomac River, and Great Falls and Turkey Run Parks border the Potomac Gorge, an area with a long history of biodiversity studies (Brown 2008). Great Falls and Turkey Run Parks are characterized by 61-m (200-ft) palisades of metamorphic rock cut by steep streams draining into the Potomac River. The park's vegetation includes a complex of upland and floodplain forest communities, riverside bedrock terrace prairies, and frequently flooded river shores (Fleming 2007). Although disturbed, secondary forests are common in formerly cleared areas of all park sites, much of the contemporary forest consists of maturing second-growth stands greater than 100 years old, with several white oak, *Quercus alba* L. (Fagaceae), more than 200 years old documented along the northern ridge of Great Falls Park (Abrams and Copenheaver 1999). These deciduous and mixed deciduous/coniferous stands support a thick shrub layer and lush herbaceous flora. The diversity and abundance of spring ephemeral wildflowers on the Turkey Run Park floodplain rival those found anywhere in Virginia. The largest wetland area found in the Great Falls Park is a 6 ha (14.8 ac) swamp, the remnant of an ancient Potomac River oxbow, which lies near the center of the park. The largest wetland in GWMP is the 22.3 ha (55.1 ac) emergent, freshwater, tidal marsh dominated by narrowleaf cattail, *Typha angustifolia* L. (Typhaceae), at Dyke Marsh Wildlife Preserve. The vascular flora of the GWMP is diverse, with more than 1,323 taxa

recorded (Steury 2011; George Washington Memorial Parkway Plants Database, September 2020), 1,020 from Great Falls Park alone (Steury et al. 2008). New plant species are still being discovered in GWMP. As recently as 2019 and 2020, small populations of the Virginia state rare orchids *Platanthera peramoena* (A. Gray) A. Gray (Purple Fringeless Orchid) and *Triphora trianthophora* (Sw.) Rydb. (Three Birds Orchid or Threebirds) (both Orchidaceae) were discovered in Great Falls Park by Park Ranger Jacquelyn Scholtz.

MATERIALS AND METHODS

Specimens were collected during a 22-year period (1998–2019) using a variety of sporadic survey methods targeting arthropods, including: Malaise traps, pitfall traps, Lindgren funnels, blacklight (UV) bucket traps, blacklight shone on sheets, leaf litter samples processed in Berlese funnels, beating sheets, and hand picking. Additionally, pan traps were used in Great Falls Park for two years but failed to capture any elateroid beetles. A summary of these methods, including site descriptions and latitudes and longitudes of the traps, can be found in Table 1 of Steury (2018). One additional year (2019) of Malaise trap sampling was conducted in Turkey Run Park. This trap was set at 38°57′16.3″N, 77°09′17.8″W, under a power line in linear, grassy, meadow-like habitat with abundant common milkweed, *Asclepias syriaca* L. (Asclepiadaceae); Indianhemp, *Apocynum cannabinum* L. (Apocynaceae); and goldenrod, *Solidago* L. spp. (Asteraceae); bordered on both sides by eastern deciduous forest dominated by oaks, *Quercus* L. spp. (Fagaceae); hickory, *Carya* Nutt. spp. (Juglandaceae); American beech, *Fagus grandifolia* Ehrh. (Fagaceae); and some Virginia pine, *Pinus virginiana* Mill. (Pinaceae). A few days of collecting in the District of Columbia on Theodore Roosevelt Island using black lights shown on a white sheet was employed in 2016 in deciduous, floodplain forest. Collectors included Christopher Acosta, Edward M. Barrows, John W. Brown, Colin Davis, Arthur V. Evans, J. Ray Fisher, Steven W. Lingafelter, Deblyn Mead, Erik T. Oberg, Michael J. Skvarla, David R. Smith, Warren E. Steiner, Brent W. Steury, Jil M. Swearingen, and Christopher C. Wirth. State record determinations are based on reviews of Downie and Arnett (1996), Evans (2008, 2014) and other literature cited in the list of species. A representative sample of specimens were pinned, labeled, and deposited in the collections maintained at GWMP, Turkey Run Park Headquarters in McLean, Virginia. Species too numerous to add to the pinned collection were identified and are preserved in vials of 95% ethanol containing other elateroid species captured during the same sampling event. These wet specimens are not included in the specimen counts in the list of species.

RESULTS

One-hundred twelve elateroid species (Coleoptera: Elateroidea) representing the families Cerophytidae (n=1), Elateridae (n=78), Eucnemidae (n=27), and Throscidae (n=6) were identified from the study site. Within the Elateridae the species represent six subfamilies and 13 tribes. Eucnemidae are represented by four subfamilies and eight tribes. Throscidae has only one subfamily represented in the study region. The Cerophytidae lacks family-group taxonomic subdivisions. Eleven species marked by an exclamation point in the list of species are first records for Virginia. Two non-native elateroid species

were detected. The elaterid species *Monocrepidius exsul* (Sharp), described from New Zealand (Stone 1975), and the non-native eucnemid species, *Dirrhagofarsus modestus* (Fleutiaux), introduced from Japan. Specimens of one elaterid species referred to as *Ampedus melsheimeri* (Leng), a name traditionally used for this species, are actually a different undescribed species that will be renamed when published (see Ramberg 1979). Common characteristic species found in the study area are *Agriotes oblongicollis* (Melsheimer), *Ampedus luteolus* (LeConte), *Aulonothroscus punctatus* (Bonvouloir), *Horistonotus curiatus* (Say), *Isorhipis obliqua* (Say), *Melanotus americanus* (Herbst), *Microrhagus carinicollis* Otto, and *Microrhagus pectinatus* LeConte. The most speciose genera were *Ampedus* Dejean (n=15), *Melanotus* Eschscholtz (13), *Athous* Eschscholtz (7), and *Microrhagus* Dejean (5). The only elateroid beetle documented from the Potomac Gorge (an area that includes portions of the study site and Maryland-owned islands and shoreline of the Potomac River) by Brown (2008) is *Cerophytum pulsator* (Haldeman), so all of the other 95 species reported here that were collected at Turkey Run Park, Great Falls Park, or at Fort Marcy, are first records for the gorge.

LIST OF SPECIES

Taxa are listed alphabetically within families and tribes following the nomenclature and taxonomic order used by Johnson (2002b). Eleven Elateroidea species new to the Commonwealth of Virginia are marked by a bold exclamation point (**!**). The number of specimens in the pinned collection is indicated in parentheses after each taxon. Sites where specimens were collected are given for Virginia: Arlington County: Arlington Woods (at Arlington House) (AW), and Roaches Run Waterfowl Sanctuary (RR); and Fairfax County: Collingwood Picnic Area (CP), Dyke Marsh Wildlife Preserve (DM), Fort Marcy (FM), Great Falls Park (GF), Little Hunting Creek (LH), and Turkey Run Park (TR); and for the District of Columbia: Theodore Roosevelt Island (RI). Collection methods are listed using the following abbreviations: black light shown on sheets (bl), leaf litter samples processed in Berlese funnels (bf), beating sheet (bs), blacklight (UV) bucket traps (bt), hand picking (hp), Lindgren funnel (lf), Malaise trap (mt), and pitfall trap (pf). The periods of adult activity are given based on dates when taxa were captured in the park. Dates separated by an en dash (–) indicate that the taxon was documented on at least one day during each month within this continuum of months, whereas dates separated by a comma represent individual observation dates. For traps set over multiple weeks, the first day of the set is used as the earliest date and the last day of the set as the latest date. Habitats are given for taxa collected by hand. Morphological variation is noted for some species.

Family CEROPHYTIDAE (rare click beetles)

Recognition. Cerophytid beetles have a distinctive combination of characteristics for recognition (Johnson 2002a). The body is moderately elongate, strongly convex dorsally; the head strongly deflexed and the frons protruding, the compound eyes strongly convex, and with antennae pectinate in the male and strongly serrate in the female; the pronotum is wider than long with short hind angles; and the hind legs have proportionately small coxae and elongate trochanters.

Biodiversity. Only two species occur in America north of Mexico, with one species, *Cerophytum pulsator*, in the eastern United States and the study area. This rarely collected beetle was reported from Maryland and Virginia by Steiner (2000), and previously in the District of Columbia by Ulke (1902).

Taxonomy. A summary of the family in North America was provided by Johnson (2002a), and Costa et al. (2003, 2014) described new taxa from tropical America and Africa and conducted phylogenetic analyses of the known species. A key to the world species of *Cerophytum* Latreille was provided by Costa et al. (2003, 2014), but these are not helpful in America north of Mexico where there are only two species widely separated geographically.

List of Taxa:

Cerophytum pulsator (Haldeman) – (1); GF; mt; 10–30 Apr.

Family ELATERIDAE (click beetles)

Recognition. Click beetles are generally recognized by possessing a combination of an elongate, narrow body form, with a disproportionately large and freely articulating prothorax, long slender legs, and serrate antennae. Most species produce an audible clicking or snapping noise and can propel themselves a distance many times their body length by rapidly moving the prosternal intercoxal process from a locked position into a deep mesosternal cavity (Johnson 2002b).

Biodiversity. Of the approximately 1000 species in America north of Mexico, 273 were treated in Downie and Arnett (1996) who covered the northeastern portions of North America, including the District of Columbia and Maryland. These authors included Virginia records of elateroid species documented in the northeastern portions of North America, however, the northern portions of Virginia have the same basic biota as southern Maryland. A study is pending on the elaterids of the southeastern states, including 286 species, but Virginia is not included (Blaine A. Mathison, in litt., 2020). An unpublished database by the first author has records of 101 species recorded from Maryland, 87 species from Virginia, and 113 from the District of Columbia. The region is a transition zone between the northern and southern insect biotas east of the Appalachian ranges. Seven species found in the study area are new records for Virginia based on published literature and the database mentioned above. The non-native sugarcane wireworm, *Monocrepidius exsul*, is extending its range northward. It is an invasive predator of soil invertebrates but is also known to feed on grass roots and sugarcane rhizomes and can be a nuisance pest of lawns and crops in the United States (Stone 1975).

Taxonomy. The Elateridae is fairly stable at the subfamily and tribal levels in America north of Mexico. The genus level taxonomy is relatively stable, but essential changes continue, such as the recent reassessment of species formerly assigned to *Cardiophorus* Eschscholtz (Douglas 2003), *Ctenicera* Latreille (Majka and Johnson 2008; Johnson in Mathison (submitted), *Glyphonyx* Candèze (Smith and Balsbaugh 1984) and *Limonius*

Eschscholtz (Al Dhafer 2009, Etzler 2019). Most of the genera and species of the eastern United States were treated by Downie and Arnett (1996), but older species level studies are still needed for determination of species (e.g., Van Dyke 1932; Becker 1956, 1971, 1974; Quate and Thompson 1967; Ramberg 1979; Stibick 1990). New distribution records and occasional species continue to be discovered and taxonomic clarifications are needed in some genera (e.g., Johnson 2016; Mathison and Johnson 2017; Etzler 2019, 2020a, 2020b).

List of Taxa:

Subfamily Agrypninae

Tribe Agrypnini

! *Lacon avitus* (Say) – (2); LH; lf; 15 Jul–11 Aug. *Lacon avitus* is documented in the United States from District of Columbia, Florida, Georgia, Indiana, New York, Ohio, Pennsylvania, Wisconsin, and Texas, and in Canada from Ontario and Quebec.

! *Lacon discoideus* (Weber) – (Figure 1); (14); FM, GF, LH, TR; bf, hp, lf, mt; 18 Mar–30 Jun, 16–22 Aug; under bark. This species is documented the United States in Alabama, District of Columbia, Georgia, Illinois, Indiana, Iowa, Louisiana, Nebraska, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Texas, and Wisconsin, and in Canada from Ontario.

Figure 1. *Lacon discoideus* (Weber). Great Falls Park, swamp, Malaise trap, 21 May–18 June 2009, collected by David R. Smith. Body length 10.9 mm (0.4 in).

Tribe Hemirhipini

Alaus oculatus (Linnaeus) – (7); GF, TR; hp, mt; 14 Apr–6 Jul; under bark.

Tribe Oophorini

Aeolus mellillus (Say) – (4); DM, GF; bf, bt, mt; 15 May–23 Jun, 16–22 Aug.

Aeolus pseudothoracicus Lin and Johnson, **new name** – (1); TR; bf; 15 Apr. This name is adopted from Lin (1997) as a replacement for *A. thoracicus* (Schaeffer 1917: 40), a junior homonym of *A. thoracicus* Candèze (1859: 344) from Colombia.

Conoderus bellus (Say) – (12); DM, CP, FM, GF, TR; bf, bs, bt, hp, mt; 15 Apr, 23–24 Jun, 5 Sep–5 Nov; turf grass. Evans (2008) reported the first record of this species in Virginia from GWMP.

Conoderus lividus (De Geer) – (15); DM, GF, TR; bt, mt; 19 Jun–21 Oct.

Conoderus suturalis (LeConte) – (10); DM, GF, LH, TR; mt; 19 Apr–30 Jun, 26 Sep–8 Nov.

! *Monocrepidius exsul* (Sharp) – (2); DM; mt; 30 Jul–26 Sep. This non-native species reaches the northern limit of its known East Coast distribution in Virginia. It is also documented from Alabama, Arizona, California, Florida, Hawaii, North Carolina, Oregon, South Carolina, and Texas. Formerly assigned to *Conoderus* Eschscholtz by numerous authors, this species should be regarded as congeneric with *M. pallipes* Eschscholtz (type species of *Monocrepidius* Eschscholtz), not *C. fuscofasciatus* Eschscholtz (type species of *Conoderus* Eschscholtz), and returned to its original combination.

Subfamily Cardiophorinae

Cardiophorus convexus (Say) – (10); GF, TR; mt; 23 May–22 Aug.

Esthesopus claricollis (Say) – (1); LH; mt; 17–28 Jul.

Horistonotus curiatus (Say) – (51); DM, FM, GF, LH, TR; bf, lf, mt; 12 Apr–4 Sep.

Subfamily Dendrometrinae

Tribe Athoini

Athous acanthus (Say) – (1); TR; mt; 3–17 Jul.

Athous brightwelli (Kirby) – (16); GF, LH, TR; mt; 21 May–30 Jul.

Athous cucullatus (Say) – (21); DM, GF, LH, TR; mt; 20 Jun–4 Sep.

Athous neacanthus Becker – (6); LH; mt; 18 May–30 Jun. Two of these specimens have an entirely black pronotum. The other four have an orange pronotum with a broad, black, midline.

Athous ornatipennis (LeConte) – (8); DM, GF, LH, TR; mt; 10 Apr–15 May.

Athous rufifrons (Randall) – (3); GF, TR; mt; 3–30 Jul.

Athous scapularis (Say) – (3); GF, TR; mt; 19 Jun–17 Aug.

Gambrinus confusus (LeConte) – (1); TR; mt; 23 May–5 Jun.

Gambrinus griseus (Palisot de Beauvois) – (12); DM, GF, LH, RR, TR; bf, bt, mt; 23 Apr–4 Aug.

Gambrinus plebejus (Say) – (2); FM, TR; bf, mt; 1–22 May.

Hemicrepidius bilobatus (Say) – (2); GF, TR; mt; 21 Jul–7 Sep.

Hemicrepidius hemipodus (Say) – (2); LH, RI; bl, mt; 2–20 Jun.

Hemicrepidius nemnonius (Herbst) – (28); GF, LH, TR; bt, lf, mt; 14 Jun–30 Jul. The original spelling of the species epithet is "*nemnonius*" (Herbst 1806: 29). Although many references, including Etzler's (2020a) recent revision of the genus *Hemicrepidius*, use the spelling "*memnonius*," we are retaining the use of the original spelling.

! *Hemicrepidius ruficornis* Kirby – (10); GF, LH, TR; mt; 18 Jul–8 Sep. This name was recently returned to species status, with *Hemicrepidius brevicollis* Candèze designated as a junior synonym (Etzler 2020a). The range of the species in the United States is recorded as Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, West Virginia, and Wisconsin.

Limonius basilaris (Say) – (9); GF, LH; mt; 23 Apr–28 Jul.

Limonius quercinus (Say) – (8); LH, TR; mt; 5 May–28 Jul.

Tetralimonius nimbatus (Say) – (25); FM, GF, LH; bf, mt; 10 Apr–2 Jun, 16–22 Aug.

Tribe Prosternini

Corymbitodes tarsalis (Melsheimer) – (1); GF; mt; 10–30 Apr.

Ctenicera pyrrhos (Herbst) – (30); GF, TR; bt, mt; 7 Jun–30 Jul. This species will be generically reassigned in a pending paper.

Neopristilophus aethiops (Herbst) – (4); GF, TR; bs, hp, mt; 14 Apr–30 Jun.

Pseudanostirus hamatus (Say) – (5); AW, GF, TR; bf, mt; 10 Apr–20 May.

Sylvanelater cylindriformis (Herbst) – (2); GF, TR; mt; 18 Mar–9 Apr.

Tribe Oxynopterini

Melanactes piceus (De Geer) – (2); GF; bs; 24 Jun.

Subfamily Elaterinae

Tribe Adrastini

! *Glyphonyx quietus* (Say) – (2); DM, TR; mt; 1–22 May, 7–19 Jul. This species is reported from Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Missouri, Mississippi, North Carolina, Nebraska, Ohio, Pennsylvania, Tennessee, and Texas.

! *Glyphonyx recticollis* (Say) – (15); DM, GF, LH, TR; mt; 10 Apr–8 Jul, 5 Sep–21 Oct. In the United States, this species is documented from Alabama, Arkansas, Connecticut, District of Columbia, Georgia, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, and Wisconsin, and in Canada, from Ontario.

Glyphonyx testaceus (Melsheimer) – (12); GF, TR; lf, mt; 10 Apr–30 Jun, 5–24 Aug.

Tribe Agriotini

Agriotes insanus Candèze – (3); DM, TR; mt; 12 Apr–20 May.

Agriotes oblongicollis (Melsheimer) – (39); GF, LH, TR; lf, mt; 10 Apr–30 Jul.

Tribe Ampedini

Ampedus areolatus (Say) – (14); DM, GF, LH, TR; mt; 10 Apr–21 Jun, 19 Sep–21 Oct. This is a highly variable species in which the pronotum can be orange or black and the apical half of the elytra can be all black or with an oblong orange spot on each elytron.

Ampedus collaris (Say) – (3); GF, TR; lf, mt; 10 Apr–20 May. *Ampedus collaris* and *Ampedus palans* (LeConte) are closely related species. Diagnostic differences are based on male genitalia, mean length, and the proportions of the pronotal length and width to the elytral length and width.

Ampedus impolitus (Melsheimer) – (8); GF, LH, TR; pf, mt; 28 Apr–21 Jul.

Ampedus linteus (Say) – (2); LH; mt; 23 Apr–5 May.

Ampedus luteolus (LeConte) – (39); DM, GF, LH, TR; mt; 10–30 Apr, 1 Jun–21 Oct.

Ampedus melsheimeri (Leng) – (9); DM, GF, LH, TR; mt; 10 Apr–21 Oct. This is the name traditionally used for this species; however, it is actually a different undescribed species that will be renamed when published.

Ampedus militaris (Harris) – (3); GF, TR; mt; 1 May–30 Jun.

Ampedus molestus (LeConte) – (11); GF, LH, TR; mt; 10 Apr–30 Jun.

Ampedus nigricollis (Herbst) – (17); AW, DM, GF, LH, TR; bf, hp, mt, pf; 14 Apr–13 Jul; under bark.

Ampedus palans (LeConte) – (2); LH, TR; mt; 23 Apr–22 May.

Ampedus rubricollis (Herbst) – (6); GF, LH; mt; 10 Apr–19 May.

Ampedus sanguinipennis (Say) – (Figure 2); (15); DM; mt; 12 Apr–23 Jul, 26 Sep–5 Dec.

Ampedus sayi (LeConte) – (1); GF; mt; 1–20 May.

Ampedus sellatus (Leng) – (1); LH; mt; 23 Apr–5 May.

! *Ampedus semicinctus* (Randall) – (Figure 3); (12); GF, TR; mt; 21 May–26 Jul. This species is documented in the United States from Connecticut, District of Columbia, Indiana, Maine, Massachusetts, Michigan, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, and Wisconsin, and in Canada from New Brunswick, Nova Scotia, Ontario, Prince Edward Island, and Quebec.

Anchastus binus (Say) – (2); GF, RI; bl, bt; 20 Jun, 3 Aug.

Melanotus americanus (Herbst) – (33); DM, GF, LH, RR, TR; bf, lf, mt, pf; 12 Apr–4 Sep.

Melanotus castanipes (Paykull) – (1); TR; mt; 23 May–5 Jun.

Melanotus communis (Gyllenhal) – (17); AW, DM, GF, LH, TR; bf, mt; 17 Apr–21 Oct.

Melanotus depressus (Melsheimer) – (1); GF; bt; 20 Jun.

Melanotus hyslopi Van Zwaluwenburg – (5); DM, GF, TR; hp, mt; 10 Apr–30 Jun; under loose bark.

Melanotus ignobilis Melsheimer – (1); GF; mt; 30 Jun–13 Jul.

Melanotus miscellus Quate – (5); DM, GF, TR; mt; 7 Jul–11 Oct.

Melanotus morosus Candèze – (13); GF, LH, TR; mt; 23 Apr–28 Jul.

Melanotus pertinax (Say) – (1); GF; mt; 23 May–5 Jun.

Melanotus sagittarius (LeConte) – (2); DM; mt; 10 May–6 Jun.

Melanotus similis (Kirby) – (20); GF, LH, TR; bt, mt; 18 Mar–21 Oct.

Melanotus testaceus (Melsheimer) – (1); LH; mt; 23 Apr–5 May.

Melanotus verberans (LeConte) – (9); GF, LH, TR; bt, mt; 23 Apr–21 Jul, 19 Sep–21 Oct.

Figure 2. ***Ampedus sanguinipennis*** **(Say).** Dyke Marsh Wildlife Preserve, ecotone, Malaise trap, 10–17 May 1998, collected by Edward M. Barrows. Body length 8.1 mm (0.3 in).

Figure 3. ***Ampedus semicinctus*** **(Randall).** Great Falls Park, swamp, Malaise trap, 21 May–18 June 2009, collected by David R. Smith. Body length 10.1 mm (0.4 in).

Tribe Dicrepidiini
Dipropus simplex (LeConte) – (1); LH; mt; 17–28 Jul.

Tribe Elaterini
Orthostethus infuscatus (Germar) – (1); LH; lf; 30 Jun–15 Jul.
Parallelostethus attenuatus (Say) – (9); GF, TR; pf, mt; 16 Jun–4 Aug.
Sericus viridanus (Say) – (6); LH; mt; 23 Apr–5 May.
Dolerosomus silaceus (Say) – (15); LH; mt; 23 Apr–30 May, 28 Jul–11 Aug. The dorsal habitus of these specimens varies from black to pale brown, but always with a paler elytral base.

Tribe Megapenthini
Megapenthes limbalis (Herbst) – (4); GF, LH; mt; 28 Jun–30 Jul.

Subfamily Lissominae

Tribe Lissomini
Drapetes exstriatus (Say) – (4); DM, GF; mt; 15 Jun–4 Sep. This name replaces *D. geminatus* (Say) of most literature (see Johnson 2015).

Subfamily Negastriinae

Negastrius choris (Say) – (1); TR; mt; 23 May–5 Jul.
Paradonus pectoralis (Say) – (4); GF, TR; bl, mt; 1–20 May, 7 Jun.

Family EUCNEMIDAE (false click beetles)

Recognition. Eucnemid beetles are superficially similar to click beetles in general body form, that is, an elongate body, often somewhat parallel-sided and shallowly to moderately convex dorsally. They differ from click beetles by having a globular hypognathous head (mouthparts directed ventrally), the labrum attached beneath an expanded clypeus and usually not visible; frons strongly narrowed between antennal insertions, then strongly expanded anterad; genae with antennal grooves; antennal scape dorsally expanded and pedicel attached eccentrically; hypomera usually with antennal grooves; and many species with tarsomere 1 of males bearing spinose sex combs (Downie and Arnett 1996, Muona 2000, 2002) and excretory pits near the elytral apices (Otto and Gruber 2016). Most eucnemids are known to snap, but less readily and with less force than most elaterids.

Biodiversity. Downie and Arnett (1996) treated 38 species in the northeastern region. Muona (2002) cited 85 species of eucnemid beetles from the Nearctic Region, with most species found in America north of Mexico. McClarin (2006) reported 92 described species from the same region, with new species or new introduced species being discovered frequently. Hoffman et al. (2009) reported 32 species for Virginia. Here, 27 species are identified from the study area, including one, *Dirrhagofarsus modestus* which is introduced from Japan. *Dromaeolus turnbowi* Muona and *Dirrhagofarsus modestus* are recorded from Virginia for the first time by this study. These species represent 4 of 6

subfamilies, and 7 of 12 tribes known from the eastern United States. The tribe Schizophilinae was recently elevated to sub-familial rank (Muona and Teräväinen 2020).

Taxonomy. Muona (2000) revised the family for the Nearctic biogeographic region, but additional species were described and reported later. There are 21 genera reported from the northeastern United States, with 37 genera from America north of Mexico (Muona 2000). Keys to the genera and many of the species of the study area were provided by Downie and Arnett (1996), Muona (2000, 2002), and McClarin (2006). Otto (2013, 2015) focused on describing larvae and new species mostly from the eastern United States.

List of Taxa:

Subfamily Eucneminae

Tribe Mesogenini
Stethon pectorosus LeConte – (3); GF, TR; bl, bt, hp, mt; 18–23 Jun.

Subfamily Macraulacinae

Tribe Macraulacini
Onichodon orchesides Newman – (7); LH, TR; mt; 7 Jun–11 Aug.
Deltometopus amoenicornis (Say) – (7); DM, GF, TR; mt; 10–30 Apr, 1 Jul–7 Sep.
Dromaeolus cylindricollis (Say) – (5); GF, TR; mt; 30 Jun–4 Aug.
! *Dromaeolus turnbowi* Muona – (Figure 4); (12); GF, TR; mt; 10–30 Apr, 22 Jun–30 Jul. This species is documented from Alabama, Florida, Georgia, Louisiana, Mississippi, Ohio, Pennsylvania, Tennessee, Texas, and West Virginia.
Fornax appalachiensis Otto – (3); GF, LH; mt; 17–30 Jul. This species was recently described by Otto (2020).
Isarthrus rufipes (Melsheimer) – (11); DM, GF, TR; mt; 7 Jun–30 Jul.
Thambus horni Muona – (16); DM, GF, LH, TR; mt; 10 Apr–4 Sep.

Tribe Nematodini
Nematodes atropos (Say) – (13); DM, LH, TR; lf, mt; 28 May–23 Jul.
Nematodes penetrans (LeConte) – (7); DM, LH, TR; lf, mt; 2 Jun–15 Jul.

Subfamily Schizophilinae

Schizophilus subrufus (Randall) – (8); GF, LH, TR; mt; 18 May–7 Sep.

Subfamily Melasinae

Tribe Melasini
Isorhipis obliqua (Say) – (57); DM, GF, LH, TR; bs, mt; 23 Apr–21 Jul.
Isorhipis ruficornis (Say) – (1); TR; mt; 1–20 May.
Melasis pectinicornis Melsheimer – (3); GF, LH; mt; 10 Apr–2 Jun.

Figure 4. *Dromaeolus turnbowi* Muona. Great Falls Park, quarry, Malaise trap, 10–30 April 2009, collected by Brent W. Steury. Body length 7.5 mm (0.3 in).

Tribe Epiphanini

Hylis terminalis (LeConte) – (5); DM, GF, LH; mt; 2–30 Jun.

Tribe Xylobiini

Xylophilus crassicornis Muona – (2); LH, TR; mt, pf; 18 May–17 Jun. The extent of the dark cloud in the center of the elytra is greatly reduced in one specimen, the elytra thus appearing more orange.

Tribe Dirhagini

Dirrhagofarsus ernae Otto – (4); GF, TR; bt, mt; 10 Apr–27 May, 7–21 Jul.

Dirrhagofarsus lewisi (Fleutiaux) – (13); DM, GF, LH, TR; bs, bt, mt; 5 May–30 Jul.

! *Dirrhagofarsus modestus* (Fleutiaux) – (Figure 5); (4); GF, LH, TR; mt; 5 May–6 Jul. This species has been recently recognized as part of the North American fauna. It is native to Japan. Robert Otto is currently working on documenting the species range in North America. It is widely introduced throughout the eastern United States (Robert L. Otto, in litt., 2020).

Microrhagus breviangularis Otto – (1); TR; mt; 22 Jun–6 Jul.

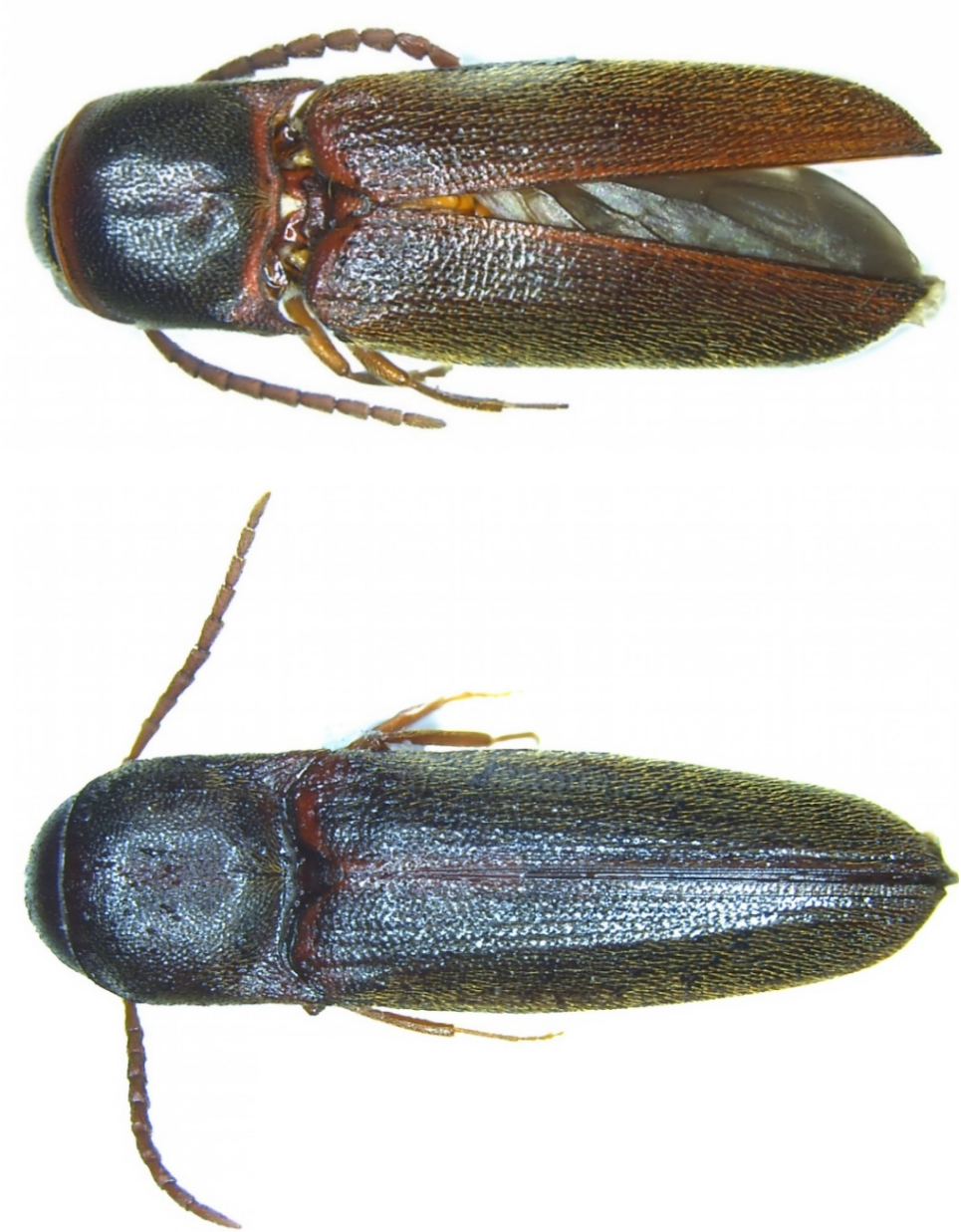

Figure 5. ***Dirrhagofarsus modestus*** **(Fleutiaux). Top:** Turkey Run Park, Malaise trap, 22 June–6 July 2006, collected by David R. Smith. Body length 5.0 mm (~0.2). **Bottom:** Great Falls Park, swamp, Malaise trap, 19–30 June 2009, collector Brent W. Steury. Body length 6.0 mm (~0.2 in).

Microrhagus carinicollis Otto – (37); DM, GF, LH, TR; mt; 20 Jun–4 Sep.
Microrhagus pectinatus LeConte – (31); GF, LH, TR; lf, mt; 12 Apr–30 Jun.
Microrhagus subsinuatus LeConte – (12); DM, GF, LH, TR; mt; 28 May–30 Jul.
Microrhagus triangularis (Say) – (3); DM, GF, TR; mt; 2–30 Jul.
Entomophthalmus rufiolus (LeConte) – (12); DM, GF, LH, TR; mt; 10 Apr–4 Sep.
Rhagomicrus bonvouloiri (Horn) – (22); DM, GF, LH, TR; mt; 31 May–4 Sep.
Sarpedon scabrosus Bonvouloir – (1); DM; mt; 2–18 Jul.

Family THROSCIDAE (throscid beetles)

Recognition. Throscid beetles are red-brown to black, and small, 1.0–3.0 mm (0.04–0.12 in) length range in the study area. The small size, capitate antenna, an oblong silhouette, shallowly convex to depressed dorsum, a deflexed head, a pronotum that fits tightly against the bases of the elytra, and retractile legs, all give the body a compact form (Johnson 2002c).

Biodiversity. There are 20 species of throscid beetle in America north of Mexico, most of which are found in the eastern portions. Six species were recovered in the study area, four species of *Aulonothroscus* Horn and two species of *Trixagus* Kugelann. *Aulonothroscus distans* Blanchard and *A. nodifrons* Blanchard were not previously reported from Virginia. *Aulonothroscus nodifrons* is a notable record for Virginia as it was previously recorded only from southern Texas (Blanchard 1917, King 2015). Further morphological study is needed to ascertain whether the Virginia specimens are actually *A. nodifrons* or a closely related and undescribed species.

Taxonomy. The family is subdivided into two subfamilies and four genera, globally. The subfamily Throscinae is the only one with representatives in the eastern United States. Three genera of throscids are known from America north of Mexico, with *Aulonothroscus* and *Trixagus* in the eastern United States (Johnson 2002c). *Trixagus* was revised and the species keyed by Yensen (1975, 1980), but the six species in the region remain difficult to determine without dissection of the male genitalia. *Aulonothroscus* was last revised by Blanchard (1917) and little has since been published on the North American species since. The genus is presently under taxonomic study by the first author.

List of Taxa:

Subfamily Throscinae

Aulonothroscus convergens (Horn) – (19); GF, LH, TR; mt; 5 May–28 Jul.
! *Aulonothroscus distans* Blanchard – (Figure 6); (2); TR; mt; 1–20 May, 1–15 Jul. This species has been previously reported only from Massachusetts, New York, and North Carolina.
! *Aulonothroscus nodifrons* Blanchard – (Figure 7); (3); TR; mt; 19 Sep–21 Oct. *Aulonothroscus nodifrons* is known only from the Lower Rio Grande Valley of Texas.
Aulonothroscus punctatus (Bonvouloir) – (36); GF, LH, TR; mt; 1 May–22 Aug.
Trixagus carinicollis (Schaeffer) – (27); DM, GF, LH, TR; mt; 1 May–21 Oct.
Trixagus chevrolati (Bonvouloir) – (10); DM, FM, TR; bf, mt; 1 May–7 Jul.

Figure 6. ***Aulonothroscus distans*** **Blanchard.** Turkey Run Park, gulch, Malaise trap, 1–15 July 2009, collected by Brent W. Steury. Body length 3.0 mm (0.1 in).

Figure 7. *Aulonothroscus nodifrons* Blanchard. Turkey Run Park, west end, Malaise trap, 19 September–21 October 2008, collected by Brent W. Steury. Body length 2.7 mm (0.1 in).

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The Tumbling Flower Beetles (Coleoptera: Mordellidae) of the George Washington Memorial Parkway, Virginia, USA

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ABSTRACT: Examination of 3038 mordellid beetles collected over a 22-year period from a national park site (George Washington Memorial Parkway) in Virginia, and a review of collections maintained at the Smithsonian Institution, National Museum of Natural History, Washington, District of Columbia, rendered 66 mordellid taxa containing 65 species in 15 genera and three tribes. Four new species descriptions resulted from this study. Twenty-six species are reported for the first time from Virginia. Of the six capture methods utilized, Malaise traps proved to be the most successful. Periods of adult activity, based on dates of capture, are given for each species. Relative abundance is noted for each species based on the number of captures. Sex ratios and notes on morphological characteristics and habitats are provided for some species. Females of two recently described species are figured and images are provided for 35 taxa.

Keywords: biodiversity, citizen science, insects, Malaise traps, national park, new species, new state records, pintail beetles, Potomac Gorge.

INTRODUCTION

Mordellidae (Coleoptera: Polyphaga) includes a relatively homogeneous group characterized by a triangular-shaped, deflexed head; humped back; apically tapered elytra; five visible abdominal sterna; an exposed, awl-shaped pygidium; large metasternum (coxal plate) with a glabrous polished area basally; prostrate spiny ridges (sometimes called combs) at various locations on the tibiae and usually the tarsi of the hind legs; eleven antennomeres; and a tarsal formula of 5-5-4. The orientation and number of the spiny hind leg ridges have often been used as the basis for taxonomic keys (Liljeblad 1945, Ciegler 2014), however, these can vary within species and even between hind legs of an individual (Jackman and Lu 2002). Palpi and antennae can be important distinguishing features, but they can vary between sexes. The color of the head, pronotum, and elytra can also vary, as can the orientation of elytral pubescence in some species. Adults are phytophagous, feeding primarily on pollen, especially of umbelliferous and composite plants. They are strong fliers and probably important native pollinators due to their pollenophagous life histories. Oviposition is generally on plant stems (Jackman and Lu 2002).

Larvae are primarily herbivores and develop inside stems or leaves of woody plants and herbs, fungi, or decaying wood (Jackman and Lu 2002), but will opportunistically prey on other stem-inhabiting larvae (Rathcke 1976). A summary of known larval food plants is given by Ford and Jackman (1996). There appears to be no correlation between adult foraging behavior and larval food plant associations (Jackman and Lu 2002).

There are at least 1,500 species in 113 genera worldwide. There are only two subfamilies. Ctenidiinae Franciscolo contains one species from South Africa and Mordellinae Latreille with 5 tribes (two restricted to the old world). Seventeen genera containing at least 205 species have been documented in North America (Jackman and Lu 2002). Ciegler (2014) reported 55 species from South Carolina. We present the first known survey in Virginia, however Liljeblad (1945) recorded many species from Plummers Island, Maryland, adjacent to the survey area within the Potomac Gorge.

STUDY SITE

The study site is in Virginia (Fairfax County and the City of Alexandria) and includes lands managed by the National Park Service as units of the George Washington Memorial Parkway (GWMP). Park sites that received inventory effort included Dyke Marsh Wildlife Preserve, Great Falls Park, Little Hunting Creek, and Turkey Run Park, in Fairfax County, and Daingerfield Island, in the City of Alexandria. This area covers approximately 897 ha (2,217 ac). Great Falls and Turkey Run Parks fall within the Piedmont physiographic province while all other collection sites are on the Coastal Plain. Most sites are situated along the shore of the Potomac River, and Great Falls and Turkey Run Parks border the Potomac Gorge, an area known for high species richness of plants and animals (Brown 2008). Turkey Run Park and Great Falls Park are dominated by maturing, second growth (although some trees are over 200 years old [Abrams and Copenheaver 1999]), primarily upland, rich, deciduous woodlands. The woodlands at Little Hunting Creek are drier, sandier, and have more pine and ericaceous shrubs. More open herbaceous habitats can be found in moist, narrow bands along the shore of Potomac River and in the emergent, freshwater, tidal marshes at Dyke Marsh Wildlife Preserve. The vascular flora of the GWMP is diverse, with more than 1,313 taxa recorded, 1,020 from Great Falls Park alone (Steury et al. 2008, Steury 2011).

MATERIALS AND METHODS

The current list of 66 taxa is the result of 10 years of survey effort over a 22-year period (1998–2019) targeting arthropods using six collecting techniques as follows: yellow, blue, and white pan traps (96.1 mm [3.25 oz] white soufflé cups painted fluorescent yellow, fluorescent blue, or left non-fluorescent white and filled with a dilute mixture of detergent and water) in Great Falls Park (June 2007–May 2008); Malaise traps set at Dyke Marsh (1998–2000), Great Falls and Turkey Run Parks (2006–2009), and Little Hunting Creek (2017–2018); Lindgren funnel traps set at Dyke Marsh, Great Falls Park, Little Hunting Creek, and Turkey Run Park (2010); black-light shone on sheets at Great Falls and Turkey Run Parks (2006 and 2010); beating sheets used during the Potomac Gorge BioBlitz and occasionally at other times (2006 and 2010); and occasional opportunistic collecting by hand. A review of the collections at the Smithsonian

Institution, National Museum of Natural History (USNM), Washington, District of Columbia, uncovered one species from GWMP that was not found during the survey. Specimens were pinned and labeled and deposited in the collections maintained at the GWMP, Turkey Run Park Headquarters in McLean, Virginia. Holotypes of new species were deposited at the USNM. New Virginia records were determined based on reviews of Bright (1986), Downie and Arnett (1996), Evans (2008), and Liljeblad (1945). Mordellid specimens were sorted from Malaise trap collection jars by citizen science volunteers in the GWMP bug lab. Collectors were Christopher Acosta, Edward M. Barrows, John W. Brown, Collin Davis, Dana M. DeRoche, Arthur V. Evans, Thomas J. Henry, Steven W. Lingafelter, Deblyn Mead, David R. Smith, Warren E. Steiner, Brent W. Steury, and Christopher C. Wirth.

As noted above, the number of the spiny ridges on the hind leg has been important for designating species in taxonomic keys of Mordellidae. However, it has been recognized that these ridge counts are variable, especially in the addition of shorter ridges adjacent (usually anterior) to the main ridges. In this paper we used parentheses to indicated a short ridge: thus, a ridge count of 3-3(4)-1(2) indicates that three strong ridges are present on each hind tibia, three strong ridges and one weak ridge are present on the first (basal) tarsomere, and there is one strong ridge and one weaker ridge on the second tarsomere. We defined a weak ridge as consisting of at least 3 spines and less than half the length of a strong ridge. Occasionally, a strong ridge that should be present is absent. This is also expressed using parentheses. For example, a count expressed as 4(3) indicates that occasionally the fourth ridge is absent and only three (generally strong) ridges are observed. Leg ridges are black in all specimens. By convention the apical ridge of the tibia (which is always present) is not counted.

RESULTS

Examination of 3038 mordellids collected from the study site rendered 66 mordellid taxa in 15 genera and three tribes. *Mordella melaena* Germar, collected in 1915 at Great Falls Park, was added to the tally by reviewing the collections at USNM. *Tolidomordella discoidea* (Melsheimer) contains two subspecies, *T. d. discoidea* (Melsheimer) and *T. d. flaviventris* (Smith). The report of *Mordellistena andrea* LeConte from Great Falls Park by Evans (2008) is based on a misidentified specimen of a female *Mordellina ancilla* (LeConte) (see discussion below under *M. ancilla*). Four species found during the survey were described as new to science (Steury and Steiner 2020). Twenty-six species are reported for the first time from Virginia. The GWMP sites with the highest taxon richness of mordellid beetles were Great Falls Park (51), Turkey Run Park (48), Little Hunting Creek (44), and Dyke Marsh Wildlife Preserve (38). Malaise traps were the most successful method of capturing mordellid beetles, yielding 64 of 65 taxa captured during this survey, further evidence that these beetles are strong fliers with substantial dispersal power. The next most productive method of capture was beating sheets which yielded only 16 taxa. The most commonly collected mordellid beetles during this study were *Glipostenoda ambusta* (LeConte) (305), *Falsomordellistena pubescens* (Fabricius) (295), *Mordellistena trifasciata* (Say) (271), *Falsomordellistena hebraica* (LeConte) (155), *Falsomordellistena bihamata* (Melsheimer) (129), *Mordellistena limbalis* (Melsheimer) (121), *Mordellistena liturata* (Melsheimer) (109), *Mordellaria serval* (Say) (107) and

Mordellina pustulata (Melsheimer) (97). The most species rich genera were *Mordellistena* Costa (29) and *Mordellina* Schilsky (12).

The 66 mordellid taxa recorded from GWMP is more than recorded from South Carolina (55) (Ciegler 2014) and only two fewer than reported for Wisconsin (Lisberg and Young 2003). Brown (2008) did not include mordellid beetles in the list of the invertebrate fauna of the Potomac Gorge, between Virginia and Maryland, however, 60 taxa were documented from this area in Turkey Run and Great Falls Parks during this study and Liljeblad (1945) includes additional species from this area collected on Plummers Island, Maryland.

Much remains to be learned about the taxonomy of mordellid beetles in eastern North America. That four new species were found during 10 years of sampling effort in an area of only 897 ha (2,217 ac) indicates that more new species are probably waiting to be discovered and described. Some taxa figured in this paper are probably new to science, but additional specimens are needed for them to be described and/or genetics work is required. Some older species descriptions lack sufficient detail to accurately discern a proper concept of the species and some holotypes are in bad condition or are poorly mounted. Sexual dimorphism in many species has undoubtedly led to males and females of the same species being described as separate species. During the study at least four taxa collected in series were represented only by male specimens: *Mordellina semiusta* (LeConte) (n=13), *Mordellina wimbledon* Steury and Steiner (n=3), *Mordellistena smithi* Dury (n=2), *Mordellistena* Costa sp. 1 (n=6), and probably *Mordellistena aspersa* (Melsheimer) (4♂, 1 undetermined) and *Mordellistena fuscata* (Melsheimer) (19♂, 10 undetermined) as well. Two taxa were documented only by females: *Mordellina ancilla* (n=7), *Mordellistena bicinctella* LeConte (n=5), and probably *Mordellistena militaris* LeConte (25 of 40 specimens determined as female, 15 left undetermined). Future field work should include attempts to capture mated pairs, perhaps using methods such as those described by Steury (2019). More dissections and imaging of the parameres of morphologically similar males would probably provide clues concerning how to separate those species but does not help with properly assigning females to males of the same species. Lab work focusing on analyzing the DNA of a series of recently collected morphospecies would be invaluable to the future of mordellid taxonomy.

LIST OF SPECIES

Taxa are listed alphabetically within families and tribes following the nomenclature and taxonomic order used by Ciegler (2014). Twenty-six mordellid species new to the Commonwealth of Virginia are marked by an exclamation point (!). The number of specimens in the collection is indicated in parentheses after each taxon. The repository is stated after this number if the specimen is not located at GWMP. Sites where specimens were collected are given for City of Alexandria: Daingerfield Island (DI); and Fairfax County: Dyke Marsh Wildlife Preserve (DM), Great Falls Park (GF), Little Hunting Creek (LH), and Turkey Run Park (TR). Collection methods are listed using the following abbreviations: black light shown on sheets (bl); beating sheet (bs); hand collecting (hc); Lindgren funnel (lf); Malaise trap (mt); and pan trap (pt). The periods of adult activity are given based on dates when live taxa have been collected in the park.

Dates separated by an en dash (–) indicate that the taxon was documented on at least one day during each month within this continuum of months, whereas dates separated by a comma (,) represent a gap in collection dates. For traps set over multiple weeks, the first day of the set is used as the earliest date and the last day of the set as the latest date. The year and collector is given for the one specimen documented from GWMP by a specimen at USNM that was not captured during this study. Plant associations or habitats are given for taxa collected by hand.

Family Mordellidae – tumbling flower beetles, also known as pintail beetles

Subfamily Mordellinae

Tribe Mordellini Smith

Glipa hilaris (Say) – (12); DM, GF, TR; bs, mt; 20 Jun–17 Aug.

Glipa oculata (Say) – (32); DM, GF, LH, TR; bs, mt; 14 Jun–17 Aug.

Hoshihananomia octopuncta (Fabricius) – (72); DM, GF, LH, TR; bs, mt; 19 May–7 Sep.

Mordella atrata Melsheimer – (15); DI, DM, GF, LH; bs, hc (on Queen Anne's lace, *Daucus carota* L., and lateflowering thoroughwort, *Eupatorium serotinum* Michx.), mt; 2 Jun–2 Sep.

Mordella marginata Melsheimer – (67); DM, GF, LH, TR; bs (on lizard's tail, *Saururus cernuus* L.), mt, pt; 2 Jun–4 Sep.

Mordella melaena Germar – (1, USNM); GF; hc (on spotted beebalm, *Monarda punctata* L.); 11 August 1915, W. L. McAtee.

Mordella obliqua LeConte – (23); GF, LH; bl, bs (on *Saururus cernuus*), mt; 23 May–4 Sep. This beautiful black mordellid has iridescent elytra with turquoise and lavender reflections. It has likely been confused with the morphologically similar *Mordella lunulata* Helmuth. We used male specimens at USNM determined by Emil Liljeblad to compare these two species. Not all characters used in keys provided by Liljeblad (1945) or Ciegler (2014) were sufficient for distinguishing them. Liljeblad and Ciegler both stated that *M. obliqua* differs in having a longer oblique humeral vitta (although Liljeblad stated it was "sometimes indistinct") and a rounded (rather than subtruncate) apex of the scutellum. We found that length of the humeral vitta and shape of the scutellum, which is fringed in pubescence that often obscures its shape (Figure 1, bottom), were not sufficient for distinguishing *M. obliqua* and *M. lunulata*. However, at least in males, the antennomeres are much broader in *M. lunulata* (Figure 1, top left) than in *M. obliqua* (Figure 1, top right). This is especially noticeable in the shape and width of antennomere four.

! *Mordellaria fascifera* (LeConte) – (11; 5♂, 4♀, 2 undetermined); LH, TR; mt; 2 Jun–17 Aug. (Figure 2). Previous records of this rarely collected mordellid are from Florida, Texas, and the District of Columbia (Bright 1986). Although not mentioned in other descriptions of this species, in these specimens the silvery grey pubescence of the median elytral band extends along the suture to the base.

! *Mordellaria serval* (Say) – (107); DM, GF, LH, TR; mt; 21 May–25 Aug. The elytral color of our specimens is uniformly dark reddish brown or with the darker (near black) pronotal color extending onto the first quarter of the base of the elytra and a short distance further along the suture.

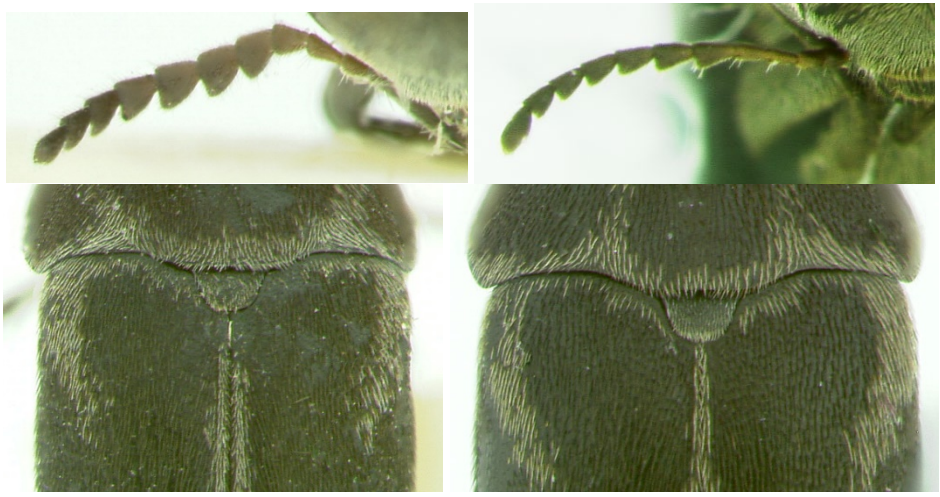

Figure 1. Top left, *Mordella lunulata* Helmuth. Male specimen at USNM collected in New York by J.B. Smith and determined by Emil Liljeblad in 1925, showing broader antennomeres than in *Mordella obliqua* LeConte **(top right)** collected in Great Falls Park, quarry, 23 May–5 June 2008, by David R. Smith and Brent W. Steury. **Bottom:** scutella of *M. lunulata* **(left)** and *M. obliqua* **(right)**. Same specimens as in top images.

Figure 2. *Mordellaria fascifera* (LeConte). Male; **left:** dorsal; **right**: lateral. Little Hunting Creek, Malaise trap, 2–20 June 2017, Brent W. Steury, Christopher Acosta, and Colin Davis.

! *Mordellaria undulata* (Melsheimer) – (5); GF, LH, TR; mt; 1 Jun–26 Jul. This species reaches its previously documented southern range limit in Maryland.

Paramordellaria triloba (Say) – (79); DM, GF, TR; bl, mt; 1 Jun–21 Oct.

Tolidomordella discoidea discoidea (Melsheimer) – (88); GF, LH, TR; mt; 1 Jun–7 Sep. All specimens have the pale humeral dash and elytral apices characteristic of this subspecies.

Tolidomordella discoidea flaviventris (Smith) – (2♀); GF, LH; mt; 14–28 Jun. Liljeblad (1945) considered this subspecies merely a color variety of *T. d. discoidea*, however Jackman and Lu (2002) listed it as a distinct subspecies. This is the only subspecies of *Tolidomordella* reported for South Carolina (Ciegler 2014).

! *Tomoxia lineella* LeConte – (77); DM, GF, LH, TR; lf, mt; 21 May–17 Aug.

! *Yakuhananomia bidentata* (Say) – (10); DM, GF, LH, TR; mt; 1 Jun–29 Aug.

Unknown genus and species (Tribe Mordellini) – (1); GF; mt; 14–26 Jul. (Figure 3). We were unable to assign this specimen to any North American genus. With a length of just 1.9 mm (0.07 in) to the tip of the elytra and 2.2 mm (0.09 in) to the tip of the pygidium, it is the smallest mordellid captured during the survey. The leg ridges are most similar to *Mordellaria* Ermisch and *Tolidomordella* Ermisch, however this male specimen lacks the securiform fourth maxillary palpomere of *Tolidomordella* and the leg ridges are weaker than in *Mordellaria* or *Tolidomordella*, except for the subapical tibial ridge. It lacks the emarginated and dilated penultimate tarsomere of the front and middle legs of *Paramordellaria* Ermisch. Its scutellum is rounded rather than trapezoidal shaped as in *Tomoxia* Costa. Its size is half that of any species from these genera in eastern North America. Its size, and shape of the antennae and palpi, are similar to *Isotrilophus* Liljeblad, however this genus has angular, vertical leg ridges on the tibia and first tarsomere and eyes that are not hairy—both characters lacking in this specimen. *Isotrilophus* also has a shorter, broader pygidium. This specimen has pale brown elytra, a black head and pronotum with sparse white pubescence, and hairy eyes. The leg ridges are weak, consisting of a very thin, almost segmented, dorsal ridge on the tibia and tarsomere one. It could be an introduced, non-native species new to North America, or it is a species new to science. Unfortunately, only one specimen was captured during this survey.

Tribe Mordellistenini Ermisch

Falsomordellistena bihamata (Melsheimer) – (129); DM, GF, LH, TR; mt; 10 Apr–25 Aug.

! *Falsomordellistena discolor* (Melsheimer) – (19); GF; mt; 15 Jun–30 Jul. (Figure 4). At lengths ranging from 5.4–5.8 mm (0.21–0.23 in), this is the largest of the four *Falsomordellistena* species found during this study (although *Mordellistena leporina* probably belongs in this genus and is nearly as large). Most specimens were captured in swamp or floodplain forest along streams. These collections represent a southern range extension from Pennsylvania.

Figure 3. Unknown genus and species, probably from tribe Mordellini. Male; **left:** dorsal; **right:** lateral. Great Falls Park, Malaise trap, 14–26 July 2006, David R. Smith and Brent W. Steury.

Figure 4. *Falsomordellistena discolor* (Melsheimer). Male; **left:** dorsal; **right:** lateral. Great Falls Park, swamp, Malaise trap, 1–15 July 2009, David R. Smith and Brent W. Steury.

Falsomordellistena hebraica (LeConte) – (155; 66♂, 89♀ and undetermined sex); DM, GF, LH, TR; bl, bs, mt; 10 Apr–11 Sep. Males of this species reportedly (Ciegler 2014) have a ferruginous head with a black vertex and a ferruginous pronotum with a dark oval spot. Females have an entirely black head and pronotum. Our male specimens exhibited more variability including two male specimens that have an entirely black head and pronotum. The dark oval spot on the pronotum was extended to the base (or close to it) in all other male specimens. In two specimens, a second smaller spot occurred above the basal spot, and in one specimen, the spot was contiguous with the apical and basal pronotal margins. The leg ridge formula for this species is reported as 3(4)-3(4)-2. Our specimens are better characterized as 3(4)-3(4)-2(1).

Falsomordellistena pubescens (Fabricius) – (295); DM, GF, LH, TR; bs, mt; 17 May–26 Jul. The leg ridge formula of this species has been reported as 3(4)-3-2 (Liljeblad 1945, Ciegler 2014). Our specimens would be better characterized as 3(4)-3(4)-2(1).

Glipostenoda ambusta (LeConte) – (305); DM, GF, LH, TR; bl, bs, mt; 2 Jun–25 Aug. Seven (possibly all female) specimens (Figure 5) captured in Turkey Run Park differ from others in the collection by being larger (5.9 mm [0.23 in] to the tip of the elytra and 6.3 mm [0.25 in] to the tip of the pygidium) and having a dark epidermal color on the central portions of the head, pronotum and elytra. Liljeblad (1945) and Ciegler (2014) give a length of just 4–5 mm (0.16–0.20 in) to the tip of the pygidium for *G. ambusta*.

Figure 5. *Glipostenoda* cf. *ambusta* (LeConte). Probable female; **left:** dorsal; **right:** lateral. Turkey Run Park, Malaise trap, 22 June–6 July 2006, David R. Smith and Brent W. Steury. This specimen is one of seven captured in Turkey Run Park that are larger than typical specimens and have a darker, central epidermal color on the head, pronotum, and elytra.

Mordellina ancilla (LeConte) – (7♀); GF, LH, TR; mt; 14 Jun–17 Aug. (Figure 6). This species concept has a long and confusing history. Three varieties were listed by Liljeblad (1945) under the name *Mordellistena andreae* LeConte: *M. andreae andreae* LeConte, *M. andreae ancilla* LeConte, and *M. andreae ustulata* LeConte. Jackman and Lu (2001) resurrected *Mordellistena ustulata* (LeConte) to species status and transferred it to *Mordellina*. Two years later, Lisberg (2003) proposed *M. ustulata* as a junior synonym of *Mordellistena ancilla* and transferred *M. ancilla* to *Mordellina*. We are of the opinion that the type specimen of *Mordellina ancilla* LeConte (visible at MCZ 2019) may be the female of the male described as *Mordellina semiusta* (LeConte) (also at MCZ 2019) in the same year (Le Conte [sic] 1862), however genetics work will be needed to confirm this. Khalaf (1971b) described the similar wing venation of *M. ancilla* and *M. semiusta*. The name *M. ancilla* would take precedence by page number. All specimens at GWMP and USNM that match the Museum of Comparative Zoology (MCZ) type of *M. ancilla* are female (n=19) and all specimens that match the type of *M. semiusta* are male (n=17). Until this supposition can be confirmed through genetic analysis or the capture of mated pairs, we have listed *M. ancilla* and *M. semiusta* (Figure 10) as separate species. However, we include *M. ustulata* as a valid species (see discussion below under *M. ustulata*). Although not captured in GWMP, we believe that *Mordellistena andreae* (both male and female holotypes at MCZ [2019], male listed under the name *Mordellistena grammica* LeConte), is probably a valid species. The penultimate segment of the anterior and middle tarsi is truncate in *M. ustulata* and emarginate in *M. andreae*, a character that separates genera according to Franciscolo (1967). However, both taxa possess an anterior ridge on the hind tarsi that crosses the entire width of the tarsus, a characteristic common in *Mordellina*, but not in *Mordellistena* (Jackman and Lu 2002).

Figure 6. *Mordellina ancilla* (LeConte). Female; **left:** dorsal; **right:** lateral. Great Falls Park, swamp, Malaise trap, 19–30 June 2009, David R. Smith and Brent W. Steury.

! *Mordellina floridensis* (Smith) – (1♂); GF; bs (hanging dead leaf cluster on fallen branch of cottonwood/poplar, *Populus* L.); 18 Jul. This species reaches its previously known northern distributional limits in Maryland.

! *Mordellina infima* (LeConte) – (7); GF; mt; 21 May–30 Jun, 18 Aug–1 Dec. (Figure 7). The apical tibial ridge is more oblique in this species than in most other *Mordellina*. *Mordellina infima* has been documented from other states near Virginia including Maryland and South Carolina (Bright 1986).

Figure 7. *Mordellina infima* (LeConte). Male; **left:** dorsal; **right:** lateral. Great Falls Park, quarry, Malaise trap, 21 May–18 June 2009, David R. Smith and Brent W. Steury.

! *Mordellina lecontei* (Ermisch) – (18; 1♂, 8♀, 9 undetermined sex); DM, GF, LH; mt; 10–30 Apr, 1 Jun–30 Jul. (Figure 8). This species is very similar to descriptions of *M. impatiens* (LeConte) (Le Conte [sic] 1862, Liljeblad 1945, Ciegler 2014). Both species are reported to have a 2-3-2 leg ridge count (Liljeblad 1945, Ciegler 2014). *Mordellina impatiens* is reportedly smaller (2.5 mm [0.10 in]) than *Mordellina lecontei* (3.3 mm [0.13 in]) (Ciegler 2014). Ciegler (2014) separated the two species in couplet 10 (Page 51) based on color of dorsal surface, "black or nearly so" leading to *M. impatiens*, however it is described in the text as having the head and apical margin of pronotum ferruginous. Liljeblad (1945) also used dorsal color to separate these species in couplet 34 with "upper surface more or less ferruginous, fulvous, or yellowish" leading to *M. lecontei* (then under the name *Mordellistena ruficeps* LeConte; see Jackman [1991] for the justified emendation of this species name from the preoccupied name, *M. ruficeps* LeConte), however the species is later described as "black; head ferruginous." The pronotum of *M. lecontei* is described as all black (Liljeblad 1945, Ciegler 2014), however, the MCZ type specimen (MCZ 2019) of *M. lecontei* clearly shows some orange on the apex of the pronotum. The two species can reportedly be separated by

the shape of the terminal maxillary palpomeres which were reported by Liljeblad (1945) and Ciegler (2014) as scalene triangular in *M. impatiens* and an isosceles triangle in *M. lecontei*. In all these specimens (male and female) the terminal maxillary palpomeres have the outer and distal sides subequal (Figure 8, bottom right), thus they might be described as either scalene or isosceles, however, *M. lecontei* has been reported (Liljeblad 1945, Ciegler 2014) to have the inner (not outer) and terminal sides of equal length. The pronotal color of these 14 specimens varies from all black to black with various proportions of the apical quarter rufous (Figure 8, bottom left and bottom center). Size varies from 2.5 mm (0.10 in) (the male specimen with the apical fourth of the pronotum ferruginous) to 4.0 mm (0.16 in) in a female specimen (with an all-black pronotum), although some female specimens have ferruginous coloration along the anterior edge of the pronotum, especially centrally. Thus, eliminating pronotal color and shape of the terminal maxillary palpomeres as valid distinctions in these two species we relied on descriptions of antennal structure. *Mordellina impatiens* was reported (Liljeblad 1945) to have antennomeres 3–5 of equal length and *M. lecontei* to have antennomere 3 shorter than 4 and 5–10 subequal. These 18 specimens have antennomeres 1–2 wider and longer than 3, 3 shorter than 4, 4 one-fourth shorter than 5, and 5–11 subequal (Figure 8, top right). Thus, based on antennal structure, we assigned all our specimens to *M. lecontei*.

! *Mordellina nigricans* (Melsheimer) – (19; 9♂, 2♀, 8 undetermined sex); DM, GF, TR; mt; 7 Jun–17 Aug. (Figure 9). Sex was determined by examination of genitalia. Our specimens (both male and female) show intermediate traits compared with descriptions of *M. nigricans* and *Mordellina blatchleyi* (Liljeblad) (Liljeblad 1945, Ciegler 2014). *Mordellina blatchleyi* has antennomeres 3–5 described as "equal." *M. nigricans* has antennomere 5 as long as 3 and 4 combined. *Mordellina nigricans* was described as having antennomeres 1–4 "rufo-testaceous" in males (the others black) and all black in females. Antennomeres of *M. blatchleyi* were described as all "fusco-ferruginous" (Liljeblad, 1945). *Mordellina blatchleyi* is one of the few species for which the antennae were not figured in Liljeblad (1945), despite it being described as a new species in that paper and distinguished from the similar *M. nigricans* only by antennomeres 3–5 being of equal length and the color of various body parts. *Mordellina blatchleyi* was described as having the palpi, middle tibiae and tarsi, and posterior tarsi, fusco-ferruginous. *Mordellina nigricans* was described as "black, with four basal segments of antennae and labrum rufo-testaceous; palpi a little darker; female entirely black." Both species have a rufous labrum, however this must be inferred for *M. blatchleyi* by the statement in Liljeblad (1945) that it "resembles *M. nigricans,* differing mainly in the antennal segments, palpi, and in the color of the legs." The palpi of *M. blatchleyi* and *M. nigricans* are not sufficiently described to discern differences from each other or these specimens. These 19 specimens differ from descriptions of *M. nigricans* in that the antennae are all pale (in males and females) as are the front legs and palps. Antennomere 3 is slightly shorter than 4, and 5 is longer and broader than 4 (Figure 9, bottom). The labrum is rufous and the front legs, tarsi and tibiae of the middle legs, antennae, and palps are pale (Figure 9). It differs from *M. blatchleyi* in that antennomere 5 is longer than (not equal to) antennomere 4. Thus, the antennomeres of these 19 specimens fit the shape and length described for *M. nigricans*, but differ in being all pale. These specimens have the other pale body parts described for *M. blatchleyi* as "fusco-ferruginous," but differ by not

having antennomeres 3–5 being of equal length. *M. nigricans* is reportedly more widely distributed with a generally northern distribution. *M. blatchleyi* is more southern, reported only from Florida, Georgia, South Carolina, Illinois, and Ohio (Bright 1986). These Virginia specimens may demonstrate intermediate variation in a single species over a broad geographic range. *Mordellina nigricans* has priority in name by 100 years. Genetics work will be needed to parse out the *M. nigricans*/*M. blatchleyi* species complex.

Mordellina pustulata (Melsheimer) – (97); DM, GF, TR; bs, mt; 28 Apr–11 Oct. This was the only species of *Mordellina* transferred from *Mordellistena* by Jackman and Lu (2001) in which the first and second ridges of the tibiae are equal in length, neither crossing the face of a tibia. The third ridge of the first tarsomere is weaklier expressed than the first two in many of these specimens.

Figure 8. *Mordellina lecontei* (Ermisch). Female; **top left:** dorsal; **top center:** lateral; **top right:** antennae. Great Falls Park, swamp, Malaise trap, 16–30 July 2009, David R. Smith and Brent W. Steury. **Bottom left and bottom center:** variation in pronotal color, **left:** male, **right:** female. **Bottom right:** terminal maxillary palpomere of male.

Figure 9. *Mordellina nigricans* (Melsheimer). Male; **top left:** dorsal; **top right:** lateral; **bottom left:** full antennae showing pale color; **bottom right:** close-up of antennomeres 1–5 showing antennomere 5 as long as 3 and 4 combined and the rufous labrum. Turkey Run Park, river trail, Malaise trap, 31 July–17 August 2009, David R. Smith and Brent W. Steury.

Mordellina semiusta (LeConte) – (13♂); DM, GF, LH; mt; 10 Apr–30 Jul. (Figure 10). Four of these specimens differ from descriptions in Downie and Arnett (1996) and Ciegler (2014) by having a dark cloud on the pronotal base. In one specimen the humeral markings are very faint. Liljeblad (1945) noted "A slight variation in color has been observed. One specimen from Tennessee has a dark triangular area on the thorax in front of the scutellum and has the middle tibiae and tarsi pale; one from Wales, Maine, has the basal half of the thorax dark." Our specimens fall within the variability noted by Liljeblad (1945) and we add Virginia to the geographic range of this variability. See further discussion above under *M. ancilla*. The holotype of *Mordellistena quadrinotata* Liljeblad examined during this study does not differ from the range of color variability or the structure of the antennae in *M. semiusta*. If determined to be a valid species, *Mordellistena quadrinotata* should be transferred to the genus *Mordellina*. Further work is needed to determine if these reputed species are distinct or should be synonymized.

Figure 10. *Mordellina semiusta* (LeConte). Male; **left:** dorsal; **center:** lateral; **right:** antennae of same specimen. Dyke Marsh Wildlife Preserve, Malaise trap, 16–30 June 1998, Edward M. Barrows.

! *Mordellina testacea* (Blatchley) – (1♂); GF; mt; 1–19 Jul. This specimen was determined after comparing it with the holotype of *M. testacea*. The specimen is male and the possibility exists that it is just an extremely pale form of *M. ustulata*. This probability is enhanced by Liljeblad (1945) being unable to locate a specimen of *M. testacea*, its rarity during this survey, the similar structure of the antennae of *M. testacea* and *M. ustulata* (see Steury and Steiner 2020), and that two male specimens included with *M. ustulata* lack black sutural margins and have a reduced amount of black color on the ventrites.

Mordellina ustulata (LeConte) – (116, 54♂, 32♀ with black mesosternum and metasternum, 30♀ with yellow mesosternum and black metasternum); DM, GF, LH, TR; bl, mt; 23 May–21 Oct. (Figure 11). This taxon is either highly variable in color or it represents a species complex. Typical males (n=53) (Figure 11, top left; middle row left; and bottom right two) have a yellow mesosternum and metasternum and yellow pronotum (rarely with a dark cloud at base); females have a black metasternum and either a black or yellow mesosternum (Figure 11, top center and top right). Females with a black metasternum and mesosternum (n=32) typically have darker pronota (Figure 11, middle row right). Females with a yellow metasternum and black mesosternum (n=30), typically have yellow pronota with some darker shading basally (Figure 11, middle row, center two). The two female color forms may be separate species, and if so, it is not known which female belongs to *M. ustulata* (thus the specimen tally for *M. ustulata* may not be correct and the total was not included in the results tally of the most common species). More confusing is that one male of the 54 specimens which could be attributable to *M. ustulata* has a black metasternum and mesosternum and a pronotum darkened basally (Figure 11, bottom, left two). The structure of the antennae is identical in all these specimens (Figure 11, bottom, right two). See also the discussion above under *M. ancilla* concerning confusion between these two species.

Figure 11. ***Mordellina ustulata*** **(LeConte). Top:** lateral views, **left:** male, **center:** female (near *M. ustulata*) with yellow mesosternum and black metasternum, **right:** female (near *M. ustulata*) with black mesosternum and metasternum. **Middle row:** pronota of *M. ustulata*, **left:** male, **center two:** female (near *M. ustulata*) with yellow mesosternum and black metasternum, **right:** female (near *M. ustulata*) with black mesosternum and metasternum. **Bottom:** male (near *M. ustulata*) with black mesosternum and metasternum, **left:** dorsal, **center:** lateral, **right two:** antennae of male *M. ustulata* (typical form). All specimens collected at George Washington Memorial Parkway.

Mordellina washingtonensis Steury and Steiner – (32; 2♂ USNM; 21♂, 9 probable ♀ GWMP); DM, GF, TR; mt; 23 May–29 Aug. This newly described species (Steury and Steiner 2020) is known only from the GWMP.

Mordellina wimbledon Steury and Steiner – (3; 1♂ USNM, 2♂ GWMP); LH, TR; mt; 1–20 Jun. The holotype specimen of this newly described species (Steury and Steiner 2020) was collected at Little Hunting Creek.

Mordellina Schilsky sp. – (1♂); TR; mt; 5–25 Aug. (Figure 12). This undetermined *Mordellina* appears closely allied to *Mordellistena heterocolor* Ray, a species known only from Big Bayou, Florida. It matches the description of *M. heterocolor* (Ray 1946) differing in the apical tibial leg ridge which is described as "somewhat longer" than the one below it in *M. heterocolor,* but in this specimen the apical ridge crosses the entire face of the tibia (as would be expected in *Mordellina*). Also, the elytral color of *M. heterocolor* is described as uniformly "fuscopiceous," however in this specimen the elytra have a faintly reddish humerus on otherwise fuscopiceous elytra. Antennomeres 5–10 are described as "equal" in *M. heterocolor*, however in this specimen antennomere 7 is at least twice as long as antennomere 5 (Figure 12, top right). All other characters match the description given by Ray (1946), including the 2-3-2 leg ridge count and emarginated anterior margin of the eye. This specimen has a very long, narrow dorsal habitus compared to most other *Mordellina* (except perhaps *M. nigricans*) and Ray (1946) described the dorsal habitus of *M. heterocolor* as "elongate." We hesitate to assign this specimen to *M. heterocolor* without examining the holotype because of the extraordinary range extension from southern Florida to Virginia and because *M. heterocolor* has not been found at any other site since it was first collected in 1920.

! *Mordellistena aspersa* (Melsheimer) – (5; 4♂, 1 undetermined); DM, GF, TR; mt; 1 May–5 Jun. (Figure 13). This is a black *Mordellistena* except for the front legs, mentum, palpomeres, first four antennomeres, and hind tibial spines which are paler. It seems to be most closely allied to *M. morula* and *M. convicta* (see discussion under *M. morula*). Male *M. aspersa* are easily separated from female *M. rubrifascia* by the longer, narrower, more erectly hairy antennomeres 4–5 in *M. aspersa* (Figure 13, right, and Figure 24, bottom left). We were unable to attribute any females to this species, however they may be quite similar to female *M. rubrifascia*. Liljeblad (1945) stated that specimens of *M. aspersa* have been seen from "nearly every State in the Union," although Virginia has never been specifically cited (Bright 1986).

Mordellistena attenuata (Say) – (46; 30♂, 16♀); DM, GF, LH, TR; mt; 21 May–30 Jul. Males of this species have a rufous pronotum with a black T-shaped mark on the anterior margin. In females, the pronotum is all black.

! *Mordellistena bicinctella* LeConte – (5♀); DM, GF, TR; mt; 1 Jun–7 Jul. Liljeblad (1945) stated the pronotum of this species can be "either black or reddish yellow or with a cloud at base." These five female specimens include all these pronotal color forms. The coxal plates vary in color from all black to orange in the ventral half and black dorsally. It is one of the smallest mordellids documented from the study area. The largest of these specimens measured only 2.4 mm (0.09 in) to the tip of the pygidium. This species reaches its previously documented southern range limit in the District of Columbia.

Figure 12. *Mordellina* Schilsky sp. (near *Mordellistena heterocolor* Ray). Male; **top left:** dorsal; **top center:** lateral; **top right:** antennomeres 1–8; **bottom:** leg ridges. Turkey Run Park, 5–25 August 2008, David R. Smith and Brent W. Steury.

Figure 13. *Mordellistena aspersa* (Melsheimer). Male; **left:** dorsal; **center:** lateral. Great Falls Park, quarry, Malaise trap, 1–20 May 2009, David R. Smith and Brent W. Steury; **right:** male terminal maxillary palpomeres and antennomeres 1–7.

! *Mordellistena convicta* LeConte – (3; 2♂, 1♀); TR; mt; 22 Jun–6 Jul. (Figure 14). All specimens were captured in the same Malaise trap sample. The leg ridges of this species are given as 3-3-2 (Liljeblad 1945). One of these female specimens fit this description, however the other two specimens have leg ridge formulas of 2-3-2 and 2-2(3)-1(2). It closely resembles *M. aspersa* and *M. morula* but the elytral pubescence occurs in four or five vittae that extend the length of the elytra. We follow the opinion of Liljeblad (1945) that the reputed type specimen in the collection at MCZ is not the specimen that was before LeConte when he described *M. convicta*, but is instead a specimen of *M. syntaenia*. See further discussion under *M. morula* and *M. syntaenia*.

Figure 14. *Mordellistena convicta* LeConte. Male; **left:** dorsal; **right:** lateral. Turkey Run Park, ravine, Malaise trap, 22 June–6 July 2006, David R. Smith and Brent W. Steury.

! *Mordellistena dimidiata* Helmuth – (13; 1♂, 7♀, 5 undetermined); GF, LH, TR; bs, mt; 19 May–17 Jul. (Figure 15). These specimens were compared with macro-images provided by the University of Michigan Museum of Zoology (UMMZ) of the male (Figure 15, bottom left and right) and a female of *M. dimidiata* which were designated by Liljeblad (1945). The sex of eight specimens was determined by examination of the genitalia. Female leg ridge counts were reported by Ciegler (2014) as 2-3-2 and by Liljeblad (1945) as 2-2(3)-1(2), while in males the ridge count is reported as 2-2-1 (Liljeblad 1945). While not all specimens agree with the ridge counts cited for males and females of this species (the one male specimen has a ridge count of 2-3-2) all specimens (male and female) possess the distinctive antennal characteristic of *M. dimidiata* in which the fourth antennomere is longer than the third and fifth (Figure 15, top right). The ridge counts on these eight specimens varied from 2-2-1 to 2-3-2, however the most common expression was 2-2-2. The specimens have dark gray metathoracic wings with venation that often shows through the apical half to one-third of the yellowish, semitransparent elytra. The black lateral margins, and especially the sutural margins, reported by Liljeblad (1945) and Ciegler (2014) are obscure in some specimens but pronounced in others.

Figure 15. ***Mordellistena dimidiata*** **Helmuth.** Female; **top left:** dorsal; **top center:** lateral; **top right:** female antennae of same specimen showing antennomere 4 longer than 3 and 5. Great Falls Park, Malaise trap, 30 June–13 July 2006, David R. Smith and Brent W. Steury. **Bottom:** male from Illinois deposited at UMMZ collected by Emil Liljeblad; **left:** antennae showing antennomere 4 longer than 3 and 5; **right:** leg ridges showing a single ridge on tarsomere 2.

! *Mordellistena fuscata* (Melsheimer) – (29; 19♂, 10 undetermined); LH, GF, TR; bl, mt; 2 Jun–17 Aug. (Figure 16). Nineteen of the 29 specimens are males per examination of genitalia. This species has never been well described. Liljeblad (1945) was unable to locate the type specimen and considered it a "species of doubtful identity." Bright (1986) previously documented it only in Pennsylvania, but Ciegler (2014) listed its range as New York to Florida, west to Indiana. Antennomeres 5–11 have a dense brush of short erect setae on the ventral side in males (Figure 16, bottom left and right). The antennae are entirely pale in most specimens, or occasionally, antennomeres 5–11 are darkened slightly. The ventrites are black with a posterior brown edge and the elytral apices are edged with brown. The tibial leg ridges are very oblique (Figure 16, top right), as in *Glipostenoda ambusta*. The fourth tarsomere of the front and middle legs is emarginated. No females could be attributed to this species. Perhaps it is a dark, male, color variation of *G. ambusta*, or a distinct species that should be assigned to that genus.

Figure 16. ***Mordellistena fuscata*** **(Melsheimer).** Male; **top left:** dorsal; **top center:** lateral; **top right:** male leg ridges; **bottom left and bottom right:** antennae of same specimen showing dense brush of erect setae on ventral surface. Turkey Run Park, gulch, Malaise trap, 1–15 July 2009, David R. Smith and Brent W. Steury.

Mordellistena fulvicollis (Melsheimer) – (8; 2♂, 6♀); DM, LH, TR; mt; 19 May–7 Jul. (Figure 17). One female specimen has a dark cloud in the posterior half of the pronotum, the other seven specimens have the pronotum entirely orange. The ridge counts on these specimens are 2-2-1 or 2-2(3)-1. Three female specimens have a weak third ridge on the first tarsomere. Liljeblad (1945) gives a ridge count of 2(3)-2(3)-1 for this species.

Mordellistena fuscipennis (Melsheimer) – (20); GF, LH, TR; mt; 1–30 Apr, 19 Jun–4 Sep. This species reaches it known southern limit in northern Virginia (Falls Church) (Liljeblad 1945, Bright 1986). It is a distinctive mordellid with an orange to rufous head, pronotum, ventral surface, and antennomeres 1–4. The elytra are black with a dense line of pale setae along the suture. Variation includes darker areas on the coxal plates and abdominal sterna, pale setae on the humeri, and dark antennomeres 3–4. The leg ridge formula in these specimens is also variable, ranging from 3-3-2-1(2) to 4(5)-4-2-2. It is one of only three species of *Mordellistena* found during this study with leg ridges on tarsomere 3, the other two being *M. vera* and *M. virginica*. Only 26.7% of the specimens had four strong tibial ridges. Body length was also variable ranging from 3.9–5.9 mm to the tip of the pygidium.

Figure 17. *Mordellistena fulvicollis* (Melsheimer). Female; **left:** dorsal; Turkey Run Park, powerline, 1–17 June 2019, B. Steury. Undetermined sex; **right:** lateral; Little Hunting Creek, Malaise trap, 19 May–2 June 2017, Brent W. Steury, Colin Davis, and Christopher Acosta. Note pale apices of the elytra in lateral image.

Mordellistena leporina LeConte – (3); LH; mt; 2 Jun–16 Jul. (Figure 18). The front and middle penultimate tarsomeres of these specimens are bilobed (Figure 18, right). Thus, it is better placed in the genus *Falsomordellistena* and it seems closely allied to *F. discolor*. Liljeblad (1945) discussed its similarities with *F. hebraica* and *F. pubescens* and considered it to be "very rare." It has been previously documented from Virginia (Fredericksburg), Maryland (Plummers Island), North Carolina, South Carolina, Florida, and Tennessee (Liljeblad 1945, Bright 1986, Ciegler 2014).

Mordellistena limbalis (Melsheimer) – (121); DM, GF, LH, TR; mt; 10–30 Apr, 2 Jun–12 Sep.

Mordellistena liturata (Melsheimer) – (109); DM, GF, LH, TR; bl, hc (on tree trunk), mt; 10–30 Apr, 2 Jun–12 Sep. Ciegler (2014) indicated a leg ridge count of 3(4)-3-2 for this species. Some of our specimens also had weak additional ridges on the first and second tarsomeres.

! *Mordellistena marginalis* (Say) – (3); DM; mt; 14 Aug–26 Sep. (Figure 19). This species is closely allied to *Mordellistena cervicalis* LeConte and *Mordellistena divisa* LeConte. Ridge counts for *M. marginalis* are described as 3-4(5)-2 (Liljeblad 1945). Our male specimen has a ridge count of 3-4-2 and the other two specimens have ridge counts of 3-4(5)-2(3) and 3(4)-4(5)-2. Antennomeres of this species were described as black by Say (1824). Antennomeres 1–4 in these specimens are pale and 5–11 are pale brown. Antennomere 3 is the shortest, 4 is shorter than 5, and 5–11 are subequal. Antennomeres 3–11 are flattened and somewhat serrate (Figure 19, bottom left and bottom right). Say (1824) described the pronotum of this species as "dull yellow-rufous, with a black quadrate oblong spot extending from the middle to the scutel, and another at each lateral angle." Variation in pronotal color in these three specimens can be seen in (Figure 19). *Mordellistena marginalis* was reported by Liljeblad (1945) from

Figure 18. ***Mordellistena leporina*** **LeConte.** Male; **left:** dorsal; **center:** lateral; **right:** middle leg showing bilobed fourth tarsomere, indicating better placement in the genus *Falsomordellistena* Ermisch. Little Hunting Creek, Malaise trap, 2–20 June 2017, Brent W. Steury, Colin Davis, and Christopher Acosta.

Figure 19. ***Mordellistena marginalis*** **(Say). Top left:** female, 26 September 1999; **top center:** undetermined sex, 14 August 1999; **top right:** male, 14–28 August 1998; **bottom left:** antennae of male specimen; **bottom right:** antennae of female specimen. All from Dyke Marsh Wildlife Preserve, collected in Malaise traps run by Edward M. Barrows.

Plummers Island, Maryland, on the opposite shore of the Potomac River from Turkey Run Park. Liljeblad (1945) also reported *M. cervicalis* from Great Falls Park but stated that it may be only a variation of *M. marginalis.* Ciegler (2014) noted a leg ridge count of 2-3(4)-2 for *M. cervicalis* and described the head as having a black spot on the base and a ferruginous pronotum in males (see Figures 6.38 and 6.35 in Ciegler 2014). *Mordellistena divisa* LeConte (holotype available online at MCZ 2019) with a ridge count of 3-4-2 and a pronotum described as "partly rufo-testaceous, sometimes more yellow and somewhat cloudy along basal margin" has been reported from northern and midwestern states with one record from New Jersey (Liljeblad 1945, Bright 1986). *Mordellistena divisa* was synonymized with *M. marginalis* by Smith (1882), but Liljeblad (1945) considered it distinct stating that they differ "in color as well as in the antennal segments." However, Liljeblad (1945) did not say what these differences were in his descriptions of the antennae of *M. marginalis* or *M. divisa*. See further discussion in Liljeblad (1945) under *M. marginalis* concerning other similar species.

! *Mordellistena masoni* Liljeblad – (31); DM, GF, LH, TR; mt; 2 Jun–25 Aug. This species is very similar to *M. liturata*. Keys in Ciegler (2014) and Liljeblad (1945) distinguish them by the addition of a leg ridge on the tibiae and first tarsomere and several spots of pubescence in the open areas between the setal bands. Our specimens of *M. liturata* and the count cited for *M. masoni* (Ciegler 2014) show some overlap (3[4]-3[4]-2[3] in *M. liturata* and 4[5]-4[5]-2 in *M. masoni*). The spots of pubescence in the open areas between the setal bands are distinctive in these 31 specimens when compared with all specimens of *M. liturata*. Specimens with spots (*M. masoni*) more often have 4 strong tibial leg ridges and those without spots (*M. liturata*) more often have 3 strong tibial ridges. However, specimens with spots that have only 3 strong tibial ridges are not uncommon. *Mordellistena masoni* has been documented in but five other states, all along the Atlantic Coast between Connecticut and Florida. Genetic studies of *M. liturata* and *M. masoni* may provide interesting insights into their taxonomic relationship.

! *Mordellistena militaris* LeConte – (40; 25♀, 15 undetermined); DM, LH, TR; bs (on eastern redcedar, *Juniperus virginiana* L.), mt; 31 May–18 Jul. (Figure 20). Twenty-five of these were captured in a Malaise trap set at Little Hunting Creek from 2–20 June. All specimens are likely female. *Mordellistena militaris* has been previously documented from only four other states: New York, North Carolina, South Carolina, and Ohio (Bright 1986, Ciegler 2014). It is a distinctive mordellid, typically with large pale oval patches on the humeri of black elytra. These specimens all have pale edging on the elytral apices, though this is not mentioned in descriptions of the species, or shown in illustrations of it (Ciegler 2014, Figure 6.32). The humeral oval patch is sometimes faint, or in the case of three specimens, the elytra are all black except for the pale apices. The ridge count is cited as 2-3-2, although some of these specimens have a weak third ridge on the tibia and the third ridge of the first tarsomere and second ridge of the second tarsomere is sometimes weak. Liljeblad (1945) and Ciegler (2014) described the color of the pronotum as "in male with apical half reddish yellow, and basal half blackish, in female with only a trace of reddish yellow at apex, remainder black." However, in our specimens, the female pronotum varies from all orange to all black (Figure 20, bottom left and right) and we were unable to attribute any males to this species.

Figure 20. ***Mordellistena militaris*** **LeConte. Top left:** usual form with pale humeral angles; **top right:** unusual form with very faint pale marking on the humerus; **bottom left and bottom right:** two images showing extremes of variation in female pronotal color. All specimens from George Washington Memorial Parkway.

! *Mordellistena morula* LeConte – (6; 2♂, 3♀, 1 undetermined); DM; mt; 20 Jun–9 Aug. (Figure 21). This species reputedly differs from *M. aspersa* by having a strong third ridge on each tibia and having the elytral setae unevenly distributed (Ciegler 2014). The ridge count was given as 3-3-2 for *M. morula* and 2(3)-3-2 for *M. aspersa* (Ciegler 2014). It is an "all black" species 2–3 mm [0.08–0.12 in] long (Liljeblad, 1945). The type description (Le Conte [sic] 1862) does not mention the unevenly distributed elytral pubescence. This character was first noted by Blatchley (1910). Smith (1882) suspected *M. morula* and *M. aspersa* were the same species. Liljeblad (1945) stated that he was "unable to verify" this species. No author has described the antennae or palpomeres. The six specimens in our collection come close to matching this species concept in being all black (although in these specimens the first four antennomeres, the palps, and the hind tibial spurs are pale), having a 3-3-2 leg ridge count, and mottled elytral pubescence. In males, *M. morula* has longer antennomeres 2–4 than does *M. convicta* (Figure 21, bottom left and bottom center), and *M. aspersa* has longer antennomeres 4–5 than does *M. morula* (Figure 21, bottom right and bottom left). Additionally, *M. aspersa* and *M. convicta* are distinguished by their pattern of elytral pubescence (Figures 13 and 14).

Figure 21. *Mordellistena morula* LeConte. Male; **top left:** dorsal; **top right:** lateral; Dyke Marsh Wildlife Preserve, Malaise trap, 7–19 July 1998, Edward M. Barrows; **bottom:** comparison of male antennomeres 1–5 of *M. morula* **(left)**, *M. convicta* **(center)**, and *M. aspersa* **(right)**, showing longer antennomeres 2–4 in *M. morula* than in *M. convicta* and longer antennomeres 4–5 in *M. aspersa* than in *M. morula*.

Mordellistena ornata (Melsheimer) – (75); DM, GF, LH, TR; bs, mt; 23 May–25 Aug. Adding to the variability noted by Ciegler (2014) for this species, the yellowish sutural line can be absent, as it was in two of these specimens.

! *Mordellistena pallipes* Smith – (4); DM, LH; mt; 5 May–24 Jun. (Figure 22). These specimens represent a southern range extension from New York. Its dorsal habitus is identical to that of *M. pratensis* Smith as shown in Figure 6.39 in Ciegler (2014), however *M. pratensis* is reportedly half its length at only 1.5 mm (0.06 in) (there is no indication of whether this length included the pygidium). The leg ridge formula of *M. pratensis* was cited as 2-2-2 (Ciegler 2014) and *M. pallipes* as 2-3-1 (Smith 1882) or 2(3)-3-1 (Liljeblad 1945). *Mordellistena pratensis* has been reported only from South Carolina and Florida, and *M. pallipes* only from the northeastern United States. The South Carolina record for *M. pratensis* is based on a single specimen with a missing abdomen (J. Ciegler, in litt., 4 November 2016). These specimens measure 3.2 mm (0.13 in) long to tip of elytra and 4.0 mm (0.16 in) to tip of pygidium, which is larger than the lengths given for *M. pallipes* (2.5 mm [0.10 in] and 3 mm [0.12 in]). The ridge counts of our specimens are intermediate between *M. pallipes* and *M. pratensis.* Three of our specimens have ridge counts of 2-2(3)-2 and one has a count of 2(3)-2(3)-1(2). The leg color of our specimens is intermediate between the type description of "all pale" (Smith 1882) and the revised description of Liljeblad (1945) "anterior legs more

or less testaceous, middle legs darker; posterior femora and tibiae black, tarsi dark testaceous." In these three specimens, only the middle and hind femora are dark. Liljeblad (1945) stated that the "insect seems to be very rare," thus few specimens have been available for comparison. It is possible that *M. pallipes* and *M. pratensis* are forms of one species with the smaller form found in the south. *Mordellistena pallipes* has precedence in name.

Figure 22. *Mordellistena pallipes* Smith. Undetermined sex; **left:** dorsal; **center:** lateral; **right:** hind tibia and tarsi showing leg ridge formula of 2-3-1. Additional weak ridges can be seen on the tibia and second tarsi. The third ridge on the first tarsomere is weaker than the other two. Dyke Marsh Wildlife Preserve, Malaise trap, 12–24 June 1998, Edward M. Barrows.

Mordellistena picipennis Smith – (67; 20♂, 31♀, 16 undetermined); GF, LH, TR; mt; 1 Jun–30 Jul. (Figure 23). Ciegler (2014) gave a ridge count of 2-3-1(2) for this species. Liljeblad (1945) (who was not able to locate the type specimen) expanded it slightly to 2(3)-3-1(2). Our male specimens have variable ridge counts ranging from 3-3-2 to 2-2-1. Interpretation of ridge counts is difficult in this species due to the additional one or two, often very short, rows of black setae commonly found on the tibia and tarsomeres. Females, determined by examination of their genitalia (n=31), differ externally from males in having a more consistent 2(3)-3-1 ridge count and slightly shorter antennomeres 5–11, which are often all pale. The dorsal habitus is similar to *M. virginica*, but males of these two species differ in the size, shape, and pubescence of the male antennomeres (Figure 23, right; Steury and Steiner 2020) and *M. virginica* (males and females) have leg ridges on tarsomere 3 while *M. picipennis* does not.

Figure 23. *Mordellistena picipennis* Smith. Male; **left:** dorsal; **center:** ventral; **right:** antennae of same specimen. Turkey Run Park, gulch, Malaise trap, 19–30 June 2009, David R. Smith and Brent W. Steury.

! *Mordellistena rubrifascia* Liljeblad – (71; 30♂, 41♀); DM, GF, TR; mt; 23 May–6 Jul. (Figure 24). Ten males and 15 females were captured in the same Malaise trap in Turkey Run Park set from 22 June to 6 July 2006. The male specimens key directly to *M. rubrifascia* in Liljeblad (1945) and Ciegler (2014) using a leg ridge count of 2-3-2. It is described as black; frons rufotestaceous; antennomeres 1–4, palpi, front legs, middle femora, and tibia testaceous (Liljeblad 1945). However, in these 64 specimens, the rufotestaceous antennomeres extend beyond 4 or they may all be pale, and there are sometimes weak anterior ridges on the tibiae and tarsomere 1. Females are described as being similar to males but with antennae testaceous throughout and the middle legs black. The 41 females assigned to this species differ from this description by their lack of a rufous frons, often having at least antennomeres 1–4 pale, and having variably colored front and middle legs ranging from all black, to all yellow, to the front legs yellow and the middle ones black, or having each leg bicolored, yellow and black.

! *Mordellistena sexnotata* Dury – (2); LH, TR; mt; 19 May–28 Jun. (Figure 25). This species has been previously reported only from Ohio, Kentucky, New Mexico and Wisconsin (Bright 1986, Lisberg and Young 2003). The dark area near the middle of the pronotum is caused by a dense patch of black setae.

Mordellistena smithi Dury – (2♂); TR; mt; 31 Jul–17 Aug. (Figure 26). This species has a similar dorsal habitus to *M. militaris* but differs in that males have a black head and pronotum. No females were captured during this study, however some female specimens attributed to *M. militaris* (those with a black pronotum) closely resemble descriptions of female *M. smithi*. A ridge count of 3-3-2(1) was cited for *M. smithi* (Ciegler 2014). The ridge counts on our two specimens are 2(3)-3-1 and 3-3-1(2). The terminal maxillary palpomeres of these two specimens are scalene triangular with the outer and terminal sides the longest. It is possible that *M. smithi* and *M. militaris* are the same species, with *M. smithi* being the male and *M. militaris* the female.

Figure 24. ***Mordellistena rubrifascia*** **Liljeblad.** Male; **top:** lateral; **bottom left:** terminal maxillary palpomere and antennomeres 1–6, Turkey Run Park, Malaise trap, 22 June–6 July, David R. Smith and Brent W. Steury. **Bottom center:** male face; **bottom right:** female face. Palpomeres and antennae are the same in both sexes.

Figure 25. ***Mordellistena sexnotata*** **Dury. Left:** dorsal; **right:** lateral. Little Hunting Creek, Malaise trap, 14–28 June 2018, Brent W. Steury.

Figure 26. *Mordellistena smithi* Dury. Male; **left:** dorsal; **right:** lateral. Turkey Run Park, River Trail, Malaise trap, 31 July–17 August 2009, David R. Smith and Brent W. Steury.

! *Mordellistena syntaenia* Liljeblad – (8; 6♀, 2 undetermined); GF, LH, TR; mt; 21 May–29 Jun. (Figure 27). Liljeblad (1945) identified the leg ridge formula for this species as 3-3-2 in females and 2-3-2 in males. In these eight specimens, two females have a very weak apical ridge on tarsomere 1 and one has a single ridge on tarsomere 2. The pattern of elytral pubescence in this species is strikingly unique. This species was not known from south of Massachusetts until Ciegler (2014) reported it from South Carolina. Virginia is only the fifth state in which this species has been documented. Concerning the MCZ type of this species, Liljeblad (1945) stated that "in the Museum of Comparative Zoology the supposed type or first specimen of *Mordellistena convicta* Leconte [sic] belongs to the present species [*Mordellistena syntaenia*]." "I am of the opinion that the specimen now the first in the Leconte [sic] collection under the name of *convicta* is not the original specimen that was before that author when he described the species."

Mordellistena trifasciata (Say) – (271; 89♂, 182♀); DM, GF, LH, TR; mt; 23 May–21 Oct. The male of this species has a yellow pronotum, mesosternum, and metasternum, and the first four ventrites are black with yellow ventral margins. The female has a black pronotum with a yellow base, black mesosternum and metasternum, and ventrites as in males. The sexes can also be separated by the shape of the terminal maxillary palpomere which is "boat-shaped" in males and elongate in females (Liljeblad 1945). Variation in the species includes the length of the apical tibial ridge, which in some specimens is nearly twice as long as the one below it.

Figure 27. *Mordellistena syntaenia* Liljeblad. Sex undetermined; **left:** dorsal; **right:** lateral. Great Falls Park, quarry, Malaise trap, 23 May–5 June 2008. David R. Smith and Brent W. Steury.

! *Mordellistena vera* Liljeblad – (75; 35♂, 40♀); DM, GF, LH, TR; mt; 19 May–30 Jul. (Figure 28). Males of this species are distinctive in having very long antennomeres 5–11 (4 to 5 times the length of number 4) that are densely covered by short, erect setae of equal height, except for a few longer erect setae at the apex of each antennomere. The only species with similar antennae are males of the recently described *M. virginica* **(**Steury and Steiner 2020). In females, antennomeres 5–11 are approximately half the length of males. The sexual differences in the antennae are not mentioned in Liljeblad (1945), who considered this beetle to be rare, or in Ciegler (2014). This is also one of only three species of *Mordellistena* captured during this study with leg ridges on tarsomere three. The leg ridge formula of this species is highly variable due to the occasional presence of numerous short ridges. A leg ridge formula of 3(2,4,5)-4(3)-2(3)-2(1) captures the number of leg ridges in these 75 specimens. One female has a ridge on tarsomere 5. The MCZ type of *M. unicolor* LeConte appears to be a female of this species (see further discussion in Liljeblad [1945] under entry for *M. unicolor*).

Mordellistena virginica Steury and Steiner – (20; 1♂, 1♀ USNM; 9♂, 9♀ GWMP); GF, TR; mt; 1 Jun–4 Sep. (Figure 29). The holotype of this species is from Great Falls Park (Steury and Steiner 2020). The male antennae of this species are similar to male *M. vera* and the dorsal habitus of males and females is similar to male and female *M. picipennis*. An image of a female is provided in Figure 29.

Figure 28. ***Mordellistena vera*** **Liljeblad.** Male; **top left:** dorsal; **top right:** lateral; **bottom left:** same specimen showing leg ridges; **bottom right:** antennae of same specimen. Great Falls Park, swamp, Malaise trap, 19–30 June 2009, David R. Smith and Brent W. Steury.

Figure 29. ***Mordellistena virginica*** **Steury and Steiner.** Female; **left:** dorsal; **right:** lateral. Great Falls Park, swamp, Malaise trap, 21 July–17 August 2009, David R. Smith and Brent W. Steury.

Mordellistena sp. (near *pallidoptera* Khalaf) – (11; 3♂, 5♀, 3 undetermined)); LH; mt; 18 May–28 Jun. (Figure 30). This species is most closely allied to *M. pallidoptera* Khalaf and *Mordellistena wenzeli* Liljeblad (Figure 31, not captured during this study). It differs from the holotype specimens of both species by having 2 rather than 1 leg ridge on tarsomere 2. It is also larger than *M. wenzeli* which is only 2.3 mm [0.09 in] long to the tip of the pygidium (this species is 3.5 mm [0.14 in] long) and has longer antennomeres (5 is only slightly longer than 4 in *M. wenzeli* and 5 is almost twice as long as 4 in this species). The type specimen of *M. pallidoptera* at NMNH is dissected and preserved as a slide mounted in polyvinyl alcohol making direct comparisons of some characters difficult. *Mordellistena pallidoptera* has been reported only from the type locality in Louisiana (Khalaf 1971a) and *M. wenzeli* only from Georgia and South Carolina (Ciegler 2014).

Figure 30. *Mordellistena* sp. (near *pallidoptera* Khalaf). Top left: dorsal; **top right:** lateral; **bottom left:** female antennae; **bottom right:** male antennomeres 2–6. Top specimen is from Little Hunting Creek, Malaise trap, 2–20 June 2017, Brent W. Steury, Christopher Acosta, Colin Davis.

Figure 31. *Mordellistena wenzeli* Liljeblad. (Not found during this study); **left:** dorsal; **right:** lateral; holotype from UMMZ, collected in Georgia.

Mordellistena Costa sp. 1 – (6♂); DM, GF, LH, TR; bs, mt; 2–30 Jun. (Figure 32). These six male specimens could not be assigned to any known taxon. They differ from *M. dimidiata* by their smaller length (4.2 mm [0.17 in] to the tip of the pygidium in *M. dimidiata* and 3.0 mm [0.12 in] in this species) and in the length of antennomere 4 compared to antennomeres 3 and 5 (Figure 32, right and Figure 15, top right and bottom left) (four being longer than five in *M. dimidiata* and four being much shorter than five in this species). The ridge counts in these specimens were best expressed as 2(3)-2(3)-2 which differs from other superficially similar species such as *M. wenzeli*. The dark elytral apices appear to be due to pigmentation in the integument rather than elytral transparency allowing a dorsal view of darkened hindwings.

Mordellistena Costa sp. 2 – (1); GF; mt; 10–30 Apr. (Figure 33). This distinctive *Mordellistena* of undetermined sex has proven difficult to identify. The ridge count on the specimen is 2-3(4)-(1). All but the first ridge of the tibia are small and weak. The head and pronotum are all black. The antennae are all pale and very short (reaching only to the midline of the pronotum). The ventral surface is black except for the tibia and tarsomeres which are pale, yellowish brown. The black elytra have two broad pale bands forming a pattern similar to those found in *M. minuta* Smith and *M. trifasciata.* This specimen has two tibial spurs, *M. minuta* and *M. trifasciata* have only one, and both have leg ridge counts of 2-2-1. Of the 269 specimens of *M. trifasciata* collected during this study, none had an all-black head or pronotum. Unfortunately, only one specimen was collected.

Mordellistena Costa sp. 3 – (1); DM; mt; 9–23 May. (Figure 34). This *Mordellistena* is distinctive in its leg ridge count and long, filiform antennae. It is all black with pale antennomeres 1–4 and dark-brown front and middle legs. The ridge count is 3(4)-4-2(3). All of the black species included in the key by Liljeblad (1945) with ridge counts between 3-4-2 and 4-4-3 are described as having short antennae, except for *M. aequalis* Smith, a species for which the antennae are not described (Smith 1882). Liljeblad did

not examine the holotype (now at MCZ) and the antennae are not visible in the holotype images, however the elytral pubescence in the MCZ type of *M. aequalis* from Illinois is not the same as in this specimen. It seems rather unlikely that Smith would not describe the antennae in a species with such distinctive antennomeres. Until additional specimens are obtained, the proper assignment of this *Mordellistena* will remain unknown.

! *Mordellochroa scapularis* (Say) – (29); GF, LH, TR; mt; 30 Apr–21 Jul. This species reaches its known southern distributional limits in Maryland.

Figure 32. *Mordellistena* Costa sp. 1. Male; **left:** dorsal; **center:** lateral; **right:** male antennomeres 1–9 showing 3 and 4 of equal length and 5 longer than 4. Little Hunting Creek, Malaise trap, 2–20 June 2017, Brent W. Steury, Christopher Acosta, and Colin Davis.

Figure 33. *Mordellistena* Costa sp. 2. Left: dorsal; **right:** lateral. Great Falls Park, quarry, Malaise trap, 10–30 April 2009, David R. Smith and Brent W. Steury.

Figure 34. ***Mordellistena*** **Costa sp. 3. Top left:** dorsal; **top right:** lateral; **middle row:** leg ridges; **bottom left and bottom right:** antennae and close up of antennomeres 1–7. Dyke Marsh, Malaise trap, 9–23 May 1999, Edward M. Barrows.

Figure 35. ***Pseudotolida syphaxi*** **Steury and Steiner.** Female; **left:** dorsal; **center:** lateral; **right:** terminal maxillary palpomeres. Little Hunting Creek, Malaise trap, 28 July–11 August 2017. Brent W. Steury, Colin Davis, Christopher Acosta.

Pseudotolida arida (LeConte) and *Pseudotolida lutea* (Melsheimer) – (40; 20♂, 20♀); DM, GF, LH, TR; bs, mt; 28 May–4 Sep. *Pseudotolida arida* is reportedly distinguished (Liljeblad 1945, Ciegler 2014), from *P. lutea* by its larger size (5.5 mm [0.22 in] to tip of the pygidium [Liljeblad 1945]) and by having one additional ridge on the hind first tarsomere. This appears to be a valid distinction in some specimens. However, 40 specimens of *Pseudotolida* Ermisch collected during this study that were analyzed for the morphological characteristics of body length, color, and the number of ridges on hind tarsomere 1, demonstrated that these characters are not sufficient for distinguishing either sex (males and females are easily separated in *Pseudotolida* by the shape of the apical maxillary palpomeres) using current taxonomic keys (Table 1). Taxonomic keys specify the anatomical requirements of *P. lutea* as < 3.8 mm [0.15 in], pale yellowish color, and two ridges on hind tarsomere 1 and for *P. arida* as > 5.4 mm [0.21 in], pale brown color, and three ridges on hind tarsomere 1. Ten of 40 specimens fall outside the size ranges given for either species. Of these ten, six were yellowish and four were pale brown. Two specimens had three tibial ridges, three had two ridges, and five had 2.5 ridges. Thus, none of these ten specimens can be clearly assigned to *P. arida* or *P. lutea*. Of the 21 specimens < 4.1 mm [0.16 in], only three met all three anatomical requirements of size, color, and number of leg ridges specified for *P. lutea*. If partial ridges are ignored, 17 of 21 specimens met the anatomical requirements needed to indicate *P. lutea*. Of the nine specimens > 5.0 mm [0.20 in], only three met the anatomical requirements for *P. arida*. Ignoring partial ridges did not change this proportion. Thus, 34 of 40 specimens were not attributable to either *P. arida* or *P. lutea* based on requirements used by taxonomic keys if partial ridges are counted on the first tarsomere and 20 specimens cannot be assigned to either species if partial ridges on the first tarsomere are ignored. Only six of 21 specimens < 4.1 mm were male. Three of nine specimens were male in the > 5.0 mm group and three of ten were male in the 4.1–5.0 mm group. The terms (coarse, smooth, and silky) used to describe differences in the elytral pubescence of *P. arida* and *P. lutea* are subjective and difficult to interpret. No differences in the density, length, or angulation of elytral pubescence, other than those attributable to individual size were observed in specimens < 4.1 mm versus those > 5.0 mm. Similarly, no differences in the structure of the maxillary palpus or antennomeres were observed in side-by-side comparisons of males and females from the < 4.1 mm and > 5.0 mm size classes. In a few dissected males examined, parameres did not differ in shape, only in size. The analysis showed a continuum of variability between specimens that key to *P. arida* and *P. lutea* demonstrating that a method to morphologically distinguish all specimens of these two reputed species does not exist. The documented ranges of *P. arida* and *P. lutea* overlap substantially, with *P. arida* reported from slightly farther south. *Pseudotolida lutea* is documented west to Arizona, north to New York, and south to Alabama. *Pseudotolida arida* is documented west to Arizona, north to New York, and south to Florida. *Pseudotolida lutea* has been reported from three states (Alabama, Delaware, and Georgia) where *P. arida* has not been reported and *P. arida* has been documented in five states (Florida, Massachusetts, Michigan, New Jersey, and Virginia) where *P. lutea* has not been recorded (Bright 1986, Burne 1987, Downie and Arnett 1996, Lisberg and Young 2003, Ciegler 2014). Since, according to current nomenclature, these taxa are considered separate species, we have included each one in the species tally and consider each to have been collected at each of the four sites listed.

Table 1. Forty specimens of *Pseudotolida* Ermisch collected from George Washington Memorial Parkway, Fairfax County, Virginia, analyzed by sex for the anatomical features of body length, color, and the number of ridges on the hind tarsomere. Taxonomic keys specify anatomical requirements for *P. lutea* (Melsheimer) as < 3.8 mm (0.15 in), pale yellowish color, and two ridges on hind tarsomere one, and for *P. arida* (LeConte) as > 5.4 mm (0.21 in), pale brown color, and three ridges on hind tarsomere one. Thirty-four of 40 specimens are not attributable to either *P. lutea* or *P. arida* based on requirements used by taxonomic keys if partial ridges are counted on the first tarsomere and 20 specimens cannot be assigned to either species if partial ridges on the first tarsomere are ignored.

Body Length	Sex	Color	Number of Ridges on Hind Tarsomere 1	Number of Specimens	Number of Specimens Outside Range of Keys (L=Length, C=Color, R-Ridges)	Number of Specimens Outside Range of Keys if Partial Ridges are Ignored (L=Length, C=Color, R=Ridges)
< 4.1 mm	♂	pale (yellowish)	2	3	0	0
< 4.1 mm	♂	pale (yellowish)	2.5	10	10 R	0
< 4.1 mm	♂	pale (yellowish)	3	0	0	0
< 4.1 mm	♂	darker (pale brown)	2	0	0	0
< 4.1 mm	♂	darker (pale brown)	2.5	1	1 C, R	1 C
< 4.1 mm	♂	darker (pale brown)	3	0	0	0
< 4.1 mm	♀	pale (yellowish)	2	0	0	0
< 4.1 mm	♀	pale (yellowish)	2.5	4	4 R	0
< 4.1 mm	♀	pale (yellowish)	3	0	0	0
< 4.1 mm	♀	darker (pale brown)	2	1	1 C	1 C
< 4.1 mm	♀	darker (pale brown)	2.5	1	1 C, R	1 C
< 4.1 mm	♀	darker (pale brown)	3	1	1 C, R	1 C, R
4.1–5.0 mm	♂	pale (yellowish)	2	1	1 L	1 L
4.1–5.0 mm	♂	pale (yellowish)	2.5	0	0	0
4.1–5.0 mm	♂	pale (yellowish)	3	0	0	0
4.1–5.0 mm	♂	darker (pale brown)	2	1	1 L	1 L
4.1–5.0 mm	♂	darker (pale brown)	2.5	1	1 L	1 L
4.1–5.0 mm	♂	darker (pale brown)	3	0	0	0
4.1–5.0 mm	♀	pale (yellowish)	2	0	0	0
4.1–5.0 mm	♀	pale (yellowish)	2.5	4	4 L	4 L
4.1–5.0 mm	♀	pale (yellowish)	3	1	1 L	1 L
4.1–5.0 mm	♀	darker (pale brown)	2	1	1 L	1 L
4.1–5.0 mm	♀	darker (pale brown)	2.5	0	0	0
4.1–5.0 mm	♀	darker (pale brown)	3	1	1 L	1 L

Body Length	Sex	Color	Number of Ridges on Hind Tarsomere 1	Number of Specimens	Number of Specimens Outside Range of Keys (L=Length, C=Color, R-Ridges)	Number of Specimens Outside Range of Keys if Partial Ridges are Ignored (L=Length, C=Color, R=Ridges)
> 5.0 mm	♂	pale (yellowish)	2	0	0	0
> 5.0 mm	♂	pale (yellowish)	2.5	0	0	0
> 5.0 mm	♂	pale (yellowish)	3	1	1 C	1 C
> 5.0 mm	♂	darker (pale brown)	2	0	0	0
> 5.0 mm	♂	darker (pale brown)	2.5	1	1 R	1 R
> 5.0 mm	♂	darker (pale brown)	3	1	0	0
> 5.0 mm	♀	pale (yellowish)	2	0	0	0
> 5.0 mm	♀	pale (yellowish)	2.5	0	0	0
> 5.0 mm	♀	pale (yellowish)	3	1	1 C	1 C
> 5.0 mm	♀	darker (pale brown)	2	0	0	0
> 5.0 mm	♀	darker (pale brown)	2.5	3	3 R	3 R
> 5.0 mm	♀	darker (pale brown)	3	2	0	0

Pseudotolida syphaxi Steury and Steiner – (22; 2♂ USNM, 11♂ GWMP, 9♀ GWMP); LH, TR; mt; 19 Jun–17 Aug. (Figure 35). The holotype of this species is from Turkey Run Park (Steury and Steiner 2020). The first image of a female is provided in Figure 35.

Tribe Conaliini Ermisch

Glipodes sericans (Melsheimer) – (72); DM, GF, LH, TR; mt; 10–30 Apr, 19 Jun–21 Oct. The size range for this species has been given as 9.0–10.0 mm (0.35–0.39 in), however our smallest specimen measured 7.8 mm (0.31 in). On the East Coast this species has only been recorded in Pennsylvania, Virginia, and South Carolina. It extends south to Central America (Bright 1986).

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Eyed Click Beetle (Eastern Eyed Elater), *Alaus oculatus* (Linnaeus) (Coleoptera: Elateridae). Photographed in Turkey Run Park, George Washington Memorial Parkway, Virginia, 2 June 2005.

Photographed by Brent W. Steury