

A Survey of the Lepidoptera of the Serpentine Barrens Area of Lake Roland Park, Baltimore County, Maryland

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Abstract: Lake Roland Park is owned by the City of Baltimore and was leased to Baltimore County after its original purpose as a raw water supply reservoir had become obsolete. The northern part of the park contains a tract of land that is geologically classified as serpentine barrens. This unique habitat is degrading due to clearcutting and subsequent replanting of pines approximately 70 years ago, coupled with increasing pressure from exotic species. This survey was conducted from 22 April to 21 September 2019 to provide information for an ecological restoration management plan for the serpentine barrens area of Lake Roland Park.

INTRODUCTION

Serpentine barrens represent a unique ecosystem where the plant community is adapted to living in shallow, well drained, nutrient-poor soils that have high levels of heavy metals including nickel, cobalt, and chromium (Pollard 2016). In Maryland, many of these habitats are rich in chromite and copper and were once mined for these minerals (Friedman 2016). The plant communities in these environments frequently have endemic species not found in adjacent communities where they are unable to compete (Brady et al. 2005).

The focus of this survey was to determine the Lepidoptera species present in the persisting serpentine barrens located in Lake Roland Park, Baltimore County, Maryland, an area historically known as the Bare Hills. No attempt was made to quantify the abundance of species.

METHODS

This survey was primarily focused in the vicinity around a large, managed clearing in the interior of the geological formation (39.3874°, -076.652°) (Figure 1). The clearing is in close proximity to an ephemeral stream and within 30 m (100 ft) of an oak grove, *Quercus* L. (Fagaceae), that was not part of the aforementioned clearcut.

Data on diurnal species was collected on 11 occasions between 22 April and 21 September and included live observation, net collection, and hand-collection of resting butterflies at night. Specimens collected by hand or net were retained for positive identification and vouchering. Additional records were provided by Debbie Terry who

made visual butterfly observations on 22 April and 31 August 2019.

Nocturnal collections were conducted on 11 nights from 9 May through 21 September and utilized different methods of sampling. A 225-watt self-ballasted mercury-vapor (MV) light powered by a 1000-watt gasoline-powered generator was used during each of the 11 collections. The MV light was placed on a 122 cm x 122 cm (48 in x 48 in) white sheet that was adjacent to a vertically-hanging white sheet (216 cm x 254 cm [85 in x 100 in]). Additionally, two or three different black-light traps were placed each night within the clearing. Two 22-watt black-light Circline tube lights (BioQuip® Products #2807C) were placed on bucket traps (BioQuip® Products #2851A). One trap was powered by an 18-volt battery while another was supplied AC power by the generator. The third black-light trap used a 10-watt LED UV-light (Aplstar®) powered by a 17000mAh battery pack. The LED light was set across the top of a 19-L (5-gal) bucket topped with a funnel. All bucket traps were lined with a white plastic bag and contained permethrin-infused compressed-paper egg cartons and one Vaportape® Mini-Strip. At the conclusion of trapping each night, bags were removed, tied shut, and placed in a cooler with ice packs and then frozen overnight in a freezer. The following morning the contents of each trap were sorted by trap and returned to the freezer until pinning.

Adult specimens were prepared on foam spreading boards using size 2 or 3 stainless steel insect pins or on custom-made micro spreading boards using minutens. Specimens will be deposited into the collection of the Natural History Society of Maryland.



Figure 1. Serpentine barrens at Lake Roland Park, Baltimore County, Maryland. Large open area that has been expanded through mechanical removal of trees and mowing. A sheet with a mercury vapor lamp for the attraction of insects can be seen in the distance.

Specimens were identified using a variety of field guides, monographs, and journal articles. When required, specimens were dissected and/or compared to specimens in the collections of the Department of Entomology, National Museum of Natural History (USNM), Smithsonian Institution, Washington, District of Columbia, and of The Natural History Society of Maryland, Baltimore, Maryland. Resources used extensively included: Opler and Malikul (1998), Gilligan et al. (2008), Beadle and Leckie (2012), Lotts and Naberhaus (2017), the *Moths of America North of Mexico* series (Wedge Entomological Research Foundation 1971–2019), and the Moth Photographers Group website (2019). The collection, pinning, and identification of specimens is estimated to have taken ~450 hours. Approximately 2,400 specimens were collected, of which 2,315 were identified. The remaining specimens were too badly damaged to be identified by morphological methods.

RESULTS

Diurnal species were collected on nine different collecting events from 9 May through 21 September 2019; additionally, butterflies were observed on 22 April and 31 August 2019. Nocturnal surveys were conducted from 9 May through 21 September 2019 for a total of 11 collecting events. Conditions for each nocturnal collection event are provided in Table 1.

Table 1. Dates of nocturnal collections with time and air temperature at sundown, cloud cover, and lunar conditions.

Date	Sundown (24 hour)	Air Temperature °F (°C)	Cloud Cover	Lunar Phase and % Illumination
09 MAY 2019	2008	72 (22)	none	waxing 23%
17 MAY 2019	2016	80 (27)	thin clouds	waxing 98%
31 MAY 2019	2027	80 (27)	cloudy	waning 10%
15 JUN 2019	2035	80 (27)	partly cloudy	waxing 96%
28 JUN 2019	2035	84 (29)	thin clouds	waning 21%
12 JUL 2019	2032	86 (30)	none	waxing 81%
27 JUL 2019	2022	85 (29)	none	waning 26%
10 AUG 2019	2005	80 (27)	thin clouds	waxing 78%
24 AUG 2019	1948	74 (23)	clear	waning 74%
06 SEP 2019	1928	70 (21)	clear	waxing 54%
21 SEP 2019	1904	78 (26)	clear	waxing 56%

Three hundred and seventy-five (375) taxa from 39 families of Lepidoptera were collected during the survey period. A list of the taxa encountered on each date is provided for diurnal taxa (Table 2) and nocturnal taxa (Table 3). Species richness of each family encountered on the site is presented in Figure 2. Taxa are arranged taxonomically with primitive families at the bottom of the table near the x-axis and more advanced families at the top. The superfamilies Noctuoidea (Erebidae, Noctuidae, Nolidae, Notodontidae), Pyraloidea (Crambidae, Pyralidae), Tortricoidea (Tortricidae) and Geometroidea (Geometridae) were found to be the most speciose with 109, 62, 51, and 44 species, respectively.

Table 2. Diurnal taxa encountered on each survey date arranged alphabetically by family, then genus and species. Dates followed by a plus sign (+) were visual observations conducted by Debbie Terry.

Taxa	22 APR 2019 ⁺	09 MAY 2019	02 JUN 2019	15 JUN 2019	28 JUN 2019	06 JUL 2019	11 AUG 2019	24 AUG 2019	31 AUG 2019 ⁺	06 SEP 2019	21 SEP 2019
Hesperiidae (skippers)											
<i>Ancyloxypha numitor</i> (Fabricius) – Least Skipper			X				X		X		
<i>Atalopedes campestris</i> (Boisduval) – Sachem									X	X	
<i>Atrytonopsis hianna</i> (Scudder) – Dusted Skipper			X								
<i>Epargyreus clarus</i> (Cramer) – Silver-spotted Skipper							X				
<i>Erynnis baptisiae</i> (W. Forbes) – Wild Indigo Duskywing							X	X			
<i>Erynnis juvenalis</i> (Fabricius) – Juvenal’s Duskywing						X					
<i>Hylephila phyleus</i> (Drury) – Fiery Skipper										X	
<i>Nastra lherminier</i> (Latreille) – Swarthy Skipper								X			
<i>Polites peckius</i> (W. Kirby) – Peck’s Skipper									X		
<i>Polites themistocles</i> (Latreille) – Tawny-edged Skipper			X								
Lycaenidae (gossamer-wing butterflies)											
<i>Celastrina</i> sp. [prob. <i>ladon</i> (Cramer) – Spring Azure]	X										
<i>Celastrina neglecta</i> (W.H. Edwards) – Summer Azure									X		
<i>Cupido comyntas</i> (Godart) – Eastern Tailed-Blue		X	X			X		X	X		
Nymphalidae (brush-footed butterflies)											
<i>Boloria bellona</i> (Fabricius) – Meadow Fritillary				X							
<i>Euptoieta claudia</i> (Cramer) – Variegated Fritillary			X	X			X				
<i>Junonia coenia</i> Hübner – Common Buckeye				X	X		X		X		X
<i>Limenitis arthemis astyanax</i> (Fabricius) – Red-spotted Purple				X			X		X		
<i>Megisto cymela</i> (Cramer) – Little Wood-Satyr			X	X							
<i>Phyciodes cocyta</i> (Cramer) – Northern Crescent							X			X	X
<i>Phyciodes tharos</i> (Drury) – Pearl Crescent	X		X		X	X	X		X	X	X
<i>Polygonia interrogationis</i> (Fabricius) – Question Mark				X							
<i>Vanessa atalanta</i> (Linnaeus) – Red Admiral	X				X	X			X		
<i>Vanessa virginiensis</i> (Drury) – American Lady	X		X	X					X		
Papilionidae (swallowtail butterflies)											
<i>Battus philenor</i> (Linnaeus) – Pipevine Swallowtail				X							
<i>Papilio glaucus</i> Linnaeus – Eastern Tiger Swallowtail	X		X	X					X		
<i>Papilio troilus</i> Linnaeus – Spicebush Swallowtail			X				X		X		
Pieridae (whites and sulphur butterflies)											
<i>Anthocharis midea</i> (Hübner) – Falcate Orangetip	X		X	X							
<i>Colias eurytheme</i> Boisduval – Orange Sulphur	X		X	X					X		X
<i>Colias philodice</i> Godart – Clouded Sulphur										X	
<i>Phoebis sennae</i> (Linnaeus) – Cloudless Sulphur			X								
<i>Pieris rapae</i> (Linnaeus) – Cabbage White	X				X	X			X		
Sphingidae (hawk moths, sphinx moths)											
<i>Hemaris diffinis</i> (Boisduval) – Snowberry Clearwing						X					

Table 3. Nocturnal taxa encountered on each survey date arranged alphabetically by family, then genus and species. Names followed by an asterisk (*) were confirmed by inspection of the genitalia and comparison to published literature or specimens in the USNM.

Taxa	09 MAY 2019	17 MAY 2019	31 MAY 2019	15 JUN 2019	28 JUN 2019	12 JUL 2019	27 JUL 2019	10 AUG 2019	24 AUG 2019	06 SEP 2019	21 SEP 2019
Attevidae (tropical ermine moths)											
<i>Atteva aurea</i> (Fitch) – Ailanthus Webworm	X	X	X	X		X	X	X	X	X	X
Autostichidae (autostichid moths)											
<i>Gerdana caritella</i> Busck – Gerdana Moth							X				
<i>Sceptea aequapulvella</i> Chambers – (no common name)								X			
<i>Symmoca signatella</i> Herrich-Schäffer – (no common name)				X							
Blastobasidae (scavenger moths)											
<i>Asaphocrita aphidiella</i> (Walsingham) – (no common name)*			X								
<i>Blastobasis glandulella</i> (Riley) – Acorn Moth*		X			X		X	X			
Bucculatricidae (ribbed cocoon-making moths)											
<i>Bucculatrix canadensisella</i> Chambers – Birch Skeletonizer					X						
<i>Bucculatrix</i> sp. [poss. <i>angustata</i> Frey & Boll – Narrow Bucculatrix]				X							
Coleophoridae (casebearer moths)											
<i>Coleophora borea</i> Braun – (no common name)			X						X	X	X
<i>Coleophora cratipennella</i> Clemens – Streaked Coleophora									X		
Cosmopterigidae (cosmet moths)											
<i>Limnaecia phragmitella</i> Stainton – Shy Comet				X							
<i>Cosmopterix floridanella</i> (Beutenmüller) – (no common name)*							X				
Crambidae (crambid moths)											
<i>Agriphila vulgavigellus</i> (Clemens) – Vagabond Crambus											X
<i>Anageshna primordialis</i> (Dyar) – Yellow-spotted Webworm			X	X	X						
<i>Apogeshna stenialis</i> (Guenée) – Checkered Apogeshna						X					
<i>Blepharomastix ranalis</i> (Guenée) – Hollow-spotted Blepharomastix			X	X	X						
<i>Chrysoteuchia topiarius</i> (Zeller) – Topiary Grass-Veneer					X						
<i>Conchylodes ovulalis</i> (Guenée) – Zebra Conchylodes							X				
<i>Crambus agitatellus</i> Clemens – Double-banded Grass-Veneer						X					
<i>Crambus laqueatellus</i> Clemens – Eastern Grass-Veneer	X										
<i>Crambus saltuellus</i> Zeller – Pasture Grass-Veneer			X	X	X	X	X				
<i>Crocidophora tuberculalis</i> Lederer – Pale-winged Crocidophora	X	X	X	X		X	X				
<i>Desmia funeralis</i> (Hübner) – Grape Leafroller		X	X	X		X	X	X			
<i>Desmia maculalis</i> Westwood – White-headed Grape Leafroller							X				
<i>Diacme adipaloides</i> (Grote & Robinson) – Darker Diacme	X	X	X	X		X	X				
<i>Diastictis argyralis</i> Hübner – White-spotted Orange Moth				X							
<i>Diastictis ventralis</i> (Grote & Robinson) – White-spotted Brown Moth	X			X			X				
<i>Diathrausta harlequinialis</i> Dyar – Harlequin Webworm						X	X				
<i>Dicymolomia julianalis</i> (Walker) – Julia’s Dicymolomia											X
<i>Donacaula sordidellus</i> (Zincken) – (no common name)		X	X			X					
<i>Elophila oblitalis</i> (Walker) – Waterlily Leafcutter			X								
<i>Glaphyria sesquialis</i> Hübner – White-roped Glaphyria							X				
<i>Hahncapsia mancalis</i> (Lederer) – (no common name)							X				
<i>Herpetogramma abdominalis</i> (Zeller) – (no common name)					X						
<i>Herpetogramma aeglealis</i> (Walker) – Serpentine Webworm			X								

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<i>Herpetogramma sphingialis</i> Handfield & Handfield – (no common name)					X			X			
<i>Herpetogramma thestealis</i> (Walker) – Zigzag Herpetogramma							X	X			X
<i>Microcrambus biguttellus</i> (Forbes) – Gold-stripe Grass-Veneer								X		X	
<i>Microcrambus elegans</i> (Clemens) – Elegant Grass-Veneer			X	X	X		X	X	X	X	
<i>Neodactria</i> sp. [poss. <i>murellus</i> (Dyar) – (no common name)]					X						
<i>Neodactria zeellus</i> (Fernald) – (no common name)			X								
<i>Nomophila nearctica</i> Munroe – Lucerne Moth							X	X	X	X	X
<i>Palpita magniferalis</i> (Walker) – Splendid Palpita			X	X		X	X	X			
<i>Pantographa limata</i> (Grote & Robinson) – Basswood Leafroller							X	X			
<i>Parapediasia decorellus</i> (Zincken) – Graceful Grass-Veneer					X	X					
<i>Parapediasia teterrellus</i> (Zincken) – Bluegrass Webworm			X	X							
<i>Pediasia trisecta</i> (Walker) – Sod Webworm					X						
<i>Saucrobotys fumiferalis</i> (Hulst) – Dusky Saucrobotys	X										
<i>Scoparia biplagiata</i> Walker – Double-striped Scoparia			X			X					
<i>Udea rubigalis</i> (Guenée) – Celery Leaf-tier	X	X	X	X			X	X	X		
<i>Urola nivalis</i> (Drury) – Snowy Urola			X	X			X		X		
Depressariidae (flat-bodied moths)											
<i>Agonopterix thelmae</i> Clarke – Thelma’s Agonopterix							X				
<i>Psilocorsis cryptolechiella</i> (Chambers) – Black-fringed Leaf-tier							X				
<i>Psilocorsis reflexella</i> Clemens – Dotted Leaf-tier	X										
Elachistidae (grass leafminer moths)											
<i>Elachista illectella</i> (Clemens) – (no common name)								X			
Erebidae (tussock moths, lichen moths, tiger moths, litter moths, owlets, snouts, underwings, zales)											
<i>Allotria elonympha</i> (Hübner) – False Underwing					X	X					
<i>Apantesis figurata</i> (Drury) – Figured Tiger Moth		X	X			X					
<i>Apantesis nais</i> (Drury) – Nais Tiger Moth	X	X	X		X	X	X	X	X		X
<i>Apantesis</i> Walker sp. – (no common name)							X				
<i>Arugisa lutea</i> (Smith) – Common Arugisa								X			
<i>Bleptina caradrialis</i> Guenée – Bent-winged Owlet			X	X	X						
<i>Caenurgia chloropha</i> (Hübner) – Vetch Looper				X					X		
<i>Cisthene plumbea</i> Stretch – Lead-colored Lichen Moth									X		
<i>Crambidia pallida</i> Packard – Pale Lichen Moth										X	
<i>Crambidia uniformis</i> Dyar – Uniform Lichen Moth										X	
<i>Euparthenos nubilis</i> (Hübner) – Locust Underwing							X				
<i>Halysidota harrisii</i> (Walsh) – Sycamore Tussock Moth*				X							
<i>Halysidota tessellaris</i> (Smith) – Banded Tussock Moth*							X				
<i>Hypena baltimoralis</i> Guenée – Baltimore Bomolocha (Baltimore Snout)							X				X
<i>Hypena humuli</i> Harris – Hop Vine Moth				X							
<i>Hypena madefactalis</i> Guenée – Gray-edged Bomolocha (Gray-edged Snout)				X	X						
<i>Hypena scabra</i> (Fabricius) – Green Cloverworm				X		X			X	X	X
<i>Hypena sordidula</i> Grote – Sordid Bomolocha (Sordid Snout)						X					
<i>Hypenodes fractilinea</i> (Smith) – Broken-line Hypenodes			X	X	X				X	X	
<i>Hypenula cacuminalis</i> (Walker) – Long-Horned Owlet						X					
<i>Hyperstrotia nana</i> (Hübner) – White-lined Graylet			X				X	X			
<i>Hyphantria cunea</i> (Drury) – Fall Webworm			X				X				
<i>Idia aemula</i> Hübner – Common Idia					X						
<i>Idia americalis</i> (Guenée) – American Idia		X							X		X
<i>Idia denticulalis</i> (Harvey) – Toothed Idia*			X								

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<i>Idia diminuendis</i> (Barnes & McDunnough) – Orange-spotted Idia				X	X	X	X				
<i>Lascoria ambigua</i> (Walker) – Ambiguous Moth	X	X		X				X			
<i>Macrochilo orciferalis</i> (Walker) – Bronzy Macrochilo							X				X
<i>Metalectra discalis</i> (Grote) – Common Fungus Moth							X				
<i>Metalectra richardsi</i> Brower – Richards’ Fungus Moth								X			
<i>Mocis texana</i> (Morrison) – Texas Mocis	X	X	X				X		X		
<i>Orgyia leucostigma</i> (Smith) – White-marked Tussock Moth											X
<i>Palthis angulalis</i> (Hübner) – Dark-spotted Palthis	X	X	X	X		X	X				X
<i>Palthis asopialis</i> (Guenée) – Faint-spotted Palthis											X
<i>Panopoda rufimargo</i> (Hübner) – Red-lined Panopoda								X			
<i>Phalaenophana pyramusalis</i> (Walker) – Dark-banded Owlet		X				X					
<i>Phalaenostola larentioides</i> Grote – Black-banded Owlet			X	X						X	
<i>Phyprosopus callitrichoides</i> Grote – Curve-lined Owlet			X								
<i>Pyrrharctia isabella</i> (Smith) – Isabella Tiger Moth			X					X			
<i>Renia adspersgillus</i> (Bosc) – Speckled Renia								X	X	X	
<i>Renia discoloralis</i> Guenée – Discolored Renia					X		X				
<i>Renia fraternalis</i> Smith – Fraternal Renia				X				X			
<i>Rivula propinquialis</i> Guenée – Spotted Grass Moth									X		X
<i>Rivula salusalis</i> (Walker) – (no common name)									X		
<i>Spargaloma sexpunctata</i> Grote – Six-spotted Gray Moth		X									
<i>Spilosoma virginica</i> (Fabricius) – Virginian Tiger Moth	X										
<i>Tetanolita floridana</i> Smith – Florida Tetanolita											X
<i>Virbia opella</i> (Grote) – Tawny Holomelina (Tawny Virbia)			X								
<i>Zale helata</i> (Smith) – Brown-spotted Zale			X								
<i>Zale lunata</i> (Drury) – Lunate Zale			X								
<i>Zale undularis</i> (Drury) – Black Zale			X				X				
<i>Zanclognatha cruralis</i> (Guenée) – Early Zanclognatha (Early Fan-Foot)								X			
<i>Zanclognatha lituralis</i> (Hübner) – Lettered Zanclognatha (Lettered Fan-Foot)	X	X									
<i>Zanclognatha martha</i> Barnes – Pine Barrens Zanclognatha			X				X				
<i>Zanclognatha obscuripennis</i> (Grote) – Dark Zanclognatha			X	X				X			
Gelechiidae (twirler moths, gelechiid moths)											
<i>Aroga epigaeella</i> (Chambers) – (no common name)*								X			
<i>Battaristis vittella</i> (Busck) – Stripe-backed Moth (Orange Stripe-backed Moth)		X	X	X	X						
<i>Chionodes discoocellella</i> (Chambers) – Eye-ringed Chionodes		X									
<i>Chionodes imber</i> Hodges – (no common name)*		X	X								
<i>Chionodes mediofuscella</i> (Clemens) – Black-smudged Chionodes	X	X					X	X	X		
<i>Chionodes sevir</i> Hodges – (no common name)*				X							
<i>Chionodes thoraceochrella</i> (Chambers) – (no common name)					X						
<i>Coleotechnites quercivorella</i> (Chambers) – (no common name)	X	X	X								
<i>Coleotechnites</i> sp. [poss. <i>florae</i> (Freeman)] – Coleotechnites Flower Moth]			X								
<i>Dichomeris copa</i> Hodges – Copa Dichomeris											X
<i>Dichomeris flavocostella</i> (Clemens) – Cream-edged Dichomeris				X							
<i>Dichomeris kimballi</i> Hodges – (no common name)*	X		X	X	X		X		X		
<i>Dichomeris ligulella</i> Hübner – Palmerworm Moth		X					X	X	X		
<i>Dichomeris setosella</i> (Clemens) – (no common name)		X									
<i>Dichomeris offula</i> Hodges – (no common name)*						X					
<i>Dichomeris ventrellus</i> (Fitch) – (no common name)		X	X	X							
<i>Exoteleia pinifoliella</i> (Chambers) – Pine Needleminer Moth	X	X	X	X							

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gen. nova et sp. nova 420495.97 – (no common name)						X					
<i>Glauce pectenalaella</i> Chambers – (no common name)*			X								
<i>Helcystogramma hystricella</i> (Braun) – Lanceolate Helcystogramma (Lanceolate Moth)											
<i>Keiferia lycopersicella</i> (Walsingham) – Tomato Pinworm Moth*				X				X		X	
<i>Recurvaria nanella</i> ([Denis & Schiffermüller]) – Lesser Bud Moth*						X					
<i>Stereomita</i> Braun sp. nova – (no common name)*			X					X	X	X	
Geometridae (geometer moths)											
<i>Aethalura intertexta</i> (Walker) – Four-Barred Gray								X			
<i>Anavitrinella pampinaria</i> (Guenée) – Common Gray	X										
<i>Campaea perlata</i> (Guenée) – Pale Beauty											X
<i>Chlorochlamys chloroleucaria</i> (Guenée) – Blackberry Looper	X	X									
<i>Cleora projecta</i> (Walker) – Projecta Gray			X								
<i>Costaconvexa centrostrigaria</i> (Wollaston) – Bent-line Carpet		X		X	X	X	X		X	X	X
<i>Cyclophora packardi</i> (Prout) – Packard’s Wave											X
<i>Digrammia continuata</i> (Walker) – Curve-lined Angle											X
<i>Epimecis hortaria</i> (Fabricius) – Tulip-Tree Beauty							X		X		
<i>Eubaphe mendica</i> (Walker) – The Beggar			X	X							
<i>Euchlaena madusaria</i> (Walker) – Scrub Euchlaena*	X		X								
<i>Eulithis gracilineata</i> (Guenée) – Greater Grapevine Looper				X							
<i>Eupithecia miserulata</i> Grote – Common Eupithecia (Common Pug)*	X										
<i>Eusarca confusaria</i> Hübner – Confused Eusarca			X	X							
<i>Eutrapela clemataria</i> (Smith) – Curved-Toothed Geometer						X					
<i>Hypagyrtis esther</i> (Barnes) – Esther Moth							X	X	X		
<i>Hypagyrtis unipunctata</i> (Haworth) – One-spotted Variant			X	X							
<i>Hypomecis umbrosaria</i> (Hübner) – Umber Moth					X						
<i>Ilexia intractata</i> (Walker) – Black-dotted Ruddy	X				X		X				
<i>Iridopsis defectaria</i> (Guenée) – Brown-shaded Gray										X	X
<i>Lomographa vestaliata</i> (Guenée) – White Spring Moth					X	X	X				
<i>Macaria aemulataria</i> Walker – Common Angle			X		X						
<i>Macaria bicolorata</i> (Fabricius) – Bicolored Angle							X				X
<i>Macaria bisignata</i> Walker – Red-headed Inchworm				X							
<i>Macaria granitata</i> Guenée – Granite Moth			X				X	X	X	X	X
<i>Macaria notata</i> (Linnaeus) – Birch Angle							X	X		X	
<i>Melanolophia canadaria</i> (Guenée) – Canadian Melanolophia					X						
<i>Melanolophia signataria</i> (Walker) – Signate Melanolophia	X										
<i>Mellilla xanthometata</i> (Walker) – Orange Wing						X		X			
<i>Metarranthis angularia</i> Barnes & McDunnough – Angled Metarranthis			X								
<i>Metarranthis hypochraria</i> (Herrich-Schäffer) – Common Metarranthis			X								
<i>Orthonama obstipata</i> (Fabricius) – The Gem	X					X	X		X		
<i>Patalene olyzonaria</i> (Walker) – Juniper Geometer (Juniper-twig Geometer)							X	X			
<i>Pero ancetaria</i> (Hübner) – Hubner’s Pero*							X				
<i>Pero honestaria</i> (Walker) – Honest Pero*	X	X					X		X		
<i>Pero morrisonaria</i> (Edwards) – Morrison’s Pero*							X				
<i>Petrophora subaequaria</i> (Walker) – Northern Petrophora							X				
<i>Pleuroprucha insulsaria</i> (Guenée) – Common Tan Wave							X	X	X	X	X
<i>Prochoerodes lineola</i> (Goeze) – Large Maple Spanworm				X							
<i>Protitame virginialis</i> (Hulst) – Virgin Moth	X	X									

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<i>Protoboarmia porcelaria</i> (Guenée) – Porcelain Gray								X	X		
<i>Scopula limboundata</i> (Haworth) – Large Lace-border			X	X					X		
<i>Selenia kentaria</i> (Grote & Robinson) – Kent’s Geometer							X				
<i>Speranza pustularia</i> (Guenée) – Lesser Maple Spanworm				X	X						
Glyphipterigidae (sedge moths)											
<i>Diploschizia impigritella</i> (Clemens) – Yellow Nutsedge Moth				X	X						
Gracillariidae (leaf blotch miner moths)											
<i>Leucospilapteryx venustella</i> (Clemens) – Snakeroot Leafminer								X			
<i>Macrosaccus robiniella</i> (Clemens) – (no common name)			X								
<i>Marmara fasciella</i> (Chambers) – White Pine Barkminer	X										
<i>Marmara</i> sp. [nr. <i>viburnella</i> Eiseman & Davis – (no common name)]*							X				
<i>Neurobathra strigifinitella</i> (Clemens) – Finite-channeled Leafminer			X								
<i>Phyllocnistis insignis</i> Frey & Boll – (no common name)			X								
Heliozelidae (leaf miners, shield bearers)											
<i>Antispila viticordifoliella</i> Clemens – (no common name)*								X			
Incurvariidae (fairy moths, incurvarid moths, yucca moths)											
<i>Phylloporia bistrigella</i> (Haworth) – (no common name)	X										
Lasiolepididae (tent caterpillar moths)											
<i>Malacosoma americana</i> (Fabricius) – Eastern Tent Caterpillar Moth			X								
Limacodidae (slug caterpillar moths)											
<i>Apoda biguttata</i> (Packard) – Shagreened Slug Moth				X							
<i>Euclea delphinii</i> (Boisduval) – Spiny Oak-Slug Moth			X	X							
<i>Heterogenea shurtleffi</i> Packard – Red-eyed Button Slug Moth					X	X		X			
<i>Isa textula</i> (Herrich-Schäffer) – Crowned Slug Moth						X	X				
<i>Lithacodes fasciola</i> (Herrich-Schäffer) – Yellow-shouldered Slug Moth						X					
<i>Natada nasoni</i> (Grote) – Nason’s Slug Moth				X							
<i>Parasa indetermina</i> (Boisduval) – Stinging Rose Caterpillar Moth					X						
Momphidae (momphid moths)											
<i>Mompha murfeldtella</i> (Chambers) – (no common name)			X								
Nepticulidae (pygmy moths, midget moths)											
<i>Ectoedemia</i> sp. [poss. <i>nyssaefoliella</i> (Chambers)] – (no common name)*					X						
<i>Stigmella</i> Schrank sp. – (no common name)				X	X						
Noctuidae (dagger moths, noctuid moths, owlet moths, underwings)											
<i>Abrostola urentis</i> Guenée – Spectacled Nettle Moth (Variegated Brindle)					X						
<i>Acronicta americana</i> (Harris) – American Dagger			X								
<i>Acronicta haesitata</i> (Grote) – Hesitant Dagger					X		X				
<i>Acronicta modica</i> (Walker) – Medium Dagger			X				X				
<i>Agrotis ipsilon</i> (Hufnagel) – Ipsilon Dart					X						
<i>Amphipyra pyramidoides</i> Guenée – Copper Underwing										X	
<i>Anicla forbesi</i> (Franclemont) – Forbes’ Dart*							X				
<i>Anicla illapsa</i> (Walker) – Snowy Dart*							X	X			X
<i>Anicla infecta</i> (Ochsenheimer) – Green Cutworm*							X		X	X	X
<i>Autographa precationis</i> (Guenée) – Common Looper*							X				
<i>Calophasia lumula</i> (Hufnagel) – Toadflax Brocade									X		
<i>Chloridea virescens</i> (Fabricius) – Tobacco Budworm									X		
<i>Chrysodeixis includens</i> (Walker) – Soybean Looper									X		X
<i>Chytonix palliatricula</i> (Guenée) – Cloaked Marvel	X										

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<i>Condica mobilis</i> (Walker) – Mobile Groundling	X	X									
<i>Condica sutor</i> (Guenée) – The Cobbler										X	
<i>Condica vecors</i> (Guenée) – Dusky Groundling				X	X	X	X	X	X		
<i>Dichagyris acclivis</i> (Morrison) – Inclined Dart									X		
<i>Elaphria grata</i> Hübner – Grateful Midget				X	X	X					X
<i>Elaphria versicolor</i> (Grote) – Variegated Midget		X		X	X	X					X
<i>Feltia herilis</i> (Grote) – Master’s Dart									X	X	
<i>Galgula partita</i> Guenée – The Wedgling			X								X
<i>Hyperstrotia pervertens</i> (Barnes & McDunnough) – Dotted Graylet				X	X						
<i>Lacinipolia renigera</i> (Stephens) – Bristly Cutworm			X					X	X	X	
<i>Leucania adjuta</i> (Grote) – Adjutant Wainscot*				X	X	X		X	X	X	
<i>Leucania commoides</i> Guenée – Comma Wainscot*			X								X
<i>Leucania inermis</i> (Forbes) – Unarmed Wainscot*								X			
<i>Leucania linda</i> Franclemont – Linda Wainscot*								X			
<i>Leucania multilinea</i> Walker – Many-lined Wainscot*								X			
<i>Leucania phragmitidicola</i> Guenée – Phragmites Wainscot*						X					
<i>Leucania ursula</i> (Forbes) – Ursula Wainscot*		X						X			
<i>Lithacodia musta</i> (Grote & Robinson) – Small Mossy Lithacodia (Small Mossy Glyph)				X		X		X			
<i>Maliattha synochitis</i> (Grote & Robinson) – Black-dotted Maliattha (Black-dotted Glyph)			X	X							
<i>Marimatha nigrofimbria</i> (Guenée) – Black-bordered Lemon			X	X	X	X	X	X	X		X
<i>Mythimna oxygala</i> (Grote) – Lesser Wainscot	X										
<i>Mythimna unipuncta</i> (Haworth) – Armyworm (The White-Speck)	X	X	X			X		X			
<i>Nephelodes minians</i> Guenée – Bronzed Cutworm											X
<i>Orthodes majuscula</i> Herrich-Schäffer – Rustic Quaker							X	X			
<i>Panthea furcilla</i> (Packard) – Eastern Panthea	X							X	X		
<i>Phosphila miselioides</i> (Guenée) – Spotted Phosphila				X							
<i>Phosphila turbulenta</i> Hübner – Turbulent Phosphila						X	X				
<i>Protodeltote muscosula</i> (Guenée) – Large Mossy Lithacodia (Large Mossy Glyph)			X	X							
<i>Pseudeustrotia carneola</i> (Guenée) – Pink-barred Lithacodia (Pink-barred Pseudeustrotia)						X					
<i>Raphia frater</i> Grote – The Brother			X								
<i>Schinia arcigera</i> (Guenée) – Arcigera Flower Moth										X	X
<i>Spodoptera frugiperda</i> (Smith) – Fall Armyworm											X
<i>Spodoptera ornithogalli</i> (Guenée) – Yellow-striped Armyworm							X	X	X	X	
<i>Spragueia leo</i> (Guenée) – Common Spragueia							X	X			
<i>Xestia c-nigrum</i> (Linnaeus) – Lesser Black-letter Dart (Setaceous Hebrew Character)							X	X	X	X	
Nolidae (nolid moths)											
<i>Meganola phylla</i> (Dyar) – Coastal Plain Meganola	X	X				X	X				
<i>Meganola spodia</i> Franclemont – Ashy Meganola	X						X				
Notodontidae (prominents)											
<i>Dasylophia thyiroides</i> (Walker) – Gray-patched Prominent				X							
<i>Heterocampa biundata</i> Walker – Wavy-Lined Heterocampa							X				
<i>Schizura concinna</i> (Smith) – Red-humped Caterpillar Moth					X						
Oecophoridae (oecophorid moths)											
<i>Epicallima argenticinctella</i> (Clemens) – Orange-headed Epicallima					X						
<i>Promalactis suzukiella</i> (Matsumura) – Suzuki’s Promalactis					X						
Plutellidae (diamondback moths)											
<i>Plutella xylostella</i> (Linnaeus) – Diamondback Moth	X	X	X	X			X				

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Pterophoridae (plume moths)											
<i>Emmelina monodactyla</i> (Linnaeus) – Morning-glory Plume Moth*					X					X	
<i>Stenoptilia zophodactylus</i> (Duponchel) – Dowdy Plume Moth*										X	
Pyralidae (grass moths, snout moths)											
<i>Acrobasis exsulella</i> (Zeller) – Cordovan Pyralid							X				
<i>Acrobasis</i> sp. [poss. <i>juglandis</i> (LeBaron) – Pecan Leaf Casebearer]											X
<i>Aphomia sociella</i> (Linnaeus) – Bee Moth	X										
<i>Ephestia kuehniella</i> Zeller – Mediterranean Flour Moth											X
<i>Ephesiodes infimella</i> Ragonot – (no common name)										X	
<i>Eulogia ochrifrontella</i> (Zeller) – Broad-banded Eulogia			X				X				X
<i>Macalla zelleri</i> (Grote) – Zeller’s Macalla			X								
<i>Moodna ostrinella</i> (Clemens) – Darker Moodna				X							
<i>Oneida lunulalis</i> (Hulst) – Orange-tufted Oneida								X			
<i>Oreana unicolorella</i> (Hulst) – (no common name)								X	X		
<i>Palatka nymphaeella</i> (Hulst) – (no common name)								X			
<i>Peoria gemmatella</i> (Hulst) – (no common name)								X			
<i>Pococera expandens</i> (Walker) – Striped Oak Webworm (Double-humped Pococera)							X				
<i>Pococera robustella</i> (Zeller) – Pine Webworm					X	X					
<i>Pococera scortealis</i> (Lederer) – Lespedeza Webworm								X			
<i>Pyla aenigmatica</i> Heinrich – (no common name)*			X	X							
<i>Salebriaria engeli</i> (Dyar) – Engel’s Salebriaria					X		X				
<i>Salebriaria turpidella</i> (Ragonot) – (no common name)*				X							
<i>Sciota uvinella</i> (Ragonot) – Sweetgum Leafroller								X			
<i>Tosale oviplagalis</i> (Walker) – Dimorphic Tosale				X				X			
<i>Varneria postremella</i> Dyar – (no common name)							X				
<i>Vitula broweri</i> (Heinrich) – Brower’s Vitula		X			X						
<i>Vitula edmandsii</i> (Packard) – Dried Fruit Moth				X							
Saturniidae (giant silkworm moths, royal moths)											
<i>Dryocampa rubicunda</i> (Fabricius) – Rosy Maple Moth	X	X	X				X	X			
<i>Eacles imperialis</i> (Drury) – Imperial Moth							X				
Scythrididae (flower moths)											
<i>Scythris eboracensis</i> (Zeller) – (no common name)			X								
Sphingidae (hawk moths, sphinx moths)											
<i>Lapara coniferarum</i> (Smith) – Southern Pine Sphinx						X					
<i>Smerinthus jamaicensis</i> (Drury) – Twin-spotted Sphinx						X					
Tineidae (fungus moths, cloths moths, tube moths)											
<i>Acrolophus arcanella</i> (Clemens) – Grass Tubeworm*			X								
<i>Acrolophus panamae</i> Busck – Panama Grass Tubeworm			X	X	X	X					
<i>Acrolophus plumifrontella</i> (Clemens) – Eastern Grass Tubeworm						X	X				
<i>Acrolophus propinqua</i> (Walsingham) – Walsingham’s Grass Tubeworm						X		X			
<i>Homostinea curviliniella</i> Dietz – (no common name)			X								
<i>Tinea apicimaculella</i> Chambers – Dark-collared Tinea										X	
Tortricidae (leaf rollers, leaf tiers)											
<i>Aethes angulatana</i> (Robinson) – Angular Aethes*				X				X	X	X	X
<i>Aethes promptana</i> (Robinson) – (no common name)*										X	
<i>Aethes razowskii</i> Sabourin & Metzler – Razowski’s Aethes*				X						X	
<i>Aethes seriatana</i> (Zeller) complex – (no common name)*						X				X	
<i>Amorbia humerosana</i> Clemens – White-line Leafroller	X	X									
<i>Ancylis comptana</i> (Frölich) – Strawberry Leafroller							X		X		
<i>Ancylis discigerana</i> (Walker) – Yellow Birch Leafroller	X	X									

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<i>Ancylis laciniata</i> (Zeller) – (no common name)	X										
<i>Archips purpurana</i> (Clemens) – Omnivorous Leafroller				X							
<i>Archips rosana</i> (Linnaeus) – Rose Tortrix						X					
<i>Argyrotaenia pinatubana</i> (Kearfott) – Pine Tube Moth	X	X	X	X	X						
<i>Argyrotaenia tabulana</i> Freeman complex – (no common name)*		X			X	X	X		X	X	
<i>Argyrotaenia velutinana</i> (Walker) – Red-banded Leafroller					X	X	X	X	X		
<i>Celypha cespitana</i> (Hübner) – Celypha Moth			X								
<i>Cenopis pettitana</i> (Robinson) – Maple-basswood Leafroller		X	X								
<i>Choristoneura conflictana</i> (Walker) – Large Aspen Tortrix	X										
<i>Choristoneura rosaceana</i> (Harris) – Oblique-banded Leafroller			X	X				X	X	X	
<i>Clepsis peritana</i> (Clemens) – Garden Tortrix*								X	X	X	
<i>Cydia candana</i> (Forbes) – (no common name)*		X									
<i>Cydia caryana</i> (Fitch) – Hickory Shuckworm*		X									
<i>Cydia latiferreana</i> (Walsingham) – Filbertworm Moth		X					X	X	X	X	
<i>Cydia toreuta</i> (Grote) – Eastern Pine Seedworm			X	X							
<i>Dichrorampha leopardana</i> (Busck) – (no common name)						X					
<i>Ecdytolopa insiticihana</i> Zeller – Locust Twig Borer						X					
<i>Endothenia hebesana</i> (Walker) – Verbena Bud Moth (Dull-barred Endothenia)						X					
<i>Epiblema obfusca</i> (Dyar) – (no common name)*			X								
<i>Eucopina monitorana</i> (Heinrich) – Red Pinecone Borer		X			X						
<i>Eucopina tocollionana</i> (Heinrich) – White Pinecone Borer					X						
<i>Eucosma ambodaidaleia</i> (Miller) – (no common name)	X										
<i>Eucosma parmatana</i> (Clemens) – (no common name)								X		X	
<i>Eugnosta sartana</i> (Hübner) – (no common name)*			X	X	X		X	X			
<i>Grapholita packardi</i> (Zeller) – Cherry Fruitworm		X									
<i>Gretchena concitricana</i> (Heinrich) – (no common name)				X	X						
<i>Gymnandrosoma punctidiscanum</i> Dyar – Dotted Ecdytolopa (Dotted Gymnandrosoma)						X	X				
<i>Gypsonoma fasciolana</i> (Clemens) – (no common name)						X					
<i>Olethreutes connectum</i> (McDunnough) – Bunchberry Leafroller										X	
<i>Olethreutes inornatana</i> (Clemens) – Inornate Olethreutes					X						
<i>Pandemis limitata</i> (Robinson) – Three-lined Leafroller						X	X	X			
<i>Phaenocarpa confixana</i> (Walker) – Macramé Moth			X	X							
<i>Platphalonidia magdalenae</i> (Metzler & Albu) – (no common name)						X					
<i>Platynota flavedana</i> Clemens – Black-shaded Platynota		X	X				X	X			
<i>Platynota idaeusalis</i> (Walker) – Tufted Apple-Bud Moth			X	X			X	X			
<i>Proteoteras crescentana</i> Kearfott – Northern Boxelder Twig Borer (Black-crescent Proteoteras)			X								
<i>Retinia comstockiana</i> Fernald – Pitch Twig Moth	X	X	X								
<i>Retinia gemistrigulana</i> (Kearfott) – Gray Retinia				X							
<i>Retinia virginiana</i> (Busck) – Wenzel's Pitch-blister Moth	X	X									
<i>Rhyacionia frustrana</i> (Comstock) – Nantucket Pine Tip Moth*								X			
<i>Sparganothis sulfureana</i> (Clemens) – Sparganothis Fruitworm			X	X			X	X	X		
<i>Sparganothis xanthoides</i> (Walker) – Mosaic Sparganothis		X									
<i>Sparganothis lentiginosana</i> (Walsingham) – Lentiginos Moth	X	X	X								
<i>Zomaria interruptolineana</i> (Fernald) – Broken-line Zomaria	X										
Yponomeutidae (ermine moths, needleminer moths)											
<i>Yponomeuta multipunctella</i> (Clemens) – American Ermine				X							
Zygaenidae (leaf skeletonizers)											
<i>Pyromorpha dimidiata</i> Herrich-Schäffer – Orange-patched Smoky Moth			X								

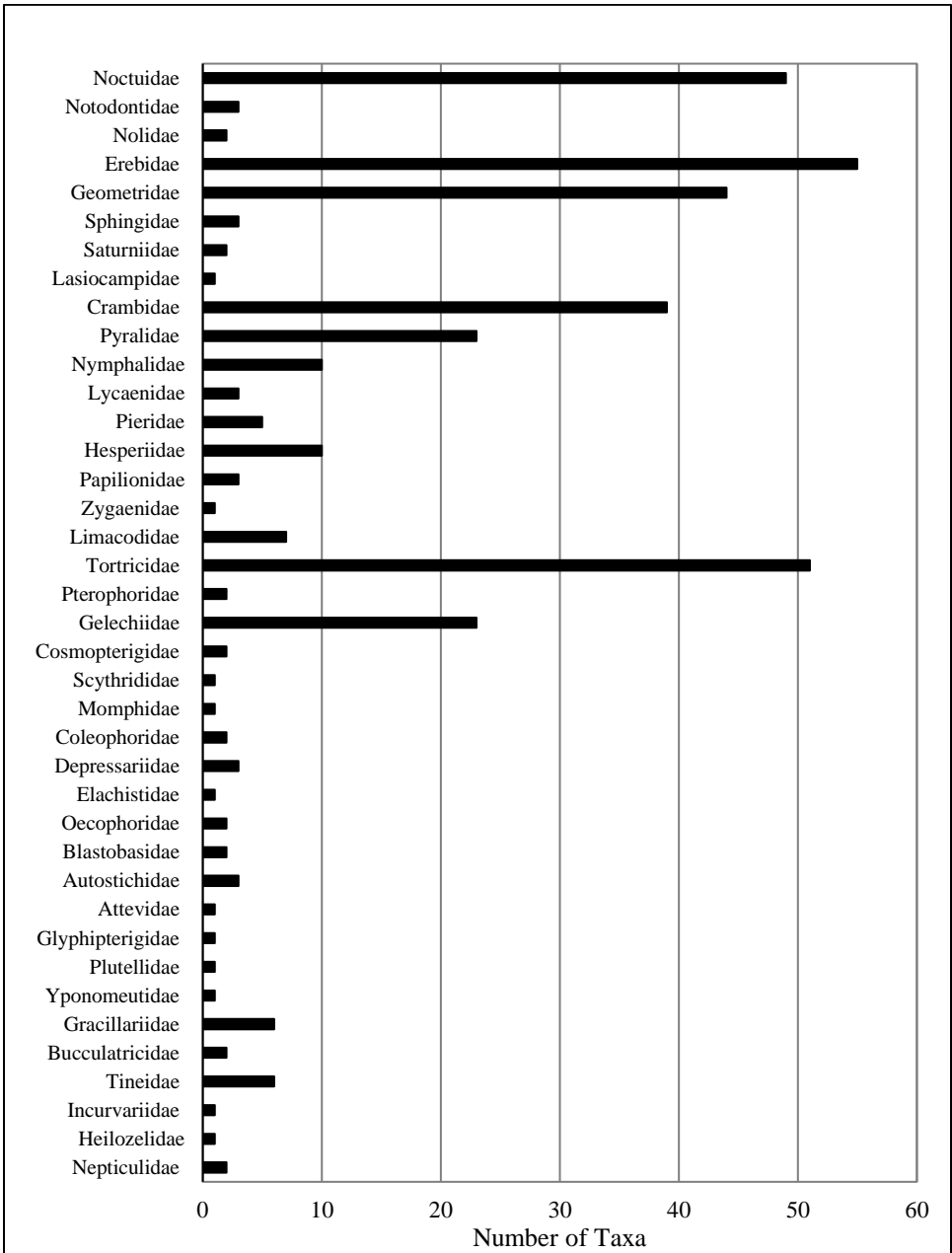


Figure 2. Observed species richness of each family of Lepidoptera encountered. Arranged taxonomically with primitive families at the bottom of the table near the x-axis and more advanced families at the top according to van Nieukerken et al. (2011).

DISCUSSION

During the course of this study, no threatened or endangered Lepidoptera, as determined by the Maryland Natural Heritage Program (2016), were encountered. The plants associated with serpentine soils in the list of Rare, Threatened, and Endangered Plants of Maryland (Maryland Natural Heritage Program 2019) were cross referenced with the caterpillar host lists in Tietz (1972). In total, the Maryland Natural Heritage Program lists 41 rare, threatened or endangered plants being associated with serpentine soils the majority of which appear in Tietz (1972). However, only a few of the associated Lepidoptera were found during this survey. Those that were found are all generalists—e.g., Silver-spotted Skipper, *Epargyreus clarus* (Cramer) (Hesperiidae); Tobacco Budworm, *Chloridea virescens* (Fabricius) (Noctuidae); and Lesser Black-letter Dart, *Xestia c-nigrum* (Linnaeus) (Noctuidae)—and therefore could not be linked to a specific host. It is worth noting that many species of Lepidoptera, especially the Microlepidoptera encountered in this study, have unknown larval hosts (Robinson et al. 2010). This is largely due to their small size, quick larval development, and cryptic feeding habits.

In total 32 species of diurnal Lepidoptera were encountered during the six-month study of the site. In comparison a three-year study of the butterflies of the serpentine barrens of Soldiers Delight Natural Environment Area (approximately 13 km [8 mi] WNW as the crow flies) found 51 species of butterflies on the site (Smith 1981, 2010). Of the 51 species, 19 were found at both sites. Seventeen of these species are common throughout the region and do not infer a unique association to any plants that are specific to serpentine soils. The Dusted Skipper, *Atrytonopsis hianna* (Scudder), and the Swarthy Skipper, *Nastra lherminier* (Latreille) (both Hesperidae), are exceptions. The Dusted Skipper was reported by Smith (1981, 2010) to be “special” to the serpentine barrens of Soldiers Delight due to the abundance of its hosts, bluestem grasses, *Andropogon* L. spp. (Poaceae) but further explanation was not provided. The Dusted Skipper is reported from 14 counties in Maryland (Hubick and Brighton 2012–2020); it is possible that Smith’s comments may relate more to the abundance of the species and not its uniqueness. The Swarthy Skipper is recorded by Steinberg (2002) to feed on little bluestem, *Schizachyrium scoparium* (Michx.) Nash (Poaceae), which is a species that is commonly associated with serpentine oak and pine barrens, *Quercus* L. (Fagaceae) and *Pinus* L. (Pinaceae) respectively, in Maryland and Pennsylvania and benefits from a fire regime.

A restoration and management plan created for the Unionville Serpentine Barrens (Latham and McGeehin 2012) lists five taxa that are of special conservation concern in Pennsylvania: Falcate Orangetip, *Anthocharis midea* (Hübner) (Pieridae); Swarthy Skipper; Esther Moth, *Hypagyrtis esther* (Barnes) (Geometridae); Inclined Dart, *Dichagyris (Richia) acclivis* (Morrison) (Noctuidae); and Pine Barrens Zanclognatha, *Zanclognatha martha* Barnes (Erebidae). None of these species are known to be of concern in Maryland (Maryland Natural Heritage Program 2016). The Maryland Biodiversity Project (Hubick and Brighton 2012–2020) was used to determine the distribution of these five species in Maryland. The Falcate Orangetip is recorded from 23 of the 24 Maryland jurisdictions (i.e., 23 counties plus Baltimore), Swarthy Skipper from 21, Esther Moth from 18, Inclined Dart from 11, and Pine Barrens Zanclognatha from 5. This suggests that at least the Inclined Dart and the Pine Barrens Zanclognatha may be

under-collected or have limited or restricted distributions in Maryland and warrant further investigation to determine the stability of these species.

There are potentially two undescribed taxa, *Stereomita* Braun (Gelechiidae), and *Stigmella* Schrank (Nepticulidae), and an almost entirely black *Apantesis* Walker (Erebidae) that were encountered during the course of this study and could not be identified. They will be addressed in future studies and subsequent publications if warranted.

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