

Owlet Moths of Virginia, I. Subfamily Plusiinae (Lepidoptera: Noctuidae)

Steven M. Roble

Virginia Department of Conservation and Recreation
Division of Natural Heritage
600 E. Main Street
Richmond, Virginia 23219

ABSTRACT

Twenty-five species of the noctuid moth subfamily Plusiinae are reported for Virginia based on recent collecting, museum specimens, literature records, and photographs. Four species, *Autographa ampla* (Walker), *Polychrysis morigera* (H. Edwards), *Pseudeva purpurigera* (Walker), and *Syngrapha alias* (Ottolengui), are recorded from the Commonwealth for the first time. *Exyra ridingsii* (Riley) may be extirpated in the state, whereas the status of *E. fax* (Grote), *E. semicrocea* (Guenée), and *Plusia putnami* Grote is unknown. Five additional members of the subfamily may occur in the state owing to their documented occurrence in adjacent or nearby states. Documented county and city records and capture dates are reported for all species.

Keywords: new state records, distribution, phenology.

INTRODUCTION

Noctuidae, commonly referred to as “owlet moths,” is one of the largest families of Lepidoptera in both the world (ca. 1,089 genera and 11,772 species; van Nieukerken et al., 2011) and North America (>2,500 described species north of Mexico; Lafontaine & Schmidt, 2010) despite the recent splitting of the family into several families (e.g., Erebiidae, Euteliidae, Nolidae). At least 475 species of noctuids are known to inhabit Virginia (Roble, unpub. data). This is the first paper in a series that will document the composition, distribution, phenology, and conservation status of the diverse noctuid moth fauna of Virginia. This installment treats the relatively small subfamily Plusiinae (commonly known as loopers), which includes about 400 species worldwide (Powell & Opler, 2009) and 79 species in North America north of Mexico (Lafontaine & Poole, 1991; Lafontaine & Schmidt, 2010). Several plusiines are economically important pests of agricultural crops, but the vast majority are not. Miller et al. (2003) studied the temporal and spatial distribution and abundance of a community of 15 rare to uncommon plusiines in the Pacific Northwest that includes conifer, hardwood tree and shrub, and herbaceous-feeding

species, and occupies a range of elevation and habitat types that include subalpine meadows and coniferous forests. These authors concluded that this plusiine fauna represented an important component of the biodiversity within these local landscapes.

Eichlin & Cunningham (1978) reported 15 species of plusiines from Virginia, whereas Pogue (2005) attributed only 12 species to the state. Range maps currently provided on the Moth Photographers Group (hereafter MPG) website include Virginia records for only seven species. They are typically limited to only 1–3 records per species, and are apparently based mostly or entirely on photographs posted on other websites (e.g., BugGuide, Butterflies and Moths of North America) rather than voucher specimens.

As is true of Lafontaine & Poole’s (1991) treatment of the Plusiinae and most other fascicles in the landmark series *Moths of North America*, as well as systematic studies and older reviews of the Nearctic moth fauna, few records from Virginia are included. This is largely due to the historical paucity of sampling of the state’s native moth fauna by professional and amateur lepidopterists. Most major museum collections contain limited Virginia material, often dominated by the efforts of a single collector (e.g., the Ellison Smyth collection at

the National Museum of Natural History [NMNH], primarily from Montgomery County, ca. 1895–1910, or the John Franclemont collection (split between at least NMNH, Cornell University, and the Canadian National Collection of Insects, Arachnids, and Nematodes [CNC]), the Virginia portion of which is almost entirely from Arlington County, ca. 1948–1955) or multiple collectors at the same site (e.g., Mountain Lake Biological Station in Giles County).

The purpose of this paper is to present a more complete summary of our current knowledge on the composition, distribution, phenology, and conservation status of the noctuid subfamily Plusiinae in Virginia.

METHODS

Staff of the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH), including the author since 1992, have been sampling the moth fauna of the state for the past three decades, relying primarily on ultraviolet light traps, with more limited use of mercury vapor lights, sugar baiting, Malaise traps, diurnal netting, and other methods. Virtually no larval sampling has been conducted. Most specimens of Plusiinae have been retained from virtually all recent VDCR-DNH samples and that material constitutes the majority of the specimens that I examined for this study. Most specimens collected by VDCR-DNH staff and collaborators are deposited in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC, and the Virginia Museum of Natural History (VMNH), Martinsville, VA, or are retained in a reference collection at the agency's headquarters in Richmond, VA. Specimens collected in national parks (e.g., Shenandoah National Park [SNP], Blue Ridge Parkway [BRP], George Washington Memorial Parkway [GWMP]) have been returned to the respective parks in compliance with U.S. National Park Service policy.

I also searched for Virginia specimens in the following institutional collections: National Museum of Natural History (NMNH), Smithsonian Institution, Washington, D.C.; American Museum of Natural History (AMNH), New York, NY; Carnegie Museum of Natural History (CMNH), Pittsburgh, PA; Academy of Natural Sciences of Drexel University (ANSP), Philadelphia, PA; McGuire Center for Lepidoptera and Biodiversity (MGCL), Florida Museum of Natural History, Gainesville, FL; Cornell University (CUIC), Ithaca, NY; University of Kentucky (UK), Lexington, KY; University of Connecticut (UConn), Storrs, CT; University of Kansas (KU), Lawrence, KS; University of Maryland (UMD), College Park, MD; Pennsylvania State University (PSU), State College, PA; West

Virginia University (WVU), Morgantown, WV; Virginia Museum of Natural History (VMNH), Martinsville, VA; Virginia Polytechnic Institute and State University (VPIU), Blacksburg, VA; Virginia Commonwealth University (VCU), Richmond, VA; Virginia Military Institute (VMI), Lexington, VA; and Radford University (RU), Radford, VA. The private collections of Susan Felker (Floyd, VA) and the late William R. Grooms (Ashburn, VA), both currently in the possession of VDCR-DNH, also were examined. Paul Dennehy (Danville, PA), Steve Johnson (Sunbury, PA), and Kelly Richers (Bakersfield, CA) provided records from their private collections. In the species accounts below I have included online (SCAN website) museum records from the University of California-Davis (UCD), Cleveland Museum of Natural History (CLMNH), and Northern Arizona University (NAU), but did not examine those specimens.

No readily accessible database exists for the many plusiine specimens examined for the monograph on the North American fauna prepared by Lafontaine & Poole (1991; J.D. Lafontaine, pers. comm.), which mostly included records from NMNH and CNC. Consequently, I have attempted to estimate the county (or city) of origin for Virginia records based on the position of dots on the range maps in that paper if I was unable to find the likely corresponding specimen(s) during my own museum searches (included NMNH but not CNC).

I also reviewed published and unpublished literature sources (including the annual Season Summary published by The Lepidopterists' Society [SS-TLS] and Virginia regional reports in Southern Lepidopterists' News [SLN]), selected internet websites (including SCAN, LepNet, Yale Peabody Museum, iDigBio, MPG, Butterflies and Moths of North America [BAMONA], BugGuide [BG], iNaturalist [iNat], Maryland Biodiversity Project, North Carolina Biodiversity Project, and the Society of Kentucky Lepidopterists [Covell et al., 2018]), and other readily available photographs (some sent directly to me) for relevant records. Photographic records are listed below only if a voucher specimen is not known to exist from the corresponding county or city. The generalized range maps in Beadle & Leckie (2012) were not considered authoritative for the purpose of determining county or state records.

ANNOTATED CHECKLIST

Twenty-five species of Plusiinae have been documented or reported from Virginia. The checklist numbers of Lafontaine & Schmidt (2010) and Hodges et al. (1983), respectively, precede the species' names. Common names (in brackets) were taken from Covell

(1984), Wagner et al. (2011), Beadle & Leckie (2012), Leckie & Beadle (2018), and the Moth Photographers Group website. The abbreviations MONA and EC78 refer to Lafontaine & Poole (1991) and Eichlin & Cunningham (1978), respectively. Adults of most of the following species are illustrated in popular field guides such as those by Covell (1984), Beadle & Leckie (2012), and Leckie & Beadle (2018), and many are included in the color plates in Pogue (2005). Illustrations of the adults of all of these species can be found in Lafontaine & Poole (1991) and various websites (e.g., MPG, BAMONA, BugGuide, and iNaturalist). Wagner et al. (2011) provided detailed life history summaries and color photos of the larvae for many eastern plusiines, as well as some adult images.

Family Noctuidae

Subfamily Plusiinae

Tribe Abrostolini

931161/8880 *Abrostola ovalis* Guenée
[Oval Nettle Moth, White-shouldered Nettle Moth]

MONA: One record is plotted in either northern Virginia (perhaps Arlington Co.) or the District of Columbia (original source unknown).

Other published Virginia records: State only (EC78).

VDCR-DNH records (7 specimens): Bath Co., Warm Springs Mountain, 10–11 August 2010, S.M. Roble (2); Bedford Co., Jefferson National Forest, Thunder Hill, 20 August 2003, S.M. Roble (1); Dickenson Co., Breaks Interstate Park, Garden Hole, 8 May 2014, S.M. Roble and A.C. Chazal (1); Floyd Co., Buffalo Mountain Natural Area Preserve, 9 July 2010, S.M. Roble (1); Montgomery Co., Sweet Spring Hollow, 1 May 2003, J.C. Ludwig and I.T. Wilson (1); Rockbridge Co., Blue Ridge Parkway, Milepost 45, 30 May 1993, S.M. Roble (BRP, 1).

Other Virginia records: Augusta Co., George Washington National Forest, WVU non-target gypsy moth study, 1995–2001, total of three captures (L. Butler & J. Strazanac, unpub. data). Loudoun Co., Ashburn, 11 June 2010 (W.R. Grooms collection, 1); Smyth Co., Walker Mountain, north of Marion, 36° 54' N 81° 32' W, 3650', 18–19 June 1992, D.C. Ferguson (NMNH, 1).

Photo records: Arlington Co., Arlington, 13 July 2016, K. Rosenthal (iNat); Gloucester Co., Pinetta, 17 August 2006, T. Kain.

Virginia flight dates: 1 May–20 August

Comments: Most of the known Virginia records of *A. ovalis* are from mountains in the western portion of the

state (Fig. 1), ranging up to 1210 m (3970') in elevation, but it has also been observed near sea level in the Coastal Plain and northern Piedmont. I have not been able to determine the source of the material seen by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991). The paucity of Virginia records for this and the following species is surprising given the fact that their larvae feed on stinging nettle (*Urtica dioica* L.) and probably native species of nettles, which are relatively common plants in the mountain and Piedmont regions of the state (Weakley et al., 2012; Virginia Botanical Associates, 2018). This northern moth ranges south to Kentucky, North Carolina, and Tennessee (Lafontaine & Poole, 1991; Pogue, 2005). Forbes (1954) regarded it as a rare species. Due to the limited number of Virginia records, *A. ovalis* is currently placed on the VDCR-DNH Animal Watchlist (Roble, 2016).

931162/8881 *Abrostola urentis* Guenée
[Spectacled Nettle Moth; Nettle Looper]

MONA: Like the preceding species, one record is plotted in either northern Virginia (perhaps Arlington Co.) or the District of Columbia (original source unknown). Forbes (1954) recorded it from the District of Columbia.

Other published Virginia records: State only (EC78), Fairfax Co. (Steury et al., 2007).

VDCR-DNH records: None

Other Virginia records: [City of Richmond], University of Richmond [presumably collected on the campus], 30 May 1936, C.C. Walton (VMNH, 1 [ex University of Richmond collection]); same data but 19 April 1937.

Virginia flight dates: 19 April–26 July, 14 September

Comments: There are very few known records for *A. urentis* in Virginia (Fig. 1). Both specimens from the 1930s have pre-printed “University of Richmond” labels, neither of which contains any annotations identifying an alternate collecting locality (only date and collector’s name). However, it should be noted that some of the insects collected by C.C. Walton during the mid-late 1930s were captured in Clifton Forge, Alleghany County (so noted by handwritten annotations on specimen labels) in the western, mountainous area of the state. I have not been able to determine the source of the material seen by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991). This northern moth ranges south to western North Carolina, with an isolated record from southeastern Texas (Lafontaine & Poole, 1991). Powell & Opler (2009) listed South Carolina as the southern range limit in the East. Pogue (2005) did not record *A. urentis* in Great Smoky Mountains National Park, but suggested that it probably occurs there.

Tribe Argyrogrammatini

931166/8885 *Argyrogramma verruca* (F.)
[Golden Looper Moth]

MONA: One or two records are plotted in Virginia (original sources unknown): one dot is in either northern Virginia (perhaps Arlington Co.) or the District of Columbia and the other appears to be in Giles County (probably Mountain Lake area).

Other published Virginia records: State only (EC78).

VDCR-DNH records: Amherst Co., George Washington National Forest, Little Piney Road at Dismal Mountain Road, 1 October 2019, E.C. Orcutt (1).

Other Virginia records: Lancaster Co., 1 mile north of Kilmarnock, 4 September 2012 and 17 October 2012, P. Dennehy (P. Dennehy collection, 2); City of Salem, 23 July 1939, Engel (CMNH, 1).

Photo records: Chesterfield Co., 1 September 2016, J. LeBlanc (BAMONA). Fairfax Co., 1 August 2014, M. O'Donnell (BG, iNat). City of Richmond, 16 August 2015, A. Belden (BAMONA).

Virginia flight dates: 23 July–17 October

Comments: This migratory, tropical species is infrequently found in Virginia (Fig. 2).

931167/8886 *Enigmogramma basigera* (Walker)
[Pink-washed Looper Moth]

MONA: The lone Virginia dot appears to be plotted in the City of Virginia Beach (original source unknown).

Other published Virginia records: State only (EC78); Hanover Co. (Ludwig, 2009); City of Virginia Beach (Bastian, 2011; photograph).

VDCR-DNH records (7 specimens): Accomack, Chesterfield, Hanover, and Northampton counties and City of Virginia Beach.

Other Virginia records: Arlington (CUIC, 1), Floyd (S. Felker collection, 1), Lancaster (P. Dennehy collection, 9), and New Kent (CMNH, 2) counties; City of Suffolk (UCD, 1).

Photo records: Fairfax Co. (BAMONA, BG, iNat), City of Richmond (BAMONA).

Virginia flight dates: 16 July–28 October

Comments: Most of the few known Virginia records for this species are from the eastern portion of the state (Fig. 3). It was formerly placed in the genus *Argyrogramma* (Covell, 1984).

931168/8887 *Trichoplusia ni* (Hübner)
[Cabbage Looper Moth]

MONA: Up to four records are plotted in Virginia (original sources unknown), which I estimate as Arlington, Frederick, Montgomery, and Prince William counties for the purposes of Figure 4.

Other published Virginia records: State only (EC78); Hanover Co. (Ludwig, 2000, 2009); Tazewell Co. (Stein, 1993); City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (15 specimens): Brunswick/Dinwiddie, Hanover, Highland, Northampton, and Patrick counties and City of Virginia Beach.

Other Virginia records: Loudoun (W.R. Grooms collection, 1), Montgomery (UK, 1; VPISU, 1), and Westmoreland (NAU, 1) counties and the cities of Norfolk (VPISU, 1) and Virginia Beach (CLMNH, 1).

Photo records: Carroll (W. Cook), Fauquier (BAMONA, larva) and Stafford (BG) counties and the cities of Newport News (BG, larva) and Richmond (BAMONA).

Virginia flight dates: 15 June–30 October

Comments: This species occurs in a wide variety of habitats in Virginia. It feeds on many species of herbaceous plants and can be a serious pest of cabbage crops (Powell & Opler, 2009). The New World range extends south into tropical America (Forbes, 1954). According to Lafontaine & Poole (1991), *T. ni* is “the most widespread species of Plusiinae and one of the more globally distributed species in the family Noctuidae.” Previously thought to be an Old World species that is now widely distributed on several continents, including North America (Zahiri et al., 2017; supplemental Table S3), recent genetic evidence suggests the Old and New World populations may represent distinct species (J.D. Lafontaine, pers. comm). Regarding the status of *T. ni* in the Northeast, Wagner (2005) noted “In recent years it has become curiously scarce...” He also stated that the northern latitude at which North America populations of *T. ni* successfully overwinter is unknown and migrants from the south reestablish northern populations each spring.

931169/8889 *Ctenoplusia oxygramma* (Geyer)
[Sharp-stigma Looper Moth]

MONA: One or two records are plotted in Virginia (original sources unknown): one dot is in either northern Virginia (perhaps Arlington Co.) or the District of Columbia and the other is in the City of Virginia Beach.

Other published Virginia records: State only (EC78); Fairfax Co. (Steury et al., 2007); Hanover Co. (Ludwig, 2000, 2009).

VDCR-DNH records (17 specimens): Amherst, Brunswick, Craig, Hanover, Isle of Wight, Montgomery, New Kent, and Prince William counties and the City of Virginia Beach.

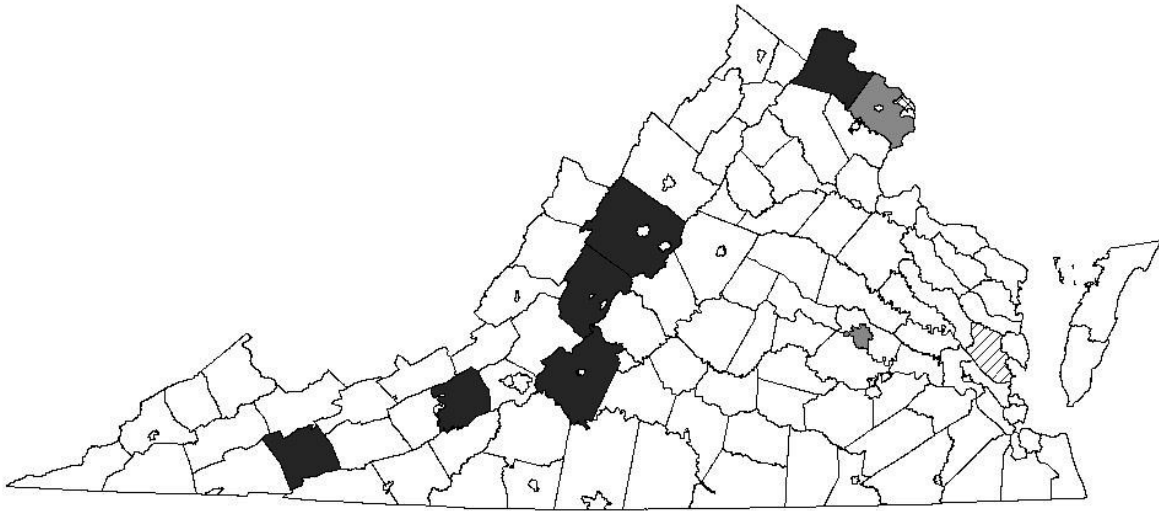


Fig. 1. County and city distribution of *Abrostola ovalis* (dark shading = voucher specimens, diagonal shading = photographs) and *A. urentis* (light shading; voucher specimens) in Virginia. Both species have been documented in Arlington County (cross hatching) and/or the District of Columbia.

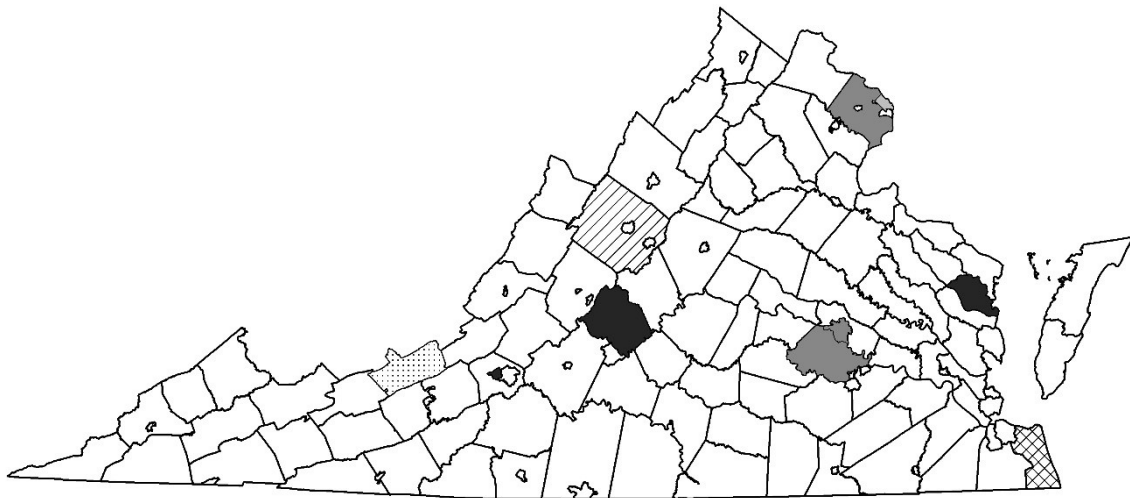


Fig. 2. County and city distribution of *Argyrogramma verruca* (dark shading = voucher specimens, medium shading = photographs; stippling = estimated county or city locations of points mapped by Lafontaine & Poole [1991]) and *Rachiplusia ou* (diagonal hatching = photographs; cross hatching = estimated county or city locations of points mapped by Lafontaine & Poole [1991]) in Virginia. The range maps in Lafontaine & Poole (1991) for both species include a point in or near Arlington County (light shading) or the District of Columbia.

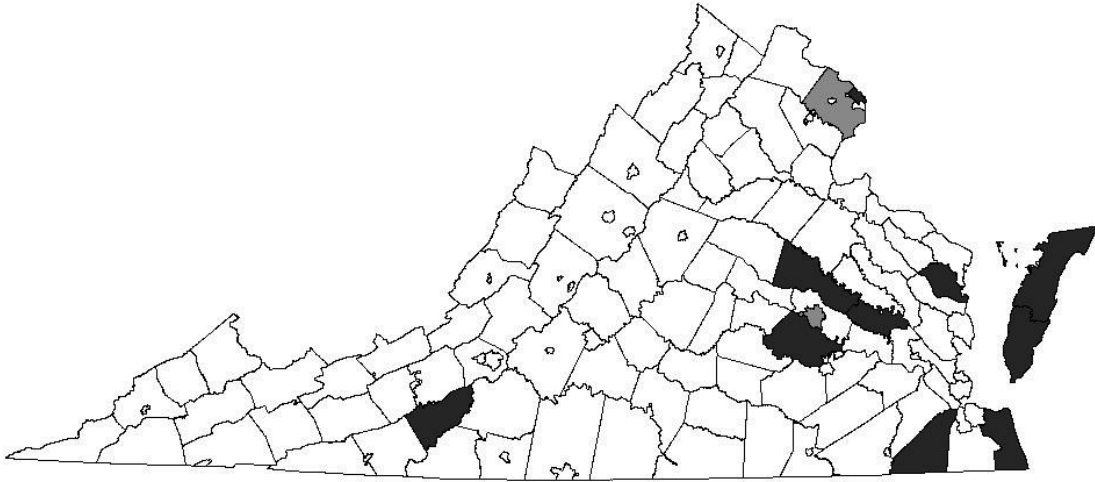


Fig. 3. County and city distribution of *Enigmogramma basigera* in Virginia (dark shading = voucher specimens, light shading = photographs).

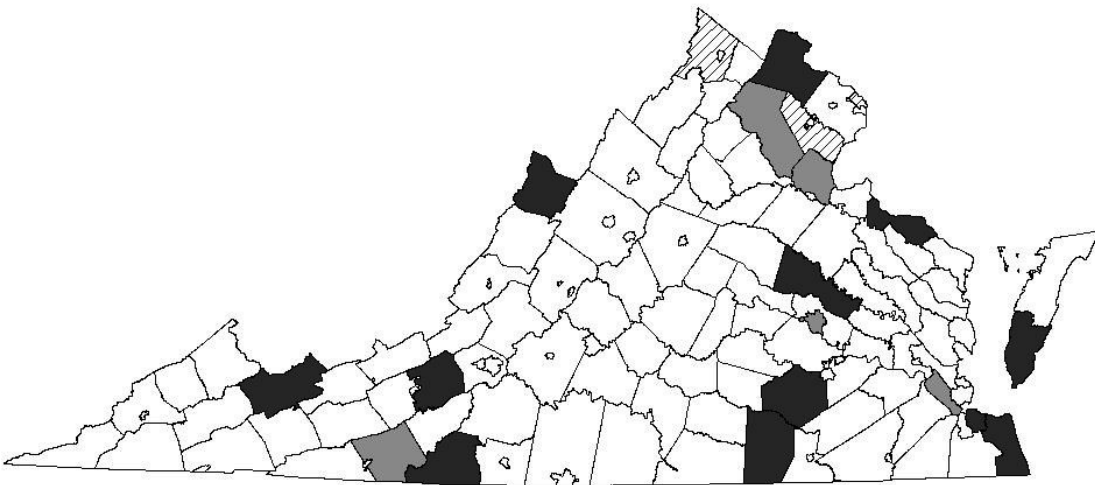


Fig. 4. County and city distribution of *Trichoplysia ni* in Virginia (dark shading = voucher specimens, light shading = photographs, diagonal hatching = estimated county or city locations of points mapped by Lafontaine & Poole [1991]).

Other Virginia specimen records: Lancaster Co. (P. Dennehy collection, 9); City of Hampton (VPISU, 1).

Photo records: Chesterfield (BAMONA, BG), Powhatan (J. Reilly), and Tazewell (BAMONA) counties; City of Richmond (BAMONA).

Virginia flight dates: 3 June; 2 August–2 November.

Comments: This species apparently occurs sporadically in Virginia (Fig. 5). Its range extends southward into tropical America (Forbes, 1954). It was formerly placed in the genus *Agrapha* (Covell, 1984).

931170/8890 *Chrysodeixis includens* (Walker)

[Soybean Looper Moth]

MONA: As many as seven widely scattered dots are plotted in Virginia (original sources unknown) for this widespread, primarily tropical species. For the purposes of Figure 6, I estimate these locations correspond to sites in Arlington, Augusta, Frederick, James City, Prince George, and Montgomery counties and the City of Virginia Beach.

Other published Virginia records: State only (EC78); Fairfax (Steury et al., 2007), Hanover (Ludwig, 2000, 2009), and Wise (Holl, 1996) counties; City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (125 specimens): Accomack, Alleghany, Augusta, Bath, Bedford, Charlotte, Chesterfield, Dickenson, Fairfax, Floyd, Giles, Halifax, Hanover, Henry, Isle of Wight, Montgomery, Northampton, Northumberland, Prince William, Roanoke, Rockbridge, Southampton, Washington, Wise, and Wythe counties and the cities of Suffolk and Virginia Beach.

Other Virginia records: Giles (VPISU, 3), Lancaster (P. Dennehy collection, 5), Loudoun (W.R. Grooms collection, 5), Madison (UCD, 1), Montgomery (VPISU, 1), Pulaski (UCD, 1), and Rockingham (K. Richers collection, 3) counties and the cities of Manassas (MGCL, 1), Norfolk (VPISU, 2), Richmond (VCU, 1), Suffolk (VPISU, 1), and Virginia Beach (CLMNH, 1).

Photo records: Arlington (BAMONA, BG, iNat), Clarke (iNat), Gloucester (T. Kain), Henrico (BAMONA), James City (BAMONA, iNat), Page (BG), Pittsylvania (iNat), Powhatan (J. Reilly), Shenandoah (BAMONA), Stafford (BG), Tazewell (BAMONA), Warren (BAMONA, iNat), Westmoreland (iNat), and York (BAMONA) counties and the cities of Alexandria (iNat), Chesapeake (BAMONA, iNat), Colonial Heights (BAMONA), and Hampton (BG).

Virginia flight dates: 7 January; 17 April–3 November

Comments: I collected an adult *C. includens* at the incandescent porch light of my residence in Chesterfield County on 7 January 2008, presumably an unusually late

rather than early date. This is the most common and widespread plusiine in Virginia (Fig. 6), probably occurring in every county in the state. Most records may be of moths that have migrated north in the spring and summer from more southerly latitudes to establish temporary breeding populations that persist until the onset of freezing temperatures. Its range extends southward into tropical America (Forbes, 1954). *Chrysodeixis includens* is an economically important species as its common name implies. It was formerly placed in the genus *Pseudoplusia* (Covell, 1984; Lafontaine & Schmidt, 2010).

Tribe Plusiini

931176/8895 *Rachiplusia ou* (Guenée)

[Gray Looper Moth]

MONA: Like *Ctenoplusia oxygramma*, one dot is plotted in either northern Virginia (perhaps Arlington Co.) or the District of Columbia and a second dot corresponds to the City of Virginia Beach (original sources unknown).

Other published Virginia records: State only (EC78).

VDCR-DNH records: None.

Photo records: Augusta Co., Staunton, 7 September 2012, M. Morris (BG).

Virginia flight dates: 7 September

Comments: I have not been able to determine the source of the material seen by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991). Apparently, there are very few records of this species from Virginia (Fig. 2). Its range extends south to Ecuador (Powell & Opler, 2009).

931177/8898 *Allagrapha aerea* (Hübner)

[Unspotted Looper Moth]

MONA: Surprisingly, only three dots are plotted in Virginia (original sources unknown) for this common species, which I estimate correspond to Giles and Smyth counties and the City of Suffolk.

Other published Virginia records: State only (EC78); Augusta (Butler et al., 2001), Bath (Skinner, 1921; CMNH, 1), Fairfax (Steury et al., 2007), and Hanover (Ludwig, 2000, 2001, 2002, 2009) counties; City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (51 specimens): Amherst, Augusta, Bedford, Botetourt, Chesterfield, Craig, Dickenson, Dinwiddie, Fairfax, Fauquier, Floyd, Hanover, Isle of Wight, Lee, Montgomery, Nottoway, Prince William, Russell, Scott, Stafford, Sussex, Washington, and Wise counties.

Other Virginia records: Bedford (VPISU, 1), Floyd (S. Felker collection, 1), Giles (VPISU, 1), Loudoun (W.R.

Grooms collection, 2; VPISU, 1), Montgomery (VPISU, 1), Rockbridge (US Forest Service non-target gypsy moth study, J. Peacock et al., unpub. data), and Rockingham (K. Richers collection, 1) counties; City of Radford (S. Felker collection, 1).

Photo records: Culpeper (iNat) and Powhatan (J. Reilly) counties; cities of Lynchburg (iNat), Richmond (BAMONA), and Salem (iNat).

Virginia flight dates: 8 May–25 October

Comments: This species is widespread in Virginia (Fig. 7).

931178/8896 *Diachrysia aereoides* (Grote)

[Dark-spotted Looper Moth, Lined Copper Looper]

MONA: No records, but there is a locality plotted in extreme southeastern Kentucky near the Virginia border. Covell (1999) reported *D. aereoides* from two localities in Kentucky, including Big Black Mountain, Harlan County, which borders Lee County, VA, the westernmost county in the state.

Published Virginia records: Fairfax Co. [Great Falls Park, 14 August 2004, J. Glaser, GWMP, 1] (Steury et al., 2007; B. Steury, pers. comm.).

VDCR-DNH records (7 specimens): Bath Co., Warm Springs Mountain, Bald Knob, 7 July 1999, J.C. Ludwig (1). Grayson Co., Jefferson National Forest, Whitetop Mountain, 22 July 2014, S.M. Roble (3). Highland Co., George Washington National Forest, South Fork Locust Spring Run, 29 July 1999, S.M. Roble (1). Smyth Co., Jefferson National Forest, Whitetop Mountain, 30 June 2010, S.M. Roble (1). Washington Co., Jefferson National Forest, Whitetop Mountain, 30 June 2010, S.M. Roble (1).

Virginia flight dates: 7 July–14 August

Comments: This attractive, pink and gold moth has a transcontinental range in northern North America (Newfoundland and Nova Scotia to British Columbia and northern California), extending south in the East to Maryland, Kentucky, and western North Carolina (Lafontaine & Poole, 1991). Covell (1999) noted that *D. aereoides* is rare in Kentucky. Butler & Strazanac (2014) listed records for five counties in eastern West Virginia, and Pogue (2005) reported four specimens, each from a different site, in Great Smoky Mountains National Park near the North Carolina-Tennessee border.

Diachrysia aereoides was not recorded for Virginia by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991). Apparently the first Virginia specimen was not collected until 1999. Most of the few Virginia records of this species are from high elevation sites (1073–1676 m [3520–5500']; Fig. 8), but there is a recent collection

from much lower elevation (≤ 100 m) in Great Falls Park in the northern Piedmont (Steury et al., 2007).

931179/8897 *Diachrysia balluca* Geyer

[Green-patched Looper Moth, Hologram Moth, Splendid Brass Looper]

MONA: One record is plotted in western Virginia, probably at or near Mountain Lake in Giles County (original source unknown). There is also a record from extreme southeastern Kentucky near the Virginia border. Covell (1999) reported *D. balluca* from two localities in Kentucky, one of which is Big Black Mountain in Harlan County (borders Virginia), and regarded this species as rare in that state.

Other published Virginia records: Bath Co. (Skinner, 1921; Hot Springs [Warm Springs Mountain, 31 July 1916, M. Hebard, CMNH (1)]). Wise Co. (Holl, 1996).

VDCR-DNH records (3 specimens): Bath Co., Warm Springs Mountain, Bald Knob, 15 June 1999, J.C. Ludwig (1), Warm Springs Mountain, 1 km S VA Rt. 39, 6 July 1999, J.C. Ludwig (1). Washington Co., Clinch Mountain Wildlife Management Area, Big Tumbling Creek, 2500', 20 September 2011, S.M. Roble (1).

Other Virginia records: None known.

Virginia flight dates: 15 June–20 September. This range of dates exceeds that of the rangewide collection period of "late July to early September" reported by Lafontaine & Poole (1991).

Comments: This is the largest plusiine in Virginia (wingspan 40–50 mm; Forbes, 1954) and perhaps the most beautiful, possessing metallic gray green forewings with a hint of pink. It was first collected in the state more than a century ago by Morgan Hebard, an orthopterist from the Academy of Natural Sciences in Philadelphia, and has been taken only three times in the past three decades during statewide sampling by VDCR-DNH biologists. Two of the recent records are from sites on the same mountain as the cabin occupied by Hebard (exact location unknown) in the summer of 1916. One of the recent Warm Springs Mountain sites is a xeric pitch pine-scrub oak ridgetop barren (Bald Knob, 1289 m [4229']), whereas the other site is in a nutrient rich forest (945 m), as is the Washington County site (762 m). All Virginia records are from mountainous areas (Fig. 8), including two lower elevation sites at or below 762 m (2500').

Pogue (2005) recorded *D. balluca* from one peak (1475–1501 m) in the North Carolina portion of Great Smoky Mountains National Park at or near its southern range limit. The 19th century Titian Peale collection at ANSP contains two specimens of *D. balluca*, one each

from the District of Columbia (mounted between 1846 and 1863) and York County, Pennsylvania (no date; ANSP website). Neither of these localities appears on the range map in Lafontaine & Poole (1991). This species is likely extirpated in at least the Washington area. Due to the limited number of Virginia records, *D. balluca* is currently placed on the VDCR-DNH Animal Watchlist (Roble, 2016).

931183/8902 *Polychrysis morigera* (H. Edwards)

[No common name] (Fig. 15)

NEW STATE RECORD

This is one of the rarest North American plusiines despite having a widespread distribution (Lafontaine & Poole, 1991). It has apparently expanded its range eastward in recent decades.

The range map in Eichlin & Cunningham (1978) includes records for only five western states, whereas Lafontaine & Poole (1991) reported that it occurs as far east as Tennessee, Kentucky, West Virginia, and western Pennsylvania. Covell (1999) stated that *P. morigera* is local and uncommon in Kentucky (records for nine counties), with the first known specimen record for that state taken in 1976, and the first in Tennessee a decade later. Butler et al. (2001) reported a single capture during a 2-year survey (1995–96) on the Monongahela National Forest in Pocahontas County, West Virginia, not far from the Virginia border (see comments below). Pogue (2005) collected four specimens in the North Carolina portion of Great Smoky Mountains National Park.

The first known Virginia specimen of *P. morigera* was collected by the late Douglas C. Ferguson of the National Museum of Natural History, Smithsonian Institution: Smyth Co.: Walker Mountain, north of Marion, 36° 54' N 81° 32' W, 3650', 18 June 1992 (NMNH, 1). VDCR-DNH staff have since taken 13 additional specimens at six sites in the southwestern portion of the state (Fig. 9), mostly in limestone habitats: Botetourt Co., private timber tract along Catawba Creek, 22 May 2001, A.C. Chazal and K.L. Derge (2); same site but 15 June 2001, A.C. Chazal and C.S. Hobson (1). Dickenson Co.: Breaks Interstate Park, Russell Fork River, Garden Hole, 3 June 2008, S.M. Roble and A.C. Chazal (1). Lee Co.: The Cedars Natural Area Preserve, Dry Creek barrens, 25 May 2000, C.S. Hobson (2). Montgomery Co.: Allen Hollow, 18 June 2003, J.C. Ludwig and I.T. Wilson (3); Slaughterpen Hollow, 10 June 2001, J.C. Ludwig (1). Russell Co.: Cleveland Barrens Natural Area Preserve, 23–24 May 2001, C.S. Hobson (3).

Virginia flight dates: 22 May–18 June

Comments: One specimen of *P. morigera* was captured on the George Washington National Forest in Augusta County (L. Butler & J. Strazanac, unpub. data) during the long-term (1995–2001) non-target gypsy moth study discussed by Butler et al. (2001; only 1995–1996 data were summarized for this paper), but it was not retained (absent from WVU collection, pers. obs.). Due to the limited number of Virginia records, *P. morigera* is currently placed on the VDCR-DNH Animal Watchlist (Roble, 2016). Powell & Opler (2009) reported that this species is not very attracted to lights although it sometimes occurs at them in good numbers. The larvae feed on wild larkspurs (*Delphinium* spp.) (Lafontaine & Poole, 1991).

931184/8899 *Pseudeva purpurigera* (Walker)

[Straight-lined Looper Moth]

NEW STATE RECORD

Published Virginia records: None known.

VDCR-DNH records (8 specimens): Bath Co., Warm Springs Mountain, 6 July 1999, J.C. Ludwig (2). Botetourt Co., private timber tract along Catawba Creek, 15 June 2001, A.C. Chazal (4). Lee Co., The Cedars Natural Area Preserve, 19 June 2000, C.S. Hobson (1). Montgomery Co., Slaughterpen Hollow, 10 June 2001, J.C. Ludwig (1).

Other Virginia records: None known.

Virginia flight dates: 10 June–6 July

Comments: This species was not recorded for Virginia by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991), and I have not found any other published sources attributing this moth to the Virginia fauna. The range of *P. purpurigera* is primarily northern (Atlantic Coast to Rocky Mountains), extending south in the East to Delaware, Kentucky, and North Carolina (Lafontaine & Poole, 1991). Glaser et al. (unpublished) recorded this species from two sites in far western Maryland (Garrett Co.), and Butler & Strazanac (2014) listed one record for each of three counties (Lincoln, Preston, Wayne) in West Virginia. Pogue (2005) collected one specimen of *P. purpurigera* in the North Carolina portion of Great Smoky Mountains National Park. Powell & Opler (2009) stated that South Carolina is the southern range limit in the East, whereas Wagner et al. (2011) reported the mountains of Georgia.

This species is uncommon to rare southward and the larvae feed on meadow-rue (*Thalictrum*) (Covell, 1984). Concerning the status of *P. purpurigera* in Delaware, Jones (1928–1939) wrote “Rarely seen unless bred from the larvae, which some seasons are fairly abundant.” The Virginia records (Fig. 10) essentially fill the gap between

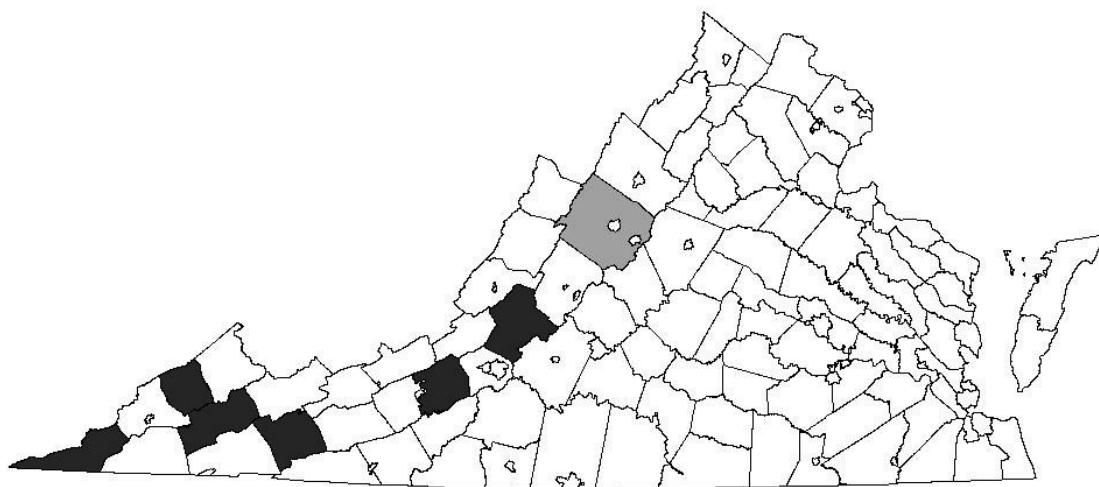


Fig. 9. County and city distribution of *Polychrysis morigera* in Virginia (dark shading = voucher specimens, light shading = discarded specimen [see text]).

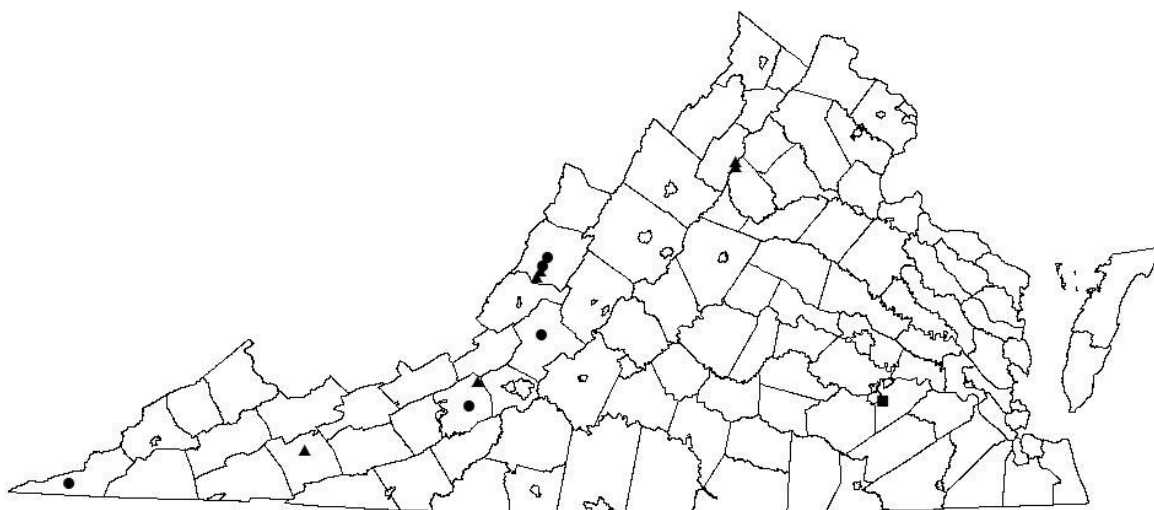


Fig. 10. Distribution of *Autographa ampla* (triangles), *Exyra ridingsii* (square), and *Pseudeva purpurigera* (circles) in Virginia (voucher specimens). *Autographa ampla* and *P. purpurigera* were collected at two sites each on Warm Springs Mountain in Bath County.

the Delaware and North Carolina records plotted by Lafontaine & Poole (1991).

931186/8904 *Chrysanympha formosa* (Grote)
[Formosa Looper Moth; Beautiful Looper]

MONA: One record is plotted in western Virginia (perhaps Alleghany or Bath Co.; original source unknown). There is also a record shown in extreme southeastern Kentucky near the Virginia border. Covell (1999) reported *C. formosa* from four localities in Kentucky, including Pine Mountain State Resort Park in Bell County, the latter of which is adjacent to Lee County, VA, the westernmost county in the state.

Other published Virginia records: State only (EC78); Augusta (Butler et al., 2001), Bath (Skinner, 1921; ANSP, 1), Giles (Milne & Milne, 1944), Hanover (Ludwig, 2001, 2002, 2009), Madison (Manderino et al., 2014), Montgomery (SLN, September 1988), Page (Manderino et al., 2014), Rappahannock (Manderino et al., 2014), and Rockbridge (Wagner et al., 1995) counties.

VDCR-DNH records (36 specimens): Alleghany, Bath, Bedford, Botetourt, Craig, Dickenson, Fauquier, Floyd, Frederick, Hanover, Isle of Wight, King and Queen, Patrick, Prince William, Rockbridge, and Wise counties and the cities of Suffolk and Virginia Beach.

Other Virginia records: Amherst (CMNH, 1), Giles (NMNH, 1), Montgomery (NMNH, 3), Nelson (NMNH, 1), and Rockingham (K. Richers collection, 2) counties and the City of Virginia Beach (NMNH, 3).

Virginia flight dates: 19 May–23/26 July

Comments: This species is widely distributed in Virginia but not often collected (Fig. 11). Most specimens were captured in June. During the WVU non-target gypsy moth study conducted on the George Washington National Forest in Augusta County, 164 adult specimens of *C. formosa* were captured during 102 successful sampling events (1.6 specimens/trap, nearly all of which were discarded), more than double the combined total ($n = 70$) captures for the eight other plusiines recorded (L. Butler & J. Strazanac, unpub. data).

Chrysanympha formosa ranges south to the mountains of Georgia (Wagner et al., 2011). Pogue (2005) recorded this species at only four sites in Great Smoky Mountains National Park near the North Carolina-Tennessee border.

931187/8905 *Eosporopteryx thyatyroides*
(Guenée)
[Pink-patched Looper Moth]

MONA: One record appears to be plotted in extreme northwestern Virginia (perhaps Frederick Co. or the City of Winchester; original source unknown). The range map also displays a record in extreme southeastern Kentucky. Covell (1999) reported *E. thyatyroides* from 11 Kentucky counties, including Harlan Co. (Big Black Mountain), which borders Lee County, VA, the westernmost county in the state.

Other published Virginia records: State only (Holland, 1903; Forbes, 1954; Eichlin & Cummingham, 1978); Giles (SS-TLS, 1992), Page, Rappahannock, and Warren counties (all Manderino et al., 2014).

VDCR-DNH records (16 specimens): Bath, Bedford, Floyd, Highland, Page, Rockingham, Russell, Scott, Washington, and Wise counties.

Other Virginia records: Augusta Co., George Washington National Forest, WVU non-target gypsy moth study, 1995–2001, total of two captures (L. Butler & J. Strazanac, unpub. data). Floyd Co. (S. Felker collection, 1).

Photo records: Tazewell Co. (BAMONA).

Virginia flight dates: 17 June–7 October

Comments: This species is collected infrequently in the mountains of western Virginia (Fig. 12). During a 2011 non-target gypsy moth study, Manderino et al. (2014, Appendix S2; four trapping periods) collected 10 adult specimens of *E. thyatyroides* at six of 15 sampling sites near Skyline Drive in Shenandoah National Park. The range of this species extends south to the mountains of Georgia (Wagner et al., 2011). The larvae feed on meadow-rues (*Thalictrum* spp.) and wild columbine (*Aquilegia*) (Powell & Opler, 2009), and possibly also on lousewort (*Pedicularis*; Wagner et al., 2011).

931188/9021 *Exyra fax* (Grote)
[Pitcher Plant Moth; Pitcherplant Looper; Epauletted Pitcher-plant Moth]
No map

931189/9024 *Exyra semicrocea* (Guenée)
[Pale Shoulder Pitcherplant Looper; Pitcherplant-mining Looper]
No map

931190/9023 *Exyra ridingsii* (Riley)
[Riding's Pitcherplant Looper]

Exyra is a small but fascinating genus of small noctuid moths. All three of its members are pitcher plant (*Sarracenia* spp.) specialists, their larvae feeding on the leaves (pitchers) of these carnivorous plants and the adults often taking refuge inside of them (Jones, 1921; Folkerts & Folkerts, 1996; Wagner et al., 2011). Jones

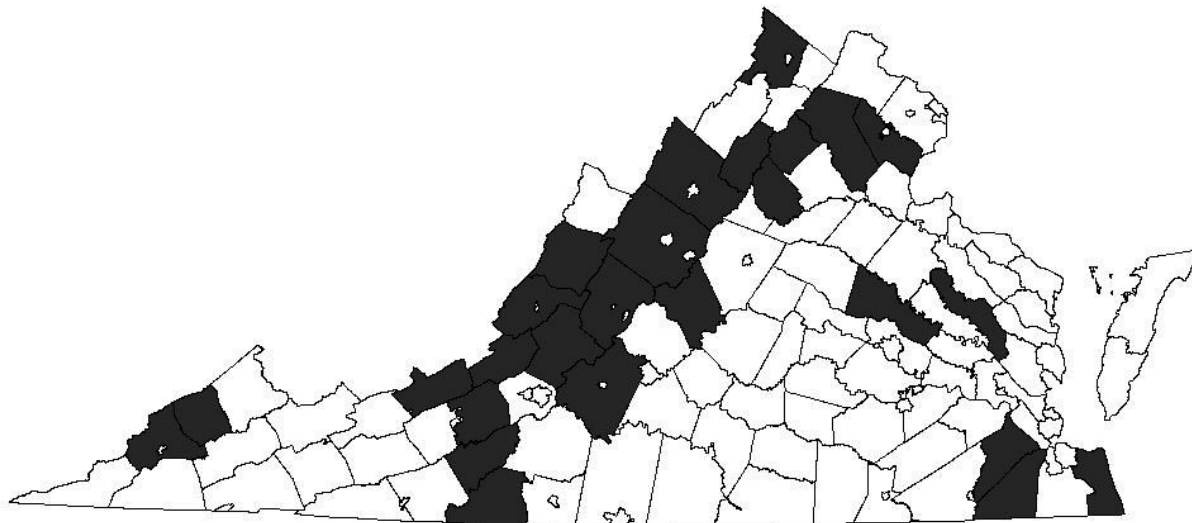


Fig. 11. County and city distribution of *Chrysanympa formosa* in Virginia (voucher specimens).

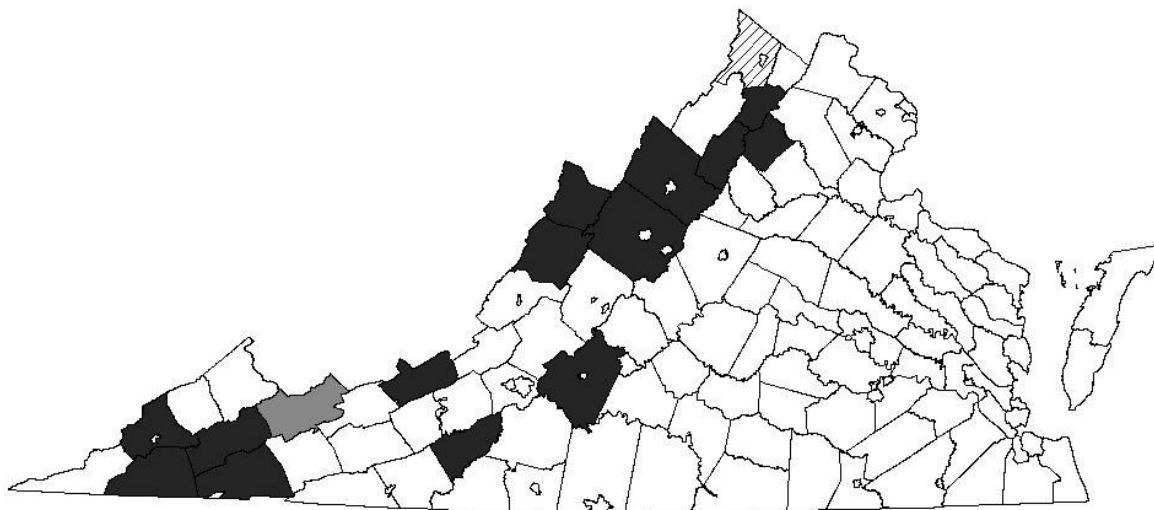


Fig. 12. County and city distribution of *Eosphoropteryx thyatyroides* in Virginia (dark shading = voucher specimens, light shading = photographs, diagonal hatching = estimated county or city locations of points mapped by Lafontaine & Poole [1991]).

(1921) reported that two of these species are associated with only one species of pitcher plant each, whereas the third (*E. semicrocea*) is found on several species of pitcher plants. He stated that North Carolina was the northern range limit for both *E. ridingsii* and *E. semicrocea*, whereas *E. fax* (= *E. rolandiana* Grote) is a more widespread species, ranging from Canada south to the Gulf of Mexico. Holland (1903) and Forbes (1954) reported New Jersey as the northern range limit of *E. semicrocea*, and the latter author remarked that *E. ridingsii* was “found as far north as North Carolina at least.” Schweitzer et al. (2011) concluded that reports of *E. ridingsii* from New Jersey were based on misidentifications of the superficially similar *Ponometa semiflava* (Guenée). Lafontaine & Poole (1991), Hall et al. (1999), and Schweitzer et al. (2011) all listed the range of *E. ridingsii* as the Coastal Plain (and Sand Hills region) from North Carolina south to Florida and west to Alabama; Wagner et al. (2011) cited a similar range (minus Alabama) for this species. Genetic differences have been documented between populations of *E. semicrocea* (Stephens et al., 2011).

No Virginia records for any species of *Exyra* were plotted on the detailed range maps prepared by Lafontaine & Poole (1991), whereas the text and generalized maps in Folkerts & Folkerts (1996) indicate that *E. ridingsii* and *E. semicrocea* reach their northern limits in southeastern Virginia. This is plausible based on the known ranges of their hostplants, but I was unable to determine the source(s) of these Virginia records. No Virginia specimens of *Exyra* are included in the Folkerts collection at Auburn University (M. Callahan, pers. comm.). However, I found two previously unsorted specimens of *E. ridingsii* in the Virginia Museum of Natural History with the following label data (brackets added): [Prince George Co.:] South of Petersburg, in pitcher plants in bog, 25 June 1936, C. Williams (VMNH [ex. University of Richmond collection], 2). The collector, Carroll E. Williams, was an undergraduate student in the biology department at the University of Richmond at that time and later became a renowned professor at Harvard University, eventually being elected to the National Academy of Sciences (Telfer, 1992; Pappenheimer, 1995). On this date in 1936, Williams accompanied several of his professors and renowned Harvard University botanist Merritt Lyndon Fernald to rare or unusual habitats in southeastern Virginia in search of rare plants (Fernald, 1937: 323).

The hostplant of *E. ridingsii* is *Sarracenia flava* L. (yellow pitcher plant or trumpets), an austral species that is very rare in Virginia, with documented records for only nine counties and cities in the southeastern corner of the state (Porter, 1991; Weakley et al., 2012; Virginia

Botanical Associates, 2018). Most of the historically known populations of *S. flava* in Virginia are now extirpated as a result of habitat destruction (e.g., ditching, draining, filling), degradation (e.g., heavy grazing/trampling), or succession (woody plant encroachment due to prolonged fire suppression), including a large (“many acres”; Fernald, 1937) boggy depression southeast of Petersburg in northwestern Prince George County. The precise location of this destroyed bog is unknown but is estimated (Fig. 10) based on information in Fernald (1937) and the VDCR-DNH rare species database. The habitat and rare plants (*S. flava* was “gratifyingly abundant”) of the bog where Williams collected *E. ridingsii* were described by Fernald (1937: 325–326, 334–335). Elsewhere in his narrative, Fernald lamented the destruction of other pitcher plant bogs by ditching or their severe degradation by livestock (Fernald, 1937: 335, 338–339). Currently, less than five extant native populations of *S. flava* are known in Virginia, most of which are very small (VDCR-DNH rare species database). Consequently, *E. ridingsii* may be extirpated in the state. This species is currently placed on the VDCR-DNH Rare Animal List (Roble, 2016).

I did not find data on any Virginia specimens of *E. fax* or *E. semicrocea*. It is unclear from the generalized map in Folkerts & Folkerts (1996) if Virginia is included in the range of *E. fax*. The larvae of this species feed on *Sarracenia purpurea* L. (purple pitcher plant), a primarily northern species that was historically documented in 16 counties and cities in coastal Virginia (Virginia Botanical Associates, 2018), but is now reduced to about 15 remnant populations (VDCR-DNH rare species database). Perhaps *E. fax* will eventually be found at one of these sites. The larvae of *E. semicrocea* feed on *S. flava* and other, more southern congeners that are not native to Virginia. It is unlikely that this moth still inhabits Virginia, if it ever did.

Stephens et al. (2011) and Stephens & Folkerts (2012) reported that pitcher plant bogs in the southeastern United States Coastal Plain have been reduced to about 3% of their former range due to habitat loss and fragmentation, and indicated that *Exyra* moths are thus deserving of conservation concern.

931191/8908 *Autographa precatationis* (Guenée)
[Common Looper Moth]

MONA: At least four widely scattered dots are plotted in Virginia (original sources unknown) for this common eastern North American species, including 2–3 in northern Virginia, another apparently corresponding to

the City of Virginia Beach, and 1–2 others in southwestern Virginia (presumably including Giles Co.). Other published Virginia records: State only (EC78); Augusta (Butler et al., 2001), Bath (Skinner, 1921; CMNH, 3), Fairfax (Steury et al., 2007), Giles (Milne & Milne, 1944), Grayson (SLN 22[3], 2000), Hanover (Ludwig, 2000, 2009), Madison (Manderino et al., 2014), and Rappahannock (Manderino et al., 2014) counties; City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (123 specimens): Accomack, Augusta, Bath, Bedford, Botetourt, Chesterfield, Craig, Dickenson, Fairfax, Fauquier, Floyd, Halifax, Hanover, Henrico, Isle of Wight, Lee, Montgomery, New Kent, Northampton, Nottoway, Prince William, Pulaski, Roanoke, Rockingham, Russell, Scott, Smyth, Stafford, and Wise counties and the cities of Chesapeake and Suffolk.

Other Virginia records: Giles (VPISU), Loudoun (W.R. Grooms collection, 5; VPISU), Madison (UCD, 2), Montgomery (VPISU), and Rockingham (CMNH, 1; K. Richers collection, 7) counties and the cities of Martinsville (VPISU), Norfolk (VPISU) and Virginia Beach (CLMNH, 1).

Photo records: Arlington (BAMONA, BG, iNat), Carroll (W. Cook), Powhatan (J. Reilly), Shenandoah (BAMONA), Spotsylvania (iNat), Tazewell (BAMONA), Warren (BAMONA, BG, iNat), and Westmoreland (iNat) counties and cities of Alexandria (iNat), Radford (BG), and Richmond (BAMONA).

Virginia flight dates: 3 April–22 November

Comments: This species is common and widely distributed in Virginia, probably occurring in every county in the state (Fig. 13).

931204/8923 *Autographa ampla* (Walker)

[Large Looper Moth, Climbing Looper, Broken-Banded Y Moth] (Fig. 15)

NEW STATE RECORD

Published Virginia records: None known.

VDCR-DNH records (5 specimens): Bath Co.: Warm Springs Mountain, 1 km N Ingalls Field Airport, 14 June 1999, J.C. Ludwig (1); Warm Springs Mountain, Bald Knob, 7 July 1999, J.C. Ludwig (3), Page Co.: Shenandoah National Park, Bettys Rock, 29 June 2005, A.C. Chazal and S.M. Roble (SNP, 1).

Other Virginia records: Madison Co., [Shenandoah National Park], Skyland, 1 July 1970, R.A. Belmont (UCD, 1). Montgomery Co., Jefferson National Forest, Rt. 630, 4 July 1983, J.D. Hooper (NMNH, 1). Smyth Co., Walker Mountain, north of Marion, 3650 feet, 18–

19 June 1992, D.C. Ferguson (NMNH, 4).

Virginia flight dates: 14 June–7 July

Comments: *Autographa ampla* was not recorded for Virginia by Eichlin & Cunningham (1978) or Lafontaine & Poole (1991), and I have not found any other literature reports for the state. This is a widespread northern species that ranges south in the East to Kentucky and North Carolina, and in the West to Arizona and New Mexico (Lafontaine & Poole, 1991). Both known Kentucky localities are in Harlan County (Covell, 1999), which borders Lee County, VA, the westernmost county in the state. Glaser et al. (unpublished) considered it rare in Maryland, with records limited to the two westernmost counties in that state. Pogue (2005) recorded *A. ampla* from four sites in Great Smoky Mountains National Park near the North Carolina-Tennessee border. Wagner et al. (2011) listed the Georgia mountains as the southern range limit. With the exception of the Montgomery County location (671 m [2200']), this species is known in Virginia only from the higher mountains (Fig. 10; elevational range 1036–1289 m [3400–4230']). It is currently placed on the VDCR-DNH Animal Watchlist because of the limited number of Virginia records (Roble, 2016).

931209/8907 *Megalographa biloba* (Stephens)

[Bilobed Looper Moth]

MONA: Up to four widely scattered dots are plotted in Virginia (original sources unknown) for this common New World species. For the purposes of Figure 14, I estimated the corresponding counties for which I lacked other records as Arlington and Smyth counties.

Other published Virginia records: State only (EC78); Hanover Co. (Ludwig, 2000, 2002, 2009); City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (14 specimens): Augusta, Bedford, Dickenson, Floyd, Hanover, Highland, Montgomery, Northampton, and Russell counties and the City of Suffolk.

Other Virginia records: Augusta Co., George Washington National Forest, WVU non-target gypsy moth study, 1995–2001, total of one capture (L. Butler & J. Strazanac, unpub. data). Floyd (S. Felker collection, 3), Giles (VPISU, 1), Lancaster (P. Dennehy collection, 1), Loudoun (W.R. Grooms collection, 1), Montgomery (UK, 1; VPISU, 7), Prince George (MCGL, 1), and Rockingham (CMNH, 1) counties.

Photo records: Powhatan Co. (J. Reilly).

Virginia flight dates: 8 April–15 October

Comments: *Megalographa biloba* is probably more

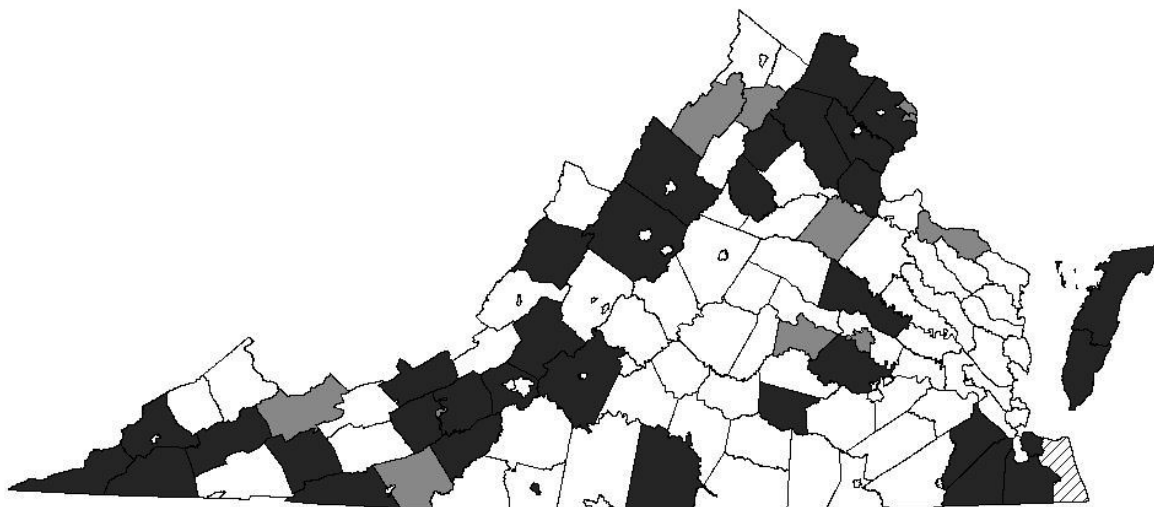


Fig. 13. County and city distribution of *Autographa precatationis* in Virginia (dark shading = voucher specimens, light shading = photographs, diagonal hatching = estimated county or city locations of points mapped by Lafontaine & Poole [1991]).

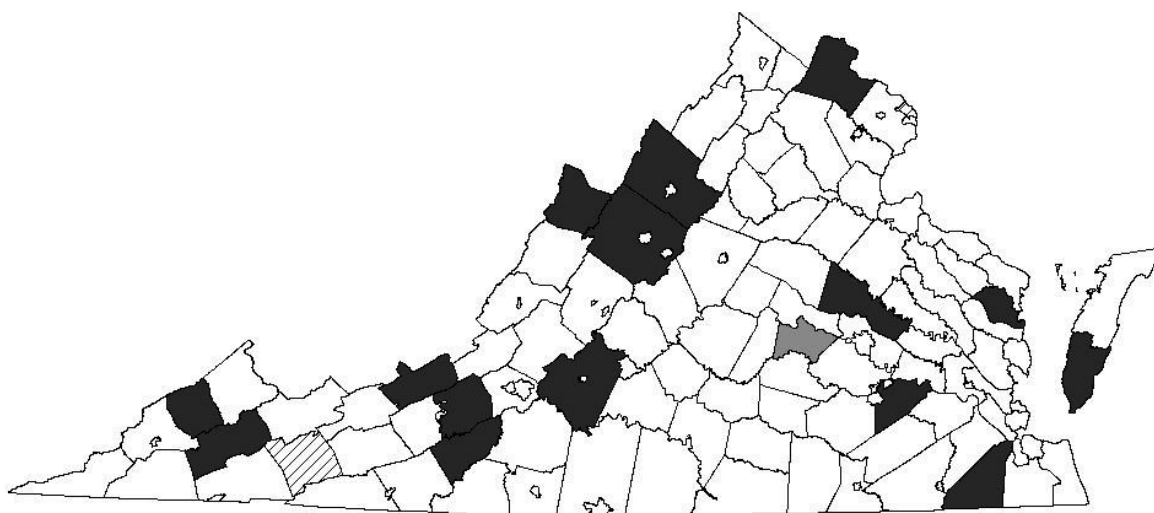


Fig. 14. County and city distribution of *Megalographa biloba* in Virginia (dark shading = voucher specimens, light shading = photographs, diagonal hatching = estimated county or city locations of points mapped by Lafontaine & Poole [1991]).

common in Virginia than the available records (Fig. 14) suggest. It exhibits migratory behavior, with records from Great Britain suggestive of trans-Atlantic movements. Its native range extends from Canada south to Argentina (Lafontaine & Sullivan, 2009). Areas with freezing winters are recolonized each summer and early fall from more southerly locations (Powell & Opler, 2009). This species was formerly placed in the genus *Autographa* (Covell, 1984; Wagner et al., 2011).

931225/8939 *Syngrapha alias* (Ottolengui)
[Hooked Silvery Y Moth, Spruce Looper] (Fig. 15)
NEW STATE RECORD

Published Virginia records: None known.

VDCR-DNH records (14 specimens): Grayson Co.: Jefferson National Forest, Whitetop Mountain, 30 June 2010, S.M. Roble and P. Bedell (1); same data but S.M. Roble (2); same site but 11 July 2012, S.M. Roble (1); same site but 22–23 July 2014, S.M. Roble (2); Grayson Highlands State Park, Haw Orchard Mountain (near Cox Visitor Center), 30 June 2011, S.M. Roble (5); Grayson Highlands State Park, Massie Gap, Wilburn Ridge, 23 July 2014, S.M. Roble (1). Highland Co.: George Washington National Forest, Bearwallow Run, 4 August 2011, S.M. Roble (1); same data but Newman Run, 4 August 2016 (1).

Virginia flight dates: 30 June–4 August

Comments: My recent collections of this species in the highest portions of the Blue Ridge Mountains in southwestern Virginia near the North Carolina border are the first known records of this species in the state. I have also taken two specimens near the West Virginia border in Highland County. All sites are dominated by red spruce (*Picea rubens* Sargent), the presumed larval hostplant in the state. The elevational range of these sites is 1067–1676 m (3500–5500'). Due to the limited number of Virginia records and its restricted habitat, *S. alias* is currently placed on the VDCR-DNH Rare Animal List (Roble, 2016). This is potentially the plusiinae most vulnerable to the effects of global climate warming because of its relictual, high elevation distribution in the southern Appalachians.

The range map in Lafontaine & Poole (1991) shows a potentially disjunct population in the mountains of western North Carolina, the next nearest record being in New Jersey. My collections (Fig. 16), plus records from West Virginia (Albu & Metzler, 2004; S. Johnson, unpub. data), partially fill in this gap. Pogue (2005) reported the collection of eight specimens of *S. alias* from the higher mountains (1603–1829 m) of North Carolina and Tennessee in Great Smoky Mountains National Park at its southern range limit.



Fig. 15. (top to bottom; scale bar 1 cm): *Autographa ampla* (Bath Co., VA, 7 July 1999); *Polychrysis morigera* (Lee Co., VA; 22 May 2000); *Syngrapha alias* (Grayson Co., VA, 30 June 2011).

931127/8942 *Syngrapha rectangula* (W. Kirby)
[Salt-and-pepper Looper Moth]

Published Virginia records: Augusta Co., George Washington National Forest (Butler et al., 2001 [plus subsequent surveys, L. Butler & J. Strazanac, unpub. data; 2 of 3 captured specimens were retained: 31 July 1995 (VDCR-DNH), 7 August 1995 (WVU)]). Giles Co., Jefferson National Forest, White Rocks campground, 20–23 August 1991, G.D. Willis (1; SS-TLS, 1992); Mountain Lake Biological Station (MONA plate 3, fig. 41 - photo of NMNH specimen collected on 7 July 1975 by J. Jaworski).

VDCR-DNH records (2 specimens): Highland Co.: near cabin off Rt. 642 at VA-WV state line, 4 August 2011, S.M. Roble (1); 2 km S Mustoe, 25 August 2016, S.M. Roble (1).

Other Virginia records: None known.

Virginia flight dates: 7 July–25 August

Comments: This species inhabits the mountains of western Virginia (Fig. 16), but apparently occurs at lower elevations than *S. alias* and not always in areas where red spruce is present. Perhaps some populations of *S. rectangula* in Virginia utilize eastern white pine (*Pinus strobus* L.) or eastern hemlock (*Tsuga canadensis* [L.]) as their hostplant.

Covell (1984) stated that *S. rectangula* is active by day, at dusk, and at night, and cited the range as Newfoundland to Pennsylvania, west through Canada, and south to Minnesota. The range map in Lafontaine & Poole (1991) includes only three records of this boreal species south of Pennsylvania, including one in Virginia (presumably Mountain Lake, Giles Co.) and two in western North Carolina. Butler & Strazanac (2014) listed one record for each of three counties in West Virginia, and Pogue (2005) recorded *S. rectangula* from four sites in North Carolina and Tennessee in Great Smoky Mountains National Park at its southern range limit. Due to the limited number of Virginia records, *S. rectangula* is currently placed on the VDCR-DNH Rare Animal List (Roble, 2016).

931234/8924 *Anagrapha falcifera* (W. Kirby)
[Celery Looper Moth]

MONA: Between two and four dots appear to be plotted in Virginia (original sources unknown) for this common North American species. For the purposes of Figure 17, I estimate that Arlington was the only corresponding county for which I lacked records from other sources.

Other published Virginia records: State only (EC78); Augusta (Butler et al., 2001), Bath (Skinner, 1921; CMNH, 4), Fairfax (Steury et al., 2007), Hanover (Ludwig, 2000, 2009), Madison (Manderino et al., 2014), Tazewell (Stein, 1993), and Wise (Holl, 1996) counties; City of Virginia Beach (Bastian, 2011).

VDCR-DNH records (61 specimens): Accomack, Alleghany, Bath, Botetourt, Dinwiddie, Fairfax, Fauquier, Floyd, Frederick, Grayson, Halifax, Hanover, Isle of Wight, Madison, Northampton, Page, Prince William, Pulaski, Richmond, and Tazewell counties and the City of Virginia Beach.

Other Virginia records: Floyd (S. Felker collection, 2), Giles (VPISU, 4), Loudoun (W.R. Grooms collection, 7; R. Lyon collection, 1), Montgomery (UK, 3; VPISU, 37), and Rockingham (CMNH, 2; K. Richers collection, 3) counties and the cities of Newport News (VPISU, 1), Roanoke (VPISU, 2), and Suffolk (VPISU, 3).

Photo records: Carroll (W. Cook), Chesterfield (BAMONA), Mecklenburg (iNat), Powhatan (J. Reilly), and Westmoreland (iNat) counties; City of Richmond

(BAMONA).

Virginia flight dates: 2 April–5 November

Comments: This species is common and widely distributed in Virginia (Fig. 17). Powell & Opler (2009) characterized it as “very adaptable and invasive,” occurring in weedy or cultivated habitats as well as natural habitats.

931236/8950 *Plusia putnami* Grote
[Putnam’s Looper Moth]

Published Virginia records: State only (Eichlin & Cunningham, 1978; Covell, 1984).

VDCR-DNH records: None.

Other Virginia records: None known.

Virginia flight dates: No data.

Comments: This Holarctic species was recorded (without details) for Virginia by Eichlin & Cunningham (1978) and Covell (1984; latter perhaps based on the former), but not Lafontaine & Poole (1991). My museum searches failed to locate any Virginia specimens of *P. putnami*, but NMNH has a century old specimen from West Virginia collected by renowned lepidopterist W.H. Edwards (1822–1909; see Calhoun, 2014) which lacks a specific locality and date (but presumably was collected post-1863, the year West Virginia gained statehood) on the label. Given the lack of any modern records from Virginia and neighboring states, the validity of the report by Eichlin & Cunningham (1978) should be considered dubious until a voucher specimen from the state has been located or collected anew. If it is indeed a member of the Virginia fauna, this would be the southernmost known record for *P. putnami* in the East according to the range map in Lafontaine & Poole (1991) and all other sources that I have checked.

DISCUSSION

Twenty-five species of the noctuid moth subfamily Plusiinae have been documented or reported from Virginia. Wagner (2005) stated that there are 50 Eastern species of plusiines, thus half of these are recorded from Virginia. The Virginia faunal tally compares favorably to the totals for North Carolina and Ohio, and exceeds the figures for Kentucky, West Virginia, and Maryland (Table 1). Pogue (2005) recorded 17 plusiines during intensive sampling of Great Smoky Mountains National Park. He also cited higher species diversity totals for more northern states such as Maine (31), New York (30), and New Hampshire (26) (Pogue, 2005).

The following five additional species of Plusiine may also occur in Virginia, with the species of *Syngrapha* perhaps having the greatest potential:

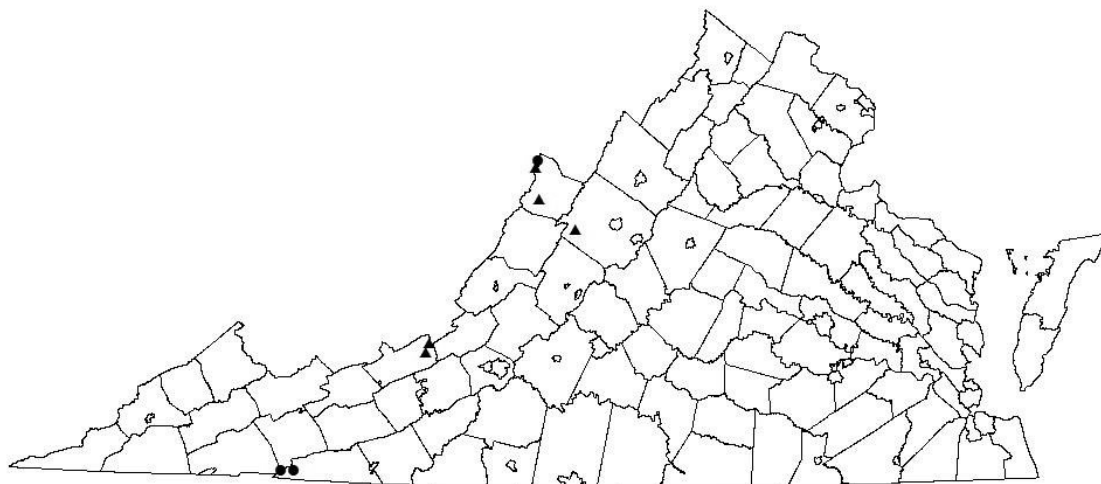


Fig. 16. Distribution of *Syngrapha alias* (circles) and *S. rectangula* (triangles) in Virginia (voucher specimens). Some symbols represent multiple proximate collecting sites.

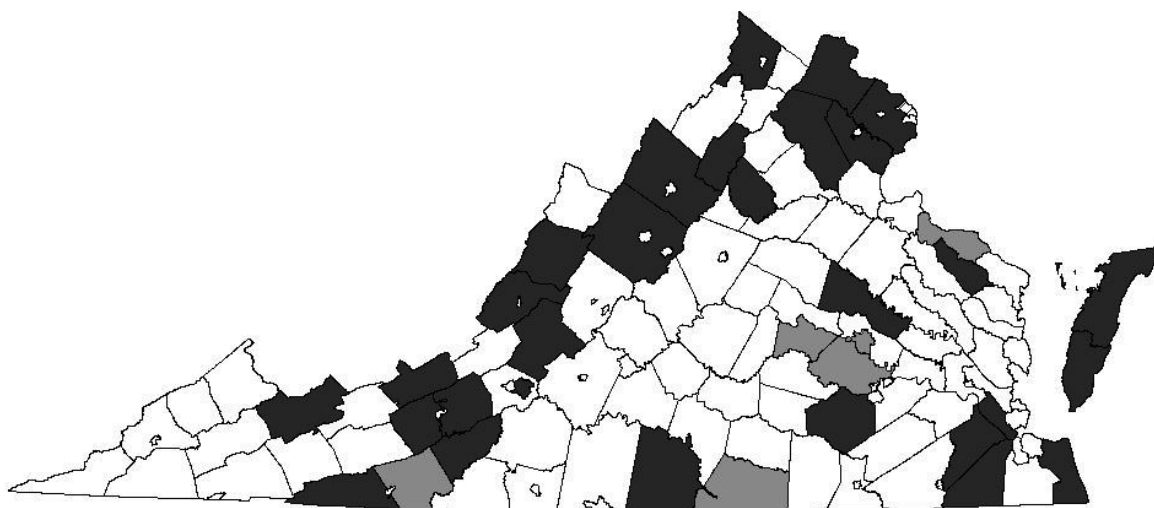


Fig. 17. County and city distribution of *Anagrapha falcifera* in Virginia (dark shading = voucher specimens, light shading = photographs, diagonal shading = estimated county or city locations of points mapped by Lafontaine & Poole [1991]).

Table 1. Comparative Plusiinae faunas of Virginia and neighboring states plus Ohio.

<u>Species</u>	<u>VA</u>	<u>MD</u>	<u>NC</u>	<u>KY</u>	<u>WV</u>	<u>OH</u>
<i>Abrostola ovalis</i>	x	x	x	x	x	x
<i>A. urentis</i>	x	x	x	x	x	x
<i>Mouralia tinctoides</i>	-	-	-	x	-	-
<i>Argyrogramma verruca</i>	x	x	x	x	x	x
<i>Enigmogramma basigera</i>	x	x	x	x	-	x
<i>Trichoplusia ni</i>	x	x	x	x	x	x
<i>Ctenoplusia oxygramma</i>	x	x	x	x	x	x
<i>Chrysodeixis includens</i>	x	x	x	x	x	x
<i>Autoplusia egena</i>	-	-	x	-	-	-
<i>Rachiplusia ou</i>	x	x	x	x	-	x
<i>Diachrysia aereoides</i>	x	x	x	x	x	x
<i>D. balluca</i>	x	x	x	x	x	x
<i>Allagrapha aerea</i>	x	x	x	x	x	x
<i>Pseudeva purpurigera</i>	x	x	x	x	x	x
<i>Polychrysia morigera</i>	x	-	x	x	x	x
<i>Chrysanympha formosa</i>	x	x	x	x	x	x
<i>Eosporopteryx thyatyroides</i>	x	x	x	x	x	x
<i>Exyra fax</i>	x	-	x	-	-	-
<i>E. semicrocea</i>	x	-	x	-	-	-
<i>E. ridingsii</i>	x	-	x	-	-	-
<i>Megalographa biloba</i>	x	x	x	x	x	x
<i>Autographa precatationis</i> *	x	x	x	x	x	x
<i>A. pseudogamma</i>	-	-	-	x	-	-
<i>A. ampla</i>	x	x	x	x	x	x
<i>Anagrapha falcifera</i>	x	x	x	x	x	x
<i>Syngrapha octoscripta</i>	-	-	-	-	-	x
<i>S. epigaea</i>	-	-	-	-	x	x
<i>S. alias</i>	x	-	x	-	x	-
<i>S. abstrusa</i>	-	x(?)	-	-	-	x
<i>S. rectangula</i>	x	-	x	-	x	x
<i>Plusia putnami</i> **	x	-	-	-	x	-
<i>P. contexta</i>	-	x	-	-	x	x
Total species	25	20	25	21	22	24

*One specimen of *Autographa californica* was collected in Maryland far out of range (Glaser et al., unpublished; USNM).

** *Plusia venusta* was collected in the 1800s in Washington, DC (Lafontaine & Poole, 1991).

Data sources: Lafontaine & Poole (1991); Rings et al. (1992); Covell (1999); Albu & Metzler (2004); Pogue (2005); Butler & Strazanac (2014); Covell et al. (2018); Glaser et al., unpublished; Line (Moths of Maryland); Maryland Biodiversity Project; North Carolina Biodiversity Project; Moth Photographers Group; BugGuide; USNM; this paper.

Autoplusia egena (Guenée) [Bean-lead Skeletonizer Moth] is a southern species that ranges north to southwestern North Carolina, with a vagrant record from near Detroit, Michigan (Lafontaine & Poole, 1991).

Syngrapha abstrusa Eichlin [Abstruse Looper Moth] is a northern, conifer-feeding species that ranges south as far as New Jersey and Ohio in the East (Lafontaine & Poole, 1991). A purported photo record from eastern Maryland (Line [Moths of Maryland website]; Maryland Biodiversity Project) is best treated as unconfirmed because differentiation of this species from *S. alias* requires genitalic dissection. Pogue (2005) did not document *S. abstrusa* in the Smokies. This species should be sought in the higher mountains of western Virginia.

Syngrapha epigaea (Grote) [Epigaea Looper Moth, Inscribed Looper, Pirate Looper] is another northern, conifer-feeding species. It reportedly ranges south to northern Ohio and central Pennsylvania in the East (Lafontaine & Poole, 1991). However, within the past decade this species has been recorded much farther south at Spruce Knob, Pendleton County, West Virginia, the highest point in that state (1482 m [4863 ft]) on at least five occasions: 3 July 2010, P. Dennehy (P. Dennehy collection, 1; photograph of specimen at BugGuide #1210658); 9 July 2011, J.D. Hooper (NMNH, 1); 10–12 July 2011 and 2–7 July 2012, S. Johnson (S. Johnson collection, 2); 11 July 2014, K. Lebo (photo; BAMONA #102590). Butler & Strazanac (2014) did not include *S. epigaea* in their list of West Virginia moths in the WVU collection. This species may occur in the red spruce forests of northwestern Highland County, Virginia, which are less than 15 km southwest of Spruce Knob, but at an elevation about 300 m (1000 feet) lower.

Plusia contexta Grote [Connected Looper Moth] is the most commonly collected species of *Plusia* in the East, ranging south to New Jersey, Pennsylvania, and Ohio (Lafontaine & Poole, 1991). Butler & Strazanac (2014) reported this species from Morgantown and Natrium, West Virginia. It has also been collected in two Maryland counties (Glaser et al., unpublished; Maryland Biodiversity Project; specimens in NMNH).

Plusia venusta Walker [White-streaked Looper Moth] has a more boreal distribution than *P. contexta*, but surprisingly, its southernmost known locality in the East is the District of Columbia (Lafontaine & Poole, 1991). This nearly century-and-a-half old record is mentioned in the original description of *P. striatella* Grote, a junior synonym (Grote, 1873). Eichlin & Cunningham (1978) recorded *P. venusta* from Maryland, but there are no

records in Glaser et al. (unpublished) or the Maryland Biodiversity Project database, thus casting doubt on the validity of their report. Lafontaine & Poole (1991) remarked that *P. venusta* is the most rarely collected of the three Eastern members of this genus.

ACKNOWLEDGEMENTS

Numerous VDCR-DNH staff, especially Anne Chazal, Chris Hobson, Chris Ludwig, Megan Ayers, Ellison Orcutt, Maureen Dougherty, Art Evans, Kathy Gipe (nee Derge), and Tom Smith, have contributed to the agency's efforts to document and assess the moth fauna of Virginia during the past three decades. This work has been supported directly and indirectly by numerous grants from multiple sources, as well as the citizens of Virginia.

For facilitating my visits and/or granting permission to examine specimens in their care I thank Michael Pogue, Paul Goldstein, John Brown, and the late Douglas Ferguson (NMNH), Eric Quinter (AMNH), John Rawlins and Robert Davidson (CMNH), Jon Gelhaus and Jason Weintraub (ANSP), Charles Covell and Andrew Warren (MGCL), James Liebherr and Jason Dombroskie (CUIC), Eric Chapman (UK), David Wagner and Jane O'Donnell (UConn), Zachary Falin (KU), Charles Mitter (UMD), Andrew Deans (PSU), John Strazanac (WVU), the late Richard Hoffman and Kal Ivanov (VMNH), Eric Day and Paul Marek (VPISU), Karen Kester (VCU), Paul Moosman (VMI), and Karen Powers (RU). I would also like to thank Melissa Callahan for checking the Auburn University collection for *Exyra* specimens from Virginia (none were found). Paul Dennehy, Steve Johnson, and Kelly Richers graciously provided records from their private collections and Susan Felker and the late William Grooms (via the late Robert Lyon) donated their collections to VDCR-DNH. I thank Teta Kain and James Reilly for sharing their photos of Virginia moths.

David Wagner, Dale Schweitzer, and Christopher Heckscher collectively made me aware of Jones' (1928–1939) unpublished manuscript on Delmarva Lepidoptera and generously provided a photocopy of it. Dale also identified some of the VDCR-DNH specimens cited above. The late John Glaser provided a copy of his unpublished manuscript (Glaser et al.) on the moth fauna of Maryland. John Strazanac shared a summary of the unpublished results of the long-term (L. Butler & J. Strazanac, 1995–2001) WVU non-target gypsy moth study conducted on the George Washington National Forest in Virginia and the Monongahela National Forest in West Virginia (few voucher specimens were retained; only data from 1995–1996 were summarized in Butler et al., 2001). John Peacock and Laura Neale shared the

results of the first year of a similar unpublished study (1991–1993) conducted in Rockbridge County, Virginia.

Finally, I thank Charles Covell, Steve Hall, Thomas Henry, Steve Johnson, and especially John Brown, for reviewing the manuscript.

LITERATURE CITED

- Academy of Natural Sciences of Drexel University (ANSP). The Titian Peale Butterfly and Moth Collection. <http://clade.ansp.org/entomology/collections/peale/index.html>. (Accessed December 2018).
- Albu, V., & E. Metzler. 2004. Lepidoptera of North America. 5. Contributions to the Knowledge of Southern West Virginia Lepidoptera. Contributions of the C.P. Gillette Museum of Arthropod Diversity, Colorado State University, Fort Collins, CO. 82 pp.
- Bastian, S. F. 2011. Virginia Beach Naturally: A Guide to Enjoying the Wildlife of Virginia Beach, VA. Privately published. Printed by Thomson-Shore, Inc., Dexter, MI. 504 pp.
- Beadle, D., & S. Leckie. 2012. Peterson Field Guide to Moths of Northeastern North America. Houghton Mifflin Harcourt Publishing Company, Boston. 611 pp.
- BugGuide. <https://bugguide.net>. (Accessed November–December 2018).
- Butler, L., V. Kondo, & J. Strazanac. 2001. Light trap catches of Lepidoptera in two Central Appalachian forests. Proceedings of the Entomological Society of Washington 103: 879–902.
- Butler, L., & J. Strazanac. 2014. Catalog of Lepidoptera in the West Virginia Collection. West Virginia University Agricultural and Forestry Experiment Station. USDA FHTET-2014-2. CD-Rom.
- Butterflies and Moths of North America (BAMONA). <https://www.butterfliesandmoths.org/>. (Accessed November–December 2018).
- Calhoun, J. V. 2014. The extraordinary story of an artistic and scientific masterpiece: *The Butterflies of North America* by William Henry Edwards, 1868–1897. Journal of the Lepidopterists' Society 68: 66–69.
- Cook, W. Carolina Nature. North Carolina and Virginia Moth Photos. <http://www.carolinanature.com/moths/> (Accessed December 2018).
- Covell, C. V., Jr. 1984. A Field Guide to the Moths of Eastern North America. Houghton Mifflin Company, Boston, MA. 496 pp.
- Covell, C. V., Jr. 1999. The butterflies and moths (Lepidoptera) of Kentucky: An annotated checklist. Kentucky State Nature Preserves Commission, Scientific and Technical Series 6: 1–220.
- Covell, C. V., Jr., B. D. Marcus, & J. M. Marcus. 2018. Kentucky Butterfly Net: An Interactive Web Database to facilitate Lepidoptera research and education in Kentucky. <http://www.kylepidopterists.org/database.html>. Society of Kentucky Lepidopterists. (Accessed December 2018).
- Eichlin, T. D., & H. B. Cunningham. 1978. The Plusiinae (Lepidoptera: Noctuidae) of America north of Mexico, emphasizing genitalic and larval morphology. U.S. Department of Agriculture, Agricultural Research Service, Technical Bulletin 1567. 122 pp.
- Fernald, M. L. 1937. Local plants of the inner Coastal Plain of southeastern Virginia. Part I. Account of a summer's collecting. Rhodora 39: 321–379.
- Folkerts, D. R., & G. W. Folkerts. 1996. Aids for field identification of pitcher plant moths of the genus *Exyra* (Lepidoptera: Noctuidae). Entomological News 107: 128–136.
- Forbes, W. T. M. 1954. Lepidoptera of New York and Neighboring States. Part III. Noctuidae. Cornell University Agricultural Experiment Station Memoir 329. 433 pp.
- Glaser, J., H. G. Stevenson, & D. C. Ferguson. Moths of Maryland: An annotated list. Unpublished manuscript.
- Grote, A. R. 1873. On eight species of Noctuidae. Bulletin of the Buffalo Society of Natural History 1: 190–194.
- Hall, S. P., J. B. Sullivan, & D. F. Schweitzer. 1999. Assessment of risk to non-target macro-moths after *Bacillus thuringiensis* var. *kurstaki* application to Asian gypsy moth in the Cape Fear region of North Carolina. U.S. Department of Agriculture, Forest Health Technology Enterprise Team, Technology Transfer 98-16. 95 pp.
- Hodges, R. W., T. Dominick, D. R. Davis, D. C. Ferguson, J. G. Franclemont, E. G. Munroe, & J. A.

- Powell. 1983. Check List of the Lepidoptera of America North of Mexico. E. W. Classey Ltd. and The Wedge Entomological Research Foundation, London. 284 pp.
- Holl, K. D. 1996. The effect of coal surface mine reclamation on diurnal lepidopteran conservation. *Journal of Applied Ecology* 33: 225–236.
- Holland, W. J. 1903. *The Moth Book*. Doubleday, Page & Co., Garden City, New York. 479 pp. (Reprinted in 1968 by Dover).
- iNaturalist. <https://www.inaturalist.org>. (Accessed December 2018).
- Integrated Digitized Biocollections (iDigBio). <https://www.idigbio.org/portal/search>. (Accessed December 2018).
- Jones, F. M. 1921. Pitcher plants and their moths. *Natural History* 21: 297–316.
- Jones, F. M. 1928–1939. *Lepidoptera of Delaware, Peninsular Maryland and Virginia*. Unpublished manuscript, Claude E. Phillips Herbarium, Delaware State University, Dover, DE. Unpaginated.
- Lafontaine, J. D., & R. W. Poole. 1991. The Moths of America North of Mexico. Fascicle 25.1. Noctuoidea. Noctuidae (part). Plusiinae. The Wedge Entomological Research Foundation, Washington, DC. 182 pp.
- Lafontaine, J. D., & B. C. Schmidt. 2010. An annotated check list of the Noctuoidea (Insecta, Lepidoptera) of North America north of Mexico. *Zookeys* 40: 1–239.
- Lafontaine, J. D., & J. B. Sullivan. 2009. A review of the genus *Megalographa* Lafontaine and Poole (Lepidoptera: Noctuidae: Plusiinae) with the description of a new species from Costa Rica. *Insecta Mundi* 0077: 1–10.
- Leckie, S., & D. Beadle. 2018. *Peterson Field Guide to Moths of Southeastern North America*. Houghton Mifflin Harcourt Publishing Company, Boston. 652 pp.
- Lepidoptera of North America (LepNet). <https://www.lep-net.org>. (Accessed December 2018).
- Line, L. Moths of Maryland. <http://www.marylandmoths.com/index.html>. (Accessed December 2018).
- Ludwig, J. C. 2000. A survey of macrolepidopteran moths near Vontay, Hanover County, Virginia. *Banisteria* 15: 16–35.
- Ludwig, J. C. 2001. An update to the survey of macrolepidopteran moths near Vontay, Hanover County, Virginia. *Banisteria* 17: 42–47.
- Ludwig, J. C. 2002. Second update to the survey of macrolepidopteran moths near Vontay, Hanover County, Virginia. *Banisteria* 19: 17–19.
- Ludwig, J. C. 2009. An updated list of macrolepidopteran moths collected near Vontay, Hanover County, Virginia 1996-2003. *Banisteria* 34: 38–44.
- Manderino, R., T. O. Crist, & K. J. Haynes. 2014. Lepidoptera-specific insecticide used to suppress gypsy moth outbreaks may benefit non-target forest Lepidoptera. *Agricultural and Forest Entomology*. DOI: 10.1111/afe.12066. [species lists in Appendix S2]
- Maryland Biodiversity Project. <https://www.marylandbiodiversity.com>. (Accessed December 2018).
- Miller, J. C., P. C. Hammond, & D. N. R. Ross. 2003. Distribution and functional roles of rare and uncommon moths (Lepidoptera: Noctuidae: Plusiinae) across a coniferous forest landscape. *Annals of the Entomological Society of America* 96: 847–855.
- Milne, L. J., & M. J. Milne. 1944. Selection of colored lights by night-flying insects. *Entomologica Americana* 24: 21–86.
- Moth Photographers Group. <http://mothphotographersgroup.msstate.edu/>. (Accessed November 2018).
- North Carolina Biodiversity Project. <http://nc-biodiversity.com/>. (Accessed November 2018).
- Pappenheimer, A. M., Jr. 1995. Carroll Milton Williams, December 2, 1916–October 11, 1991. *National Academy of Sciences Biographical Memoir*, pp. 412–432. National Academies Press, Washington, DC.
- Pogue, M. G. 2005. The Plusiinae (Lepidoptera: Noctuidae) of Great Smoky Mountains National Park. *Zootaxa* 1032: 1–28.
- Porter, D. M. 1991. Trumpets, *Sarracenia flava* Linnaeus. Pp. 111–112 *In* K. Terwilliger (coordinator), *Virginia's Endangered Species: Proceedings of a Symposium*. McDonald and Woodward Publishing Company, Blacksburg, VA.

- Powell, J. A., & P. A. Opler. 2009. Moths of Western North America. University of California Press, Berkeley, CA. 369 pp.
- Rings, R. W., E. H. Metzler, F. J. Arnold, & D. H. Harris. 1992. The Owlet Moths of Ohio (Order Lepidoptera, Family Noctuidae). Bulletin of the Ohio Biological Survey, Volume IX (New Series), Number 2. 219 pp.
- Roble, S. M. 2016. Natural heritage resources of Virginia: Rare animals. Natural Heritage Technical Report 16-07. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. 56 pp.
- Schweitzer, D. F., M. C. Minno, & D. L. Wagner. 2011. Rare, Declining, and Poorly Known Butterflies and Moths (Lepidoptera) of Forests and Woodlands in the Eastern United States. U.S. Forest Service, Forest Health Technology Enterprise Team, Technology Transfer Bulletin FHTET-2011-11. 517 pp.
- Skinner, H. 1921. Moths collected at Hot Springs, Virginia (Lepid.). Entomological News 32: 65–71.
- Stein, K. J. 1993. Moth records from Burkes Garden, Virginia. Banisteria 2: 14–17.
- Stephens J. D., & D. R. Folkerts. 2012. Life history aspects of *Exyra semicrocea* (Pitcher Plant Moth) (Lepidoptera: Noctuidae). Southeastern Naturalist 11: 111–126.
- Stephens J. D., S. R. Santos, & D. R. Folkerts. 2011. Genetic differentiation, structure, and a transition zone among populations of the pitcher plant moth *Exyra semicrocea*: Implications for conservation. PLoS ONE 6(7): e22658. doi:10.1371/journal.pone.0022658
- Steury, B., J. Glaser, & C. S. Hobson. 2007. A survey of the macrolepidopteran moths of Turkey Run and Great Falls National Parks, Fairfax County, Virginia. Banisteria 29: 17–31.
- Symbiota Collections of Arthropods Network (SCAN). <http://scan-bugs.org/portal/> (Accessed December 2018).
- Telfer, W.H. 1992. Obituary: Carroll Milton Williams (1916–1991). Journal of the Lepidopterists' Society 46: 169–171.
- van Nieukerken, E. J. and 50 coauthors. 2011. Order Lepidoptera Linnaeus, 1758. Pp. 212–221 *In* Z.-Q. Zhang (ed.). Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Zootaxa 3148.
- Virginia Botanical Associates. 2018. Digital Atlas of the Virginia Flora. <http://www.vaplantatlas.org>. c/o Virginia Botanical Associates, Blacksburg. (Accessed December 2018).
- Wagner, D. L. 2005. Caterpillars of Eastern North America. Princeton University Press, Princeton, NJ. 512 pp.
- Wagner, D. L., J. W. Peacock, J. L. Carter, & S. E. Talley. 1995. Spring caterpillar fauna of oak and blueberry in a Virginia deciduous forest. Annals of the Entomological Society of America 88: 416–426.
- Wagner, D. L., D. F. Schweitzer, J. B. Sullivan, & R. C. Reardon. 2011. Owlet Caterpillars of Eastern North America. Princeton University Press, Princeton, NJ. 576 pp.
- Weakley, A. S., J. C. Ludwig, & J. F. Townsend. 2012. Flora of Virginia. B. Crowder (ed.). Foundation of the Flora of Virginia Project Inc., Richmond, VA. Botanical Research Institute of Texas Press, Fort Worth, TX. 1,554 pp.
- Zahiri, R., J. D. Lafontaine, B. C. Schmidt, J. R. deWaard, E. V. Zakharov, & P. D. N. Hebert. 2017. Probing planetary biodiversity with DNA barcodes: The Noctuoidea of North America. PLoS ONE, 12(6): e0178548