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Field Guide to the Slug Moths (Lepidoptera: Limacodidae) of West Virginia

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Cover Images:
Row 1 left to right: *Isochaetes beutenmuelleri* larva, *Acharia stimulea* larva, *Parasa indetermina* larva.
Row 2 left to right: *Euclea delphinii* adult, *Prolimacodes badia* adult, *Parasa chloris* adult.

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Introduction

The focus of this field guide is family Limacodidae, in the order Lepidoptera (butterflies and moths), specifically the species found in mountainous West Virginia. Members of family Limacodidae are called limacodids, better known as "slug moths" as adults and "slug caterpillars" as larvae. They exhibit incredible diversity as caterpillars, occurring in nearly every imaginable color and a host of shapes and forms throughout their known range. Caterpillars of some species are button-like in appearance, while others resemble snowflakes. Some have horns, some are smooth, and some are even notorious for stinging with their venomous spines.

Much of the public remains unfamiliar with limacodids although they are fairly well known in the entomological world. This guide will introduce these elaborate organisms to readers unacquainted with them. It is also intended to provide useful information to even the most experienced lepidopterists via detailed observations by the authors, records of adults and caterpillars, and distribution maps.

All who read these pages are sure to be astounded at the complexity of these miniature marvels. For more information about limacodids and other lepidopterans, consult the works in the bibliography starting on page 82.

Geography, Climate, and Natural History of West Virginia

West Virginia is aptly nicknamed the Mountain State as it is the only state completely within the Appalachian Mountain region, and its average elevation of 457 meters (1,500 feet) above sea level is higher than that of any other state east of the Mississippi River (Fig.1).

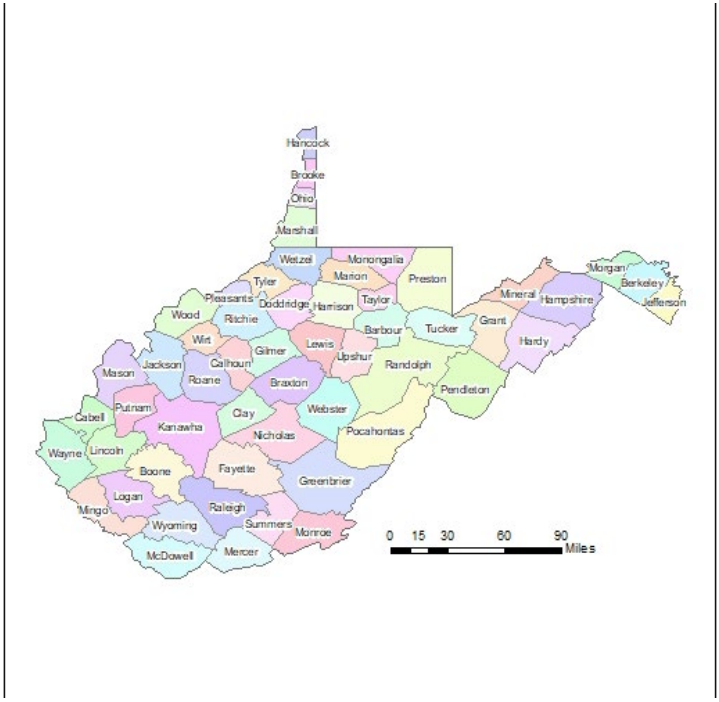


Fig. 1. West Virginia county map. Ann Steketee, USFS 2022.

Geography: West Virginia is one of the South Atlantic states of the United States. It lies in the Appalachian region and has an area of 62,755 square kilometers (24,230 square miles). The tallest peak, Spruce Knob, is 1,481 meters (4,861 feet) and the lowest point, the Potomac River at Harpers Ferry, is 73 meters (240 feet). The western border is created by the Ohio River and the eastern border by the Appalachian Mountains, a system of mountains in eastern and northeastern North America. Specifically, the Blue Ridge Mountains run along the eastern boundary with Maryland and Virginia, and the Allegheny Mountains lie west of the Blue Ridge Mountains. West Virginia can be divided into two geographical regions: the Appalachian Ridge and Valley Region, known for its high peaks, parallel ridges that were cut by streams, and forests, and the Allegheny Plateau Region, which spreads across the rest of the state and has flat-topped hills and rounded peaks. Deep stream-cut gorges and a wall of mountains called the Allegheny Front separate the state's two regions.

Climate: There are four distinct seasons in West Virginia. Its climate is char-

acterized by moderately cold winters and warm and humid summers. Due to the state's rugged topography, climate conditions vary considerably. Average minimum winter temperatures range from around -7 °C (20 °F) in the mountains, central, and northeastern portions of the state to around -1 °C (30 °F) in the far south. Average maximum summer temperatures range from around 29 °C (85 °F) in the southwest near the Ohio River to less than 27 °C (80 °F) in the east-central mountains. The central portion of the state receives 127 centimeters (cm) or more (50 inches or more) of precipitation, while around 102 cm (40 inches) falls in the west along the Ohio River. To the west of the Alleghey Front, a "rain shadow" extends into the Eastern Panhandle, where the average precipitation drops to about 89 cm (35 inches) per year. For comparison, average rainfall for the United States is about 96.5 cm (38 inches) per year. Since moist air masses passing through the state move from west to east, western slopes are generally wetter than eastern slopes. West Virginia averages 84 cm (33 inches) of snow per year, as compared to the U.S. average snowfall of 71 cm (28 inch-es) per year. West Virginia gets some kind of precipitation, on average, 145 days per year (U.S. average: 106 days). On average, there are 164 sunny days per year in the state (U.S. average: 205 days). Most of West Virginia lies in Zone 6 of the U.S. Department of Agriculture Plant Hardiness Zone Map; the exception is the Appalachian Mountains, which are in Zone 5.

Temperatures in West Virginia were highest in the 1930s and lowest from the 1960s through the 1980s. Temperatures have risen about 1 °C since the 1960s and in the 21st century have been comparable to the levels of the 1930s and early 1950s. Gradual warming has occurred since the early 1980s to drive long-term temperature averages in the 21st century. The number of very cold nights (minimum temperatures below about -18 °C or 0 °F) has been below average since the 1990s. There is no overall trend in average statewide precipitation for the 118-year record period. Precipitation has generally been near to above average since the early 1990s. The number of extreme precipitation events (precipitation totals greater than about 5 cm or 2 inches) has been above average since the late 1990s. Flood-producing extreme precipitation over the rugged topography is the most severe natural hazard for the state.

Natural History: West Virginia is the third most forested state in the United States. Forests are 78 percent (4.2 million hectares or 12 million acres) of the state's 6.2 million hectares (15.4 million acres) of land. Oak/hickory is the dominant forest type at 71% of the total forest land. Northern hardwoods account for 20% of the total timberland. Other forest types include elm/ash/red maple, loblolly pine/shortleaf pine, and oak/pine. The forests are increasing in volume and maturing, with 70 percent of the timberland in the largest diameter size classes. Areas in the mountainous eastern portion of the state that exceed an elevation of 915 meters (3,000 feet) are designated upland forests. Some of the plants and animals found in these forests are at or near their

northernmost and southernmost distributional limits. Soils associated with the upland forests tend to be fairly shallow, strongly to very strongly acidic, and are usually characterized by low natural fertility. The upland forest is divided into two major forest types: northern hardwoods and subalpine coniferous. Even though forests occupy almost 80 percent of the land, other habitats, such as grasslands and swamps, are distributed within the two geographical regions (Appalachian Ridge and Valley and Allegheny Plateau).

Three areas of the state support flora usually found in other parts of the world. Ice Moun-tain is the site of a 61-hectare (150-acre) mesophytic forest. Cooler-than-aver-age temperatures on the mountain create a unique ecosystem that encourages growth of boreal-type plants more commonly found in subarctic regions. Dolly Sods Wilderness is a rocky high-elevation plateau with balsam fir, spruce, sphagnum bogs, and heath shrubs, creating a tundra-like landscape similar to Alaska's. Cranberry Glades is a high-elevation cluster of forest-type bogs. The peat-type bogs support plants normally found at higher elevations.

The Nature Conservancy has protected more than 50,586 hectares (125,000 acres) of critical natural lands in West Virginia. Many of these areas have unique habitats resulting from the landscape complexities and microclimates. Examples are Slaty Mountain Preserve (dry hardwood and pine woodland including a globally rare shale barrens), Bear Rocks Preserve (a flat, windswept expanse of subalpine heath barrens, stunted red spruce, and ancient bogs), and Cranesville Swamp Preserve (a high-elevation conifer wetland).

Historically, the forested ecosystems in West Virginia have been transformed by extensive and intensive logging, fire, and mining. During the half century between 1870 and 1920, the upland forests were subjected to such intensive logging that by the end of this period the original forests had been eliminated. The sterilizing element of fire continued until the remaining green timber and all new growth were destroyed. Many stands of virgin hardwood were not cut but instead destroyed by fire. Of the 6.5 million hectares (16 million acres) of original forest in West Virginia only a tiny fraction remains: the Cathedral State Park, 54 hectares (133 acres) of ancient hardwood forest, and Monon-gahela National Forest Gaudineer Knob Scenic Area, 53 hectares (130 acres) of virgin spruce. Extensive surface mining has removed the forest from large areas. Some intermittent and perennial streams were permanently lost. In the reaches of the remaining rivers, rising chemical levels in the water resulted in the loss of many aquatic species. Today, even though logging and mining operations use practices that have lower environmental impacts, sulfur diox-ide, acid deposition, and possibly oxidant pollutants such as ozone may be the agents most likely to affect large areas of the biotic communities of West Vir-ginia's upland forest region. At the local scale, insects and diseases may pose the greatest threats. In spite of the habitat destruction that has taken place

in relatively recent history, landscape complexities, specialized habitats, and microclimates allow many different species to live in this region, sometimes in areas far removed from their natural range.

History of Collecting Butterflies and Moths in West Virginia

Over the years, many individuals have collected butterflies and moths in West Virginia, but few retained their collections or deposited them at institutions with staff to maintain or expand the collections. Fortunately, a few individuals provided both published accounts of their collections and deposited their collections at various institutions and agencies. In 1980, Andrew D. Hopkins was named the first state entomologist for West Virginia. He is often referred to as "the Father of Forest Entomology." His understanding of forest entomology was exceptional, and he is known for "Hopkins' Law of Bioclimatics" and his research on North American bark beetles. William Henry Edwards (1822–1909) spent most of his life near Charleston, West Virginia and published a three-volume set, "The Butterflies of North America with Colored Drawings and Descriptions." Paul Opler conducted surveys of butterflies in the early 1980s and published "A Field Guide to Eastern Butterflies." In 2004, Valeriu Albu and Eric H. Metzler produced "Lepidoptera of North America 5. Contributions to the Knowledge of Southern West Virginia Lepidoptera." Nineteen limacodid species were collected in southern West Virginia during this survey. In 2009, James Kavanaugh and Raymond Laung produced a nature guide titled "West Virginia Butterflies and Moths: A Folding Pocket Guide to Familiar Species." In the 1990s, John Rawlins (deceased, Carnegie Museum of Natural History [CMNH]) conducted several surveys of butterflies and moths in West Virginia, including two surveys on the Monongahela National Forest (Seneca Rocks) and one biodiversity survey for The Nature Conservancy at four preserves widely separated in West Virginia (Cranesville Swamp, Ice Mountain, Hungry Beech, and Slaty Mountain). All of the surveys produced vast numbers of specimens and are stored at the CMNH in the Invertebrate Zoology Collection.

From the 1970s to the present, Linda Butler (retired, West Virginia University [WVU]) and Vicki Kondo (WVU) collected specimens and curated the collections at WVU. Bob Acciavatti (retired, Forest Service, U.S. Department of Agriculture) collected specimens and deposited them at WVU and CMNH. Thomas Allen (deceased, West Virginia Department of Natural Resources [WVDNR]) collected many specimens and published "The Butterflies of West Virginia and Their Caterpillars" in 1997. In 2012, Susan Olcott (WVDNR) announced the creation of a West Virginia Butterfly Atlas project to run through 2016. In 2021, Olcott stated that 800 different species of moths were recovered in West Virginia and she suspected as many as 2,000 species exist in

the state. She also collected many specimens in West Virginia and deposited them in the WVDNR and CMNH collections. In 2022, the lead author of this field guide summarized all of the data for family Limacodidae in the WVU, WVDA, WVDNR, CMNH, and Colorado State University collections.

Taxonomy

Family Limacodidae exists within superfamily Zygaenoidea, which includes related families Zygaenidae, Megalopygidae, Somabrachyidae, Dalceridae, Epipyropidae, and Aididae. Outside of the limacodids, there are relatively few other species in superfamily Zygaenoidea in West Virginia, the most common and well-known species being *Megalopyge crispata* (Megalopygidae), *Norape cretata* (Megalopygidae), *Harrisina americana* (Zygaenidae), *Pyromorpha dimidiata* (Zygaenidae), and *Fulgoraecia exigua* (Epipyropidae). To give morphological descriptions of each group is impractical to this study; however, readers who are interested in superfamily Zygaenoidea outside of family Limacodidae will want to obtain Marc Epstein's 1996 "Revision and Phylogeny of the Limacodid-Group Families, with Evolutionary Studies on Slug Caterpillars (Lepidoptera: Zygaenoidea)."

World-wide, family Limacodidae consists of approximately 300 genera and 1,670 species. In West Virginia, the family is represented by 13 genera and 19 species; two other species, *Heterogenea shurtleffi* and *Monoleuca semifascia*, have not been reported in the state but occur in surrounding states.

General Morphology

A. Adults

As in all insect species, the body of adult limacodids is divided into three main sections: the head, thorax, and abdomen. There are three main types of antennae: bipectinate (feathery), pectinate (feathery, but only on one side), and threadlike (not feathery). When at rest, the wings are held in tentiform fashion, often while holding the tip of the abdomen straight in the air (Fig. 2).

B. Caterpillars

Unlike most lepidopteran caterpillars, limacodids lack crochets, instead having sucker-like features on the underside of the caterpillar. Many species are fiercely armed in stinging spines arising from scoli, while others lack spines altogether and appear rather smooth overall. Interestingly, the head is commonly withdrawn into the thorax while the caterpillar is at rest (Fig. 3).

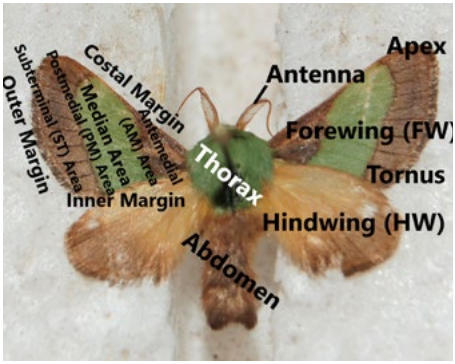


Fig. 2. Limacodid adult anatomy.

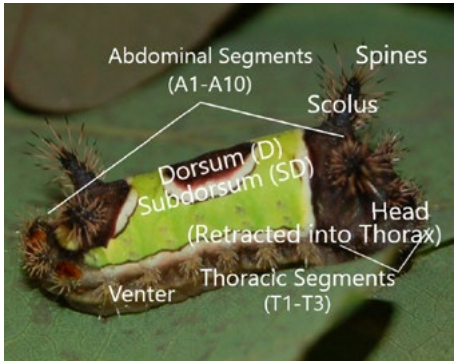


Fig. 3. Limacodid caterpillar anatomy.

Life History and Ecology

Limacodid eggs are rather flattened and transparent, with one species in eastern North America (*Monoleuca semifascia*) bearing bodily scales from the adult female on the egg surface (Fig. 4).

Eggs may be laid in small bunches or singly, those of the spiny species being laid in apparently much larger numbers than those of the smooth-surfaced species. Since spiny species rely on stinging spines for defense and many gelatine (smooth-surfaced) species rely on crypsis, it seems logical that many limacodids lay their eggs in bunches due to the effective aposematism of the caterpillars. More study is needed to confirm this hypothesis, however. *Acharia stimulea* seems to provide evidence for this idea in that it is the most well-defended limacodid in eastern North America, as well as the limacodid species in which the highest number of eggs are laid per cluster. *Euclea delphinii*, in which the caterpillars are nearly as well defended as those of *A. stimulea*, also lay eggs in substantially large groups. These species are among the most well-defended limacodid caterpillars in North America; thus the large number of eggs laid per cluster seems to be significant.

Interestingly, first instars of spiny species do not feed, instead molting into a feeding second instar. In contrast, first instars of gelatine species do feed.

As for feeding, nearly all limacodids in eastern North America are widely polyphagous on deciduous trees; favorites include oaks (*Quercus* spp.), beech (*Fagus grandifolia*), hickories (*Carya* spp.), cherry (*Prunus* spp.), American hornbeam (*Carpinus caroliniana*), maples (*Acer* spp.), hackberry (*Celtis* spp.), birches (*Betula* spp.), basswood (*Tilia americana*), poplar (*Populus* spp.), willow (*Salix* spp.), and hawthorn (*Crataegus* spp.). Limacodids prefer glabrous foliage, but many will take to hairier species (for example, *Celtis* and *Ulmus*) if necessary. Young caterpillars are mesophyll feeders; that is, only tissues

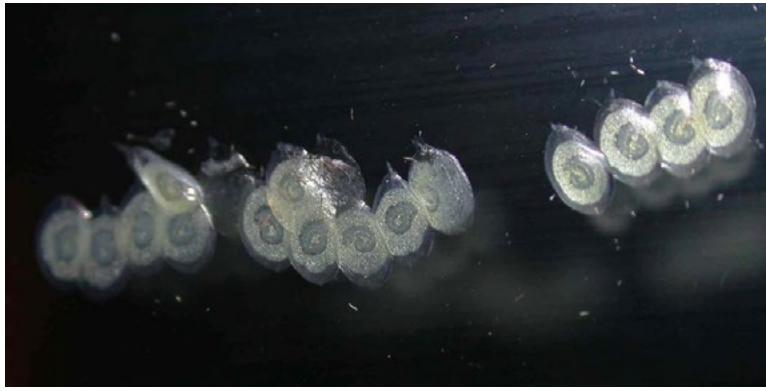


Fig. 4. Limacodid eggs, *Euclea delphinii,* Diane P. Brooks.

from the surface of a leaf are consumed. During the third or fourth instar, this behavior changes, with caterpillars feeding on the entire leaf. Mid- to late instars feed with their heads well retracted into the thorax, grasping their host plant via two prothoracic flaps. Crypsis is a key defense mechanism for the smooth-surfaced species (*Tortricidia* and *Apoda*, for instance). The stinging species, of course, use their spines as an effective means of defense. *Prolimacodes badia* secretes dorsal droplets when provoked, apparently aiding the caterpillar as a deterrent to would-be predators.

Limacodid locomotion is unique among lepidopterans. Using several ventral suction cups, limacodids can stick to virtually any surface, moving in a fashion not unlike that of actual slugs (hence their common name, "slug caterpillars") by use of a process known as peristalsis, which makes the caterpillar appear to move in waves. This process can be easily observed by allowing a caterpillar to crawl upside-down on a Petri dish or microscope slide.

Caterpillars are active in summer through mid-fall, most individuals maturing by October. Mature caterpillars construct usually ovaloid cocoons consisting of saliva and silk, and sometimes spines in spiny species or tubercles in *Phobetron pithecium* (Fig. 5). The caterpillars will pass the winter in this cocoon as pre-pupal larvae, pupating and emerging as adults the following spring.

The bodies of the adults vary from robust, the case in most species, to rather slender (*Packardia* for instance). Active from mid-spring to early fall, adults of most species are strongly attracted to lights (especially mercury vapor lamps). The notable exception to this tendency is *Phobetron pithecium*, which is uncommon at lights despite rather abundant populations. Adult activity peaks in July and early August. Many species (*Euclea delphinii* and *Parasa* spp., for example) are exceptionally strong fliers, capable of reducing their wings to mere shreds if left in a hard-walled container overnight. When at

rest, all WV species commonly hold their wings in a tentiform fashion, easily separating limacodid adults from moths of several otherwise confusing taxa (for example, members of family Pyralidae).

Adult males and females of all West Virginia spiny species and *Phobetron pithecium* may be reliably differentiated in that males have pectinate antennae, whereas females have threadlike antennae. For those species in which this characteristic is not evident, sex identifications for adults can usually be made without magnification by looking at the genitalia: males should have two "claspers" (valves) protruding (sometimes very conspicuously) from the tip of the abdomen, while the females' abdomen tips are much more rounded and often considerably larger than those of the males. Additionally, males of many species frequently have their abdomens strikingly upturned when at rest. Females usually keep their abdomens straight due to the weight of the developing eggs.

Fig. 5. Left to right, Limacodid cocoons: *Acharia stimulea* and *Packardia geminata*, Tucker Cooley.

Collecting and Rearing

A. Collecting

For the serious student, physically collecting slug caterpillars and adults may be a highly desirable procedure. For the most part, procedures for collecting lepidopterans in general may be easily and effectively applied to the limacodids.

Caterpillar Collecting .As most avid insect collectors know, many caterpillar species are aided defensively by crypsis, which makes leaf-by-leaf searches for caterpillars a difficult, pain-staking process. Since many mature limacodid species are aposematic, locating these individuals via leaf-by-leaf searches can be an easier process. However, a serious disadvantage arises for the collector when the cryptic gelatine species are desired (especially in early instars). Even

aposematic species can be hard to locate in their earlier instars due to the minute size and camouflage. For this reason, a method known as beating has been developed for easily obtaining cryptic or early-instar caterpillars. This method is simple and cost-efficient, involving spreading a light-colored sheet, umbrella, or similar receptacle underneath the desired tree for caterpillar collecting and vigorously shaking the branches above the sheet. The caterpillars will fall to the light-colored sheet, and the collector can easily obtain them. Of course, in so doing one will want to ensure that all individuals which fell to the sheet are accounted for: accidentally grasping a stinging saddleback caterpillar because it fell in a corner of the sheet in which it was not noticed is not a pleasant experience. Overall, beating is probably the most effective means of yielding limacodid caterpillars. Unfortunately, most species of eastern North American limacodids (with the exception of a few, such as *Packardia* spp.) are generally canopy feeders, making beating much less productive in many cases.

If one wishes to obtain first-instar limacodids, obtaining eggs from an adult female is often the easiest and most reliable method. Adult females of most eastern North American limacodids are easily collected at lights. Once a female is obtained, it should be immediately transferred to a container from which it cannot escape, such as a plastic bag. The walls of this receptacle should be as smooth as possible because limacodid females prefer to lay their eggs on the smoothest possible surface. Leaves of a known larval food plant should also be present in the receptacle. The eggs should be deposited by the mother moth overnight, but one should bear in mind that not every captured female will lay eggs. Because the majority of limacodid species have flattened, rather translucent eggs (often appearing as no more than tiny droplets of water on the sides of a container), extra care should be taken at this stage. After oviposition, one will want to ensure that abdominal scales from the mother limacodid are removed, as these can harbor mold if left untouched. This may be done by means of a fine brush, taking into consideration that limacodids have thin eggshells, which are easily damaged. The eggs should hatch within a week or two depending on species.

Adult Collecting. As previously noted, adults of most limacodid species in eastern North America are readily collected at lights, with the exception of *Phobetron pithecium*. The best collecting occurs in mid- to late summer. Perhaps the best options for collecting slug moths are black light and mercury vapor lamps (not to be confused with sodium vapor lamps), both of which are available at biological supply stores. It is preferable to use a white sheet behind the light source since moths will generally land on a sheet after a few minutes of flying in circles around the light bulb. The majority of moths collected will be males, but females of most species appear at light setups fairly regularly. (For tips on differentiating males and females, see "Life History and Ecology" section.)

B. Rearing

Due to the sluglike locomotion and colorful aposematism of many limacodid species, rearing slug caterpillars has been found to be an extremely enjoyable experience. Obtaining caterpillars is as simple as the procedure described in the "Collecting" section. Thus, the difficult aspect of the process is not a matter of finding the caterpillars, but keeping them alive and healthy. The following procedures give simple guidelines for doing so.

Fortunately for collectors, most eastern North American limacodid caterpillars can adapt to a wide range of hosts. The first author, for example, once had an *Acharia stimulea* caterpillar originally found on *Quercus alba* feed on *Quercus velutina*, *Acer saccharum*, *Fraxinus americana*, *Celtis occidentalis*, *Ulmus rubra*, *Malus pumila*, *Yucca filamentosa*, *Morus alba*, *Juglans nigra*, *Cornus florida*, *Liriodendron tulipifera*, *Catalpa speciosa*, and *Prunus serotina* in the few weeks it was reared in the lab. Because all West Virginia species commonly use oak as a food plant, oak leaves are perhaps the most efficient and reliable food source. Glabrous foliage is preferred over hairy foliage. First-instar caterpillars are mesophyll feeders, making the surface of a selected leaf appear discolored. Later instars gravitate to the leaf margin and will readily accept old foliage if offered, even when secondary compounds and tannins are at their highest. Over-aged leaves and frass should be removed from the receptacle as soon as possible because of the rapid development of molds. Moisture levels should be at a well-balanced medium, as either extreme can kill the caterpillars. This can be maintained by lightly misting foliage with a spray bottle every few days.

As the slug caterpillar reaches maturity (probably September or October), it will immediately seek a shelter in which it can construct its cocoon. This cocoon may be constructed from larval saliva, silk, spines, or even bodily tubercles in *Phobetron pithecium*. At this point, the caterpillar will remain dormant throughout the winter as a pre-pupa, so disturbance should be kept

to a minimum. If one should get curious about the caterpillar's well-being at any time during this pre-pupal stage, a simple procedure may be applied: cut a hole in the cocoon, taking care not to damage the pre-pupa, and glue a microscope cover slip over the opening (Marc Epstein, pers. comm.). The pupa should be present by spring, the adult emerging shortly thereafter.

Species Descriptions

The remainder of this field guide is devoted to the accounts and information for each of 15 limacodid genera. Genus introductions are given for each new genus, followed by diagnoses (how to differentiate a particular species from look-alikes), caterpillar and adult descriptions, caterpillar food plants, phenology, and range for each of the 21 species described. Please note that all life stage graphs throughout the species accounts reflect the phenology of that particular species throughout its known range (not just WV) as recorded via iNaturalist.com. Also, all distribution maps are simply a summary of each *recorded* observation of a slug moth adult or caterpillar; in other words, just because a county is not color-coded does not mean that representatives of that particular species do not exist within the county, rather indicating that verified observations of that species are yet to be reported in that region. Any additional infor-mation for a particular species may be given in the "Notes" section at the end of the species account.

Genus *Apoda*

Four species of genus *Apoda* have been described, all of which occur north of Mexico. *Apoda biguttata* and *A. y-inversa*, the most widespread of the *Apoda* spp., are found throughout the eastern United States and parts of southeastern Canada. The other two species, *Apoda latomia* and *Apoda rectilinea*, are endemic to certain regions of the southeastern United States.

Apoda caterpillars are characterized by an especially smooth texture and two subdorsal (SD) stripes that run nearly the entire length of the body. No red markings are present on the dorsum, immediately distinguishing this group from another gelatine genus, *Tortricidia*. Interestingly, the tail is not rounded or squared-off as in some species (for example, *Tortricidia* and *Lithacodes fasciola*), instead being rather sharply angled downward. First-instar *Apoda* caterpillars, like all gelatine limacodids, feed as soon as they hatch in spite of being reported to fast through the first instar like nettle species.[1]

The rather large *Apoda* adults, although varying considerably in coloration from species to species, are characterized by the medial and postmedial (pm.) lines nearly meeting at the costa but branching farther apart toward the inner margin. The two notable exceptions to this line formation are some forms of *A. latomia*, which may lack the pm. line altogether, and the melanic form of *A. y-inversa*, which has the region within the two lines filled with dark coloration, making the lines appear to be absent altogether. However, because *A. latomia* exists far to the south of West Virginia and the dark forms of *A. y-inversa* have not yet been reported in the state, these exceptions should not apply to West Virginia *Apoda* spp. Typical for gelatine species, the antennae are threadlike in both sexes; the males, however, commonly raise the abdomen when at rest, making sex identifications for this species possible.

[1] Dyar mistakenly reported that *Apoda* caterpillars, like nettles, do not feed during the first instar (Dyar and Morton 1895: 153). Although Dyar corrected his mistake in a later work, Wagner (2005: 41) did not catch Dyar's correction and repeated the error in his "Caterpillars of Eastern North America."

Apoda biguttata
Shagreened slug

Diagnosis: *Apoda biguttata* caterpillars have two look-alikes in West Virginia, *Lithacodes fasciola* and *Apoda y-inversa*. Although each species bears a heavily granulated surface, *L. fasciola* tends to be much wider and more trapezoidal in shape than the others with two prominent yellow SD stripes and a heavily "pocked" or indented surface. These features are usually reliable for differentiating *L. fasciola* from *Apoda* spp. One should note, however, that individuals in earlier instars may closely resemble *Apoda* regardless of the listed characterizations. From here, *Apoda biguttata* can usually be separated from *A. y-inversa* in that it lacks the conspicuous mesothoracic (T2) collar and paired blue segmental spots of *A. y-inversa*. The SD striping in *A. biguttata* also tends to be much less pronounced than in *A. y-inversa*.

The adults are unique among West Virginia limacodids in that they have a grayish Y-shaped forewing (FW) median, pm., and part of the subterminal (st.) area bordered in white striping and two reddish-brown patches along the outer margin (one at the apex and the other at the tornus), both of which share the white border of the Y-shaped marking.

Description: The caterpillar is green to bluish-green with a heavily shagreened surface (Fig. 6). Two longitudinal SD stripes are bordered inwardly in green to bluish-green coloration that is darker than the overall body color. Note that these stripes are not connected by a yellow mesothoracic collar like *A. y-inversa*. Although pocked, this species is not nearly as pocked as *Lithacodes fasciola*. The tail is rather small and squared-off. There are seven instars, the mature caterpillar reaching roughly 9–15 millimeters (mm) in length. The first-instar caterpillar has white setae that are conspicuously knobbed with widened bases, changing to straight, darker setae by the second instar.

The adult has a brownish gray body with several prominent FW markings: (1) a tan basal region bordered with a white medial line, (2) a Y-shaped gray region extending from the median area to part of the pm. and st. regions that shares the white border of the tan basal region, and (3) two reddish patches, one at the apex and the other

Fig. 6. *Apoda biguttata* larva, Ashley Bosarge.

near the tornus, both of which share white bordering with the Y-shaped marking (Fig. 7). Adults of either sex may rest with the abdomen upright; the abdomen in females, however, tends to be wider and larger than in males. Typical for West Virginia gelatine species, the antennae are threadlike in both sexes.

Common Caterpillar Food Plants:
American hornbeam, beech, hickory, ironwood, and oak.

Phenology: The adults are most commonly observed from May through August, peaking in June and July; they occur frequently at lights in West Virginia and throughout the known range. The caterpillars are active from July through October. Males seem to be encountered much more frequently than females (Fig. 8).

Range: *Apoda biguttata* exists from Minnesota east to Maine and Nova Scotia, south to Florida, and west to Texas and Oklahoma, occurring throughout West Virginia (Fig. 9).

Notes: Although this species' common name is "shagreened slug,", one must note that having a heavily granulated surface is typical of many West Virginia gelatine slug caterpillars (for example, *Apoda y-inversa*, *Lithacodes fasciola*). In other words, just because a slug caterpillar is "shagreened" does not mean it is *Apoda biguttata*.

Fig. 7. *Apoda biguttata* adult, Paul Shaw.

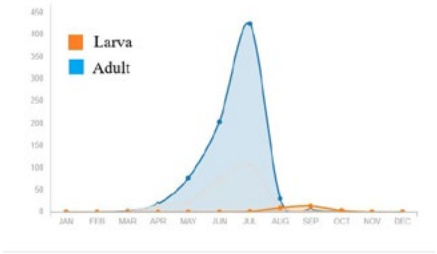


Fig. 8. *A. biguttata* life stage graph [iNaturalist.com]

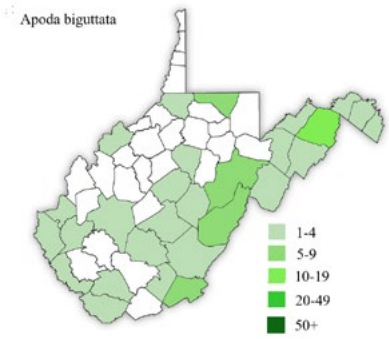


Fig. 9. Map: *Apoda biguttata* distribution map.

Apoda y-inversa
Yellow-collared slug

Diagnosis: In West Virginia, *Apoda y-inversa* caterpillars have one main look-alike: *Apoda biguttata*. The two can usually be reliably differentiated, however, in that *A. biguttata* lacks the conspicuous yellow mesothoracic collar and blue dorsal spots of *A. y-inversa*. Additionally, *A. y-inversa* tends to have its SD stripes much more pronounced than those of *A. biguttata*.

The distinctive orangish FW distinguishes *A. y-inversa* adults from all other *Apoda* spp.; however, one non-*Apoda* sp., *Tortricidia flexuosa*, is commonly mistaken for *A. y-inversa* due to its similar FW color and pair of dark medial and pm. stripes on each FW. Although similar in many cases, the two can be reliably differentiated in that *A. y-inversa* has both the medial and pm. stripes straight, while *T. flexuosa* has the pm. stripe notably bent. Like other *Apoda* spp., *A. y-inversa*, is also usually larger and more robust than the slender *T. flexuosa*.

Description: The green caterpillars of *A. y-inversa* are conspicuously beset with a bright yellow collar on the metathorax (T3), two yellowish SD stripes, and blue segmental spotting on the middorsum (Fig. 10). Typical for *Apoda* spp., the body is overall heavily shagreened, making the caterpillar appear as if it had been coated in a layer of sugar frosting. There are seven instars, the mature caterpillar reaching roughly 9–15 mm in length. The first-instar caterpillar is whitish with rows of large segmentary spines.

Fig. 10. *Apoda y-inversa* larva, Giff Beaton

Fig. 11. *Apoda y-inversa* adult, Paul Shaw

The adult is of an overall orangish color with a brownish medial and pm. line on each FW (Fig. 11). These lines nearly converge at the costa, gradually spreading farther apart toward the inner margin. In West Virginia, the area within these lines is orange (body color) with several smaller brownish lines throughout; although not yet known in West

Virginia, forms in which this area is totally occupied with the brownish-black coloration of the FW lines do exist (Fig. 12). Although both sexes commonly raise the abdomen when at rest, the female has a notably wider abdomen than the male.

Common Caterpillar Food Plants: American hornbeam, beech, hickory, and oak.

Phenology: The adults are mainly active from May through August, commonly occurring at lights. The caterpillars are present from June through September (Fig. 13).

Range: *Apoda y-inversa* exists from the Great Plains east to southern Quebec and Maine, and south to the Gulf Coast states, occurring commonly throughout West Virginia (Fig. 14).

Fig. 12. *Apoda y-inversa* adult, Annika Lindqvist.

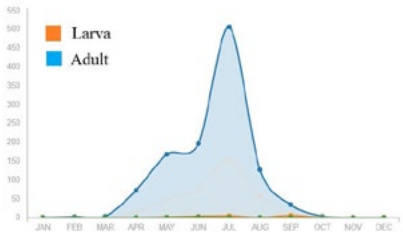


Fig. 13. *A. y-inversa* life stage graph [iNaturalist.com]

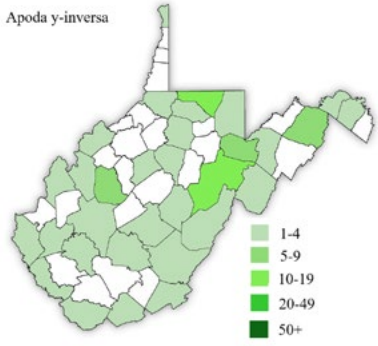


Fig. 14. *A. y-inversa* distribution map.

Genus *Heterogenea*

Heterogenea is a genus of gelatine limacodids with only two species worldwide. The North American member, *Heterogenea shurtleffi*, exists primarily throughout the southeastern United States, though it has been observed as far north as New England; thus far it has not been reported in West Virginia but has been reported in neighboring state Maryland.[2] Because records exist so close to West Virginia, it seems likely that it exists in the state currently or perhaps will do so in the future. The other member, *Heterogenea asella*, exists throughout large portions of Europe.

Heterogenea larvae closely resemble the caterpillars of *Tortricidia* in both ground color and dorsal markings. *Heterogenea shurtleffi* resembles *Tortricidia flexuosa* because of its blue and red dorsal (D) spot(s) while *Heterogenea asella* appears more like *Tortricidia testacea* or *Tortricidia pallida* due to its large "coat of arms" (see descriptions for *Tortricidia* spp.) over the dorsum. Both species feed as first-instar caterpillars. The adults in both species are unique among the West Virginia gelatine groups (*Tortricidia* and *Packardia*, for instance) in that they are sexually dimorphic, the males being dark chocolate brown and the females tan. Interestingly, the females tend to be much more common than males; in many cases the male would be considered rare as neither species seems to be observed very frequently, at least compared to other limacodid groups. Regardless of sex, the FW is notably rounded in comparison to some other West Virginia gelatine genera (for example, *Tortricidia*).

[2] See observations for this species on iNaturalist.com and the North American Moth Photographers Group webpage.

Heterogenea shurtleffi
Red-eyed button slug

Diagnosis: *Heterogenea shurtleffi* caterpillars are most commonly confused with the mature caterpillars of *Tortricidia flexuosa*, which may have dorsal markings similar to those of *H. shurtleffi* in some individuals. One means of differentiating the two is simply a matter of range and abundance—*H. shurtleffi* is not commonly observed and occurs primarily in the southern United States, while *T. flexuosa* is much more common and seems to be observed more often in the northern United States. A generally reliable means of differentiating the two physically is to look at the anterior end of the caterpillar. *Heterogenea shurtleffi* will have a yellow collar edged in red toward the head, while *T. flexuosa* does not have the yellow collar. The first instars appear very much like those of *T. pallida* and *T. flexuosa* but have smaller setae that alternate in position.

A small size and chocolate brown FW make the adult males hard to confuse with other West Virginia slug moths. The females, however, are superficially similar to the form of *Tortricidia pallida* in which two dark stripes are present on each FW but are easily diagnosed when a few characterizations are examined: (1) females of *H. shurtleffi* usually have a tan FW color, whereas *T. pallida* almost always has a light cream-colored FW and (2) *H. shurtleffi* has a notably rounder FW than *T. pallida*.

Description: The green caterpillars are beset with two longitudinal SD stripes and (usually) some form of red D spotting (Fig. 15). This spotting may stretch over many segments as a chain or may be confined to just one or two segments near the center of the caterpillar. Each spot is frequently outlined in yellow. The largest of the spots is the central spot, which is often centered in

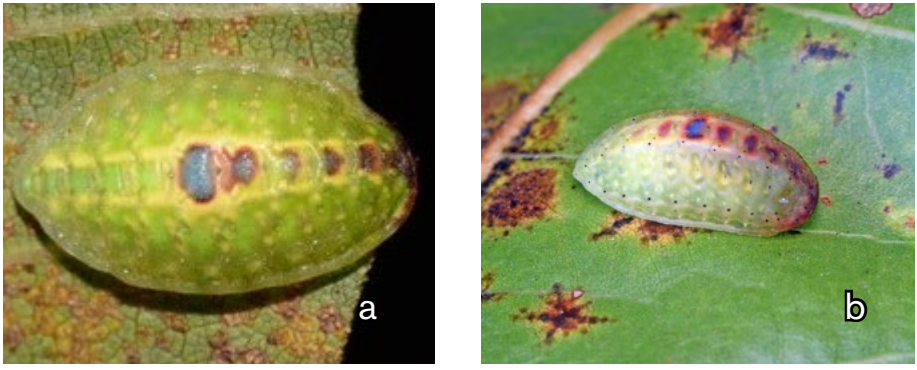


Fig. 15.(a) *Heterogenea shurtleffi* larva Ashley Bosarge; (b) *H. shurtleffi* larva, Giff Beaton.

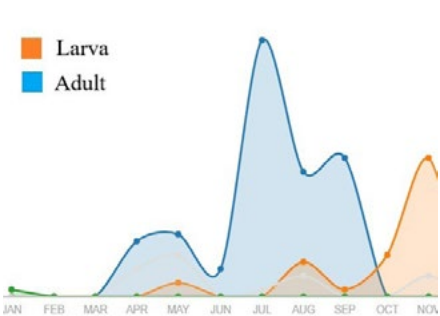
blue coloration; this large spot serves as the only dorsal marking in some individuals. As mentioned earlier, a yellow collar with red edging is present at the anterior. There are six instars, the mature caterpillar reaching roughly 5–10 mm in length. The first-instar caterpillar is whitish as usual with Y-shaped D setae on T3–A8. These Y-shaped setae change to two distinct setae on T2 and A9.

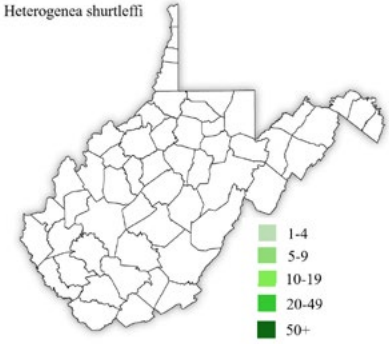
The adults are sexually dimorphic, the male being smaller and chocolate brown (Fig. 16) and the female tan (Fig. 17). In both sexes, two wavy stripes are present on the FW, one in the pm. area and the other in the am. area; a small patch of dark scales is usually present between the stripes in each sex.

Common Caterpillar Food Plants: Beech, chestnut, ironwood, and oak.

Phenology: The adults are observed most frequently from May through September (Fig. 18), occurring at lights fairly often. The caterpillars are active from August through November. Interestingly, the males are rarely seen in comparison to females. Although it has not yet been reported in West Virginia, records from Maryland exist, making it appear likely that this species exists in West Virginia currently or will do so in the future.

Range: *Heterogenea shurtleffi* exists from New York south along the East Coast to Florida, and west to Texas and Oklahoma; it has not yet been reported in West Virginia (Fig. 19).





Left to right: Fig. 16. *Heterogenea shurleffi* male, Zach DuFran; Fig. 17. *H. shurleffi* female, Rose A. Payne; Fig. 18. *H. shurleffi* life stage graph [iNaturalist.com]; Fig. 19. *H. shurleffi* distribution map.

Genus *Lithacodes*

Of the four known species in North American genus *Lithacodes*, only one species, *Lithacodes fasciola*, is a resident of West Virginia, the rest being common in southern states. Caterpillars of *L. fasciola* are unique among the West Virginia gelatine groups in that they are notably wide and trapezoidal and have a heavily pocked surface. *Apoda* larvae are perhaps the closest in form among the West Virginia gelatine species but tend to be narrower and much less pocked. A squared-off tail is evident at the posterior, tending to be much more pronounced in *L. fasciola* than in *Apoda* spp. As is characteristic of gelatine groups, *Lithacodes* first instars always feed.

Lithacodes fasciola, Lithocodes gracea, and *Lithocodes graefii* adults are characterized by an orange FW with a "toothed" white medial line bordered in black and gray. *Lithacodes fiskeanus*[3] is the only member of the group lacking this FW trait, having instead a tan FW with two black lines. The FW of *Lithacodes* spp. is somewhat rounded, although not as rounded as in some gelatine groups (*Packardia* and *Heterogenea*, for instance), yet not as pointed as in other groups (*Tortricidia* and *Apoda*, for example). The males tend to curl the abdomens upward when at rest.

[3] *Lithacodes fiskeanus* has been reported in several states in the eastern United States, none of which borders West Virginia. It is possible that neighboring states such as Pennsylvania or Ohio or perhaps even West Virginia itself could turn up with records in the future, however.

Lithacodes fasciola
Yellow-shouldered slug

Diagnosis: The caterpillars of *Lithacodes fasciola* are distinguished from other West Virginia gelatine species in that they are particularly wide, more trapezoidal, and heavily pocked. *Apoda biguttata* and *Apoda y-inversa* are perhaps the closest in form to *Lithacodes fasciola* in West Virginia, mainly due to their similar green body color and SD stripes. However, *Apoda* spp. are usually not as wide and are less trapezoidal with a surface that is pocked much less noticeably.

The orange adults look unlike any other West Virginia slug moth and hence should not be confused with any other limacodid within the state (see following description). The closest look-alikes to *L. fasciola* are *Lithacodes gracea* and *L. graefii* of the southern United States, both of which tend to have a paler FW and markings than *L. fasciola*.

Description: The caterpillars are yellow-green with two SD stripes (hence the common name "yellow-shouldered") and a heavily pocked surface (Fig. 20) . Although not forming a "collar" as in *Apoda y-inversa*, a small yellow band is present at the anterior that connects the two yellow SD stripes. A squared-off tail is present at the posterior; this is unlike *Apoda* spp., which have the dorsum angled straight across without a tail. As noted before, the overall shape is extremely wide (perhaps twice as wide as high) and trapezoidal. There are seven instars, the mature caterpillar reaching roughly 7–13 mm in length. The first-instar caterpillar is white with irregularly knobbed setae.

The adults have an orange FW with a "toothed" white median band edged in gray or black (Fig. 21). The shade of orange may vary from individual to individual. A brown-black arc extends from the gray or black area nearly to the tornus.

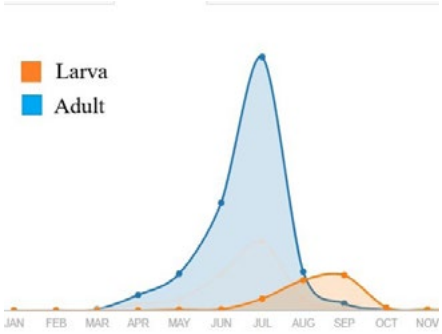
Common Caterpillar Food Plants: American hornbeam, apple, beech, birch, blackgum, blueberry, cherry, chestnut, eastern redbud, hickory, honeylocust, hophornbeam, linden, maple, oak, and willow.

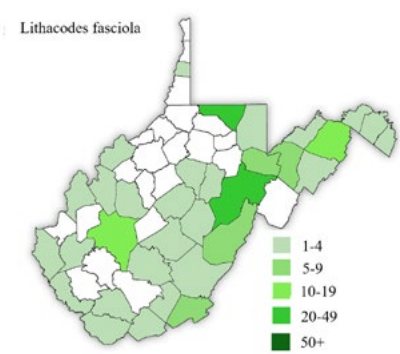
Phenology: Adults are most abundant from April through September, commonly occurring at lights. The caterpillars are active from June through November (Fig. 22). Males, frequently found with their abdomens curled prominently upward, seem to be much more common than females.

Range: *Lithacodes fasciola* occurs from the Dakotas and the Great Lakes states

east to New Brunswick and Nova Scotia, south to northern Florida, and west to Texas and the Great Plains, occurring commonly throughout West Virginia (Fig. 23).

Notes: One should note that this species' common name is "yellow-shouldered," not "yellow-collared" (*Apoda y-inversa*).





Left to right: Fig. 20. *Lithacodes fasciola* larva, Ashley Bosarge; Fig. 21. *Lithacodes fasciola* adult, Tucker Cooley; Fig. 22. *H. shurleffi* life stage graph [iNaturalist.com]; Fig. 23. *H. shurleffi* distribution map.

Genus *Packardia*

Genus *Packardia* consists of three species, two of which occur in West Virginia. Its caterpillars are unique among the West Virginia gelatine species in that a long, distinct tail is present at the posterior and the body bears D and SD rows of sharp setae. Another West Virginia gelatine species, *Prolimacodes badia,* also has a distinct tail but lacks the setae of *Packardia* spp. Despite having rows of setae, *Packardia* caterpillars retain the smooth overall appearance of gelatine species, the granulation of which is not unlike that of *Apoda* spp. These setae are indeed sharp through most of the caterpillar's instars (some might even call these structures spines), changing to simple setae by maturity.

The adults are noted for their somewhat rounded FW bearing white or black spots at roughly the tornus and conspicuous lines or shading near the middle of the wing. The FW as a whole may be brown, tan, or gray depending on species, the lines or shading near the wing center being generally much darker in color than the rest of the wing. As gelatine species, *Packardia* spp. have threadlike antennae in both sexes. The male, however, commonly raises the abdomen high when at rest while the female generally does not, making sex identifications possible.

Packardia elegans
Elegant tailed slug

Diagnosis: The most obvious look-alike to *Packardia elegans* caterpillars is another *Packardia* sp., *P. geminata*. The two can be easily differentiated by examining the following characteristics: (1) *P. geminata* is generally of a turquoise color overall, while *P. elegans* is generally of a yellow green coloration; (2) *P. geminata* bears one straight, whitish SD stripe on each side of the body, whereas SD stripes of *P. elegans* are rather yellowish and wavy; and (3) the tail of *P. geminata* is of its characteristic turquoise body color dorsally, while that of *P. elegans* is usually red dorsally. The first-instar caterpillars of the two species are practically indistinguishable, having both the same setae structure and location.

The adult *P. elegans* may have similar markings to *P. geminata* but has black spots at the FW tornus and a gray overall FW color, as opposed to the white spots and tan-brown FW of *P. geminata*. Perhaps *P. elegans* is most easily confused in West Virginia with two non-limacodid species, *Baileya doubledayi* and *Baileya opthalmica* (both family Nolidae), each of which has very similar FW colors and markings to *P. elegans*; however, the markings between the groups are not identical and can easily be separated in the field. The FW of the *Baileya* spp. is also notably narrower and more pointed than the short, rounded FW of *P. elegans*.

Description: The caterpillars are generally lime green overall with two wavy, yellow SD stripes and a long, pointed tail. The area between the SD stripes is darker green than the ground color. The tail is interestingly covered in red dorsally, unlike *Packardia geminata* (Fig. 24). The first instar tubercles are simple and unbranched in the D and SD rows. In the instars succeeding this stage, the tubercles become two D spines and one SD spine per bump. It is very difficult to call these "spines," as they do not possess the urticating power of some of the nettle caterpillars; "sharp setae" fits these structures better. By maturity, the spines appear as simple setae and are much less noticeable than in the previous stage, making the caterpillar appear much more glossy than previously. There are seven instars, the mature caterpillar reaching roughly 7–14 mm in length.

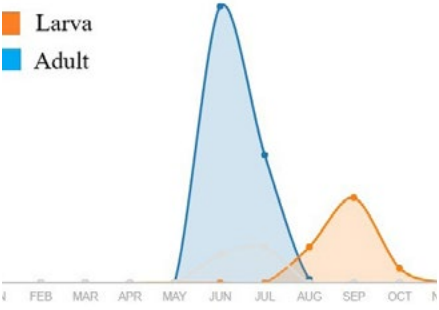
The adults are stone gray overall with a white medial and pm. line and two or three black dots near the tornus (Fig. 25). In freshly eclosed individuals, a third smaller stripe may be present between the two larger stripes. The area between the stripes may also be of a darker shade of gray than the rest of the FW in some individuals. The HW is light gray.

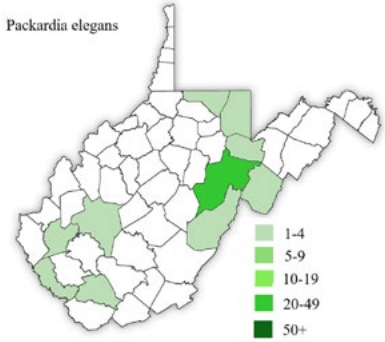
Common Caterpillar Food Plants: Basswood, beech, black birch, blackgum,

black oak, chestnut, chokecherry, hickory, hophornbeam, maple, wild cherry, witch-hazel, and *Vaccinium*. Unlike most West Virginia limacodids, which feed primarily in the canopy, the caterpillars of *P. elegans* feed most commonly on low-hanging branches.

Phenology: Adults are most frequently encountered from June through July, commonly occurring at lights. The caterpillars are active from July through October (Fig. 26). Males seem to be much more commonly observed than females.

Range: *Packardia elegans* thrives from Minnesota and Wisconsin east to Maine and Nova Scotia, south to North Carolina, and west to Kentucky; it occurs fairly often in West Virginia (Fig. 27). Interestingly, this species is more commonly observed in the northern part of its range than in the southern part.





Left to right: Fig. 25. *Packardia elegans* larva, Coulter; Fig. 26. *P. elegans* adult, Paul Shaw. Fig. 27. *P. elegans* life stage graph [iNaturalist.com]; Fig. 28. *P. elegans* distribution map.

Packardia geminata
Jeweled tailed slug

Diagnosis: As mentioned, *Packardia* caterpillars are unique among the West Virginia gelatine groups due to their conspicuous tails and spines or setae; thus no species outside of *Packardia* can be legitimately confused with *Packardia geminata*. *Packardia elegans*, the other West Virginia *Packardia* sp., however, is similar in structure and coloration to *P. geminata*, and the two are commonly mistaken for each another. While it must be noted that many younger caterpillars (and some mature caterpillars in a few cases) cannot be reliably identified to species, the two can usually be differentiated in that *P. geminata* is of a turquoise color as opposed to the apple green color of *P. elegans*, and has much lighter, straighter SD stripes.

The adults are distinct among West Virginia slug moths in that white spots are present at the FW tornus. *Packardia elegans* also has spots at the tornus, but these are black instead of white. The FW of *Packardia albipunctata* has white spots like *P. geminata*, but this species is considered synonymous with *P. geminata* in this field guide.

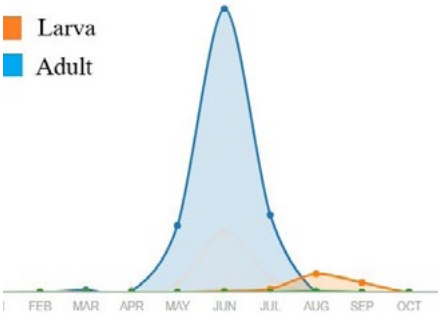
Description: As its common name suggests, the caterpillar of *P. geminata* indeed appears bejeweled, having a relatively glossy turquoise body with shiny rows of sharp setae and two longitudinal white SD stripes (Fig. 28). Typical of *Packardia* spp., the sharp setae change to simple setae as the caterpillar matures; in other words, the sharp setae gradually become less conspicuous from instar to instar, almost appearing absent altogether in many mature caterpillars. The characteristic tail is present at the posterior, though not topped with the D red coloration of *P. elegans* caterpillars. Of course, it must be noted that not every jeweled tailed slug encountered will have a tail, as the caterpillar may detach part or all of its tail if attacked by a foe.

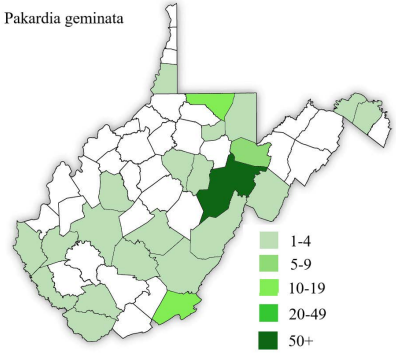
The adults will be addressed in two general forms in this guide: form true *geminata* and form *albipunctata*. Form true *geminata* is characterized by a cream-colored FW speckled in dark scales, a large, triangular-shaped brown area at roughly the center of the FW, and two or three white spots near the tornus. In contrast, form *albipunctata* has a brown to rust-colored FW overall with a beige triangular area (Fig. 29). Regardless of form, the abdomen is commonly raised high in males when at rest, while the females have thicker abdomens and hence do not normally raise them as high as the males do.

Common Caterpillar Food Plants: Beech, blackgum, cherry, hickory, and oak.

Phenology: The adults are active from April through July. The caterpillars are most common from August through September (Fig. 30).

Range: *Packardia geminata* exists from the Great Lakes States east to New Brunswick and Nova Scotia, and south to Georgia and Alabama, occurring throughout West Virginia (Fig. 31).





Left to right: Fig. 28. *Packardia geminata* larva, Tucker Cooley; Fig. 29. *Packardia albipunctata, Paul Shaw*, ; Fig. 30. *P. geminata* life stage graph [iNaturalist. com]; Fig. 31. *P. geminata* distribution map.

Genus *Tortricidia*

With three species in the state, *Tortricidia* has more species in West Virginia than any other limacodid genus. In most cases,[4] *Tortricidia* caterpillars can be separated from other gelatine species in West Virginia in that they have a conspicuous red D marking spanning many abdominal segments, which will be referred to as a "coat of arms" in this field guide. Although some other West Virginia gelatine groups have D markings, none have markings as large and conspicuous as the coat of arms in *Tortricidia*. The caterpillars are also considerably pocked (although not as pocked as *Lithacodes*) with a small, squared-off tail. All *Tortricidia* caterpillars are oval in shape. As with all gelatine species, *Tortricidia* larvae feed during the first instar. The first instars are characterized by Y-shaped SD setae that change to two separate setae on T2 and A9.

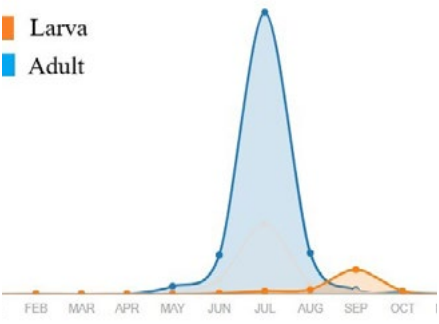
Adults are rather drab-looking individuals, all species having some form of light cream or orangish coloration on the FW. As usual for the *Apoda* complex, neither the legs nor the body is particularly woolly. The FW is somewhat triangular and more pointed than in most West Virginia gelatine groups. The males are commonly found with the abdomens prominently raised. Although both sexes have threadlike antennae, the males' antennae tend to be slightly wider than those of the females.

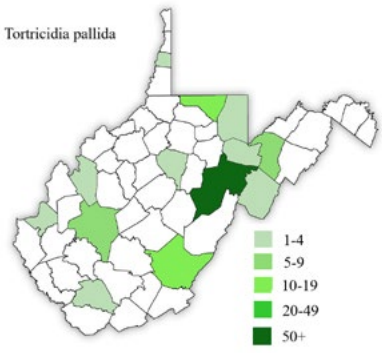
[4]In some examples of *Tortricidia flexuosa*, the coat of arms is reduced to a small dot or is absent altogether.

Tortricidia pallida
Red-crossed button slug

Diagnosis: *Tortricidia pallida* caterpillars can be most easily differentiated from the caterpillars of other *Tortricidia* spp. (and hence other West Virginia gelatine species) in that the dorsal coat of arms marking is widened at the sides (compare to the narrower coat of arms for *Tortricidia testacea*) and extends to or past the subdorsum. Unfortunately, some individuals do not have these characteristics, instead overlapping in markings with the other *Tortricidia* spp.

The adults are most commonly confused with *T. testacea* but can be differentiated in that *T. pallida* lacks the large, tan FW stripe of *T. testacea*. The fact that the FW is unmarked distinguishes this moth from all other West Virginia limacodids.





Left to right: Fig. 32. *Tortricidia pallida* larva, Coulter; Fig. 33. *T. pallida* adult, Paul Shaw; Fig. 34. *T. pallida* life stage graph [iNaturalist.com]; Fig. 35. *T. pallida* distribution map.

Description: The caterpillar is lime green overall, obviously decked with the characteristic coat of arms D marking (Fig. 32). The coat of arms is bordered in brown or red, which is frequently bordered in yellow. Occasionally, a small patch of pinkish coloration is evident at the center of the coat of arms. As with other *Tortricidia* spp., a small, squared-off tail is present. There are seven instars, the mature caterpillar reaching roughly 6–10 mm in length. The first-instar caterpillar is whitish with Y-shaped SD setae that change to two separate setae on T2 and A9, as is characteristic of *Tortricidia* spp.

As mentioned previously, the adults are light cream in color with no markings on the FW (Fig. 33). Males are frequently found with the abdomens upturned.

Common Caterpillar Food Plants: Apple, basswood, beech, birch, chestnut, hickory, maple, oak, wild cherry, willow, and witch-hazel.

Phenology: The adult is most frequently observed from May through August, commonly occurring at lights. The caterpillars are active from July through October (Fig. 34). Males appear to be much more abundant than females.

Range: *Tortricidia pallida* occurs most commonly from Minnesota and the Great Lakes east to Quebec and Nova Scotia, south to Georgia and Alabama, and west to Oklahoma and Louisiana, occurring commonly within West Virginia (Fig. 35).

Tortricidia flexuosa
Abbreviated button slug

Diagnosis: When the caterpillar of *Tortricidia flexuosa* bears the coat of arms marking on the dorsum, it can readily be differentiated from other *Tortricidia* spp. in that the coat of arms does not reach the sides of the body and extends in a narrow red line to both the anterior and posterior. However, it must be noted that this form is not always the case, as many individuals can be found with the coat of arms reduced to a single dot. Individuals of this form closely resemble the larvae of *Heterogenea shurtleffi* but can usually be easily differentiated in that *H. shurtleffi* bears a yellow collar at the anterior, while *Tortricidia flexuosa* does not.

The adult is most commonly confused with *Apoda y-inversa* in West Virginia but is easily differentiated in that the dark FW stripes or patch in *T. flexuosa* curve inward near the costal margin while the dark FW stripes or patch in *A. y-inversa*, though almost coming together near the costal margin, remains straight. Another adult limacodid commonly confused with *T. flexuosa* are the females of *Heterogenea shurtleffi* due to the similarity in FW striping. When comparing these two species, one must keep in mind that *Heterogenea* wings are considerably rounded with an overall tan FW color (*T. flexuosa* has a pointed FW with a light cream color overall).

Description: The lime green caterpillars come in three general forms, all of which deal with the size and shape of the dorsal markings: (1) a large red coat of arms not extending to the sides, (2) a small, red D rectangle at the anterior, or (3) the small rectangle at the anterior accompanied with another small red D dot near the center of the caterpillar (Fig. 36). Two faint yellow SD stripes are often present in forms 2 and 3. There are seven instars, the mature caterpillar reaching roughly 6–10 mm in length. The first-instar caterpillar is whitish with Y-shaped SD setae that change to two separate setae on T2 and A9, as is characteristic of *Tortricidia* spp.

The adults, like the caterpillars, are variable from individual to individual, coming in two general forms: (1) two dark stripes on the FW (one in the pm. and the other in the median area, both converging near the costal margin) with no dark shading filling in between the stripes (other than perhaps an inconspicuous patch of darker scales) and (2) the two dark stripes with prominent black shading throughout nearly the entire area (Fig. 37). In form 2, individuals can often be found with dark shading on the abdomen of the same color as the dark FW shading. Regardless of form, the general FW color

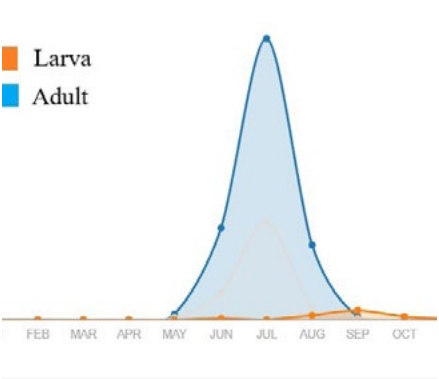
is light cream or slightly orangish as is usual for *Tortricidia* spp. Males are commonly found with the abdomens upturned.

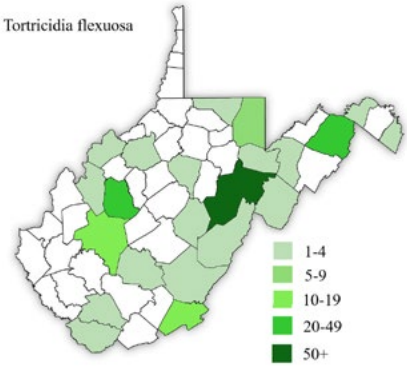
Common Caterpillar Food Plants: American beech, apple, birch, chestnut, hazelnut, hickory, maple, oak, plum, serviceberry, and wild cherry. Because *T. flexuosa* caterpillars can overlap in pattern with other *Tortricidia* caterpil-lars, it seems possible (if not highly likely) that the food plant records for this species have been confused with those of other *Tortricidia* spp.

Phenology: The adults are most commonly observed from May through August, frequently occurring at lights. The caterpillars are most commonly found from August through October (Fig. 38). Males are much more abundant than females.

Range: *Tortricidia flexuosa* thrives from Minnesota and the Great Lakes east to Quebec, New Brunswick, and Nova Scotia, south to Georgia and Alabama, and west to Oklahoma and Missouri, occurring throughout West Virginia (Fig. 39).

Notes: *Tortricidia flexuosa* and *Tortricidia pallida* are not currently treated as completely distinct from each other due to their identical genitalia and tendency to grade into each other. Marc Epstein (pers. comm.) suggests that a collective effort of many people in different locations throughout the species' ranges might be sufficient to solve this *Tortricidia* puzzle.





Left to right: Fig. 36. *Tortricidia flexuosa* larva, Bo Zaremba. Fig. 37. *T. flexuosa* adult, Tucker Cooley. Fig. 38. *T. flexuosa* life stage graph [iNaturalist.com]; Fig. 39. *T. flexuosa* distribution map.

Tortricidia testacea
Early button slug

Diagnosis: *Tortricidia testacea* caterpillars are most commonly confused with other *Tortricidia* caterpillars but can usually be diagnosed in that the side extensions of the red coat of arms are notably narrowed. The fact that side extensions are present immediately separates this species from *Tortricidia flexuosa*, which lacks them. From here, the only species that *T. testacea* can reasonably be confused with is *Tortricidia pallida*, but the two can usually be separated in that *T. pallida* has wide extensions of the coat of arms as opposed to the narrowed extensions of *T. testacea*. Despite this difference, many individuals cross over in markings with other *Tortricidia* spp. Consequently, many identifications for this species are best left at genus level.

The FW of the adults usually bears a large tan stripe throughout, immediately distinguishing the species from its closest look-alike, *T. pallida*.

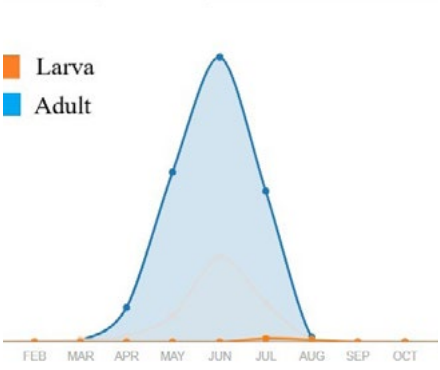
Description: The caterpillars are green overall with a conspicuous red coat of arms (Fig. 40). The side extensions do reach the sides of the caterpillar and are frequently narrowed. A pinkish patch is often visible near the center of the coat of arms. As with other *Tortricidia* spp., a squared-off tail is present. There are seven instars, the mature caterpillar reaching roughly 6–10 mm in length. The first-instar caterpillar is whitish with Y-shaped SD setae that change to two separate setae on T2 and A9.

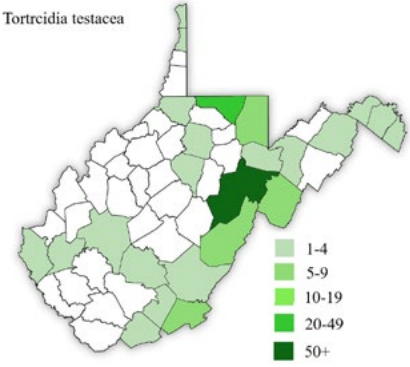
The adults have a light cream to orangish FW with a large, conspicuous tan stripe occupying both the pm. and median areas and extending from the apex to the tornus (Fig. 41). In freshly eclosed individuals, the veins are often also tan. The head and beginning of the thorax are often tan as well. Males are frequently found perched with the abdomen upturned.

Common Caterpillar Food Plants: Basswood, beech, birch, blackgum, chestnut, hickory, oak, wild cherry, and witch-hazel. As with the other *Tortricidia* spp., past host plant records may not always be reliable because *Tortricidia* caterpillars often grade into each other in pattern and coloration.

Phenology: Adults are active from April through August, a month before the oth-er *Tortricidia* spp. (hence the common name "early button slug"), making T. *testacea* one of the earliest active West Virginia slug moths. The caterpillars are present from July through August, which is also a month earlier than the other *Tortricidia* spp. (Fig. 42). Males are much more commonly observed than females.

Range: The most westward-ranging of the *Tortricidia* spp., *T. testacea* exists from the Pacific Northwest and British Columbia east to Quebec, New Brunswick, and Nova Scotia, south to Georgia, and west to California, occurring commonly throughout West Virginia (Fig. 43).





Left to right: Fig. 40. *Tortricidia testacea* larva, John Abrams; Fig. 41. *T. testacea* adult, Gordo Laidlaw; Fig. 42. *T. testacea* life stage graph [iNaturalist.com]; Fig 43. *T. testacea* distribution map.

Genus *Prolimacodes*

Prolimacodes is a primarily tropical genus represented by seven known species throughout its range. Of these seven, only two species exist north of Mexico, and only one in West Virginia.

Prolimacodes caterpillars are characterized by their unusually high shape, heavily sclerotized SD ridge, and long, pointed tail. Each species seems to be notably variable in coloration and pattern; *Prolimacodes badia*, for example, may be green, brown, tan, purplish, yellowish, or a mixture of each. It has been suggested that no two caterpillars of this species are identical in pattern or coloration.

The adults are unusual among gelatine species in that one-half of the FW (the side bordering the costal margin) is covered in beige coloration, bulging near the median area, while the other half is some shade of lighter brown. The halves tend to share a faint white line near their border. All are rather large for gelatine species, with a somewhat long, pointed FW. The body and legs are rather woolly. In comparison to many other gelatine groups, the body is also very robust. As is typical for a gelatine genus, *Prolimacodes* adults have threadlike antennae in both sexes; unfortunately, the body is so robust in this genus that neither sex tends to raise the abdomen when at rest, making positive sex identifications a challenge.

Prolimacodes badia
Skiff moth

Diagnosis: The heavily sclerotized SD ridge and long, pointed tail distinguish the caterpillars of *Prolimacodes badia* from those of other species in West Virginia. The first instars are also distinct among the West Virginia gelatine groups, being larger at the anterior (as in mature caterpillars) with two rows of tubercles and two setae arising from each tubercle.

As with the caterpillar, the adult is also distinct; the light half along the inner and outer margins and bulging dark half along the costal margin distinguish these moths from all others in West Virginia. Adults of *Prolimacodes trigona* of the southwestern United States, the only other *Prolimacodes* sp. north of Mexico, appear similar to *P. badia* adults except that they have the light-colored section of the FW divided into two regions, one being brown and bordering the inner and outer margins, the other smaller area being white and bordering the darker region to nearly the costa.

Description: The distinct caterpillars are green, tan, brown, yellowish, purplish, or a mixture of each with a heavily sclerotized SD ridge and long, pointed tail (Fig. 44). The SD ridge bears one (or occasionally two) conspicuous, horn-like extensions on A4 and a large white dot on A7 and A8. A faint, yellow line is present in many individuals on the middorsum. It must be noted that marking and coloration will vary considerably from individual to individual. There are seven instars, the mature caterpillar generally reaching roughly 12–18 mm in length, which is large for the gelatine group. The first-instar caterpillar is considerably larger at the anterior than the posterior, having two rows of tubercles with two setae on either side.

As mentioned, the adult FW is divided into a chocolate brown section along the costal margin and a light cream or grayish section along the inner and outer margins (Fig. 45). Both sections are bordered in a faint white stripe.

Common Caterpillar Food Plants: American beech, American persimmon, apple, aspen, basswood, bayberry, birch, blackgum, blueberry, boxelder, citrus, chestnut, elm, hazelnut, hickory, holly, hophornbeam, oak, poplar, rhododendron, serviceberry, sweetgum, sycamore, walnut, wild cherry, willow, and witch-hazel. *Prolimacodes badia* caterpillars seem to be among the most polyphagous of West Virginia slug caterpillars.

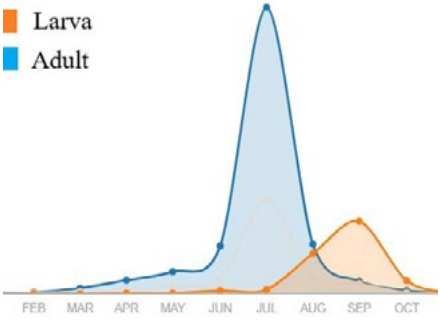
Phenology: The adults are frequently observed from March through October, commonly occurring at lights. The caterpillars are active from June through

November (Fig. 46). Since the adult males do not raise the abdomen when at rest and the antennae are threadlike in both sexes, it is often difficult to tell male and females apart for this species in the field. Nevertheless, males do seem more common than females.

Range: Among the most widespread West Virginia limacodids, *Prolimacodes badia* thrives in most of the eastern United States, southeast Ontario, Mexico, Central America, Colombia, and Ecuador, occurring commonly throughout West Virginia (Fig. 47).

Notes: *Prolimacodes scapha* is synonymous with *Prolimacodes badia*.

Fig. 44. *Prolimacodes badia* larva (a, b, c) Ashley Bosarge; (d) Giff Beaton.



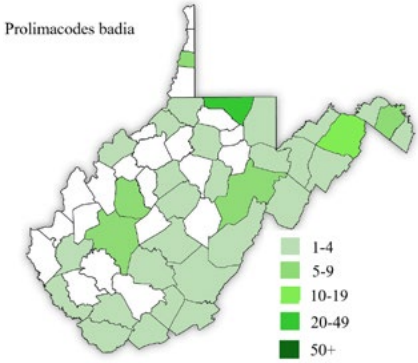


Fig. 44e. *Prolimacodes badia* larva, Tom Murray; Fig. 45. *P. badia* adult, Paul Shaw; Fig. 46. *P. badia* life stage graph [iNaturalist.com]; Fig. 47. *P. badia* distribution map.

Genus *Phobetron*

The unique caterpillars of tropical genus *Phobetron* are characterized by stiff setae throughout the body accompanied with long, detachable tubercles, making the caterpillars appear somewhat like a hairy spider. Despite popular belief, these caterpillars lack spines and cannot sting. Because they lack spines, members of *Phobetron* are classified in the gelatine group. Interestingly, the tubercles are used in cocoon construction; in West Virginia and the eastern United States, no other limacodid species is known to do this. *Phobetron* adults are sexually dimorphic: the robust female has a large, rounded FW with distinct markings, and the male is considerably smaller with a small, more pointed, somewhat transparent FW. Males have pectinate antennae. Both sexes have rather woolly bodies and legs with large, light-colored tufts of scales on the midlegs.

Phobetron pithecium
Monkey slug or Hag moth

Diagnosis: Compared to other West Virginia caterpillar species (both limacodid and non-limacodid), *Phobetron pithecium* is among the most distinct in the state due to its spider-like appearance, detachable tubercles, and sharp setae. The only two species that this caterpillar could reasonably be confused with in West Virginia are *Megalopyge crispata* and *Megalopyge opercularis* (Megalopygidae), both of which have setae of the same color as *P. pithecium*. The species are easily differentiated, however, in that Megalopyge caterpillars have much longer setae, lack the detachable tubercles, and lack hidden stinging spines. The setae in *P. pithecium* first instars are notably long, thin, and pointed, perhaps more so than any other West Virginia limacodid.

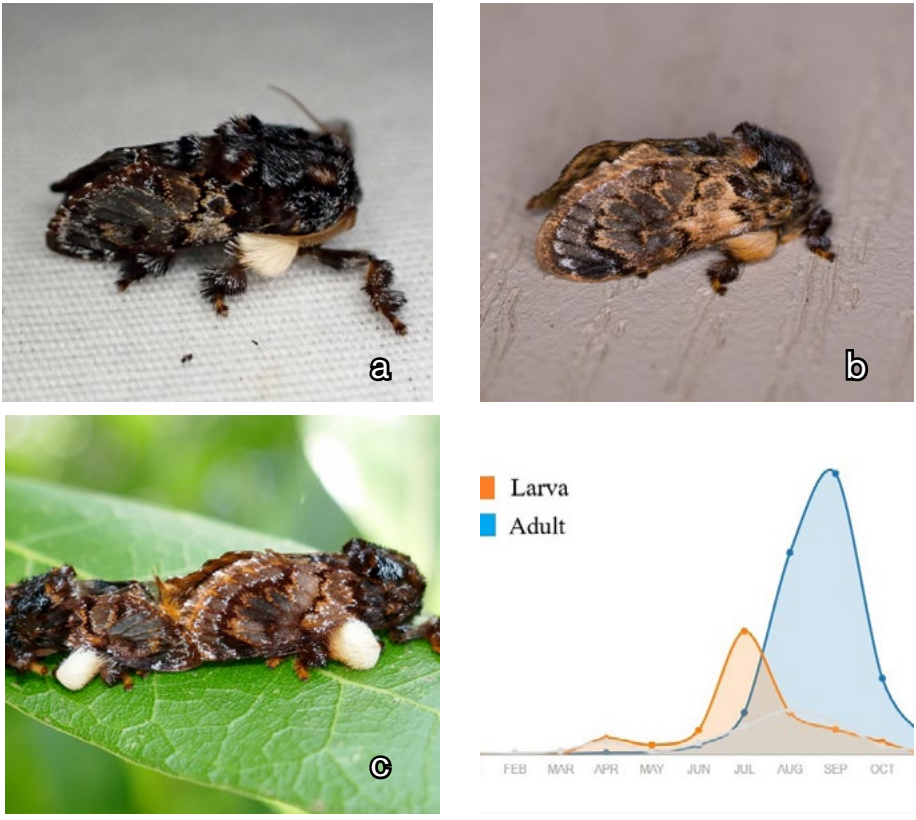
The adult male is unlike any other slug moth in West Virginia due to its relatively tiny, transparent FW and overall dark body color. The female, however, is frequently confused with some dark females of *Isochaetes beutenmuelleri,* which have a dark FW color and large leg tufts similar to those of *P. pithecium*. Although extremely similar in some cases, the two can usually be reliably differentiated in that *P. pithecium* has much more distinct FW markings and midleg tuft.

Description: The unmistakable caterpillar, as mentioned, is densely covered in short, stiff, tan–brown setae with nine pairs of conspicuous tubercles (Fig. 48). The third, fifth, and seventh pairs of tubercles are notably longer than the rest, which are instead rather short. Similar to how a starfish can detach its arms in an emergency without doing any significant harm to itself, *P. pithecium* caterpillars can shed these tubercles as a defense mechanism

Left to right: Fig. 48. *Phobetron pithecium* larva, Giff Beaton; Fig. 49. *Phobetron pithecium* larva, Ashley Bosarge.

without seriously harming the caterpillar. If several tubercles are shed, the caterpillar may look like a totally different species (*Parasa chloris*, for example) (Fig. 49). If the tubercles are retained until maturity, they will be used in cocoon construction. There are nine instars, the mature caterpillar reaching roughly 13–22 mm in length. The first-instar caterpillar has long, black-tipped spines arranged in rows, changing to small tubercles by the second instar.

The adults are sexually dimorphic: the robust male is dark in coloration throughout with orangish antennae and black and brown spotting on the FW, which is almost transparent (Fig. 50a). The HW is curiously triangular. The female is also robust but notably larger than the male with cream blotches and more distinct markings on the FW (Fig. 50b). Regardless of sex, all the legs are notably furry with a conspicuous whitish tuft of scales on the midleg (Fig. 50c).



Left to right: Fig. 50 (a). *Phobetron pithecium* adult, John Trent; Fig. 50 (b). *P. pithecium* adult, Richard Yank; Fig. 50 (c). *P. pithecium* adult Kai Squires; Fig. 51. *P. pithecium* life stage graph [iNaturalist.com]

Common Caterpillar Food Plants: American beech, American persimmon, apple, ash, basswood, birch, bittersweet, bramble, buttonbush, citrus, cherry, chestnut, dogwood, hickory, hophornbeam, lilac, oak, rose, sassafras, willow, and witch-hazel.

Phenology: The adults are active from April through September, reportedly uncommon at lights. Males have been observed during the day, a trait that is unusual for West Virginia limacodids. The caterpillars are active from June through November (Fig. 52). Interestingly, females are observed much more commonly than males.

Range: *Phobetron pithecium* thrives from Minnesota east to Maine and Quebec, south to Florida, and west to Texas and Oklahoma, occurring throughout West Virginia (Fig. 53).

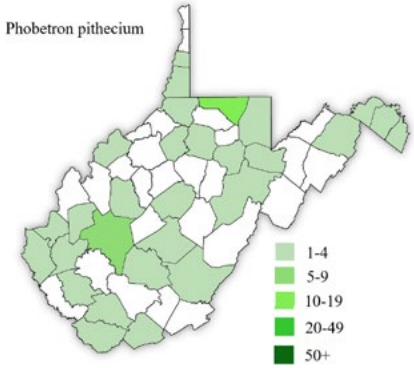


Fig. 52. *Phobetron pithecium distribution-*map.

Genus *Isochaetes*

Genus *Isochaetes* is closely allied to *Phobetron*; the caterpillars of *Isochaetes* also have detachable tubercles densely set with setae. Unlike *Phobetron* spp., however, *Isochaetes* caterpillars tend to be white, bluish green, or green overall, often with white setae. One should note that these setae are indeed setae: a common misconception is that these setae serve as venom-filled spines, which is absolutely not the case in *Isochaetes* spp. Because these setae are not spines, members of *Isochaetes* are classified in the gelatine group. The caterpillars are capable of shedding their tubercles in case of an emergency, much like those of *Phobetron* spp. Although *Phobetron* spp. use the tubercles in cocoon construction, mature *Isochaetes* caterpillars will shed their tubercles, if they have not already lost them, shortly before cocoon construction and thus will not incorporate them into their cocoons.

Isochaetes adults have a brown, somewhat triangular FW with blotches of darker or lighter browns and blacks throughout. A few species, such as *Isochaetes beutenmuelleri* and *Isochaetes rufescens*, commonly have a conspicuous light spot on the outer half of the FW. All species seem to have considerably woolly bodies and legs. Males have pectinate antennae but do not tend to raise the abdomen when at rest. Although neither sex tends to raise the abdomen, the extremely furry legs are often posed in odd fashion while the moth is at rest.

Isochaetes beutenmuelleri
Spun glass slug

Diagnosis: The caterpillar of *Isochaetes beutenmuelleri* is highly unlikely to be confused with any other species in West Virginia due to its characteristic snowflake-like appearance and shape.

The adult is also generally distinct from other West Virginia lepidopterans, having a conspicuous yellowish pm. spot on the FW. Perhaps the dark females are the most commonly confused morphs of this species, as some females of *Phobetron pithecium* look nearly identical to these dark *Isochaetes* females. When dealing with this particular instance, one should bear in mind that *P. pithecium* females lack the conspicuous pm. spot and have a large tuft of scales on the midleg. *Isochaetes beutenmuelleri* may have large leg scales, but none will be as conspicuous as the white leg scales of *P. pithecium*.

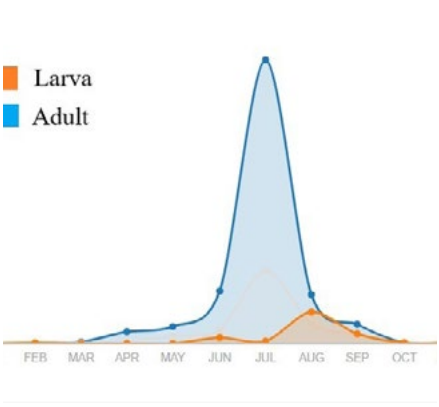
Description: The whitish to greenish caterpillar has 18 conspicuous tubercles along its sides, each of which is densely covered in bristly setae (Fig. 53) making the caterpillar superficially appear like a large snowflake. Smaller, gumdrop-like D tubercles are also present in two long rows, all of which are also densely beset in stiff setae. A longitudinal bluish stripe is usually conspicuous on the mid-dorsum. As mentioned in the genus introduction, the long, fleshy tubercles are easily detached without harming the caterpillar. Individuals in which the tubercles have been detached, like *Phobetron* caterpillars, often look nothing like the original caterpillar (Fig. 54). The tubercles are shed shortly before the caterpillar forms the cocoon. This species has eight instars, the mature caterpillar reaching roughly 11–16 mm in length. The first instar is whitish with fleshy tubercles of alternating lengths.

The woolly adults are brown throughout the body with various darker brown, yellowish, and blackish markings throughout the FW (Fig. 55). Females tend to be darker than males. Although neither sex tends to raise the abdomen, the extremely furry legs are often posed in odd fashion while the moth is at rest.

Common Caterpillar Food Plants: Beech and oak.

Phenology: The adults are frequently observed from April through September, commonly occurring at lights. The caterpillars are active from June to October (Fig. 56). Males are more commonly observed than females.

Range: *Isochaetes beutenmuelleri* exists from Missouri and Indiana east to New Jersey, south to Florida, and west to Texas and Oklahoma; it is common throughout most of West Virginia (Fig. 57).



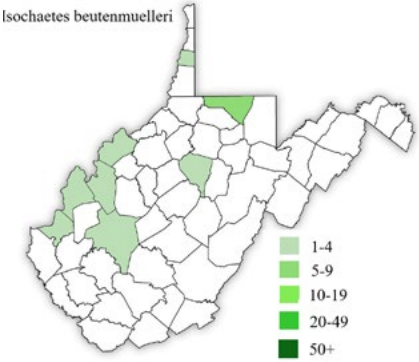


Fig. 53. *Isochaetes beutenmuelleri* larva, Bowen; Fig. 54. *I. beutenmuelleril* larva, Scott Bolick; Fig. 55. *I. beutenmuelleri* adult, Hans Holbrook and Van Ramsen; Fig. 56. *I. beutenmuelleri* life stage graph [iNaturalist.com]; Fig. 57. map: *I. beutenmelleri* distribution map.

Genus *Natada*

Caterpillars of the large, widespread genus *Natada* are considerably variable in coloration from species to species, as is typical of many nettle groups. Stinging spines are present throughout the body of *Natada* caterpillars, although no caltrop spines are present.

The adults are somewhat robust, neither sex commonly resting with the abdomen pointed upward. Despite this robustness, the body and legs do not seem to be particularly woolly. Males have pectinate antennae.

Natada nasoni
Nason's slug

Diagnosis: *Natada nasoni* is among the most distinct West Virginia limacodids. Caterpillars of this species should not be confused with those of any other lepidopterans within the state due to their unique oval shape, apple green body coloration, white, retractable spines, and bright red warts. The first instars of *N. nasoni* and *Isa textula*, the closest relative of *N. nasoni* in West Virginia, may look superficially similar in that both are rather elevated, but this similarity between the two is short-lived. *Isa textula* soon becomes flattened and considerably wide laterally while *N. nasoni* remains elevated and rather chunky.

The adults have a triangular FW with two beige stripes per wing, distinguishing this species from most others in West Virginia. *Isa textula* also has a somewhat triangular FW (especially in males) but is darker brown and lacks the two beige stripes per FW, instead having a large white patch near the center of the FW.

Description: The apple green caterpillars bear rows of white stinging spines arising from bright red warts (Fig. 58). The anterior SD pairs of spine clusters seem to be the most conspicuous and effective of the caterpillar's stinging spines. Each spine cluster is kept inside its red wart until the caterpillar is threatened. In response to a threat, the spines are everted outward for defense. A faint yellow SD stripe connects the SD red warts on either side. There are eight instars, the mature caterpillar reaching roughly 13–19 mm in length. The first-instar caterpillar is whitish with thick rows of SD and L tubercles. The chocolate brown cocoon is peculiarly dark for West Virginia limacodids (Fig. 59).

The adult has a light brown FW peppered in black scales with a tan thorax and abdomen and two beige stripes on each wing (Fig. 60). The outermost stripe extends from the apex straight to the tornus, while the other stripe extends essentially where the outer stripe stops (near the tornus) to the inner margin near the base of the wing. In undamaged individuals, these beige stripes are conspicuously bordered outwardly in white.

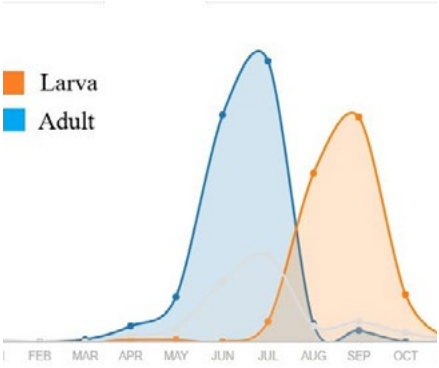
Common Caterpillar Food Plants: American hornbeam, beech, box elder, cherry, chestnut, eastern redbud, hickory, and oak.

P**henology: T**he adults are most frequently observed from April through August, occurring commonly at lights. The caterpillars are active from July

through October (Fig. 61 *N. nasoni* iNat Life Stage Graph). Males seem to be more abundant than females, although perhaps not as noticeably as in other groups (for instance, *Parasa* and *Euclea*).

Range: Natada nasoni thrives from Indiana east to Long Island and New Jersey, south to Florida, and west to Texas and Oklahoma, occurring throughout West Virginia (Fig. 62 *Natada nasoni*).

Fig. 58. *Natada nasoni* larva, Giff Beaton; Fig. 59. *N. nasoni* cocoon, Tucker Cooley; Fig. 60 (a, b), *N. nasoni* adults, Paul Shaw.



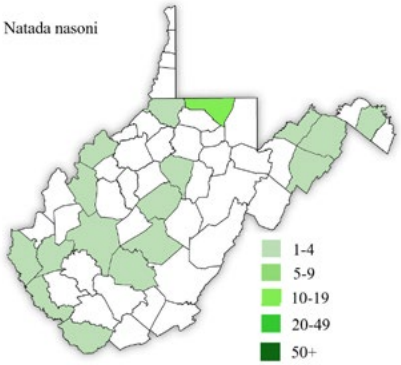


Fig. 61. *N. nasoni* life stage graph [iNaturalist.com]; Fig. 62. *N. nasoni* distribution map.

Genus *Isa*

Isa is an entirely New World genus with at least four described species (*Isa textula*, *Isa shaeferrana*, *Isa diana*, and *Isa brusha*); of these four, only *I. textula* and *I. shaeferrana* occur north of Mexico, and only *I. textula* is found in West Virginia. The genus is closely related to genus *Natada*; first instars of *Isa* spp. seem to be rather elevated and somewhat similar to those of *Natada* spp. in overall appearance. Unlike many *Natada* caterpillars, which remain stocky and elevated throughout the larval stage, *Isa* caterpillars usually become considerably flattened as they mature. Radiating, spine-tipped scoli are often conspicuous along the caterpillar's sides. These scoli form a characteristic
"crown" at the anterior, which may be very large and colorful in a few species (for example, *I. diana*).

The adults vary from light to dark brown; males have pectinate antennae.

Isa textula
Crowned slug

Diagnosis: *Isa textula* is another unique West Virginia nettle. Caterpillars of this species should not be confused with other West Virginia lepidopterans due to their flattened appearance, large, lateral scoli tipped in stinging spines, dark "crown" at the anterior, and bright red D spots.

The adult also appears distinct from West Virginia limacodids, having a unique triangular FW shape (especially in males) and a large white patch near the center of the wing. In some cases, the FW may appear similar to those of *Tortricidia* spp., but the overall robustness of both male and female *I. textula* immediately distinguishes this species from their slender counterparts.

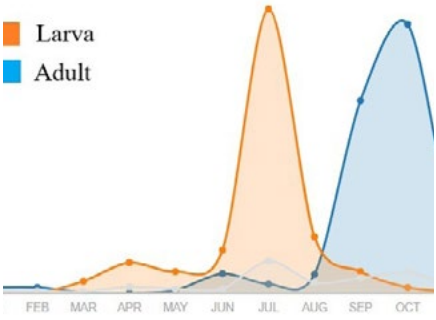
Description: The considerably flattened, sea green caterpillar is conspicuously arrayed with large scoli along the sides, each of which is tipped in stinging spines (Fig. 63). These scoli form the characteristic purplish "crown" at the anterior of the body. Other much smaller green scoli are present in SD rows, each of which also bears numerous spines. Two longitudinal yellowish SD stripes are present on either side of the caterpillar, accompanied with usually two (sometimes more) red spots between the stripes on roughly A5 and A7. There are eight instars, the mature caterpillar reaching roughly 12–19 mm in length. The first-instar caterpillars have two rows of large tubercles on each side of the body. The tips of these tubercles bear one apical seta with several surrounding setae radiating from its sides.

The adults are orangish-tan with a large white patch of scales on the FW (Fig. 64). This white patch may or may not be conspicuous, depending on the condition of the individual moth. The thorax and abdomen tend to be of a darker tan than the FW.

Common Caterpillar Food Plants: American hornbeam, basswood, beech, buckeye, cherry, chestnut, elm, hickory, maple, and oak.

Phenology: The adults are most abundant from April through September, commonly occurring at lights. The caterpillars are present from June through December (sometimes January in parts of its range), which is late for a West Virginia limacodid (Fig. 65). Males are observed more frequently than females.

Range: *Isa textula* exists most commonly from Wisconsin and Michigan east to Maine and Quebec, south to northern Florida, and west to Texas, occurring throughout West Virginia (Fig. 66).



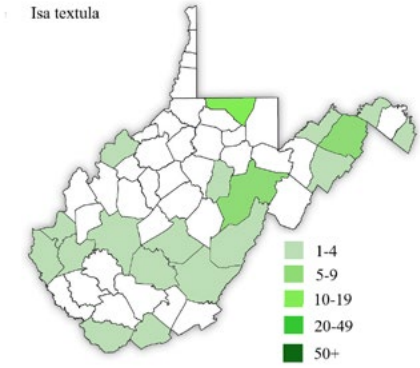


Fig. 63. *Isa textula* larva, Ashley Bosarge; Fig. 64. *I. textula* adult, Paul Shaw. Fig. 65. *I. textula* life stage graph [iNaturalist.com]; Fig. 66. *I. textula* distribution map.

Genus *Parasa*

Parasa is a large, greatly diverse, worldwide genus, comprising almost 250 species globally, most of which exist in tropical regions. The stinging caterpillars are exceedingly diverse in coloration and pattern. The two West Virginia *Parasa* spp., *P. chloris* and *P. indetermina*, for example, are completely different in coloration and structure.

Parasa adults are characterized by their green FW and thorax, which may vary considerably in amount and location from species to species. Some *Parasa* spp. (for example, *P. wellesca* and *P. pastorialis*) have the FW almost entirely covered in green, while others (for example, *P. minima* and *P. viridogrisea*) have little or no green on the FW. Although the thorax is usually consistently green throughout, some species such as *P. darma* may have only a small area of the thorax green. The body as a whole is rather robust and woolly, as are the legs. This genus is not known for commonly raising the abdomen when at rest. The males have wide pectinate antennae that are often conspicuously orange in many species.

Parasa chloris
Smaller parasa

Diagnosis: *Parasa chloris* caterpillars are not likely to be confused with any other lepidopterans in West Virginia due to their unique humpbacked shape, purplish-pinkish-orangish overall color, and whitish, retractable stinging spines. Caterpillars of *Epimecis hortaria* (family Geometridae) are also humpbacked but are considerably more slender than *P. chloris* and lack the stinging spines.

Adults are very commonly confused with the other West Virginia *Parasa* sp., *P. indetermina*, as both share the apple green thorax and broad FW bands. However, the two can usually be reliably differentiated in that *P. indetermina* has the broad FW band notably wider (especially in males) than *P. chloris* and is larger overall. *Parasa chloris* is also occasionally confused with *Euclea delphinii*, which also has green on the FW. Although the two may be superficially similar, they can always be differentiated in that *E. delphinii* has a chocolate brown thorax, whereas *P. chloris* has an apple green thorax.

Description: The purplish, pinkish, or orangish mature caterpillar is strongly humpbacked with five pairs (three at the anterior and two at the posterior) of whitish D spines and a long, pointed tail (Fig. 67). These clusters of whitish spines are normally kept hidden but may be easily everted outward if the caterpillar is threatened (compare to *Natada nasoni*). In other words, the white spines that once appeared as mere bumps suddenly appear as large, conspicuous caltrop spines to any observer who bothers this unique caterpillar. Smaller, darker spine clusters exist along a dark D stripe between the anterior and posterior pairs of whitish spines. A unique background of faint, wavy stripes is found throughout the caterpillar. The venter is notably white, bordered dorsally by a longitudinal dark reddish stripe. There are eight instars, the mature caterpillar reaching roughly 10–21 mm in length. The first-instar caterpillar is whitish with medium-sized tubercles at the ends and short tubercles in between. Each tubercle is tipped in three setae.

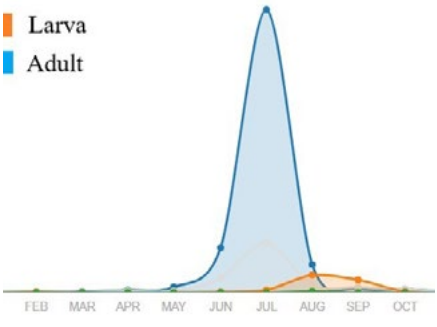
Adults have an FW conspicuously decked in a broad (although not as broad as in P. indetermina), apple green median band, as is characteristic of many *Parasa* spp. (Fig. 68). This broad band is bordered by dark am. and pm. stripes, separating this area of the FW from tan pm., st., and basal regions. The veins may be outlined in dark brown, especially in the outer tan region. The HW is light cream-colored on the inner two-thirds of the wing and darker brown on the outer third. Although the abdomen is tan (same color as the two tan regions of the FW), the thorax is apple green (same color as the median area of the FW). The green thorax and FW median area are connected by a narrow green "isthmus." The tan legs are extremely furry, often held in bizarre fashion while the moth is at rest. Neither sex commonly raises the abdomen, but, as is common among some limacodids (especially robust nettles) the male abdomen ex-

tends just past the FW tornus, whereas the female abdomen is usually totally covered by the large FW. The males additionally have orange pectinate antennae; the females have brownish threadlike antennae.

Common Caterpillar Food Plants: American hornbeam, apple, aspen, basswood, bayberry, bittersweet, blueberry, chestnut, dogwood, elm, hickory, loosestrife, oak, rose, and willow.

Phenology: The adults are present from May through August and into September, commonly occurring at lights. The caterpillars are active from July through October (Fig. 69). Males seem to be much more common than females.

Range: *Parasa chloris* occurs from Missouri and Illinois northeast to New England, south to Georgia, and west to Louisiana. Records also exist for much of Texas, but some appear to have been falsely identified as *Parasa minima*, a look-alike and close relative of *P. chloris*. In West Virginia, this species is very common throughout the state (Fig. 70).



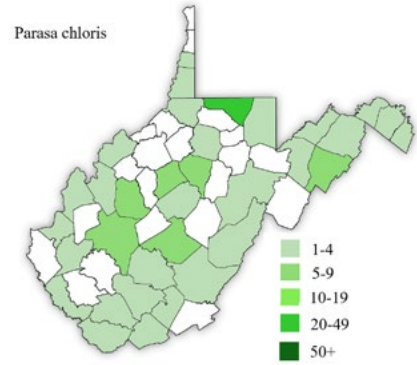


Fig. 67. *Parasa chloris* larva Beaton; Fig. 68. *P. chloris* adult, Shaw; Fig. 69. *P. chloris* life stage graph [iNaturalist.com]; Fig. 70. *P. chloris* distribution map.

Parasa indetermina
Stinging rose caterpillar

Diagnosis: Another unusual caterpillar, *Parasa indetermina* is unlikely to be confused with any other species in West Virginia due to its characteristic bright yellow, orange, or scarlet overall color, bluish and black D stripes, and long scoli tipped in stinging spines.

The adults, however, are very commonly confused with the other West Virginia *Parasa* sp., *P. chloris*. Despite being superficially similar, these two species can usually be differentiated in that *P. indetermina* is larger, has a wider green median band that bulges toward the outer margin of the FW, and commonly has a dark smear on the st. area of the FW that is either faint or absent in *P. chloris*. Perhaps the majority of misidentifications occur among females of the two species, in which the green median band can be similar in shape and area. Although most females can be diagnosed to a species level, there remain individuals, unfortunately, that cannot be identified reliably in the field and thus are best left at the genus level.

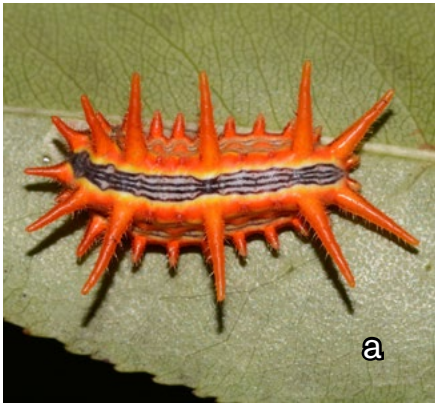
Description: A classic example of insect aposematism, *P. indetermina* caterpillars may be either bright yellow, neon orange, or scarlet overall and are fiercely armed in whitish stinging spines (Fig. 71). Six long pairs of scoli are present in an SD row on each side of the caterpillar, all of which bear numerous spines. The lateral scoli are medium in size, each of which also bears stinging spines. The smallest scoli, which appear as small, spiny warts, are found on the SD area of the segments between the large scoli. Four black stripes alternate side-by-side with three bluish stripes along almost the entire dorsum. A similar less conspicuous arrangement of stripes exists along and just above the spiracles. There are eight instars, the mature caterpillar reaching roughly 16–22 mm in length. The first instar is very similarly structured to the first instars of *Parasa chloris* and *Euclea delphinii* (see description for each species).

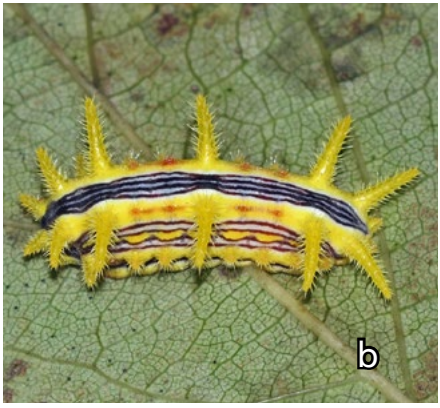
The adult, like West Virginia *P. chloris*, is woolly and has a rather robust body with an apple green thorax and large median FW band (Fig. 72). The large band is bordered on either side in tan, separated from these tan regions by a thin dark stripe. The tan region nearest the thorax is interrupted along the costal margin by apple green coloration, a continuation of the broad apple green stripe that connects the green stripe to the concolorous thorax. A conspicuous blackish patch of scales is usually present midway down the outer margin of each FW. As in *P. chloris*, the HW is light cream-colored on the inner two-thirds of the wing, darker brown on the outer third. Males have wide, orangish, pectinate antennae, whereas those of the females are yellow-brown and threadlike.

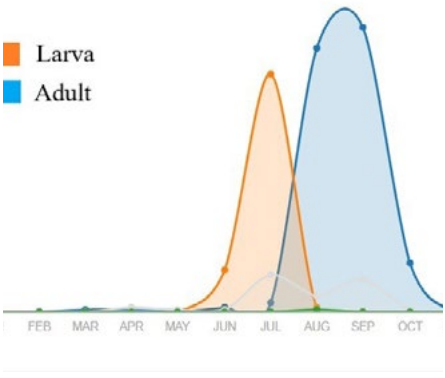
Common Caterpillar Food Plants: American persimmon, apple, bayberry, dogwood, hickory, maple, oak, poplar, rose (hence the common name), sycamore, and wild cherry.

Phenology: The adults are present from June through August, commonly occurring at lights. The caterpillars, reported and observed often due to their flashy colors, are active from July through October (Fig. 73). Males are much more common than females, as is typical for West Virginia nettles.

Range: *Parasa indetermina* thrives from Missouri and Illinois northeast to New England, south to Florida, and west to Louisiana and Oklahoma. Although by no means rare, this species is not nearly as common as some other West Virginia limacodids (Fig. 74).







Lleft to right: Fig. 71(a,b). *Parasa indetermina* larva Ashley Bosarge, Giff Beaton; Fig. 72. *P. indetermina* adult Giff Beaton; Fig. 73. *P. indetermina* life stage graph [iNaturalist.com].

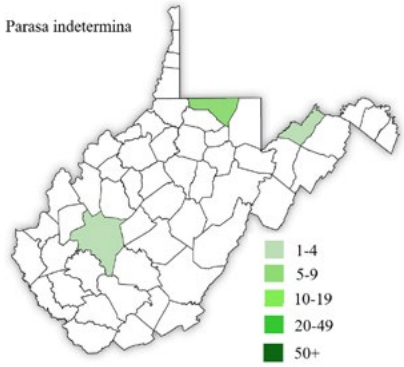


Fig. 74. Map: *P. indetermina* distribution map.

Genus *Acharia*

Members of the extensive New World genus *Acharia* are perhaps best known for their sizable, fearsome caterpillars, all of which can generate painful stings via their large, venom-filled spines. By far the most prominent of these spines are those on the long scoli on the anterior and posterior ends of the caterpillar, yet the caterpillars are by no means limited to these, as many smaller clusters of spines are present behind the large scoli and along the sides. Interestingly, the caterpillars are completely bereft of these spines on the middorsum; the caterpillars seem to be well aware of this "Achilles' heel," however: as any would-be predator soon realizes, for any foreign object that touches the caterpillar's bare spot the caterpillar responds by arching its back and hurling its long, spine-tipped scoli at the object. In some species (*Acharia stimulea* and *Acharia hyperoche*, for instance), the bare spot on the dorsum has a unique oval pattern, making the caterpillar appear to be "saddled." The coloration of *Acharia* caterpillars is highly variable, ranging from black and white with orange spines in *A. nesea* to green and turquoise with whitish spines in *A. horrida*.

Another unique aspect of *Acharia* caterpillars is that they are gregarious after the early instars, many remaining in groups throughout the entire larval stage. As maturity is reached, a cocoon composed of spines and silk is constructed; because some spines are present in the cocoon, collectors must be cautious with this stage, as these spines can still cause irritation to skin. This cocoon is curiously dark in coloration, at least more so than many nettle species.

The particularly woolly adults are frequently dark brown in coloration with white spots near the apex of the FW. The furry legs are often held in bizarre positions while the moth is at rest, adding to the moths' overall woolly appearance. Males have conspicuously bipectinate antennae toward the base, whereas those of the females are threadlike. Additionally, females have notably larger wings than males that extend over the abdomen, whereas the wings of males are shorter to the extent that the tip of the abdomen is very much visible.

Acharia (=*Sibine*) *stimulea*
Saddleback caterpillar

Diagnosis: The characteristic coloration and markings distinguish *Acharia stimulea* caterpillars from all others in West Virginia. The adults are also generally distinct, though it must be noted that some forms of *Euclea delphinii*, another West Virginia nettle species, may appear similar to *A. stimulea*. The two are readily differentiated, however, in that the FW spots of *A. stimulea* are always white, while those of *E. delphinii* are always light green. Adults of *A. stimulea* are also generally considerably larger than *E. delphinii* adults.

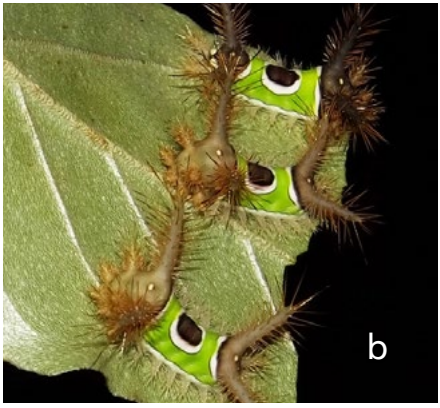
Description: Mid- to late instars of this peculiar caterpillar are characterized by a conspicuous lime green dorsal "saddle" (hence the species' common name, the "saddleback"), which is centered by a distinct black oval with a white peripheral ring (Fig. 75). Two pairs of noticeable scoli exist at either end of the body, the uppermost scoli being considerably longer and more conspicuous. A long chain of warts outlines the caterpillar, each of which is armed in dozens of venom-filled spines. These spines are undoubtedly an effective means of defense for the caterpillar, causing severe rash and irritation in even humans who are unfortunate enough to come in contact with these poison-filled barbs. To the first author, the sting is much like that of hand sanitizer on a wound but is longer lasting. As is typical of *Acharia* spp., *A. stimulea* will arch its long, spine-tipped scoli at any object that touches the bare spot on its back (Fig. 76).

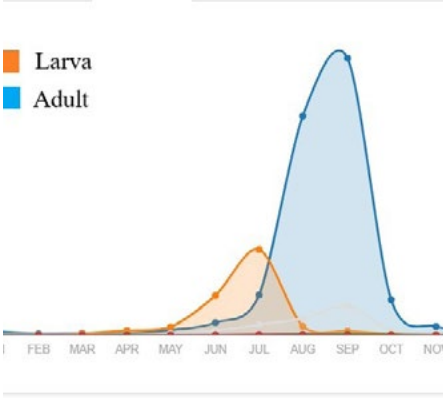
Adults of *A. stimulea* are likely the largest among eastern North American limacodids, the females capable of exceeding 2.0 cm in FW length from base to apex. Although female saddlebacks are reportedly the largest, the males may be equaled or exceeded in size by a few species (for example, *Prolimacodes* or *Parasa*). The FW is chocolate brown in both sexes, accompanied by several white spots in the apex and roughly the center of the wing (approximately the inner margin) (Fig. 77). Males have conspicuously bipectinate antennae near the base.

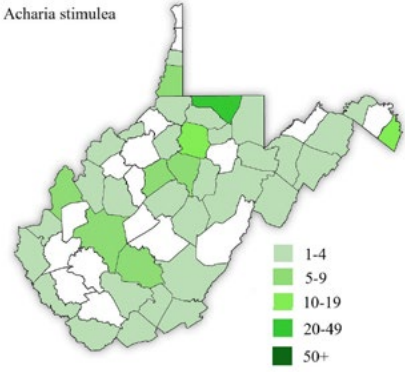
Common Caterpillar Food Plants: Apple, aster, basswood, blueberry, cabbage, cherry, citrus, corn, grape, grass, oak, and many others.

Phenology: The adults are found most commonly in June and July, frequently occurring at lights. The caterpillars are active from August through October (Fig. 78).

Range: A wide-ranging species, *Acharia stimulea* thrives throughout eastern North America south through Central America. In West Virginia, it is observed very commonly (Fig. 79).







Left to right: Fig. 75 (a, b). A*charia stimulea* larva, Tucker Cooley and Alex Bowen; Fig. 76. *A. stimulea* adult, Paul Shaw; Fig. 77. *A. stimulea* adult female, adult female, Lena Struwe; Fig. 78. *A. stimulea* life stage graph [iNaturalist.com]; Fig. 79. *A. stimulea* distribution map.

Genus *Adoneta*

Adoneta is an entirely North American genus with four species, two of which occur in West Virginia. The caterpillars of the West Virginia species, *Adoneta bicaudata* and *Adoneta spinuloides*, are especially noted for their bright body colors, which may consist of green, red, orange, yellow, purple, white, and pink on a single larva. The other *Adoneta* spp., *A. gemina* and *A. pygmaea*, are endemic to Texas and surrounding areas, yet, surprisingly, are not nearly as colorful as the other *Adoneta* spp., being green-blue as opposed to a rainbow of colors. Regardless of species, *Adoneta* caterpillars are characterized by short spines arising from small knobs (with the exception of the posterior knobs of *A. bicaudata*, which are 2–3 times longer than the regular knobs).

The adults are rather slender-bodied moths with a dark- to light-brown FW. All species have some form of a thin, white, curved stripe on the FW that is frequently outlined in black (or at least dark) coloration. The legs are moderately woolly and often held in odd positions when the moth is at rest. Although the body is rather slender, neither sex commonly raises the abdomen when at rest. In spite of this, males can be easily separated from females; males have pectinate antennae and are usually much smaller than females. The pectinate antennae of the male are considerably narrower than in other species (for instance, *Euclea delphinii* and *Acharia stimulea*) yet are still noticeably wider than the threadlike antennae of the female.

Adoneta bicaudata
Long-horned slug

Diagnosis: The gumdrop-like knobs and wide array of bodily coloration distinguish the West Virginia *Adoneta* caterpillars from all other species in the state. Though distinct from most other caterpillars, caterpillars of these two *Adoneta* spp. are commonly mistaken for each other due to two main characteristics: (1) *Adoneta bicaudata* has the purple D coloration arranged in several symmetrical diamonds that are very close to each other in shape, while *A. spinuloides* has rounded purple blobs on the dorsum that vary in size and shape; and (2) the posterior scoli of *A. bicaudata* are curved and 2–3 times longer than those of *A. spinuloides*, which are small and gumdrop-like. Additionally, *A. spinuloides* tends to be much more common than *A. bicaudata* (especially in the northern United States).

The adults are much easier to diagnose, as A. bicaudata tends to be substantially lighter brown on the FW than *A. spinuloides* and neither has any close look-alikes in West Virginia besides each other.

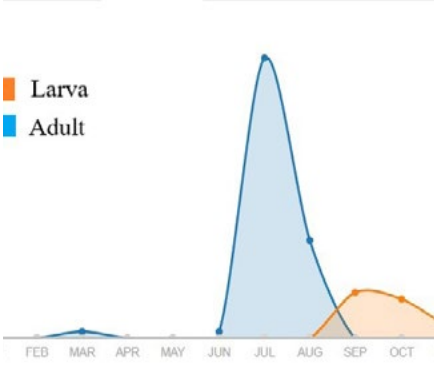
Description: *Adoneta bicaudata* caterpillars, although variable, are generally bluish green from the subdorsum downward with a yellow dorsum beset with conspicuous purple, red, or pink diamonds; additionally, many orange-red knobs are present in SD and lateral rows, each of which bears numerous stinging spines (Fig. 80). Curved and 2–3 times larger than the other knobs, the longest of the knobs are evident at the posterior. The purple D diamonds are commonly connected to one another by a small purple-pink band. The SD row of knobs are often brightly colored, especially at the anterior and posterior. On the other hand, the lateral knobs are pale green (like the caterpillar's sides) and inconspicuous. There are nine instars, the mature caterpillar reaching roughly 9–15 mm in length. The first-instar caterpillar is covered in SD and lateral rows of thick knobs of alternating sizes, each of which is tipped in two or three setae.

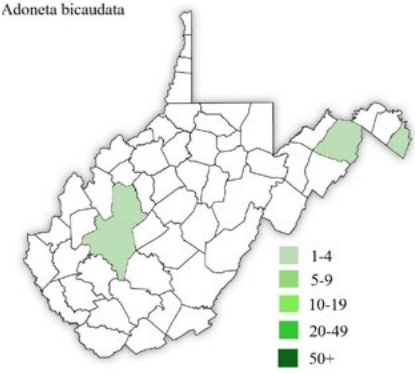
The slender adult has a light brown FW with a thin, S-shaped, white line in the median area (Fig. 81). This S-shaped line breaks in the center, re-forming on the opposite side of the wing. Additionally, three or four blackish dots can be found in the pm. area of the FW, and another larger (typically) and more conspicuous dot is present in the median area just below the S-shaped line. Although neither sex raises the abdomen, males can be separated from females in that males have narrow pectinate antennae and tend to be much smaller than females.

Common Caterpillar Food Plants: Eastern redbud, maple, and oak. Since this is a relatively uncommon species, it seems likely that it also uses other woody tree species for food.

Phenology: The adults are most common from June through August, peaking in July. The caterpillars are active from September through November (Fig. 82). Males are more common than females.

Range: *Adoneta bicaudata* exists rather uncommonly from Ohio east to New Jersey, south to Florida, and west to Alabama, being most common in the Southeast. Currently, only eight records for this species exist in West Virginia (Fig. 83), but it seems reasonable to expect more in the future.





Left to right: Fig. 80. *Adoneta bicaudata* larva, Giff Beaton; Fig. 81. *A. bicaudata* adult, Hans Holbrook; Fig. 82. *A. bicaudata* life stage graph [iNaturalist.com]; Fig. 83. *A. bicaudata* distribution map.

Adoneta spinuloides
Purple-crested slug

Diagnosis: As with the previous species, *Adoneta spinuloides* caterpillars are unique among West Virginia lepidopterans and not likely to be confused with other species outside of *Adoneta bicaudata*. The two species are commonly mistaken for each other because of their similar structure and coloration. Despite this similarity, each can usually be easily diagnosed in that *A. spinuloides* lacks the long, curved, posterior knobs of *A. bicaudata* and has globs of purple D coloration that vary in size, as opposed to the neat purple diamonds of *A. bicaudata*.

The adults are not likely to be confused with any other species in West Virginia (including *A. bicaudata)* due to their reddish-brown FW and characteristic white, S-shaped stripe that is surrounded by varying amounts of orange and black coloration.

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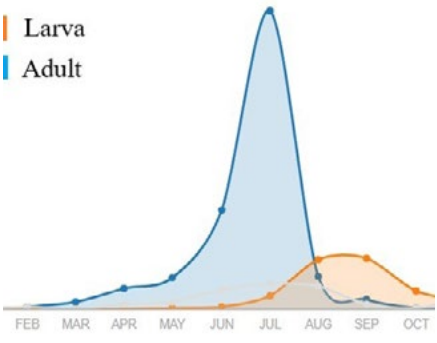
Description: As the common name implies, the purple-crested slug caterpillar has several purple globs on the dorsum, each of which is surrounded by bright yellow (or less commonly orange) coloration that extends to the subdorsum; the remainder of the caterpillar below this yellow or orange region is pale green to bluish green with (commonly) dark green striping (Fig. 84). These purple D globs are usually outlined in red or blackish and often become considerably lighter purple or pinkish toward the middorsum. Gumdrop-like knobs are present in SD and lateral rows; although the lateral knobs are concolorous with the green sides of the body (and hence inconspicuous), the SD knobs are frequently bright orange, especially on the ends of the caterpillar. Each knob is tipped in stinging spines, but the sting does not appear to be as painful as the stings of some other West Virginia slug caterpillars (*Acharia stimulea*, for instance). There are seven instars, the mature caterpillar reaching roughly 8–12 mm in length. Similar to other nettle species, the first-instar caterpillar is whitish and translucent with three setae arising from each tubercle.

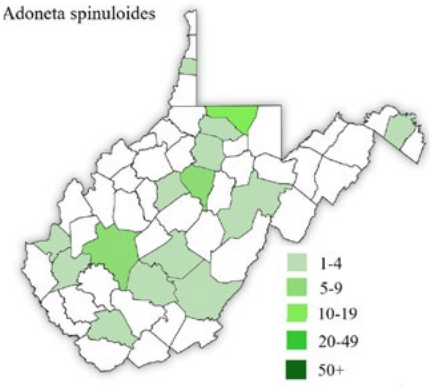
The slender adult has a reddish-brown FW with a thin, S-shaped stripe in the median area and varying amounts of blackish and orange markings throughout the wing (Fig. 85). In undamaged individuals, a patch of white scales borders the S-shaped stripe and basal area of the FW along the costal margin. The furry legs, although most commonly brownish like the rest of the body, may also have this whitish tint in some fresh individuals. As is typical of *Adoneta* spp., *A. spinuloides* often holds its legs in bizarre fashion when at rest. Males do not commonly raise the abdomen when at rest, but they do have narrowly pectinate antennae, making sex identifications possible in the field.

Common Caterpillar Food Plants: Basswood, beech, birch, blackgum, cherry, chestnut, locust, oak, and willow.

Phenology: The adults are present from April through August and into September, peaking in activity in July and occurring very commonly at lights. The caterpillars are active from June to October (Fig. 86). Males are much more common than females.

Range: *Adoneta spinuloides* thrives from Minnesota and Wisconsin east to New England, south to Florida, and west to the Great Plains and Texas, occurring throughout West Virginia (Fig. 87).





Left to right: Fig. 84. *Adoneta spinuloides* larva, John Rawlins; Fig. 85. *A. spinuloides* adult, Tucker Cooley; Fig. 86. *A. spinuloides* life stage graph [iNaturalist.com]; Fig. 87.. *A. spinuloides* distribution map.

Genus *Euclea*

Euclea is a large, primarily neotropical genus consisting of approximately 40 species world-wide. Only one species exists in West Virginia, *Euclea delphinii*. *Euclea* caterpillars vary considerably in coloration and form from species to species, but most are characterized by lateral scoli and anterior and posterior pairs of scoli, all of which are moderately long and fiercely armed in sharp, stinging spines. In some *Euclea* spp. (*E. distrahens*, for instance) the SD spines on the anterior and posterior scoli may be considerably larger and of a different color than spines on other scoli in the same caterpillar, as is typical for many nettle groups. The dorsum and sides are often marked in a wide array of colorful shapes and patterns.

Adults in some species, may be conspicuously marked in green coloration on the FW; however, unlike *Parasa* spp., there is no green on the thorax. Other *Euclea* spp. (for example, *E. obliqua* and *E. aethes*) are uni-form brown or orangish with various stripes and markings. All species seem to be very woolly on both legs and body. Neither sex commonly raises the abdomen when at rest, but males can be separated from females in that males have conspicuously pectinate antennae.

Euclea delphinii
Spiny oak slug

Diagnosis: In West Virginia, *Euclea delphinii* caterpillars, though exceedingly variable in coloration, can be readily differentiated from others by the presence of moderately long lateral scoli, three pairs of anterior SD scoli, and two pairs of posterior scoli. All scoli between these long SD scoli are short. *Parasa indetermina* may have similar coloration and scolus length but can always be differentiated in that *P. indetermina* has six pairs of long SD scoli throughout the subdorsal ridge, as opposed to *E. delphinii*'s three long pairs at the anterior and two long pairs at the posterior.

Due to the green coloration on the FW, *E. delphinii* adults are commonly confused with *Parasa* spp. In West Virginia, by far the most common form of *E. delphinii* consists of a large green basal spot with several smaller green subapical spots. Because this form does not have a large area of the FW covered in green, it should not be confused with any other species within the state. Confusion of *E. delphinii* with *Parasa* spp. usually occurs outside of West Virginia in regions (New England, for example) where most of the FW is covered in green. A simple remedy to this issue is to glance at the thorax: in eastern U.S. *Parasa* spp., the thorax is covered in green, while the thorax of *E. delphinii* is chocolate brown.

Description: By far the most common caterpillar form of *E. delphinii* (especially in West Virginia) is yellow-green overall with yellow SD scoli, yellow-green lateral scoli, a unique pattern of light and dark greens on the sides and middorsum, and three conspicuous pairs of red SD squares (Fig. 88). This morph may be the most abundant, but it must be noted that an all-green form, lichen form, orange form, and orange-and-green Florida form also exist, although much less commonly than the yellow morph. Regardless of form, all *E. delphinii* can be characterized by the three large pairs of anterior SD scoli at the anterior, two large pairs of scoli at the posterior, and tiny scoli in between, each of which is armed fiercely in stinging spines. There are eight instars, the mature caterpillar reaching roughly 14–20 mm in length. The first-instar caterpillar is whitish with thick SD tubercles that vary in size.

The chocolate brown adult has a brown FW with two orange patches, median black dot, and varying amounts of mint green coloration on the FW (Fig. 89). In West Virginia, the most common form has a rather large basal green spot and several smaller green subapical spots. In some other areas throughout this species' range, morphs with a mostly green FW may be common. Males do not commonly raise the abdomen when at rest but can be separated from

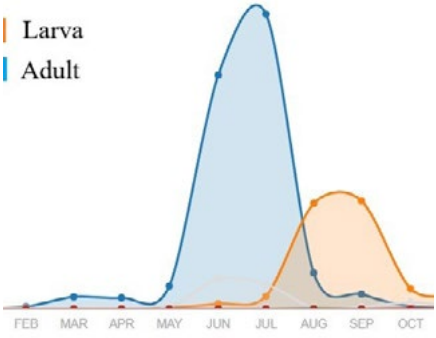
females in that males have wide, pectinate antennae.

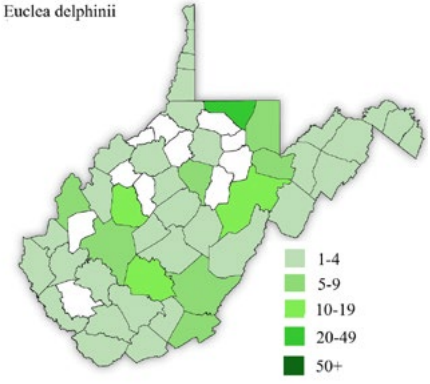
Common Caterpillar Food Plants: Apple, ash, basswood, beech, birch, blueberry, cherry, chestnut, hackberry, hickory, maple, oaks (most commonly), poplar, sycamore, and willow.

Phenology: The adults are present from April through September, commonly occurring at lights. The caterpillars are most abundant from June through October (Fig. 90). Male populations heavily outnumber female populations.

Range: *Euclea delphinii* exists from Minnesota east to Maine and New Brunswick, south to Florida, and west to eastern Texas, Oklahoma, and Missouri; it occurs quite commonly in West Virginia (Fig. 91).

Left to right: Fig. 88 (a, b). *Euclea delphinii* larva, Ashley Bosarge; (c) *E. delphinii,* Judy Gallagher, (d) *E. delphinii*, Nathan Peters.





Left to right: Fig. 89. (a, b) *E. delphinii* adult, Paul Shaw; (c) *E. delphinii* adult, Rob Ferber; (d) Greg Lasley. Fig. 90. *E. delphinii* life stage graph [iNaturalist.com]; Fig. 91. *E. delphinii* distribution map.

Genus *Monoleuca*

Only four species of New World genus *Monoleuca* exist world-wide, two of which occur north of Central America. *Monoleuca* caterpillars, although variable in coloration from species to species, are characterized by whitish stinging spines arising from short knobs throughout the body. With the exception of *Monoleuca occidentalis*, which is green overall with white stripes, *Monoleuca* spp. tend to be brightly colored in long purplish, scarlet (vermilion), or yellowish (or combination thereof) stripes.

The adults have a tan to chocolate brown FW. In *Monoleuca semifascia*, *Monoleuca erectifascia*, and *Monoleuca longifascia*, the only marking on the otherwise uniform brown FW is a whitish median or am. marking running from the inner margin to near the middle of the wing. The FW tends to have the outer margin considerably rounded yet still coming to a distinct point at the apex. All are very woolly throughout the body and legs, much like *Euclea* spp. Adult males have wide, pectinate antennae, as is typical for nettles. Neither sex tends to raise the abdomen when at rest.

Monoleuca semifascia
Pin-striped vermilion slug

Diagnosis: The bright vermilion and purplish stripes, unique arrangement of short knobs, and conspicuous white spines distinguish *Monoleuca semifascia* caterpillars from all others in the United States north of Florida. Indeed, this species more closely resembles some exotic nudibranch than a caterpillar.

The adult, too, is distinct: although its characteristic white, wavy stripe is the only marking on an otherwise uniform chocolate brown FW, this stripe is unlike that of any other lepidopteran in West Virginia.

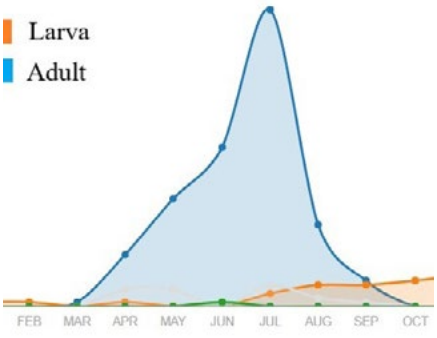
Description: The beautiful caterpillar may be either red (usually) or pinkish overall with nine wavy, purplish stripes (three on each side and three on the dorsum) and small knobs bearing whitish stinging spines (Fig. 92). Most of these knobs appear as nothing more than simple clusters of spines throughout much of the body, save for the four anterior-most and posterior-most knobs, which may be considerably larger than the others. There are eight instars, the mature caterpillar reaching roughly 13–17 mm in length. The yellowish first-instar caterpillar has two rows of yellowish tubercles on either side of the body, each of which is tipped in three setae.

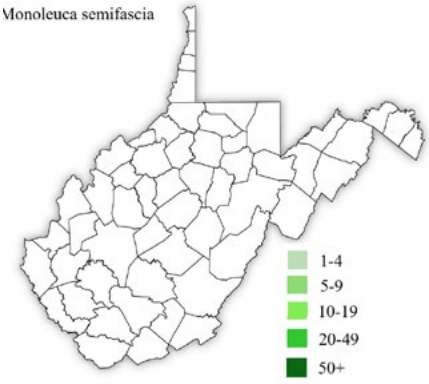
The adult is chocolate brown overall and unmarked except for a conspicuous, wavy stripe that exists from the inner margin to roughly the center of the FW (Fig. 93). The thorax, abdomen, and legs are very woolly. Males do not commonly raise the abdomen when at rest but can be separated from females in that males have wide, pectinate antennae.

Common Caterpillar Food Plants: American persimmon, cherry, oak, and pecan.

Phenology: The adults are most frequently observed from April through September, commonly occurring at lights. The caterpillars are active from July through December (Fig. 94). Males, which have particularly wide pectinate antennae, are much more common than females.

Range: *Monoleuca semifascia* exists from Long Island along the East Coast and south to Florida, west to central Texas, and north to Missouri. Although records are currently not present for West Virginia, it seems likely that this species will be present in the state if it is not already, as its presence in surrounding states has been recorded (Fig. 95).





Left to right: Fig. 92. *Monoleuca semifascia* larva, Giff Beaton; Fig. 93. *M. semifascia* adult, Stuart J. Marcus; Fig. 94. *M. semifascia* life stage graph [iNaturalist.com]; Fig. 95. *M. semifascia* distribution map.

Resources for Additional Information

iNaturalist.com—https://www.inaturalist.org

Bugguide.net—https://bugguide.net

North American Moth Photographers Group—Moth Photographers Group — Main Menu (msstate.edu); https://mothphotographersgroup.msstate.edu

The Lepidopterists' Society—Home | The Lepidopterists' Society (lepsoc.org); https://www.lepsoc.org

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Glossary of Terms

A

abdomen—the hindmost or posterior-most group of segments of the insect body
adult—the imaginal stage of development
antemedial (am.) area—region of the forewing just inside of the median area (compare to postmedial area)
antemedial (am.) line—a line within the antemedial area
antenna (plural form: antennae) —paired, segmented, flexible, sensory appendages located on the head
anterior—the front or upper portion of an object; or referring to that portion of an object
apex—the outer angle or tip of a lepidopteran wing
apical seta—seta located at the tip of a scolus or other bodily structure
aposematic (noun form: aposematism)—possessing warning coloration

B

basal region—area closest to the base of a wing
bipectinate—describing structures with comb-like teeth or other projections on each side; feathery
brood—a cohort of individuals that eclose at one time from eggs laid by a female and which normally mature concurrently

C

caltrop spines—the branched and otherwise specialized irritating spines
caterpillar (larva)—the larval stage of a lepidopteran with a completely segmented abdomen
cocoon—a covering of silk or other material that surrounds the pupa
chitin—a fibrous substance consisting of polysaccharides and forming the major constituent in the exoskeleton of arthropods and the cell walls of fungi
chitinous—composed of chitin or like chitin in texture
concolorous—of the same color as a specified article; used especially to describe one part of an insect by comparison with another
costa—the thickened anterior of a wing, particularly the forewing
costal margin—the side of the wing nearest the head that borders the costa
crochets—tiny structures on the abdominal legs of many lepidopterans that aid in gripping; not present in limacodids
crypsis—state of being hidden within the environment
cuticle (adjectival form: cuticular)—the outer covering of an insect

D

deciduous—structure that is shed or falls off at maturity or at specific periods of development
dimorphic—referring to a structure that occurs in two distinct forms
diurnal—referring to an activity that occurs during daylight only
dorsum—the anatomical upper surface of any structure or body

E

eclosion (verb form: eclose)—the process of an insect emerging as an adult from the pupa or a larva from the egg
evert—to turn (a structure or organ) outward or inside out
exuviae—the portion of the integument of a larva, nymph, or naiad that is shed from the body during the process of molting

F

forewing (FW)—the anterior wing of an insect which is attached to the mesothorax
frass—solid larval insect excrement
frons—upper (anterior) portion of the head capsule

G

gelatine—referring to a limacodid caterpillar characterized by a lack of stinging spines and frequently smooth in overall texture
generation—a cohort of individuals comprising a population with common ancestors and which demonstrates collective dynamic properties
genitalia—sexual organs of males and females
glabrous—smooth
granulated—shagreened
gregarious—living in a group
gravid—pertaining to females with eggs in the reproductive system

H

hindwing (HW)—the posterior wing of an insect, attached to the mesothorax

I

imaginal—descriptive of conditions pertaining to the adult
inner margin—the side of the forewing nearest the hindwing
instar—stages of a caterpillar's life from molt to molt
integument—a tough outer protective layer, especially that of an animal or plant

J

K

L

larva (plural form: larvae)—the stage of development following the egg stage, preceding the pupal stage and differing fundamentally from the adult
lepidopteran—a butterfly or moth

M

medial line—a line within the median area
median area—central area of the forewing
melanic form—an abnormally dark morph of a particular species
mesophyll feeder—an insect that feeds on the mesophyll (food-producing cells) of a leaf; such insects feed only on the surface of the leaf
mesophytic—describing a plant needing only a moderate amount of water
mesothorax (T2) (adjectival form: mesothoracic)—the second or middle thoracic segment which bears the middle legs and anterior wings
metathorax (T3) (adjectival form: metathoracic)—the third or posterior-most thoracic segment which bears the hind legs and posterior pair of wings
mimic—to assume or resemble another organism
moult—to engage in the act by which insects cast off elements of the integument during postembryonic growth

N

nettle—a limacodid caterpillar characterized by the presence of stinging spines on the body
nudibranch—a shell-less marine mollusk of the order Nudibranchia; a sea slug

O

operculum—the lid-like portion of an insect egg shell
outer margin—the side of the wing opposite from the wing base

P

pectinate—feathery, but only on one side; comb-like
phenology—the study of periodic events in the life cycle of a particular organism (for example, time of activity) and how natural factors such as climate affect them
pocked—having noticeable pits or indentations on the surface
polyphagous—referring to an herbivorous insect that feeds on many species of food plants

postembryonic—pertaining to any stage after the insect has emerged from the egg
posterior—the rear or lower portion of an object; or referring to that portion of an object
postmedial (pm.) area—region of the forewing just outside of the median area (compare to antemedial area)
postmedial (pm.) line—a line within the postmedial area
proleg—one of the non-segmented abdominal legs of caterpillars
prothorax (T1) (adjectival form: prothoracic)—the first thoracic segment, or portion of the thorax nearest the head
pupa—the stage between larva and adult

Q

R

S

sclerite—the hard body wall of an insect
sclerotized—especially hard and thick, in reference to the sclerites
scolus (plural form: scoli)—smooth or rough elevated cuticular protuberances which bear setae or spines
seta (plural form: setae)—a hollow, hair-like cuticular projection produced by epidermal cells of the integument; hair
sexual dimorphism—distinct difference in size or appearance between the sexes of an animal
shagreened— referring to a surface made rough by minute tooth-like projections
spike—an elongated, hard projection from the integument or egg
spine—a stiff, sharp, pointed tapered projection on the surface of a plant or animal
spiracle—a pore, hole, or aperture in the integument which serves as an adaptation to permit gas exchange between the body and the environment
sp. (plural form: spp.)—a single species
subterminal (st.) area—outermost area of the forewing
subterminal (st.) line—a line within the subterminal area
suture—a seam or seam-like line of contact between two sclerites

T

taxa (singular form: taxon)—taxonomic groups of any rank, such as a species, family, or class
tegmen—a covering
tentiform—tent-like

thorax—the second or middle segment of the insect body
tornus—hind angle of the forewing
trapezoidal—describing a four-sided shape with two sides parallel and two that are not parallel
tubercle—a small rounded protuberance; a wart-like cuticular body structure

U

USDA Plant Hardiness Zones—13 zones that the U.S. Department of Agriculture delineates by long-term average annual extreme minimum temperatures
urticating—causing a stinging or burning sensation of the skin

V

vein—any chitinous rod-like or hollow tube-like structure supporting and stiffening the insect wings
venomous—poisonous
venter—the underside of a caterpillar

W

wart—the enlarged, common base of a group of setae

X

Y

Z