# New Records of Leafmining in Tortricidae (Lepidoptera)

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# NEW RECORDS OF LEAFMINING IN TORTRICIDAE (LEPIDOPTERA)

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*Abstract*.—Leafmining in early instars is newly reported for three species of tortricid moths in the eastern USA. *Argyrotaenia amatana* (Dyar) was reared from leaf-tying larvae found in association with recently vacated mines on *Chiococca alba* (L.) Hitchc. (Rubiaceae) in Florida. *Aterpia approximana* (Heinrich) was reared from a larva mining in *Samolus parviflorus* Raf. (Primulaceae) in North Carolina, a new host and distribution record, and larvae were found in New England in similar mines on *Lysimachia ciliata* L., a known host for this moth. *Olethreutes osmundana* (Fernald) was reared from larvae mining in *Osmunda spectabilis* Willd. (Osmundaceae) in North Carolina. For each species we summarize previous host, distribution, and phenological records. We also briefly describe the larvae and provide the first published photographs of them.

*Key Words:* rearing, seaside brookweed, fringed loosestrife, royal fern, West Indian milkberry

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Larvae of tortricid moths exhibit a wide variety of feeding modes on their host plants, including externally (but concealed) within leaf shelters and internally within stems, roots, and fruits. There are some species that feed as leafminers, either in early instars or throughout their development, in both Olethreutinae (Eucosmini, Grapholitini, Olethreutini) and Tortricinae (Archipini, Cnephasiini, Cochylini, Sparganothini) (Eiseman et al. 2020, Eiseman 2022). Here we add three eastern North American species to the list of tortricids that are known to feed initially as leafminers, and review previously published data on their hosts and habits. We believe these represent the first records of leafmining in *Aterpia* Guenée and *Olethreutes* Hübner (Olethreutini), as well as the first record of angiosperm leafmining in *Argyrotaenia* Stephens (Archipini).

## MATERIALS AND METHODS

Leaves with tortricid larvae were collected in airtight vials or jars, with pieces of toilet paper or paper towel added to absorb excess moisture. These containers were checked daily, and as needed, fresh leaves were added, and paper was replaced. Emerging adult moths were refrigerated overnight, photographed, and then placed in a killing jar with ammonium carbonate.

The specimens were then pinned, spread, and double-mounted. Identifications were made by comparing wing patterns of the reared adults (https://bugguide.net/, https://mothphotographersgroup.msstate.edu/, Gilligan et al. 2008) with those of tortricids known to be associated with their respective host plants (Brown et al. 2008). The *Aterpia* and *Argyrotaenia* identifications were confirmed by dissecting males and comparing their genitalia with illustrations in Obraztsov (1961), Gilligan et al. (2008), and Austin et al. (2019). All moth specimens are in CSE's personal collection. Parasitoids were preserved in 95% ethanol and are deposited in the Canadian National Collection of Insects, Arachnids & Nematodes, Ottawa. Plant taxonomy follows POWO (2024).

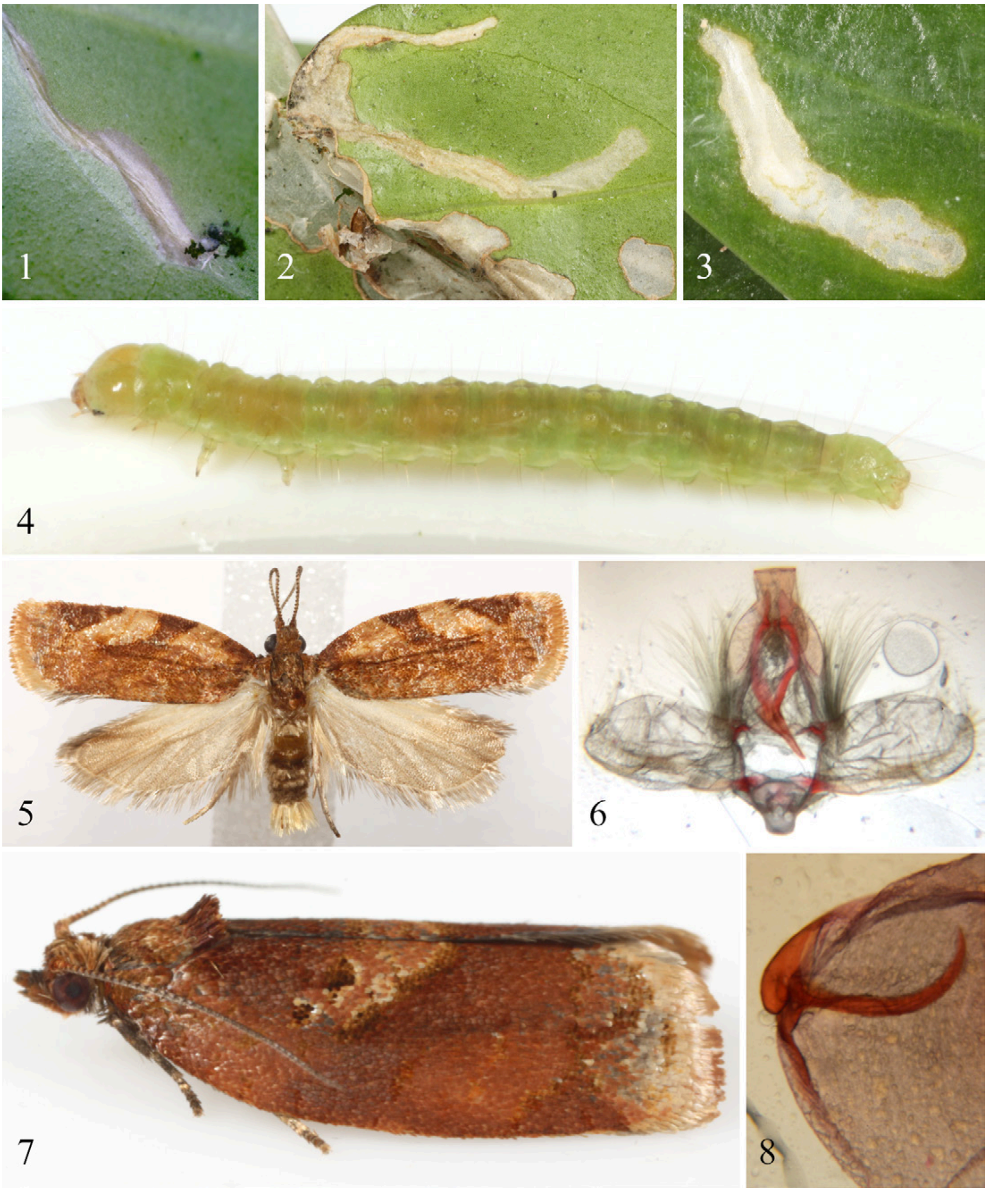
## Results and Discussion

### *Argyrotaenia amatana* (Dyar) (Figs. 1–8)

Reared adults.—FLORIDA: Lee Co., Sanibel Island, J.N. Ding Darling National Wildlife Refuge, 27.xii.2021, em. 3.ii.2022, T.S. Feldman, ex *Chiococca alba*, #CSE7227 (1♀); same but em. 5.ii.2022, #CSE7229 (1♀); same but em. 7.ii.2022, #CSE7236 (1♂), #CSE7237 (1♀); same but em. 4.iii.2022, #CSE7285 (1♀).

Hosts.—Annonaceae: *Annona glabra* L. (Dyar 1901a, as *Anona laurifolia*), *A. macrophyllata* Donn.Sm. (Heppner 2007, as *A. diversifolia*), *A. squamosa* L. (Heppner 2007); Combretaceae: *Laguncularia racemosa* (L.) C.F.Gaertn. (Barrows 1991); Cupressaceae: *Taxodium distichum* (L.) Rich. (Barrows 1991); Fabaceae: *Lysiloma latisiliquum* (L.) Benth. (Barrows 1991, as *L. bahamensis* Bentham); Lauraceae: *Damburneya coriacea* (Sw.) Trofimov & Rohwer (Dyar 1901a, as *Nectandra wildenoviana*), *Persea americana* Mill. (Freeman 1944, as "avocado"), *P. borbonia* (L.) Spreng. (Barrows 1991); Meliaceae: *Swietenia mahagoni* (L.) Jacq. (Austin et al. 2019); Myrtaceae: *Eugenia* P.Micheli ex L. (Kimball 1965); Oleaceae: *Ligustrum japonicum* Thunb. (Austin et al. 2019); Podocarpaceae: *Podocarpus* L'Hér. Ex Pers. (Austin et al. 2019); Rubiaceae: *Chiococca alba* (L.) Hitchc. (Dyar 1901b, Kearfott 1907, as *C. racemosa*; this study), *Gardenia jasminoides* J.Ellis (Heppner 2007), *Erithalis fruticosa* L. (Austin et al. 2019); Rutaceae: *Calodendrum capense* (L.f.) Thunb. (Austin et al. 2019), *Citrus* sp. (Austin et al. 2019, as *Citrofortunella* sp.), *C.* × *aurantium* L. (Bullock et al. 1997, as *C. sinensis* Osbeck and "oranges and grapefruit"), *C. hystrix* DC. (Austin et al. 2019); Salicaceae: *Salix caroliniana* Michx. (Barrows 1991); Sapindaceae: *Acer rubrum* L. (Barrows 1991); Sapotaceae: *Pouteria sapota* (Jacq.) H.E.Moore & Stearn (Austin et al. 2019); Viburnaceae: *Viburnum odoratissimum* Ker Gawl. (Heppner 2007). Barrows (1991) also reported rarely finding larvae on, but not successfully rearing adults from, *Sagittaria lancifolia* ssp. *media* (Micheli) Bogin (as *S. falcata*) (Alismataceae) and *Fleischmannia incarnata* (Walter) R.M.King & H.Rob. (as *Eupatorium incarnatum* (Asteraceae). Austin et al. (2019) cited Heppner (2007 [2003 version]) as listing *Solidago* sp. (Asteraceae) and *Rosa* sp. (Rosaceae) as hosts for *Argyrotaenia amatana*, but in Heppner (2007) these hosts are actually listed in an adjacent column under *A. ivana* (Fernald).

Biology.—Dyar (1901a) observed this species on *Annona* and *Damburneya*, and stated, "The larva spins up the leaves with a series of transverse walls of web with a round hole in each near the leaf for the larva to pass through." Under the heading "*Cacœcia georgiana* Walk." (a misidentification; Kearfott (1907) described the reared adults as *Tortrix chioccana*, now considered a synonym of *A. amatana*), Dyar (1901b) reported that "The larvae




Figs. 1–8. *Argyrotaenia amatana* on West Indian milkberry (*Chiococca alba*). 1, Empty leaf mine found in association with leaf-tying larvae (note frass expelled from mine at lower right). 2, Same, with associated window-feeding patches from leaf-tying larvae. 3, Another vacated mine. 4, Leaf-tying larva. 5, Reared adult male. 6, Male genitalia. 7, Reared adult female. 8, Detail of female genitalia (signum).

were found webbing together the leaves of [*Chiococca alba*], the abode webby, not fastened with stitches." We have seen no further descriptions of the larval habits except for those of Bullock et al. (1997), who reported *A. amatana* and *A. kimballi* Obraztsov feeding on both citrus leaves and fruit. They made no distinction between the larval habits of the two species, and reported that both can complete their life cycles on the surface of the fruit. Larvae feed under the calyx or on the button of the fruit, circling the stem end and causing scarring in the mature fruit. Larvae of both species frequently tie together three or four young terminal leaves with tubular webbing and feed on the fresh leaves of surrounding branches as well as the wilting leaves that have been tied together; they also often cut halfway through small twigs and stems of tender growth (Bullock et al. 1997).

Phenological data are generally lacking for the above observations, except that Dyar's (1901b) larval collections were made in January or February, and Bullock et al. (1997) mentioned collecting larvae in "early spring." Barrows (1991) found larvae in May and June, Freeman (1944) examined a reared adult that emerged on 8 June, and Kimball (1965) listed a reared specimen that emerged in July. Barrows (1991) stated that based on literature and specimen data, *A. amatana* flies in every month of the year, although he was unable to find this species in Collier County in July or November. Bullock et al. (1997) trapped males of *A. amatana* and *A. kimballi* in every month of the year but did not report data for the two species separately. According to Heppner (2007, 2013), March through November is the flight period for *A. amatana* in Florida.

We presume that early instars of *A. amatana* are responsible for elongate, irregular, full-depth leaf mines, containing little or no frass (expelled at one end), which we found associated with later leaf-tying instars (Figs. 1–3). Several larvae were collected in late December; one larva was observed pupating in mid-January; and adults emerged from early February to early March.

Larva.—The larvae we observed (Fig. 4) were uniformly pale green, consistent with the brief descriptions given by Dyar (1901a, 1901b).

Distribution.—Florida (mostly southern, with records north to St. Johns County); the Bahamas (Austin et al. 2019).

Notes.—This polyphagous species is the only tortricid known to feed on *Chiococca alba* (Brown et al. 2008). To our knowledge, leafmining by *Argyrotaenia* spp. has not been reported previously on any broad-leaved plant, but at least three Pinaceae specialists feed initially as needleminers (Eiseman 2022). Although our successfully reared larvae of *A. amatana* were not feeding as miners when collected, the empty associated mines were similar to those from which we have reared other tortricines (Eiseman et al. 2020), and in a previous year we found mines on *C. alba* occupied by similar green larvae but failed to rear adults. We are unaware of similar mines being found on any of the other reported larval hosts of *A. amatana*. It is possible that this species has a narrower host range in early instars and that many of the host records involve older larvae that wandered from their original hosts, but if *A. amatana* can truly complete its entire life cycle on the surface of a citrus fruit as stated by Bullock et al. (1997), then leafmining by early instars is clearly a facultative behavior.

An alternative is that the species mining leaves of *Chiococca alba* is distinct from *A. amatana*, and we considered this possibility upon noting that our reared specimens do not perfectly match the information and figures in Austin et al. (2019). In the male genitalia (Fig. 6), the uncus is nearly uniform in width, not distinctly spatulate with an apical bulb approximately 1.25× wider than the neck, and the vinculum has a pronounced, squarish saccus unlike anything we have seen illustrated for this or any other *Argyrotaenia* species. However, the uncus shape is not dramatically different than that of the Dyar specimen illustrated by Obraztsov (1961), and J. Dombroskie (in litt.) suspects that the genitalia of our male fall within the substantial variation (especially in valve shape and saccus) that occurs in this species, although the saccus is larger than any he has seen. In the female genitalia, the signum (Fig. 8) is more evenly curved than in illustrations of *A. amatana* (Obraztsov 1961, Austin et al. 2019). Also, none of the specimens have orange hindwings. Regarding forewing pattern, J. Dombroskie (in litt.) notes that "the male [Fig. 5] is consistent with some of the morphs more common in the Caribbean, and the female [Fig. 7] is a good match." Future molecular comparisons between our specimens and more typical material of *A. amatana* would be of interest.

*Aterpia approximana* (Heinrich)
(Figs. 9–17)

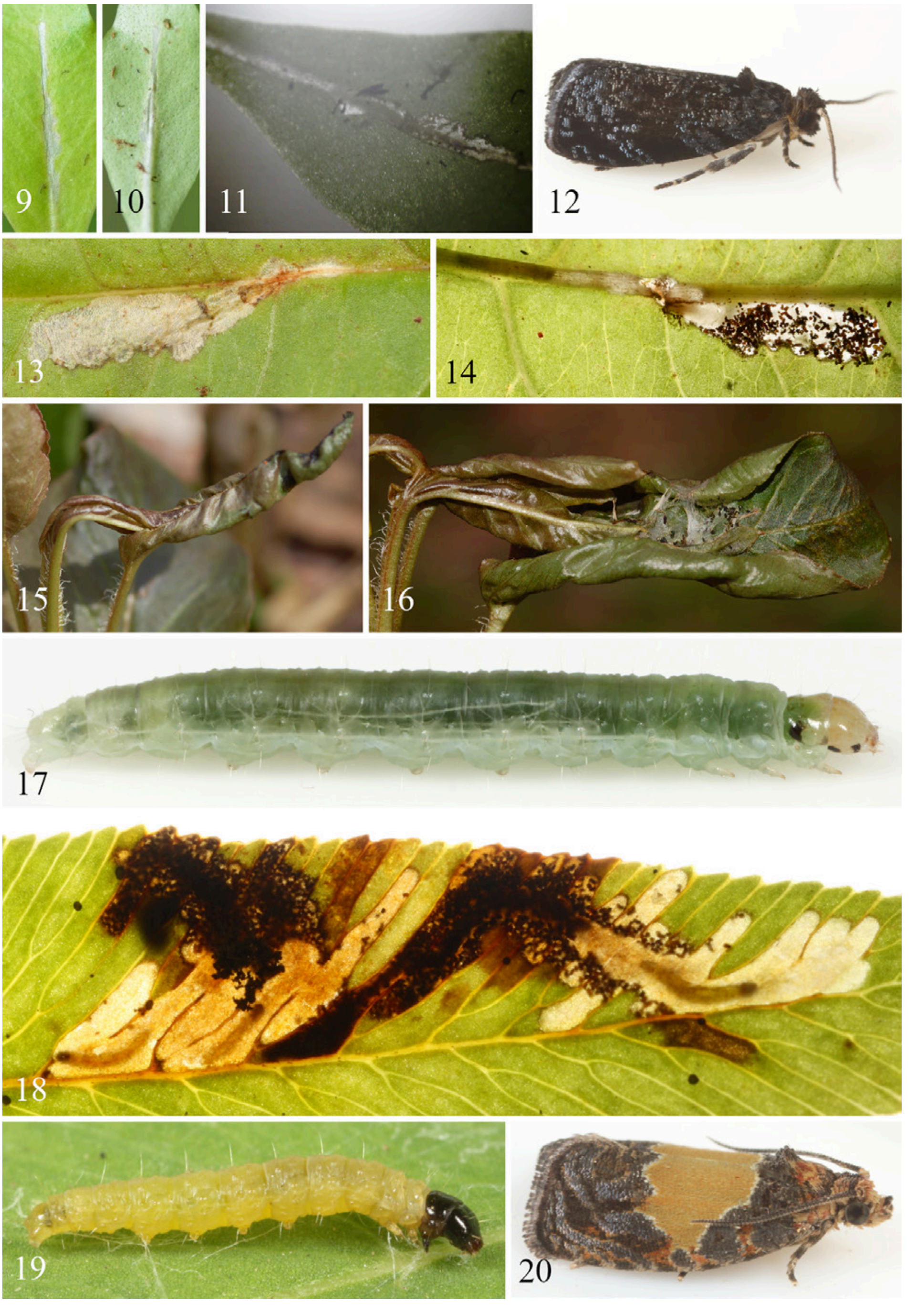
Reared adults.—MASSACHUSETTS: Franklin Co., Northfield, 42.646860, -72.425335, 12.v.2020, em. ~30.v.2020, C.S. Eiseman, ex *Lysimachia ciliata* (several adults, released after photographing (Eiseman 2020)); NORTH CAROLINA: Beaufort Co., Hills Creek, near Chocowinity, 23.vi.2022, em. 16.vii.2022, T.S. Feldman, ex *Samolus parviflorus*, #CSE7620 (1♂).

Hosts.—The type series was reared from "loosestrife" in New York (Heinrich 1919). Heinrich (1926) interpreted "loosestrife" to mean *Lythrum* L. (Lythraceae), but this common name also applies to species of *Lysimachia* Tourn. ex L. (Primulaceae). MacKay (1959) examined a larva collected from *Lysimachia ciliata* L. in Ontario and referred to associated adult specimens, apparently the same ones noted by Ferguson (1975) as having been reared from "*Lysimachia* sp." Adults have also been reared from *Lysimachia* sp. in Illinois (Godfrey et al. 1987). We have reared this species from *L. ciliata* and *Samolus parviflorus* Raf. (Primulaceae).

Biology.—Heinrich (1919) noted that the type series was reared from "larvae rolling the terminal leaves" of loosestrife, and no further details have been published since then. Reported emergence dates for reared adults are 6–9 June in Illinois (Godfrey et al. 1987) and 17 June in Ontario (Ferguson 1975), the latter evidently from larvae collected on 1 June (MacKay 1959). The flight period of "June to early September" reported by Gilligan et al. (2008) suggests this species may be bivoltine. The earliest adult collection record we have seen is 19 May in Illinois (Godfrey et al. 1987).

On *Lysimachia ciliata*, we found larvae in shelters consisting of two or more young leaves tied together, generally involving more irregular crumpling than rolling (Figs. 15–16). Since these larvae were well developed on 12 May in Massachusetts, we surmise that this species overwinters as larvae, given the prior phenology data summarized above. Adults began emerging from this collection at the end of May.

When collected in late June, the North Carolina larva had consumed all green tissue within a portion of the midrib of a *Samolus* leaf, and this full-depth mine extended irregularly a few mm into the adjacent leaf blade (Figs. 9–11). Fecal pellets were deposited within the mine, concentrated in the widest portion. Within the next three days, the larva mined out the entire leaf, then exited and fed externally, spinning some silk. We did not record whether this feeding took place between tied leaves, but a leaf photographed when




Figs. 9–20. Olethreutini with leaf-mining early instars. 9, Leaf midrib mine of *Aterpia approximana* on seaside brookweed (*Samolus parviflorus*), viewed from above. 10, Same, viewed from below. 11, Same, backlit to show larva and frass inside. 12, Adult *A. approximana* reared from seaside brookweed. 13, Midrib mine and adjacent "pseudomine" of *A. approximana* on fringed loosestrife (*Lysimachia ciliata*), viewed from above. 14, Same, viewed from below and backlit; note larva in midrib at upper left. 15, New fringed loosestrife leaves tied by overwintered *A. approximana* larvae. 16, Same. 17, Larva of *A. approximana* from tied fringed loosestrife leaves. 18, Confluent leaf mines of three *Olethreutes osmundana* larvae in a leaflet of royal fern (*Osmunda spectabilis*). 19, Larva of *O. osmundana* (leaf-tying stage). 20, Adult *O. osmundana*.

the adult emerged in mid-July has a patch of window-feeding (all tissue except one epidermis consumed) extending from the midrib to the leaf margin. The larva pupated in the folded-over apex of this leaf, and the pupa exited this fold immediately before the adult (Fig. 12) emerged.

Having observed the habits of early instars, we are now convinced that the following observations also apply to this species. On 22 September 2015 in Berkshire County, Massachusetts, CSE found larvae that each had hollowed out a portion of a *Lysimachia ciliata* midrib and had also fed adjacent to the midrib in what appeared to be a blotch mine but was actually a "pseudomine" formed by spinning a sheet of silk on the lower leaf surface and consuming all leaf tissue beneath this except for the upper epidermis (Figs. 13–14). Copious frass was incorporated into the silk as well as deposited in the midrib, which the larva continued to use as a retreat when not feeding. The larvae were collected and continued to feed for another month or so, eventually transitioning to feeding between leaves that they tied together with silk. By 1 November, at least one of them had spun a silken chamber in which to overwinter. We have no record of whether they were still alive the following spring. CSE found similar midrib mines on *L. ciliata* on 15 September 2019 in Rutland County, Vermont, but failed to rear these larvae as well.

Larva.—MacKay (1959) described in detail a larva that was thought to be a final instar of this species. She stated, "living larva bright blue-green, with a pale-green head which has no pattern or markings other than the black ocellar areas." The larva on *Samolus* was pale yellowish, and apparently unmarked, at the time of collection and when photographed up to eight days later. We took clearer photographs of larvae from the successful *Lysimachia* rearing, probably final instars, on 22 and 27 May 2020 (Fig. 17). In both cases the head was whitish with orange dorsal and lateral mottling, black eyespots, and an elongate black spot at the posterior margin behind each eyespot. The body was translucent dark green dorsally in the anterior half, gradually becoming paler posteriorly, and greenish- or bluish-white below the spiracles, with a conspicuous, irregular, roundish black spot above the spiracle on the prothorax. Two early-instar individuals were photographed on 22 October 2015 in connection with a failed rearing from the same host. One was uniformly yellow-orange except for the black eyespot and elongate black spot at the posterior margin of the head; the other had an orange head but the body was yellow with pale brown spots, the posterior half of the prothoracic shield dark brown, and a dark brown dorsal spot at the anterior margin of the last abdominal segment. The larva that was photographed in a silken hibernaculum on 1 November matched the latter description.

Distribution.—Alberta to Nova Scotia (Pohl et al. 2018), south in the eastern USA to Kentucky and New Jersey (Gilligan et al. 2008). Our specimen from North Carolina represents the southeasternmost record of this species.

Notes.—Our first collection of larvae on *Lysimachia ciliata* produced a male microgastrine braconid (*Apanteles* sp. or *Dolichogenidea* sp.; CSE2146) on 26 October 2015.

Eiseman and Davis (2020) suggested that the species responsible for the midrib mines and "pseudomines" on *Lysimachia* may be what Chambers (1875) described (from Kentucky) as *Lithocolletis lysimachiaeella* Chambers (Gracillariidae), which was listed as a *nomen dubium* by Eiseman and Davis (2023). The entire description of *Lithocolletis lysimachiaeella* reads as follows: "The larva is cylindrical and very small. It makes a very small tentiform mine on the under side of the leaves of (*Lysimachia lanceolata*) the loosestrife. The imago is, no doubt, very small—probably not larger than *L. desmodiella*, Clem., which is the smallest known species of this genus; but I have not succeeded in rearing it" (Chambers 1875). There are no further records of any insect mining leaves of *Lysimachia lanceolata* Walter, and the only other known *Lysimachia* leafminer in North America is *Nola cilicoides* (Grote) (Nolidae) (Eiseman 2022). Larvae of *N. cilicoides* form full-depth blotch mines on *L. ciliata*, which they exit before winter, continuing to feed as stem borers in spring (Wagner and Connolly 2009). *Lithocolletis lysimachiaeella* could conceivably be a junior synonym of *N. cilicoides* or a senior synonym of *A. approximana*, but it will remain a *nomen dubium* until adults can be reared from something resembling an underside tentiform mine on *L. lanceolata*.

Similar midrib mines with adjacent "pseudomines" have been reported for *Paralobesia liriodendrana* (Kearfott) on *Liriodendron tulipifera* L. (Magnoliaceae) (Kearfott 1904). Peterson (1960) reported "*Lobesia liriodendrana*" constructing something similar on *Magnolia grandiflora* L., but the species he studied was evidently *P. parsaura* Royals and Gilligan, since one of the paratypes of that species is a specimen of his with data matching what he reported in his paper (Royals et al. 2019). TSF has found unidentified larvae with a similar feeding mode on *Silphium asteriscus* L. (Asteraceae) in Durham County, North Carolina in early June, and CSE found one on *Cornus amomum* Mill. in Rutland County, Vermont in mid-September, as well as a vacated mine on *Arnica* L. (Asteraceae) in Plumas Co., California in mid-July. Possibly these will prove to represent other olethreutines.

*Olethreutes osmundana* (Fernald)
(Figs. 18–20)

Reared adults.—NORTH CAROLINA: Camden Co., Gamelands, Public Creek, 12.vii.2022, em. 4.ix.2022, T.S. Feldman, ex *Osmunda spectabilis*, #CSE7824 (1♂); same data, but em. 14–15.ix.2022, #CSE7842 (1♀).

Hosts.—The type series was reared from *Osmunda spectabilis* Willd. (Osmundaceae) (as *O. regalis*) (Fernald 1879). Heinrich (1926) examined specimens reared from *Osmundastrum cinnamomeum* (L.) C.Presl (as *Osmunda cinnamomea*) and *Pteridium aquilinum* (L.) Kuhn (Dennstaedtiaceae). One of our adults (CSE7824) was partially reared on *Osmunda claytoniana* L. when our supply of *O. spectabilis* temporarily ran out. Kearfott (1910) reported the larva of this species "in seeds of *Ambrosia trifida*" L. (Asteraceae); as noted by Gilligan et al. (2008), this is a questionable record given that *Olethreutes osmundana* has otherwise been found only on ferns.

Biology.—Fernald (1879) reported the larva "drawing the leaves together with its silken threads," and no further details have been reported since then, apart from the questionable record involving *Ambrosia* seeds. Reared adults have emerged on 28 May in Massachusetts (Heinrich 1926), on 1 July in Maine (Fernald 1879), and on 7 July in New Jersey (Heinrich 1926). Given the flight period of June through August reported by Gilligan et al. (2008), it appears that larvae overwinter.

An occupied leaf mine on *Osmunda spectabilis* was collected in Camden County, North Carolina on 12 July 2022, and by 20 July there were two additional larvae feeding in separate mines in the same leaflet. The mines were small and more or less elongate, bounded by the leaf venation, and at least the two newer ones had silk spun outside them, on the lower leaf surface. One of the larvae had deposited all of its frass outside the mine's entrance on the lower leaf surface, another had done so on the upper surface, and the original mine, which was much larger than the others, was almost filled with frass and had none on the surface. By 27 July, the mines had become confluent, and all three larvae were depositing their frass inside (Fig. 18). The shape of the mines was still largely influenced by the leaf venation, but the original larva had formed a frass-lined channel cutting across the veins, with digitate extensions to either side that were bounded by the veins. By 7 August, the larvae had begun to spin extensive webbing between the leaf and the wall of the rearing vial (presumably in nature they would have been tying leaves together) and window-feed beneath it. As frass accumulated, each larva incorporated it into the sides of a silken tunnel that formed a retreat from which it made feeding forays. They were still feeding at least as late as 19 August; pupae were noted on 30 August—one in a tight leaf fold and one in dense silk between a leaf and the wall of the vial—and the adults (Fig. 20) emerged in early and mid-September, leaving their pupal exuviae protruding from their pupation sites.

Larva.—Uniformly yellowish except for the black head and the first thoracic segment, which is dark brown with black legs and a black dorsal shield (Fig. 19).

Distribution.—Quebec to Nova Scotia (Pohl et al. 2018); Maine to Indiana, south to Florida and Louisiana (Gilligan et al. 2008).

Notes.—Our collection of three leafmining larvae of *Olethreutes osmundana* produced, in addition to the two adult moths, a female *Apanteles* sp. (Braconidae) (CSE7735). The host larva had transitioned to leaftying before succumbing to the parasitoid.

Given the record from Heinrich (1926), mines of this species may also occur on *Pteridium*, and TSF has repeatedly found mines on this host in North Carolina, but when occupied they have proven to contain entirely different moth larvae. These are pale yellowish with each abdominal segment having a broad band of fine brown dorsal mottling and a dark ventral spot; the head is pale amber with black eyespots, and the prothoracic shield is colorless. The mines are typically narrowly linear and may be bounded by veins or freely cut across them; one example followed the midrib and had digitate extensions bounded by the smaller veins. In both of these mine types there is some frass deposited inside and some may be expelled from the beginning. A blotch mine found in association with these mines was presumably made by a later instar of the same species. We suspect this unknown moth does not complete development as a leafminer, but we have not observed the larvae to feed externally, and each rearing attempt has ended with the leaves turning brown and the larvae no longer being in evidence.

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## Literature Cited


Austin, K. A., Dombroskie, J. J., Matthews, D. L., and J. Y. Miller. 2019. A review of the Archipini of the Bahamas with the description of a new species of *Argyrotaenia* Stephens (Tortricidae). Journal of the Lepidopterists' Society 73(1): 5–17. https://doi.org/10.18473/lepi.73i1.a2

Barrows, E. M. 1991. Host plants, flight period, and distribution of a precinctive Florida moth *Argyrotaenia amatana* (Lepidoptera: Tortricidae). Florida Entomologist 74(1): 152–153. https://doi.org/10.2307/3495254

Brown, J. W., G. Robinson and J. A. Powell. 2008. Food plant database of the leafrollers of the world (Lepidoptera: Tortricidae) (Version 1.0). http://www.tortricidae.com/foodplants.asp [Last accessed January 2024].

Bullock, R. C., E. E. Killer, and R. R. Pelosi. 1997. Population dynamics and citrus fruit damage by two species of leafroller, *Argyrotaenia amatana* and *Argyrotaenia kimballi* (Lepidoptera: Tortricidae). Proceedings of the Florida State Horticultural Society 110: 27–32.

Chambers, V. T. 1875. Tineina of the central United States. The Cincinnati Quarterly Journal of Science 2(2): 97–121.

Dyar, H. G. 1901a. An apparently new tortricid from Florida. Journal of the New York Entomological Society 9(1): 24–25.

Dyar, H. G. 1901b. Notes on the winter Lepidoptera of Lake Worth, Florida. Proceedings of the Entomological Society of Washington 4(4): 446–485.

Eiseman, C. 2020. Fringed loosestrife fauna. https://bugtracks.wordpress.com/2020/11/11/fringed-loosestrife-fauna/ [Last accessed January 2024].

Eiseman, C. 2022. Leafminers of North America. Self-published e-book, available from https://charleyeiseman.com/leafminers. clxvii + 2213 pp.

Eiseman, C. S., K. A. Austin, J. A. Blyth, and T. S. Feldman. 2020. New records of leaf-mining Tortricidae (Lepidoptera) in North America, with the description of a new species of *Grapholita*. Zootaxa 4748(3): 514–530. https://doi.org/10.11646/zootaxa.4748.3.6

Eiseman, C. S. and D. R. Davis. 2020. Wrong side of the leaf: assigning some Lithocolletinae species (Lepidoptera: Gracillariidae) to their proper genera. Zootaxa 4751(2): 201–237. https://doi.org/10.11646/zootaxa.4751.2.1

Eiseman, C. S. and D. R. Davis. 2023. Family Gracillariidae, pp. 50–56. *In* Pohl, G.R. and S. R. Nanz, eds. Annotated Taxonomic Checklist of the Lepidoptera of North America, North of Mexico. Wedge Entomological Research Foundation. 580 pp.

Ferguson, D. C. 1975. Host records for Lepidoptera reared in eastern North America. United States Department of Agriculture Technical Bulletin 1521: 1–49.

Fernald, C. H. 1879. Tortricidae. The Canadian Entomologist 11(8): 155–158. https://doi.org/10.4039/Ent11155-8

Freeman, T. N. 1944. A review of the North American species of the genus *Argyrotaenia* Stephens, (Lepidoptera, Tortricidae). Scientific Agriculture 25: 81–95.

Gilligan, T. M., D. J. Wright, and L. D. Gibson. 2008. Olethreutine moths of the midwestern United States: An identification guide. Bulletin of the Ohio Biological Survey 16: 1–334.

Godfrey, G. L., E. D. Cashatt, and M. O. Glenn. 1987. Microlepidoptera from the Sandy Creek and Illinois River Region: an annotated checklist of the suborders Dacnonypha, Monotrysia, and Ditrysia (in part) (Insecta). Illinois Natural History Survey Special Publication 7: 1–44.

Heinrich, C. 1919. A new olethreutid from New York (Lepidoptera). Insecutor Inscitiae Menstruus 7(4–6): 65–66.

Heinrich, C. 1926. Revision of the North American moths of the subfamily Laspeyresiinae and Olethreutinae. Bulletin of the United States National Museum 132: 1–216. https://doi.org/10.5479/si.03629236.132.1

Heppner, J. B. 2007. Lepidoptera of Florida. Part 1: Introduction and Catalog. Arthropods of Florida and Neighboring Land Areas [Florida Department of Agriculture & Consumer Services, Gainesville] 17: 1–670.

Heppner, J. B. 2013. Florida Lepidoptera biodiversity: distributions and phenologies. Lepidoptera Novae 6(2–4): 65–128.

Kearfott, W. D. 1904. North American Tortricidae. Transactions of the American Entomological Society 30(4): 287–299.

Kearfott, W. D. 1907. New North American Tortricidae. Transactions of the American Entomological Society 33(1): 1–97.

Kearfott, W. D. 1910. Family Tortricidae, pp. 537–552. *In* Morse, S.R., ed. Annual Report of the New Jersey State Museum, Including a Report of the Insects of New Jersey. MacCrellish & Quigley. 888 pp.

Kimball, C. P. 1965. The Lepidoptera of Florida: an annotated checklist. Arthropods of Florida and Neighboring Land Areas [Florida Department of Agriculture, Gainesville] 1: 1–363.

MacKay, M. R. 1959. Larvae of the North American Olethreutidae (Lepidoptera). The Canadian Entomologist 91 (Supplement 10): 5–338. https://doi.org/10.4039/entm9110fv

Obraztsov, N. S. 1961. Descriptions of and notes on North and Central American species of *Argyrotaenia*, with the description of a new genus (Lepidoptera, Tortricidae). American Museum Novitates 2048: 1–42.

Peterson, A. 1960. A leaf skeletonizer, *Lobesia liriodendrana* (Kearfott), Olethreutidae, on *Magnolia grandiflora* in Florida. The Florida Entomologist 43(3): 105–114. https://doi.org/10.2307/3492674

Pohl, G. R., J.-F. Landry, B. C. Schmidt, J. D. Lafontaine, J. T. Troubridge, A. D. Macaulay, E. J. van Nieukerken, J. R. deWaard, J. J. Dombroskie, J. Klymko, V. Nazari, and K. Stead. 2018. Annotated checklist of the moths and butterflies (Lepidoptera) of Canada and Alaska. Series Faunistica, Pensoft, 118: 1–580.

POWO. 2024. Plants of the world online. https://plantsoftheworldonline.org [Last accessed January 2024].

Royals, H. R., J.-F. Landry, and T. M. Gilligan. 2019. *Paralobesia* (Lepidoptera: Tortricidae), a systematic revision. Memoirs of the Lepidopterists' Society 6: 1–149.

Wagner, D. L. and B. Connolly. 2009. Pithing and mining by a punkie: the unusual feeding strategies of *Nola cilicoides* (Grote, 1873) (Noctuidae: Nolinae). Journal of the Lepidopterists' Society 63(1): 48–51.