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# *Amphiphala*, a new genus and its three new species from eastern North America (Lepidoptera: Tortricidae: Cochylina)

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# *Amphiphala*, a new genus and its three new species from eastern North America (Lepidoptera: Tortricidae: Cochylina)

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**Abstract.** *Amphiphala* Roberts and Sabourin, **new genus** (Lepidoptera: Tortricidae), is proposed for three new species: *A. liatriana* Roberts and Sabourin, **new species**; *A. landryana* Brown, **new species**; and *A. carolana* Sabourin, **new species**. The genus is recorded from the eastern part of North America from Ontario, Canada south to South Carolina, and west to Manitoba and Mississippi. Owing to its superficial similarity to the banded sunflower moth, *Cochylichroa hospes* (Walsingham, 1884), *Amphiphala* remained hidden in North American Lepidoptera collections. *Amphiphala liatriana* has been reared from northern blazing star, *Liatris scariosa* (L.) Willd. (Asteraceae), in Maine.

**Key words.** Banded sunflower moth, conservation, generic framework, Kennebunk Plains, larval host, *Liatris*, morphology.

**ZooBank registration.** urn:lsid:zoobank.org:pub:0B3554C6-EA09-4D2D-9103-B054870B23D2

## Introduction

A stable and robust generic framework for North American Cochylina has been long in the making. Busck (1907) was the first to present a list of the genera: *Phalonia* Hübner, *Pharmacis* Hübner, *Commophila* Hübner, *Hysterosia* Stephens, and *Carposina* Herrich-Schäffer; the last was subsequently recognized as belonging to a different family - Carposinidae. This framework was followed by McDunnough (1939) in his checklist of North American Lepidoptera. Busck (1939) later revised his generic concepts, increasing the number from four (with *Carposina* excluded) to 14, adding the following genera: *Lorita* Busck, *Propira* Durrant, *Clysia* Hübner, *Chlidonia* Hübner, *Lozopera* Stephens, *Henrichia* Busck (preoccupied and subsequently replaced by *Henricus* Busck), *Carollella* Busck (a replacement name for the preoccupied *Pharmacis*), *Euxanthis* Hübner, *Aethes* Billberg, *Phtheochroa* Stephens, , and *Saphenista* Walsingham. Only six of these are currently recognized as valid genera for Nearctic species.

Powell's (1983) contribution to the check list of the Lepidoptera of America north of Mexico included nine genera, with nearly 50 species included under "incertae sedis" (i.e., unplaced). In his unpublished thesis of North American Cochylina, Pogue (1986) and later Pogue and Mickevitch (1990) recognized 23 genera, 10 of which were designated as new but subsequently treated as nomina nuda because they lacked valid descriptions. Metzler and Brown (2014) incorporated changes proposed since Powell (1983) and presented an updated checklist for the Nearctic fauna. Brown (2019) formalized five of Pogue's manuscript names, and Brown et al. (2020) conducted

a molecular phylogenetic analysis of the tribe, proposing the elevation of several subgenera of *Cochylis* in an attempt to define monophyletic genera within the large and confusing "Cochylis Group." While substantial progress has been made towards a generic framework, new genera continue to be discovered among the considerable undescribed cochyline fauna of North America.

The discovery of a *Liatris*-feeding (Asteraceae) cochyline with a forewing pattern nearly identical to that of the banded sunflower moth, *Cochylichroa hospes* (Walsingham), but with unique male genitalia, stimulated the first author to explore further the systematic position and life history of the new species. During work on the Tortricinae of the midwestern U.S., the second author discovered an additional species with a forewing pattern and genitalia similar to those of the *Liatris*-feeding species. A third new species was discovered through a review of barcode data for *C. hospes*. Because these three species do not fit convincingly into any currently described genus, a new genus is proposed for them, and they are here described as well. The overarching goal of this contribution is to continue to build on the generic framework for the North American fauna of Cochylina.

## Materials and Methods

We examined 268 pinned specimens of *Amphiphala*, along with 32 slide-mounted genitalic preparations. Methods for dissecting genitalia followed those of Holloway et al. (1987) using chlorazol black as the stain, and slide mounting the structures in Euparal. Departures from this protocol involved the use of lactic acid in place of isopropanol, and acid fuchsin as a secondary staining agent. Two of the examined slides were made prior to our study, likely using different techniques than ours. Bleached or denuded wings were stained following the method of Zimmerman (1978) and slide mounted in Euparal; also see Sabourin et al. (2002) for additional details on methods. Morphological terms follow Horak (1984, 1998) and Razowski (1997), except that "phallus" is used here rather than "aedeagus," and "hind margin" is used for the trailing edge of the forewing rather than "dorsum."

Measurements were made under magnification to the nearest 0.5 mm. Forewing length was measured from the base of the wing to the apex, including the fringe. Slide mounted genitalia were examined using Leica MZ23 and MS5 stereo microscopes and a Nikon E600 compound microscope. Images of adults and genitalia were captured using a Canon EOS 40D Digital SLR Camera (Canon U.S.A., Lake Success, NY) mounted on a Visionary Digital BK Lab System (Visionary Digital, Palmyra, VA). Multiple images were stacked using Helicon Focus software and edited using GIMP software.

Specimens examined reside in the following institutional and private collections:

**CNC** Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario;
**JBS** J. Bolling Sullivan Collection, Beaufort, North Carolina;
**JVC** James Vargo Collection, Mishawaka, Indiana;
**MEM** Mississippi Entomological Collection, Mississippi State University, Starkville, Mississippi;
**MGCL** McGuire Center for Lepidoptera and Biodiversity, Gainesville, Florida;
**MSC** Michael Sabourin Collection, Marshfield, Vermont;
**MSM** Maine State Museum, Anthropological and Biological Collection, Augusta, Maine;
**MSUC** Michigan State University Collection, East Lansing, Michigan;
**UMSP** University of Minnesota, St. Paul, Minnesota;
**USNM** National Museum of Natural History, Smithsonian Institution, Washington, DC.

## Results

### *Amphiphala* Roberts and Sabourin, new genus

**Type species.** *Amphiphala liatriana* Roberts and Sabourin, **new species**.

**Diagnosis.** Superficially, the three known species of *Amphiphala* are virtually indistinguishable, with a yellow ochre forewing ground color that features a dark brown, subtriangular median fascia, narrowest at the costa and broadened to the hind margin, and a dark tawny, slightly sinuous, narrow, incomplete preapical fascia (Fig. 3–6).

The forewing pattern alone serves to distinguish the genus from superficially similar North American Cochylina, except *Cochylichroa hospes*. In *C. hospes* (Fig. 1, 2), the intersection of the medial fascia with the costa is usually slightly narrower than in *Amphiphala*, often subtly isolating a small, pale, somewhat rounded region at the costa beyond the median fascia that is conspicuous in series of specimens but less so in individuals; the base of the triangular fascia is usually slightly broader at the hind margin; the fascia is usually dark brown in *Amphiphala* and more dark reddish brown in *C. hospes*; and the preapical fascia is less defined. However, these pattern elements are rather variable, and hence, often unreliable for accurate identification, especially in flight-worn specimens.

The male genitalia of *Amphiphala* (Fig. 7–10) are distinguished from those of all other Cochylina by the highly modified, tripartite valva, represented by three distinct elements: 1) an isolated, long, crescent-shaped costal portion (possibly representing the fusion of the socii with the costa of the valva) widely separated from 2) a longer, slenderer, somewhat digitate, saccular portion, and 3) a median process (of uncertain homology) arising from the juxta or attached to the dorsal corners of the juxta, extending parallel to (but not fused with) the vinculum to the lateral junction with the transtilla and tegumen, and with a long, curved, attenuate process near its tenuous connection with base of the sacculus (Fig. 7–10). The median process may possibly be homologous with a furca (of the juxta); however, its attachment to the juxta is uncertain. The female genitalia (Fig. 12–16) are characterized by an unusual, large, recurved, rounded or subquadrate, lobe-like process ventrad to the ostium. In


**Figures 1–6.** Adults of *Cochylichroa hospes* and *Amphiphala*. **1)** *Cochylichroa hospes* from New York. **2)** *C. hospes* from Missouri. **3)** Holotype of *A. liatriana* from Maine. **4)** Male of *A. liatriana* from Ohio. **5)** Holotype female of *A. landryana* from Manitoba. **6)** Paratype male of *A. carolana* from Missouri.

addition, a signum and other conspicuous sclerotization of the corpus bursae are absent, a feature shared with a few other cochyline genera.

Owing to the highly modified valva in the male genitalia, it is difficult to identify the putative sister genus of *Amphiphala*. Some species of *Ceratoxanthis* Razowski (e.g., *C. argentomixtana* (Staudinger) and *C. externana* (Eversmann)) (see Razowski 1970: fig. 141, 142) and *Fulvoclysia* Obraztsov (see Razowski 1970: fig. 144, 145) have an elongate process of the juxta (i.e., a furca) that is reminiscent of the median process of the valva in *Amphiphala*, but the homology of the features between those genera and *Amphiphala* is uncertain (see Discussion below). In addition, *Cochylis caulocatax* Razowski and *C. sierramastre* Razowski and Becker have a digitate median process of valva that is similar of that of *Amphiphala*. Nevertheless, DNA barcodes (the mitochondrial gene cytochrome oxidase subunit I) place *Amphiphala* closest (3.21% difference) to *C. hospes*, with which it is superficially most similar as well.

**Description. Head.** Vertex with a pair of sublateral, fan-shaped clusters of scales meeting at the mid-line of the head; scaling on frons bushy, ascending; ocellus well developed; chaetosemata present; antennae ca. 0.5 length of forewing, with 37–39 flagellomeres, short ciliate in male, cilia virtually absent in female; labial palpus porrect, all segments combined ca. 1.5 times diameter of compound eye; haustellum present, presumably functional; maxillary palpus minute, two-segmented.

**Thorax.** Dorsum smooth scaled, tegula conspicuous, metathoracic tuft short; legs unmodified, without secondary sex scales in male. Forewing relatively narrow, length ca. 3.0 times width; median fascia complete from costa to hind margin; preapical fascia narrow, incomplete. All veins present and separate; $R_1$ from middle of discal cell; $R_5$ to costa, $R_4$ to termen; origin of $M_2$ closer to $M_3$ than to $M_1$; $M_3$ and $Cu_1$ approximate at base; $Cu_2$ arising ca. 0.67 length of discal cell; CuP absent; $A_1$ and $A_2$ separate in basal ca. 0.5. Hindwing trapezoidal, widening distad, with costa straight in basal 0.66, then slightly convex; male with costal roll of sex scales, extending ca. 0.6 wing length, enclosing hairpencil; Sc fused with Rs ca. 0.67 length of discal cell, extending abruptly to costa at ca. 0.33 of wing in male; Sc separated from Rs in female; male frenulum with one bristle, female with two.

**Abdomen.** Without modified sex scales. Male genitalia (Fig. 7–10) with tegumen broad; uncus small, sparsely setose; socius small, thumb-shaped; transtilla broad with well-developed median process, with two to eight short apical teeth, lateral extremities of transtilla forming anteriorly folded lobes; vinculum stout, sulcate, recurved, continuous with outer basal membrane of ventral process of valva; valva tripartite: dorsal portion (representing costa or fused costa and socius) long, setose, broadly crescent-shaped, tapering to rounded apex, with sclerotized dorsal margin; ventral portion (representing sacculus) elongate-digitate, slightly tapered distally, with slightly concave dorsal margin; third portion a broad-based, heavily sclerotized, sickle-shaped process (possibly homologous with a furca) extending from juxta to basal membrane of ventral part of transtilla; juxta broad, shield-like; phallus robust, long, straight or weakly curved in distal 0.4, attenuate and pointed apically; vesica with variable number of small non-capitate, non-deciduous cornuti and a small plate. Female genitalia (Fig. 12–16) with papillae anales slender, setose, fused at posterior end of lobes; apophyses slender, ca. 2 times length of papillae anales; lamella postvaginal a broad band posteriorly, with median suture (absent in *A. carolana*), well-sclerotized, arched, with rough margin, sparsely setose, with long, attenuate sublateral arms flanking ostial plate; ostium round with thickened margin, concealed by anterior end of unusual, large, recurved, rounded or subquadrate, lobe-like process ventrad to ostium (Fig. 13), with (*A. liatriana* and *A. landryana*) or without (*A. carolana*) paired sublateral sclerites; ductus bursae short, broad, weakly differentiated from corpus bursae, often spiculate; corpus bursae irregularly oblong, lacking signum and other sclerotization; accessory bursae from long, slender ductus, arising from ductus bursae near ostium; corpus bursae large, ovate, delicately spiculate throughout, lacking signum.

**DNA barcodes.** A specimen of *A. liatriana* from the type locality submitted to the Department of Agricultural Sciences, Colorado State University (JWB-DNA-21-035) failed to yield sequence data. Of two specimens of *A. carolana* (CCDB-30812-H02 and CCDB-29467-H06) submitted to the Biodiversity Institute of Ontario, Guelph University, the first yielded only 250 bp and the second yielded no sequence data. We assume the lack of sequence data is the result of the age (>20 years) of the specimens. However, the female holotype of *A. landryana* has a full-length barcode (BOLD: AAB3055) that is 3.21% different from that of *C. hospes* (BOLD: AAB3054).

**Biology and distribution.** *Amphiphala* comprises three species, two of which exhibit rather disjunct distributions: *A. liatriana* from Maine, North Carolina, South Carolina, and the midwestern U.S. (Ohio, Indiana, Illinois, Missouri, Michigan, Wisconsin); and *A. carolana* from midwestern U.S. (Illinois, Missouri) and Mississippi. Owing to subtle variation in structures of the genitalia (some geographic, but others possibly artifacts of slide-mounting), it is possible that one or more cryptic species are hidden within the three species we circumscribe. Hence, we have restricted the type series to specimens from Maine for *A. liatriana*, Manitoba for *A. landryana*, and Missouri and Illinois for *A. carolana*.

The genus may be associated with remnant prairie or savannah habitat throughout its range. *Amphiphala liatriana* appears to be univoltine at its type locality in Maine, but appears to be bivoltine in the southern portion of its range (e.g., North Carolina). *Amphiphala carolana* is likely bivoltine with cumulative capture records from late June to early October. *Amphiphala liatriana* has been reared from northern blazing star, *Liatris scariosa* (Asteraceae), on numerous occasions in Maine, and this is the only documented host plant for the genus.

**Etymology.** *Amphiphala* is a Latinized Greek feminine noun for a two-horned ancient warrior's helmet and refers to the median process of the valva, characteristic of the genus.

### *Amphiphala liatriana* Roberts and Sabourin, new species

Fig. 3, 4, 7, 8, 12–14

**Diagnosis.** *Amphiphala liatriana* cannot be separated reliably from its congeners by facies alone (Fig. 3–6); it ranges slightly larger than *A. carolana*, but not significantly so. The male genitalia differ from those of *A. carolana* in having the crescent-shaped, costal portion of the valva slightly wider; a longer, narrower median process of the transtilla; the long median process of the valva more curved; and the phallus straighter with only a very few tiny cornuti in the vesica (Fig. 7, 8). In the female genitalia of *A. liatriana*, the lateral sclerites of the lamella postvaginalis (Fig. 12) are straighter than the curved, horn-shaped sclerites characteristic of *A. carolana* (Fig. 15). In addition, *A. liatriana* has a pair of short, unequal, crescent-shaped sclerites in the lobe-like process ventral to the ostial plate that are lacking *A. carolana*.

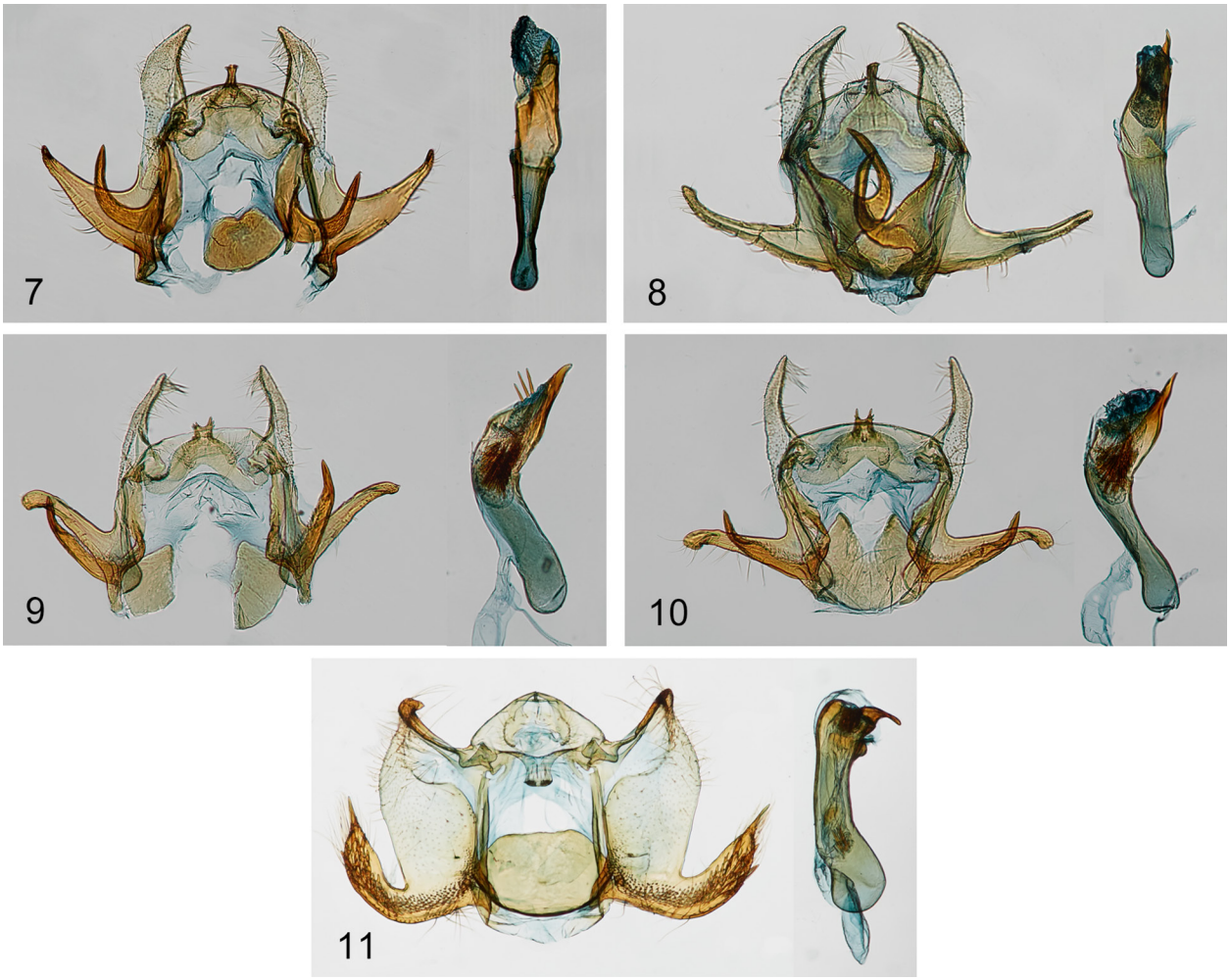
**Description. Head.** Vertex and frons whitish yellow, overlaid with pale yellow ochre around compound eyes and between bases of antennae; antenna with scape pale yellow ochre, overlaid with rusty ochre, flagellomeres with tan gray scales, rusty ochre in basal portion; labial palpus yellowish white on outer surface, yellow ochre on inner surface.

**Thorax.** Notum pale yellow-ochre, margins and posterior tuft slightly darker yellow ochre, occasionally with scattered rusty ochre scales; tegula concolorous with nota on anterior 0.5, paler in posterior 0.5. Venter yellowish white; legs rusty orange mixed with blackish gray. Forewing length 4.5–6.0 mm (mean = 5.5 mm; n = 77); forewing ground color pale yellow ochre, somewhat shiny; system of paired costal strigulae weakly developed; median fascia broad, triangular, dark brown to black, its base occupying medial 0.33 of hind margin, its truncate apex occupying medial 0.12 of costa; a variably developed, usually narrow, dark tawny preapical fascia; variably-developed, pale tawny blotch between median and preapical fasciae; fringe concolorous with ground color. Underside gray with contrasting pale yellow-ochre costal pairs of strigulae in postmedian and subterminal areas. Hindwing pale gray to dark smoky gray, slightly paler at base; male with costal roll of sex scales, extending ca. 0.6 wing length, enclosing hairpencil; fringe gray to pale yellowish gray with narrow line of darker scales basally. Underside pale whitish to yellowish gray.

**Abdomen.** Yellowish gray dorsally, pale yellowish white ventrally. Male genitalia (Fig. 7, 8) as described for genus, except median process of transtilla with two teeth, and phallus with 0–4 tiny cornuti. Female genitalia (Fig. 12–14) as described for genus, except posterior margin of lamella postvaginalis relatively straight; rounded recurved process ventral to ostial plate with two small, irregularly crescent-shaped sublateral sclerites, and ductus bursae broad, gradually tapering anterad to 0.5 its greatest width.

**Types.** Holotype ♂, USA, Maine, York Co., Kennebunk Plains, 8–9 Aug 2000, M. Roberts (USNM).

Paratypes (112♂, 119♀). Maine: York Co.: Kennebunk Plains, 7 Aug 1995 (10♂, 15♀), 12 Aug 1996 (7♂, 52♀), 8–9 Aug 2000 (90♂, 50♀), 11–12 Aug 2001 (2♂), reared from potted soil, 12 Aug 2022 (1♂), 14 Aug 20002 (2♂), 16–17 Aug 2006 (2♀) (MGCL, MSC, MSM, USNM).




**Figures 7–11.** Male genitalia of *Amphiphala* and *Cochylichroa hospes*. **7)** Paratype of *A. liatriana* from Maine, USNM slide 154,699; vinculum arms separated. **8)** *A. liatriana* from Ohio, USNM slide 154,695. **9)** Paratype of *A. carolana* from Missouri, USNM slide 154,713; vinculum arms separated. **10)** Paratype of *A. carolana* from Illinois, USNM slide 154,701. **11)** *C. hospes* from Martha's Vineyard, Massachusetts, USNM slide 154,743.

**Additional material examined.** USA: Indiana: Pulaski Co., 2 Aug 1997 (3♂), J. Vargo (JVC). Jasper Co.: 6 Aug 2003 (4♂), J. Vargo (JVC). Michigan: Allegan Co.: T3N, R14W, Sec 26, 25 Jul 1987 (1♀), G. Balogh (MSUC); T2N R15W, Sec, 1 sand prairie, savannah 25 Jul 1992 (1♀), G. Balogh (MSUC); T3N, R14, Sec. 11, 3 Aug 1990 (1♂), G. Balogh (MSUC). North Carolina: Carteret Co.: Mills Savanna, longleaf pine & wiregrass, 7 Aug 2002, J. B. Sullivan (USNM). Beaufort, 22 Apr 2022 (1♀), J. B. Sullivan (BSC). Cumberland Co.: Fort Bragg, NEA Commel Savanna, 78°55'56"W, 35°11'54"N, 18 Sep 2002, J. B. Sullivan (USNM). Ohio: Lucas Co.: Swanton Township, Sec. 28, 9 Aug 1996, E. Metzler (USNM). South Carolina: Chesterfield Co.: Patrick, 15 Sep 2012, J. Glaser (USNM). Wisconsin: Burnett Co.: Grantsburg, 21 Jul 1999 (2♂), 9 Aug 2000 (1♀), 27 Jul 2000 (1♀), 26 Jul 2001 (4♂), 27 Jul 2000 (1♂, 1♀), 13 Aug 2002 (1♂), M. Sabourin (MSC). Kewaunee Co.: T25N, R26E, Sec. 7, Lake Michigan shore, 23 Aug 1993 (1♂), J. Wilterding (MSUC). CANADA: Ontario: Lambton Co., Port Franklin, 14 Aug 1996, (1♀) K. H. Stead (MSC).

**Biology and distribution.** Based on observations in Maine, the whitish-translucent eggs are deposited singly on the bracts of the flowers of *Liatris*. Within three to four days of oviposition, larvae are visible through the translucent chorion; hatching takes place 4–5 days later. Newly hatched larvae do not consume the shell but migrate to the top of the flower and descend into it, feeding directly on the seeds, boring horizontally, tunneling from

one seed to the next. Larvae have been observed from August through September, feeding on the seeds of *Liatris* in competition with larvae of a species of *Isophrictis* Meyrick (Gelechiidae). Last instar larvae are 7–8 mm long, translucent gray, shaded with dark green and pinkish purple; the cervical shield is pale; the head is pale brownish yellow, darkened only on the mouthparts and ecdysial sutures; the prolegs have 12 uniordinal crochets arranged in a lateral penellipse; and an anal fork is well developed. Chaetotaxy is typical of other Cochylina, with an elongated L-pinaculum on T1, and a bisetose L-group on A9. Pupation has not been observed, but likely takes place in the summer. Attempts to rear larvae in the lab proved unsuccessful.

Adults are active at dusk (1800–2000 hr) but can be flushed from vegetation during the daytime. In Maine, the geographic source of the majority of the specimens examined, the flight period is the first and second week of August, congruent with flowering of the host plant.

Although specimens from the midwestern U.S. are exceedingly similar to those from Maine (the type locality), subtle variation in the male and female genitalia suggest that they may not be conspecific. However, as provisionally defined herein, this species is recorded from Maine, Michigan, Indiana, Ohio, Wisconsin, North Carolina, South Carolina, and Ontario.

**Etymology.** The species name is a Latinized feminine adjective referring to the genus of the larval host plant, *Liatris*; the suffix "-ana" is a traditional ending for tortricid species names.

### *Amphiphala landryana* Brown, new species

Fig. 5, 15

**Diagnosis.** Superficially, *A. landryana* is indistinguishable from its congeners (Fig. 3–6), although the holotype female is slightly larger than many other congeners. The female genitalia of *A. landryana* (Fig. 15) are most similar to those of *A. liatriana* (Fig. 12–14), but they can be distinguished from those of the latter by the much larger sublateral sclerites of the recurved median ventral lobe (the lobe best shown in Fig. 14).

**Description. Head.** Vertex and frons whitish yellow; [labial palpus missing]; antennal scape with pale yellow scales, flagellomeres with tan gray scales.

**Thorax.** Notum concolorous with head; tegula slightly darker basally. Under surface pale yellow. Forewing length 6.0 mm (n = 1); forewing ground color white, overlaid with pale yellow and pale tawny scales; median fascia broad, subtriangular, its base occupying medial 0.33 of hind margin, its truncate apex occupying medial 0.12 of costa, blackish brown, with irregular patches of silvery gray near dorsal margin; preapical fascia small, fuscous, with scattered black and rust scales; fringe concolorous with ground color. Underside gray with contrasting pale yellow ochre costal striae in postmedian and subterminal areas. Hindwing mostly whitish with limited pale gray overscaling; fringe pale yellowish gray. Underside pale yellowish gray.

**Abdomen.** Pale yellow dorsally, slightly paler ventrally. Male genitalia unknown. Female genitalia (Fig. 15) as described for genus, except rounded recurved process posterior to ostial plate with two long, slightly curved, sublateral sclerites; ductus bursae densely spiculate.

**Type.** Holotype ♀, Canada, Manitoba, Manitoba Tall Grass Prairie Preserve, Prairie Trail, 289 m, 49.0730, -967740, 18 Jul 2007, MV light, J.-F. Landry & V. Nazari, CNCLEP00040582, USNM slide 154,796 (CNC).

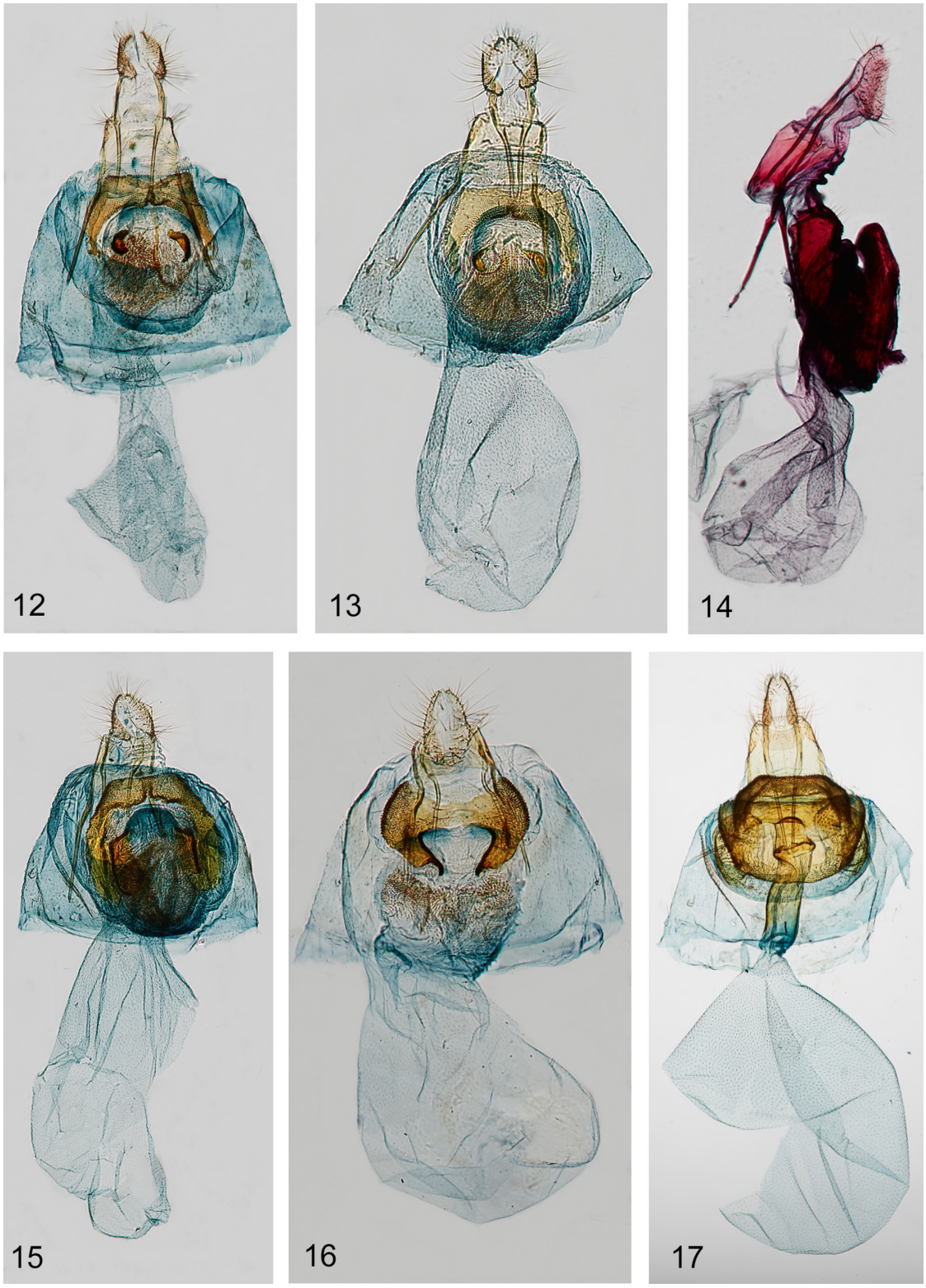
**Biology and distribution.** This species is known only from the holotype collected in prairie habitat in southernmost Manitoba, Canada, in mid-July.

**Etymology.** The specific epithet is a patronym for our lifelong friend Jean-François Landry, the collector of the holotype specimen. It is considered an adjective, and the suffix "-ana" is a traditional ending for tortricid species names.

### *Amphiphala carolana* Sabourin, new species

Fig. 6, 9, 10, 16

**Diagnosis.** *Amphiphala carolana* is superficially nearly indistinguishable from *A. liatriana*. However, its male genitalia differ in having a shorter median process of the transtilla with more conspicuous apical teeth, and a more curved phallus with a dense cluster of numerous, slender, spine-like cornuti. In the female genitalia of *A. carolana*, the posterior margins of the lamella postvaginalis are evenly rounded, and the lateral sclerites of




**Figures 12–17.** Female genitalia of *Amphiphala* and *Cochylichroa hospes*. **12)** Paratype of *A. liatriana* from Maine, USNM slide 154,700. **13)** Paratype of *A. liatriana* from Maine, USNM slide 154,71512. **14)** Paratype of *A. liatriana* from Maine, lateral view, USNM slide 154,706. **15)** Paratype of *A. carolana* from Missouri, USNM slide 153,617. **16)** Holotype of *A. landryana* from Manitoba, USNM slide 154,796. **17)** *C. hospes* from Maine, USNM slide 154,725.

the ostial plate are broad, elongate, and pointed anteriorly; in comparison, the elongate lateral sclerites appear straighter in *A. liatriana*.

**Description. Head.** Vertex and frons whitish yellow; labial palpus yellow ochre on outer surface, white on inner surface; antenna with scape pale yellow; flagellomeres with tan gray scales, pale rusty ochre in basal portion.

**Thorax.** Notum concolorous with head; tegula darker, with mixture of white and yellow ochre scales. Venter yellowish white; fore- and mid-leg two-toned, predominantly fuscous with pale yellowish stripes at junction of segments. Forewing length 4.0–5.5 mm (n = 6); forewing ground color white, overlaid with pale yellow scales; median fascia broad, subtriangular, blackish brown, its base occupying medial 0.33 of hind margin, its truncate apex occupying medial 0.12 of costa; preapical fascia small, fuscous, with scattered black and rust scales; fringe concolorous with ground color. Underside gray with contrasting pale yellow ochre costal striae in postmedian and subterminal areas. Hindwing smoky gray; male with costal roll of sex scales, extending ca. 0.6 wing length, enclosing hairpencil; fringe gray to pale yellowish gray. Underside pale whitish to yellowish gray.

**Abdomen.** Yellowish gray dorsally, pale yellowish white ventrally. Male genitalia (Fig. 9. 10) as described for genus, except inner margin of dorsal process of valva slightly concave; median process with a long, lateral, curved spine, its dorsal margin not as deeply concave as in *A. liatriana*; median process of transtilla short, stout, bifid, armed with eight small apical teeth; vesica with approximately 24 moderate-sized cornuti, with nearly equal number of minute cornuti. Female genitalia (Fig. 16) as described for genus, except posterior margin of lamella postvaginalis evenly rounded, lateral margin broadly rounded, terminating in inward directed, curved tip.

**Types.** Holotype ♂, USA, Missouri, Randolph Co., South of Moberly, 27 Jul 1968, J. R. Heitzman (USNM).

Paratypes (6♂, 3♀). USA: Illinois, Putnam Co., 29 Jul 1961 (1♂), 8 Jul 1960 (1♂), 29 Jul 1963 (1♂), M. O. Glenn (USNM). Missouri: Randolph Co., South of Moberly, 27 July 1968 (2♂, 1♀); Benton Co., J. R. Heitzman, 4 mi W Warsaw, 7 Aug 1968 (1♀), 8 Aug 1968 (1♂, 1♀), J. R. Heitzman (USNM).

**Additional specimens examined.** Mississippi: Forest Co.: Brooklyn, 7–18 Jun 1997 (1♀), #180527, R. Kergosien (MEM). Harrison Co.: Pass Christian, 1 Oct 1994 (1♂), #164308, R. Kergosien (MEM). Lee Co.: Tombigbee State Park, 10–24 Jun 1995 (1♂), #166539, R. Kergosien (MSC). Long Beach, 27 Sep 1995 (1♂), R. Kergosien (MSC).

**Biology and distribution.** The host is unknown, but larvae are suspected to feed on Asteraceae. In Illinois and Missouri, adults have been collected from early July to early August, indicating a single generation. However, in Mississippi, specimens have been collected from mid-June to the first of October, suggesting a bivoltine life history.

**Etymology.** The specific epithet is a patronym for Dr. Carol E. Weyland, the wife of the second author. It is considered an adjective, and the suffix "-ana" is a traditional ending for tortricid species names.

## Discussion

**Relationships and morphology.** Forewing maculation and DNA barcodes place *Amphiphala* nearest *Cochylichroa hospes*; however, the male genitalia of *Amphiphala* are remarkably divergent from those of *C. hospes*, and from all other *Cochylichroa* Obraztsov and Swatschek for that matter. Furthermore, the assignment of *C. hospes* to *Cochylichroa* is somewhat provisional; the species may require a new genus of its own. Prior to its transfer to *Cochylichroa* by Brown et al. (2019), *C. hospes* had resided in *Phalonia* (Westdal 1949), in *Cochylis* (Walsingham 1884; Arthur and Campbell 1979; Arthur and Powell 1990; Barker and Enz 1993; Barker and Grugel 1996; Barker 1997; Foster et al. 2003; Morris et al. 2005), in "unplaced species" (Razowski 1997), and in "incertae sedis" (Powell 1983). In a phylogenetic tree generated by a maximum likelihood analysis of COI (Brown et al. 2020: fig. 7), it lies just outside of *Cochylichroa* in a polytomy with *Atroposia* Pogue, *Thyraylia* Walsingham and a monophyletic *Cochylichroa*. In summary, although DNA barcodes and facies present evidence that *Amphiphala* is most closely related to *C. hospes*, dramatic differences in the male and female genitalia (Fig. 12–17) easily distinguish the two genera.

The modification of the costal margin of the valva into a free, elongate process, possibly homologous with enlarged socii, is observed elsewhere in Cochylina. For example, in *Cochylidia* Obraztsov the socii are erect

and sclerotized, and in *Cochylis caulocatax* they are large, hairy, and somewhat crescent-shaped. Likewise, the modification of the sacculus into a long, free, digitate process is not unique, occurring in *Nycthia* Pogue and *Cochylichroa hospes*. In *Ceratoxanthis* a similar structure is present; however, it clearly originates from the juxta, and therefore is unambiguously a furca. The unusual digitate median process of the valva appears to be unique to *Amphiphala*, although a similar structure is found in *Cochylis caulocatax* (see Pogue 1987: fig. 3). Although saccular processes of the valva, in general, are more common in basal Cochylina, (e.g., the *Phtheochroa* group of genera), the presence of a hindwing costal roll places *Amphiphala* among the more advanced cochylines (e.g., the *Cochylis* group of genera).

The presence/absence of cornuti is treated as a diagnostic character for separating *A. liatriana* from *A. carolana*. Although the near absence of cornuti in the vesica of *A. liatriana* may suggest that they are deciduous and lost, three lines of evidence indicate otherwise. 1) All dissected males of *A. liatriana* (n = 10) possess only a small patch of tiny cornuti, whereas all dissected males of *A. carolana* (n = 4) have a large patch of long cornuti. 2) No cornuti were found in the corpus bursae of any dissected females of *Amphiphala* (n = 18). 3) The presence of non-deciduous cornuti in the vesica is a rather consistent character that supports the monophyly of Cochylini (including Cochylina and Euliina)+(Tortricini+Cnephasiini) (Regier et al. 2012; Brown et al. 2020).

**Conservation.** The Kennebunk Plains, the primary source of specimens of *A. liatriana*, is a 210-ha sand plain-grassland in the costal lowlands of southern Maine. The site is jointly managed by The Nature Conservancy and the Maine Department of Inland Fisheries and Wildlife in an effort to preserve the largest known extant population of northern blazing star, *Liatris scariosa* (L.) Willd. var. *novae-angliae* (Lunnell) Shinners (Asteraceae). This rare plant is listed as endangered or imperiled throughout most of its narrow range, with only four of its 54 known localities supporting more than 1000 individuals. However, the population of northern blazing star on Kennebunk Plains is estimated to exceed 300,000 individuals (Vickery 2002). Hence, the conservation value of this site is exceedingly high. To preserve populations of this and other rare plants, it is essential to understand their pollinators and herbivores. Hence, we hope this study contributes a component to the overall knowledge of the ecology of *Liatris scariosa*.

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