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A NEW GEOMETRID GENUS AND SPECIES FROM SOUTHEASTERN ARIZONA
(ENNOMINAE: NACOPHORINI)

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ABSTRACT. The new genus *Chiricahua* is described from moths collected in the Chiricahua Mtns., Cochise Co., Arizona. Two species are recognized: the new species *C. lichenaria*, the type species for the genus, and *C. multidentata*, previously placed in *Biston*. Adults and genitalia are illustrated.**Additional key words:** Arizona, *Biston*, Bistonini, *Chiricahua multidentata*, *Chiricahua lichenaria*, Ennominae, Geometridae, Nacophorini

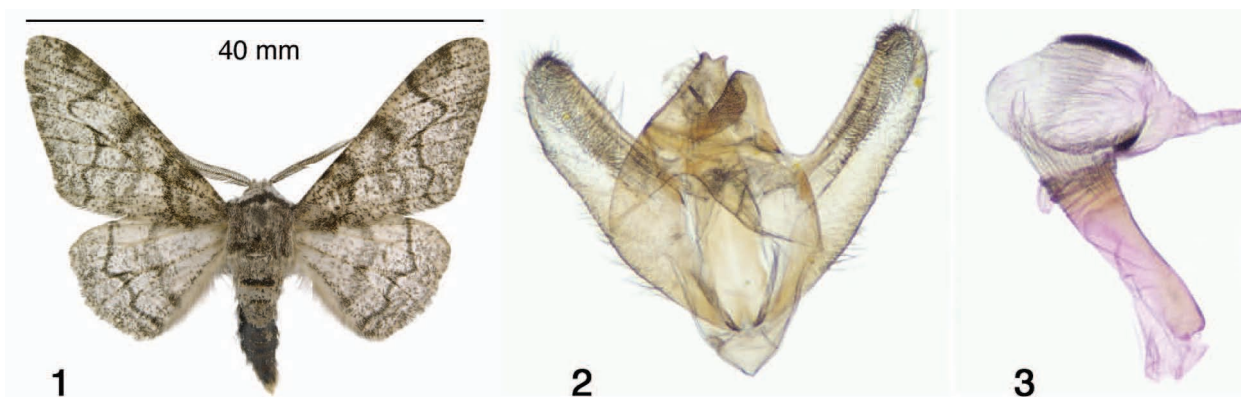
In mid-2008, I received from Ronald Leuschner, Manhattan Beach, CA, a male specimen of *Biston multidentata* Guedet, and two pairs of an undescribed moth also presumed to be a *Biston*, all collected in the Chiricahua Mtns. of southeastern Arizona. The abdomens were missing from one pair of the unknown species and the pin labels indicated that genitalic slides had been made. No slides accompanied the specimens and they are presumed lost following a thorough search for them. Guedet (1941) described *B. multidentata* from three females. When Rindge revised the New World Bistonini (1975), he had for examination only the three Guedet female specimens (from the California Academy of Sciences) and a fourth female collected by R. F. Sternitzky, also from the type locality (Flys Peak, Chiricahua Mtns., Cochise Co., AZ). The male was unknown at that time. Superficially the five specimens that I received certainly resemble a *Biston* species, excepting that the male antennae are not bipectinate. Rindge, however, did note a wing venation character in *B. multidentata* that differed from typical Bistonini and stated that a male would have to be examined to insure proper generic placement of the taxon. For reference, an adult male *Biston betularia cognataria* (Gn.) and genitalia are illustrated in Figs. 1–3.

When I dissected the male *multidentata* and the intact male of the undescribed species, I found the genitalia to be very similar, but totally different from anything in the Bistonini. Based on the male genitalia and a close examination of the external morphology, it is clear to me that both species belong in the Nacophorini, despite their superficial resemblance to *Biston*. The members of the tribe Nacophorini appear to be united by a character of the male genitalia: the frequently articulated or partially fused processes of the anellus (Figs. 9, 11, 14, 16). In her extensive treatment of the Australian Nacophorini, Young (2008) considered the tribe on a world basis, and briefly reviewed the New

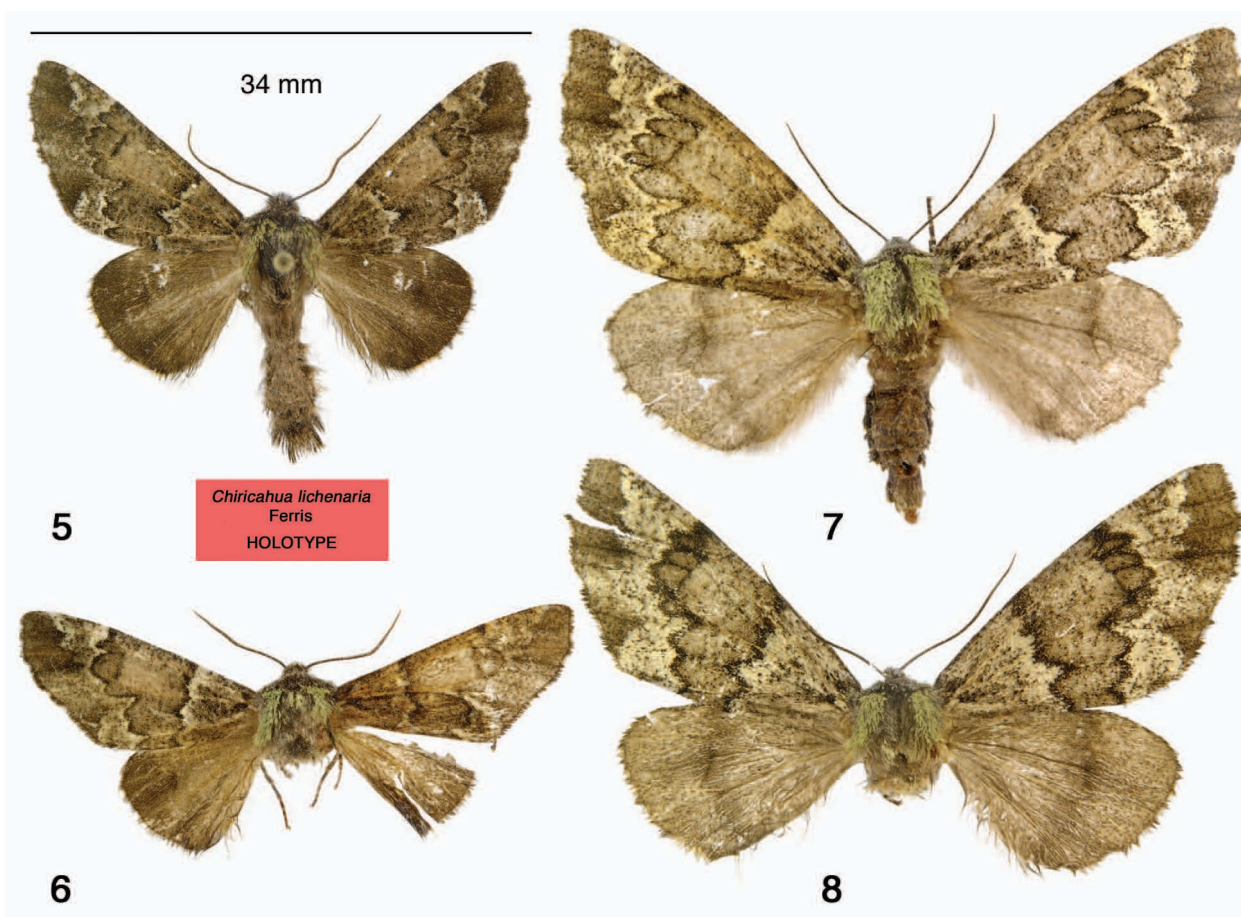
World species groups defined by Rindge (1983). The reader is referred to Young's treatise for discussion of the problems associated with defining this tribe.

In his comprehensive generic revision of the New World Nacophorini, Rindge (1983) recognized forty genera (in four species groups), ten of which occur north of Mexico. Pitkin (2002) followed Rindge's arrangement in her treatment of the Neotropical Nacophorini genera. Rindge defined the tribe by thirteen external morphological characters (Table 1, nos. 1–13, p. 151), eleven male genitalic characters (Table 3, nos. 14–24, p. 154), and 8 female genitalic characters (Table 5, nos. 25–32, p. 157). Each character is represented by a plesiomorphic (–) and an apomorphic state (+). When I coded the two species according to Rindge's characters 1–32, and then compared the results against his genus characters in Tables 1, 3, and 5, I did not find an exact match with any of the 40 recognized genera. The two species at hand have vestigial tongues in addition to lacking bipectinate antennae in the males. This combination does not match any of the forty genera in Rindge's Table 1. There are many genera without male bipectinate antennae or with vestigial tongues, but not in that combination. The male genitalic characters are closest to *Papago* Rindge, but fail to match on the antennae, uncus tip shape, and vesica sclerotization. No close genus affinities were found relative to the female genitalic characters. Based upon these results, I now propose a new genus.

CHIRICAHUA Ferris, new genus
(Fig. 4)*Biston*, in part: Rindge, 1975, pp. 78–88, figs. 11, 17Type species: *Chiricahua lichenaria*, Ferris, 2010.**Diagnosis.** The two included species are medium-sized (length of forewing: 13–18 males, 17–26 mm



FIGS. 1–3. *Biston betularia cognataria*, Grant Co., NM. 1, adult male; 2, male genitalia less aedeagus; 3, aedeagus with vesica everted.



FIGS. 5–8. *Chiricahua lichenaria* adults. 5, holotype male (before dissection); 6, male paratype; 7–8, female paratypes (7 before dissection).

females), heavy-bodied, robust moths with cryptically mottled gray or brown wings, with the females larger than the males. The forewing apex is acute, but not falcate; the outer margin is slightly curved at the apex, then straight. The wing venation (Fig. 4) of the male paratype of *C. lichenaria* was visualized by supporting a specimen on back-lit glass slides, wetting the wings with isopropanol, photographing the veins, then tracing the photo to obtain the line drawing. The venation in *C. multidentata* is similar. The male antennae are dentate, the female antennae filiform. Eyes are of normal size. The tongue is vestigial. There is one pair of spurs on the hind tibia and no hair pencil in the males. In the male genitalia, the uncus is simple and straight, the gnathos v-shaped, upcurved, and medially pointed, anellus with two prominent sclerotized processes, the vesica of the aedeagus is simple without armature. In the female genitalia, the corpus bursae is elongate, without striations, and with or without an inconspicuous small signum just above the fundus; the accessory glands are extremely large. Using Rindge's character set, the genus is represented as follows (characters 5–7 are omitted as they apply to bipectinate antennae; – = plesiomorphic state; + = apomorphic state): *External morphology*. (1 +) vestigial tongue; (2 –) 3rd segment of palpi one-half or less length of middle segment; (3 –) female palpi as large as those of males; (4 +) male antennae fasciculate; (8 –) front flat; (9 –) metathoracic tufts present; (10 +) dorsal abdominal tufts absent; (11 –) row of setae ventrally on 3rd abdominal segment of male abdomen absent; (12 +) one hind-tibial pair of spurs; (13 –) male hind-tibial hair pencil absent. *Male genitalia*. (14 –) uncus simple, straight; (15 +) uncus length greater than 1.0 mm; (16 –) socius present; (17 –) socius low, padlike; (18 –) gnathos present; (19 +) gnathos v-shaped, medially pointed; (20 –) valves simple without projections; (21 –) processes of anellus prominent, sclerotized; (22 +) length of processes of anellus shorter than length of uncus; (23 –) anellus without posteromedian extension; (24 +) spines or sclerotized rod absent in vesica. *Female genitalia*. (25 +) median point of attachment of apophyses posteriores to papillae anales; (26 +) length of ductus bursae shorter than wide; (27 –) length of corpus bursae less than twice as long as apophyses posteriores; (28 –) striations on posterior of corpus bursae absent; (29 –) shape of corpus bursae elongate/elliptical; (30 +/-) signum present/absent; (31 –) signum (when present) irregularly shaped, partially dentate; (32 –) shape of signum inside corpus bursae, flat, on surface only.

Biology. Unknown. Adults in June–August.

Distribution. Above 8000' (2440 m), Chiricahua Mtns., Cochise Co., Arizona; Durango, Mexico.

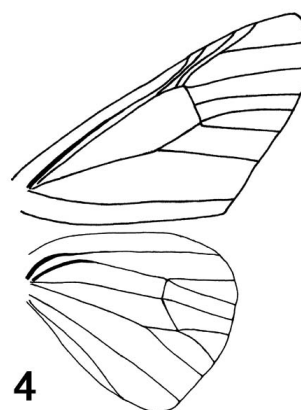


FIG. 4. Wing venation in *Chiricahua* from male paratype of *C. lichenaria*.

Etymology. The generic name is that of a mountain (*Chiricahua* means “Great Mountain”) and an Indian tribe in Arizona; the gender is masculine.

Discussion. Consideration of its overall characters places *Chiricahua* in Rindge's Group I. Descriptions of the two species assigned to this genus follow.

Chiricahua lichenaria Ferris, new species

(Figs. 5–12)

Diagnosis. Its overall brown color, mottled appearance, and dorsal thorax mossy green scaling separate *Chiricahua lichenaria* from the sharply contrasting dark gray-brown and white pattern of its congener *C. multidentata*. In the male genitalia, the teeth on the dorsal surface of the gnathos are small and extend from about mid-length to the tip in *C. lichenaria* (Fig. 11); in *C. multidentata* the teeth are large and restricted to the area of the tip (Fig. 16). In the female genitalia of *C. lichenaria* there is a small signum in the corpus bursae that is absent in *C. multidentata*.

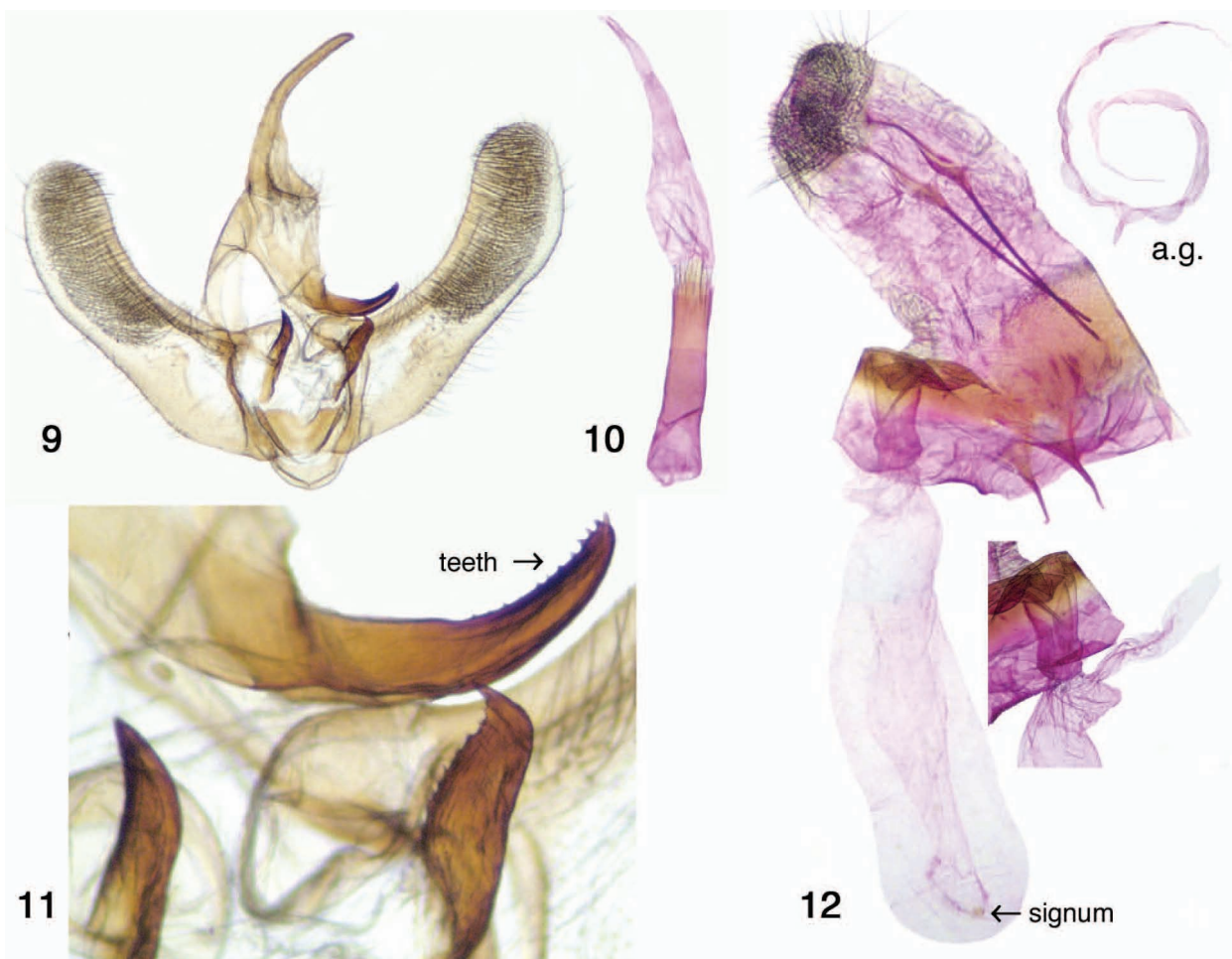
Description. As for the genus in general. *Head*. Antennae brown, dentate in males, filiform in females; front flat; eyes of normal size, elliptical (long axis vertical); labial palpi porrect and relatively short (length about that of eye vertical axis) with mixed dark brown and paler scales, ventral circle of whitish scales immediately behind head. *Thorax*. Anterior brown collar, then mixed mossy-green, brown, and paler scales dorsally, ventrally mostly brown scales with many hair-like long scales. Legs with alternating brown and whitish rings; one pair of hind-tibial spurs. *Abdomen*. Clothed with brown scales dorsally and ventrally. *Wings*. Male (FWL = 17–18 mm, n = 2). Ground color brown; dorsal forewing irregular dark brown AM line with pale shading basad; median area slightly paler brown than basal region; irregular dark brown PM line with distal narrow pale shading mid-wing, expanding into prominent mottled pale patches at costa and inner margin; fringe checkered brown and whitish; dark brown linear discal spot; overall scattered peppering of single or two conjoined dark brown scales. Dorsal hindwing uniformly brown, slightly paler basad; fringe checkered brown and

white. Ventrally both wings uniformly brown; PM line and discal spot repeated on forewing; hindwing with narrow irregular dark brown median band. Female (FWL = 23–26 mm, $n = 2$). Dorsal forewing similar to males, but ground color slightly paler with expanded pale areas; discal spot obscured by smeary patch of brown scales. Ventral hindwing with “print though” of dorsal maculation. Dorsal and ventral hindwing uniformly brown with broad irregular darker brown median band. Fringes as in males. *Male genitalia*. As for the genus in general. Uncus long, slender, tapers to a point; pad-like socius with long slender hairs; medially-pointed and recurved gnathos v-shaped, with small teeth on dorsal surface near tip; valves simple, broad with sclerotized costa; two robust sclerotized anellus processes, with teeth dorsally near tips; aedeagus tubular, membranous vesica without sclerotization, slightly swollen about mid-length. *Female genitalia*. As for genus in general. Posterior apophyses ca. 4.7× length of anterior apophyses; ductus seminalis originates from small diverticulum at top of corpus bursae; corpus bursae long, of nearly uniform diameter expanding slightly toward fundus; small weakly sclerotized roughly circular signum with five scat-

tered insignificant surface projections and irregular margin just above fundus.

Types. Holotype male (Figs. 5, 9–11): Arizona, Cochise Co., Rustler Park [Chiricahua Mtns.], 6 August, 1991, R. & J. K. Robertson. Deposited in American Museum of Natural History [AMNH], New York, NY. Paratypes (Figs. 6–8): 1♂, same locality as holotype, 21.vii.1985, R. Robertson; 2♀, same data as holotype. The paratypes are in the author's collection.

Additional Material. Following the initial submission of this paper, I received a photograph of an unspread female specimen in the Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Canada. It was collected by J. E. H. Martin at 9000' (2745m) 10 mi. west of El Salto, Durango, Mexico on 11 August, 1964. I have not included this specimen in the type series since I examined it by color photograph only.



FIGS. 9–12. *Chiricahua lichenaria* genitalia. 9–11, male genitalia: 9, genitalia, aedeagus removed; 10, aedeagus with vesica everted; 11, lower part of gnathos and anellus processes. 12, lateral images female genitalia (accessory glands removed); insets show: diverticulum and ductus seminalis viewed from opposing side; accessory glands (a.g.) at much reduced magnification.

Biology. Unknown.

Distribution. Known from the type locality and vic. El Salto, Durango, Mexico.

Etymology. The name *lichenaria* (adjective) reflects the lichenous pattern of the forewings.

***Chiricahua multidentata* Guedet. new status**
(Figs. 13–18)

Amphidasis multidentata Guedet, 1941, Pan-Pacific Entomol. 17(4), pp. 191–192.

Biston multidentata Rindge, 1975.

Diagnosis. Males of *Chiricahua multidentata* are recognized by their dentate antennae, thus separating them from similar-looking *Biston* species. The sharply contrasting dark gray-brown and white wing pattern and brown and white banded dorsal thorax separates *multidentata* from its sombre mottled brown congener *lichenaria*. In the male genitalia, the teeth on the dorsal surface of the gnathos are large and restricted to the tip in *C. multidentata*; in *C. lichenaria* the teeth are small and extend from about mid-length to the tip. In the female genitalia, the small signum seen in *C. lichenaria* is absent in *C. multidentata*.

Comment. Both Guedet (1941) and Rindge (1975) provided descriptions of the external morphology of the female of this species. Rindge illustrated the female adult and genitalia, and provided a detailed description of the latter. The male was unknown, and is now described along with a brief description of the female.

Description. Male, as for genus in general. *Head.* Antennae dentate, checkered brown and pale gray; eyes of normal size, elliptical (long axis vertical); labial palpi porrect and relatively short (length about that of eye vertical axis) with mixed dark brown and paler scales; tuft of white scales between eyes; collar dark brown. *Thorax.* Ventral with mixture of long mixed brown hair-like scales; dorsal with three broad white axial bands separated by two narrow dark brown bands, outer bands edged in dark brown, midthoracic brown and white scale tuft. Legs with alternating brown and whitish rings; one pair of hind-tibial spurs. *Abdomen.* Clothed with pale gray-brown scales dorsally and ventrally, except last two terminal segments dark brown. *Wings* (FWL = 13–15 mm, n = 3). Dorsal forewing ground color white, sprinkled lightly with brown scales; irregular bold dark brown AM band; median area more heavily brown irrorated than basal area; discal spot a narrow dark brown vertical line; PM line irregular, very dark brown, inwardly brown shaded from costa to below discal spot; marginal area white with slight brown irroration; broad brown marginal band interrupted at middle by broad white intrusion. Dorsal hindwing white, heavily irrorated by brown scales; narrow broken irregular median band; checkered brown and white fringes, both wings. Dorsal wing pattern repeated ventrad. Female (FWL = 17–19 mm, n = 5). Wings and body virtually identical in color and maculation to males; dorsal forewing median band slightly paler than in males. *Male genitalia.* As for the genus in general. Uncus long, slender, tapers to a point; pad-like socius with long slender hairs; medially-pointed and recurved gnathos v-shaped, with well-developed teeth on dorsal surface at tip; valves simple, broad with sclerotized costa; two sclerotized anellus processes, pointed at tips;

aedeagus tubular with rod-like process originating at mid-length and extending beyond apex; membranous conical vesica without sclerotization. *Female genitalia.* As for genus in general. Posterior apophyses ca. 2.6× length of anterior apophyses; ductus seminalis originates from small diverticulum at top of corpus bursae; corpus bursae long, of nearly uniform diameter expanding into a bulb toward fundus; signum absent.

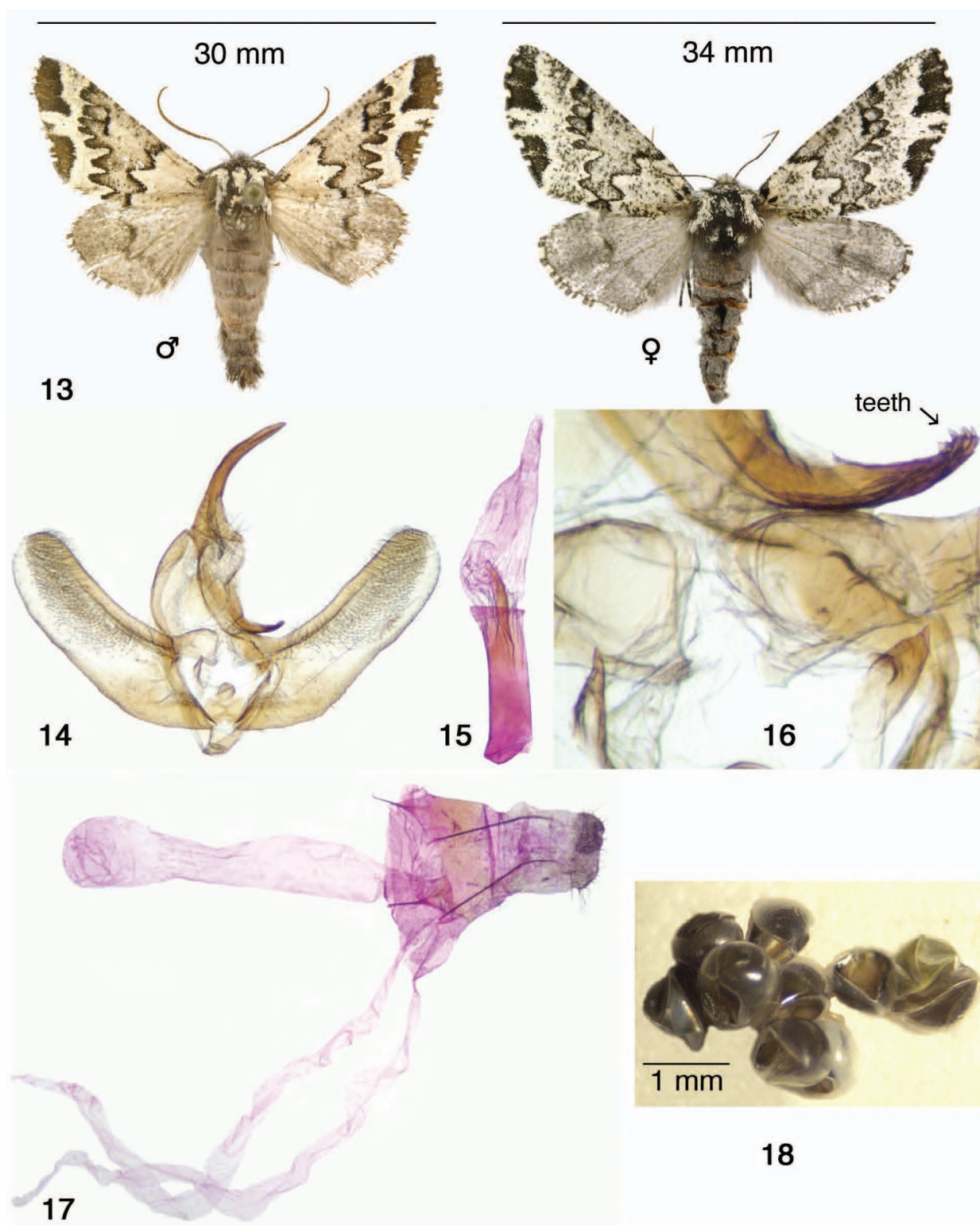
Types. Holotype and two paratypes deposited in California Academy of Sciences, San Francisco, CA. Holotype female, type No. 5206. Type locality: Fly [*sic*] Peak, Chiricahua Mountains, Cochise County, Arizona, 9000–9300 feet [2745–2837m], July 30, 1927, collected by J. A. Kusche. Two female paratypes, same locality on 28 July, 1927.

Additional Material Studied. In addition to the three females in the type series, a fourth female from the type locality was collected by R. F. Sternitzky on 17 June, 1974 and is in the American Museum of Natural History, New York. A fifth female (abdomen missing) collected by W. C. McGuffin 10 miles west of El Salto, Durango Mexico, 9000' (2745m), 10 August, 1964 is in the Canadian National Collection of Insects, Arachnids, and Nematodes (CNC). The male specimen described herein is one of two collected in Rustler Park, 8500' (2590m) on 27 July, 1998 by Ron Leuschner and K. Richers. Until June, 2009, *C. multidentata* was known only from 2 males and 5 females with collection dates spanning from 1927 to 1974. On the night of 13 June, 2009, John Palting (Tucson, AZ) collected eleven fresh males in Long Park, 9160' (2794m), Chiricahua Mtns., Cochise Co., AZ at mercury vapor light, and on the night of 17 July, 2009 three additional males and five females. J. B. Walsh (Tucson, AZ) collected a fresh male at mercury vapor light in Long Park on the night of 16 June, 2009. Thus in 2009, fifteen males and five females of *C. multidentata* were collected with now seventeen males and ten females known for this species. Long Park is the trailhead for the Flys Peak trail. I visited Long Park on the night of 29 July, 2009, and although the weather conditions were very favorable for moth collecting, no *C. multidentata* were found, nor was *C. lichenaria*.

Biology. Unknown. One of the females collected by John Palting deposited black eggs on a pine stem after being offered a suite of plants that included alder, aspen, *Spirea*, maple, spruce and pine. The eggs (Fig. 18) failed to hatch.

Distribution. Known from the Chiricahua Mtns., Cochise Co., Arizona, and Durango, Mexico.

Discussion. Based upon current evidence, both species of *Chiricahua* are uncommon (with collection dates spanning from 1927 to 2009). To my knowledge, the only specimens existing in collections are the thirty-two mentioned herein. Flys Peak lies in the Chiricahua Wilderness Area with the only access by foot or possibly horseback, which accounts for few visits by collectors.



FIGS. 13–18. *Chiricahua multidentata*. **13**, adults (before dissection; male slightly faded, Rustler Park, 27.vii.1998; female, Long Park, 17.vii.2009). **14–16**, male genitalia: **14**, genitalia, aedeagus removed; **15**, aedeagus with vesica everted; **16**, lower part of gnathos and anellus processes. **17**, female genitalia (ventro-lateral view) showing the two large accessory glands, ductus seminalis obscured by overlying tissue. **18**, eggs.

Long Park is accessible by a high-clearance 4x4 vehicle over a primitive trail. On the other hand, Rustler Park is a popular camping and collecting area with good road access and regular visits by collectors. The lack of viable mouth parts suggests that the adult moths have short lives. The collection dates are during the monsoonal rain period, the start of which can vary by several weeks annually. One might infer that adult emergence is triggered by rain and that individual moths then fly during a few nights only. June 2009 was unusually wet in SE Arizona. The cryptic pattern of *Chiricahua multidentata* suggests that adults may roost on the bark of Aspens. The somber and mottled pattern of *C. lichenaria* suggests the roosting substrate to be lichen-covered dark tree trunks or perhaps lichen-covered boulders. It's possible that the Chiricahua Mtns. represent the northern range limit of these two species, and that they are more abundant in montane areas yet to be explored in Mexico. It is interesting to note that one specimen each of both species was taken a night apart at the same locality in Durango, Mexico.

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