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## REVIEW OF *REBINEA* RAZOWSKI AND *ELIACHNA* RAZOWSKI (TORTRICIDAE: EULIINI)— SISTER GROUPS ENDEMIC TO CHILE AND ARGENTINA

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**ABSTRACT.** *Rebinea* Razowski and *Eliachna* Razowski, two formerly monotypic genera known only from males, are redescribed based on large series of specimens ( $n = 320$ ) including both sexes. As presently defined, *Rebinea* is monotypic, with a single variable species, *R. erebina* (Butler, 1883), and its synonym, *Arotrophora balsamodes* Meyrick, 1931. It is possible that two (or more) species are concealed within the variation, but we were unable to separate them using traditional morphological characters. *Eliachna* is represented by three species: *E. chiliana* Razowski, 1999, *E. digitana* Brown and McPherson, new species, and *E. hemicordata* Brown and McPherson, new species. Both genera are restricted to south-central Chile and southwestern Argentina, ranging from coastal lowlands (5 m) to middle elevations (1200–1700 m) at the southern end of the Andes. A phylogenetic analysis of the four species (plus two out-group species) provides support for the sister relationship of *Rebinea* and *Eliachna* based on the following synapomorphies: (1) elongate labial palpi (length 3–4 times horizontal diameter of the compound eye); (2) a pair of stout, digitate, submedial processes on the dorsum of the transtilla; (3) a deep, rounded excavation near the mid-venter of the valva; and (4) a pair of semicircular, lateral flanges from the posterior edge of the sterigma.

**Additional key words:** new species, genitalia, phylogenetics, leafrollers.

The tortricid fauna of Chile and Andean Argentina is distinct from that of the remainder of South America, comprised primarily of endemic, or nearly endemic genera (e.g., *Accuminulia* Brown, *Acmanthina* Brown, *Argentulia* Brown, *Chapoania* Razowski, *Chileulia* Powell, *Eliachna* Razowski, *Haemateulia* Razowski, *Nesochoris* Clarke, *Proeulia* Clarke, *Rebinea* Razowski, *Recintonia* Razowski, *Varifula* Razowski). Although the contributions of Razowski (1995, 1999) and Brown (1998, 2000a, b) have added substantially to our knowledge of Euliini of this region, phylogenetic relationships among genera of the tribe are unresolved and many species remain undescribed. Prior to this study, *Rebinea* and *Eliachna* were considered monotypic, known only from a handful of males. The discovery of additional specimens of the two genera, including both sexes, reveals a close phylogenetic relationship between them and the presence of two new species. The purposes of this paper are to redescribe

*Rebinea* and *Eliachna* based on new information, describe two new species of *Eliachna*, provide data on the geographic distribution of the included species, and examine the phylogenetic relationship between the two genera.

### MATERIALS AND METHODS

We examined 320 pinned adults of *Rebinea* and *Eliachna* deposited in the following institutions: American Museum of Natural History, New York, New York, U.S.A. (AMNH); The Natural History Museum, London, England (BMNH); Mississippi Entomological Museum, Mississippi State, Mississippi, U.S.A. (MEM); Essig Museum of Entomology, University of California, Berkeley, California, U.S.A. (UCB); National Museum of Natural History, Smithsonian Institution, Washington, D.C., U.S.A. (USNM); and Zoological Museum, Copenhagen, Denmark (ZMC). Specimens were sorted by forewing pattern, geo-

graphic location, and sex. The resulting groups then were examined for differences in male and female genitalia, which have been shown to provide the most reliable morphological features for distinguishing among related species of Tortricidae. Preparation of genitalia slides followed the methodology summarized in Brown and Powell (1991). Because of the phenotypic similarity of, and variation within the treated species, we examined the genitalia of all male specimens. For undissected specimens, we used a fine camel-hair brush to remove scales from the external margin of one valva, which provided enough detail to convincingly assign all males to a species-level taxon. Specimens were examined using a Wild M3Z dissecting microscope; slide mounted genitalia were studied using the dissecting microscope and a Zeiss compound microscope. Illustrations of genitalia were drawn with the aid of a Ken-A-Vision microprojector (model X1000-1). Unless indicated otherwise, genitalia illustrations are of a single preparation. Text descriptions of all characters are composite, based on all available specimens. Measurements of forewing and labial palpi were made with an ocular micrometer mounted in a Wild M3Z dissecting microscope under low power ( $\times 10$ – $16$ ). Forewing length was measured in a straight line from the base to the apex of the wing, including the fringe. Forewing width was measured at the widest place perpendicular to the length measurement. Where available, a minimum of 15 individuals of each sex were measured. Colors follow Ridgway (1912); terminology for wing venation and genitalia structures follows Horak (1984). Abbreviations and symbols are as follows: DC = discal cell; ca. = circa (approximately); n = number of individuals examined;  $\bar{x}$  = mean; N, E, S, W = compass points.

Polymorphism or moderate variation in phenotype is uncommon to rare in most Euliini. However, many euliine species in Chile and Argentina (e.g., *Chileulia*, *Proeulia*, *Haemateulia*), including the two genera treated here, are variable in forewing pattern and maculation. Consequently, examination of the genitalia is the only reliable method for accurately identifying species. Comparison with the illustrations provided is highly recommended. For males, the profile of a single valva is adequate; females must be dissected.

#### SYSTEMATICS

##### *Rebinea* Razowski, 1986

*Rebinea* Razowski, 1986:22; Powell et al., 1995:145; Razowski, 1999:84.

Type species. *Sericoris erebina* Butler, 1883:72, by original designation.

**Diagnosis.** Adults of *Rebinea* are superficially and morphologically most similar to those of *Eliachna* among described Euliini genera. The two share a similar forewing shape, size, and pattern; extremely elongate labial palpi (3–4 times horizontal diameter of the compound eye); a pair of stout, digitate, submedial processes from the dorsum of the transtilla; a deep, rounded excavation near the mid-venter of the valva; and a pair of semicircular, lateral flanges at the posterior edge of the sterigma. Superficially, males of many *Rebinea* can be distinguished from *Eliachna* by their slightly longer forewings and paler ground color. Genitalia characters that distinguish *Rebinea* from *Eliachna* include its broad, straight aedeagus, with a single, large, compound conutus; the absence of an elongate, free process at the distal end of the sacculus; and an extremely short, broad ductus bursae.

**Redescription.** Head: Antennal cilia approximately 1.5 times width of flagellomere in male; cilia short, unmodified in female. Labial palpus porrect, 3–4 times horizontal diameter of eye in both sexes (i.e., without dimorphism). Vertex with overhanging tuft of scales. Proboscis present, presumably functional. Ocellus moderately large. Chaetosema present. Thorax: Smooth scaled. Male without foreleg hairpencil. Forewing (Figs. 5, 9): Length 2.3–2.6 times width; length of DC ca. 0.6 times forewing length; width of DC ca. 0.2 times DC length;  $CuA_2$  originates 0.6–0.7 along DC length; all veins separate beyond DC; chorda and M-stem absent;  $CuP$  weak, present only at margin. No upraised scale tufts; male without costal fold. Hindwing:  $Sc + R$  and  $Rs$  closely approximate at base;  $Rs$  and  $M_1$  stalked;  $M_3$  and  $CuA_1$  connate or short-stalked;  $CuP$  present; M-stem absent; tuft of hairlike scales at base of  $1A + 2A$  in both sexes. Abdomen: Smooth scaled; dorsal pits absent; no modified corethrogynous scaling in female. Male genitalia (Fig. 10): Uncus short, moderately stout, curved, strongly sclerotized; socius moderately short, hairy, drooping, slightly expanded distally; gnathos arms slender, with a delicate terminal plate; transtilla a transverse band with a pair of stout, digitate, submedial processes on dorsum, sometimes with tips slightly expanded; valva broad at base, with deep, rounded excavation near mid-venter; sacculus restricted to basal portion of valva, strongly sclerotized, ending in short, dorsal-projecting hook; pulvinus absent; vinculum well developed, strongly sclerotized; juxta large, stout arrowhead-shaped. Aedeagus large, straight, with a single large, compound, capitate cornutus, consisting of several fused filaments; vesica finely spiculate. Female genitalia (Fig. 14): Apophyses anteriores and posteriores moderate in length, slender. Sterigma relatively broad, with narrow, shallowly U-shaped, sclerotized band and a pair of semicircular lateral flanges from posterior edge. Ductus bursae extremely short, broad, with a short membranous region immediately anterad of antrum; a frail, obovate, accessory bursa from a moderately long ductus originating from dorsum of corpus bursae in posterior one-third; corpus bursae moderately large, ovoid, with dense spiculae and a large, irregularly rounded, sclerotized plate, usually along lateral wall.

**Distribution and biology.** *Rebinea* is known from Chile and Argentina between about 30° and 45°S latitude, ranging from the coastal lowlands (50 m) to the middle elevations (1400 m) of the southern Andes (Fig. 1). Collecting localities seem to have little in common in terms of habitat type, ranging from

*Nothofagus* forest (e.g., Alto Tregualemu) to xeric areas dominated by succulents and leguminous trees (e.g., Nague, Los Vilos) (see Davis 1986 for descriptions of the habitat at many of the collecting localities listed below). Adults have been captured primarily in October (n = 16), November (n = 118), and December (n = 95), with a few specimens recorded from January through March. The early stages are unknown.

**Remarks.** Razowski (1986) included two species in *Rebinea*: *R. erebina* (Butler) and *R. balsamodes* (Meyrick). Powell et al. (1995) synonymized the two without explanation. Although the types of the two nominal taxa are fairly distinct in forewing size and facies, they have extremely similar genitalia. The abundance of material now available from Chile and Argentina suggests that the two probably represent forms of an extremely variable species. Alternatively, there may be more than one species concealed within this variation (see discussion below).

*Rebinea erebina* (Butler, 1883)  
(Figs. 1, 5, 9, 10, 14)

*Sericoris erebina* Butler, 1883:72.

*Arotrophora balsamodes* Meyrick, 1931:381; Clarke, 1963:8 [illustration of adult and male genitalia].

*Rebinea balsamodes*: Razowski, 1986:22.

*Rebinea erebina*: Razowski, 1986:22 [illustration of male genitalia]; Powell et al., 1995:145; Razowski, 1999:84.

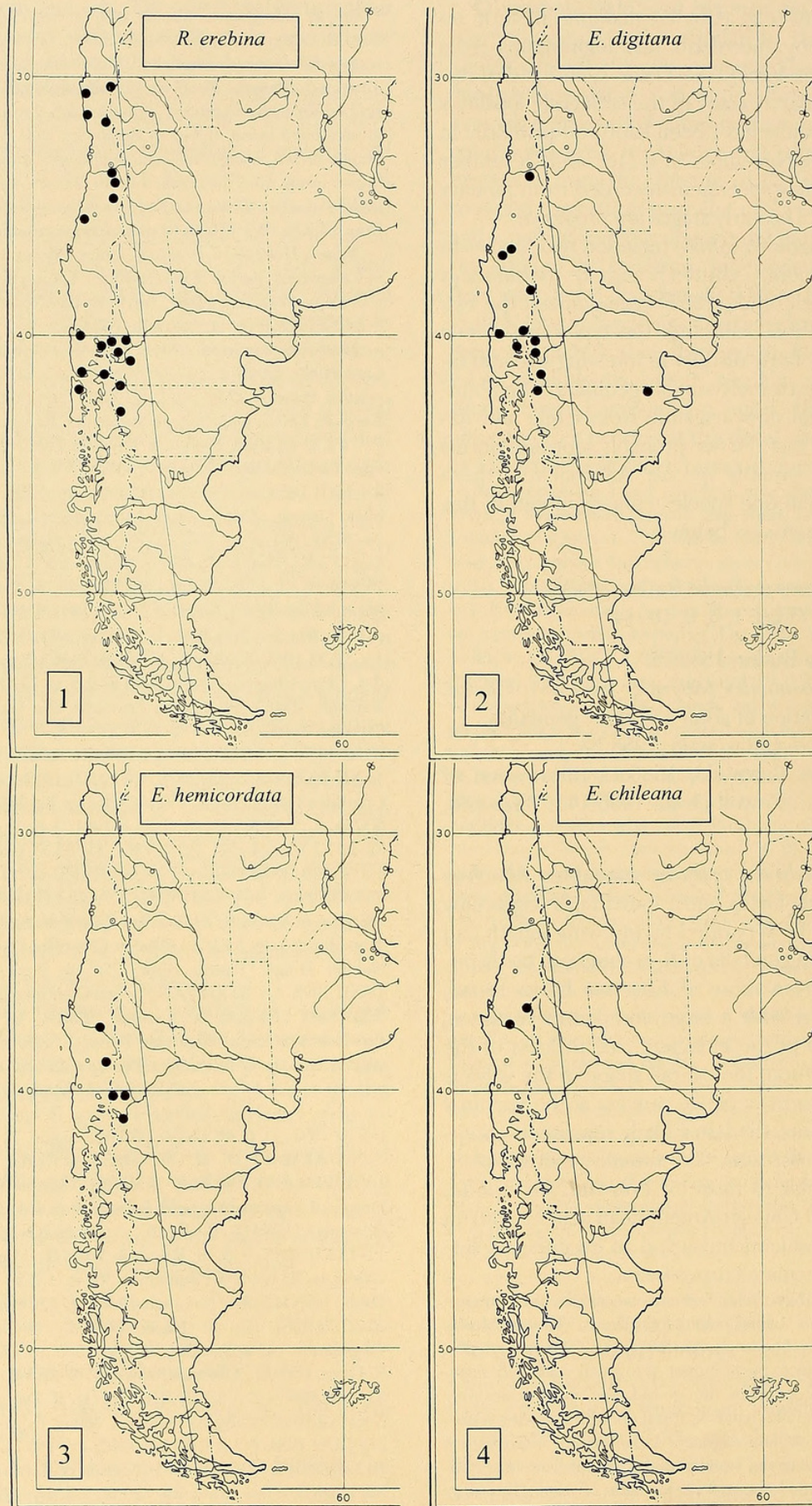
**Diagnosis.** *Rebinea erebina* resembles *Eliachna* species in general facies; most individuals (especially females) cannot be separated by forewing length and pattern. The male genitalia of *R. erebina* can be distinguished easily from those of *Eliachna* by its broad, straight aedeagus with a large compound cornutus, and the absence of the elongate, free process of the sacculus. In addition, the overall shape of the valva is distinct, with a short hooklike process at the terminal end of the sacculus; the latter likely represents an autapomorphy for *Rebinea*. The female genitalia of *R. erebina* are similar to those of *Proeulia*, *Argentulia*, and other related Chilean-Argentinean genera, with an extremely broad ductus bursa and an irregularly sclerotized, highly spiculate corpus bursa.

**Redescription.** Male. Head: Lower frons pale tan to cream; upper frons gray brown. Labial palpus light brown. Thorax: Mostly brown. Forewing (Fig. 5): Length 6.6–8.8 mm ( $\bar{x}$  = 7.9 mm; n = 25); ground color pale gray to burnt umber, with small, scattered, indistinct patches of orange-brown, orange-red, and cream scales; frequently with faint, parallel bands in distal one-third of wing represented by series of slightly disjunct, darker scales; often with a variably developed, diagonal fascia of darker brown from near midcosta to dorsum, angled outward near middle of wing. Hindwing:

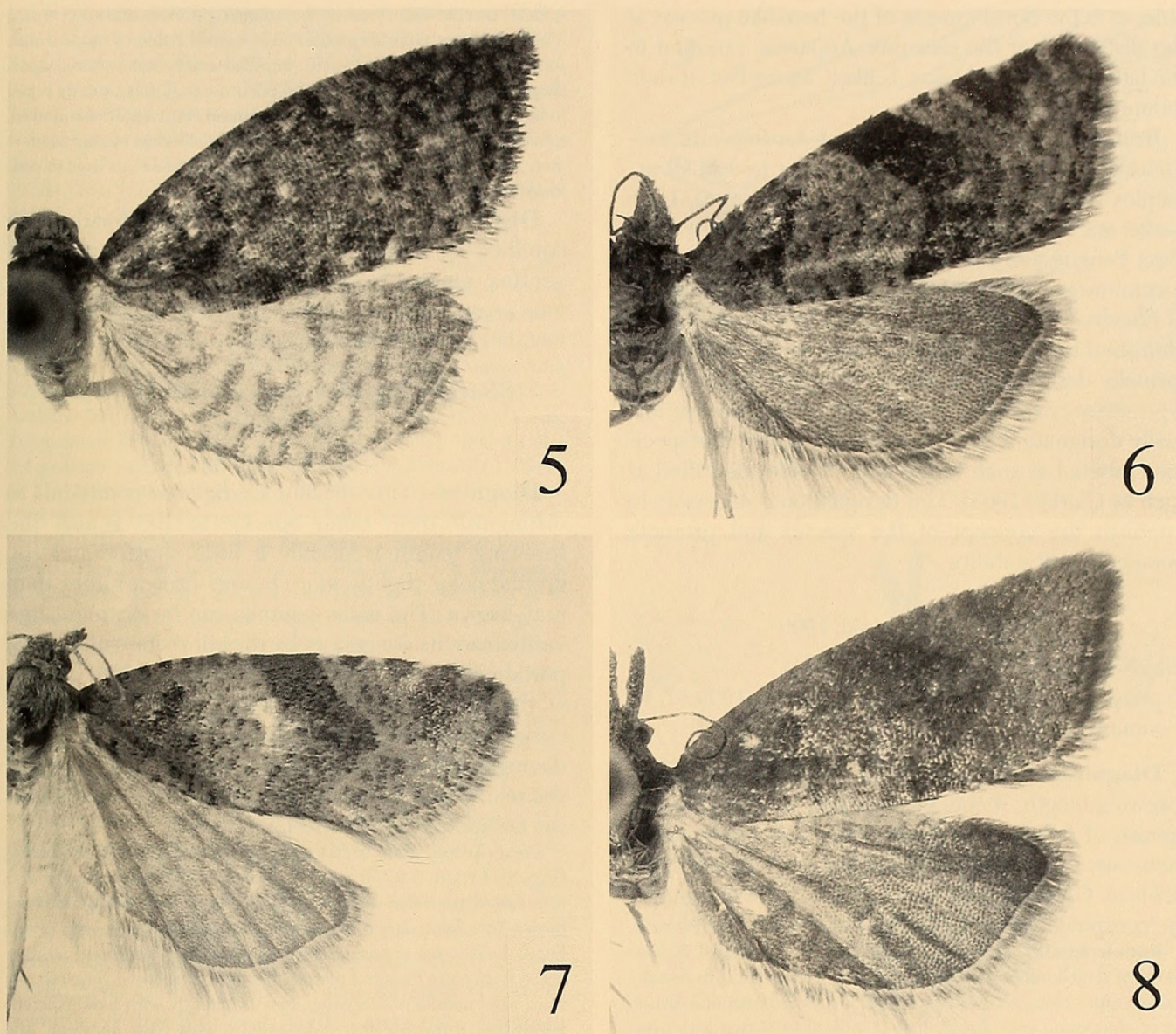
White to pale brown, usually with brownish-gray mottling. Abdomen: Pale yellow brown to dark brown. Genitalia (Fig. 10): As described for genus (drawn from USNM slide 90383; 15 preparations examined). Female. Head, thorax, and abdomen: Essentially as described for male. Forewing: Length 6.2–8.2 mm ( $\bar{x}$  = 7.4; n = 15); ground color burnt umber to cinnamon, with indistinct patches of orange-brown, orange-red, and cream scales; a variably defined, red-brown fascia from near midcosta to dorsum, angled outward near middle of wing. Genitalia (Fig. 14): As described for genus (drawn from USNM slide 81239; 10 preparations examined).

**Types.** Holotype ♂ (*erebina*), Chile, [Mountains of the hacienda of Cauquenes, Butler 1883] (BMNH). Lectotype (new designation) ♂ (*balsamodes*), Argentina, Territory Río Negro, Lake Gutierrez, 3–14.XI.1926 (F. & M. Edwards, BMNH).

**Material examined.** ARGENTINA: Chubut Province: El Bolsón, Lago Puelo, 220 m, 2 ♂, 17.XI.1978, 1 ♂, 2 ♀, 21.XI.1978 (Misión Científica Danesa, ZMC), 1 ♀, 22.X.81, 3 ♀, 23.X.1981 (Nielsen & Karsholt, ZMC); Esquel, Lago Menéndez, El Sagrario Puerto, 600 m, 1 ♂, 1 ♀, 2–4.I.1982 (Nielsen & Karsholt, ZMC). Neuquén Province: Lago Lacar, Pucará, 750 m, 4 ♀, 10.XI.1978, 2 ♂, 2 ♀, 25.XI.1978, 5 ♂, 2 ♀, 1.XII.1978, 3 ♂, 7 ♀, 2.XII.1978, 5 ♂, 3 ♀, 3.XII.1978 (Misión Científica Danesa, ZMC); Lago Lacar, Pucará, 600 m, 21 ♂, 3 ♀, 28–29.XI.1981, 1 ♂, 1 ♀, 26–27.XII.1981 (Nielsen & Karsholt, ZMC); Lago Lacar, 5 km E Hua-Hum, 640 m, 2 ♂, 3 ♀, 6.XI.1981, 2 ♂, 1 ♀, 25.XI.1981, 1 ♀, 26–27.XII.1981 (Nielsen & Karsholt, ZMC); San Martín de los Andes, 640 m, 1 ♂, 14.X.1981, 1 ♂, 1 ♀, 17–31.X.1981, 4 ♂, 16.X.1981, 3 ♂, 2.XI.1981, 1 ♀, 5–6.XI.1981, 3 ♂, 6 ♀, 7–15.XI.1981, 1 ♀, 26.XI.1981 (Nielsen & Karsholt, ZMC); San Martín de los Andes, Cerro Chapelco, 1400–1600 m, 2 ♂, 2–19.XII.1981 (Nielsen & Karsholt, ZMC). Río Negro Province: San Carlos de Bariloche, Colonia Suiza, 810 m, 1 ♀, 6.XI.1978, 1 ♂, 15.XI.1978, 3 ♀, 28.XI.1978, 3 ♂, 29.XI.1978, 1 ♀, 4.XII.1978, 1 ♀, 5.XII.1978, 3 ♀, 11.XII.1978, 1 ♂, 12.XII.1978, 1 ♂, 15.XII.1978, 1 ♀, 9.I.1979 (Misión Científica Danesa, ZMC); San Carlos de Bariloche, Colonia Suiza, 800 m, 1 ♂, 26.X.1981, 1 ♂, 31.X.1981, 1 ♂, 11.XI.1981, 2 ♂, 1 ♀, 12–20.XI.1981, 4 ♂, 21–22.XI.1981, 1 ♀, 23.XI.1981, 1 ♂, 24.XI.1981, 1 ♂, 2 ♀, 29–30.XI.1981, 2 ♂, 3 ♀, 3.XII.1981, 2 ♂, 1 ♀, 5–6.XII.1981, 1 ♂, 7.XII.1981, 1 ♂, 8.XII.1981, 1 ♀, 22.XII.1981, 1 ♀, 5–7.I.1982 (Nielsen & Karsholt, ZMC); San Carlos de Bariloche, Camino de Tronador, 2 ♀, 29.XI.1978 (Misión Científica Danesa, ZMC); Lago Nahuel Huapi, Puerto Blest, 770 m, 1 ♂, 27.XI.1978, 1 ♀, 18.XII.1978, 1 ♂, 30.XII.1978 (Misión Científica Danesa, ZMC), 1 ♂, 3.XII.1981 (Nielsen & Karsholt, ZMC). CHILE: Aconcagua Province: Los Andes, Curimon, 700 m, 1 ♂, 28.III.1979 (Misión Científica Danesa, ZMC). Chiloé Province: Puntra, ca. 30 air km S Ancud, 50 m, 1 ♂, 1 ♀, 21–22.XII.1981 (D. Davis, USNM). Coquimbo Province: Fray Jorge National Park, ca. 70 km W Ovalle, 4 ♂, 2 ♀, 6–9.XI.1981 (D. & M. Davis, USNM); Nague, 11 km N Los Vilos, 1 ♂, 4–5.XI.1981 (D. & M. Davis, USNM); Coquimbo, 1 ♀, 1.VII–19.X.1883, "Walker" (BMNH). Llanquihue Province: Casa Pangué, 1 ♀ (paralectotype of *balsamodes*), 4–10.XII.1926 (F. & M. Edwards, USNM); Peulla, 1 ♀ (paralectotype of *balsamodes*), 12–13.XII.1926 (F. & M. Edwards, BMNH). Maule Province: Paso García, ca. 23 km NW Cauquenes, 300 m, 1 ♀, 29–30.XI.1981 (D. R. Davis, USNM); Río Teno, ca. 40 km E Curico, 800 m, 1 ♂, 1 ♀, 25–27.XI.1981 (D. R. Davis, USNM). Ñuble Province: Alto Tregualemu, ca. 20 km SE Chovellen, 500 m, 5 ♀, 1–3.XII.1981 (D. R. Davis, USNM). Osorno Province: P. N. Puyehue, Ag. Calientes to 3 km W, 600 m, 2 ♂, 12–20.XII.1981 (D. R. Davis, USNM); Parque Nacional Puyehue, Aguas Calientes, 450 m, 6 ♂, 1 ♀, 12.XI.1981, 1 ♂, 2 ♀, 13.XI.1981, 6 ♂, 5 ♀, 10.XII.1981, 4 ♂, 1 ♀, 11.XII.1981, 1 ♂, 6 ♀, 12.XII.1981, 2 ♀, 13.XII.1981 (Nielsen & Karsholt, ZMC); Parque Nacional Puyehue, Anticura, 350 m, 2 ♂, 2 ♀, 17.XI.1981, 2 ♂, 2 ♀,



FIGS. 1-4. Geographic distribution of *Rebinea* and *Eliachna*. 1, *R. erebina*; 2, *E. digitana*, new species; 3, *E. hemicordata*, new species; 4, *E. chilleana*.



FIGS. 5–8. Adults of *Rebinea* and *Eliachna*. 5, *R. erebina*; 6, *E. chilleana*; 7, *E. hemicordata*, new species; 8, *E. digitana*, new species.

18.XI.1981, 2 ♀, 19.XI.1981, 1 ♀, 15.XII.1981, 3 ♀, 17.XII.1981, 1 ♀, 18.XII.1981 (Nielsen & Karsholt, ZMC). Santiago Province: Los Maitenes, Colorado River, 33°22'S, 70°17'W, 1200–1400 m, 2 ♂, 16.X.1954 (L. Peña, USNM); Pilay, Río Puelco, ca. 45 km S Santiago, 800 m, 1 ♂, 23–24.XI.1981 (D. R. Davis, USNM). Valdivia Province: 20 km S Valdivia, Rincon de la Piedra, 180 m, 2 ♀, 14.XI.1981, 1 ♂, 3 ♀, 15.XI.1981 (Nielsen & Karsholt, ZMC). Valparaiso Province: Valparaiso, 1 ♂, 30.IX–8.X.1883, "Walker 3074" (BMNH). Unknown Province: Central Austral, 2 ♂, I–III.1898 (V. Izquierdo, USNM).

**Discussion.** *Rebinea erebina* is either a single, highly variable species or two (or more) extremely similar species that cannot be separated reliably using traditional morphological characters. At one extreme are specimens with a large forewing length (7.3–8.8 mm), a pale (gray to beige) forewing ground color, a poorly defined forewing pattern, and a pale hindwing, usually mottled with gray brown (similar to the type of *ere-*

*bina*). Although a majority of the specimens of this phenotype are males, a few females approach this general aspect. At the other extreme are specimens with a shorter forewing length (6.6–7.7 mm), a darker (red brown to brown) forewing ground color, and a more uniformly dark hindwing (similar to the type of *balsamodes*). Although this phenotype is typical of females, some males approach this aspect (see Clarke 1963). Male genitalia are only slightly variable among all the specimens examined ( $n > 100$ ), and the variation is concordant with neither differences in facies, forewing length, nor geographic distribution. In some male specimens, the distal end of the venter of the valva is somewhat pointed and slightly reflexed, while in others it is somewhat rounded. The width of the paired processes from the transtilla is somewhat vari-

able, as is the development of the hooklike process at the distal end of the sacculus. Apparent variation in the latter feature, however, is likely an artifact of slide mounting of genitalia.

**Remarks.** In his description of *Arotrophora balsamodes*, Meyrick (1931) indicated that he had six examples from "Argentina, Territory Rio Negro, Lake Gutierrez, November; S. Chile, Llanquihue Province, Casa Pangué and Peulla, December." Three of these specimens are in the BMNH, one of which is a female of *Eliachna*; one specimen is in USNM. Clarke (1963) identified the male from Argentina as "type" without formally designating it as the lectotype. Because the type series consists of more than one species, we formally designate a lectotype, and we select the specimen labeled as such in the BMNH and identified as such by Clarke (1963). This designation is necessary to establish the concept of the species and promote nomenclatural stability.

*Eliachna* Razowski, 1999

*Eliachna* Razowski 1999:87.

Type species. *Eliachna chileana* Razowski 1999:87, by monotypy.

**Diagnosis.** *Eliachna* is most similar to *Rebinea* in forewing length, shape, pattern, and venation (see diagnosis of *Rebinea* above for details), and most specimens are difficult to distinguish superficially from *Rebinea*. Genitalic differences between the two genera are conspicuous and are detailed above under *Rebinea*.

**Redescription.** Head: Antennal cilia approximately 1.5 times width of flagellomere in male; cilia short, unmodified in female. Labial palpus elongate, porrect, length 3–4 times horizontal diameter of compound eye, slightly longer in female. Vertex with overhanging tuft of scales. Proboscis present, presumably functional. Ocellus moderately large. Chaetosema present. Thorax: Smooth scaled. Legs unmodified, male without foreleg hairpencil. Forewing (Figs. 6–8): Length ca. 2.4 times width; length of DC ca. 0.6 times forewing length; width of DC ca. 0.2 times DC length; CuA<sub>2</sub> originates 0.6–0.7 along DC length; all veins separate beyond DC; chorda and M-stem absent; CuP weak, present only at margin. No upraised scale tufts; male without costal fold. Hindwing: Sc + R and Rs closely approximate at base; Rs and M<sub>1</sub> stalked ca. one-third distance from DC to margin; M<sub>3</sub> and CuA<sub>1</sub> connate or short-stalked; CuP present; M-stem absent; tuft of hairlike scales at base of 1A + 2A in both sexes. Abdomen: Dorsal pits absent; no modified corethropyne scaling in females. Male genitalia (Figs. 11–13): Uncus slender, short, simple, strongly sclerotized; socius moderately short, broad, hairy, slightly expanded distally; gnathos with slender lateral arms connected to terminal plate by membrane. Transtilla a simple band, highly sclerotized laterally, weaker medially, with a pair of submedial, digitate processes, slightly rounded apically. Valva broad basally, with variable excavation near mid-venter; sacculus well defined, with free, elongate-digitate terminal process of variable shape and length; pulvinus absent; juxta strongly sclerotized, stout arrowhead-shaped. Aedeagus somewhat elongate, variably curved near

middle, usually with distal spine projecting dorsoposteriorly; vesica with or without minute spinules and/or small patch of tiny cornuti. Female genitalia (Figs. 15–16): Papillae anales somewhat slipper-shaped. Apophyses anteriores and posteriores slender, nearly equal in length. Sterigma usually crescent-shaped, with a pair of rounded, sclerotized lateral flanges at posterior edge. Ductus bursae moderately short; corpus bursae ovoid, with dense spicules, at least in posterior one-half.

**Distribution and biology.** *Eliachna* apparently is confined to south-central Chile and adjacent Argentina, ranging from coastal lowlands (5 m) to montane areas (1700 m). Adults have been collected from October to April. Nothing is known of the early stages.

***Eliachna digitana* Brown & McPherson,  
new species**

(Figs. 2, 8, 11, 15)

**Diagnosis.** Superficially, *E. digitana* is difficult to distinguish from other species in the genus; the forewing length is usually a little shorter and the ground color slightly more orange brown rather than gray brown. The male genitalia can be distinguished easily from its congeners by the subrectangular distal portion of the valva; the short, straight, digitate process at the termination of the sacculus; and the weakly curved aedeagus. Female genitalia, likewise, are easily distinguished; the lateral pouches of the sterigma and the sclerotized, knoblike diverticula of the ductus bursae are unique to this species.

**Description.** Male. Head: Labial palpus dark brown. Forewing (Fig. 8): Length 5.9–7.0 mm ( $\bar{x}$  = 6.5;  $n$  = 15); ground color and maculation somewhat variable; ground color usually gold gray to red brown, with faint, dark brown reticulations, infrequently with ill-defined, darker area in basal one-third; a variably developed median fascia from costa to dorsal margin, brown to red brown, angled outward near middle of forewing; apex frequently with darker patch. Hindwing: Brownish gray, infrequently with faint mottling. Abdomen: Gold brown to dark brown. Genitalia: As in Fig. 11 (drawn from USNM slide 90484; 7 preparations examined). Uncus, socius, gnathos, and transtilla as described for the genus. Valva long, subrectangular, only slightly narrowed near middle and slightly broadened distally; sacculus broad basally, with a free, mostly straight, digitate process distally. Juxta as described for the genus. Aedeagus weakly undulate; spine at termination of coecum strongly sclerotized, slightly disjunct from coecum; vesica densely punctate, especially in distal three-fourths; a row of minute cornuti near the base. Female. Essentially as described for male. Forewing length 6.5–7.6 mm ( $\bar{x}$  = 6.9;  $n$  = 15). Genitalia: As in Fig. 15 (drawn from USNM slide 81228; 6 preparations examined). Sterigma subrectangular, with a pair of shallow lateral pouches at anterior edge. Ductus bursae short, with a short, stout, knoblike, sclerotized diverticula dorsally; corpus bursae oblong, uniformly covered with fine spinules.

**Type.** Holotype ♂, Chile, Ñuble Province, 17.5 km S Curanipe, near coastal stream, 50 m, 25.I.1979 (D. & M. Davis & B. Akerbergs, USNM).

**Paratypes.** ARGENTINA: Chubut Province: El Bolsón, Lago Puelo, 220 m, 1 ♂, 18.XI.1978 (Misión Científica Danesa, ZMC), 1 ♀, 13.X.1981 (Nielsen & Karsholt, ZMC); Esquel, 550 m, 1 ♂, 1.I.1982 (Nielsen & Karsholt, ZMC); Sierra Colorada, 800 m, 1 ♂, 29.I.1983

(M. & P. Gentili, USNM). Neuquén Province: San Martín de los Andes, 640 m, 1 ♀, 13.X.1981, 1 ♂, 7–15.XI.1981 (Nielsen & Karsholt, ZMC); Lago Lucar, Pacará, 650 m, 1 ♂, 10.XI.1978 (Misión Científica Danesa, ZMC), 1 ♂, 26–27.XII.1981 (Nielsen & Karsholt, ZMC). Río Negro Province: Lago Gutierrez, 1 ♀ (paralectotype of *balsmodes*), 3–14.XI.1926 (F. & M. Edwards, BMNH); San Carlos de Bariloche, Colonia Suiza, 810 m, 1 ♂, 2.XII.1981, 1 ♀, 20.XII.1981, 1 ♂, 23.XII.1981, 1 ♂, 5–7.I.1982 (Nielsen & Karsholt, ZMC), 1 ♀, 9.XI.1978, 1 ♂, 19.XI.1978, 1 ♂, 29.XI.1978, 1 ♀, 9.XII.1978, 1 ♀, 12.XII.1978, 1 ♀, 9.I.1979, 1 ♀, 10.I.1979, 1 ♀, 11.I.1979 (Misión Científica Danesa, ZMC). CHILE: Cautín Province: Fundo Neltume, 2 km N Villarrica, 200 m, 1 ♂, 1 ♀, 27.II.1979 (D. & M. Davis & B. Akerbergs, USNM); Fundo el Coigue, 27 km NE Villarrica, 500 m, 2 ♂, 28.II–3.III.1979 (D. & M. Davis & B. Akerbergs, USNM). Malleco Province: Río Manzanares, 5 ♀, 19.X.1979 (Flint & Barria, USNM). Ñuble Province: Forel Carrizalillo, 250 m, 1 ♀, 30.I–5.II.1981 (L. E. Peña, USNM); Alto Tregualemu, 500 m, 1 ♀, 27–28.I.1981 (L. E. Peña, USNM); Alto Tregualemu, ca. 20 km SE Chovellen, 500 m, 2 ♂, 26–27.I.1979 (D. & M. Davis & B. Akerbergs, UCB), 4 ♀, 1–3.XII.1981 (D. Davis, USNM); 17.5 km S Curanipe, near coastal stream, 50 m, 3 ♂, 2 ♀, 25.I.1979 (D. & M. Davis & B. Akerbergs, USNM); Piedra de la Iglesia, 8 km N Cobquecura, 5 m, 4 ♀, 25.I.1979 (D. & M. Davis & B. Akerbergs, USNM), 1 ♂, 4 ♀, 24.I.1979 (D. & M. Davis & B. Akerbergs, USNM); Cachapoal, Cajón de Lisboa, Alhue, 800 m, 1 ♂, 19–21.XII.1987 (L. E. Peña, USNM). Llanquihue Province: Llanquihue, Petrohue, 1 ♂, 8.III.959, 1 ♂, 12.III.959 (J. F. G. Clarke, USNM). Osorno Province: Parque Nacional Puñue, Anticura, 250 m, 1 ♂, 17.XII.1981 (Nielsen & Karsholt, ZMC). Santiago Province: Rinconada Maipú, 450 m, 35°31'S, 70°47'W, 1 ♂, 14.IV.1966 (W. Hichins & M. E. Irwin, UCB); Pilay, Río Peuco, ca. 45 km S Santiago, 800 m, 1 ♂, 23–24.XI.1981 (D. Davis, USNM). Valdivia Province: Valdivia, 1 ♀, 7.III.1960 (E. Krahmer, ZMC); 20 km S Valdivia, Rincón de Piedra, 180 m, 1 ♂, 24.XI.1981 (Nielsen & Karsholt, ZMC).

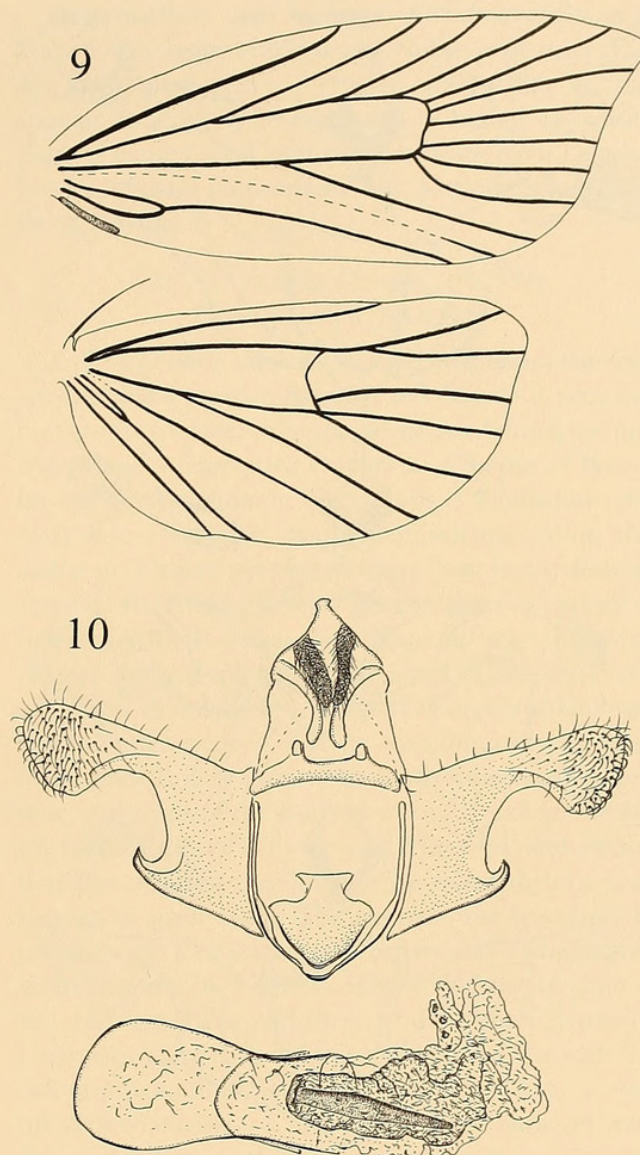
**Distribution and biology.** *Eliachna digitana* occurs from Santiago Province, Chile, to Chubut Province, Argentina (Fig. 2), ranging from coastal *Nothofagus* forests (5 m) to arid uplands (1300 m) dominated by Fabaceae and Lauraceae. Capture records are from October (n = 3), November (n = 5), December (n = 11), January (n = 20), February (n = 4), March (n = 3), and April (n = 1). Nothing is known of the early stages.

**Etymology.** The species name refers to the digitate process that comprises the distal portion of the sacculus.

**Remarks.** N. Obraztsov probably was the first to recognize this species as distinct and undescribed; he labeled the specimen from Llanquihue, Peulla (USNM) with a manuscript name.

***Eliachna hemicordata* Brown & McPherson,  
new species  
(Figs. 7, 13)**

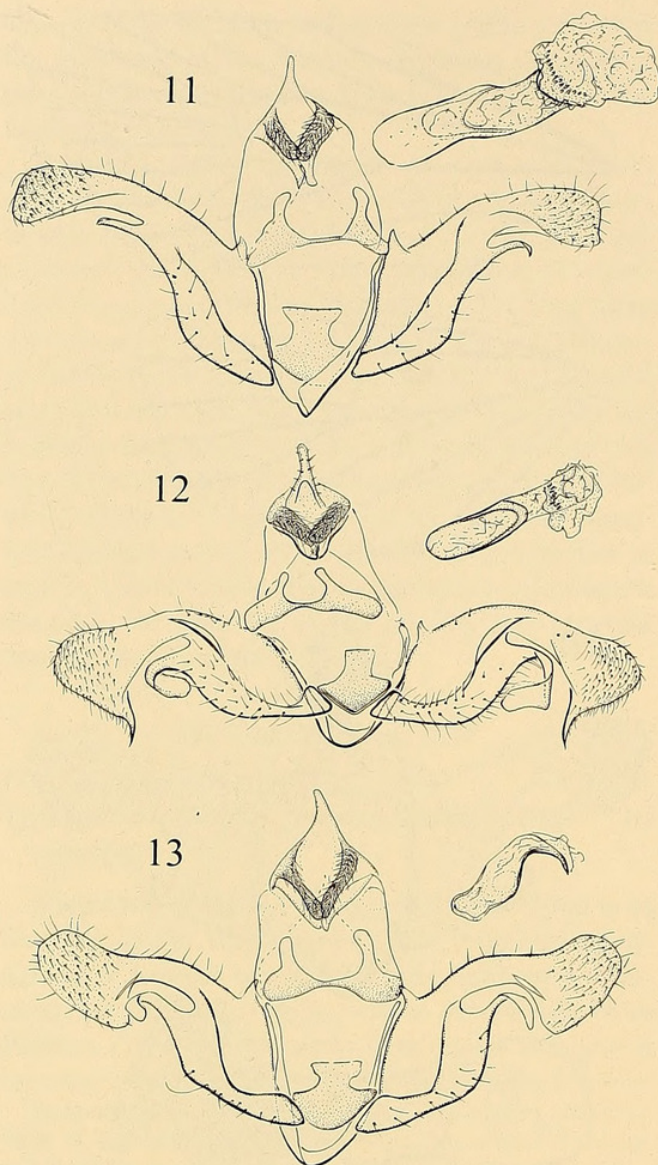
**Diagnosis.** *Eliachna hemicordata* has a slighter greater forewing length and a paler ground color than other species in the genus. Males can be distinguished from other *Eliachna* by the somewhat cordate distal



FIGS. 9–10. *Rebinea erebina*. 9, Wing venation; 10, Male genitalia, aedeagus removed, valvae spread.

portion of the valva; the elongate, curved, digitate, free process of the sacculus is similar to that of *E. chilleana*. The female is unknown.

**Description:** Male. Head: Labial palpus dark brown. Thorax: Brown to dark brown. Forewing (Fig. 7): Length 7.8–8.0 mm ( $\bar{x}$  = 7.9; n = 5); ground color pale orange cream, with tiny black specks throughout; moderately broad median fascia, extending from costa ca. 0.6–0.7 from base to apex, to dorsum ca. 0.7–0.8 from base to tornus, angled outward near middle of forewing. Hindwing: Pale gray brown with variably developed darker mottling. Abdomen: Gold brown to dark brown. Genitalia: As in Fig. 13 (drawn from USNM slide 81222; 7 preparations examined). Uncus, socius, gnathos, transtilla as described for genus. Valva long, distal portion ovoid, with short hooklike process from venter of apex; sacculus with elongate, slightly flattened, weakly curved free process. Juxta as described for genus. Aedeagus curved dorsad just beyond coecum, with dorsoposteriorly projecting spine at distal end; vesica without spicules. Female. Unknown.

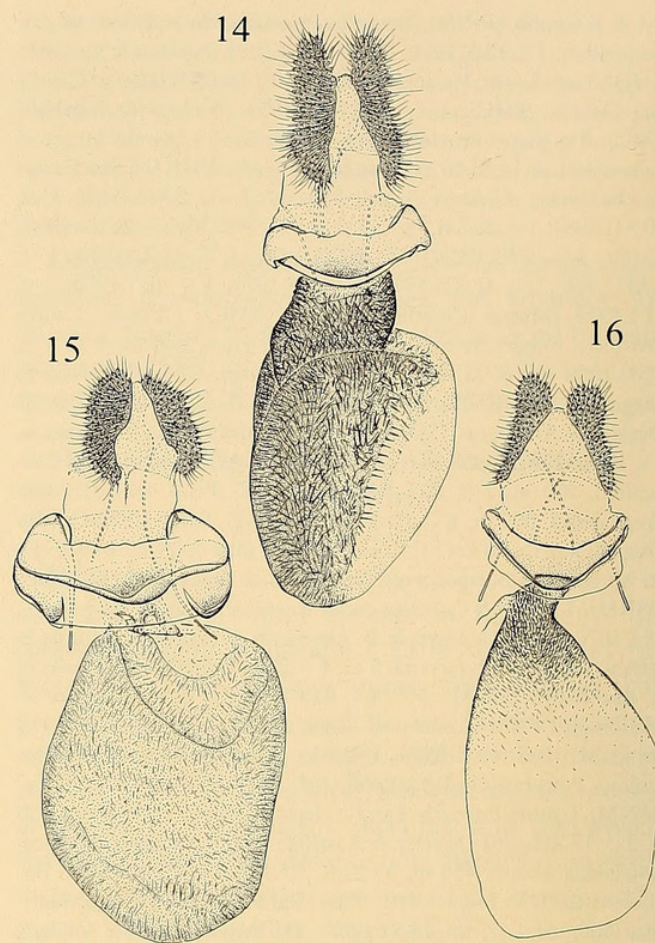


FIGS. 11–13. Male genitalia of *Eliachna*, aedeagus removed, valvae spread. **11**, *E. digitana*, new species; **12**, *E. chileana*, new species; **13**, *E. hemicordata*.

**Type.** Holotype ♂, Argentina, Neuquén, Chapelco Lengua, 1700 m, 24.I.1984 (M. & P. Gentili, USNM).

**Paratypes.** ARGENTINA: Neuquén Province: Chapelco Techos, 1400 m, 1 ♂, 21.I.1982 (M. & P. Gentili, USNM); Lago Lacar, Trompul, 1200 m, 1 ♂, 6.I.1983 (M. & P. Gentili, USNM); San Martín de los Andes, Tr. Kura, 1000 m, 1 ♂, 29.XII.1985 (M. & P. Gentili, USNM). Río Negro Province: Lago Nahuel Huapi, Puerto Blest, 1 ♂, 23.XII. 1978 (Misión Científica Danesa, ZMC). CHILE: Bío-Bío Province: Lago El Barco, Gualali, Sta. Barbara, 1200 m, 1 ♂, 25–28.II.1981 (L. E. Peña, USNM). Cautin Province: [Parque Nacional] Conguillio, 1200 m, 1 ♂, 4–8.II.1988 (L. E. Peña, USNM). Unknown Province: V. Villarica, 16 km S Pucon, 1 ♂, 20.XII.1982 (R. Brown, MEM).

**Distribution and biology.** *Eliachna hemicordata* is known from Neuquén and Río Negro provinces, Argentina, and Bío-Bío and Cautin provinces, Chile, between 1000 and 1400 m (Fig. 3). Capture records are



FIGS. 14–16. Female genitalia of *Rebinea* and *Eliachna*. **14**, *Rebinea erebina*; **15**, *E. digitana*, new species; **16**, *E. chileana*.

from January ( $n = 3$ ), February ( $n = 2$ ), and December ( $n = 3$ ). Nothing is known of the early stages.

**Etymology.** The species name refers to the half-hearted shape of the distal portion of the valva.

*Eliachna chileana* Razowski, 1999  
(Figs. 6, 12, 16)

*Eliachna chileana* Razowski, 1999:88 [male genitalia illustrated].

**Diagnosis.** The male genitalia of *E. chileana* can be distinguished from those of other species in the genus by the greatly expanded distal portion of the valva, terminating in an attenuate, pointed tip. The female genitalia can be distinguish by the simple U-shaped sterigma.

**Redescription.** Male. Head: Labial palpus light brown. Thorax: Mostly brown. Forewing (Fig. 6): Length 7.1–7.8 mm ( $\bar{x} = 7.5$  mm;  $n = 4$ ); ground color dull silvery gray, faintly overscaled with red orange and copper orange; basal one-fourth usually with patch of slightly darker scales; variably defined, red-brown median fascia from near mid-costa to dorsum, angled outward near middle of forewing; terminal area with irregular patches of black and orange-red scales, decreasing toward apex. Hindwing: Pale olive brown, with faint brown-

17

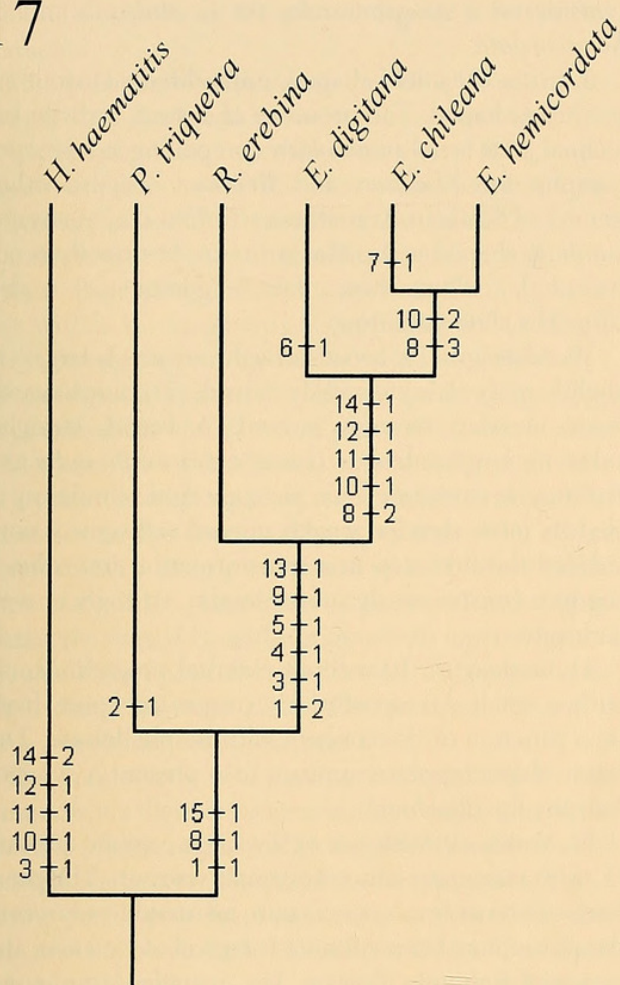


FIG. 17. Hypothesis of phylogenetic relationship among the taxa. Numbers on the left refer to characters (1–15); numbers on the right refer to character states (see Table 1).

ish-gray reticulations. Abdomen: Pale yellow brown to dark brown. Genitalia: As in Fig. 12 (drawn from USNM slide 81223; 5 preparations examined). Uncus, socius, and gnathos as described for genus. Valva broad basally, narrowed at middle, greatly expanded distally, with elongate, curved, beaklike process directed ventrally; sacculus with elongate, free, slightly flattened, curved, digitate process. Juxta as described for genus. Aedeagus strongly curved near middle; vesica with several minute spines and a few short, capitate cornuti. Female. Essentially as described for male. Forewing: Length 6.7–7.0 mm ( $\bar{x}$  = 6.9;  $n$  = 4). Genitalia: As in Fig. 16 (drawn from USNM slides 90493 and 90177; 5 preparations examined). Sterigma weakly U-shaped, uniform in thickness. Ductus bursae moderately short, with large ductus seminalis originating dorsally about midway between ostium and corpus bursae. Corpus bursae as described for the genus.

**Type.** Holotype ♂, Chile, Ñuble Province, Las Trancas, Shangri-la, Chillan area, SE Recinto, 1500 m, 15.XII.1983 (L. Peña, AMNH).

**Additional specimens examined.** CHILE: Malleco Province: nr. Los Gringos Camp, Nahuelbuta Nat. Park, 1300 m, 3 ♂, 2 ♀, 6–11.I.1982 (D. R. Davis, USNM). Ñuble Province: Shangri-la, SW side Volcan Chillan, 1600 m, 1 ♂, 19–21.I.1979 (D. & M. Davis & B. Akerbergs, USNM); Las Trancas, 21 km E Recinto, near high waterfall, 1300 m, 1 ♂, 3 ♀, 17.I.1979 (D. & M. Davis & B. Akerbergs, USNM).

**Distribution and biology.** *Eliachna chileana* is known only from Malleco and Ñuble provinces (Fig. 4). With all captures between 1300–1600 m, this species appears to be restricted to higher elevations than its congeners. Capture records are from December ( $n$  = 1) and January ( $n$  = 10). Nothing is known of the early stages.

#### EXPLANATION OF CHARACTERS AND PHYLOGENETIC ANALYSIS

A phylogenetic analysis was performed on the four species that comprise *Rebinea* and *Eliachna*, plus two out-group species, *Proeulia triquetra* Obraztsov and *Haemateulia haematitis* (Meyrick). The use of *Proeulia* and *Haemateulia* as out-groups is somewhat arbitrary because sister group relationships within this clade of Euliini previously have not been demonstrated. However, the two genera share a variety of features with *Rebinea* and *Eliachna* (e.g., forewing pattern, polymorphism, broad, short valvae, etc.), and all appear to belong to a complex of endemic Chilean-Argentinean genera that is taxonomically isolated from other Euliini present in South America. The primary purposes of the analysis were to confirm the sister relationship of *Rebinea* and *Eliachna*, and ensure that the two in-group genera are monophyletic with respect to each other. The analysis was based on 15 morphological characters (11 binary and 4 multistate), including two of the head, one of the thorax, nine of the male genitalia, and three of the female genitalia. Character state polarity was determined through the out-group method and using Horak's (1984) assessment of characters of Tortricinae. The character state data were subjected to parsimony analysis using the "mhennig\*" command of Hennig86 (Lipscomb 1994). Characters used in the analysis are listed and discussed briefly below; the character matrix is present in Table 1.

1. Labial palpi: (0) upturned, ca. 1.5–2.0 as long as horizontal diameter of the compound eye; (1) somewhat porrect, ca. 2.0–3.0 as long as horizontal diameter of the compound eye; (2) porrect, 3–4 times the horizontal diameter of the compound eye. While elongate labial palpi occur in several groups scattered throughout Euliini (e.g., *Proeulia*, *Seticosta* Razowski, *Anopinella* Powell, etc.), none of these taxa have palpi as long as those of *Rebinea* and *Eliachna*.

2. Male antennal cilia: (0) conspicuous, elongate, ca. 1.0–1.5 times the width of the flagellomere; (1) inconspicuous, extremely short, ca. 0.5 times the width of the flagellomere. The value of this character is diminished somewhat by its variability in the out-group taxa (e.g., length of male antennal cilia varies among species of *Proeulia*).

TABLE 1. Character matrix ("?" = missing data).

<i>haematitis</i>	00100	00001	11020
<i>triquetra</i>	11000	00100	00001
<i>erebina</i>	20111	00110	00101
<i>digitana</i>	20111	10211	11111
<i>chileana</i>	20111	01312	11111
<i>hemicordata</i>	20111	00312	11???

3. Male foreleg hairpencil: (0) present; (1) absent. The presence of a male foreleg hairpencil is assumed to represent the plesiomorphic condition in Euliini (Brown 1990). However, because the structure is evolutionarily labile, there is no evidence that its shared absence is truly a synapomorphy for the taxa that lack it.

4. Transtilla: (0) a simple bridge; (1) with a pair of stout, digitate, submedial processes on dorsum. Although digitate structures are present on the dorsum of the transtilla of *Inape* Razowski and *Ortognathosia* Razowski (see Razowski 1988 for illustrations), few other features of the male or female genitalia of the latter two genera indicate a close relationship with *Rebinea* and *Eliachna*. Hence it is suspected that the structures represent convergent development in *Inape*, *Ortognathosia*, and *Rebinea* + *Eliachna*.

5. Valva: (0) venter uniform; (1) venter with a deeply excavated portion near middle resulting in a broad basal portion, a narrow "neck" near the middle, and an expanded distal portion. The distinctive shape of the valva is apparently unique to *Rebinea* and *Eliachna*, and is reminiscent of the valva of some Eucosmiini (Olethreutinae).

6. Valva: (0) distal one-third somewhat club-shaped; (1) distal portion narrowed, somewhat elongate-rectangular. The latter character state is considered an autapomorphy for *E. digitana*.

7. Valva: (0) distal one-third somewhat club-shaped; (1) distal portion greatly expanded into an elongate, curved, beaklike process directed ventrally. The latter character state is considered an autapomorphy for *E. chileana*.

8. Sacculus: (0) weak, lacking free terminal process; (1) well-defined, with short, free, distal termination; (2) well-defined, with slender, digitate process; (3) well-defined, with long, slightly flattened, curved process. A sacculus lacking a free terminal process, such as that in the genitalia of *Haemateulia*, is considered the plesiomorphic condition. A well-defined sacculus with a short, free, distal termination, such as that in the genitalia of *Proeulia*, is considered derived; and the development of the free tip into an elongate, digitate process is considered a synapomorphy for *Eliachna*. Its further development into an extremely long, slightly flattened, curved process is

considered a synapomorphy for *E. chileana* and *E. hemicordata*.

9. Juxta: (0) shield-shaped, unmodified; (1) stout arrowhead-shaped. The presence of a stout, arrowhead-shaped juxta is not particularly compelling as a synapomorphy for *Eliachna* and *Rebinea* because other genera of Chilean-Argentinean Euliini may possess a similarly shaped juxta. The structure frequently is not included in illustrations of male genitalia or is distorted by slide mounting.

10. Aedeagus: (0) broad, straight, relatively large; (1) slightly more slender, weakly curved; (2) conspicuously more slender, strongly curved. A broad, straight, relatively large aedeagus, characteristic of *Proeulia* and *Rebinea*, is considered the plesiomorphic condition. A slightly more slender, weakly curved aedeagus is considered the first step in a transformation series leading to a conspicuously more slender, strongly curved aedeagus.

11. Aedeagus: (0) without external projections; (1) with a small dorsoposteriorly projecting spine from near junction of the coecum and the phallobase. The latter character state appears to represent a synapomorphy for *Eliachna*.

12. Vesica: (0) with one or few large capitate cornuti; (1) with numerous tiny non-capitate cornuti. The presence of one or few large cornuti, assumed to represent the plesiomorphic condition, is typical of *Proeulia*; the vesica of *Rebinea*, likewise, has a single, large, compound cornutus.

13. Sterigma: (0) unmodified; (1) with a pair of semicircular sclerotized flanges located at the posterior edge. The latter character state appears to represent a synapomorphy for *Rebinea* and *Eliachna*.

14. Ductus bursae: (0) extremely broad, nearly as broad as the corpus bursae; (1) slightly more narrow, weakly differentiated from corpus bursae; (2) relatively narrow, clearly differentiated from corpus bursae. In *Proeulia*, *Argentulia*, and related Chilean-Argentinean genera, the ductus bursae is extremely broad. This condition, considered the plesiomorphic state, also is present in *Rebinea*. The slightly more narrow ductus bursae of *Eliachna* is considered a synapomorphy for this genus, and the relatively well defined ductus bursae of *Haemateulia* is considered the most advanced state. Because this character varies throughout Euliini (sometimes even within a single genus), it is a less compelling indicator of relationship.

15. Corpus bursae: (0) finely punctate; (1) densely spiculate. A densely spiculate corpus bursae is shared by *Proeulia*, *Rebinea*, *Eliachna*, *Argentulia*, and additional related Chilean-Argentinean genera. The finely punctate corpus bursa of *Haemateulia*, similar to most

Euliini, is considered the plesiomorphic state for this character.

The parsimony analysis of the 15 characters described above resulted in one most parsimonious tree with a length of 24, a consistency index of 0.83, and a retention index of 0.69. The consistency and retention indices are biased by the fact that the data set includes characters that are non-informative in a phylogenetic context (i.e., autapomorphies and characters consistent within the in-group). The cladogram (Fig. 17) shows strong support for the monophyly of *Rebinea* + *Eliachna* on the basis of the following characters: labial palpi extremely elongate and porrect (character state 1.2); male foreleg hairpencil absent (character state 3.1); transtilla with a pair of stout, digitate, submedial processes on the dorsum (character state 4.1); venter of valva with a deeply excavated mesal portion (character state 5.1); juxta stout and arrowhead-shaped (character state 9.1); and sterigma with a pair of semi-circular sclerotized flanges located at the posterior edge (character state 13.1). The most convincing of these are characters 1, 4, 5, and 13.

The monophyly of *Eliachna* is supported by the presence of a digitate process at the termination of the sacculus (character state 8.2); a slender, weakly curved aedeagus (character state 10.1); a dorsoposteriorly projecting distal spine from near the junction of the coecum and the phallobase (character state 11.1); numerous tiny cornuti in the vesica of the aedeagus (character state 12.1); and a slightly more narrow ductus bursae (character state 13.1). The most convincing of these are characters 8, 11, and 12.

While the sister relationship of *Eliachna* and *Rebinea* is well supported in the context of the genera used in this analysis, their relationship to other euliine genera endemic to Chile and Argentina remains unknown. Fortunately, the unique leafroller fauna of this region is receiving greater attention from systematists and pest managers worldwide, as many of the native species have broadened their host ranges to include economically important crops (Brown 2000b). An anticipated increase in specimens and host information will undoubtedly shed additional light on phylogenetic relationships among these genera.

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