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BRACHYGYNA INCAE, A NEW GENUS AND SPECIES OF PSYCHID FROM PERU WITH ATYPICAL LARVAL BIOLOGY (LEPIDOPTERA: PSYCHIDAE)

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ABSTRACT.—*Brachygyna incaea*, a new genus and species of Psychidae, is described from Machu Picchu, Peru, where the larva feeds on lichens growing on the walls of the ancient Inca fortress. The female is brachypterous, with wings approximately half the size of the males. Proposed synapomorphies for the genus include the unusual degree of wing reduction in the female, the loss of the basal pair of tibial spurs in the hindlegs, the narrowly V-shaped form of the saccus and the short, stout, ventral lobe of the valva in the male genitalia. Prepupal larval behavior is atypical of the family, with the last instar larva not inverting its body prior to pupation. The larva instead maintains an upright vertical position inside the larval case prior to pupation, with the adult later emerging from a subapical slit near the point of attachment of the case and not from the caudal end of the case in the manner typical of other Psychidae.

KEY WORDS: bagworm moth, *Brachygyna* n. gen., *Brachygyna incaea* n. sp., chaetotaxy, hostplants, larva, larval biology, larval case, lichenivorous, Neotropical, *Pterogyne*, South America, taxonomy, Typhoniinae.

All members of the bagworm family Psychidae construct portable larval cases which they carry and enlarge throughout their larval life and in which they eventually pupate. One of the behavioral anomalies characteristic of all Psychidae prior to this report involves the last instar larva. Immediately prior to pupation, the larva attaches the upper, anterior end of the case to some support, and then inverts its body inside the case, so that the head is directed down toward the lower or free end of the case (Kozhanchikov, 1956; Davis, 1964, 1987, 1999). Consequently, the adult (at least for all males and nonvermiform females) emerges from the lower, caudal end of the case. The species described herein is interesting in that it represents the first reported instance of a member of this family in which prepupal larval inversion does not occur, with the adult instead emerging from a subapical slit in the upper, anterior end of the case (Fig. 2).

The first specimens of *Brachygyna incaea*, new species, were collected by Emmanuel de Bros (deceased 25 March 1997), formerly of Basel, Switzerland in July 1979 and were sent to the author for identification. It was not until I visited the type locality of Machu Picchu (Fig. 3) in 1981 to secure immatures that I realized the adult of this species emerges from the attached upper end of the larval case. Eugene Munroe and James Early later visited the site in June 1982 and, at my request, collected larvae that I was able to rear in my lab. All material collected thus far was found on the walls of the ruins of Machu Picchu (Fig. 4), where the larvae feed on lichens, *Usnea rubicunda* Stirt. in particular. The species is univoltine, with the optimal time to collect larvae for rearing being June to mid July.

Brachygyna is one of the more primitive genera of Psychidae and is tentatively placed in the subfamily Typhoniinae (Sauter and Hättenschwiler, 1991). This is indicated by: 1) female with all appendages developed (although with wings reduced), 2) female exiting and mating outside case, 3) pupa with abdominal tergal spines in multiple rows, and 4) larva lichenivorous. At least one other undescribed member of this genus, represented by a unique male (USNM) in rather poor condition from an unspecified site in Colombia, has been examined. Possible synapomorphies for the genus are the partially reduced wings of the female, the loss of the basal tibial spurs on the hindleg, the narrowly V-shaped saccus, and

short, stout ventral lobe at distal third of valva in the male genitalia.

This is the first report of a long term study by the author on the primitive, largely lichenivorous Psychidae of the Neotropical region. Fifty-eight species, over 80 % of which represent new taxa and none of which were treated previously in either my 1964 or 1975 papers, have been examined and illustrated to date. These statistics are increasing steadily as our fieldwork in the neotropics continues. Acronyms used in this paper to show deposition of specimens include the following: MUSM (Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; PH (Peter Hättenschwiler of Uster, Switzerland); USNM (collections of the former United States National Museum, now deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C.)

Brachygyna Davis, new genus

MALE.—*Head* (Fig. 5): Eye small, interocular index approximately 0.55. Ocellus absent. Antenna 1/3 the length of forewing, bipectinate with rami up to 4X the length of supporting flagellomere and arising from base of segment (Fig. 17); scape rough, covered with piliform scales and without specialized pecten; dorsum of flagellum densely covered with slender, bidentate scales irregularly arranged in multiple rows (Fig. 18); venter naked. Mandible reduced to a minute, stout spine. Maxillary palpus reduced to a single, short, acute lobe about 1/2 the length of basal labial palpal segment. Haustellum even more reduced to a minute lobe arising immediately anterior to vestigial maxillary palpus and 0.5-0.65 the length of the latter (Fig. 5). Labial palpus short, 2-segmented, apical segment 1.8 the length of basal segment. *Thorax:* Forewing moderately broad, L/W index 2.2, 11-veined (Fig. 8); R with 4 branches, all branches arising separate; R1 arising from basal third of discal cell; R2+3 completely fused and connate with R4; accessory cell present; M 3-branched; M1 & 2 connate or nearly so; base of M divided over half the length of cell; base of A1+2 with short fork; retinaculum a moderately long subcostal fold extending under base of Sc. Hindwing 8-veined; Rs arising near distal third of discal cell, the latter short, less than half the length of hindwing; M with all 3 branches arising separate. Foretibia without epiphysis; tibial spurs 0-2-2 (Fig. 6). *Abdomen:* Eighth segment unmodified, coremata absent; 8S broadly quadrate, similar to 8T in size and outline.

MALE GENITALIA.—Tegumen shallowly bilobed. Vinculum tapering



Fig. 1-4. *Brachygyna incaea*. 1) Male (left), wingspan 18mm. Female (right), wingspan 11mm. 2) Larval cases, with pupal shell protruding from anterior end of case. 3) Type locality: Machu Picchu, Peru. 4) The author, with daughter Marisa, collecting larval cases from stone walls of Machu Picchu, October 1981.

anteriorly to a moderately long, narrowly V-shaped saccus. Valva elongate, with ventral margin excavated at distal third and produced into a short, stout, rounded lobe. Aedeagus a simple, slightly curved tube, approximately equal to valva in length.

FEMALE (Fig. 1).— Similar to male, except *Head*: Antenna irregularly unimoto bipectinate; pectinations much shorter (Fig. 19), with longest rami about equal to length of supporting segment. Labial palpi slightly shorter than in male. *Thorax*: Wings reduced, approximately half the size of male; venation similar to male except discal cell proportionately longer in both fore- and hindwings of female (Fig. 7); frenulum consisting of 3 slender bristles. *Abdomen*: Seventh segment with corythogyne consisting of a dense ring of piliform scales.

FEMALE GENITALIA.— Ovipositor elongate, telescoping. A pair of pseudapophyses extending the length of A10. Ostium opening within deep, inverted V-shaped cleft near anterior end of eighth sternum. Corpus bursae membranous, without signum.

ETYMOLOGY.— The generic name is derived from the Greek *brachys* (short) and *gyne* (female), in reference to the shortened wings in the adult female.

Brachygyna incaea Davis, new sp.

ADULT (Fig. 1).— Length of forewing: ♂, 7-10 mm, ♀, 5-6 mm. Head, antenna, thorax, and wings uniformly dark fuscous. Wings uniformly covered with relatively broad, 3-5-dentate scales. Legs mostly dark fuscous in male, with heavy suffusion of light golden scales dorsally over foretibia and tarsi of mid- and hindlegs; legs of female similar but without golden scales. Abdomen uniformly fuscous in male, with whitish corythogyne scales overlaid by fuscous on A7 of female.

MALE GENITALIA (Fig. 9-11).— Genital capsule broad. Saccus relatively stout, width at base approximately 0.7 that of length. Valva elongate, length of valva (not including apodemes ~ 0.8 the length of entire genital capsule; ventral lobe of valva blunt, short (length ~ 0.6 the width of cucullus); basal pad (pulvillus) of valva greatly reduced.

FEMALE GENITALIA (Fig. 12).— Anterior apophysis elongate, free arm about 2/3 the length of posterior apophysis. Ostium with a short (width about equal to length), quadrate to broadly triangular, sclerotized antrum.

LARVA (Fig. 20-36).— Length of largest larva 7.5 mm; head width 1.1 mm. Integument with lustrous reddish brown plates separated by darker brown, granular cuticle. Chaetotaxy similar to that described for *Pterogyne insularis*

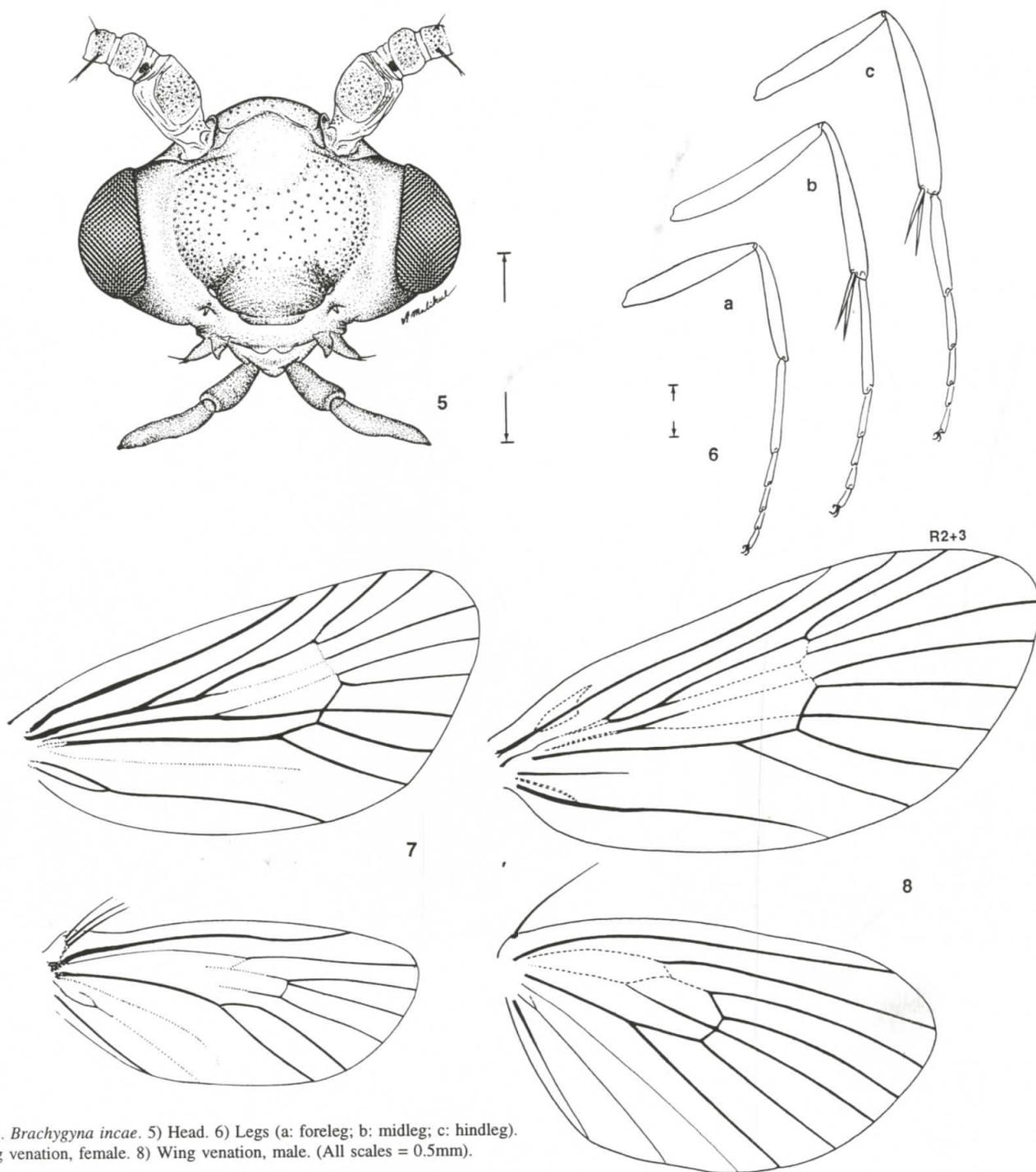


Fig. 5-8. *Brachygyna incae*. 5) Head. 6) Legs (a: foreleg; b: midleg; c: hindleg). 7) Wing venation, female. 8) Wing venation, male. (All scales = 0.5mm).

(Davis, 1975) except head with AF2 arising lower on adfrontal sclerite near dorsal third, and D2 arising directly anterior (same level as) to D1 on abdominal segments 1-7; SV1 absent on A9. **Head:** Dark brown, nearly black. AF2 elongate, more than 5X length of AF1. Six stemmata present; cornea of 1 and 6 more flattened (Fig. 21). Antenna and maxilla with sensilla as shown (Fig. 22-23). Venter of labrum with 4 pairs of epipharyngeal setae (Fig. 35), with lateral pair short, less than 0.5 the length of mesal pair. Mandible broad, with 3-4 short cusps. Labial palpus with segment II elongate, ca. 8X length of III (Fig. 24). **Thorax:** Pronotum dark brown, nearly black anteriorly. SV bisetose on T1, trisetose on T2-3. **Abdomen:** D1 and D2 arising from separate, transversely narrow plates on A1-7, together on on A8, and with SD1 on A9. Pinnacula below level of spiracles indistinct. SV bisetose on A1, 2 and 7, trisetose on A3-6, unisetose on A8, and absent on A9. Anal plate with D2 absent, represented instead by prominent pore. Cuticle

immediately dorsal to anus densely spinose (Fig. 28). Prolegs 3-6 with 14-19 crochets; anal crochets 15-18.

PUPA (Fig. 15-16, 37-44).—Male: Length 6-7mm, light to medium brown in color. Vertex broadly rounded, smooth. Antennal sheaths extending to middle of A4 (Fig. 16); wing sheaths to A5. Dorsal spines present along anterior margin of A3-7, arranged in 4-5 scattered rows of short, stout spines (Fig. 15, 38-41). A pair of large, nearly contiguous, low tubercles on ninth sternum (Fig. 42). Cremaster consisting of 2 pairs of short, dorsal spines (Fig. 42, 43). **PUPA (Fig. 13-14, 45-48).—Female:** Length 7-8mm, medium to dark brown. Vertex smoothly rounded. Antennal sheaths extending to middle of A3, almost to apex of wings (Fig. 14). Dorsal spines similar to male, consisting of 4-5 scattered rows of short, stout spines near anterior margin of A3-7 (Fig. 13). Ninth sternum smooth, without large tubercles (Fig. 48). Cremaster

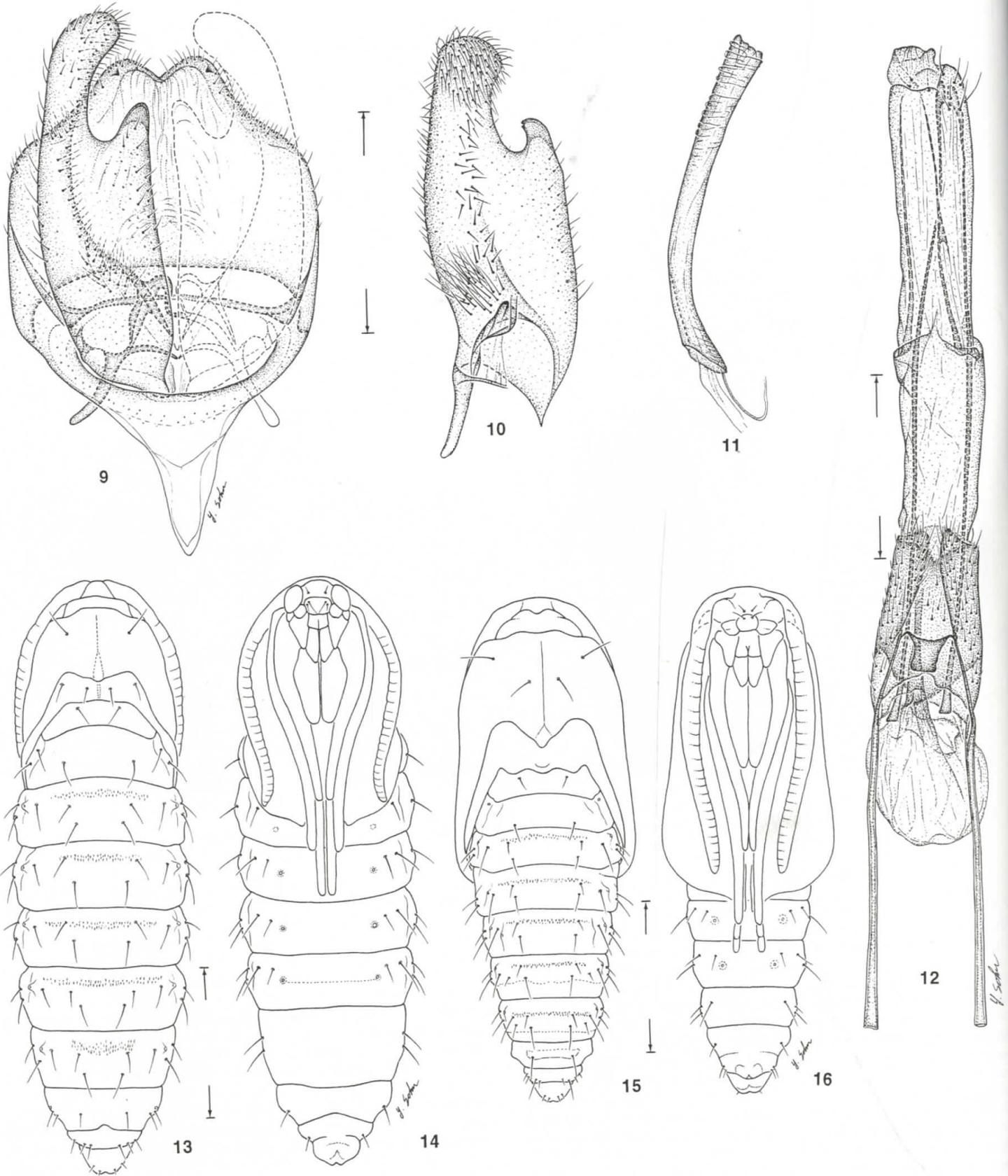


Fig. 9-16. *Brachygyna incaea*. 9) Male genitalia, ventral view (0.5mm). 10) Valva, mesal view. 11) Aedeagus, lateral view. 12) Female genitalia, ventral view (1 mm). 13) Female pupa, dorsal view (2mm). 14) Ventral view of Fig. 13. 15) Male pupa, dorsal view (2mm). 16) Ventral view of Fig. 15. (Scale lengths in parentheses).

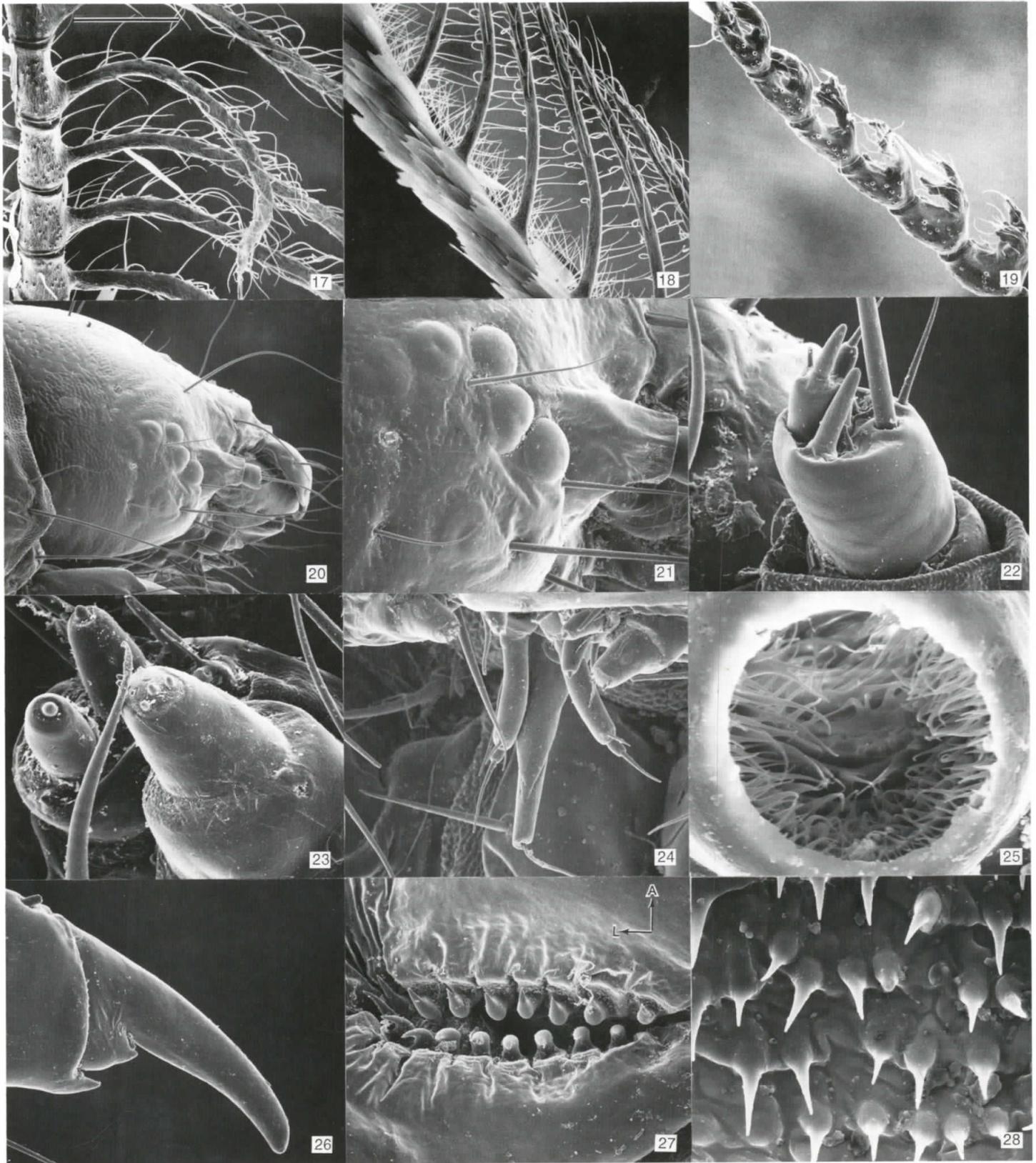


Fig. 17-28. *Brachygyna incaea*. 17) Male antenna, ventral view (150 μm). 18) Male antenna, dorsal view (176 μm). 19) Female antenna (176 μm). Fig. 20-28: last instar larva. 20) Head, lateral view (240 μm). 21) Enlarged view of stemmatal area (96 μm). 22) Antenna (34 μm). 23) Maxilla (24 μm). 24) Labial palpi and spinneret (60 μm). 25) Abdominal spiracle, A6 (15 μm). 26) Metatarsal claw (48 μm). 27) Crochets, abdominal segment 5 (48 μm ; A = anterior; L = lateral). 28) Anal area, A10 (12 μm). (Scale lengths in parentheses; bar scale for all photographs shown in Fig. 17).

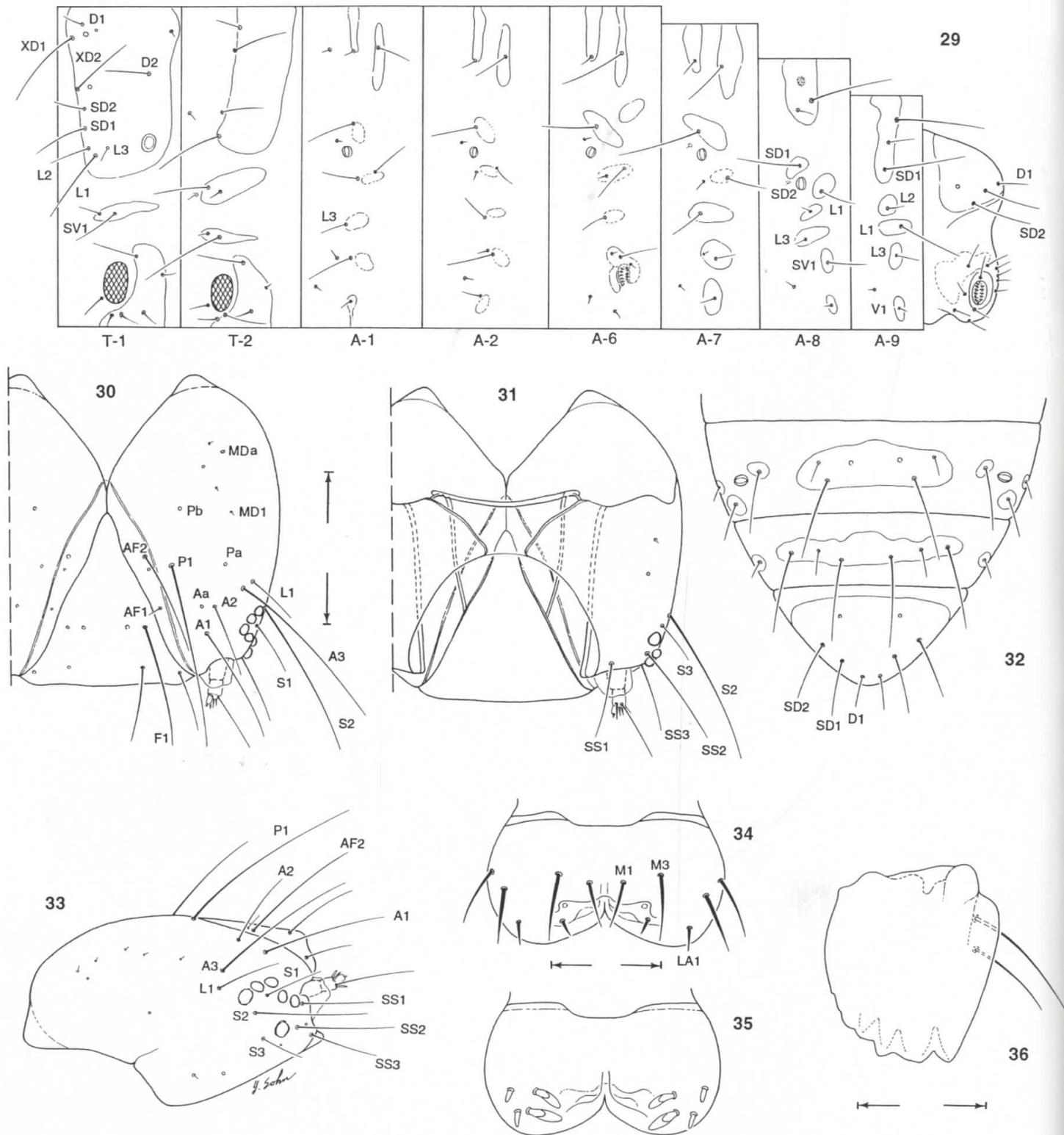


Fig. 29-36. *Brachygyna incae*, larval chaetotaxy. 29) Lateral schematic. 30) Head, dorsal view (0.5mm). 31) Head, ventral view. 32) Abdominal terga 8-10. 33) Head, lateral view. 34) Labrum, dorsal view (0.2mm). 35) Labrum, ventral view. 36) Mandible (0.2mm). (Scale lengths in parentheses).

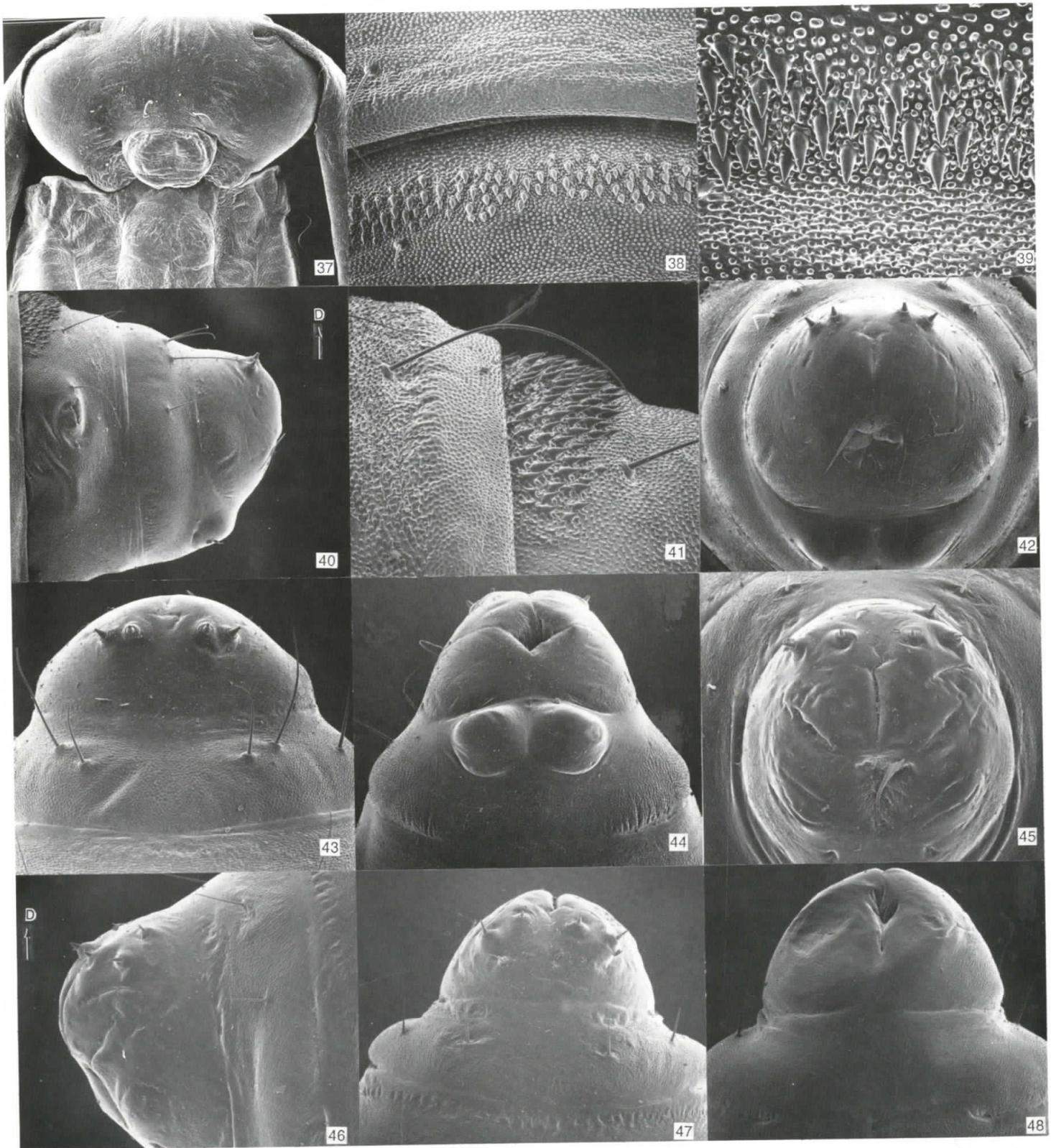


Fig. 37- 48. *Brachygyna incaea*, male pupa: Fig. 37-44. 37) Head (0.58mm). 38) Dorsal spines of A4 (200 μ m). 39) Detail view of Fig. 38 (72 μ m). 40) Lateral view of A7-10 (0.38mm, D = dorsal). 41) Lateral view of dorsal spines of A7 (136 μ m). 42) Caudal view of A10 (0.3mm). 43) Dorsal view of A8-10 (250 μ m). 44) Ventral view of A9-10 (250 μ m). Female pupa: Fig. 45- 48. 45) Caudal view of A10 (231 μ m). 46) Lateral view of A9-10 (250 μ m). 47) Dorsal view of A10 (0.27mm). 48) Ventral view of A9-10 (0.27mm). (Scale lengths in parentheses; bar scale for all photographs shown in Fig. 37).

consisting of 2-3 pairs of short dorsal spines (Fig. 46, 47); third pair variable, possibly an anomaly.

HOLOTYPE.—♂; Machu Picchu, 2450m, Cusco Prov., Peru; 29-30 Jun 1982, em. 25 Jul 1982, Early & Munroe, (USNM).

PARATYPES.—Same locality as holotype: Urubamba, 3300m, 23 Jul 1979, E. De Bros, 5 ♂, cases, pupa; 1 ♀, em. Aug 1979; 1 ♂, case, em. 7 Aug 1979; 1 ♀, case, em. 13 Aug 1979, slides DRD 3407, 3408, (EdB). Same data as holotype except: ca. 70 larval cases, 16-18 Oct 1981, D. & M. Davis, ex *Usnea rubicunda*, (USNM); 3 ♂, em. Jul 1982 (DRD 487); 2 ♂, 2 ♀, em. 20 Jul 1982; 12 ♂, 8 ♀, em. 21-23 Jul 1982; 7 ♂, 4 ♀, em. 25 Jul 1982; 1 ♂, em. 27 Jul 1982; 2 ♂, 1 ♀, em. 28 Jul 1982; 2 ♀, em. 1 Aug 1982; ca. 100 larval cases, 5 larvae, ca. 30 pupal exuviae, slides USNM 23687, 23688, 28552, 28553, 31908, (MUSM, PH, USNM). An additional 35 ♂, ♀ emerged in transit to the USNM and are in too poor condition to be included in the type series.

HOST.—*Usnea rubicunda* Stirt. (Parmeliaceae) (det. Mason Hale).

DISTRIBUTION.—Known only from the Inca ruins of Machu Picchu, Peru.

FLIGHT PERIOD.—Late June to early August; univoltine.

REMARKS.—The reduction in wing size in the female of this species is most evident in that part of the wings distal to the discal cell. The basal half of the female fore- and hindwings appears similar in proportion to the male, compared to the more shortened distal half.

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LITERATURE CITED

Davis, D. R.

1964. Bagworm moths of the Western Hemisphere (Lepidoptera: Psychidae). *U. S. Nat. Mus. Bull.* (Washington), 255:1-233.
1975. A review of the West Indian moths of the family Psychidae with descriptions of new taxa and immature stages. *Smithson. Cont. Zool.* (Washington), 188:1-66.
1987. Micropterigidae, Eriocraniidae, Acanthopteroctetidae, Nepticulidae, Opostegidae, Tischeriidae, Heliozelidae, Adelidae, Incurvariidae, Prodoxidae, Tineidae, Psychidae, Ochsenheimeriidae, Lyonetiidae, Gracillariidae, Epipyropidae. In F. W. Stehr (ed.), *Immature insects* [1], 341-378, 456, 459-460. Dubuque: Kendall/Hunt Publ.
1999. Eriocottidae, Acrolophidae, Arrhenophanidae, Psychidae, Lypusidae, and Gracillarioidea. In N. P. Kristensen (ed.), *Lepidoptera. Vol. 1. Handbuch der Zoologie*, 35. Berlin: Walter de Gruyter.

Kozhanchikov, I. V.

1956. Nasekomye tsheschuekrylye. Part 3(2):1-516. Psychidae. In *Fauna SSSR*. St. Petersburg. (In Russian). [English translation: 1969. Smithsonian Institution and the National Science Foundation, Washington, D.C.]

Sauter, W. and P. Hättenschwiler

1991. Zum System der palaearktischen Psychiden (Lep. Psychidae) 1. Teil: Liste der palaearktischen Arten. *Nota Lepid.* (Basel), 14:69-89.