

## Andesianidae, a new family of monotrysian moths (Lepidoptera: Andesianoidea) from austral South America

Donald R. Davis<sup>A,B</sup> and Patricia Gentili<sup>A</sup>

<sup>A</sup>Department of Systematic Biology – Entomology, National Museum of Natural History, PO Box 37012, Smithsonian Institution, Washington, DC 20560-0127, USA.

<sup>B</sup>To whom correspondence should be addressed. Email: davis.don@nmnh.si.edu

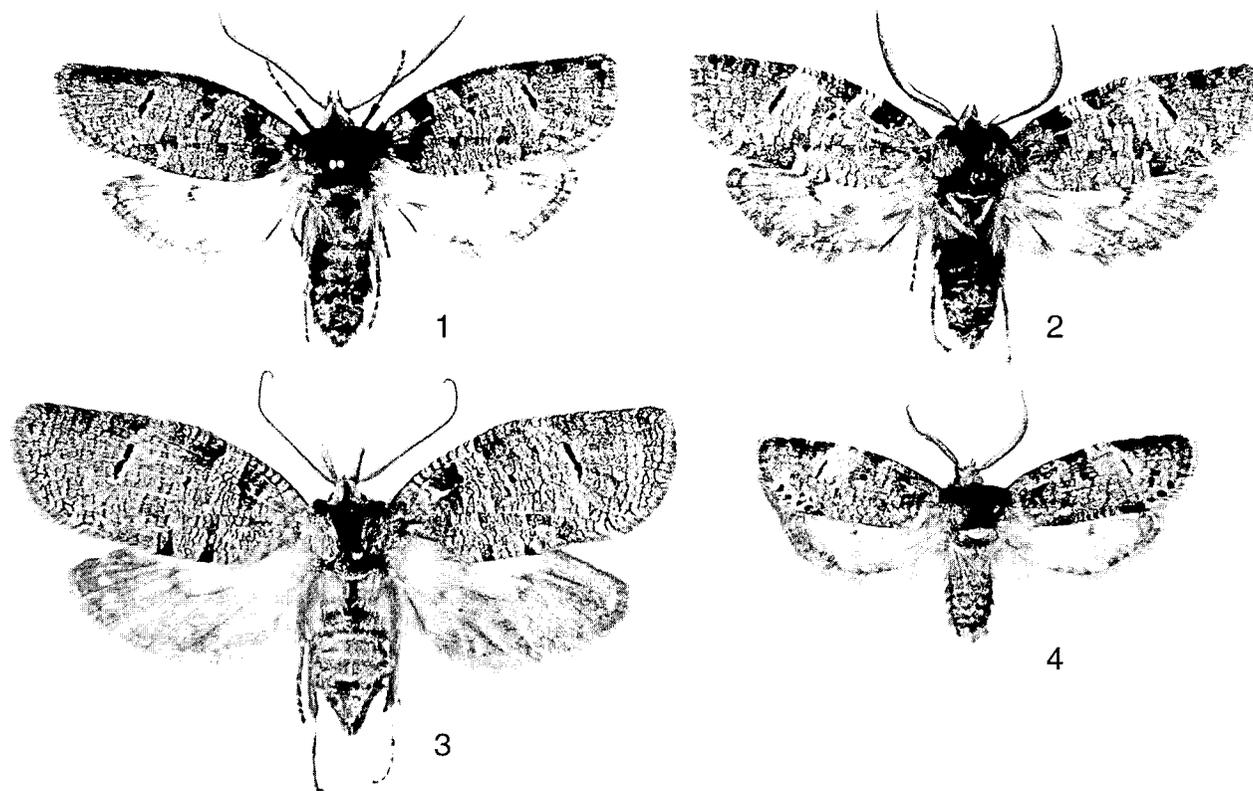
**Abstract.** The new family Andesianidae is proposed for the genus *Andesiana*, consisting of three previously described species, *A. brunnea* Gentili, *A. lamellata* Gentili and *A. similis* Gentili, from southern Argentina and Chile. Originally described in the ditrysian family Cossidae, *Andesiana* has been found to possess a monotrysian female reproductive system. The principal autapomorphies for the family are the elongate second segment of the labial palpi, presence of a male tibial pouch and associated femoral hair pencil and, within the monotrysian Heteroneura, possibly the strongly dimorphic antennae (broadly bipectinate in male, filiform in female). Other significant characters of the group include a greatly reduced haustellum, male genitalia with a broad vinculum, acuminate uncus, scutiform juxta and a pronounced saccular lobe of the valva that bears a subapical, setose appendage within a shallow, mesal cavity. The female genitalia possess a short cloaca and paired anal papillae and lack signa. Although known to be retained only in the female of *A. lamellata*, the presence of a two-branched Rs in the hindwing may indicate an origin of the Andesianidae basal to the Nepticuloidea. In contrast, the structure of the wing coupling apparatus for the family suggests a later appearance. Because no synapomorphy is known linking the Andesianidae with any other superfamily, the new superfamily, Andesianoidea, is proposed.

### Introduction

Field investigations conducted in the southern temperate regions of South America, largely during the decade of 1979–1989, significantly increased our knowledge of the more primitive, basal groups of Lepidoptera. As a direct result of these collective efforts, three new families of moths have been documented including the Heterobathmiidae (Kristensen and Nielsen 1979, 1983), Palaephatidae (Davis 1986) and, in this report, Andesianidae. Another result of that fieldwork was the discovery of four families previously not known to occur in either the New World (Necropsustidae, Davis 1975 and Davis and Nielsen 1980; Eriocottidae, Davis 1990), South America (Micropterigidae, Kristensen and Nielsen 1982), or the southern hemisphere (Prodoxidae, Nielsen and Davis 1985).

The genus *Andesiana* Gentili, with three included species (*A. brunnea* Gentili, *A. lamellata* Gentili and *A. similis* Gentili) from southern Argentina and Chile was proposed originally in the ditrysian family Cossidae (Gentili 1989). Later questioning the family placement of this genus, PG then requested DRD to examine specimens of *Andesiana*. After dissecting a female, DRD recognised that it represented a new family of monotrysian moths.

The monotrysian Heteroneura, a questionably monophyletic assemblage of five distantly related superfamilies, is believed to represent the basal group of the infraorder Heteroneura, as indicated by the (1) retention of a primitive monotrysian reproductive system (Dugdale 1974), with a single reproductive opening in the female, ventral common oviduct and absence of a tubular ductus seminalis; (2) presence of a tergo-sternal connection (Kyrki 1983) immediately caudad to the first abdominal spiracle (Fig. 23), formed by a ventrocaudal process from tergum I connecting with the anterolateral extension of sternum II; and (3) often more generalised distribution of wing microtrichia. Major synapomorphies shared with the ditrysian Heteroneura include: (1) reduction of the hindwing Rs system (i.e. heteroneurous venation, with Sc and R fused from the basal fourth of the wing to the wing margin and Rs typically unbranched); (2) frenulum–retinaculum wing coupling; (3) composite male frenulum; (4) presence of precoxal bridge (Nielsen and Kristensen 1996); and (5) loss of the first abdominal sternum (Brock 1971; Kristensen 1984). Monophyly of the monotrysian Heteroneura (or Monotrysia) is inadequately supported, with two possible synapomorphies proposed (Davis 1999): (1) presence of spine



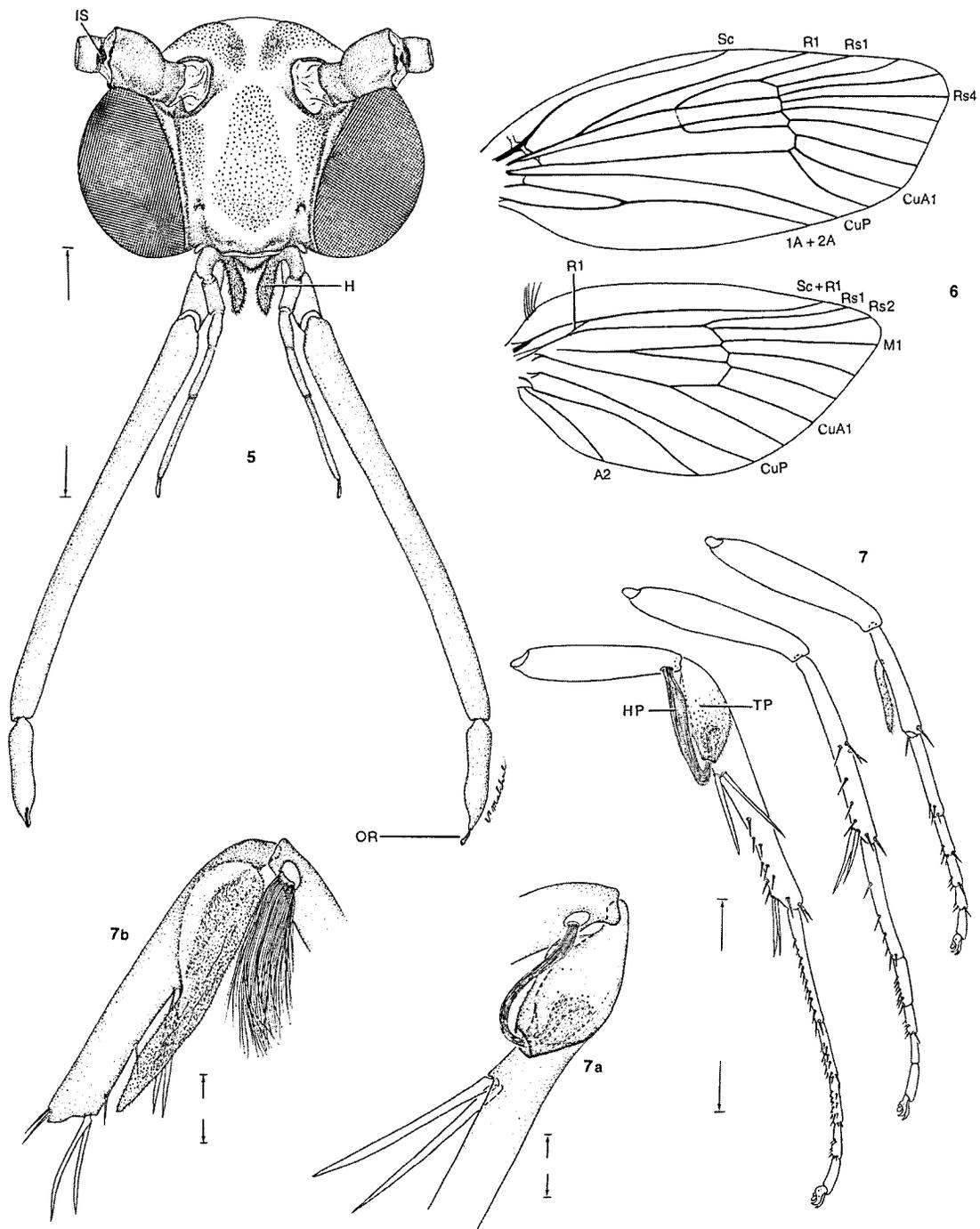
**Figs 1–4.** Adults of *Andesiana*. 1, *Andesiana lamellata*, male (45 mm); 2, *Andesiana lamellata*, male (45 mm); 3, *Andesiana lamellata*, female (54 mm); 4, *Andesiana similis*, male (35 mm). (Wingspan in parentheses).

combs (pectinifers) on the male valva (absent in Tischerioidea, Palaephatoidea and *Andesiana*); and (2) complete or partial subdivision of the second abdominal sternum into a smaller anterior sclerite (S2a) and a usually much larger caudal sclerite. The latter condition is often associated with the development of a pair of oval areas (windows) that largely separate the more sclerotised anterior/posterior regions of sternum II. Lightly sclerotised windows also occur on S2 in some ditrysian families (e.g. Acrolophidae). Partial to complete subdivision of sternum II, often associated with paired sternal windows, is known to exist in other primitive glossatan families (e.g. Eriocraniidae and Acanthopteroctetidae, Davis 1978; Lophocoronidae, Nielsen and Kristensen 1996) and may be part of the Lepidoptera Glossata groundplan.

Adult *Andesiana* are moderately large, heavy bodied, cossoid-appearing moths quite unlike any previously recognised member of the Monotrysia Heteroneura. Their wing span ranges from 27 to 61 mm (1.19–2.38 inches), with a maximum size nearly twice that of the largest previously known monotryisian species (e.g. 32 mm in female *Palaephatus dimorphus* Davis). Moreover, the bodies and wings of dried specimens often become greasy, a condition typically occurring in other families, particularly Cossidae,

whose larvae are known to be stem borers. Consequently, adult *Andesiana* may be easily mistaken for a member of the ditrysian family Cossidae, unless the female internal reproductive morphology is examined. Although their biology is unknown, the greasy condition, which develops in many museum specimens, as well as their relative body size, strongly suggests that larval *Andesiana* are also stem borers. Adult Andesianidae are phototrophic and are readily attracted to ultraviolet light.

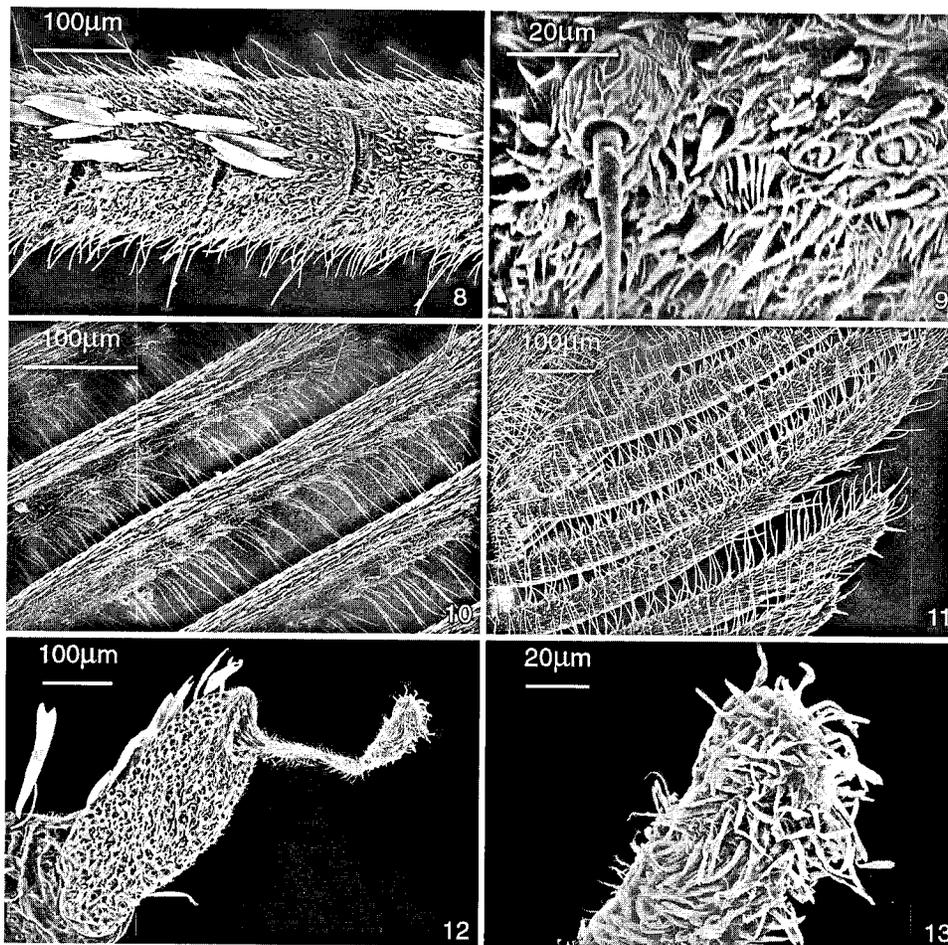
Andesianidae is characterised by at least two autapomorphies: (1) elongate second segment of the labial palpi (Fig. 5) and (2) presence of male tibial pouch and associated femoral hair pencil (Fig. 7a, b). The second labial palpal segment is nearly 4 × the length of the apical segment. The latter terminates in an elongate sensory pit (organ of vom Rath; Figs 5, 14), which often is found everted in dried specimens (Fig. 12). Specialised organs for pheromone dispersion are sparingly developed among the monotryisian Heteroneura, with the notable exception of Palaephatidae (Davis 1986) and one unusual occurrence within the Incurvarioidea (Wojtusiak 1999). The males of *Andesiana* possess a rather elaborate androconial organ on the hind leg consisting of an elongate hair pencil composed of numerous filamentous setae that arise subapically from the femur and



**Figs 5–7.** Adult morphology of *Andesiana*. *Andesiana lamellata* 5–7a: 5, frontal view of head (1.0 mm); 6, female wing venation; 7, male legs (5.0 mm); 7a, detail of male femoral hair pencil and tibial pouch (0.5 mm). 7b, *Andesiana similis*: male femoral hair pencil and inflated tibial pouch (1.0 mm). (HP = hair pencil; H = haustellum; IS = intercalary sclerite; OR = organ of vom Rath; TP = tibial pouch; scale lengths in parentheses).

extend approximately 1/2–2/3 the length of the tibia. The distal fourth to one third of the hair pencil normally rests inside an inverted pocket within a large, membranous, inflatable pouch at the base of the hind tibia (Fig. 7a). The

external wall of the pouch is densely covered with minute, non-deciduous, piliform scales. Hydrostatic pressure within the pouch everts the pocket, thereby expelling the hair pencil. Once expelled, it is unlikely that the hair pencil can ever be



**Figs 8–13.** *Andesiana lamellata*, head morphology. 8, Female antenna, near basal third of flagellum, top of photo = dorsal. 9, Detail of sensillum coeloconicum (centre) from Fig. 8. 10, Male antennal pectinations, dorsal view. 11, Venter of Fig. 10. 12, Labial palpal segment III with subapical organ of vom Rath exerted. 13, Detail of apical sensillae in Fig. 12.

reinserted into the tibial sac. The length of the fully inflated pouch ranges from approximately half the length of the tibia in *A. lamellata* to nearly its entire length in *A. similis* (Fig. 7b). No males of *A. brunnea* were available for study.

Strongly dimorphic antennae (broadly bipectinate in male, filiform in female) (Figs 8, 10, 11) may constitute another autapomorphy for *Andesiana*. Within the monotrysian Heteroneura, development of bipectinate antennae was known to occur only in the males of some species of Incurvariidae (e.g. *Incurvaria masculella* (D. & S.)). The pectinations are more developed in the males of *Andesiana* than those of *Incurvaria*, with the longest rami approximately 4.5–5.0 × the length of the flagellomere. The dorsum of the antenna in both sexes is somewhat thinly covered from the scape nearly to the apex with slender, bi-tridentate scales arranged in indefinite, scattered rows (Figs 8, 10). The male rami are naked ventrally except for a

dense scattering of long sensillae chaetica (Fig. 11), which are more dispersed over the female antenna (Fig. 8). Sensillae coeloconica are scattered along the lower surfaces of the male rami and arc denser ventrally along the female flagellomeres (Figs 8, 9). A broadly triangular intercalary sclerite is present between the postcrioventral margins of the scape and pedicel.

The forewings of *Andesiana* are moderately broad with a L/W ratio of *c.* 2.5 and a hindwing ratio of nearly 2.0. Microtrichia are primarily restricted to the forewing anal region. The male retinaculum consists of a broadly triangular, subcostal flap with a densely scaled, revolute apex into which the single, large, compound frenulum inserts. The female frenulum is composed of 5–6 smaller bristles arising in a separated series from the base of the hindwing costal margin, thus resembling that found in certain other monotrysian genera such as

*Palaephatus*. Concentration of the female frenular bristles near the base of the hindwing may indicate an appearance of the Andesianidae later than the Nepticuloidea, although the enlarged series present in female Nepticuloidea may also represent a derived state (Davis 1986).

The hindwing radial system of female *Andesiana lamellata* is unusual among the Heteroneura in possessing two separate branches of the radial sector vein (Rs1, 2) arising near the apex of the discal cell (Fig. 6). No females of *A. similis* or *A. brunnea* were available for this study. The normal condition within the Lepidoptera Heteroneura is for the radial sector to be unbranched (Scoble 1992). The extra Rs vein reported in a few more advanced heteroneuran genera (Busck 1914; Braun 1933) probably represents secondary reversals without phylogenetic significance (Nielsen and Kristensen 1996). Although Rs2 has been observed only in the females of one member of the family, the presence of Rs2 in the hindwing of the monotrysian *Andesiana* may indicate this group's origin basal to the Nepticuloidea. This contradicts the somewhat weaker evidence based on a comparison of female frenular structure.

Sternite IX (vinculum) of male *Andesiana* (Figs 24, 29, 34) resembles that of several monotrysian genera of Incurvarioidea and Nepticulidae in being typically long and broad. The valvae are unique in being almost completely divided, with a prominent, digitate, saccular lobe bearing a small, elliptical, strongly setose appendage (ASL; Fig. 33) within a subapical cavity, which opens mesally (Fig. 33). The juxta in Andesianidae consists of a sclerotised, well developed, roughly quadrate to medially constricted plate more similar to that present in some Incurvarioidea (Davis 1999). A juxta is poorly developed to absent in the Nepticuloidea, Tischerioidea and Palaephatoidea.

The female reproductive system of *Andesiana* does not agree closely with any known monotrysian family. The Incurvarioidea are typically distinguished by their greatly extensible, piercing ovipositor, elongate posterior apophyses, extended cloaca and enclosure of the eighth segment normally within the greatly enlarged seventh. Although differing less in general morphology from the Palaephatoidea, female *Andesiana* possess paired anal papillae (not developed in Palaephatoidea) and lack a terminal, median sensory ridge (a possible synapomorphy for Palaephatoidea and Tischeriidae). Tergum IX + X of Opostegidae varies in either lacking anal papillae, or possessing one- or, usually, two-lobed papillae (Davis 1989). Paired anal papillae also occur in Tischeriidae, in close association with a median sensory ridge (Davis 1986). The caudal terminations of the alimentary tract (anus) and reproductive tract (oviporus) in Andesianidae merge within a broad, poorly defined cloaca consisting largely of a surrounding membranous fringe which opens terminally on segment X. A cloaca is absent in Palaephatoidea, with the

anus and oviporus well separated and exposed. Attached to the anteriolateral walls of the cloaca of *Andesiana* near the junction of the rectum and vagina are a pair of tendon-like apodemes (CIA; Fig. 41). These may be homologous to the cloacal apodemes present in Adelidae (Davis 1998, fig. 6.8G).

Because no synapomorphy was found linking the Andesianidae with any other superfamily, a new superfamily, Andesianoidea, is proposed, pending a molecular analysis of the monotrysian families.

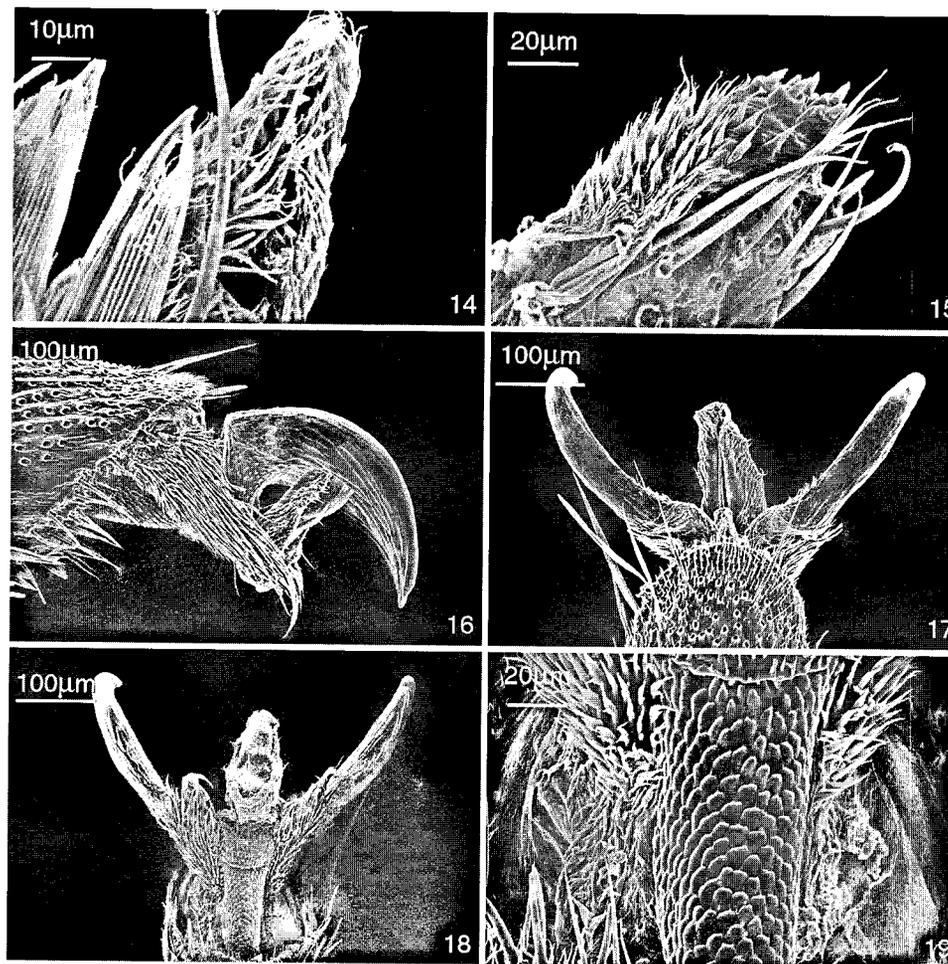
### Andesianidae, new family

Type genus: *Andesiana* Gentili, 1989.

#### Description

**Head** (Fig. 5). Vestiture of frons and vertex rough, consisting of dense, long, piliform scales forming a longitudinal crest over vertex. Chaetosemata absent. Cranium with a pair of broad, slightly raised swellings at vertex. Compound eyes naked, large, with interocular index of ~1.25 and eye index of ~0.93; all species nocturnal and attracted to light. Lateral ocelli absent. Antenna long, ~0.55 length of forewing in both sexes, with 66–93 segments in males, 64–88 in females; scape cupuliform, covered by white scales, without pecten; intercalary sclerite broadly triangular; pedicel a slightly globose cylinder; flagellomeres cylindrical, with two long pectinations (rami) in male; rami arising ventrally from flagellomere, near proximal end; a slightly swollen area bearing a concentration of sensillae chaetica located distal to origin of rami. Tentorium with well developed anterior arms, decreasing in diameter posteriorly; dorsal arms absent. Labrum reduced to a shortened, broadly triangular sclerite; pilifers indistinct. Mandibles vestigial, mostly membranous, with only a narrow, sclerotised lateral rim preserved. Haustellum reduced, approximately equal in length to first segment of labial palpus; food channel shallow, with a row of minute, slender legulae bordering channel. Maxillary palpus well developed, 5-segmented; length ratio of segments from base: ~1:1:1.6:2.5:0.5. Labial palpus 3-segmented, with extremely elongate second segment; length ratio from base for males is 1:3.5:1.08; for females, 1:6.3:1.2; apical segment with elongate, eversible sensory pit (organ of vom Rath), ~0.33–0.50 length of apical segment.

**Thorax.** Wings broad; forewing almost rectangular. Wingspan: 27.3–45.0 mm in males, 47.4–61 mm in females. Radial system of forewing five-branched, with R arising from basal third of discal cell, and branches of radial sector from the areola (accessory cell). Dorsal vestiture of forewing smooth except for a patch of more erect scales at end of discal cell, which are also present but less dense on hindwing. Microtrichiae generally absent over both wings except for anal patch near the base of forewing. Retinaculum

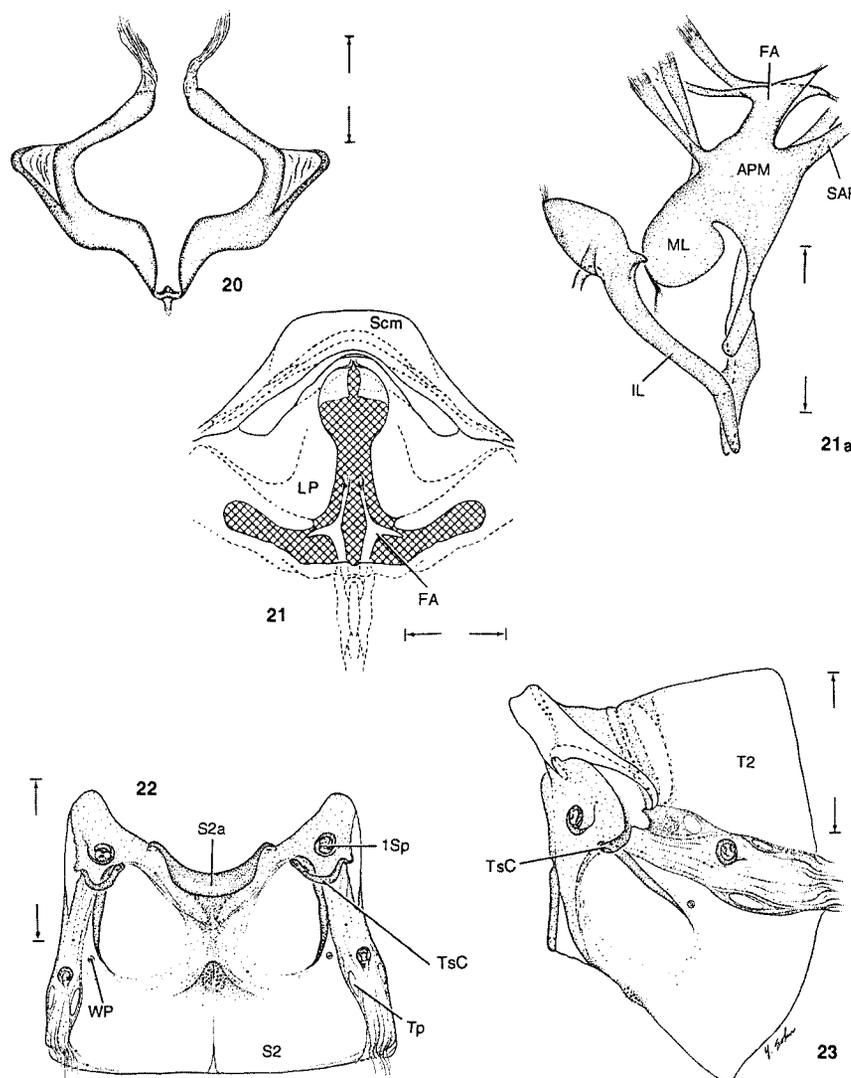


**Figs 14–19.** *Andesiana lamellata*, adult morphology. 14, Labial palpal segment III showing aperture of organ of vom Rath. 15, Apical sensillae of maxillary palpal segment V. 16, Lateral view of prothoracic pretarsus. 17, Dorsal view of Fig. 16 showing pseudempodial seta (centre). 18, Ventral view of Fig. 16. 19, Detail of unguitactor plate from Fig. 18.

a broad ventral lobe from costal margin in male, with curved, densely scaled apex; retinaculum in female consisting of stiff scales along costal margin. Hindwing with veins Sc and R fused from basal fourth to apex; Rs unbranched except with Rs1 and Rs2 preserved in female *Andesiana lamellata* (Fig. 6). Base of medial vein present and forked within discal cell. Medial veins always arising separately from cell. 1A+2A forked over basal third. Male frenulum a single, composite spine; female frenulum consisting of 4–6 smaller, well spaced spines along costal margin. Legs elongate (Fig. 7); tibial spur formula 0–2–4; spurs asymmetrical, densely covered by short hairs, cylindrical, with acute apex. Epiphysis flattened, elongated, 0.56–0.60 length of fore tibia in male, 0.48–0.52 in female. Hind tibia of male with a basal, eversible pouch, which at rest holds tip of elongate hair pencil arising from inner subapical surface of hind femur (Fig. 7a, b); hair pencil and pouch absent in female. Tarsus and apical half of tibia with numerous scattered spines along

ventral surface; structure of pretarsus typical for most Lepidoptera families; ungues long, strongly curved; arolium, pseudempodial seta, and median unguitactor plate well developed (Figs 16–19); pulvillae triangular, densely setose, somewhat reduced, less than length of ungues. Prothorax with lateral cervical sclerite evenly curved as in Crinopterigidae (Davis 1999); lateral angle produced as thin plate with thickened ventral margin (Fig. 20). Metafurcasternum with furcal arms broad, tapering, and free; anteromedial process relatively short; apex of mesal lamella broadly rounded (Fig. 21, 21a).

**Abdomen.** Sternum 1 absent; sternum 2 subdivided, with a pair of oval, lightly sclerotised windows between S2a and S2; S2a broadly U-shaped, less than half width of S2 (Fig. 22). Tergosternal connection present caudad to first abdominal spiracle. Coremata absent in male; corythogyne absent in female. Spiracle 8 well developed and functional in female, vestigial in male. Eighth sternum of male widely

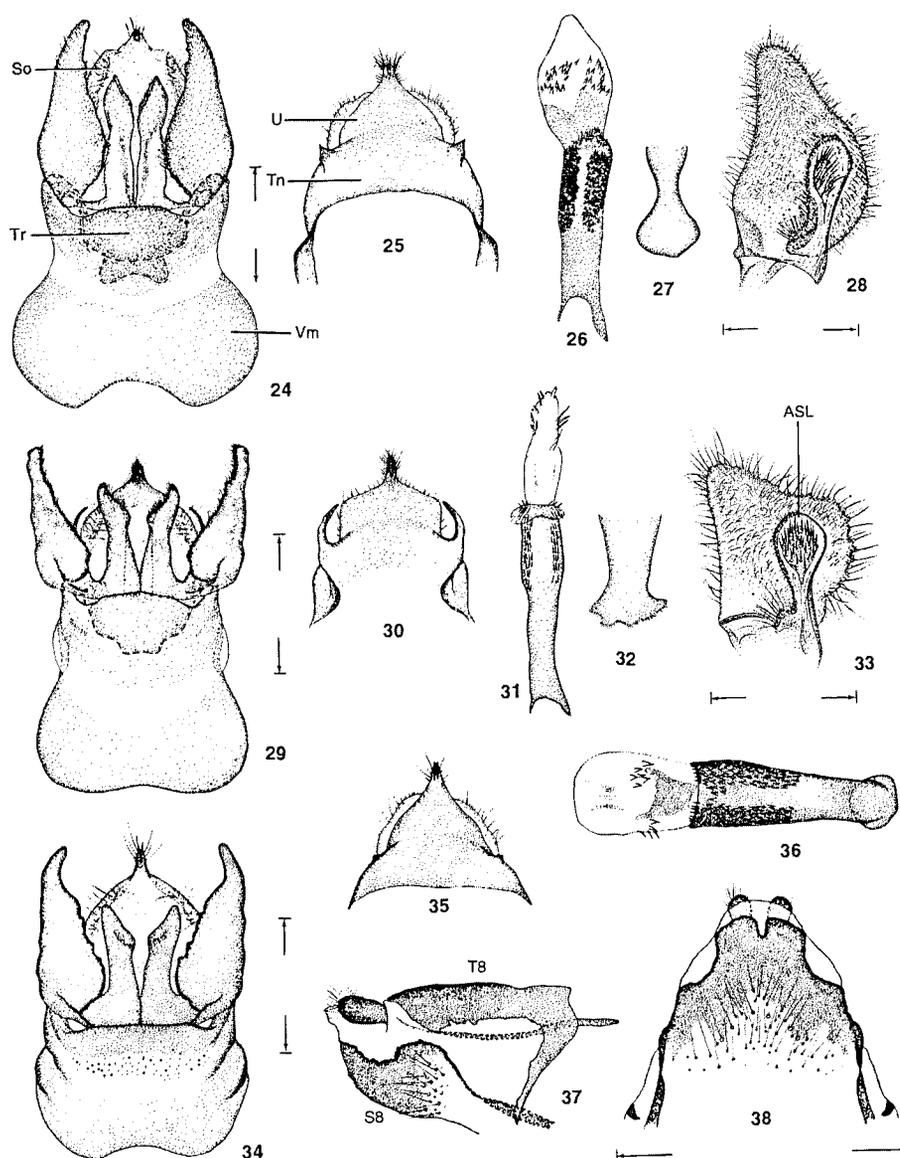


**Figs 20–23.** *Andesiana lamellata*, thoracic morphology. 20, Anterior view of prothoracic lateral cervical sclerites (0.5 mm). 21, Posterior view of metathorax (1.0 mm); (a), lateral view of metafurcasternum (1.0 mm). 22, Ventral view of second abdominal sternum (2.0 mm). 23, Lateral view of abdominal base (2.0 mm). (APM = anteriomedial process of metafurcasternum; FA = furcal apophysis; IL = intercoxal lamella of basisternum; LP = laterophragma; ML = mesal lamella of metafurcasternum; SAF = secondary arms of metafurcasternum; S2a = anterior sclerite of second sternum; Scm = scutellum; 1 SP = first abdominal spiracle; T2 = second tergum; TP = tuberculate plate; TsC = tergo-sternal connection; WP = wart-like protuberance; scale lengths in parentheses).

excavated along caudal margin to accommodate broad vinculum; sternum VIII of female densely setose, caudal margin either entire and narrowly rounded or with median cleft (in *A. similis*).

**Male genitalia** (Figs 24–38). Ninth segment a continuous ring consisting of an elongate, broad, roughly quadrate sternum (vinculum) and much more narrow tergum (tegumen); anterior half of vinculum slightly flared, with a sinuate to concave anterior margin (Figs 24, 29, 34); lateral angles of tegumen with variously developed, paired processes (Figs 25, 30, 35). Tenth tergum (uncus) variably

triangular, fused to tegumen but with suture moderately distinct; apex of uncus acuminate, slightly curved ventrad, with a double row of short, stout spines. Gnathos absent. Socii reduced, present as small, membranous, setose pads ventrolateral to tegumen. Valva strongly fused basally by a broad, strongly developed transtilla; valva divided for nearly its entire length into a broad cucullus and stout, digitiform, sacculus (Figs 28, 33); mesal subapex of saccular lobe shallowly excavate, containing an elliptical, densely setose appendage (ASL; Fig. 33); pedicel of sacculus either with a membranous, mesal groove extending from base to subapical

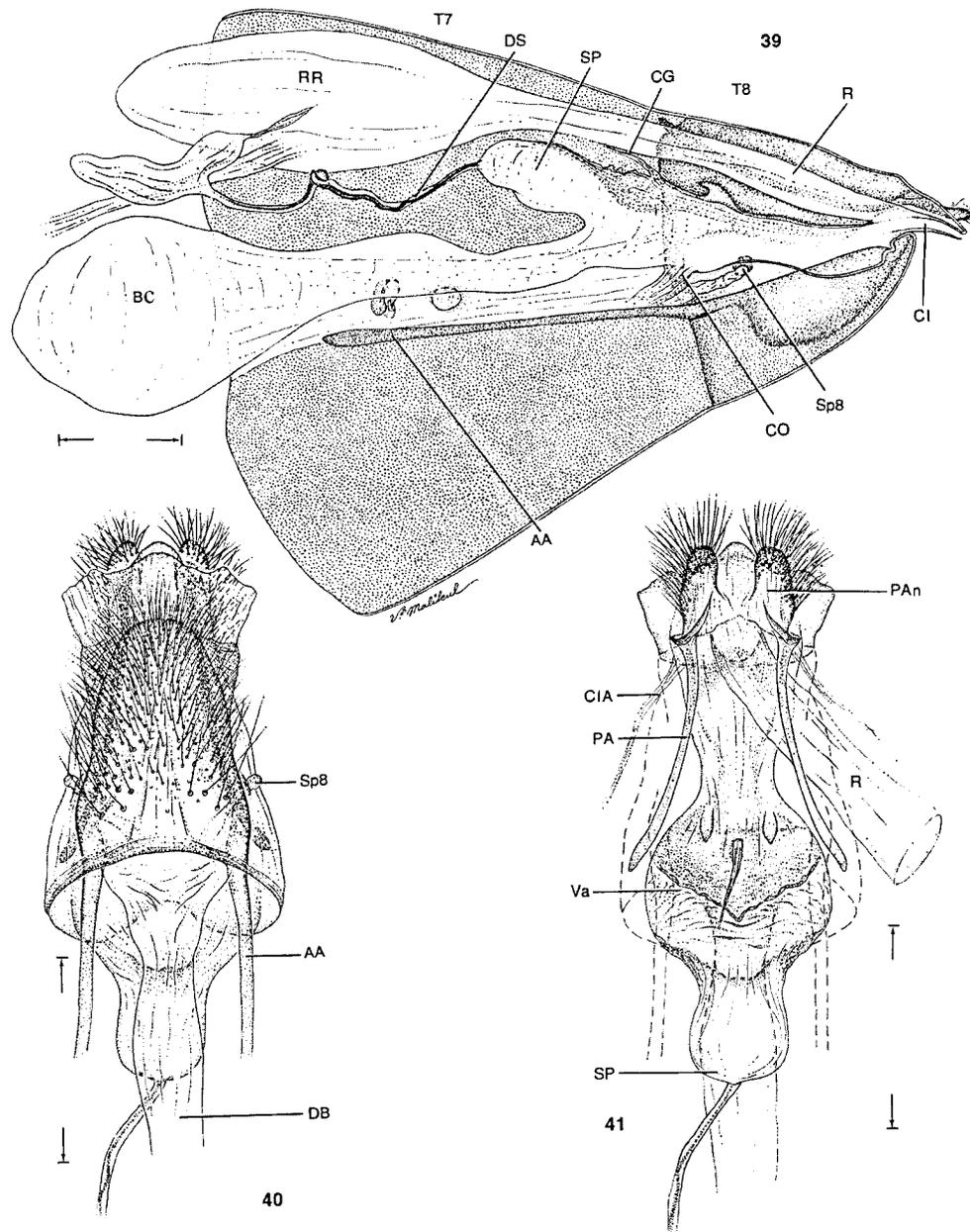


**Figs 24–38.** Male genitalia and female abdominal segments 8–10 of *Andesiana*. 24–28, *Andesiana lamellata*: 24, ventral view, male genitalia (1.0 mm); 25, dorsal view of tegumen and uncus; 26, aedeagus; 27, juxta; 28, mesal view of valva (1.0 mm). 29–33, *Andesiana similis*: 29, ventral view (1.0 mm); 30, dorsal view of tegumen and uncus; 31, aedeagus; 32, juxta; 33, mesal view of valva (1.0 mm). 34–36, *Andesiana brunnea*: 34, ventral view (1.0 mm); 35, dorsal view of tegumen and uncus; 36, aedeagus. 37–38, *Andesiana similis*: abdominal segments 8–10 of female: 37, lateral view (0.5 mm); 38, ventral view. (ASL = appendage of saccular lobe; PAn = papilla analis; S8 = eighth sternum; So = socii; T8 = eighth tergum; Tn = tegumen; Tr = transtilla; U = uncus; scale lengths in parentheses).

cavity (in *A. lamellata*, *A. similis*) or completely sclerotised and without groove (in *A. brunnea*). Juxta a short, sclerotised, subrectangular plate, moderately to strongly constricted at middle (Figs 27, 32); distal end ventrally attached to aedeagus through anellar membrane. Anellus with a pair of elongate, laterodorsal concentrations of small spines. Aedeagus moderately stout and short, ~equal to valva in length; coecum poorly developed, only a slight basal

enlargement evident in one species (*A. brunnea*); cornuti of vesica either scattered or arranged in two longitudinal rows.

*Female genitalia* (Figs 37–41). Ovipositor non-piercing, short, largely enclosed within eighth abdominal segment. Segments IX + X fused, represented primarily by a pair of small, setose anal papillae immediately dorsal to terminal cloacal opening. Posterior apophyses slender, approximately equal to eighth segment in length. Anterior



**Figs 39–41.** Female genitalia of *Andesiana lamellata*. 39, Parasagittal view of abdominal segments 7–10 (1.0 mm). 40, Ventral view of abdominal segments 8–10 (1.0 mm). 41, Dorsal view of Fig. 40, with tergum removed (1.0 mm). (AA = anterior apophysis; BC = bursae copulatrix; CG = duct of colleterial gland; CIA = cloacal apodeme; CO = common oviduct; Cl = cloaca; DB = ductus bursae; DS = ductus seminalis; PA = posterior apophysis; PAn = Papillae analis; R = rectum; RR = rectal reservoir; SP = spermathecal papilla; Sp8 = eighth abdominal spiracle; T7 = seventh tergum; T8 = eighth tergum; Va = vagina; scale lengths in parentheses).

apophyses arising from eighth sternum,  $\sim 1.6 \times$  length of posterior apophyses. Cloaca broad, extremely short, formed primarily by membranous fringe surrounding cloacal opening. A pair of cloacal apodemes (CIA; Fig. 41) arising from anteriolateral walls of cloaca. Common oviduct entering vagina ventrally. Bursa copulatrix located dorsal to

oviduct, membranous, without signa. Spermatheca with papilla greatly enlarged, joining vagina anterior to junction of common oviduct. Vagina broad at anterior junction with spermathecal papilla, then narrowing beyond junction with oviduct. Common duct of colleterial gland joining vagina dorsally, caudad to spermathecal papillae.

*Andesiana* Gentili, 1989

Type species: *Andesiana lamellata* Gentili, 1989: 21, original designation.

*Description**Adult*

As described for the family.

*Species synopses**Andesiana lamellata* Gentili, 1989*Description**Adult* (Figs 1–3)

Length of forewing: ♂ 15.7–26.1 mm, ♀ 21.5–26.1 mm. Largest of the three species, with the most evident sexual dimorphism: females often 1/3 larger than males. Vestiture of male forewing grey with a metallic sheen, covered by a reticulate pattern of reddish-brown; markings more dense and forming three irregular patches (sub-basal, median and sub-terminal) along costa, and another patch touching hind margin in cubito-anal area. A well defined bar of darker brown composed of erect, dense scales at end of discal cell. Hindwings grey with a diffuse reticulated brownish pattern, lighter towards wing base; a darker bar along end of discal cell as in the forewing, but not as prominent. Females with a less pronounced wing pattern. Vestiture of the head, thorax and abdomen a combination of piliform scales and broader scales forming crests and tufts on head, collar and thorax; abdomen grey.

*Male genitalia* (Figs 24–28). Laterodorsal processes of tegumen triangular, short, acute. Transtilla a broad plate tapering slightly anteriorly, with more narrow, free anterior end bilobed. Juxta strongly constricted at middle; anterior margin smoothly rounded. Valva with apex of cucullus more extended than in other species; digitiform saccular lobe of valva relatively elongate, subapical cavity elliptical. Aedeagus with cornuti relatively reduced in size, numerous and scattered; anellar spines in two, relatively broad, lateral patches.

*Female genitalia* (Figs 39–41). Anal papillae lightly sclerotised, posterior apophyses reaching the anterior margin of eighth tergum. Posterior margin of sternum VIII arcuate, sclerotised.

*Distribution* (Fig. 42)

*Andesiana lamellata* is the most common species of the group, with a geographical range in Argentina (Neuquén and

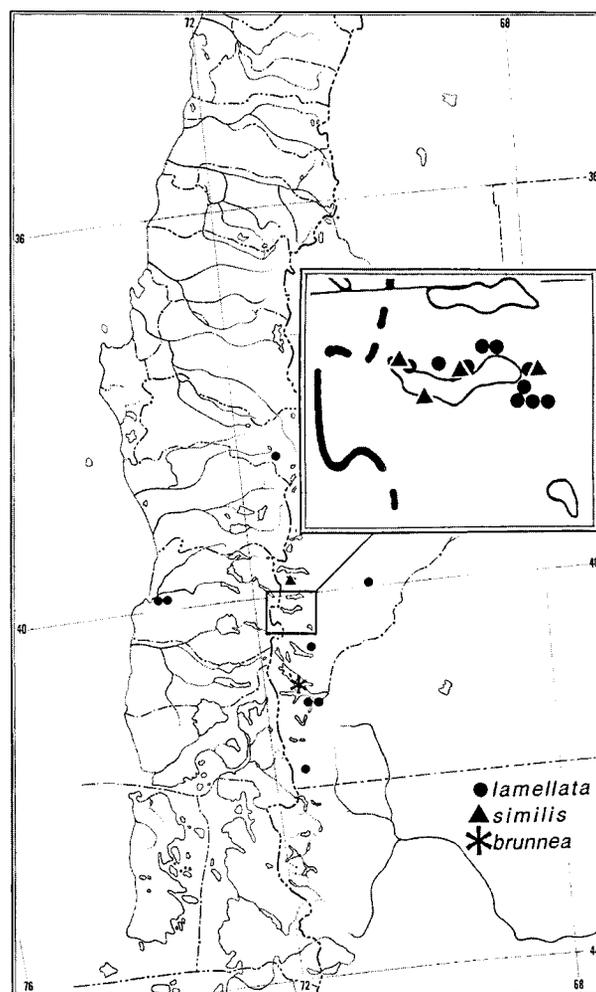


Fig. 42. Distribution of *Andesiana lamellata*, *A. similis* and *A. brunnea* in southern Chile and Argentina.

Río Negro) and Chile (Malleco and Valdivia) between 38°40' and 42°S. Adults fly during the spring into early summer (late September to mid January, with isolated records in February and April) in *Nothofagus pumilio* and *N. antarctica* forests. They occur over a broad altitudinal range, between 100 and 1750 m.

*Remarks*

Of the other two species in the genus, only *A. similis* is likely to be confused with *A. lamellata*. The male genitalia of *A. similis* are characterised by long, curved, digitate, laterodorsal processes of the tegumen (short in *A. lamellata*); dorsal plate of transtilla sub-trapezoidal (rectangular in *A. lamellata*); juxta basally expanded, with expansions terminating in acute apices (not expanded, more simple in *A. lamellata*).

*Andesiana similis* Gentili, 1989*Description**Adult* (Fig. 4)

Length of forewing: ♂ 17.4–18.2 mm, ♀ 21.15 mm (only one female known). Vestiture of male forewing steel-grey with a metallic sheen; pattern as in *A. lamellata* but not as prominent and dominated by a white subapical band oblique across wing; also a series of dark spots at terminus of veins. Hindwings whitish-grey with copper iridescence on veins. Female with less pronounced wing pattern. Vestiture of head, thorax and abdomen as in *A. lamellata*.

*Male genitalia* (Figs 29–33). Laterodorsal processes of tegumen long and curved towards uncus. Transtilla broad, strongly tapered anteriorly; anterior margin superficially sinuate. Lateral margins of juxta almost parallel, proximally expanded; anterior margin of juxta irregular. Valva with cucullar margin more truncate than in *A. lamellata*; digitiform saccular lobe of valva relatively shorter and more clavate than in *A. lamellata*; apical cavity more circular. Aedeagus with cornuti more elongate and arranged in two subapical rows; anellar spines arranged in more slender lateral patches than in other species.

*Female genitalia* (Figs 37–38). Anal papillae sclerotised. Posterior apophyses slightly surpassing anterior margin of eighth tergum. Eighth sternum sclerotised over distal half; distal margin protruding, with a strong median indentation.

*Distribution* (Fig. 42)

*Andesiana similis* commonly occurs in *Nothofagus dombeyi* forests with an understory of *Chusquea culeou* in Argentina (Neuquén) around 40°S. Adults fly during the spring (late October to mid December). Their altitudinal range is more restricted, between 640 and 950 m.

*Remarks*

This species can only be confused with *A. lamellata*, from which it differs by its smaller size and lighter colouration, particularly by the sub-apical white band across the forewing. *Andesiana lamellata* also lacks the brown spots at the end of the veins. Differences in genitalic morphology are summarised above under *A. lamellata*. Diagnostic comparison with *A. brunnea* is provided below.

*Andesiana brunnea* Gentili, 1989*Description**Adult*

Length of forewing: ♂, 12.4 mm, only one specimen known. The smallest of the three species, with generally dark reddish-brown vestiture. Forewing pattern reduced to a well

defined, dark brown bar composed of erect dense scales at end of discal cell. Hindwings are almost denuded of scales, with scattered brown scales along margins; a darker bar along end of discal cell as in forewing. Vestiture of head, thorax and abdomen with same combination of crests and tufts, but more uniform in colour and dark reddish brown as in wings.

*Male genitalia* (Figs 34–36). Laterodorsal processes of tegumen reduced to a pair of short denticles. Transtilla (not illustrated in Fig. 34) broad, tapering to more narrow anterior margin. Juxta constricted at middle, anterior margin rounded. Saccular lobe without longitudinal groove. Aedeagus short, vesica with a conspicuous subapical sclerotised plate and two small patches of cornuti; anellar spine patches similar to *A. lamellata*.

*Female genitalia*. Unknown.

*Distribution* (Fig. 42)

*Andesiana brunnea* is known from a single specimen from Argentina (Isla Victoria, Lago Nahuel Huapi, Neuquén) collected in early October.

*Remarks*

The small size, dark brown colouration, and more slender wings of this species easily distinguish *A. brunnea* from the foregoing species. The male genitalia possess short, paired, laterodorsal processes on the tegumen more similar to those of *A. lamellata* and distinct from the elongate processes of *A. similis*.

**Acknowledgments**

We dedicate this paper to the memory of Ebbe S. Nielsen, whose interest in the lower Lepidoptera was both inspiring and broad in scope. It is interesting to note that one of the last discussions DRD had with Ebbe centred on the relationships of *Andesiana*, wherein he queried ‘was *Andesiana* actually a monotrystian?’ We hope this report answers his question. From the Department of Systematic Biology, Smithsonian Institution, we thank Vichai Malikul and Young Sohn for the line illustrations, and George Venable for assistance with graphics. Susann Braden of the Smithsonian Scanning Electron Microscope Laboratory and John Steiner of the Smithsonian Photographic Services assisted with the photographs.

**References**

- Braun, A. F. (1933). Pupal tracheation and imaginal venation in Microlepidoptera. *Transactions of the American Entomological Society* 59, 229–268.
- Brock, J. P. (1971). A contribution towards an understanding of the morphology and phylogeny of the ditrypsian Lepidoptera. *Journal of Natural History* 5, 29–102.
- Busck, A. (1914). On the classification of the Microlepidoptera. *Proceedings of the Entomological Society of Washington* 16, 46–54.

- Davis, D. R. (1975). Systematics and zoogeography of the family Neopseustidae with a proposal of a new superfamily (Lepidoptera: Neopseustoidea). *Smithsonian Contributions to Zoology* **210**, 1–44.
- Davis, D. R. (1978). A revision of the North American moths of the superfamily Eriocranioidea with the proposal of a new family, Acanthopteroctetidae (Lepidoptera). *Smithsonian Contributions to Zoology* **251**, 1–131.
- Davis, D. R. (1986). A new family of monotrystian moths from austral South America (Lepidoptera: Palaephatidae), with a phylogenetic review of the Monotrystia. *Smithsonian Contributions to Zoology* **434**, 1–202.
- Davis, D. R. (1989). Generic revision of the Opostegidae, with a synoptic catalogue of the World's species (Lepidoptera: Nepticuloidea). *Smithsonian Contributions to Zoology* **478**, 1–97.
- Davis, D. R. (1990). Neotropical Microlepidoptera XXIII. First report of the family Eriocottidae from the New World, with descriptions of new taxa. *Proceedings of the Entomological Society of Washington* **92**, 1–35.
- Davis, D. R. (1998). The Monotrystian Heteroneura. In 'Handbook of Zoology, Vol. IV, Part 35. Lepidoptera, Moths and Butterflies. Volume 1: Evolution, Systematics, and Biogeography'. (Ed. N. P. Kristensen.) pp. 65–90. (Walter de Gruyter: Berlin, Germany.)
- Davis, D. R., and Nielsen, E. S. (1980). Description of a new genus and two new species of Neopseustidae from South America, with discussion of phylogeny and biological observations. *Steenstrupia* **6**, 253–289.
- Dugdale, J. S. (1974). Female genital configuration in the classification of Lepidoptera. *New Zealand Journal of Zoology* **1**, 127–146.
- Gentili, P. (1989). Revision sistemática de los Cossidae (Lep.) de la Patagonia Andina. *Revista de la Sociedad Entomológica Argentina* **45**, 3–76.
- Kristensen, N. P. (1984). Studies on the morphology and systematics of primitive Lepidoptera (Insecta). *Steenstrupia* **10**, 141–191.
- Kristensen, N. P., and Nielsen, E. S. (1979). A new subfamily of micropterigid moths from South America. A contribution to the morphology and phylogeny of the Micropterigidae, with a generic catalogue of the family (Lepidoptera: Zeugloptera). *Steenstrupia* **5**, 69–147.
- Kristensen, N. P., and Nielsen, E. S. (1982). South American micropterigid moths: two new genera of the *Sabatinea*-group (Lepidoptera: Micropterigidae). *Entomologica Scandinavica* **13**, 513–529.
- Kristensen, N. P., and Nielsen, E. S. (1983). The *Heterobathmia* life history elucidated: immature stages contradict assignment to suborder Zeugloptera (Insecta, Lepidoptera). *Zeitschrift für Zoologische Systematik und Evolutionsforschung* **21**, 101–124.
- Kyrki, J. (1983). Adult abdominal sternum II in ditrypsian tineoid superfamilies – morphology and phylogenetic significance (Lepidoptera). *Annales Entomologici Fennici* **49**, 89–94.
- Nielsen, E. S., and Davis, D. R. (1985). The first southern hemisphere prooxid and the phylogeny of the Incurvarioidea (Lepidoptera). *Systematic Entomology* **10**, 307–322.
- Nielsen, E. S., and Kristensen, N. P. (1996). The Australian moth family Lophocoronidae and the basal phylogeny of the Lepidoptera-Glossata. *Invertebrate Taxonomy* **10**, 1199–1302.
- Scoble, M. J. (1992). 'The Lepidoptera, Form, Function, and Diversity.' (Oxford University Press: New York, USA.)
- Wojtusiak, J. (1999). A new type of scent organ in Lepidoptera: a giant thoracic pheromone-disseminating structure in a male incurvarioid moth (Lepidoptera, Adeliidae). *Journal of Natural History* **33**, 819–824.