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Loboponera gen. n. and a review of the Afrotropical *Plectroctena* genus group (Hymenoptera: Formicidae)

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CONTENTS

SYNOPSIS. The Afrotropical ponerine ant genus *Loboponera* is newly described. It contains 7 new species and one species previously regarded as a member of *Pachycondyla* F. Smith (*L. nasica* (Santschi) **comb. n.**). The relationships of *Loboponera* within the *Plectroctena* genus group and tribe Ponerini are discussed and apomorphy-based diagnoses are provided for all taxa. An identification key and descriptions are provided for the workers of *Loboponera*. Revised keys and taxonomic synopses are given for *Psalidomyrmex* (6 species) and *Plectroctena* (15 species); within the latter *Pl. gabonensis* is a new junior synonym of *Pl. minor*.

INTRODUCTION

The name *Loboponera* first appeared in print in Bolton's (1994: 156) key to the Afrotropical Ponerinae, where it was taxonomically unavailable. The genus was known to be undescribed several years earlier and was included so that a full picture of the regional fauna could be provided, using the name assigned to it by William L. Brown Jr. At that time Brown was engaged in a revision of the world Ponerini genera and the appearance of a formal description for *Loboponera* was expected soon afterwards. Sadly, Professor Brown died before he had completed his studies and so his work on *Loboponera*, and the rest of the Ponerini, went into abeyance.

More recently Steven O. Shattuck (ANIC, Canberra) has retrieved Brown's Ponerini manuscripts and is currently working on them in an attempt to bring the study of the genera to a conclusion. He passed on Brown's *Loboponera* notes to me, so that I could conclude work on this genus to species rank. Stefan Cover (MCZ, Harvard) kindly provided me with the figures for the genus that Brown had prepared and they are published here.

While studying material of the *Loboponera* species it became apparent that they formed a monophyletic group with two other Afrotropical Ponerini genera,

Psalidomyrmex and *Plectroctena*, both of which had been revised previously (Bolton, 1974, 1975). This presented a reasonable opportunity to update our knowledge of these two genera and at the same time introduce the new genus, so that a group diagnosis and new findings for all of them could be included in a single publication. Diagnoses of all three genera are presented, as are comparative notes and keys to species. Formal diagnoses of the *Loboponera* species are given but the species of the other two genera are more summarily treated as revised descriptions already exist. Thus for the species of *Psalidomyrmex* and *Plectroctena* only taxonomic synopses are presented, together with additional distribution records.

It should be pointed out that a subtribal name, Plectroctenina, exists for this group. It was originally spelled Plectroctenini Emery, 1911: 92, but the suffix is modified here in accordance with the Fourth Edition of the International Code of Zoological Nomenclature (1999). At present this subtribal name is treated as a junior synonym of Ponerini (Bolton, 1994, 1995). As well as *Plectroctena* and *Psalidomyrmex*, Emery also included in his subtribe *Myopias* Roger and *Trapeziopelta* Mayr, the latter of which is now a junior synonym of the former (Willey & Brown, 1983: 249). *Myopias*, distributed through the Oriental, Malesian and Austral regions, is not part of the *Plectroctena* group. Its affinities appear to lie with *Pachycondyla* and its immediate allies.

The three genera of the *Plectroctena* group are strictly Afrotropical, with a majority of species in the forest zones of West and Central Africa. All nest in rotten wood or in the soil and foraging is carried out there and in the leaf litter layer. Some species may also use abandoned termitaries as nest sites (Dejean, Durand & Bolton, 1996). Diet where known appears entirely carnivorous and the species are specialised predators. *Plectroctena* species prey mostly, or perhaps in some species entirely, on millipedes or their eggs (Lévieux (1972), Bolton (1974), Bolton, Gotwald & Leroux (1979)). *Pl. minor* has been recorded as preying on termites as well as millipedes (Dejean & Suzzoni, 1991). Arnold (1915) mentions millipedes, beetles and termites forming the diet of *Pl. mandibularis*, though Hamish Robertson (SAM, personal communication) informs me that the record for beetles as prey has never been confirmed. *Psalidomyrmex procerus* captures earthworms (Lévieux (1982), Dejean, Schatz, Orivel & Beugnon (1999)); the prey of *Loboponera* remains unknown. Little detail is known of the biology and ecology of individual species apart from comments in the publications just mentioned and some scattered remarks in the literature of original descriptions, but Villet (1991) has reported on colony foundation by, and the origin of, ergatoid queens in *Pl. mandibularis*.

Standard measurements and indices, and abbreviations for the names of museums, are as noted in the earlier publications (Bolton, 1974, 1975).

The tribe Ponerini

The subfamily Ponerinae, as it is presently understood, is probably paraphyletic. Bolton (1990a, 1990b) and Baroni Urbani, Bolton & Ward (1992) proposed tergosternal fusion of the fourth abdominal segment as a synapomorphy of the subfamily, but the validity of the character was compromised by Ward (1994). In consequence the tribal composition, and indeed the monophyly, of the Ponerinae is still very much in doubt (Keller, 2000).

Of the Ponerinae tribes that are currently recognised, with varying degrees of confidence, the Ponerini is easily the largest (Bolton, 1994). In recent years tribe Amblyoponini has been redefined by Ward (1994) and the phylogeny of the Ectatommini and its relatives has been investigated by Lattke (1994) and Keller (2000). At present the tribe Ponerini is diagnosed by the following synapomorphic characters.

1. Median portion of clypeus is narrowed posteriorly and is narrowly inserted between the frontal lobes as a slender triangle or linear strip (worker and queen).
2. Inner borders of frontal lobes are very closely approximated or confluent for most or all of their length, often separated merely by a sulcus (worker and queen).
3. Outer borders of frontal lobes form simple short semicircles or blunt triangles and have a distinctly pinched-in appearance posteriorly (worker and queen).
4. Helcium projects from low down on the anterior face of the first gastral (= third abdominal) segment and the anterior face above the helcium is vertical and usually high (worker and queen).
5. Mandibles are reduced, short to lobate, edentate except for apical tooth at most (male).

The *Plectroctena* genus group

Within the tribe Ponerini a small group of Afrotropical genera, *Plectroctena* + *Psalidomyrmex* + *Loboponera*, share the following autapomorphic development in workers and queens.

Anteroventral articulatory surface of petiole long and very broad, the surface with a narrow median V-shaped longitudinal groove or central small pore-like depression (see comments for discussion).

Other characters that in combination are diagnostic of female castes in the group include the following. Some are plesiomorphic but some (marked with an asterisk) are probable apomorphies of which analogues have apparently developed convergently elsewhere in tribe Ponerini.

*Frontal lobes hypertrophied.
Antenna with 12 segments.
Promesonotal suture strongly developed.
Orifice of propodeal spiracle round or very broadly oval, nearly round.
Metapleural gland orifice lateral.
Metanotal groove usually absent, rarely vestigial.
*Mesotibia and metatibia each with only a single spur (also in males).
Pretarsal claws simple, small.
Petiole nodiform in profile.
Constriction between first and second gastral segments deep and broad.
*Stridulitrum absent from pretergite of second gastral (= 4th abdominal) segment.

Comments

Within Ponerini but outside this group the anteriormost part of the ventral surface of the petiole, where it articulates with the alitrunk, is quite uniform. At the junction, immediately behind the alitrunk margin and intersegmental membrane, the petiole has an arched or broadly horseshoe-shaped strip of cuticle which, when the petiole is flexed down, slides into the alitrunk; this is the articulating surface proper. Immediately behind this is a transverse impression or depressed area which is followed by a flat or slightly convex zone upon which there are usually a number of proprioceptor hairs.

The members of the *Plectroctena* genus group have modified this basic arrangement by extending the length of the articulating surface of the petiole posteriorly on each side, and expanding its width towards the ventral midline. This has the effect of constricting the subsequent areas into a narrow median impression or groove. In most members of the group this groove is a narrow inverted V-shape but in some (*Plectroctena lygaria, Psalidomyrmex foveolatus*) the development has gone so far that only a tiny median pore-like depression remains.

Formal diagnoses of the three genera included in the group are given below, but they can be distinguished quickly in the worker and queen castes by the following features.

Plectroctena has linear mandibles and a large semicircular excavation in the clypeal margin at the mandibular articulation.

Psalidomyrmex has the labrum projecting as a prominent lobe in front of the anterior clypeal margin and the mandible has a long attenuated apical tooth.

Loboponera has the median portion of the clypeus produced into a lobe that overhangs the mandibles and has the second gastral tergite strongly vaulted.

Dolioponera Brown (1974) may also belong to this genus group but as the taxon is known only from a single worker, the holotype, there is no chance of dissection to assess the presence of the apomorphy. Nevertheless, it has most of the features noted above and the mandible, with its rounded basal angle, is reminiscent of *Psalidomyrmex*. There are however some striking differences. *Dolioponera* lacks the characteristic labral lobe of *Psalidomyrmex*, the median portion of its clypeus projects as a short truncated lobe, the propodeum lacks a median longitudinal groove and the second gastral segment is elongate and cylindrical. Finally, the three genera of the group all have an anteroventral process on the first gastral sternite that projects somewhat forward and downward beneath the helcium; this is absent in *Dolioponera*.

LOBOPONERA Bolton & Brown **gen. n.**

(Figs. 1–11)

[*Loboponera* Bolton, 1994: 156 (in key), *unavailable name*.]

Type-species: *Loboponera vigilans*, by present designation.

WORKER. Ponerine ants with the tribe and group characters noted above and also with the following.

1. Median portion of clypeus extended anteriorly as a lobe that projects out over the mandibular basal margins; anterolaterally the clypeus with a small projecting lobe that overhangs the outer base of the mandible.
2. Labrum not visible in full-face view with mandibles closed.
3. Mandible subtriangular to triangular; apical tooth the largest but not attenuated; basal angle narrowly rounded to angulate.
4. Palp formula 2,2 (dissections of *obeliscata, vigilans*).
5. Posteroventral curve of head in profile with a projecting curved flange that is formed from the hypertrophied lateral portion of the occipital carina.
6. Propodeal dorsum without a median longitudinal groove or impression.
7. Mesofemur and metafemur with a longitudinal (glandular?) groove present mid-dorsally on basal half.
8. Tergite of second gastral (= 4th abdominal) segment vaulted, strongly arched and down-curved posteriorly; second gastral sternite correspondingly reduced.

QUEEN. The few known (*basalis, nasica, vigilans*) are slightly larger than the worker, dealate, with the above characters and the usual modifications associated with this caste.

MALE. Unknown.

Comments

Characters 1, 4, 5 and 8 are autapomorphic; 2, 3 and 6 are plesiomorphic. Character 7 is equivocal; it may be

autapomorphic but synapomorphy with *Plectroctena*, which also has femoral grooves developed, is a possibility. The latter case would leave *Psalidomyrmex*, which has no trace of femoral grooves, either plesiomorphic for this character or apomorphic by secondary loss.

Species of *Loboponera* superficially resemble the Afrotropical members of *Pachycondyla* that are stockily built, more heavily sculptured and have a nodiform petiole (i.e. former members of *Bothroponera*). Indeed, the only previously described species, *nasica*, was originally included there. However, those *Pachycondyla* species (in the broad sense of Bolton, 1994, 1995) that superficially resemble *Loboponera*, beside lacking the petiole articulation autapomorphic in the *Plectroctena* group, also differ as they have the following features.

Mesotibia and metatibia each with two spurs, one large and pectinate, the other smaller and simple.
Mesofemur and metafemur without a mid-dorsal longitudinal groove.
Posteroventral curve of head without a projecting flange.
Stridulitrum present on pretergite of second gastral segment.
Tergite of second gastral segment curved but not vaulted.
Orifice of propodeal spiracle usually slit-shaped.
Palp formula usually greater than 2,2.

Loboponera also shows some striking parallelisms with the ectatommine genus *Gnamptogenys*. Their habitus similarities may indicate that *Loboponera* shares some ecological or behavioural features with the latter genus. This is an interesting speculation as *Gnamptogenys*, with many species in the Neotropical, Oriental and Malesian regions (Brown, 1958; Lattke, 1995 and in preparation), is absent from the Afrotropical; *Loboponera* on the other hand is restricted to the Afrotropical region. All collections of this genus have been recovered from leaf litter, rotten wood or abandoned termitaries.

List of species

obeliscata group
  obeliscata Bolton & Brown **sp. n.**
  politula Bolton & Brown **sp. n.**
trica group
  trica Bolton & Brown **sp. n.**
vigilans group
  basalis Bolton & Brown **sp. n.**
  edentula Bolton & Brown **sp. n.**
  nasica (Santschi, 1920) **comb. n.**
  subatra Bolton & Brown **sp. n.**
  vigilans Bolton & Brown **sp. n.**

Key to species (workers)

1 Dorsum of alitrunk and first gastral tergite without standing hairs of any form (Figs. 4–6). Second gastral tergite punctate or with fine dense sculpture but without longitudinal costate sculpture. With head in full-face view the sides without projecting hairs (Figs. 2–3) 2

– Dorsum of alitrunk and first gastral tergite with numerous to abundant stiff, usually short, standing hairs (Figs. 7–9). Second gastral tergite with coarse longitudinal costate sculpture. With head in full-face view the sides with at least 1–2 sho-rt projecting hairs (Fig. 1) 4

2 Leading edge of scape without projecting hairs; dorsum of scape finely and densely punctulate. Dorsal surfaces of head and body, including the frontal lobes, entirely blanketed with very fine dense sculpture, opaque. Propodeal lamella restricted to lower half of declivity. (Ivory Coast) ..... *trica*

– Leading edge of scape with a row of suberect projecting hairs; dorsum of scape longitudinally costulate-rugulose. Dorsal surfaces of head and body not entirely finely densely sculptured, not opaque. Propodeal lamella extends the whole depth of the declivity 3

3 With petiole in profile the dorsum rising medially to a bluntly subpyramidal point (Fig. 4). Scape longer, SI > 95; when laid back the apex of the scape just reaches the occipital margin (Fig. 3). Larger species, HW > 0.90. (Ghana, Gabon) ..... *obeliscata*

– With petiole in profile the dorsum shallowly convex to flat, not rising to a median subpyramidal point (Fig. 5). Scape shorter, SI < 90; when laid back the apex of the scape distinctly fails to reach the occipital margin (Fig. 2). Smaller species, HW < 0.70. (Ivory Coast, Ghana, Nigeria) ..... *politula*

4 First gastral sternite with a mid-ventral longitudinal cuticular crest or carina that may extend entire length of sternite or be restricted to posterior half; carina usually partially to entirely translucent and clearly visible in profile 5

– First gastral sternite without a mid-ventral longitudinal cuticular crest or carina that is partially to entirely translucent and clearly visible in profile 7

5 Base of gaster deeply concave when viewed from above and slightly to the front; on each side the tergite at its lowest point, at about the level of the helcium, projects forward and curves medially, forming a strongly defined incurved lobe (Figs. 9–10). (Ivory Coast, Ghana, Cameroun) ..... *basalis*

– Base of gaster transverse to shallowly concave when viewed from above and slightly to the front; on each side the tergite at its lowest point, at about the level of the helcium, forms a simple angle and does not project forward and curve medially as an incurved lobe 6

6 In dorsal view first gastral tergite coarsely foveolate, not costulate; spaces between foveolae raised and flat, entirely covered with fine dense shagreenate sculpture, dull and opaque. Longitudinal costae of second gastral tergite

densely shagreenate and opaque. Eye large, with > 10 ommatidia in its maximum diameter and that diameter greater than maximum width of second funicular segment (Fig. 7). (Ivory Coast, Nigeria, Cameroun, Gabon, Zaire) ..... *vigilans*

– In dorsal view first gastral tergite predominantly longitudinally costulate or rugulose, with scattered foveolate punctures between the costulae/rugulae; entire surface glossy, without dense opaque shagreenate sculpture. Longitudinal costulae of second gastral tergite glossy, not densely shagreenate and opaque. Eye small, with < 10 ommatidia in its maximum diameter and that diameter less than maximum width of second funicular segment (Fig. 8). (Ivory Coast, Ghana, Cameroun, Gabon) ..... *nasica*

7 Propodeal declivity with a small tubercle above a larger more basally situated tooth. Side of head behind and below eye sculptured with large, broad-rimmed coarse foveolate punctures, not costulate. With head in profile the lower occipital curve with a large lobate cuticular flange that is much broader than the maximum diameter of the eye. (Cameroun) ..... *subatra*

– Propodeal declivity unarmed and smoothly rounded above a basally situated tooth. Side of head behind and below eye sculptured with fine longitudinal costulae and scattered small foveolate punctures. With head in profile the lower occipital curve with a small shallow cuticular crest that is narrower than the maximum diameter of the eye. (Rwanda) ..... *edentula*

Synopsis of species

obeliscata group

(Figs. 2–5)

Mandible with 1–2 teeth between apical tooth and basal angle.

Median portion of clypeus, anterior to frontal lobes, narrow but not strongly bilaterally compressed; without a median longitudinal carina.

Propodeal declivity with a simple lamella on each side that extends its entire height; without a projecting lobe or tooth close to the base of the declivity.

Sculpture between punctures on dorsal alitrunk and gaster mostly to entirely effaced; surfaces between punctures mostly to entirely smooth and shining.

Dorsal surfaces of head behind frontal lobes, alitrunk, petiole node and first gastral tergite without standing hairs; second gastral tergite with standing hairs restricted to apical quarter.

Scape with projecting hairs on the leading edge.

Loboponera obeliscata sp. n.

(Figs. 3, 4)

HOLOTYPE WORKER. TL 5.6, HL 1.13, HW 1.00, CI 88, SL 0.97, SI 97, AL 1.64. Characters of *obeliscata* group and the following. Eye minute and difficult to see, scarcely larger than one of the adjacent foveolate punctures; maximum diameter 0.04. Scape when laid back in full-face view reaches occipital margin. Small lobe at anterolateral angle of clypeus distinctly prominent. Propodeal lamella broad at sides, narrowing near dorsal angle and thinly continued onto dorsum but narrowed medially or with a mid-dorsal gap. Propodeal declivity finely transversely striate. Petiole in profile with anterior and posterior margins more or less parallel and with the dorsal surface extended medially into a high subpyramidal blunt point; in posterior view the sides slope steeply upward to a pointed apex. First gastral tergite in profile with its anterior face distinctly inclined posteriorly from top to bottom, in dorsal view overhanging the helcium.

PARATYPE WORKER. TL 5.7, HL 1.14, HW 1.00, CI 88, SL 1.00, SI 100, AL 1.72.

Holotype worker, **Ghana**: Tafo, 9.ix.1966, ant ecology sample 251 (*D. Leston*) (BMNH).

Paratype. 1 worker with same data as holotype (MCZ).

Non-paratypic material examined. **Gabon**: La Makandé, Foret des Abeilles (*A. Dejean*).

Closest related to *politula* but easily distinguished by the unique shape of the petiole node.

Loboponera politula sp. n.

(Figs. 2, 5)

HOLOTYPE WORKER. TL 3.7, HL 0.73, HW 0.64, CI 88, SL 0.52, SI 81, AL 1.09. Characters of *obeliscata* group and the following. Eye minute, maximum diameter 0.03. Scape when laid back in full-face view distinctly fails to reach occipital margin. Propodeal lamella narrow at sides, petering out at dorsal angle and not continued onto dorsum; the latter separated from the declivity by an angle. Petiole in profile with anterior margin rising to a blunt anterodorsal angle, behind which the dorsum slopes posteriorly and is flat or very feebly convex. In posterior view the petiole node dorsum is broadly evenly rounded. First gastral tergite in profile or in dorsal view with its anterior face overhanging the helcium.

PARATYPE WORKERS. TL 3.4–3.7, HL 0.70–0.73, HW 0.60–0.64, CI 85–90, SL 0.48–0.52, SI 79–82, AL 1.01–1.09 (3 measured).

Holotype worker, **Nigeria**: Ibadan, IITA no. 62, 16.vii.1974 (*B.R. Critchley*) (BMNH).

Paratypes. 1 worker, **Ivory Coast**: Abidjan, Banco Nat. Pk, 18.iii.1977, primary forest litter (*I. Löbl*); 1 worker, **Ghana**: Mampong, 10.viii.1970 (*P. Room*); 1 worker, **Nigeria**: near Ibadan, 26.vii.1981, secondary forest, no. 10 (*A. Russell-Smith*) (BMNH, MCZ).

Non-paratypic material examined. **Ghana**: Bunso, nr Tafo (*R. Belshaw*).

This species is smaller than the above and, beside

lacking the unique subpyramidal shape of the petiole node that characterises *obeliscata*, has much shorter scapes.

trica group

(Fig. 6)

Mandible with 3 teeth between apical tooth and basal angle.

Median portion of clypeus, anterior to frontal lobes, strongly bilaterally compressed, narrow and with a nearly vertical longitudinal carina.

Propodeal declivity with a rounded lobe near base, without a lamella above the lobe.

Sculpture between punctures everywhere on dorsal head and body fine and very dense.

Dorsal surfaces of head behind frontal lobes, alitrunk, petiole node and first gastral tergite without standing hairs; second gastral tergite without standing hairs.

Scape without projecting hairs on the leading edge.

Loboponera trica sp. n.

(Fig. 6)

HOLOTYPE WORKER. TL 3.0, HL 0.59, HW 0.55, CI 93, SL 0.43, SI 78, AL 0.90. Characters of *trica* group and the following. Maximum diameter of eye 0.02. Scape when laid back not reaching occipital margin. Dorsum of head opaque, extremely densely finely striolate-punctulate and with larger shallow foveolae that are overlaid and partially masked by the finer components of the sculpture. Alitrunk and gaster similarly sculptured, in places with the foveolae more conspicuous.

PARATYPE WORKER. TL 3.0, HL 0.59, HW 0.55, CI 93, SL 0.47, SI 85, AL 0.90.

Holotype worker, **Ivory Coast**: Abidjan, Banco Nat. Pk, 14.iii.1977, dead wood sample (*I. Löbl*) (BMNH).

Paratype. 1 worker with same data as holotype (MCZ).

L. trica is a very distinctive small species that is easily recognised by its lack of standing hairs coupled with the presence everywhere of uniform fine dense sculpture.

vigilans group

(Figs. 1, 7–11)

Mandible with 3–5 teeth between apical tooth and basal angle.

Median portion of clypeus, anterior to frontal lobes, usually with a low median longitudinal carina.

Propodeal declivity with a lobe or triangular tooth near base; margin above this either unarmed, or with a narrow lamella, or with a small tooth, or with a lamella and a tooth.

Sculpture coarse and dense on dorsal alitrunk and gaster, basically of coarse foveolae with rugulose or costate-striate interspaces.

Dorsal surfaces of head behind frontal lobes, alitrunk, petiole node and first gastral tergite with numerous short suberect to erect hairs; second gastral tergite with standing hairs everywhere.

Scape with projecting hairs on the leading edge.

Loboponera basalis sp. n.

(Figs. 1, 9, 10)

HOLOTYPE WORKER. TL 6.6, HL 1.20, HW 1.06, CI 88, SL 1.02, SI 96, AL 1.87. Characters of *vigilans* group and the following. Maximum diameter of eye 0.07. First gastral sternite with a mid-ventral longitudinal translucent carina that extends the length of the segment. First gastral tergite in profile with its anteroventral angle extended forward as a broadly triangular tooth, just above the helcium. In ventral view the extended anteroventral angles of the first tergite are seen to be drawn out as incurved triangular broad teeth or short stout horns on each side of the helcium. In dorsal view the anterior face of the first gastral tergite forms a broad concave arc that is extended forward and inward on each side by the broadly triangular curved angles. Propodeal declivity above the basal tooth with a narrow uneven lamella that terminates dorsally in a small tooth or tubercle. Sculpture everywhere on the glossy dorsum longitudinally costate-rugulose between broad foveolate punctures that are mostly sharply defined. On the second gastral tergite the longitudinal costate-rugose sculpture predominates.

PARATYPE WORKERS. TL 5.9–6.6, HL 1.11–1.16, HW 1.05–1.11, CI 95–96, SL 1.00–1.08, SI 94–97, AL 1.82–2.02 (3 measured).

Holotype worker, **Ivory Coast**: Lamto, Toumodi, 5.iii.1968, rotten wood (*J. Lévieux*) (MCZ).

Paratypes. 2 workers with same data as holotype; 1 worker, **Ivory Coast**: Nzi Noua, on Ndouci-Toumodi Highway, about 21 km. N. of Ndouci, in rotten wood (*J. Lévieux*); 1 worker, **Ghana**: Tafo, rotten wood (*D. Leston*); 2 workers, Tafo, 25.v.1970, on ground at base of tree (*B. Bolton*) (MCZ, BMNH, MNHN).

Non-paratypic material examined. **Ivory Coast**: Iringou (*F. Krell*). **Cameroun**: Kala (*A. Dejean*).

The unique structure of the base of the first gastral tergite immediately isolates this very conspicuous species.

Loboponera edentula sp. n.

HOLOTYPE WORKER. TL 6.1, HL 1.11, HW 1.03, CI 93, SL 0.98, SI 95, AL 1.78. Characters of *vigilans* group and the following. Maximum diameter of eye

0.07. First gastral sternite without a tooth on each side of the anteroventral median process and without a translucent median longitudinal carina. Propodeal declivity with a small sharp tooth near base but otherwise unarmed and rounding evenly into the dorsum. Sculpture on glossy head and alitrunk is of relatively fine longitudinal costulae and scattered foveolate punctures. On the first gastral tergite the costulae are mostly supressed, much less obvious than on the alitrunk, and the spaces between the foveolae are very glossy and partially to mostly smooth.

PARATYPE WORKER. TL 6.1, HL 1.11, HW 1.04, CI 94, SL 0.94, SI 90, AL 1.79.

Holotype worker, **Rwanda**: Kayove, 23.iv.1973, 2100 m (*P. Werner*) (MCZ).

Paratype. 1 worker, **Rwanda**: Rangiro, ix.1976, litter (*P. Werner*) (BMNH).

The form of the propodeal declivity, coupled with the lack of a longitudinal carina on the first gastral sternite, isolates this species within the group.

Loboponera nasica (Santschi) comb. n.

(Figs. 8, 11)

Pachycondyla (Bothroponera) nasica Santschi, 1920: 6. Holotype worker, GABON: Samkita (*F. Faure*) (NMB).

WORKER. TL 4.7–5.6, HL 0.91–0.99, HW 0.86–0.95, CI 95–96, SL 0.80–0.90, SI 93–95, AL 1.82–2.02 (3 measured). Characters of *vigilans* group and the following. Maximum diameter of eye 0.03–0.04. First gastral sternite without a tooth on each side of the anteroventral median process but with a median longitudinal carina. Propodeal declivity with an acute tooth near the base; above this the margin has an indistinct narrow irregular lamella that may peter out dorsally or may have a small dorsal tubercle or blunt tooth. Base of first gastral tergite without the bizarre modification of *basalis* (see above). All dorsal surfaces of head and body glossy, with longitudinal costulate-rugulose sculpture and scattered foveolate punctures. On the second gastral tergite coarse longitudinal costae predominate.

This is the most generalised species of the group, characterised mainly by its lack of the specialisations shown in the other four species.

MATERIAL EXAMINED. **Ivory Coast**: Lamto Field Station, nr Toumodi (*J. Lévieux*). **Ghana**: Tafo (*D. Leston*); Legon (*D. Leston*); Mampong (*P. Room*), Kade (*R. Belshaw*). **Cameroun**: Bakundu (*A. Dejean*). **Gabon**: Samkita (*F. Faure*).

Loboponera subatra sp. n.

HOLOTYPE WORKER. TL 7.3, HL 1.32, HW 1.11, CI 84, SL 1.27, SI 114, AL 2.38. Characters of *vigilans* group and the following. Maximum diameter of eye 0.10. First gastral sternite without trace of a median longitudinal carina. Anteroventral median process of first gastral sternite with an anteriorly directed blunt tooth on each side that also arises from the sternite. Propodeal declivity with a broad triangular tooth near base, the margin above this with a small rounded tubercle; dorsum of alitrunk rounds into declivity. Short pilosity very dense on all dorsal surfaces, also dense on scapes, femora and tibiae. Dorsum of head and alitrunk predominantly longitudinally costate-rugose, the alitrunk also with foveolae but most of these are partially effaced by the longitudinal component; foveolae are most clearly defined on propodeum. Second gastal tergite longitudinally costate-rugose, the sculpture better defined here than on the first tergite, where the foveolate component is more obvious.

Holotype worker, **Cameroun**: Nkoemvon, 1980, P74 (*D. Jackson*) (BMNH).

This relatively large, slender species is recognised by the lateral blunt tooth on each side of the anteromedian process of the first gastral sternite. In *vigilans* there is usually an angular development in the same place, but the latter species has characteristic sculpture and has a median carina on the first gastral sternite, which is completely absent in *subatra*.

Loboponera vigilans sp. n.

(Fig. 7)

HOLOTYPE WORKER. TL 6.3, HL 1.20, HW 1.15, CI 96, SL 1.10, SI 96, AL 2.10. Characters of *vigilans* group and the following. Maximum diameter of relatively large eye 0.19. First gastral sternite with a median longitudinal carina at least on the posterior half of the sclerite. First sternite at each side of the anteroventral median process forms a short projecting angle or low prominence. First gastral tergite in dorsal view with bluntly angular anterolateral corners; sides slightly constricted behind the corners. Propodeal declivity with a blunt tooth near base and another, smaller, tooth near apex; the basal teeth appear very broad and coarse in dorsal view. Petiole in dorsal view bluntly subtriangular, widest posteriorly. All dorsal surfaces of head and body with coarse broad foveolate punctures, separated by longitudinal costae or elevated narrow flat surfaces. The entirety, including bases of foveolae and surfaces that separate them, is completely covered with extremely fine dense microsculpture and is dull and opaque. This microsculpture also occurs on at least the upper half of the propodeal declivity and is present, though less intensely, on the scapes and legs.

PARATYPE WORKERS. TL 6.0–6.6, HL 1.16–1.23, HW 1.06–1.20, CI 91–98, SL 0.99–1.19, SI 95–103, AL 1.91–2.14 (10 measured). Maximum diameter of eye 0.15–0.20.

Holotype worker, **Ivory Coast**: Abidjan, Banco National Forest, 17.vi.1958, rain forest (*E.S. Ross & R.E. Leech*) (CAS).

Paratype workers. 4 workers with same data as holotype; 1 worker, **Ivory Coast**: Abidjan, Banco Nat. Pk, 14.iii.1977, dead wood sample (*I. Löbl*); 4 workers, Tai Forest, 17.x.1980 (*V. Mahnert & J.-L. Perret*); 1 worker, Agboville, Yapo Forest, nr Yapo-Gare, 21–22.iii.1977, forest litter (*I. Löbl*); 6 workers, **Nigeria**: Gambari, 16.vii.1969, rotten log (*B. Bolton*); 1 worker, nr Ibadan, IITA, 18.v.1981, secondary forest, no. 7 (*A. Russell-Smith*); 1 worker, **Cameroun**: Nkoemvon, 24.iv.1980 (*D. Jackson*) (CAS, MCZ, BMNH, SAM).

Non-paratypic material examined. **Cameroun**: Mvini (*A. Dejean*); Ottotomo (*A. Dejean*); Pan Pan (*A. Dejean*). **Gabon**: La Makandé, Foret des Abeilles (*S. Lewis*). **Zaire**: Kikwit, Kinzambi (*A. Dejean*).

Apart from having the largest eyes known in the genus, *vigilans* is quickly identified by its unique sculpture. Scanning electron microscope photographs of this species appear in Bolton, 1994: 180, figs 493, 494.

PSALIDOMYRMEX André

Psalidomyrmex André, 1890: 313. Type-species: *Psalidomyrmex foveolatus*, by monotypy.

WORKER. Ponerine ants with the tribe and group characters noted above and also with the following.

1. Median portion of clypeus with its anterior margin shallowly convex, not forming a projecting lobe.
2. Labrum with upper portion directed anteriorly and projecting as a narrow but conspicuous lobe in front of the clypeal margin; labral lobe clearly visible in full-face view and usually transversely striate.
3. Mandible triangular to falcate, the apical tooth attenuated and the basal angle rounded.
4. Palp formula 3,4 (dissections of *foveolatus, procerus*)
5. Posteroventral curve of head in profile without a flange.
6. Propodeal dorsum with a median longitudinal groove or impression.
7. Mesofemur and metafemur without a mid-dorsal longitudinal groove on the basal half.

QUEEN. Known for *feae, foveolatus, procerus*: slightly larger than the worker, alate, with the above characters and the usual modifications associated with this caste.

MALE. Known for *foveolatus, procerus, reichenspergeri*: mesotibia and metatibia each with a single spur; pretarsal claws with a preapical tooth; pygidium truncated, not spinose; notauli absent. For general description see Bolton (1975).

Comments

Characters 2 and 3 are autapomorphic; 1 and 5 are plesiomorphic. Characters 4 and 6 are possible synapomorphies with *Plectroctena*. The first of these (PF 3,4) appears to be the basic maximum count in both genera (with subsequent reductions to PF 2,3 and PF 2,2 in some *Plectroctena* species). Character 6 appears autapomorphic at first glance but queens of some species in the *Plectroctena minor* group show a partial (*cristata* ergatoid) to complete (*minor, latinodis* alates) propodeal groove. In addition, some *Pl. minor* workers have a short anterior stub of the groove, so a basically synapomorphic state with subsequent loss in most *Plectroctena* must be considered. Character 7 is equivocal and is noted under *Loboponera* comments.

The genus *Psalidomyrmex* was revised earlier by Bolton (1975). Following the key are taxonomic synopses and records of more recently discovered material of each species, together with diagnoses of species groups within the genus, but formal diagnoses of individual species are not repeated as no new species-rank taxa are reported here.

List of species

foveolatus group
- ***foveolatus*** André, 1890
- ***reichenspergeri*** Santschi, 1913
  - = *mandibularis* subsp. *mabirensis* (Arnold, 1954)
- ***sallyae*** Bolton, 1975

procerus group
- ***feae*** Menozzi, 1922
  - = *feae* var. *impressa* Menozzi, 1922
- ***procerus*** Emery, 1901
  - = *longiscapus* Santschi, 1920
  - = *obesus* Wheeler, 1922
  - = *procerus* st. *collarti* Santschi, 1937
- ***wheeleri*** Santschi, 1923

Key to species (workers)

1 Masticatory margin of mandible concave posterior to the elongate apical tooth and with a number of short or blunted small teeth at least near the basal angle; overall appearance of mandible falcate 2

– Masticatory margin of mandible straight posterior to the elongate apical tooth and edentate throughout its length; overall appearance of mandible not falcate 4

2 Dorsum of first gastral tergite with small punctures, the diameters of which are less than the distances separating them. Sculpture on anterior half of first gastral tergite strongly contrasting to that on anterior half of second tergite: the former smooth between the small punctures, the latter longitudinally costulate-striate with scattered larger punctures. Petiole node in dorsal view longer than broad. Large black species, HW > 2.50. (Cameroun, Zaire, Uganda) ..... *reichenspergeri*

– Dorsum of first gastral tergite with coarse foveolate punctures, the diameters of which are equal to or greater than the distances separating them. Sculpture on anterior half of first gastral tergite basically the same as that on anterior half of second tergite: either both smooth between foveolate punctures, or both longitudinally costulate-striate between foveolate punctures. Petiole node in dorsal view as broad as or broader than long. Smaller red-brown species, HW <2.50 3

3 Spaces between foveolate punctures on pronotal dorsum and first gastral tergite densely striate. Anterodorsal margin of mesotibia in its apical half with a row of short but strong spine-like traction setae among the normal pilosity, the same as the traction setae present at the mesotibial apex. Scape relatively short, SI < 75. (Sierra Leone, Ivory Coast, Ghana, Nigeria, Cameroun) ..... *foveolatus*

– Spaces between foveolate punctures on pronotal dorsum and first gastral tergite unsculptured, mostly smooth and shining. Anterodorsal margin of mesotibia without spine-like traction setae among the normal pilosity; traction setae present at the mesotibial apex. Scape relatively long, SI > 80. (Ghana) ..... *sallyae*

4 Scape relatively longer and head narrower; SI 90–102, CI 84–89. Petiole node longer that broad in dorsal view. (Cameroun, Zaire) ..... *wheeleri*

– Scape relatively shorter and head broader, SI 79–88, CI 91–96. Petiole node broader than long in dorsal view 5

5 Frontal lobes smooth and shining over the antennal insertions. Median portion of clypeus not longitudinally striate. (Sao Tomé & Principe) ..... *feae*

– Frontal lobes uniformly striate over the antennal insertions. Median portion of clypeus longitudinally striate. (Ghana, Cameroun, Gabon, Zaire, Burundi, Uganda) ..... *procerus*

Synopsis of species

foveolatus group

Mandible falcate; blade of mandible relatively slender, narrowing apically and continuing to narrow without interruption into a much elongated curved apical tooth.
Masticatory margin of mandible concave and with weak teeth or crenation on the concave margin distal of the basal angle.
Mandible proximal of rounded basal angle narrowed and elongated.

Psalidomyrmex foveolatus André

Psalidomyrmex foveolatus André, 1890: 314. Syntype workers, SIERRA LEONE (*A. Mocquerys*) (MNHN).

Psalidomyrmex foveolatus André; Emery, 1899: 471 (misidentification); Stitz, 1910: 129; Wheeler, W.M. 1922: 785; Bernard, 1953: 209; Bolton, 1975: 7.

MATERIAL EXAMINED. As Bolton (1975), plus: **Ivory Coast**: Palmeraie Lame (*T. Diomande*); Iringou (*F. Krell*). **Nigeria**: Gambari (*B. Taylor*); Ibadan (*A. Russell-Smith*). **Cameroun**: Ottotomo (*A. Dejean*).

Psalidomyrmex reichenspergeri Santschi

Psalidomyrmex reichenspergeri Santschi, 1913: 302. Holotype worker, CAMEROUN: Molunda (*A. Reichensperger*) (NMB).
Plectroctena mandibularis subsp. *mabirensis* Arnold, 1954: 293, figs 3, 3a. Syntype workers, UGANDA: Mabira Forest, 21.v.1952 (*G. Arnold*) (SAM, BMNH). [Synonymy by Bolton, 1975: 8.]
Psalidomyrmex mabirensis (Arnold); Bolton, 1974: 334. [Raised to species and revised combination.]
Psalidomyrmex reichenspergeri Santschi; Santschi, 1914b: 288; Wheeler, W.M. 1922: 90, 786; Bolton, 1975: 8.

MATERIAL EXAMINED. As Bolton (1975).

Psalidomyrmex sallyae Bolton

Psalidomyrmex sallyae Bolton, 1975: 9, fig. 5. Holotype and paratype workers, GHANA: Tafo, 23.vii.1966, ant ecology sample 120 (*D. Leston*); paratype worker, GHANA: Tafo, 19.vii.1966, ant ecology sample 110 (BMNH, MCZ, AMNH, SAM).

MATERIAL EXAMINED. Known only from type-series.

procerus group

Mandible subtriangular; blade of mandible relatively broad and with an elongate curved apical tooth.
Masticatory margin of mandible straight and edentate.
Mandible proximal of rounded basal angle short and stout.

Psalidomyrmex feae Menozzi

Psalidomyrmex feae Menozzi, 1922: 349. Syntype workers, queen and male, SAO TOMÉ & PRINCIPE: Principe I., Roça Infante Don Henrique, iii.1901, 100–300 m. (*L. Fea*) (IE, MCZ).
Psalidomyrmex feae var. *impressa* Menozzi, 1922: 352. Syntype workers and male, SAO TOMÉ & PRINCIPE: Principe I., Roça Infante Don Henrique, ii.1901, 200–300 m. (*L. Fea*) (IE, MCZ, BMNH). [Synonymy by Bolton, 1975: 11.]
Psalidomyrmex feae Menozzi; Bolton, 1975: 11.

MATERIAL EXAMINED. Known only from above series.

Psalidomyrmex procerus Emery

Psalidomyrmex procerus Emery, 1901: 50. Syntype worker, queens and male, CAMEROUN (*Conradt*) (MCSN, NMB).

Psalidomyrmex longiscapus Santschi, 1920: 8. Holotype queen, GABON: Samkita (*F. Faure*) (NMB). [Synonymy by Bolton, 1975: 12.]

Psalidomyrmex obesus Wheeler, W.M. 1922: 92, fig. 19. Syntype workers, ZAIRE: Medje (*Lang & Chapin*) (MCZ, AMNH). [Synonymy by Bolton, 1975: 12.]

Psalidomyrmex procerus var. *obesus* Wheeler; Santschi, 1937: 74. [Reduced to variety.]

Psalidomyrmex procerus st. *collarti* Santschi, 1937: 74. Holotype worker, ZAIRE: Ituri, Matenda, 22.ix.1929 (*A. Collart*) (MRAC). [Synonymy by Bolton, 1975: 12.]

Psalidomyrmex procerus Emery; Stitz, 1910: 129; Wheeler, W.M. 1922: 90, 785 (misidentification); Bernard, 1953: 209; Wheeler, G.C. & Wheeler, J. 1964: 454; Bolton, 1975: 12.

Scanning electron microscope photographs of this species appear in Bolton, 1994: 175, figs 471, 473.

MATERIAL EXAMINED. As Bolton (1975), plus: **Cameroun**: Ottotomo (*A. Dejean*); Abong Mbang (*A. Dejean*). **Burundi**: Banage (*A. Dejean*).

Psalidomyrmex wheeleri Santschi

Psalidomyrmex wheeleri Santschi, 1923: 263. Syntype workers, ZAIRE: Medje, Akenge & Niapu (*Lang & Chapin*) (MCZ, AMNH, MRAC, BMNH, SAM).

Psalidomyrmex wheeleri Santschi; Bolton, 1975: 13.

MATERIAL EXAMINED. As Bolton (1975).

Dispersal from *Psalidomyrmex*

Psalidomyrmex clavicornis Bernard, 1953: 209, fig. 5. [Transferred to *Pachycondyla*, where it is a junior synonym of *P. talpa* (André), by Bolton, 1975: 6.]

PLECTROCTENA F. Smith

Plectroctena F. Smith, 1858: 101. Type-species: *Plectroctena mandibularis*, by monotypy.

Cacopone Santschi, 1914c: 325. Type-species: *Cacopone hastifer*, by monotypy. [Synonymy by Bolton, 1974: 313.]

WORKER. Ponerine ants with the tribe and group characters noted above and also with the following.

1. Median portion of clypeus with its anterior margin shallowly concave.
2. Clypeal margin anterolaterally with an extensive, roughly semicircular, excavation around the mandibular articulation.
3. Labrum with basal portion not produced into a projecting lobe; sclerite minutely but extremely densely strongly sculptured.
4. Mandible stoutly linear, blunt or obliquely truncated apically, with 0–2 teeth; dorsal surface with a longitudinal groove or trench.
5. Palp formula 3,4 (dissections of *cristata, macgeei, mandibularis, minor, strigosa*), or PF 2,3 (*ugandensis*), or PF 2,2 (*anops, cryptica, lygaria, subterranea*).
6. Posteroventral curve of head in profile without a projecting flange but anterior portion of occipital carina may form a conspicuous crest on the ventral surface.
7. Propodeal dorsum usually without a median longitudinal groove but a vestige may be present in some individuals of the *minor* group.
8. Mesofemur and metafemur with a longitudinal (glandular?) groove present mid-dorsally, at least on the basal half.

QUEEN. Mostly alate but four species have ergatoid queens (*cristata, dentata, macgeei, mandibularis*). All have the above characters and alates have the usual modifications associated with this caste. Ergatoids may be extremely worker-like but usually retain ocelli or ocellar vestiges; see Bolton (1974). Queens remain unknown in *hastifera, laevior, strigosa.*

MALE. Insufficiently known (*lygaria, mandibularis, minor, subterranea* only). For general description see Bolton (1974) but this is compromised as *lygaria* lacks the notauli and toothed pretarsal claws that are present in the other three.

Comments

Characters 1, 2, 4 and second part of 3 (sculpture) are autapomorphic; 6 is plesiomorphic. The possibly synapomorphic nature of characters 5 and 7 is discussed under *Psalidomyrmex*, that of 8 under *Loboponera*.

The genus *Plectroctena* was revised earlier by Bolton (1974). Following the key are taxonomic synopses and records of more recently discovered material of each species, together with diagnoses of species groups within the genus, but formal diagnoses of individual species are not repeated as no new species-rank taxa are reported here.

List of species

hastifera group
- ***anops*** Bolton, 1974
- ***hastifera*** (Santschi, 1914)

minor group
- ***cristata*** Emery, 1899
  - = *cristata* var. *semileavis* Santschi, 1924
- ***dentata*** Santschi, 1912
  - = *emeryi* Santschi, 1924

latinodis Santschi, 1924
minor Emery, 1892
= *gabonensis* Santschi, 1919 **syn. n.**
= *minor* var. *perusta* Santschi, 1924
= *minor* var. *liberiana* Santschi, 1924
= *minor* var. *insularis* Santschi, 1924
mandibularis group
cryptica Bolton, 1974
gestroi Menozzi, 1922
laevior Stitz, in Santschi, 1924
lygaria Bolton, Gotwald & Leroux, 1979
macgeei Bolton, 1974
mandibularis F. Smith, 1858
= *caffra* Spinola, 1851 (*nomen nudum*)
= *caffra* st. *major* Forel, 1894
= *minor* st. *conjugata* Santschi, 1914
= *mandibularis* st. *integra* Santschi, 1924
[*mandibularis* st. *strigosa* var. *strialiventris* Stitz, in Santschi, 1924; unavailable name]
strigosa Emery, 1899
subterranea Arnold, 1915
= *punctatus* Santschi, 1924
ugandensis Menozzi, 1933

Key to species (workers)

1 Propodeum with a continuous cuticular lamella that forms an uninterrupted projecting flange across the dorsum and down the sides of the declivity. Apical half of each mandible swollen, basal tooth always absent. Head relatively narrow, CI < 80 2

– Propodeum either without a projecting cuticular lamella or with a lamella that is confined to each side of the declivity and does not extend across the dorsum. Apical half of each mandible not swollen, basal tooth usually present. Head relatively broad, CI > 85 3

2 Dorsal surfaces of head, alitrunk, petiole and first and second gastral tergites with numerous short erect to suberect hairs. Eyes present, minute. (Ghana) ..... *hastifera*

– Dorsal surfaces of head, alitrunk, petiole and first and second gastral tergites without standing hairs of any form. Eyes absent. (Ghana) ..... *anops*

3 Dorsum of first gastral tergite with an anteriorly located transverse groove or impression which may extend the width of the tergite or be confined to the median quarter of the width of the sclerite 4

– Dorsum of first gastral tergite without trace of an anteriorly located transverse groove or impression 7

4 Ventral surfaces of the head and usually also the sides of the head, at least below and behind the eyes, with the spaces between punctures finely striate. Funicular segments 3–4 as long as, or longer than broad 5

– Ventral surfaces of the head and the sides of the head below and behind the eyes with the spaces between punctures smooth and shining. Funicular segments 3–4 broader than long, usually markedly so 6

5 Very large species with relatively very long mandibles, HL > 4.0, MI > 90. Transverse groove on first gastral tergite strongly developed across the width and preceded by a thick crest of cuticle; very conspicuous in profile. (Cameroun, Zaire, Uganda, Kenya) ..... *cristata*

– Smaller species with relatively shorter mandibles, HL < 4.0, MI < 90. Transverse groove on first gastral tergite faint and poorly developed, only visible in the middle of the tergite and not preceded by a thick crest of cuticle; scarcely discernible in profile. (Republic of Congo, Zaire, Angola, Uganda) ..... *dentata*

6 Petiole node in dorsal view as broad as long. (Cameroun, Zaire) ..... *latinodis*

– Petiole node in dorsal view longer than broad. (Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Nigeria, Cameroun, Equatorial Guinea, Gabon, Zaire) ..... *minor*

7 Dorsum of head coarsely sculptured with foveolae or large pits whose diameters are greater than the distances that separate them or which are adjacent. Mesonotum and propodeum with a polished, virtually unsculptured, median longitudinal strip. (Liberia, Ivory Coast, Ghana) ..... *cryptica*

– Dorsum of head finely sculptured with small punctures whose diameters are less than the distances that separate them. Mesonotum and propodeum without a polished, virtually unsculptured, median longitudinal strip 8

8 Labrum shallowly transversely concave and with a sharply incised median longitudinal groove that extends the entire length of the sclerite and completely breaks the fine surface sculpture. Mandible edentate. (Ghana, Nigeria) ..... *macgeei*

– Labrum without a median longitudinal groove, the fine surface sculpture uninterrupted across the entire shallowly transversely concave sclerite. Mandible at least with a strong basal tooth; usually also with a second, smaller, tooth in the apical half 9

9 Dorsal surfaces of head and alitrunk with numerous short erect or suberect hairs present. (Principe I.) ..... *gestroi*

– Dorsal surfaces of head and alitrunk without standing hairs 10

10 Ventral surfaces of head without striation between the punctures 11

– Ventral surfaces of head with striation between the punctures, at least anteriorly 14

11 Propodeal declivity armed near its base with a stout triangular tooth; lamella not developed dorsal to the tooth. Larger species, HL > 3.0; full adult colour blackish brown to black. (Tanzania) ..... *laevior*

– Propodeal declivity not armed near its base with a stout triangular tooth; lamella fully developed and extends almost the height of the declivity. Smaller species, HL < 2.5; full adult colour orange-brown or dark red 12

12 Foveolate punctures on dorsum of head each with an appressed small hair arising from its centre, the hair directed toward the cephalic midline. (Ivory Coast) ..... *lygaria*

– Foveolate punctures on dorsum of head without appressed small hairs arising from their centres 13

13 Basal tooth on mandible with distal (anterior) and proximal (posterior) surfaces that are of about equal length and slope; proximal base of tooth linked to mandible base by a shallow low ridge. Colour orange-brown. (Kenya, Malawi, Zimbabwe, Namibia) ..... *subterranea*

– Basal tooth on mandible with vertical distal (anterior) surface but without a defined proximal (posterior) surface; instead the apex of the tooth is extended to the mandible base as an oblique high ridge. Colour dark red. (Ivory Coast, Cameroun, Zaire, Uganda) ..... *ugandensis*

14 Leading edge of scape with a row of suberect to erect short hairs. All dorsal surfaces of head and body entirely covered with extremely dense fine striate sculpture. (Kenya, Tanzania, South Africa) ..... *strigosa*

– Leading edge of scape without suberect to erect short hairs. Sculpture variable in density and intensity but not all dorsal surfaces of head and body entirely covered with extremely dense fine striate sculpture. (Ethiopia, Kenya, Uganda, Burundi, Zaire, Angola, Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, South Africa) ..... *mandibularis*

Synopsis of species

hastifera group

Propodeal lamellae form a continuous flange or rim around the sides and dorsum of the declivity.
Mandible with basal tooth absent.
First gastral tergite without an anteriorly situated transverse groove or impression on the dorsum.
Petiole node in profile long and low.
Head considerably longer than broad, CI < 80.

Plectroctena anops Bolton

Plectroctena anops Bolton, 1974: 319, figs 4, 7. Holotype worker, GHANA: Tafo, 8.ix.1966, ant ecology sample 249c (*D. Leston*) (BMNH).

MATERIAL EXAMINED. As Bolton (1974), plus: **Ghana**: Kwadaso (*J. Plisko*).

Plectroctena hastifera (Santschi)

Cacopone hastifer Santschi, 1914c: 325, fig. 11. Holotype worker, GHANA: Aburi (*F. Silvestre*) (IEN).
Plectroctena hastifera (Santschi); Bolton, 1974: 320. [Revised combination.]

MATERIAL EXAMINED. As Bolton (1974).

minor group

Propodeal lamellae restricted to sides of the declivity, often very weakly developed.
Mandible with basal tooth present and usually also with a second, smaller, more apically situated tooth.
First gastral tergite with an anteriorly situated transverse groove or impression on the dorsum.
Petiole node in profile as high as or higher than long.
Head relatively broad, CI 89–97.

Plectroctena cristata Emery

Plectroctena cristata Emery, 1899: 470. Syntype workers, CAMEROUN (*Conradt*) (MCSN).
Plectroctena cristata var. *semileavis* Santschi, 1924: 163 (variant spelling as *semilaeve*: 173). Holotype worker, ZAIRE: Luebo, Kamaiembi, 22.ix.1921 (*H. Schouteden*) (MRAC). [Synonymy by Bolton, 1974: 321.]
Plectroctena cristata Emery; Stitz, 1910: 129; Wheeler, W.M. 1922: 88, 783; Santschi, 1924: 163; Bolton, 1974: 321.

MATERIAL EXAMINED. As Bolton (1974), plus: **Uganda**: Busongoro (*G.D.H. Carpenter*). **Cameroun**: Tissongo (*D. Jackson*).

Plectroctena dentata Santschi

Plectroctena minor var. *dentata* Santschi, 1912: 150. Syntype workers, ANGOLA: Benguela, Cucala (*J. Cruchet*) (NMB, MRAC).
Plectroctena dentata Santschi; Santschi, 1924: 164. [Raised to species.]
Plectroctena emeryi Santschi, 1924: 164. Holotype queen (ergatoid, not worker), REPUBLIC OF CONGO (*J. de Gaule*) (NMB). [Synonymy by Bolton, 1974: 322.]
Plectroctena dentata Santschi; Bolton, 1974: 322.

MATERIAL EXAMINED. As Bolton (1974).

Plectroctena latinodis Santschi

Plectroctena latinodis Santschi, 1924: 165, fig. 2a. Syntype worker and queen: ZAIRE: Congo da Lemba (*R. Mayné*) (NMB, MRAC).
Plectroctena latinodis Santschi; Bolton, 1974: 323.

MATERIAL EXAMINED. As Bolton (1974).

Plectroctena minor Emery

Plectroctena minor Emery, 1892: 556, pl. 15, figs 1, 2. Holotype queen, IVORY COAST: Assinie, vii–viii.1886 (*C. Alluaud*) (MCSN).
Plectroctena gabonensis Santschi, 1919a: 336. Syntype workers, GABON: Libreville, 1.xii.1897 (*Chalot*) and GABON: Samkita, 1914 (*F. Faure*) (NMB). **Syn. n.**

Plectroctena subterranea st. *gabonensis* Santschi, 1919b: 90. [Second description as new, based on same specimens as above.]

Myopias subterranea subsp. *gabonensis* (Santschi); Wheeler, W.M. 1922: 785. [Revised combination.]

Plectroctena gabonensis Santschi; Santschi, 1924: 170. [Revived combination and revived status.]

Plectroctena minor var. *perusta* Santschi, 1924: 168, fig. 2b. Syntype workers, CAMEROUN: Barumbistation (*Preuss*) (NMB). [Synonymy by Bolton, 1974: 324.]

Plectroctena minor var. *liberiana* Santschi, 1924: 169, fig. 2c. Holotype worker, LIBERIA (NMB). [Synonymy by Bolton, 1974: 324.]

Plectroctena minor var. *insularis* Santschi, 1924: 169, fig. 3a. Holotype worker, EQUATORIAL GUINEA: Fernando Po I. (*Conradt*) (MCSN). [Synonymy by Bolton, 1974: 324.]

Plectroctena gabonensis Santschi; Wheeler, W.M. 1922: 783; Bolton, 1974: 323.

Plectroctena minor Emery; Emery, 1902: 32; Wheeler, W.M. 1922: 88, 784; Santschi, 1924: 167; Bolton, 1974: 324.

Comment

Accretion of new material has gradually eliminated the supposed differences of size, colour, relative size of eye and minor structural features that were formerly invoked to separate *minor* and *gabonensis* (Santschi, 1924; Bolton, 1974); the two are newly synonymised here.

Scanning electron microscope photographs of this species appear in Bolton, 1994: 175, figs 470, 472.

MATERIAL EXAMINED. As Bolton (1974), plus: **Ghana**: Tafo (*D. Leston*); Wiawso (*D. Leston*); Odomi Riv. (*D. Leston*). **Togo**: Palimé, Klouto (*Vit*). **Cameroun**: Ottotomo (*A. Dejean*); Ndupe (*A. Dejean*); Nzi (*A. Dejean*); Nkoemvon (*D. Jackson*). **Gabon**: La Makandé, Foret des Abeilles (*S. Lewis*). **Zaire**: Kinzambi (*A. Dejean*).

mandibularis group

Propodeal lamellae restricted to sides of the declivity, often very weakly developed.

Mandible with basal tooth usually present (absent only in *macgeei*); usually also with a second, smaller, more apically situated tooth.

First gastral tergite without an anteriorly situated transverse groove or impression on the dorsum.

Petiole node in profile usually as high as or higher than long (relatiely long and low in *macgeei*).

Head relatively broad, CI 86–95.

Plectroctena cryptica Bolton

Plectroctena cryptica Bolton, 1974: 327, fig. 5. Holotype worker, GHANA: Tafo, 2.i.1969, on mud below dam (*B. Bolton*) (BMNH). Paratype workers, IVORY COAST: Lamto (Toumodi), 11.iv.1968, sample AA279N2; Lamto, 20.vi.1968, sample AA334N4; and Lamto, 21.ii.1969 (*J. Lévieux*) (BMNH, MCZ).

MATERIAL EXAMINED. As Bolton (1974), plus: **Ivory Coast**: Tai Forest (*T. Diomande*); Abidjan, Adiopodoumé (*I. Löbl*). **Ghana**: Mt Atewa (*D. Leston*).

Plectroctena gestroi Menozzi

Plectroctena gestroi Menozzi, 1922: 348, fig. 1. Syntype workers and queen, SAO TOMÉ & PRINCIPE: Principe I.: Roca Infante Don Enrique, iii.1900 (*L. Fea*) (IE, MCZ).

Plectroctena gestroi Menozzi; Bolton, 1974: 328.

MATERIAL EXAMINED. Known only from type-series.

Plectroctena laevior Stitz

Plectroctena mandibularis st. *laevior* Stitz, in Santschi, 1924: 163, fig. 1d. Holotype worker, TANZANIA: Kiwugebeit (*Kadt*) (MNHU).

Plectroctena laevior Stitz; Bolton, 1974: 329. [Raised to species.]

MATERIAL EXAMINED. Known only from holotype.

Plectroctena lygaria Bolton, Gotwald & Leroux

Plectroctena lygaria Bolton, Gotwald & Leroux, 1979: 373, figs 1, 2. Holotype worker, paratype workers, queens and males, IVORY COAST: Lamto, 4.vi.1974, forêt galerie du Bandama (*W.H. Gotwald & J.M. Leroux*) (BMNH, MCZ, MNHN, NMB, MHN, ANIC, SAM).

MATERIAL EXAMINED. Known only from type-series.

Plectroctena macgeei Bolton

Plectroctena macgeei Bolton, 1974: 330, figs 1, 8. Holotype worker, NIGERIA: Western State, Gambari, 28.x.1969, amongst termites under log (*B. Bolton*) (BMNH).

MATERIAL EXAMINED. As Bolton (1974), plus: **Ghana**: Tafo (*D. Leston*); Ashanti, Juaso (*R. Belshaw*); Atewa For. Res., nr Kibi (*R. Belshaw*). **Nigeria**: Gambari (*B. Taylor*); Ibadan (*B.R. Critchley*).

Plectroctena mandibularis F. Smith

Plectroctena mandibularis F. Smith, 1858: 101, pl. 7, figs 1–5. Syntype queen (ergatoid, not worker) and male, SOUTH AFRICA: Natal, Durban (= Port Natal) (*Gueinzius*) (BMNH).

Ponera caffra Spinola, 1851: 53; Spinola, 1853: 69.

Nomen nudum (attributed to Klug). [Spinola material referred to *mandibularis* by Roger, 1861: 41.]

Plectroctena caffra (Klug); Roger, 1861: 41 [combination]; Emery, 1892: 556 [as valid species, in error]; Dalla Torre, 1893: 31 [as senior synonym of *mandibularis*, in error].

Plectroctena caffra r. *major* Forel, 1894: 74. Holotype queen (ergatoid, not worker), MOZAMBIQUE: Delagoa (*P. Berthoud*) (MHN). [Synonymy by Emery, 1899: 469; Santschi, 1924: 160; Bolton, 1974: 330.]

Plectroctena mandibularis var. *major* Forel; Emery, 1911: 95; Santschi, 1914a: 54; Arnold, 1915: 86.

Plectroctena minor st. *conjugata* Santschi, 1914d: 8. Syntype workers and queen: SOUTH AFRICA: Natal, Stamford Hill, Charlestown, 30.iv.1905, and SOUTH AFRICA: Zululand (*I. Trägårdh*) (NMB, MCZ, MRAC). [Synonymy by Arnold, 1926: 209; revived from synonymy by Bolton, 1974: 326; synonymy reaffirmed by Villet, McKitterick & Robertson, 1999: 282.]

Plectroctena mandibularis var. *integra* Santschi, 1924: 161. Syntype worker, KENYA: Nairobi, Wa Kikongo et Masai, 1904 (*C. Alluaud*); syntype male, KENYA: Bura, Wa Taita, 1904 (*C. Alluaud* (NMB). [Synonymy by Bolton, 1974: 330.]

[*Plectroctena mandibularis* st. *strigosa* var. *strialiventris* Stitz, in Santschi, 1924: 162 (with variant spellings *strativentris* and *striativentris*: 162). Unavailable name; material (from Malawi) referred to *mandibularis* by Bolton, 1974: 330.]

Plectroctena conjugata Santschi; Wheeler, W.M. 1922: 785; Santschi, 1924: 166 [raised to species]; Bolton, 1974: 326; Wheeler, G.C. & Wheeler, J. 1989: 52.

Plectroctena mandibularis F. Smith; Gerstäcker, 1873: 346; Emery, 1899: 469; Forel, 1913: 108; Wheeler, W.M. 1922: 783; Santschi, 1924: 160; Bolton, 1974: 330; Villet, McKitterick & Robertson, 1999: 282.

MATERIAL EXAMINED. As Bolton (1974), plus: **Kenya**: Shimba Hills (*B. Hölldobler*); Kajiado (*G. Nyamasyo*); Olikoriti, nr Kajiado (*M.G. Lepage*). **Burundi**: Bujumbura (*A. Dejean*). **Tanzania**: Old Shinyanga (*O.W. Richards*); Mkomazi Game Res., Ibanya (*A. Russell-Smith*). **Botswana**: Maxwee (*A. Russell-Smith*). **South Africa**: Transvaal, Hoedspruit (*C. Peeters*); Natal, Mkuzi Res. (*C. Peeters*); Cape Prov., Grahamstown (*F. Jacot-Guillarmod*); Grahamstown (*W.L. Brown*); Grahamstown (*L.S. Naylor*); Cape Prov., nr Pt Alfred (*H.G. Robertson*); Cape Prov., Alexandria (*H.G. Robertson*).

Plectroctena strigosa Emery

Plectroctena mandibularis var. *strigosa* Emery, 1899: 469. Holotype worker, SOUTH AFRICA: Natal (*Staudinger & Bang-Haas*) (MCSN).

Plectroctena mandibularis var. *strigosa* Emery; Arnold, 1915: 88; Wheeler, W.M. 1922: 784.

Plectroctena cristata st. *strigosa* Emery; Santschi, 1924: 161.

Plectroctena strigosa Emery; Bolton, 1974: 332. [Raised to species.]

Comment

Hamish Robertson (SAM) has drawn attention to the fact that material from Kenya and Tanzania that is referred to *strigosa* fits the original description, but no specimen matching the Kenyan/Tanzanian material has yet been seen from Natal, the type-locality. It is possible that the name is misapplied or the specimen mislabeled (Emery mentions a specimen from Zanzibar in his discussion). A reappraisal of the holotype will be necessary to resolve the situation.

MATERIAL EXAMINED. As Bolton (1974), plus: **Kenya**: Tiwi Beach (*C.J. Powles*); Shimba Hills (*B. Hölldobler*); Shimba Hills (*C. Peeters*); Gedi Natl. Monument (*P.S. Ward*). **Tanzania**: Mkomazi Game Res., Ibaya (*A. Russell-Smith*).

Plectroctena subterranea Arnold

Plectroctena subterranea Arnold, 1915: 84, pl. 3, figs 23, 23a. Syntype workers and queen, ZIMBABWE: Bulawayo, 14.vi.1913 (*G. Arnold*), and Shiloh (*G. Arnold*) (BMNH, SAM).

Myopias subterranea (Arnold); Wheeler, W.M. 1922: 785. [Revised combination.]

Plectroctena subterranea Arnold; Santschi, 1924: 171. [Revived combination.]

Plectroctena punctatus Santschi, 1924: 170. Holotype male, KENYA: Bura Wa Taita, iii.1912, 1050 m, st. 61 (*C. Alluaud & R. Jeannel*) (NMB) [Synonymy by Bolton, 1974: 333.]

MATERIAL EXAMINED. As Bolton (1974), plus: **Kenya**: Kibwezi (*S.A. Neave*). [Also recorded from Namibia by Robertson (2000).]

Plectroctena ugandensis Menozzi

Plectroctena ugandensis Menozzi, 1933: 99, fig. 2. Holotype queen, UGANDA: Bussu (*E. Bayon*) (location of holotype not known, presumed lost).

Plectroctena ugandensis Menozzi; Bolton, 1974: 334.

MATERIAL EXAMINED. As Bolton (1974), plus: **Ivory Coast**: Tai Forest (*T. Diomande*). **Cameroun**: nr Yaoundé (*G. Terron*); Nzi (*A. Dejean*).

Disperal from *Plectroctena*

Plectroctena mandibularis subsp. *mabirensis* Arnold, 1954: 293. [Transferred to *Psalidomyrmex* by Bolton, 1974: 334; junior synonymy with *P. reichenspergeri* by Bolton, 1975: 6 (see above).]

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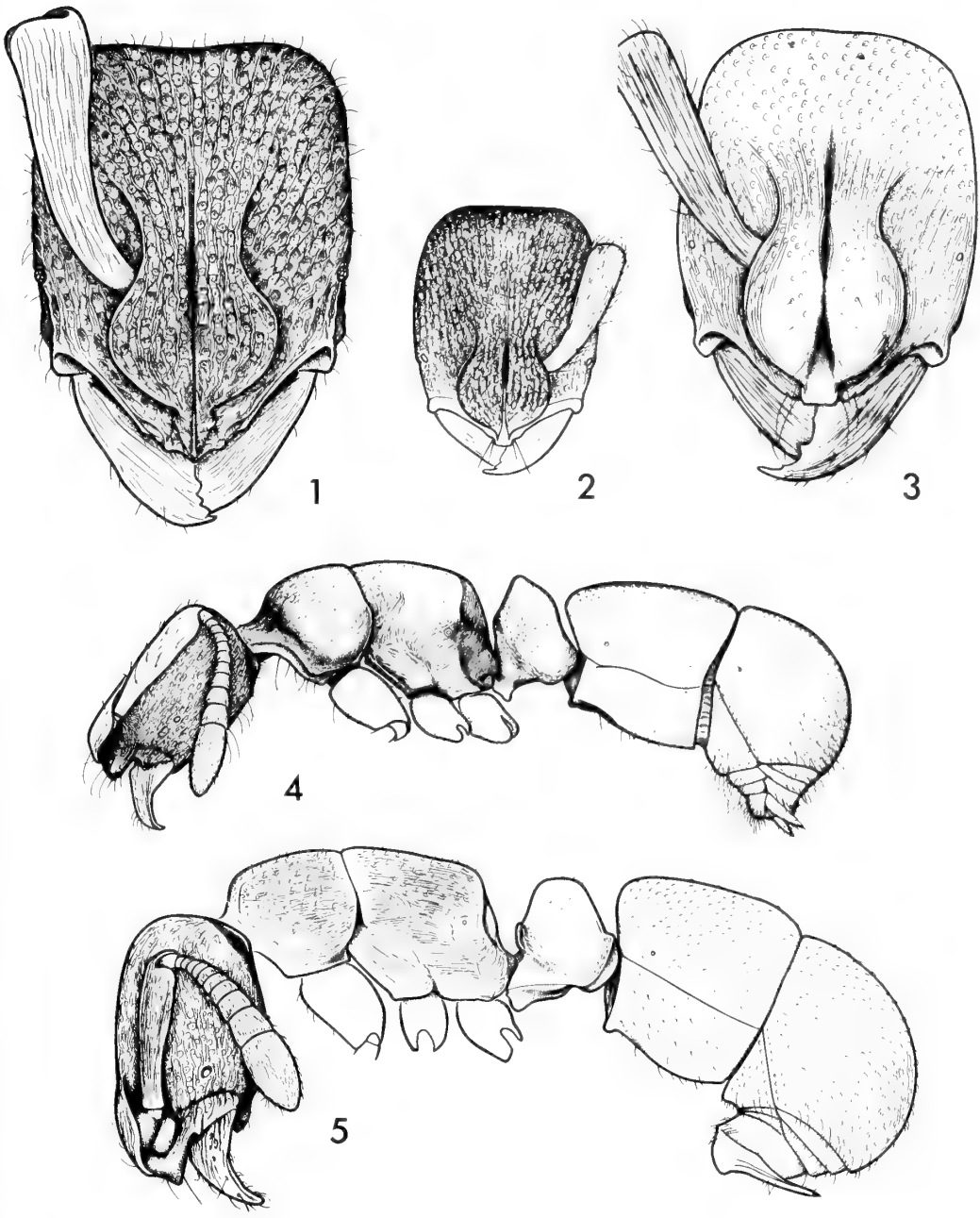
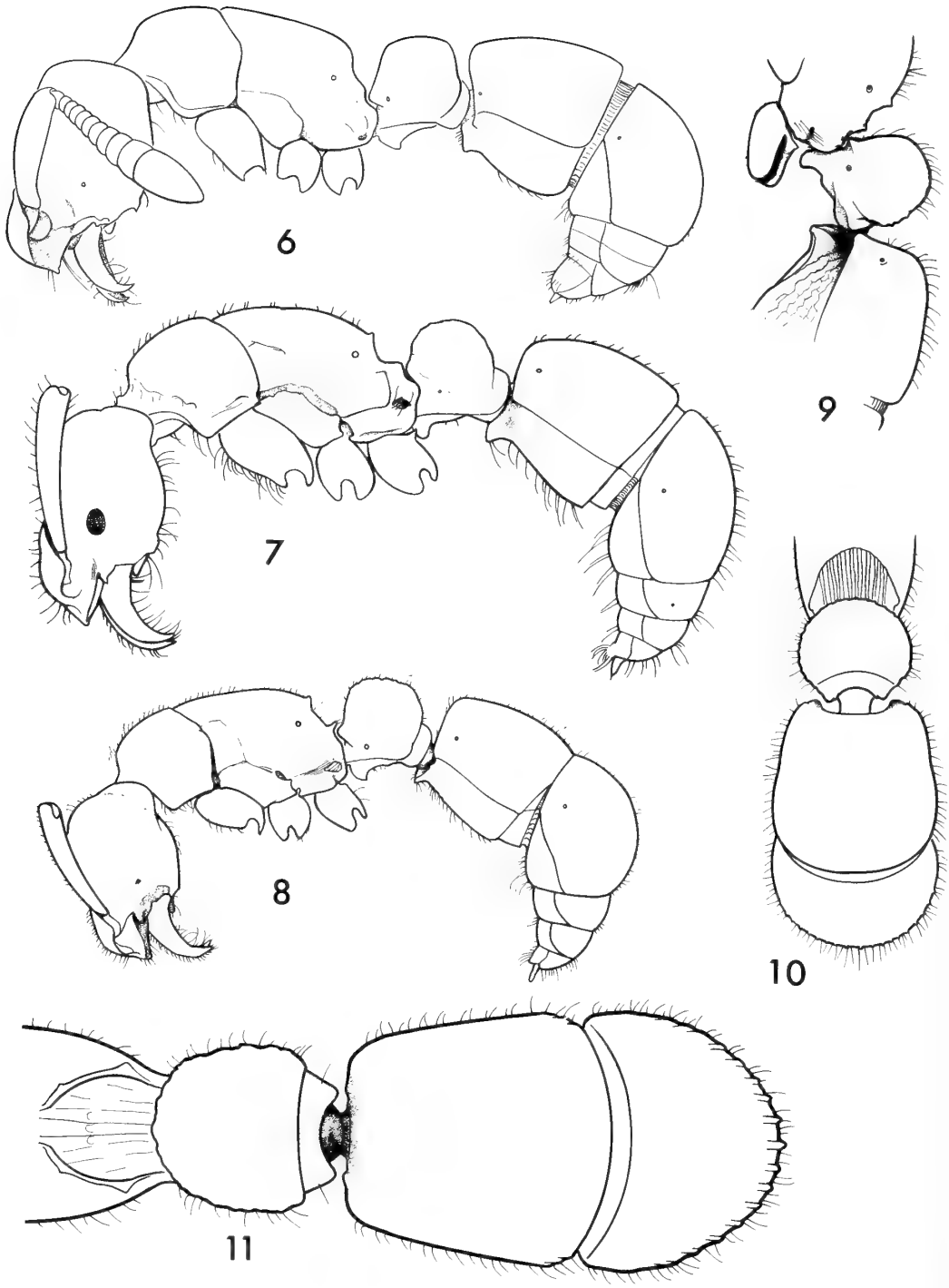


Figs. 1–5. *Loboponera* workers: **1–3,** heads in full-face view of 1, *basalis*; 2, *politula*; 3, *obeliscata*; **4–5,** body profiles of 4, *obeliscata*; 5, *politula*.



Figs. 6–11. *Loboponera* workers: **6–8,** body profiles of 6, *trica*; 7, *vigilans*; 8, *nasica*; **9,** profile of petiole and base of gaster of *basalis*; **10–11,** dorsal view of petiole and gaster of 10, *basalis*; 11, *nasica*.

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New Neotropical Nepticulidae (Lepidoptera) from the western Amazonian rainforest and the Andes of Ecuador

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CONTENTS

SYNOPSIS. Fieldwork in 2000–2001 in the upper Amazon basin and the Andes (Ecuador) has yielded 16 new species of Nepticulidae, described here. Four genera are represented: *Enteucha* Meyrick (two species: *E. acuta, E. guajavae*), *Stigmella* Schrank (four species: *S. montanotropica, S. nubimontana, S. rubeta, S. austroamericana*), *Fomoria* Beirne (two species: *F. repanda, F. tabulosa*) and *Acalyptris* Meyrick (8 species: *A. ecuadoriana, A. onorei, A. basihastatus, A. pseudohastatus, A. articulosus, A. rotundus, A. amazonius, A. insolentis*); the authors of all new taxa are Puplesis & Diškus. Larvae have been reared from three genera of different plant families: *Psidium* (Myrtaceae), *Acalypha* (Euphorbiaceae) and *Rubus* (Rosaceae). The adult moths of all 16 species treated are illustrated in black and white, with line drawings of genitalia and, for four species, drawings of leaf-mines.

INTRODUCTION

Nepticulidae are a very specialized, isolated family of primitive monotrysian Microlepidoptera with a world-wide distribution and about 750 described species. Description of the Neotropical fauna began in the late 19th and early 20th century with descriptions of species by Zeller (1877) and Meyrick (1915, 1931). Further species were described by Forbes & Leonard (1930), Bourquin (1962), Davis (1978, 1984, 1985), Wilkinson (1981) and Newton & Wilkinson (1982). A consider-

able boost was given to the number of species known from the Neotropical region by Puplesis & Robinson (2000) who described as new 33 species, mostly from Belize.

In this paper we report upon the results of field-collecting by Rimantas Puplesis (VPU) and Simon R. Hill (UW) in 2000–2001 in the upper Amazon basin and the Andes of Ecuador, areas unrepresented among material reviewed by Puplesis & Robinson (2000). From these new collections we describe below 16 new species – a significant addition to our knowledge of the Amazonian and Andean nepticulids – and provide larval rearing data from three host genera in different plant families.

This ongoing collaborative project (for previous publications, see Puplesis & Robinson, 1999; 2000) was undertaken at the Natural History Museum, London with the support of the Royal Society (London) and Professor Hering Memorial Fund. It combines Robinson's interests in Microlepidoptera biodiversity with Puplesis's and Diškus's expertise and interest in inventorying the families of primitive Microlepidoptera. We hope that further documentation of the Neotropical fauna and illustration of newly discovered species will stimulate further studies of the Nepticulidae of South America; we are very conscious that there is probably a great deal more yet to be discovered and described.

MATERIAL AND METHODS

Three primary collecting-sites were utilized in the upper Amazon Basin, in addition to brief collecting trips within the Ecuadorian Andes, covering the western and eastern slopes and altitudes from 700 m to 4200 m. Primary sites were: the Yasuni Research Station (Napo Region, SE of Coca, rainforest at 260 m, 76°36′W, 00°38′S) and Jatun Sacha Biological Station and Misahualli (both localities in Napo Region, SE of Tena, premontane tropical forest at 400–500 m, 77°36′W, 01°04′S).

Two main collecting methods were used: mining larvae were collected and reared, and adults were collected at light. Mined leaves (or other plant parts) were placed in Petri dishes which were then checked regularly for emerged adults. Emergence occurred within 1–3 weeks. Adult moths were collected by attracting them to mercury-vapour light from a lamp suspended slightly above eye-level and 5–10 cm in front of a white screen, rather closer than is usual in the standard method for light-collecting (described by Robinson *et al.*, 1994) in which the lamp is about 0.5 m from the illuminated surface. A portable Honda EX 350 generator was used as a power-source. As many different habitats and sites as possible were sampled. Moths attracted to the screen were collected into small glass tubes and pinned after killing with ethyl acetate vapour.

Genitalia were prepared following the method described by Robinson (1976). After maceration of the abdomen in 10% KOH and subsequent cleaning, male genital capsules were removed from the abdomen and mounted ventral side uppermost. In cases of complicated armature, the genitalia were studied and sketched in glycerin before fixation. The aedeagus was removed from and mounted alongside the genital armature. Female genitalia were removed entirely from the abdomen, cleaned and mounted ventral side uppermost. Genitalia and abdominal pelts of both sexes were stained with Chlorazol Black (Direct Black 38/Azo Black) and mounted in Euparal.

Forewing length is expressed as a range, where availability of material made this possible, measured along the costa from the wing base to the apex of the cilia. Wingspan was measured from the tip of the left wing to the tip of the right wing, where well-mounted specimens were available; in other cases the forewing length was doubled and the thorax width added.

Illustrations of the adults and leaf-mines were made in Indian ink by Mr Arturas Skorupskas (VPU) using preliminary sketches and notes by R. Puplesis and with additional observations using a stereoscopic microscope (MBS-10). Adults are illustrated at the same scale to indicate comparative size. It should be noted that the illustrations of adults are idealized and generalized. Unfortunately black and white drawings cannot show the metallic lustre and coloured iridescence characteristic of most Nepticulidae; details of such colours have been incorporated into species descriptions.

Genitalia and wing venation drawings were made by Puplesis using a camera lucida, mainly from permanent slides, but occasionally from temporary glycerin mounts.

Depositories of types are given in the species descriptions: either BMNH – The Natural History Museum, London, UK (formerly British Museum (Natural History)) or VPU – Vilnius Pedagogical University, Vilnius, Lithuania.

ABBREVIATIONS OF INSTITUTIONS

BMNH	The Natural History Museum, London, UK (formerly British Museum (Natural History))
INEFAN	Instituto Ecuatoriano Forestal de Areas Naturales y Vida Silvestre, Ecuador
NNM	Nationaal Natuurhistorisch Museum (Naturalis), Leiden, Netherlands
PUCE	Pontificia Universidad Católica del Ecuador, Quito, Ecuador
VPU	Vilnius Pedagogical University, Vilnius, Lithuania

USNM National Museum of Natural History, Washington DC, USA (formerly United States National Museum)
UW University of Westminster, London, UK
ZMUC Zoologisk Museum, University of Copenhagen, Copenhagen, Denmark

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DESCRIPTIONS OF NEW SPECIES

For generic diagnoses and synonymy, see Puplesis & Robinson (2000).

ENTEUCHA Meyrick

Enteucha acuta Puplesis & Diškus **sp. n.**

(Figs 4, 26–28)

MALE (Fig. 4). Forewing length: about 1.6 mm. Wingspan: about 3.4–3.5 mm. Head: palpi brownish cream; frontal tuft ochreous [heavily rubbed in the single available example]; collar probably cream [totally rubbed off in the available specimen]; eyecaps cream, large; antenna brown, comprising of about 17–18 segments. Thorax, tegulae and forewing brown; area of forewing before and after fascia dark brown; fascia postmedial, shining silver, very distinctive, perpendicular to forewing. Cilia grey. Underside of forewing brown or brownish. Hindwing lanceolate, brownish grey; its cilia concolorous. No androconia on forewing or hindwing. Legs brownish cream, darkened with fuscous brown on upperside. Abdomen brown on upperside, paler on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 26–28). Capsule 230–233 m long. Tegumen band-like, laterally slightly extended into papillated sublateral lobes. Uncus triangular with single, well-sclerotized caudal papilla. Gnathos with large posterior process and triangular lateral arms; central plate weakly developed, in shape of narrow band; anterior processes apparently absent or as tiny anterior papillae only. Valva 160–170 µm long; slender, curved inwardly, with broader basal one-quarter to one-third, and with pointed apex. Transtilla apparently absent (i.e., no sclerotized transverse bar developed), however basal parts of valva joined ventrally. Juxta present, a very large, medium or weakly sclerotized lobe reaching gnathos, basally fused with valva. Vinculum relatively short, constricted and smoothly rounded distally; no anterior excavation or lateral lobes. Aedeagus 165–170 µm long, with one very large cornutus and two smaller ones one-quarter or less length of major cornutus; apex of aedeagus with small sharp denticles and long, slender, cornuti-like sclerotized wrinkles.

BIOLOGY. Single adult collected in January.

DIAGNOSIS. Distinctive species; among all currently known species of the genus strongly differing by the presence of a large cornutus. In external features, particularly the fascia, it bears a superficial resemblance to the Neotropical *gilvafascia* (Davis) and *snaddoni* Puplesis & Robinson; however the fascia of the new species is shining silver, and there is no white apical spot on the forewing.

DISTRIBUTION. Lowland Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. The single specimen is badly pinned, the head is rubbed, however the wings are well preserved with clear patterning.

MATERIAL EXAMINED. Holotype ♂: **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National

Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*) genitalia slide no. 29604 (BMNH).

REMARKS. This remarkable species represents the first member of the genus to be found in Amazonia, and it is described from only a single specimen because of the very distinct characters of the genitalia, which exhibit considerable apomorphic modification in comparison with other related species.

Enteucha guajavae Puplesis & Diškus **sp. n.**

(Figs 2, 3, 20–25, 89, 90, 100, 101)

MALE (Fig. 3). Forewing length: 1.4–1.6 mm. Wingspan: 3.1–3.6 mm. Head: palpi brownish cream; frontal tuft ochreous orange; collar cream and paired; eyecaps cream and glossy; antenna fuscous on upperside and grey on underside, comprising of about 21–24 segments. Thorax and tegulae fuscous with some purple iridescence; forewing of same colour, with two striking shiny silvery fasciae: basal fascia almost half width of postmedial. Cilia greyish with distinct cilia-line. Underside of forewing fuscous. Venation with Sc, four radials, one medial, but no cubital vein (Fig. 2). Hindwing lanceolate, covered with brownish cream androconial scales (especially dense on underside of wing, making the hindwing the same colour as the underside of the abdomen); cilia of hindwing grey. Legs brownish cream, darkened with fuscous brown on upperside. Abdomen fuscous on upperside but ochreous cream on underside.

FEMALE. Hindwing grey. Otherwise as in male.

GENITALIA ♂ (Figs 20–25). Capsule 317–285 µm long. Tegumen band-like, distally widely rounded. Uncus with two short but broad papillated lateral lobes. Gnathos in shape of inverted 'v'; caudally directed part weakly sclerotized and rounded; lateral arms very slender. Valva 140–155 µm long; slender, curved inwardly, with broader and strongly sclerotized basal one-quarter to one-third and with pointed apex. Distinct transtilla apparently absent; however, a weakly sclerotized transverse bar is evident between basal processes of valvae; valvae additionally connected ventrally by ventral sclerite which is fused with vinculum plate. Juxta weakly developed and without clearly defined shape. Vinculum very long and widely rounded distally; no anterior excavation or lateral lobes; caudally directed lateral arms of vinculum strongly sclerotized and therefore distinct (in contrast to many other nepticulids). Aedeagus a little longer than vinculum plate, 195–230 µm long, with small pointed lateral extension at the caudal end and with a few (4–5) compactly arranged cornuti; cornuti resemble the 'usual' spine-like ones common in many nepticulids; however, in this species they are weakly defined, sometimes with unsclerotized apices.

GENITALIA ♀ (Figs 89, 90). Total length about 305–365 µm. Abdominal tip widely rounded, anal papillae indistinct. Apophyses anteriores distally with longer and narrow lateral process and large blunt inner lobe. Apophyses posteriores slender and much exceeding apophyses anteriores. Ductus spermathecae originating from a heavily sclerotized and wrinkled area between apophyses posteriores, narrow and long, with three sclerotized convolutions. Corpus bursae weakly folded, relatively very small, distinctly globular, with an oval signum formed by a group of numerous, large, blunt pectinations.

BIOLOGY (Figs 100, 101). Host-plant: *Psidium guajava* L. (Myrtaceae). Larvae green, found in January; mining leaves. Egg on underside of leaf. Mine slender, sinuous, from short to relatively long, mainly on upperside of leaf. In the first half of the mine blackish frass can fill most of the width, with narrow but still distinct clear margins remaining; in the second half of the mine frass is deposited as a black narrow central line with broad clear margins remaining; sometimes the central line of frass can be interrupted, but in most examples it forms an uninterrupted line. Cocoon greyish ochreous, flattened, strongly narrowed to the posterior end, ca. 2.5 by 1.5 mm. Voltinism of the species is not known. Mining larvae in January were found together with old and very old mines from probably November–December. Adults from larvae collected in January emerged after 20–25 days (in February). The new species seems quite common on cultivated guava in Ecuador.

DIAGNOSIS. Very distinctive species; from all currently known species of this genus (and most species of other genera) it differs strongly by the presence of two distinctive forewing fasciae. In the male genitalia this species is easily distinguishable by the shape of the gnathos (an inverted 'v'). In the female genitalia it differs from other *Enteucha* by the oval signum formed by a group of numerous, large, blunt pectinations. The unusual host-plant may also make this species distinctive, but as very little is known about the biology of other *Enteucha* it is uncertain how atypical the utilisation of Myrtaceae might be.

DISTRIBUTION. Western foothills of the Andes (Ecuador), but probably with a much wider distribution. Common in the Bucay area (80 km E of Guayaquil) (Fig. 101).

CONDITION OF TYPE MATERIAL. A few paratype specimens from the type series containing 8 specimens of this minute species are badly pinned.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: 80 km E of Guayaquil, Bucay, western foothills of Andes, 700 m, premontane tropical forest and orchards, 16–19.i.2001 (*Puplesis & Hill*), genitalia slide AD0340

(VPU). Paratypes, 5♂, data as holotype, genitalia slides AD0341, AD0342, (VPU)], 2♀, genitalia slides AD0343, AD0344, forewing venation slide AD0346 (VPU)]. Mines no. 4722–VPU.

STIGMELLA Schrank

Stigmella montanotropica Puplesis & Diškus **sp. n.**

(Figs. 5, 29, 30, 91, 98, 99, 102)

MALE. See Remarks.

FEMALE (Fig. 5). Forewing length: 2.2–2.4 mm. Wingspan: 5.0–5.1 mm. Head: palpi cream; frontal tuft from pale orange to bright orange; collar forming two clearly separated tufts of cream coloured lamellar scales; eyecaps cream; antenna fuscous, comprised of 22 segments. Thorax, tegulae and forewings fuscous brown with some bronzy-golden and purple reflection. Cilia dark grey to fuscous. Underside of forewing fuscous with some indistinct bronze-golden and purple reflection. Hindwing lanceolate, dark brown; cilia concolorous. Legs dark fuscous grey, distally cream. Abdomen fuscous, shiny, with long anal tufts.

GENITALIA ♂ (Figs 29, 30). Capsule 250–260 µm long. Uncus strongly sclerotized, constricted towards distal end, with four slender and distinct distal papillae. Tegumen very short, simple, band-like. Gnathos with large medially narrowed central plate and two very slender and long posterior processes parallel with each other; anterior extensions of gnathos triangularly lobate, weakly developed; lateral arms of gnathos narrowing caudally, relatively very short. Valva 144–151 µm long, constricted at apex and with two closely spaced and pointed apical processes. Transtilla with inwardly curved transverse bar, broad triangular angles but without sublateral processes. Ventral plate of vinculum relatively short, one-half or more of length of valva; anterior excavation wide but shallow, lateral lobes small, distally pointed. Aedeagus broad (90–100 µm) and relatively short (212–218 µm long). Vesica with 14 large or very large horn-like cornuti, the largest apical. Juxta apparently absent.

GENITALIA ♀ (Fig. 91). Total length about 1125 µm. Anal papillae weakly developed, two widely rounded but very short setose lobes. Apophyses anteriores gradually tapering distally, straight. Apophyses posteriores very slender and long, their distal ends slightly exceeding apophyses anteriores. Accessory sac globular, wrinkled, with slender, medium to weakly sclerotized ductus spermathecae, its inner duct with about nine neatly arranged convolutions. Corpus bursae large, oval, with a semicircular signum comprising very numerous pectinations; proximal part of corpus bursae long and strongly folded.

BIOLOGY (Figs 98, 99, 102). Host-plant: *Acalypha* sp. (Euphorbiaceae). Larvae in January–February, mining leaves. Egg on upperside or underside of leaf, usually deposited close to a small leaf-vein. Mine very long, slender, sinuous to contorted, mainly on upperside of leaf, more than 100 mm in straightened length. In the first half of the mine dark brown or blackish frass may fill up the entire width of the mine, latterly deposited in arcuate waves with or without leaving narrow, clear margins to the mine; the longest, final stage of the mine is usually with a broad trace of black granulated frass, leaving clear margins. Cocoon whitish, oval, flattened, strongly narrowed to the posterior end, ca. 2.5 by 1.5 mm. Voltinism not known. Mining larvae in early February were found together with old and very old mines from probably November–January. Currently adults are known from February–early March.

DIAGNOSIS. Belongs to the *S. salicis*-group (see Puplesis, Diškus, Robinson & Onore, 2002). Easily recognisable among all other species of the group by the combination of smoothly scaled fuscous forewings (without fascia) with numerous large cornuti in the aedeagus. Among Neotropical representatives of the group, the male genitalia most closely resemble those of *andina* (Meyrick) and *cuprata* (Meyrick); however, this species may be distinguished by the uniformly dark forewing and hindwing, and by the shape of the cornuti and the apical processes of the valva.

DISTRIBUTION. Tropical montane forest of the western slopes of the Andes (Ecuador) (Fig. 102); known from altitudes around 1200 m. See also Remarks.

CONDITION OF TYPE MATERIAL. Holotype and especially female paratype in relatively good condition; the male paratype comprises only a genitalia slide (29618 BMNH), the genitalia, fully formed and sclerotized, dissected from a dead pupa.

MATERIAL EXAMINED. Holotype ♀, **Ecuador**: E of Santo Domingo de los Colorados, Tandapi, montane tropical forest, 1200 m, larvae on leaves of *Acalypha* sp. (Euphorbiaceae), 3–6.ii.2000 (*Puplesis*), genitalia slide no. 29619 (BMNH). Paratypes, data as holotype, 1♂ genitalia slide [only – see above] no. 29618 (BMNH), 1♀, slide AD0336 (VPU). Mines no. 4628 (VPU). See also Remarks.

REMARKS. The description of the external features of this species is based on females.

A few specimens closely resembling this species were reared from *Acalypha* leaf-mines in 2001 in premontane tropical forest SE of Tena (Misahualli) and montane forest in Baños. These specimens will not be dealt with further until additional material is available; they may represent a closely related but different allopatric new species. The specimens are deposited in VPU (male genitalia slides AD 0345, AD 0347, AD 0348).

Stigmella nubimontana Puplesis & Diškus **sp. n.**

(Figs 6, 31–36, 94, 95)

MALE (Fig. 6). Forewing length: about 2.5 mm. Wingspan: 5.2–5.3 mm. Head: palpi grey-cream; frontal tuft pale orange; collar small, dark brown with some purple reflections; eyecaps cream with strong golden reflection; antenna fuscous, comprising of 29–30 segments. Thorax and tegulae dark brown with golden reflection. Forewing coppery-brown with golden and purple reflection, purple reflection particularly strong along costal margin towards fascia; fascia postmedial, weakly demarcated, comprising coppery-golden shining scales; area behind fascia dark brown with purple iridescence; additionally a slender terminal spot or fascia comprising the same shining, coppery-golden scales as the fascia. Cilia fuscous to grey at distal end. Underside of forewing brown with some purple reflection distally. Hindwing and its cilia brown-grey. No androconia on hindwing or forewing. Legs fuscous, shiny. Abdomen fuscous.

FEMALE. Unknown.

GENITALIA ♂ (Figs 31–36). Capsule 290–309 µm long. Uncus with shallow distal excavation and almost parallel, strongly sclerotized lateral margins; the structure may vary a little in length. Tegumen small, simple, band-like. Gnathos with very long, slender, parallel caudal processes, narrowed lateral arms and short, wide central plate, gradually constricted at the middle. Valva 168–207 µm long, broad, with two inwardly curved and pointed apical processes; the ventral process blunt, lobe-like. Transtilla with slender transverse bar and almost rounded corners. Juxta apparently absent. Ventral plate of vinculum with large triangular lobes and deep semicircular excavation distally. Aedeagus 195–220 µm long, with many fine spine-like cornuti and three large horn-like ones.

BIOLOGY (Figs 94, 95). Host-plant: *Rubus* sp. (Rosaceae). Larvae are known mining leaves in January–February but the mining period is likely to be much longer. Egg on the underside of leaf, usually deposited close to a leaf-vein. Mine usually between two leaf-veins, a compactly deposited gallery which resembles an elongated blotch, about 2.8–3.8 cm in straightened length. Beginning of mine slender and filled with dark brown frass; later the gallery widening considerably, the frass dark brown, deposited in a broad compact central line with clear margins; final length of mine very broad (sometimes a blotch), with granulated dark brown frass deposited more or less irregularly or into a relatively slender central line. Final part of mine usually covering beginning of mine, so the initially slender gallery may be impossible to see. Larva yellowish. Cocoon pale brown with some yellowish tint, oval, flattened, gradually narrowed to the posterior end, ca. 2.8–3.0 × 1.8 mm. Voltinism not known. Numerous mining larvae in early February were found together with very numerous old and very old mines from probably November–January period. Adults known from February–early March.

DIAGNOSIS. Belongs to the *S. salicis*-group (see Puplesis, Diškus, Robinson & Onore, 2002); two shining forewing fasciae and the combination of three large cornuti with numerous fine, spine-like cornuti make this a distinctive species of the group. This high Andes species is somewhat similar and related to *rubeta*, the other *Rubus*-mining species from montane tropical forest on the western slopes of the Andes; *nubimontana* differs from *rubeta* in the more strongly developed fasciae of the forewing, particularly in the unelaborated uncus & tegumen, and the presence of many fine, spine-like cornuti (in *rubeta* no tiny cornuti are present). There are some differences in the mines too: the slender beginning of the gallery made by *rubeta* has a very slender, broken line of blackish frass whereas in mines of *nubimontana* dark brown frass fills up the entire width of the gallery.

DISTRIBUTION. Cloud forest of the high Andes (Ecuador), at about 3500 m, where it appears to be very common.

CONDITION OF TYPE MATERIAL. The male holotype is a reared specimen with well-preserved forewings and antennae but with detached hindwings stored in a small gelatine capsule beneath the specimen. The two paratypes came from dead late-stage pupae and are therefore not represented by pinned adults, just by good-quality genitalia preparations, mines and cocoons.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, Andes, 3500 m, Papallacta, cloud forest, larvae 2–3.ii.2000 on *Rubus* sp. (*Puplesis & Hill*), genitalia slide no. 29614 (BMNH). Paratypes, 2♂, data as holotype, genitalia slide nos AD0321, AD0322 (VPU). Mines no. 4630 (VPU).

REMARKS. During fieldwork in Ecuador in 2000 very many mining larvae of this species were collected in the Andes (Papallacta). However, for some unknown reason (not parasitism – very few parasitoids were observed), very few adults emerged. Another species mining on the same *Rubus* sp. at the same time in the same locality was also noticed, and a single female specimen was reared (no. AD0337 VPU). This last species is not included here because of its inadequate representation.

Stigmella rubeta Puplesis & Diškus **sp. n.**

(Figs 7, 37–39, 92, 96, 97, 102)

MALE (Fig. 7). Forewing length: about 2.0 mm. Wing-

span: 4.5 mm. Head: palpi grey-cream or brown-cream; frontal tuft orange; collar small, fuscous; eyecaps cream with some golden reflection; antenna fuscous, number of segments unknown. Thorax and tegulae fuscous with some golden reflection. Forewing fuscous with golden and purple reflections, and without distinct fascia: there are only some shiny silver scales in the usual area of a median-postmedial fascia and at apex of forewing. Cilia fuscous to grey at the distal end. Underside of forewing brown. Hindwing and its cilia dark grey. No androconia on hindwing or forewing. Legs fuscous, distally grey-cream. Abdomen fuscous.

FEMALE. Externally probably very similar to male, however, the single female known came from a dead pupa and therefore the scaling pattern could not be studied.

GENITALIA ♂ (Figs 37–39). Capsule 290–300 µm long. Uncus elaborate in comparison with related species: the bilobate, deeply divided structure is paralleled by an additional broad dorsal lobe (Fig. 38). Tegumen small, also unusually elaborate, with strongly sclerotized anterior extension distally. Gnathos with very long, slender, parallel caudal processes, narrowed lateral arms and short, wide central plate constricted at middle and with a small anterior papilla. Valva 175–185 µm long, broad, with rounded inner lobe of valva (not forming a process as in *nubimontana*) and with inwardly curved and pointed apical process. Transtilla with slender transverse bar and angular corners. Juxta apparently absent. Ventral plate of vinculum with large triangular lobes and deep semicircular excavation distally. Aedeagus about 200 µm long, without small, spine-like cornuti, but with seven large ones: three of them broad-based and four well-sclerotized and slender.

GENITALIA ♀ (Fig. 92). Total length about 800–820 µm. Abdominal tip widely rounded. Apophyses posteriores about 187–225 µm long, very slender and straight. Apophyses anteriores slightly longer and broader. Accessory sac globular, wrinkled. Ductus spermathecae membranous, a short section only coiled and strongly sclerotized. Corpus bursae distinctly oval, with numerous pectinations all over the sac; proximal part of corpus bursae narrowed, short and strongly folded.

BIOLOGY (Figs. 96, 97, 102). Host-plant: *Rubus* sp. (Rosaceae). Larvae mine leaves in January–February (but the mining period is probably much longer). Egg on underside of leaf, usually deposited close to a leaf-vein. Mine usually between two leaf-veins, starting as a long and very narrow gallery with blackish or black frass deposited in a broken, slender to very slender central line; later the gallery widening, sometimes very contorted and resembling more a blotch; the blackish (sometimes brown) frass in the wider part of the mine tending to be deposited in a broad, irregular central line. Total length of straightened gallery about 4.2–4.6 mm (about half of this length belongs to the very slender part of the mine), but the mine does not superficially appear as long, as the slender region is very indistinct; wider part very convoluted, sometimes covering beginning of mine. Larva yellowish. Cocoon pale brownish with some yellowish tints, oval, flattened, gradually narrowed to the posterior end, 2.5–2.6 × 1.8 mm. Voltinism not known. Numerous mining larvae were found in early February together with very numerous old and very old mines from probably the November–January period. Adults are known from February–early March.

DIAGNOSIS. Belongs to the *S. salicis*-group (see Puplesis, Diškus, Robinson & Onore, 2002); this tropical montane *Rubus*-mining species is most similar and related to *nubimontana*, the high-Andean species also feeding on *Rubus*. Differs from *nubimontana* by the darker wings, less prominent forewing pattern, the elaborate uncus and tegumen, the absence of very small spine-like cornuti (which are very characteristic for *nubimontana*) and by the presence of broad-based cornuti on the vesica (which are apparently absent in *nubimontana*). Additionally, there are some differences in the mines: the slender start of the gallery made by *rubeta* has a very slender, broken line of blackish frass (Fig. 97) whereas in mines of *nubimontana* dark brown frass fills the whole width of the gallery (Fig. 95).

DISTRIBUTION. Tropical montane forest of the western slopes of the Andes (Ecuador), at about 1200 m, where it appears to be quite abundant.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: western Andes, E of Santo Domingo de los Colorados, Tandapi, montane tropical forest, larvae 3–6.ii.2000 on *Rubus* sp. (*Puplesis & Hill*), genitalia slide no. 29616 (BMNH). Paratype: ♀, data as holotype, genitalia slide no. 29617 (BMNH) (*Puplesis*) (genitalia only – see Remarks). Mines no. 4629 (VPU).

REMARKS. The female specimen mentioned above was taken from a fully-developed pupa, and the paratype is represented only by a preparation of the fully formed and sclerotized genitalia. It appears that *rubeta* and *nubimontana* represent two very closely related, allopatric species.

Stigmella austroamericana Puplesis & Diškus **sp. n.**

(Figs 8, 40–43)

MALE (Fig. 8). Forewing length: 1.6–1.7 mm. Wingspan: 3.6–3.8 mm. Head: palpi (and face) whitish cream; frontal tuft pale yellowish orange, collar large, whitish cream; eyecaps whitish cream; antenna of contrasting colour, fuscous on upperside, but distinctly

cream on underside, comprising of 38 segments. Thorax, tegulae and forewing dark grey-brown irrorated uniformly with grey with strong golden reflection; a few scales just before forewing cilia may appear glossy white when viewed at a certain angle. Cilia grey. Underside of forewing brownish fuscous: fuscous-tipped scales densely irrorated grey-cream on grey background. Hindwing and cilia brown-grey. No androconia on forewing or hindwing. Legs brownish cream distally and on underside, elsewhere dark grey-brown. Abdomen silver-blackish on upperside, grey, glossy; tufts indistinct.

FEMALE. Unknown.

GENITALIA ♂ (Figs 40–43). Capsule about 320 µm long. Uncus comprising two very large, distally rounded lobes. Tegumen band-shaped, slightly spined distally. Gnathos with two very slender and long caudal processes and pair of anterior processes that are 3× broader and about one-half length of anterior processes; central plate very slender; lateral arms short and narrow. Valva 190–196 µm long, bulged medially and constricted to a pointed apical process caudally, with long plumose scales in apical half. Transtilla with sublaterally directed processes and transverse bar which is not fused in the middle. Ventral plate of vinculum with deep, semicircular anterior excavation and long, distally truncate lateral lobes. Aedeagus 215–226 µm long, slender, with tiny, pointed apical processes on both sides of the tube, and with a few fine, spine-like cornuti in the apical part. Juxta membranous, lobate, hardly visible.

BIOLOGY. Adults collected in late January.

DIAGNOSIS. Belongs to the same species-group (see Remarks) as two other Neotropical species: *plumosetaeella* Newton & Wilkinson and *barbata* Puplesis & Robinson. Externally this species is easily distinguished from the fasciated *plumosetaeella* by the dark forewing; it is externally similar to *barbata* but differs in the absence of brownish androconial scales at the apex of forewing and in the absence of long thickened brown androconial scales on the dorsal margin of the hindwing. In the male genitalia *austroamericana* is easily distinguished from both related species by the long lobes of the vinculum, the huge, deeply lobate uncus, and long, almost straight apical processes of the valva.

DISTRIBUTION. Ecuador; Amazon premontane rainforest, at altitudes of about 500 m.

CONDITION OF TYPE MATERIAL. The holotype is well preserved.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, SE of Tena, near Rio Napo, Jatun Sacha, Amazon rainforest, 500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29613 (BMNH).

REMARKS. This species represents a very distinctive member of a still unnamed species-group obviously comprising also *plumosetaeella* Newton & Wilkinson and *barbata* Puplesis & Robinson; on some similarities in forewing pattern and genitalia it is also easy to assume that *austroamericana* is more related to *barbata* Puplesis & Robinson; they may represent allopatric sister-species.

FOMORIA Beirne

Fomoria repanda Puplesis & Diškus **sp. n.**

(Figs 9, 44–52)

MALE (Fig. 9). Forewing length: 1.6–1.9 mm. Wingspan: 3.7–4.4 mm. Head: palpi cream to ochreous cream; frontal tuft ochreous orange; collar indistinct, comprising pale ochreous piliform scales; eyecaps cream with or without some pale brownish scales; antenna brownish to brown or ochreous brown on upperside, cream on underside, comprising of 24–28 segments. Thorax and tegulae ochreous cream with many brownish, brown or dark brown scales; these brown scales may be weakly developed and/or easily lost. Cream to brownish cream background of forewing irrorated with brown and dark brown scales; these dark scales more densely distributed on base of wing, close to costa and especially distinctive and dark behind the fascia, i.e., in apical part of forewing. Fascia median-postmedial, broad and oblique, formed by fuscous-brown scales. Cilia ochreous cream. Underside of forewing yellowish brown. Hindwing and cilia cream. No androconia on hindwing or forewing. Legs cream with or without some dark brown shading. Abdomen yellowish brown on upperside, paler on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 44–52). Capsule 330–342 µm long. Pseuduncus distinctly bilobed; the lobes very large, irregularly triangular. Uncus with distally rounded median lobe (see Remarks). Gnathos with relatively short caudal element and long slender lateral arms. Valva 100–109 µm long, divided into slender, distally rounded and setose lobe, and slender and distally pointed dorsal lobe. Transtilla with very extended lateral arms and with an angular plate (transverse bar); plate of transtilla weakly sclerotized. Vinculum very long, without anterior (distal) excavation or lobes. Juxta apparently absent. Aedeagus very large, about 575 µm long, with a wide band of broad, triangular and lobe-like cornuti, and with about seven very large horn-like cornuti in apical one-quarter; three orfour of these horn-like cornuti straight, remainder with curved bases. Aedeagus of holotype (Fig. 45) with inverted vesica, and not all cornuti preserved and visible; see paratype (Fig. 52).

BIOLOGY. Adults fly in January.

DIAGNOSIS. This distinctive Amazon rainforest species forms a natural group with a few other Neotropical *Fomoria*: *molybditis* (Zeller) [Colombia], *diskusi* Puplesis & Robinson [Belize], and unnamed species 29122 [Belize] (see Puplesis & Robinson, 2000). Externally *repanda* differs from all these species in the dark fascia of the forewing. The male genitalia exhibit some similarities to *molybditis* and species 29122 in the presence of numerous cornuti in the aedeagus. However, *repanda* clearly differs from *molybditis* in the deeply divided valva without a spine-like process and in the broad median lobe (element) of the uncus; from species 29122 it differs in the very long aedeagus, slender ventral lobe of the valva, and broad uncus.

DISTRIBUTION. Lowland Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. Holotype and paratype well preserved.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*), genitalia slide no. 29603 (BMNH). Paratype: ♂, data as holotype, genitalia slide no. AD0315 (VPU),

REMARKS. In the genitalia slides of both currently known specimens the median lobe of the uncus is directed anteriorly, but it is uncertain that this is the natural position and not an artefact of preparation. The normal position might well be with the median lobe directed caudally, as is characteristic of other *Fomoria*.

Fomoria tabulosa Puplesis & Diškus **sp. n.**

(Figs 10, 53–55)

MALE (Fig. 10). Forewing length: 2.6 mm. Wingspan: about 5.6 mm. Head: palpi cream with some brownish shading; frontal tuft pale ochreous; collar inconspicuous, comprised of ochreous cream piliform scales; eyecaps large, yellowish cream; antenna ochreous cream distinctly annulated with brown, comprising of about 35 segments. Thorax, tegulae and forewing uniform: greyish cream background densely irrorated with brown and dark brown scales. Cilia and underside of forewing brownish. Hindwing lanceolate, brownish; its cilia also brownish. No androconia on forewing or hindwing. Legs pale ochreous distally with fuscous shading. Abdomen brown; tufts weakly developed.

FEMALE. Unknown.

GENITALIA ♂ (Figs 53–55). Capsule 408–415 µm long. Pseuduncus triangular with a short, slender and distally truncate process. Uncus inverted 'V'-shaped, with short and blunt extension, which in most *Fomoria* is caudally directed [the extension of the uncus in a ventral direction in the holotype – see Fig. 53 – was probably caused by the process of fixation and mounting in Euparal]. Gnathos with single, slender caudal process and slender, caudally directed lateral arms. Valva 240–253 µm long, broad at base, strongly narrowed towards apex, very slender and slightly curved inwardly in apical third. Transtilla with slender transverse bar and short, slender sublateral processes. Juxta (Fig. 54) represented by a pair of lateral, lobe-like, spinose processes behind (dorsal to) ventral lobes of valvae. Ventral plate of vinculum half length of valva, narrowed distally and with small rounded sublateral corners; distal excavation of vinculum plate particularly shallow. Aedeagus 332 µm long, with broad inverted 'U'-shaped sclerite; no apical carinae or spine-like cornuti.

BIOLOGY. Adults collected in January.

DIAGNOSIS. Easily distinguished from other *Fomoria* and all other nepticulids by the inverted 'U'-shaped sclerite in the aedeagus.

DISTRIBUTION. Lowland Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. The holotype is in good condition.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*), genitalia slide no. 29625 (BMNH).

ACALYPTRIS Meyrick

Acalyptris ecuadoriana Puplesis & Diškus **sp. n.**

(Figs 11, 56–58)

MALE (Fig. 11). Forewing length: 2.5 mm. Wingspan: 5.4–5.5 mm. Head: palpi cream; frontal tuft ochreous; collar indistinct, consisting of ochreous cream piliform scales; eyecaps large, cream, with some brownish scales; antenna on upperside broadly annulated with brown to almost cream, cream on underside, comprising of about 28 segments. Thorax, tegulae and forewing before the fascia golden cream with some brownish scales close to forewing costa. Fascia postmedial, oblique, formed by fuscous brown scales; area behind fascia brown-grey with some fuscous-brown tipped scales. Cilia cream. Some long, thickened, dark brown scales extending over hindwing from dorsal margin of forewing. Underside of forewing brownish cream except margins which are brown. Hindwing lanceolate, neatly covered with small brownish (probably androconial) scales (on upperside only); cilia of hindwing brownish or greyish. Legs ochreous cream.

Abdomen dark brown to yellowish brown with some dark brown scales; on upperside – brownish to yellowish.

FEMALE. Unknown.

GENITALIA ♂ (Figs 56–58). Capsule 280 µm long. Pseuduncus triangular and neatly papillated distally. Uncus paired, X-shaped, broadened anteriorly. Gnathos (Fig. 57) with slender, bar-like central plate, and very elaborate, unusual lateral arms, their ventrally sclerotized margins resembling distinctly pointed caudal processes; ventral arms of gnathos with inwardly directed dorsal lobes; real caudal process(es) absent. Tegumen not forming lateral rod-like sclerites beneath valvae, along capsule as in many other Neotropical *Acalyptris*. Valva 168–173 µm long, broad in basal two-thirds and very slender, inwardly curved in apical third. Transtilla with narrow, medially very constricted (or not fused) transverse bar and outwardly curved sublateral processes one-half length of transtilla. Juxta a sclerotized transverse bar behind valval bases, slightly varying in shape. Ventral plate of vinculum with widely rounded lateral lobes and very shallow anterior excavation. Aedeagus 244 µm long, sclerotized and distinctly constricted at base, and with three very long horn-like sclerites in apical half; one of them with a strongly sclerotized basal extension.

BIOLOGY. Adults collected in January.

DIAGNOSIS. Together with the Amazonian *onorei* and the Central American *latipennata* Puplesis & Robinson and *dividua* Puplesis & Robinson this species forms a distinctive species group. Externally *ecuadoriana* clearly differs from *onorei* in the well-developed forewing fascia, the absence of androconial patches on the hindwing and by the lanceolate hindwing shape; in *onorei* the hindwings are distinctly broadened. From *latipennata* and *dividua* it differs in the presence of long piliform scales on the dorsal margin of the forewing and by the background colour of the forewing – *latipennata* is paler, and *dividua* darker. In the male genitalia this species differs from all related ones in the absence of inner, spine-like valval processes, a distinctly X-shaped uncus with broadened anterior components, distally excavated vinculum, very broad valva in basal two-thirds, and the specialized shape of the gnathos.

DISTRIBUTION. Premontane Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. The type series is well-preserved.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, near Rio Napo, Jatun Sacha, premontane rainforest, 400–500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29624 (BMNH). Paratypes: 1♂, data as holotype, genitalia slide no. AD0325 (VPU); 1♂, data as holotype but Misahualli, 22–31.i.2001 (*Puplesis & Hill*), genitalia slide no. AD0349 (VPU).

Acalyptris onorei Puplesis & Diškus **sp. n.**

(Figs 1, 12, 13, 59–64)

MALE (Figs 1, 12, 13). Forewing length: 2.0–2.2 mm. Wingspan: 4.5–4.9 mm. Head: palpi cream; frontal tuft ochreous orange; collar indistinct, comprised of ochreous cream piliform scales; eyecaps cream; antenna cream, annulated with brownish to fuscous brown on upperside, comprising of 26–28 segments. Thorax and tegulae irrorated with numerous brownish to brown scales. Forewing broad with some bluish and green reflection; in basal three-fifths, cream to grey-cream background indistinctly, more or less smoothly irrorated with brownish scales, apical two-fifths distinctly irrorated with larger, brown to fuscous brown scales; a clear fascia undeveloped, however, numerous fuscous brown scales distributed just behind middle of forewing resemble an irregular, oblique postmedial fascia. Cilia greyish cream. Underside of forewing dark brown with very long, median band of cream androconial scales along width of wing. Forewing venation (Fig. 1) typical for *Acalyptris*, however R4 and R5 preserved as two separate veins in contrast to the usual *Acalyptris* venation where these veins are fused. Hindwing (Fig. 13) unusually broad, on upperside with large, elongated patch of neatly arranged cream scales close to hind margin and base; covered with brown scales, very densely deposited just before apex; apex brownish; with single frenulum and, close to base, a dark brown hair pencil comprising many very long, thickened chaetae-like scales; behind hair pencil with many cream, elongated lamellar scales arising from anterior margin of wing. Cilia of hindwing cream, overlapped by long, thickened, brownish scales from posterior margin near apex. Underside of hindwing brownish to brown; sometimes with a paler zone along main vein. Legs pale ochreous or ochreous cream. Abdomen brown with broad dark bands along upperside, underside yellowish brown or brownish.

FEMALE. Unknown.

GENITALIA ♂ (Figs 59–64). Capsule 295 µm long. Pseuduncus with two small triangular lobes apically; excavation between apical lobes as deep/broad as the length/width of each lobe. Uncus (Fig. 62) paired, comprising lateral, strongly sclerotized plates which are widened at distal end and outwardly curved at bases. Gnathos (Fig. 63) paired, comprising two lateral, strongly sclerotized, broad, V-shaped sclerites; no central plate or any transverse bar connecting lateral parts of gnathos. Tegumen not forming lateral rod-like sclerites beneath valvae, along capsule as in many other Neotropical *Acalyptris*. Valva 175–181 µm long,

with large, horn-like apical process and similar medial one. A pair of small rounded sclerotizations visible on diaphragma between medial process of valva and transtilla bar; homology of these sclerites unknown. Transtilla with narrow, long, bridge-like transverse bar, and outwardly curved sublateral processes one-third length of bar. Juxta apparently absent. Vinculum large, ventral plate trapezoidal, gradually narrowed towards anterior (distal) end, without lateral lobes and without anterior excavation. Aedeagus about 255 µm long, strongly narrowed in basal third, and with three large, horn-like sclerites apically.

BIOLOGY. Adults collected in January.

DIAGNOSIS. Together with the Amazonian *ecuadoriana* and two Central American species, *latipennata* Puplesis & Robinson and *dividua* Puplesis & Robinson, *onorei* forms a distinctive species group. Externally it differs from these related species in the distinctly broadened hindwing with androconial patches, and weakly developed (or undeveloped) forewing fascia. In the male genitalia *onorei* differs from all related species by the unique gnathos comprised of two lateral sclerites without a transverse bar.

DISTRIBUTION. Lowland Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. The holotype is well preserved; the paratype has a slightly rubbed head and wings.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*), genitalia slide no. 29623 (BMNH). Paratype ♂: data as holotype, genitalia slide no. AD0324 (VPU), forewing venation slide no. AD0351 (VPU).

REMARKS. This remarkable species is named in honour of Dr. Giovanni Onore (Departamento de Biologia, Pontificia Universidad Católica del Ecuador, Quito, Ecuador) who helped to organize the first collecting trip to Ecuador specifically targeted at Amazon rainforest Nepticuloidea.

Another species, closely related to *onorei,* was found by Puplesis & Hill (2001) in premontane tropical rainforest (Misahualli, 17 km SE of Tena). The specimen will not be described until further material becomes available; it is deposited at VPU (genitalia slide no. AD0352).

Acalyptris basihastatus Puplesis & Diškus **sp. n.**

(Figs 14, 65–67, 71)

MALE (Fig. 14). Forewing length 1.9–2.1 mm. Wingspan: 4.3–4.6 mm. Head: palpi cream; frontal tuft ochreous to pale orange-ochreous; collar indistinct, comprised of cream piliform scales; eyecaps cream; antenna brownish, comprising of about 33–35 segments. Thorax and tegulae densely irrorated with brown (or dark brown) scales. Golden cream background of forewing (except costal area) irrorated with small, indistinct pale brownish scales; the narrow area along costa densely covered with dark brown scales; apical part of forewing irrorated with dark brown or fuscous-tipped scales; some dark scales overlapping on cilia. Cilia cream. Underside of forewing dark brown. Hindwing lanceolate, brownish or greyish; cilia greyish. No androconial patches on hindwing or forewing. Legs cream with golden reflection. Abdomen dark brown on upperside and yellowish brown on underside, with paired abdominal tuft of long piliform scales.

FEMALE. Unknown.

GENITALIA ♂ (Figs 65–67, 71). Capsule 312–320 µm long. Tegumen extended into distally bilobed pseuduncus; each lobe rounded and papillated. Uncus in shape of inverted Y; the caudal process slender and short. Gnathos with large caudal process, somewhat slender lateral arms, and subangular central plate. Tegumen forming lateral rod-like sclerites beneath valvae, along capsule. Valva (Fig. 71) 205–218 µm long, with large, pointed, subcaudally directed basal process, bulged inner lobe and gradually constricted apical half. Transtilla with slender and long transverse bar and similarly slender sublateral processes one-half length of bar. Juxta indistinct or apparently absent. Ventral plate of vinculum broad and short, with very broad, triangular, distally rounded lateral lobes. Aedeagus 439–448 µm long (including distal carina); tube equally broad, apically with five large, mostly asymmetrical carinae and large, elongated, semi-triangular sclerotization near bases of lowest (lateral) carinae; in undissected genitalia, this elongated plate-like sclerotization probably attaches to caudal margin of vinculum. Vesica with some very small triangular cornuti close to the elongated, plate-like sclerotization. Cathrema very sclerotized, relatively very long, almost as long as any carinae.

BIOLOGY. Adults collected in late January.

DIAGNOSIS. This species is distinguished from all currently known Neotropical *Acalyptris* by the large, straight and pointed, distinctly basal process of the valva. Externally it might be confused with other *Acalyptris* with irrorated forewings, particularly with the central american *martinheringi* and the related, Amazonian *pseudohastatus* or *articulosus*. In *martinheringi* the somewhat similar basal processes are slightly curved or bifid, and are associated with the juxta, not the valva; the pseuduncus is distally rounded, and the valva slender. In *pseudohastatus* the valval

process is attached for its entire length to the inner lobe of the valva and is sinuous, not straight; the pseuduncus is truncated, not bilobed; the aedeagal carinae are very long. In *articulosus*, in contrast to *basihastatus*, the basal lobe of the valva is articulated.

DISTRIBUTION. Amazon premontane rainforest (Ecuador), at altitudes of about 500 m.

CONDITION OF TYPE MATERIAL. The holotype and four paratypes are in good or satisfactory condition, with spread wings, and are little worn. The best preserved scaling of forewing and head is undoubtedly in paratype AD0316.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, near Rio Napo, Jatun Sacha, premontane rainforest, 400–500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29605 (BMNH). Paratypes: 3♂, data as holotype, genitalia slide nos 29606 (BMNH), AD0316 (VPU), AD0317 (VPU); 1♂, data as holotype but Misahualli, 22–31.i.2001 (*Puplesis & Hill*), genitalia slide no. AD0350 (VPU).

Acalyptris pseudohastatus Puplesis & Diškus **sp. n.**

(Figs 15, 68–70, 72)

MALE (Fig. 15). Forewing length: 2.1–2.2 mm. Wingspan: 4.7–4.9 mm. Head: palpi cream; frontal tuft ochreous orange to pale ochreous; collar indistinct, comprised of cream piliform scales; eyecaps cream; antenna brown to brownish, comprising of about 36–38 segments. Thorax and tegulae densely irrorated with brown (or dark brown) scales. Greyish cream or golden cream background of forewing irrorated with brownish, brown and dark brown scales; dark brown-tipped scales particularly abundant in apical half of forewing; some dark scales overlapping on forewing cilia; a narrow area along costa densely covered with dark brown scales. Cilia greyish. Underside of forewing brown to dark brown. Hindwing lanceolate, grey or brownish; cilia grey. No androconial patches on hindwing or forewing. Legs brownish cream with dark brown shading (particularly on forelegs). Abdomen dark brown on upperside and yellowish brown on underside, with paired abdominal tuft of long piliform scales.

FEMALE. Unknown.

GENITALIA ♂ (Figs 68–70, 72). Capsule 340–354 µm long. Tegumen extended into trapezoidal, distally truncate pseuduncus. Uncus in shape of inverted Y; the caudal process slender and short. Gnathos with large caudal process, slightly slender lateral arms, and with small central plate. Tegumen forming lateral rod-like sclerites beneath valvae, along capsule. Valva (Fig. 72) 240–249 µm long, with large, pointed, caudally directed median process, bulged inner lobe and gradually constricted apical half. Transtilla with slender and long transverse bar and very slender sublateral processes half length of bar. Juxta indistinct or apparently absent. Ventral plate of vinculum broad and very short, with triangular, short, distally almost pointed lateral lobes. Aedeagus 350–362 µm long (including distal carina); tube equally broad, apically with five very large carinae and some very small triangular cornuti on vesica. Cathrema well sclerotized and half as long as any apical carinae.

BIOLOGY. Adults collected in late January.

DIAGNOSIS. This species is very easily distinguished from other Neotropical *Acalyptris* by the combination of the very characteristic median process of the valva with the truncate pseuduncus and five very long aedaegal carinae. Relationships are to other Amazonian *Acalyptris*, notably *basihastatus*; however, in *pseudohastatus* the valval process is attached for its entire length to the inner lobe of the valva and is sinuous, not straight; the pseuduncus is truncate (not bilobed), the carinae of the aedeagus are very long and very slender distally.

Externally it could be easily confused with other *Acalyptris* with a similarly irrorated forewing, particularly the central american *martinheringi* and Amazonian *basihastatus* and *articulosus*.

DISTRIBUTION. Amazon premontane rainforest (Ecuador), at altitudes of about 500 m.

CONDITION OF TYPE MATERIAL. The holotype and one paratype (no. AD0319 VPU) are in good condition, while the two remaining paratypes are more worn (no. 29608 BMNH and no. AD0316 VPU).

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, near Rio Napo, Jatun Sacha, premontane rainforest, 500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29607 (BMNH). Paratypes, 3♂, data as holotype, genitalia slides no. 29608 (BMNH), no. AD0318 (VPU), no. AD0319 (VPU).

Acalyptris articulosus Puplesis & Diškus **sp. n.**

(Figs 16, 73–75)

MALE (Fig. 16). Forewing length: 1.8–2.0 mm. Wingspan: 4.3–4.5 mm. Head: palpi cream; frontal tuft dark orange or dull orange; collar comprising orange-cream piliform scales; eyecaps cream; antenna brownish to brownish cream, comprising of about 34–36 segments. Thorax and tegulae irrorated with brown (or dark brown) scales. Cream background of forewing irregularly irrorated with indistinct, small, pale brown scales, densest in basal half of wing, and with brown to fuscous brown scales predominating in apical half of forewing; no fascia or distinct spots, but a few dark fuscous scales together may form a patch, however, this patch not obviously developed on other wing of

same specimen; some dark scales overlapping on forewing cilia. Cilia brownish cream. Yellowish cream background of underside of forewing densely covered with small elongated dark brown scales. Hindwing generally slender, slightly broadened anteriorly in basal half, uniformly covered either with grey-cream or brownish grey scales; cilia of hindwing greyish. No androconial patches on hindwing or forewing. Legs brownish cream to cream with or without fuscous shading distally. Abdomen brown on upperside and yellowish brown on underside, with paired abdominal tuft of long piliform scales.

FEMALE. Unknown.

GENITALIA ♂ (Figs 73–75). Capsule 270–276 µm long. Tegumen caudally extended into a gradually tapered pseuduncus, with two slender and short distal lobes. Uncus inverted 'Y'-shaped, with a short, slender, apically thickened and slightly broadened caudal process. Gnathos with short, strongly sclerotized lateral arms; central plate relatively large, laterocaudally very strongly sclerotized, anteriorly with more or less membranous, triangular extension. Valva 216–229 µm long, slender for entire length, with caudally directed basal lobe; lobe divided caudally into two unequally developed and unequally sclerotized processes. Transtilla with long transverse bar and short, very slender sublateral process. Without the lateral rod-like sclerites beneath valvae and along capsule, characteristic of very many *Acalyptris*, particularly Neotropical species. Ventral plate of vinculum very short, gradually constricted distally, with two very small, rounded lateral lobes with very shallow excavation between them. Aedeagus 287–317 µm long, very broad (114–126 µm), with a pair of curved, horn-like lateral carinae joined by a common transverse bar, five or four (minimum three) large, horn-like cornuti, and numerous tiny, spine-like triangular cornuti; cathrema strongly sclerotized, short and very broad.

BIOLOGY. Adults collected in late January.

DIAGNOSIS. This species is easily distinguished from other *Acalyptris* by the basal lobe of the valva which is clearly and deeply divided into two unequally developed processes, and by the combination of a bilobed pseuduncus with a broadened central gnathos plate, and tiny vinculum. Externally this species could be easily confused with some other *Acalyptris* possessing similarly irrorated forewings, particularly with the Central American *martinheringi*, and the Amazonian *basihastatus* and *pseudohastatus* (see above).

DISTRIBUTION. Amazon premontane rainforest (Ecuador), at altitudes of about 500 m.

CONDITION OF TYPE MATERIAL. The holotype is in fair condition, however the pattern of the forewings is not very distinct; the specimen with the best preserved scaling and the most distinct forewing pattern is paratype no. 29609 BMNH; however, the head of this specimen is detached and glued to a separate minuten pin. The remaining paratype, no. AD0320 VPU is in fair condition, but the hindwings are detached and stored in a small gelatine capsule beneath the specimen.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, near Rio Napo, Jatun Sacha, premontane rainforest, 500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29610 (BMNH). Paratypes: 2♂, data as holotype, genitalia slides no. 29609 (BMNH), no. AD0320 (VPU).

Acalyptris rotundus Puplesis & Diškus **sp. n.**

(Figs 17, 76–78)

MALE (Fig. 17). Forewing length: about 1.9 mm. Wingspan: about 4.3–4.4 mm. Head: palpi cream; frontal tuft ochreous orange or orange; collar inconspicuous, comprised of orange-cream piliform scales; eyecaps cream; antenna mostly brownish cream or cream with some dark brown shading, comprising of about 33–34 segments. Thorax and tegulae pale creamy brown, indistinctly irrorated with brownish scales. Brownish cream background of forewing irrorated with brownish and brown scales before middle, and with predominantly larger fuscous scales in apical half or two-fifths; forewing pattern tending to be irregular, but with median, broad, ill-defined fascia formed by whitish cream scales; a few whitish scales also forming an indistinct, small, more or less rounded apical spot that is unequally developed on both wings of the same specimen. Cilia distinctly grey, except distal area. Underside of forewing brown. Hindwing lanceolate, greyish or brownish; its cilia brownish. No androconial patches on hindwing or forewing. Legs dark cream. Abdomen with a distinct cream abdominal tuft of long piliform scales, dark brown on upperside and yellowish brown on underside.

FEMALE. Unknown.

GENITALIA ♂ (Figs 76–78). Capsule 204–224 µm long, distinctly rounded. Pseuduncus distinctly rounded, strongly sclerotized and papillated. Uncus broad, inverted 'Y'-shaped with two very strongly sclerotized, lateral, slightly anteriorly curved and distally pointed processes, almost as long as caudal process; caudal process well-sclerotized, slender. Gnathos with large caudal process, broad but short lateral arms and relatively large central plate excavated from anterior margin. Valva about 120–125 µm long, generally narrow, slightly broadened towards base, with many papillae on inner margin. Both valvae joined basally by ventral transverse bar which forms a central triangular sclerotization. Transtilla with very narrow transverse bar and tiny, very slender sublateral proc-

esses. Well-sclerotized lateral rod-like sclerites beneath valvae, along capsule, as is characteristic of very many *Acalyptris* species, particularly Neotropical ones. Ventral plate of vinculum extremely small, band-like, distally truncate or rounded, without any lateral lobes and distal excavation. Aedeagus about 100 µm long, broad and short, with two lateral, long, very slender and pointed carinae, and very many small, fine cornuti.

BIOLOGY. Adults collected in late January.

DIAGNOSIS. This species is very easily distinguished from other *Acalyptris* by the combination of the very characteristic, three-processed uncus and the distinctly rounded capsule, and the broad, rounded pseuduncus and broad aedeagus with two very slender lateral carinae. While the unusual cream forewing fascia of this species may be thought of as distinctive, the character is of limited value since it is not well-defined and even slight abrasion may render it very hard to recognise.

DISTRIBUTION. Amazon premontane rainforest (Ecuador), at altitudes of about 500 m.

CONDITION OF TYPE MATERIAL. The holotype is in quite good condition, with well-preserved scaling; the wings are not spread but the hindwing is easily visible.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, near Rio Napo, Jatun Sacha, premontane rainforest, 500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29611 (BMNH).

Acalyptris amazonius Puplesis & Diškus **sp. n.**

(Figs 18, 79–82, 93)

MALE (Fig. 18). Forewing length: 1.5 mm. Wingspan: 3.4–3.5 mm. Head: palpi yellowish cream; frontal tuft orange-ochreous, distally ochreous brown; collar indistinct, comprised of pale ochreous or ochreous cream piliform scales; eyecaps yellowish cream; antenna dark brown on upperside and yellowish cream on underside, comprising of 24–26 segments. Thorax and tegulae dark brown, unicolorous. Forewing generally dark, basal three-fifths brown, then with an indistinct, oblique, fascia-like, paler, brownish-cream area; apical area of forewing densely irrorated with fuscous brown scales. Cilia pale brown. Underside of forewing dark brown or brown. Hindwing and cilia grey-brown. No androconia on hindwing or forewing. Legs brownish cream with abundant brown to fuscous brown shading laterally and distally. Abdomen fuscous brown, very reflective on upperside and with brown gloss on underside; pair of anal tufts distinct, composed of long piliform scales.

FEMALE (see Remarks). Forewing length: 1.6–1.7 mm. Wingspan: 3.7 mm. Head: palpi whitish; frontal tuft whitish cream; collar sometimes indistinct, comprised of cream piliform scales; eyecaps cream, with some brownish scales; antenna brown on upperside and brownish on underside, comprising of about 27–28 segments. Thorax and tegulae dark brown, unicolorous. Forewing generally dark, basal three-fifths brown, apically irrorated with fuscous brown scales; pale area before the apical region, characteristic in the male, absent. Cilia brown. Underside of forewing brown. Hindwing and cilia grey-brown. Legs brownish cream with some brown to fuscous brown shading. Abdomen fuscous on upperside, with reddish and purple reflection and pale silvery on underside.

GENITALIA ♂ (Figs 79–82). Capsule 240–250 µm long. Tegumen extended into broad, distally widely-rounded and heavily papillated pseuduncus; anteriorly with unusual trapezoidal extension. Uncus (Fig. 81) with lateral band-like components and caudal element directed ventrally; the last very strongly sclerotized and resembling a crown. Gnathos with small pointed caudal process, small oval central plate and well developed lateral lobes wider than the caudal element. Valva 134–139 µm long, equally narrow for entire length except apex which is visibly constricted and very strongly papillated; basally valva strongly sclerotized. Transtilla with slender transverse bar and sublateral processes one-half length of bar. Juxta apparently absent. Ventral plate of vinculum half length of valva, slightly and gradually constricted distally, and with shallow anterior excavation; lateral lobes weakly developed, broadly triangular. Lateral rod-like sclerites (usually very characteristic for Neotropical *Acalyptris*) distinct and sclerotized only distally while at bases not demarcated from tegumen. Aedeagus about 263 µm long, with pair of slender lateral carinae, long and well-sclerotized cathrema, four slender and long spine-like cornuti, and a few very tiny, indistinct ones.

GENITALIA ♀ (Fig. 93) (see Remarks). Total length about 702–708 µm. Abdominal tip broadly rounded. Anal papillae undeveloped, but with a distinct, sclerotized plate connected with bases of apophyses anteriores. Both anterior and posterior apophyses very slender, but anterior apophyses one-third to one-quarter longer (125–138 µm). Vestibulum with large Y-shaped sclerite. Corpus bursae large, elongate-oval with a distinct, band-like signum on each side, with tiny pectinations around the signa. Accessory sac undeveloped; ductus spermathecae with 8–9 compactly arranged convolutions.

BIOLOGY. Adults collected in January.

DIAGNOSIS. Among Neotropical *Acalyptris* this species resembles externally only the dark Central American *hispidus* Puplesis & Robinson, *novenarius* Puplesis & Robinson and *platygnathos* Puplesis & Robinson; however, it is easily distinguished by the genitalia.

In the male genitalia *amazonius* differs very strongly

by the crown-shaped uncus and by the apically slightly constricted but heavily papillated valva.

DISTRIBUTION. Lowland Amazon rainforest (Ecuador).

CONDITION OF TYPE MATERIAL. The holotype is well preserved.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*), genitalia slide no. 29612 (BMNH). Excluded from paratype status: 1 ♀, data as holotype, genitalia slide no. AD0330 (VPU).

REMARKS. A single female has been associated with the holotype since it has very similar dark forewings with fuscous apical irroration; it is similarly small and was collected at the same time in the same locality. However, there are some points of difference which make us preclude this specimen from paratype status: 1) the palpi are whitish, not yellowish cream as in the male; 2) the head is slightly rubbed and comparison with the holotype is difficult, but the tuft still present is quite whitish (not orange-ochreous as in the male); 3) there is no pale postmedial area developed on the forewing as in the male; 4) the abdomen is silvery on the underside, not brown.

Acalyptris insolentis Puplesis & Diškus **sp. n.**

(Figs 19, 83–88)

MALE (Fig. 19). Forewing length: 1.7–2.0 mm. Wingspan: 3.8–4.5 mm. Head: palpi cream; frontal tuft orange or pale ochreous; collar indistinct, comprised of cream piliform scales; eyecaps cream to whitish; antenna brownish, comprising of about 24 segments. Thorax and tegulae yellowish cream. Forewing with slightly variable but distinct pattern; basal area before fascia, except large costal area, covered with small, pale brownish scales; costal area distinctly paler, yellowish cream, as tegulae; fascia slightly postmedial, distinctly oblique and broadening at tornus, formed by fuscous brown and brown scales; area beyond the fascia yellowish cream; apex of forewing with yellowish cream background but irrorated with brown and fuscous scales; some fuscous scales overlapping onto cilia. Cilia cream only at distal end of forewing, otherwise grey or greyish. Underside of forewing brown to ochreous brownish. Hindwing lanceolate, brown or pale brownish depending upon angle of observation; cilia greyish to grey. No androconial patches on hindwing or forewing. Legs ochreous cream. Abdomen brown on upperside, yellowish brown on underside, with a pair of cream abdominal tufts composed of long piliform scales.

FEMALE. Unknown.

GENITALIA ♂ (Figs 83–88). Capsule 270–280 µm long. Tegumen extended into short, broadly rounded pseuduncus. Uncus (Fig. 84) with lateral, well-sclerotized, rod-like parts and broadened, lobe-like caudal element. Gnathos (Fig. 85) complex and distinctive; central plate large, with oval anterior extension and broad lobe-like caudal extension homologous with caudal process of other *Acalyptris*; the last weakly sclerotized, almost membranous, usually inconspicuous even in stained slides; lateral arms of vinculum very broad, almost as broad as long. Tegumen with two distinct, lateral rod-like sclerites along capsule beneath valvae. Valva 176 µm long, straight, generally narrow, slightly bulged inwardly before apex and at base; no processes developed. Transtilla with very slender transverse sublateral processes, more than one-half length of transverse bar which may be straight in contrast to Fig. 83. Juxta formed by vinculum posterior margin and attached to ventral side of aedeagus, a small, sclerotized, variable, oval to rounded, triangular or square lobe between bases of valvae. Vinculum very short with unusually long, slender, distally truncate lateral lobes; anterior excavation square and deep. Aedeagus 212–220 µm long, with two large paired lateral carinae and large, ventral lobe-like extension attached to vinculum; cornuti either absent, or occasionally represented by an indistinct single spine.

BIOLOGY. Adults collected in January.

DIAGNOSIS. Externally this species resembles the Central American *hispidus* Puplesis & Robinson, *novenarius* Puplesis & Robinson and *laxibasis* Puplesis & Robinson; however *insolentis* differs in the presence of a large, yellowish cream costal area. In the male genitalia the characteristic gnathos with caudal and anterior extensions distinguish this species from all known *Acalyptris*; the lobate caudal component of the uncus together with the slender lateral lobes of the vinculum are also, in combination, distinguishing characters.

DISTRIBUTION. Premontane and lowland Amazon rainforest (Ecuador); thus apparently more widespread, at least in the western Amazon basin, than any other species found so far.

CONDITION OF TYPE MATERIAL. The holotype and three paratypes are in good condition but the frontal tuft of the holotype is rubbed; the fourth paratype (AD0323 VPU) has the detached hindwings stored in a small gelatine capsule beneath the specimen.

MATERIAL EXAMINED. Holotype ♂, **Ecuador**: *Napo Region*: near Rio Napo, Jatun Sacha, premontane rainforest, 500 m, 26–31.i.2000 (*Puplesis & Hill*), genitalia slide no. 29621 (BMNH). Paratypes: 2♂, data as holotype, genitalia slides nos 29622 (BMNH) and AD0329 (VPU); 1♂, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 15–25.i.2000 (*Puplesis & Hill*), genitalia slide no. AD0323 (VPU).

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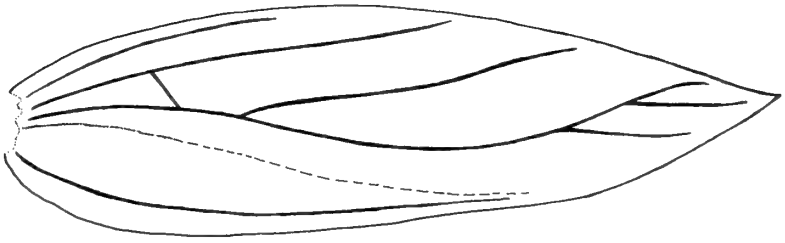
Principal references are in **bold.**



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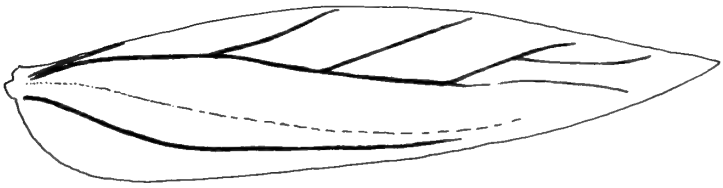

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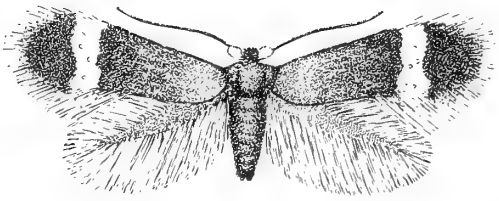
Figs 1–3. Neotropical Nepticulidae. 1, *Acalyptris onorei* forewing venation; 2, *Enteucha guajavae* forewing venation; 3, same, adult moth.



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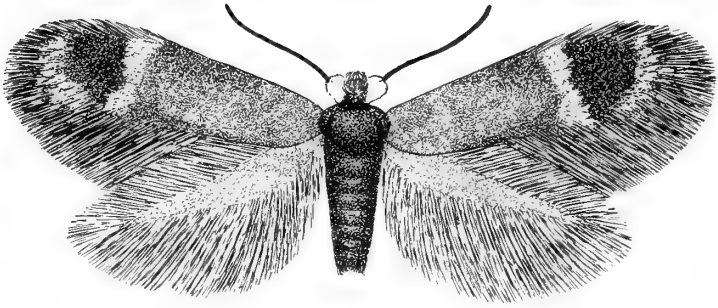

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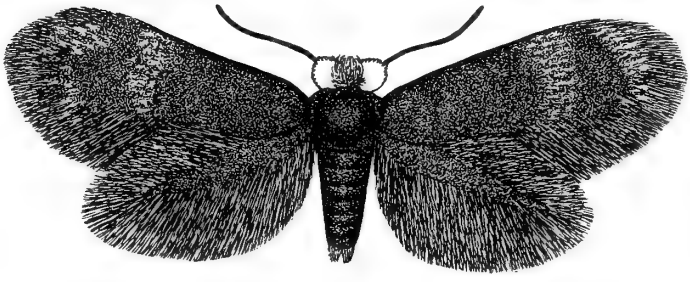

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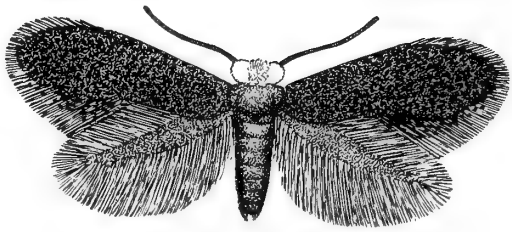
Figs 4–7. Neotropical Nepticulidae. 4, *Enteucha acuta*; 5, *Stigmella montanotropica*; 6, *S. nubimontana*; 7, *S. rubeta*.



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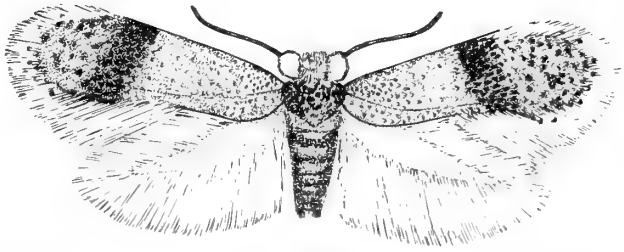

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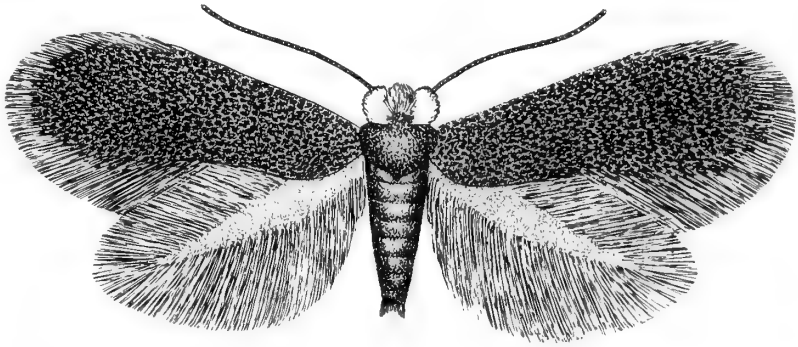

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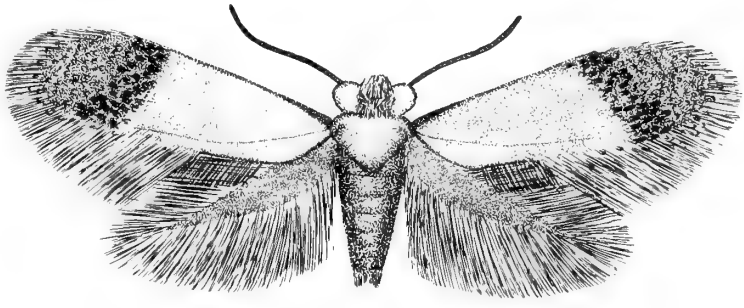

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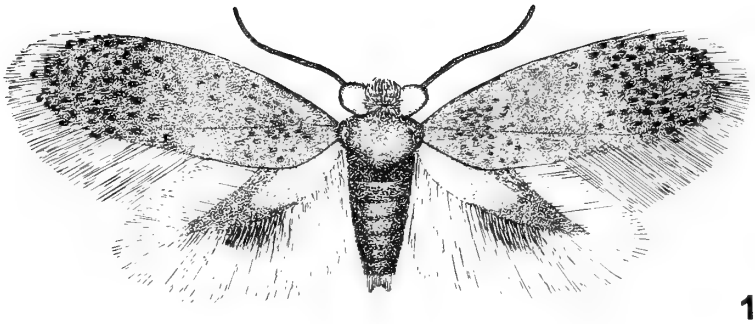
Figs 8–11. Neotropical Nepticulidae. 8, *Stigmella austroamericana*; 9, *Fomoria repanda*; 10, *F. tabulosa*; 11, *Acalyptris ecuadoriana*.



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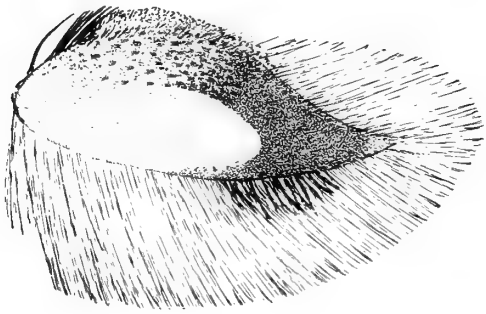

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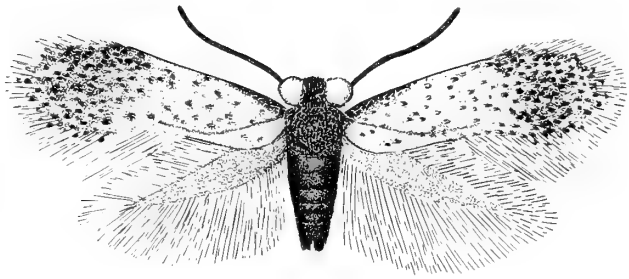

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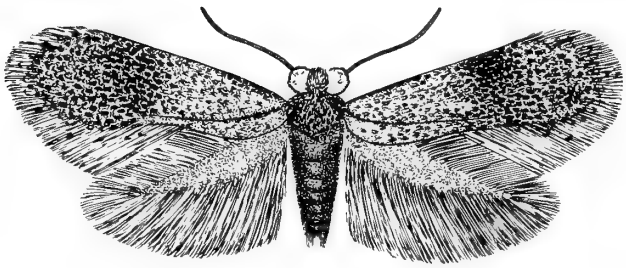

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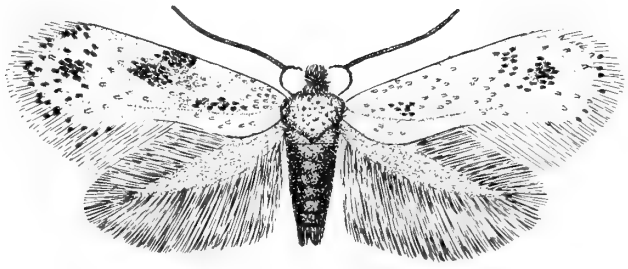
Figs 12–15. *Acalyptris* species. 12, *onorei*; 13, same, hindwing; 14, *basihastatus*; 15, *pseudohastatus*.



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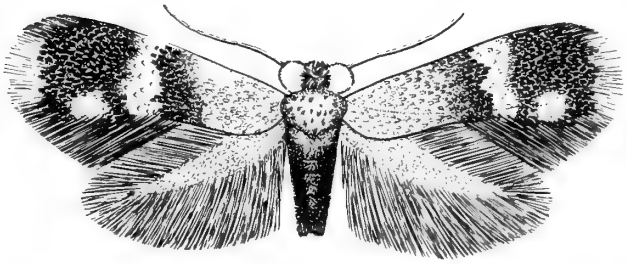

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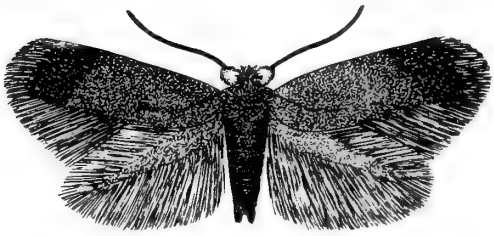

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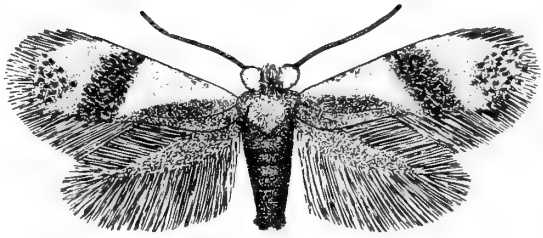

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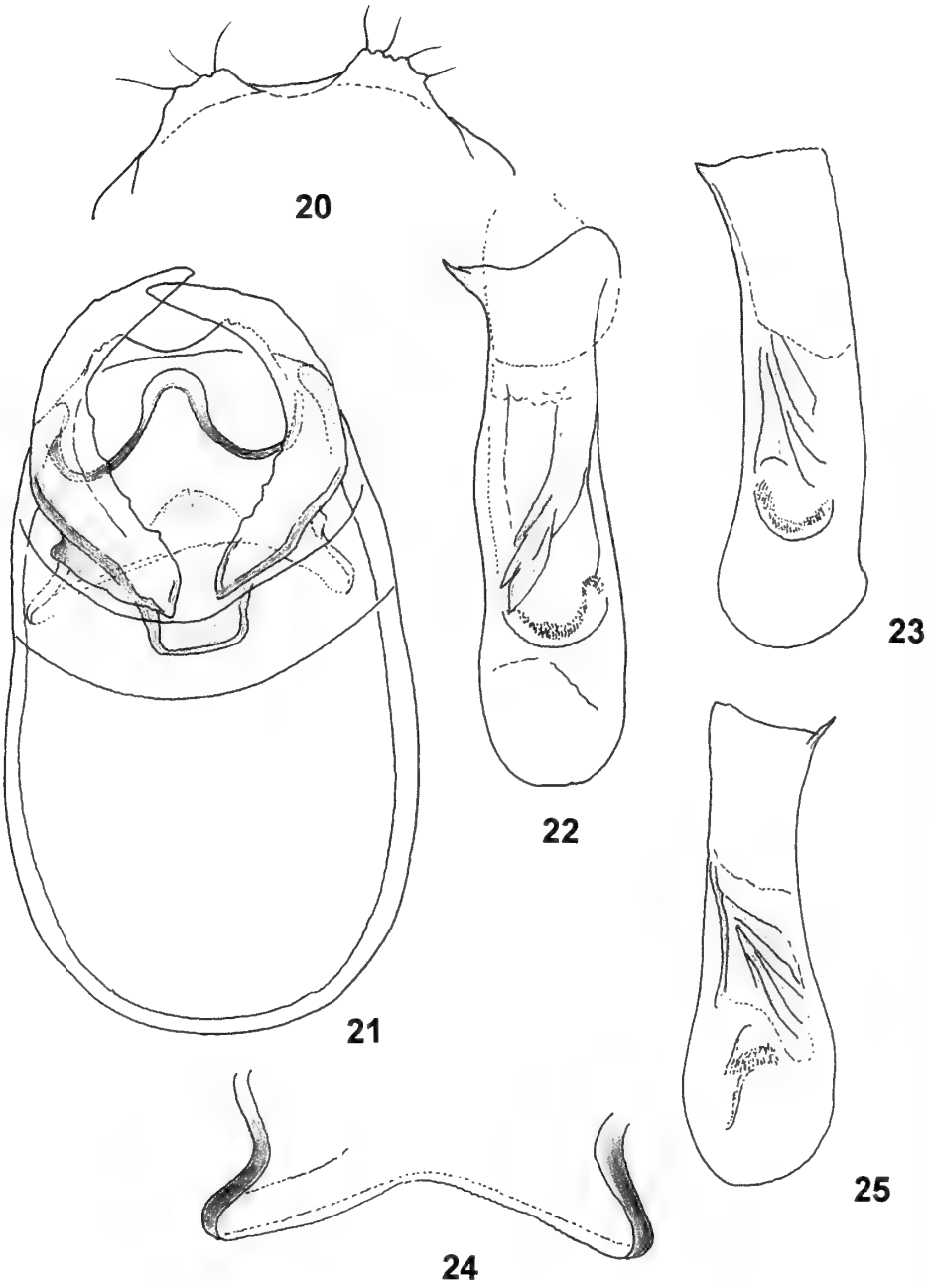
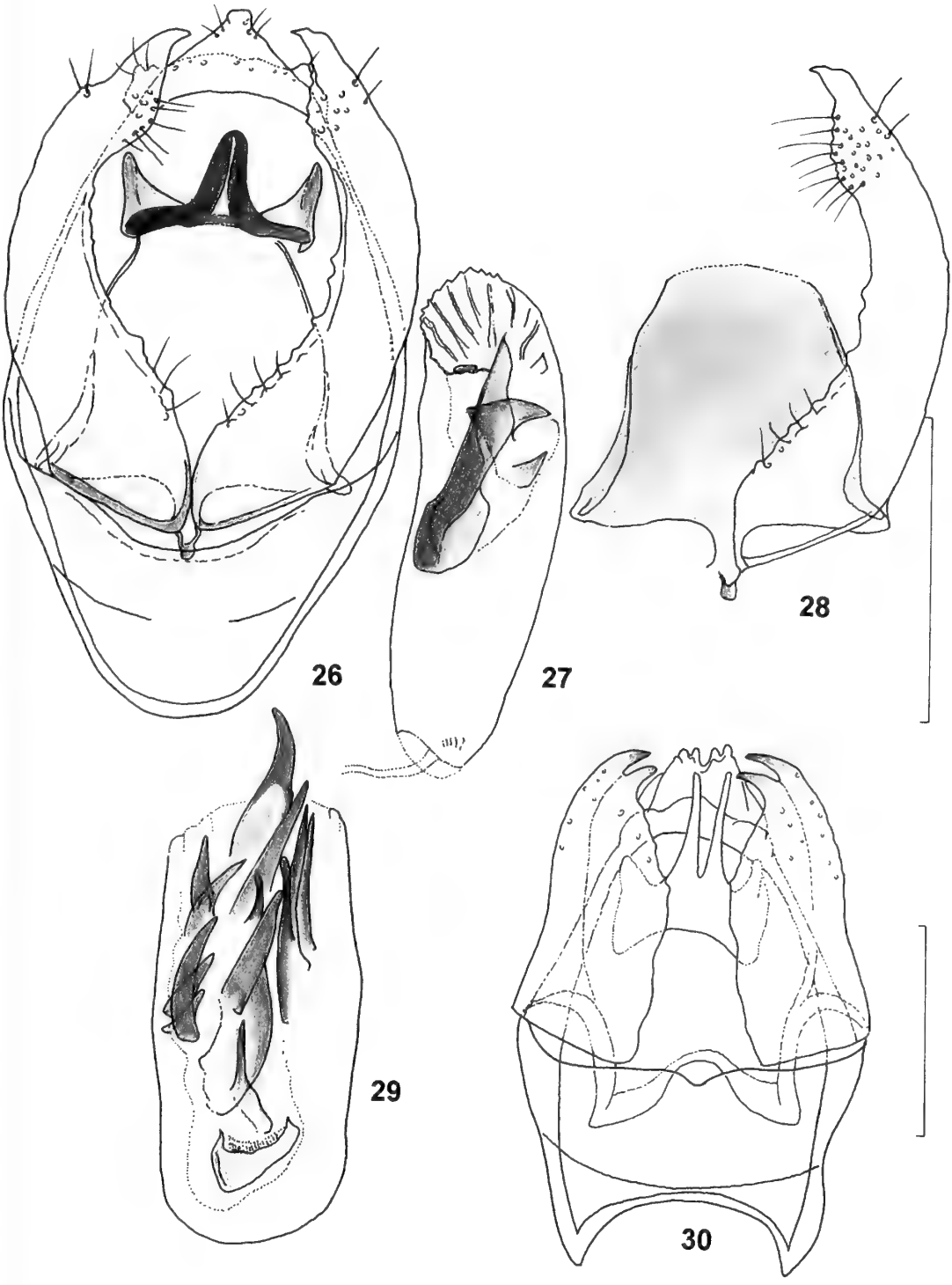
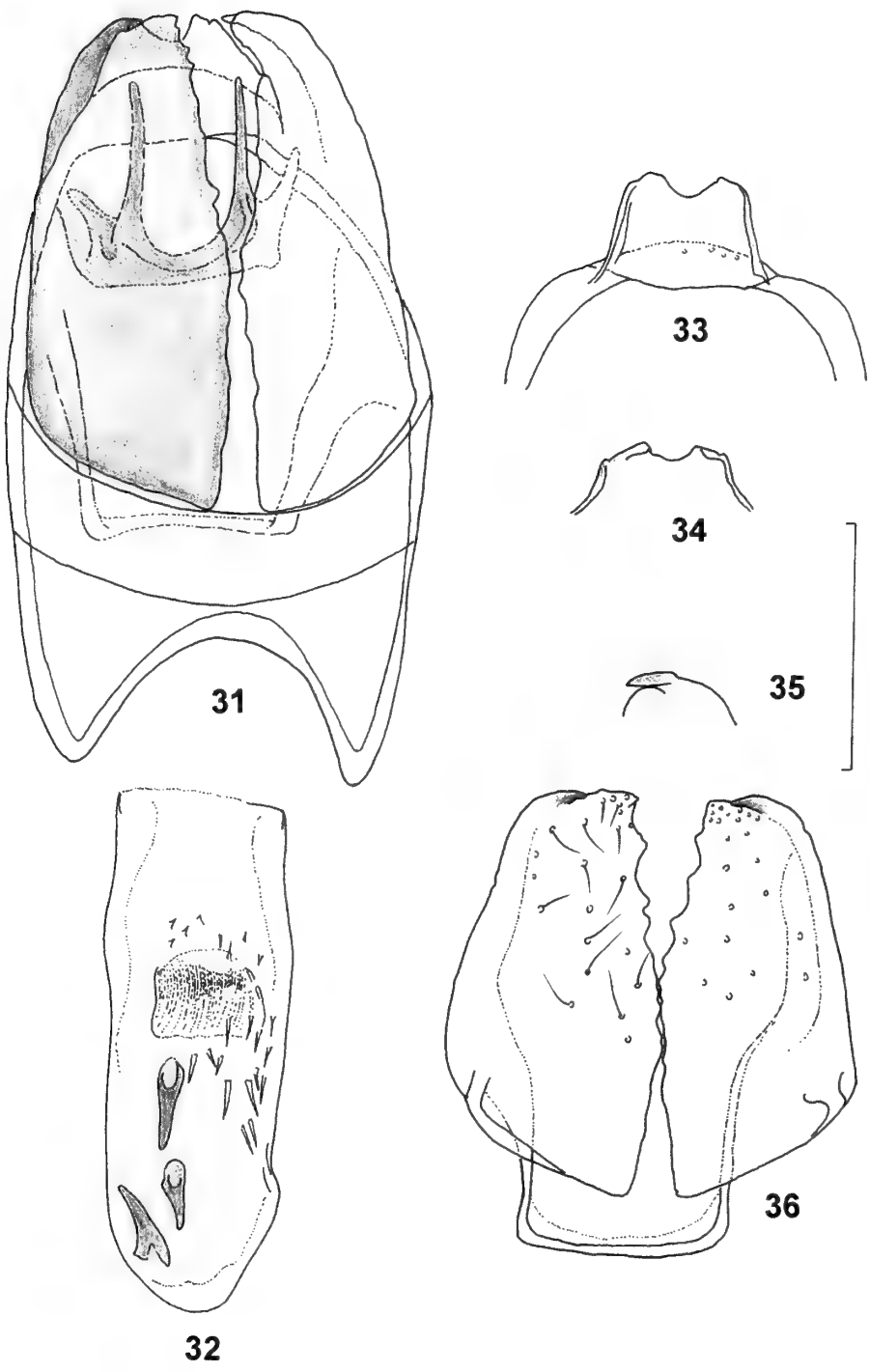
Figs 16–19. *Acalyptris* species. 16, *articulosus*; 17, *rotundus*; 18, *amazonius*; 19, *insolentis*.



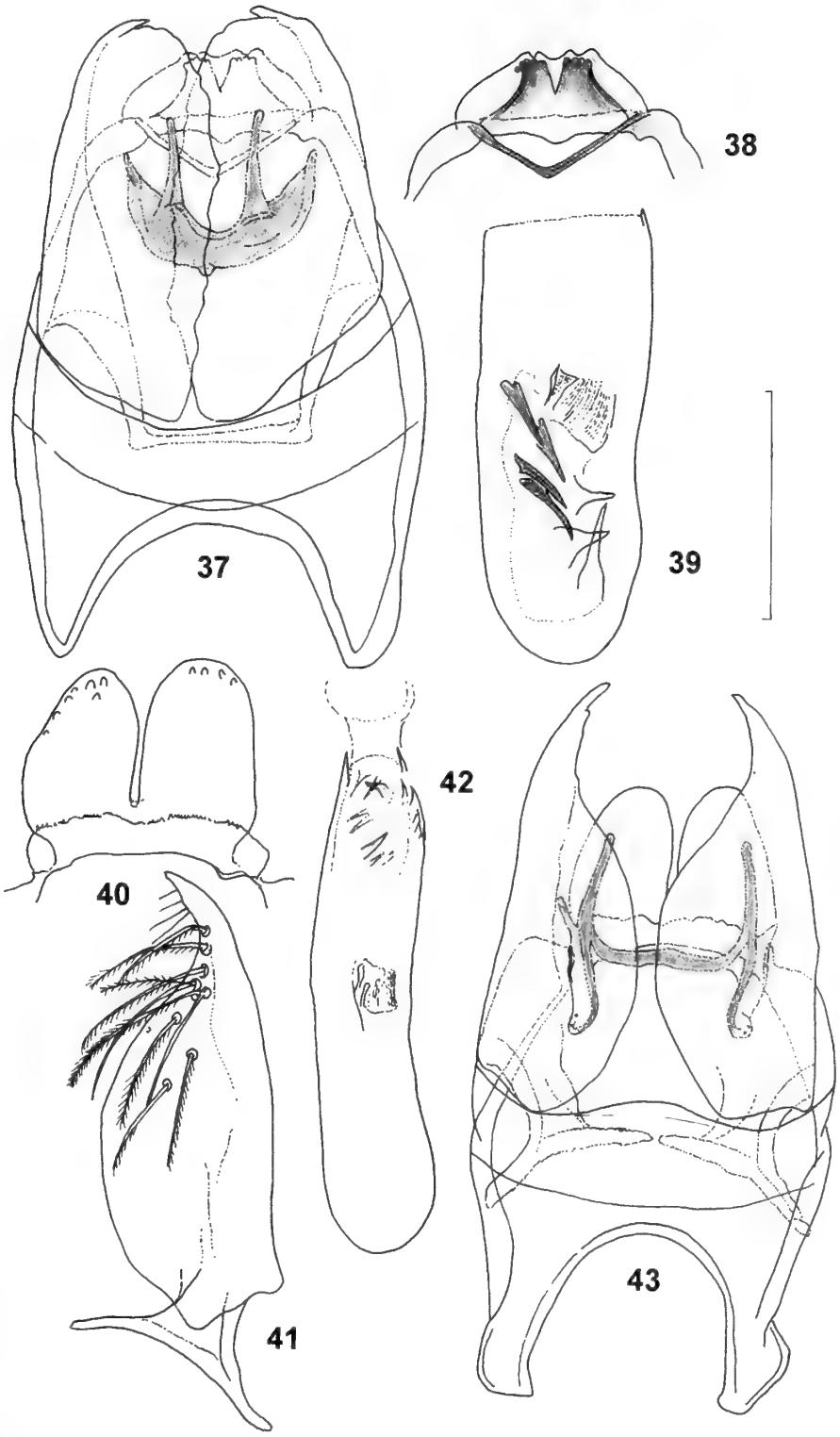
Figs 20–25. Male genitalia of *Enteucha guajavae*. 20, holotype (AD0340-VPU) uncus; 21, same, capsule; 22, same, aedeagus; 23, paratype (AD0342-VPU) aedeagus; 24, paratype (AD0341-VPU) transtilla; 25, same, aedeagus. Scale: 0.1 mm.



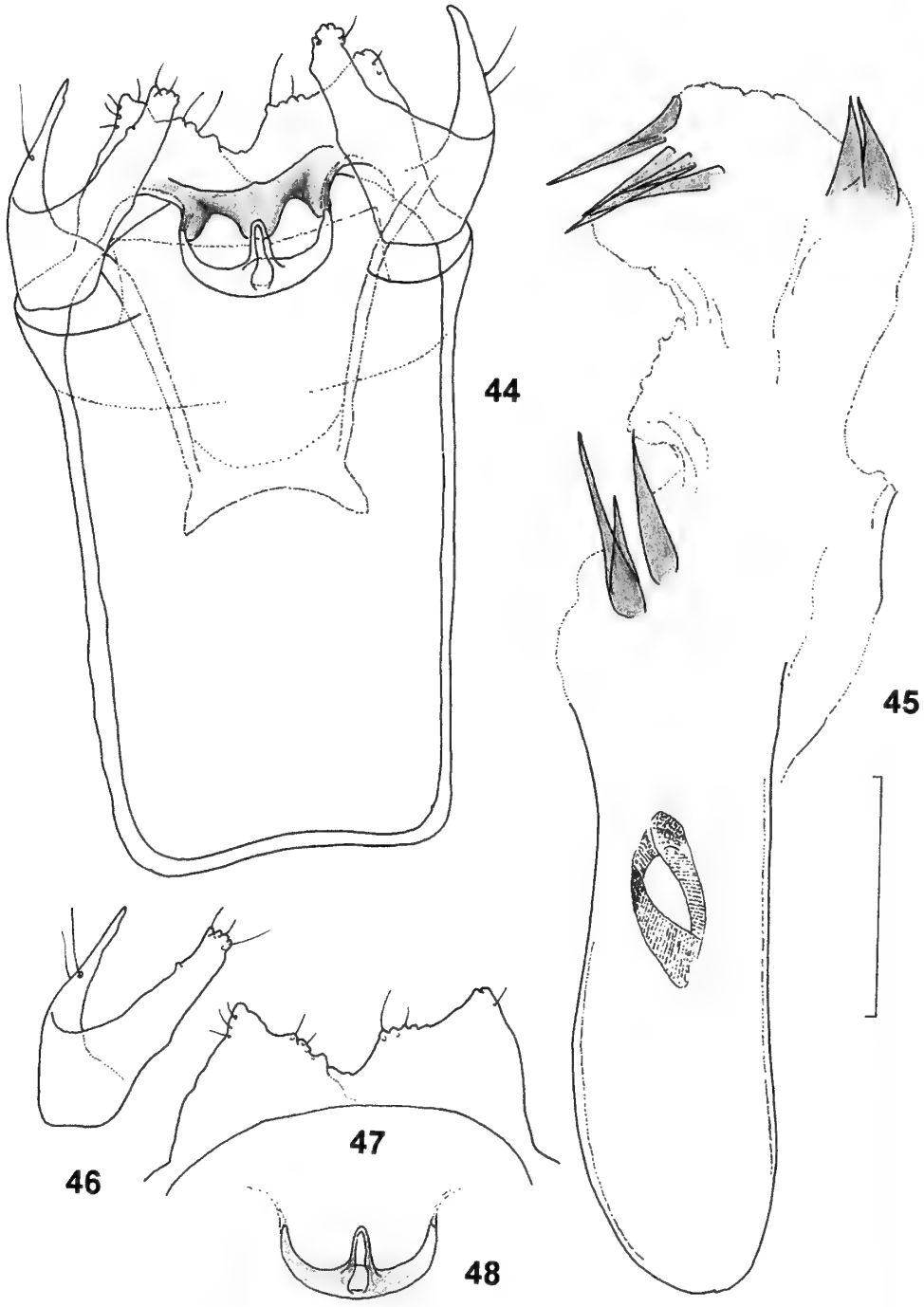
Figs 26–30. Male genitalia of Nepticulidae. 26, *Enteucha acuta*, holotype (29604-BMNH) capsule; 27, same, aedeagus, 28, same, right valva and juxta; 29, *Stigmella montanotropica*, paratype, (29618-BMNH) aedeagus; 30, same, capsule. Scale: 0.1 mm.



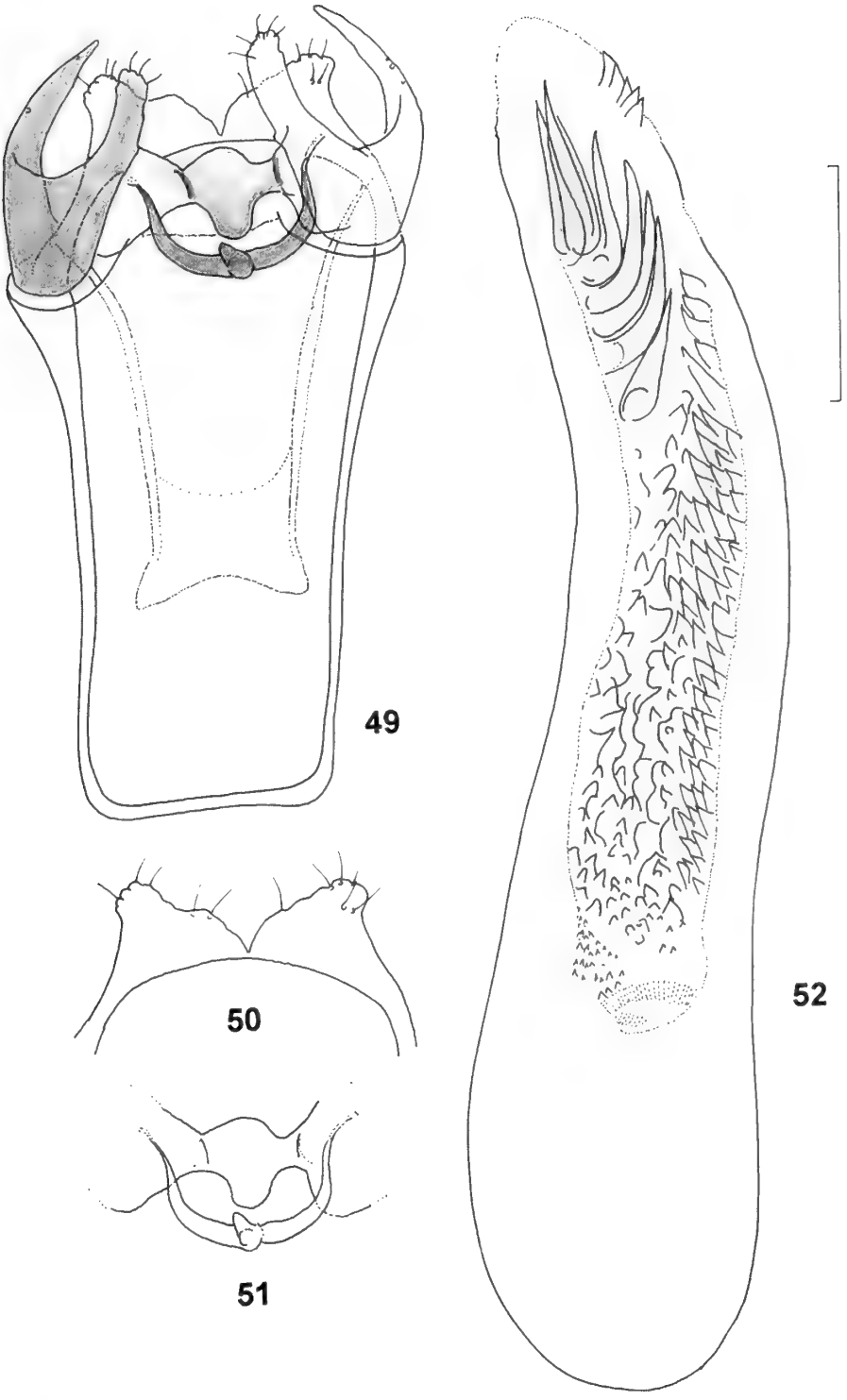
Figs 31–36. Male genitalia of *Stigmella nubimontana*. 31, holotype (29614-BMNH) capsule; 32, same, aedeagus; 33, paratype (AD0322-VPU) uncus; 34, paratype (AD0321-VPU) uncus; 35, paratype (AD0321-VPU) apex of valva; 36, paratype (AD0322-VPU) both valvae and transtilla. Scale: 0.1 mm.



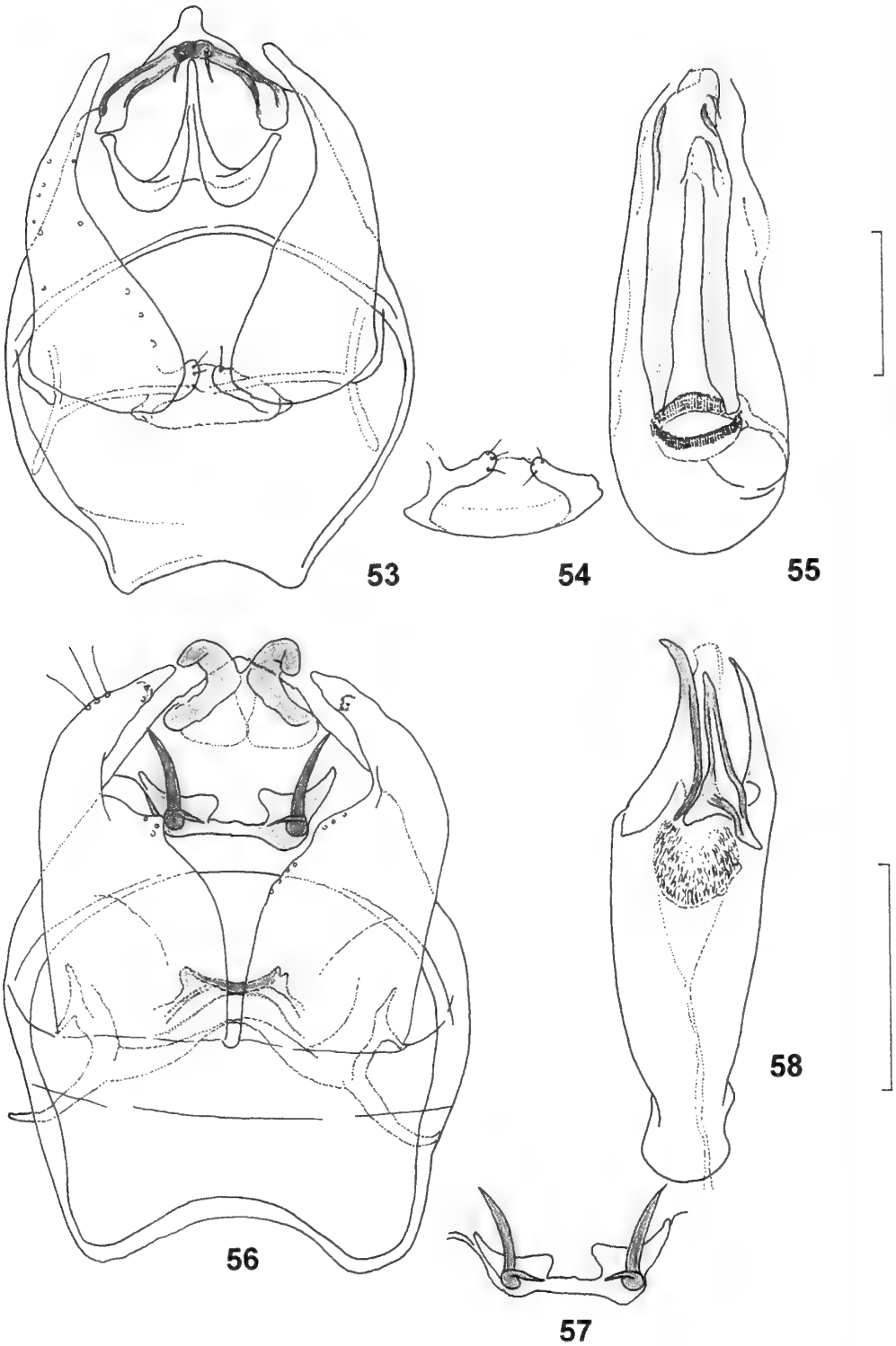
Figs 37–43. Male genitalia of *Stigmella*. 37, *rubeta*, holotype (29616-BMNH) capsule; 38, same, tegumen + uncus; 39, same, aedeagus; 40, *austroamericana*, holotype (29613-BMNH) uncus; 41, same, valva; 42, same, aedeagus; 43, same, capsule. Scale: 0.1 mm.



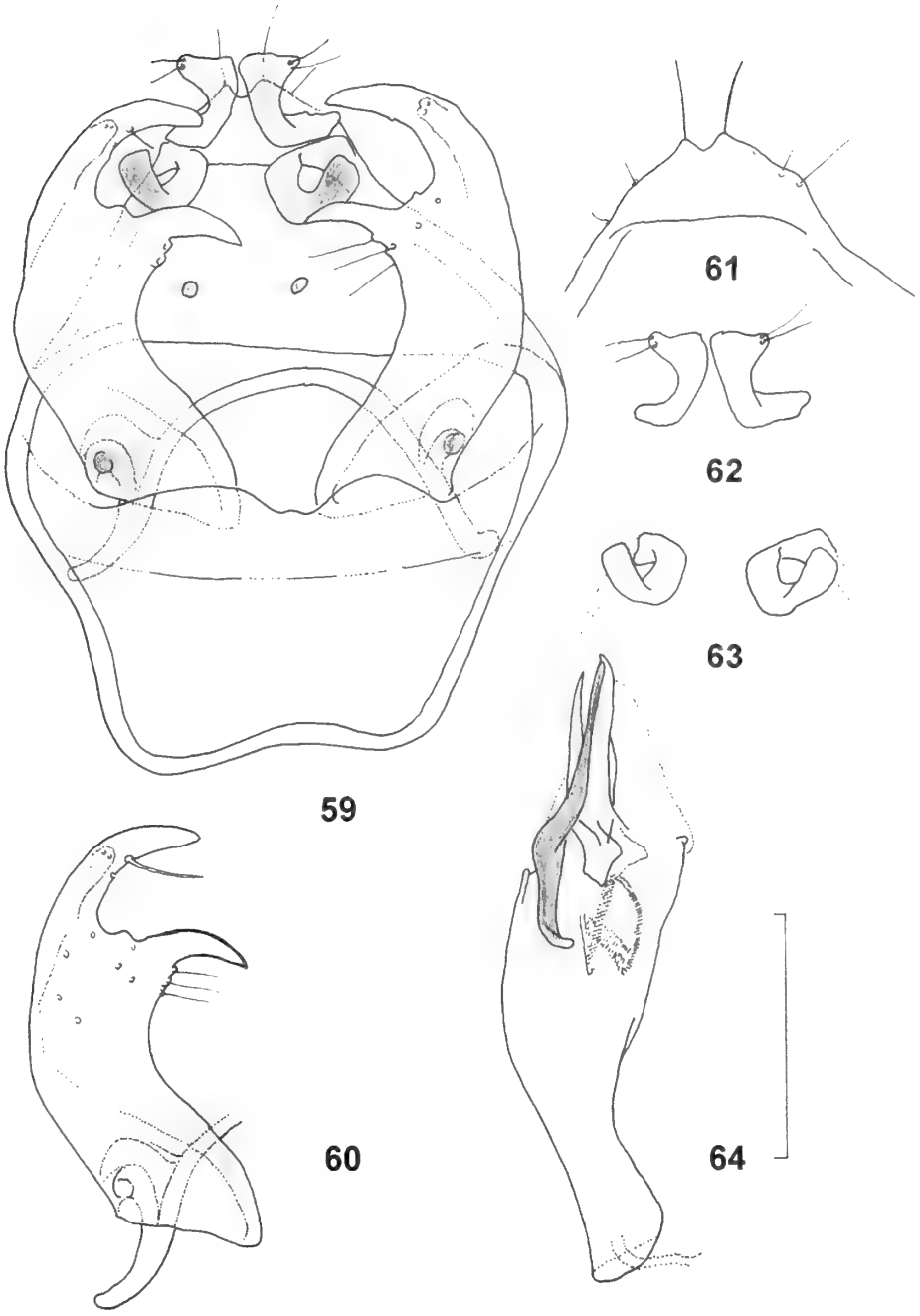
Figs 44–48. Male genitalia of *Fomoria repanda*, holotype (29603-BMNH). 44, capsule; 45, aedeagus; 46, valva, 47, pseuduncus; 48, gnathos. Scale: 0.1 mm.



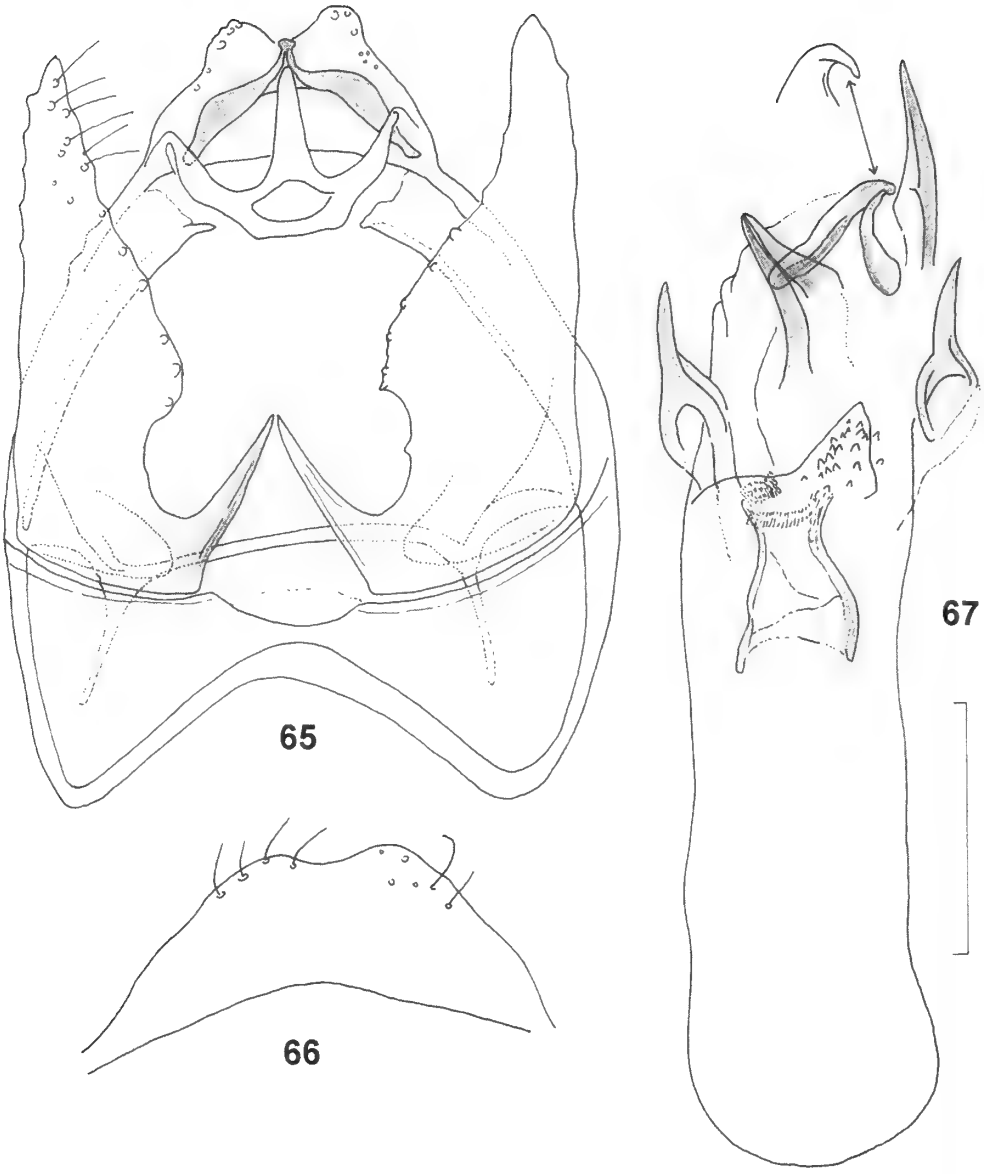
Figs 49–52. Male genitalia of *Fomoria repanda*, paratype (AD0315-VPU). 49, capsule; 50, pseuduncus; 51, uncus + gnathos; 52, aedeagus. Scale: 0.1 mm.



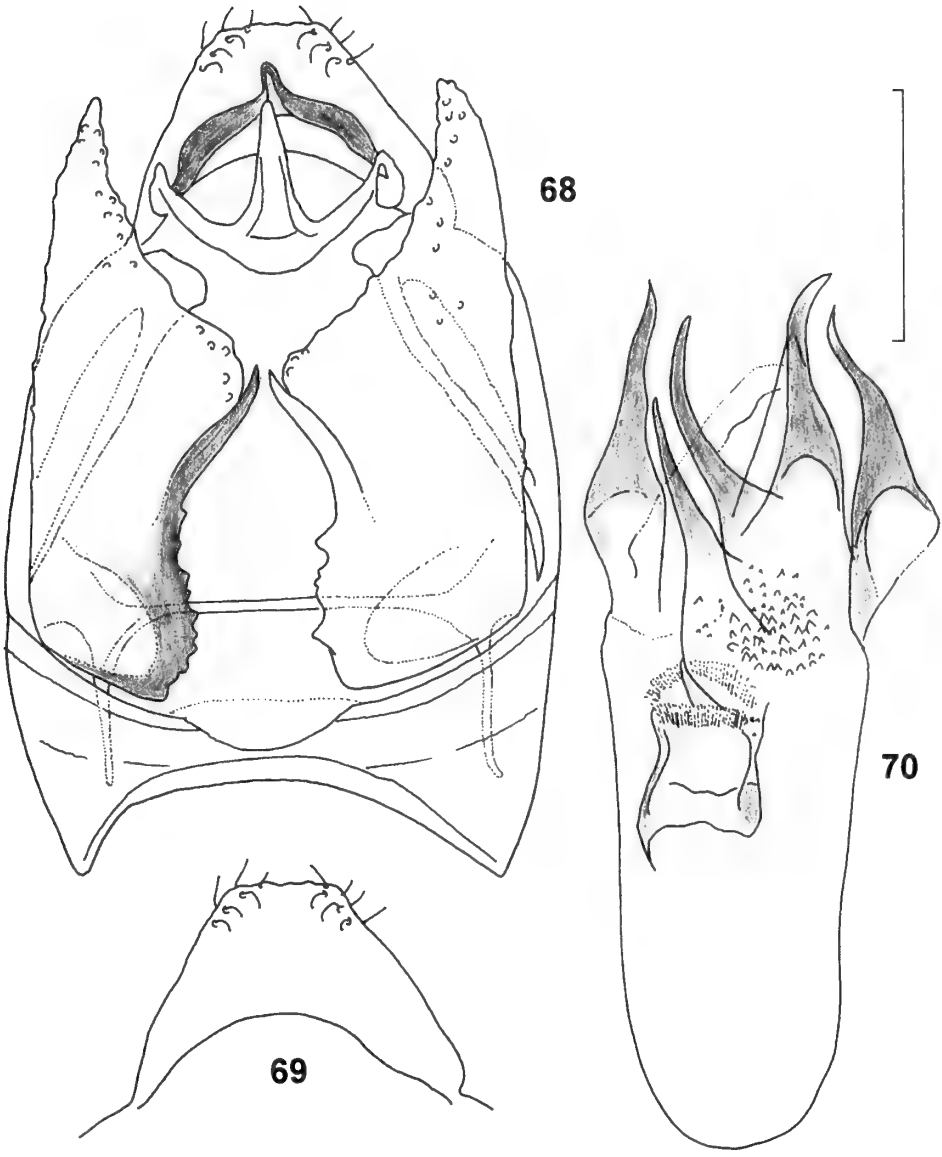
Figs 53–58. Male genitalia of Nepticulidae. 53, *Fomoria tabulosa*, holotype (29625-BMNH) capsule; 54, same, juxta; 55, same, aedeagus; 56, *Acalyptris ecuadoriana*, holotype (29624-BMNH) capsule; 57, same, gnathos; 58, same, aedeagus. Scale: 0.1 mm.



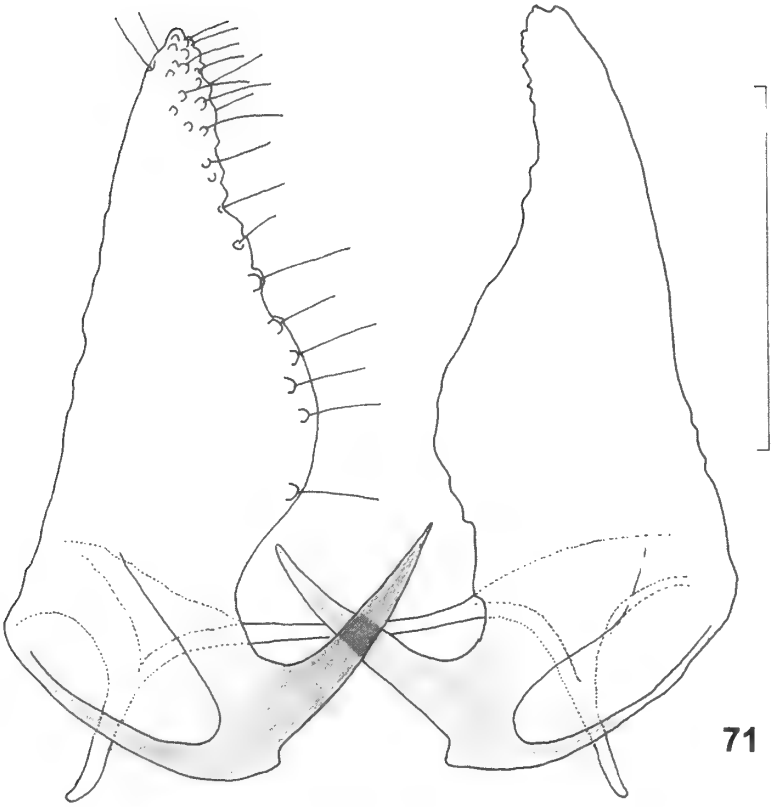
Figs 59–64. Male genitalia of *Acalyptris onorei*, holotype (29623-BMNH). 59, capsule; 60, valva; 61, pseuduncus; 62, paired uncus; 63, paired gnathos; 64, aedeagus. Scale: 0.1 mm.

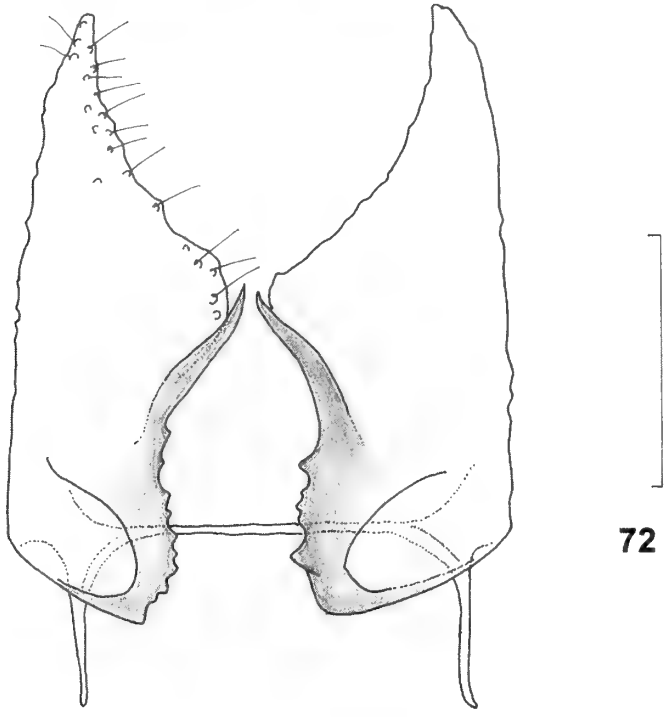


Figs 65–67. Male genitalia of *Acalyptris basihastatus*. 65, holotype (29605-BMNH) capsule; 66, paratype, (29606-BMNH) pseuduncus; 67, holotype (29605-BMNH) aedeagus. Scale: 0.1 mm.

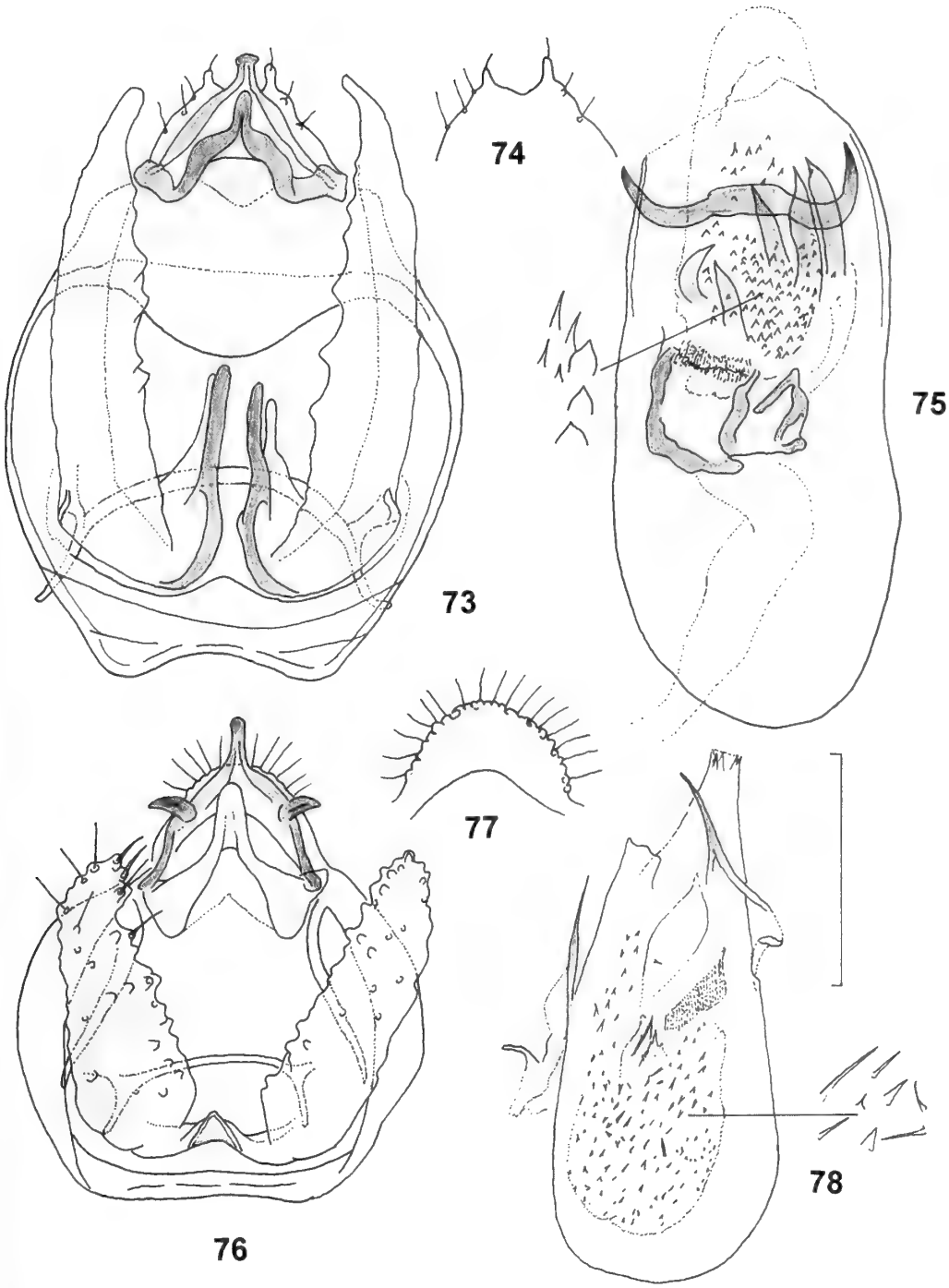


Figs 68–70. Male genitalia of *Acalyptris pseudohastatus,* holotype (29607-BMNH). 68, capsule; 69, pseuduncus; 70, aedeagus. Scale: 0.1 mm.

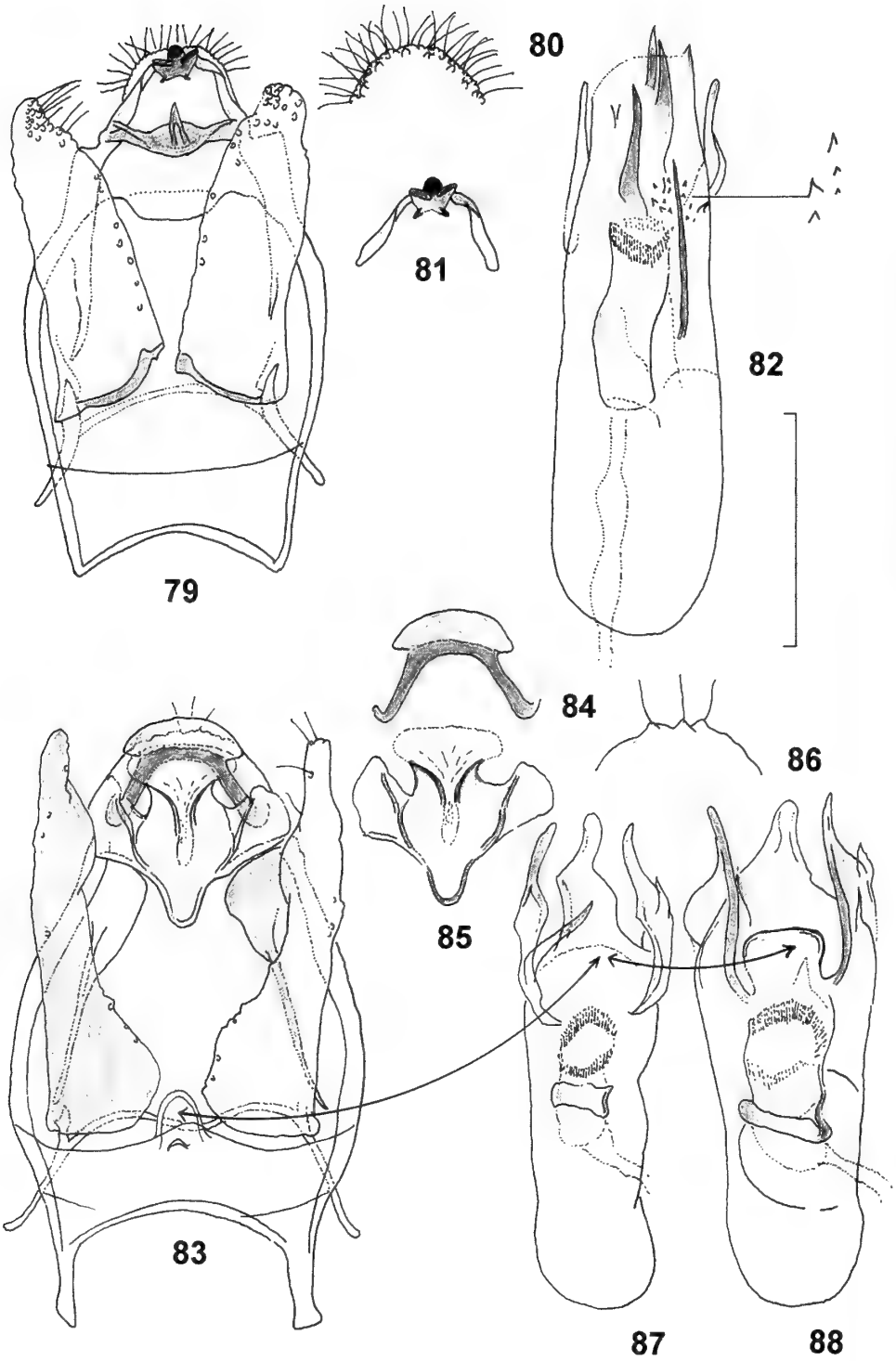




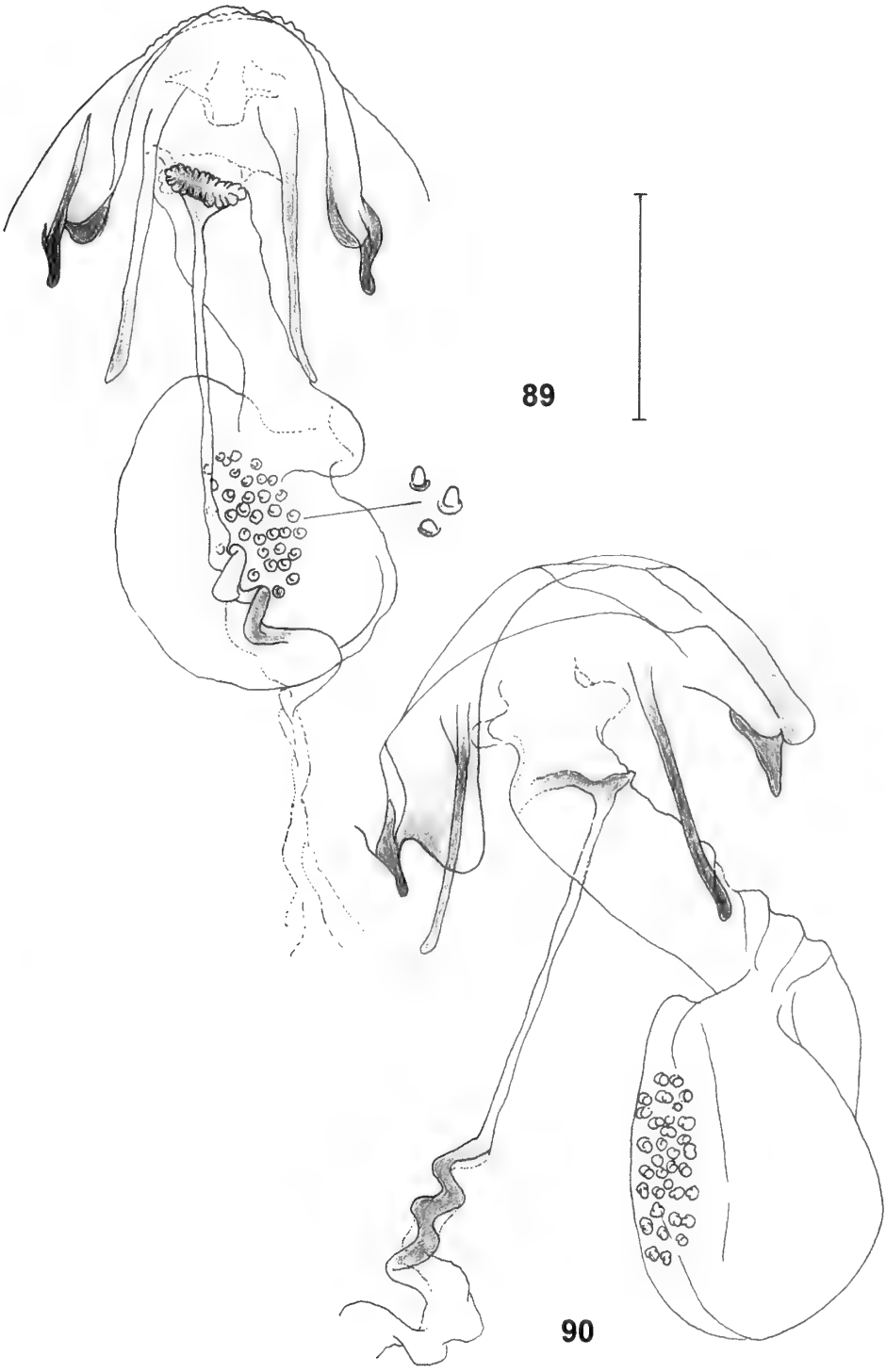
Figs 71, 72. Valvae of *Acalyptris*. 71, *basihastatus*, paratype (29606-BMNH); 72, *pseudohastatus,* holotype (29607-BMNH). Scale: 0.1 mm.



Figs 73–78. Male genitalia of *Acalyptris*. 73, *articulosus*, holotype (29610-BMNH) capsule; 74, same, pseuduncus; 75, same, aedeagus; 76, *rotundus,* holotype (29611-BMNH) capsule; 77, same, pseuduncus; 78, same, aedeagus. Scale: 0.1 mm.

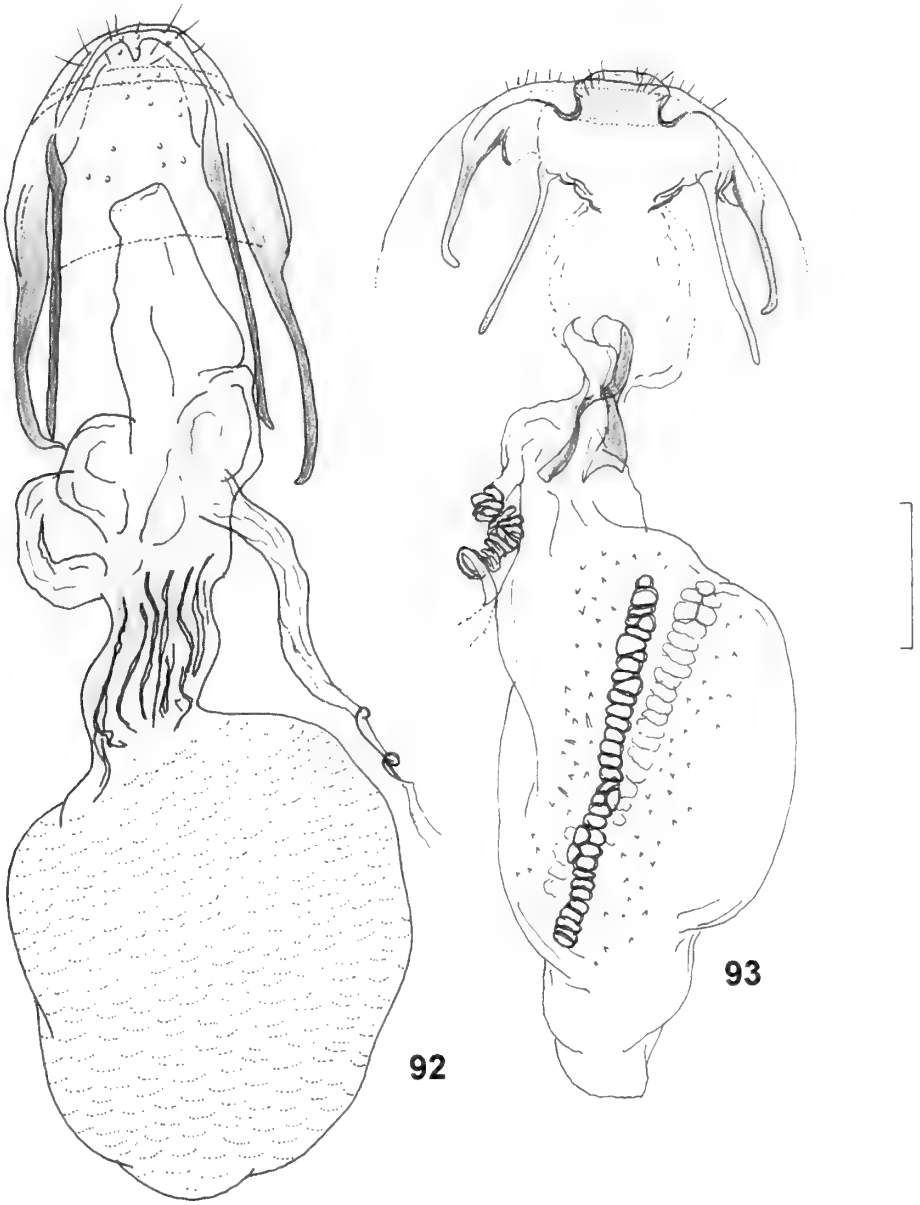


Figs 79–88. Male genitalia of *Acalyptris*. 79, *amazonius*, holotype (29612-BMNH) capsule; 80, same, pseuduncus; 81, same, uncus; 82, same, aedeagus; 83, *insolentis*, holotype (29621-BMNH) capsule; 84, same, uncus; 85, same, gnathos; 86, same, pseuduncus; 87, same, aedeagus with broken ventral lobe (juxta); 88, paratype (29622-BMNH) aedeagus. Scale: 0.1 mm.

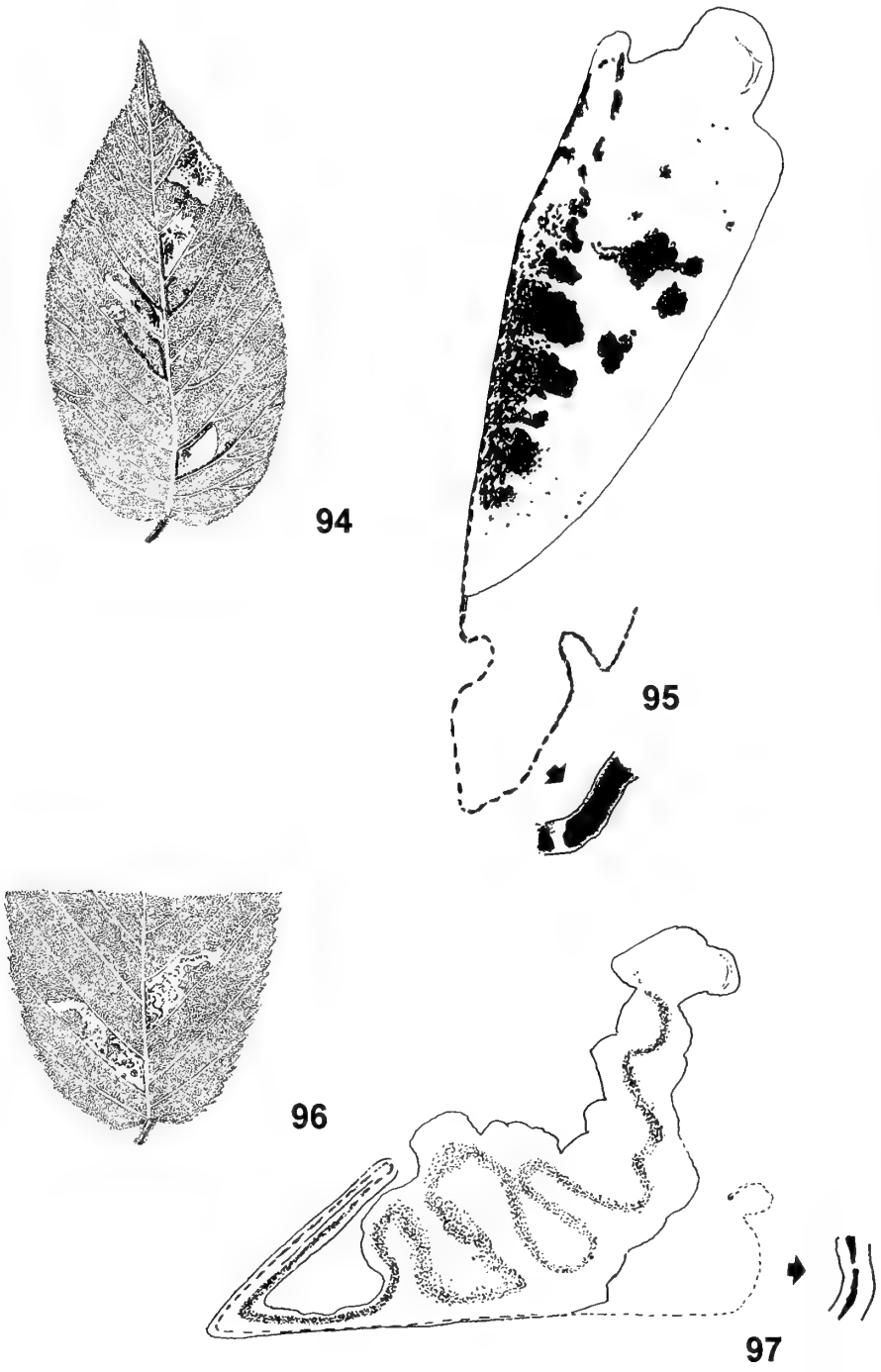


Figs 89, 90. Female genitalia of *Enteucha guajavae*. 89, paratype (AD0344-VPU); 90, paratype (AD0343-VPU). Scale: 0.1 mm.

Fig. 91. Female genitalia of *Stigmella montanotropica*, holotype (29619-BMNH). Scale: 0.1 mm.



Figs 92, 93. Female genitalia of Nepticulidae. 92, *Stigmella rubeta*, paratype (29617-BMNH); 93, *Acalyptris amazonius*, specimen excluded from type series (AD0330-VPU). Scale: 0.1 mm.



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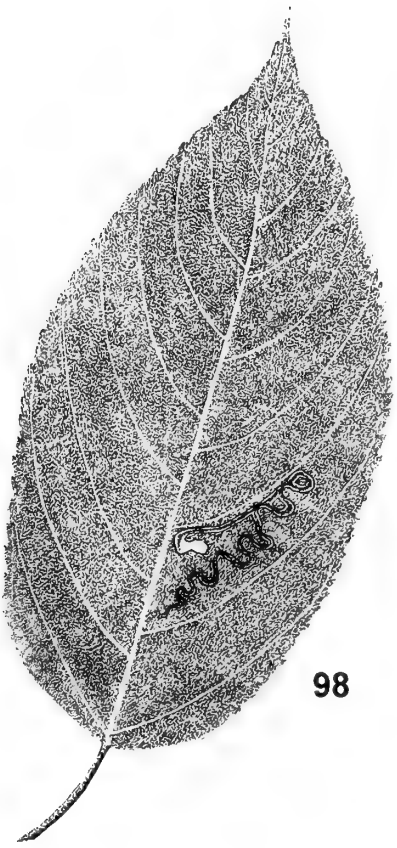

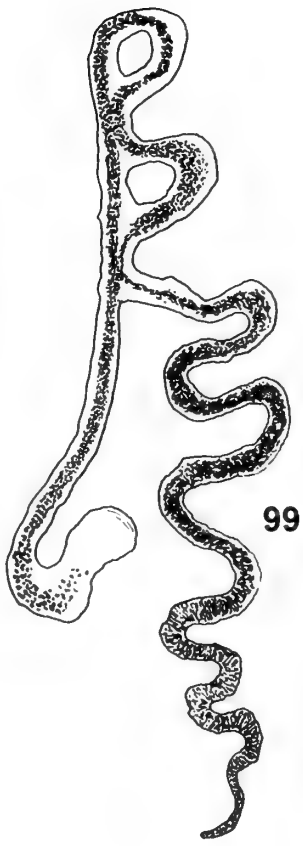

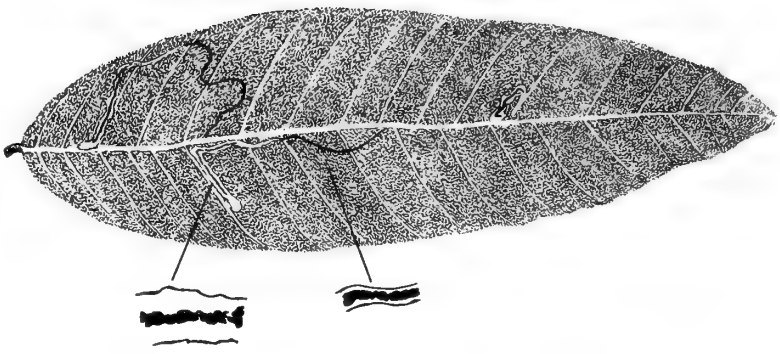

Figs 98–100. Mines of Nepticulidae. 98, *Stigmella montanotropica*, damaged leaf of *Acalypha* with a sinuous mine, western slopes of Andes, Tandapi, sample no. 4628-VPU; 99, same, gallery showing frass distribution; 100, *Enteucha guajavae*, damaged leaf of *Psidium guajava* with mines, western foothills of Andes, Bucay, sample no. 4722-VPU.

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A review and checklist of the Neotropical Nepticulidae (Lepidoptera)

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CONTENTS

SYNOPSIS. Fieldwork in 2000–2001 has added substantially to our knowledge of the Nepticulidae of the upper Amazon basin and the Andes and increased the number of species known from the Neotropical Region from 58 to 74. Two species – *Manoneura basidactyla* (Davis) and *Ectoedemia fuscivittata* Puplesis & Robinson – are recorded from equatorial America for the first time here and are redescribed, with amplified descriptions and illustrations. A revised checklist of the Neotropical Nepticulidae is given together with an updated distribution map for Central and Southern America. *Fomoria latipennata* Puplesis & Robinson is transferred to *Acalyptris*, **comb. n.** Four new species-groups (*Stigmella tiliella-group*, *S. barbata-group*, *Fomoria molybditis-group* and *Acalyptris latipennata-group*) are defined. Hostplant data are reviewed and further hostplant genera from which mines or cocoons have been collected are noted. The diversity and distribution of the Neotropical Nepticulidae are discussed.

INTRODUCTION

Nepticulidae are a family of minute monotrysian Microlepidoptera with a worldwide distribution and about 750 described species. Their morphology, biology and taxonomic composition have been recently reviewed (Puplesis & Robinson, 2000).

The size of the adults, concealed mining life-style of the larvae (predominantly in leaves), and the difficulty of rearing imagines goes some way towards explaining why these moths are still poorly studied in many regions. Only the northern European nepticulid fauna can be considered to have been exhaustively studied. Studies in other regions of the world in all probability underestimate the diversity of the group. Key works are reviewed by Puplesis & Robinson (2000).

The history of description of Nepticulidae from the Neotropical Region has been reviewed by Puplesis & Robinson (2000). That paper, based on the results of fieldwork in Belize in 1998 by Puplesis and Simon Hill (UW) together with investigation of unidentified material in ZMUC and USNM, documented a total of seven genera and 58 species of Nepticulidae from Central and Southern America. Twenty-eight of those species recognized were new taxa from Belize (including four species left unnamed). None was from the "heart" of the Neotropics – the Amazon basin – and it was assumed that the absence of specimens from Amazonian rainforest reflected collecting effort, coupled with a lack of diversity.

In the preceding paper in this journal (Puplesis, Diškus & Robinson, 2002) sixteen new species from the upper Amazon basin and the Andes (Ecuador) are recorded, increasing the number of species known from the neotropics by more than one-fifth. The fieldwork in Ecuador upon which that paper is based resulted in the acquisition of additional material of *Manoneura basidactyla* (Davis) and *Ectoedemia fuscivittata* Puplesis & Robinson. These are the first records of these taxa from equatorial America. In this paper we amplify the descriptions and provide further illustrations of these species and update the checklist of Neotropical Nepticulidae with a distribution chart and map. We define four species-groups and review the known biologies of neotropical Nepticulidae, adding observations on nepticulid leaf-mines in Ecuador, and review the diversity of Nepticulidae in tropical America.

The present collaborative project was undertaken at the Natural History Museum, London with the support of the Royal Society (London), Professor Hering Memorial Fund (London) and in cooperation with the Pontificia Universidad Católica del Ecuador, Quito, Ecuador (Dr Giovanni Onore).

MATERIAL AND METHODS

Brief details of collecting localities in Ecuador (Fig. 1) were given in the preceding paper (Puplesis, Diškus & Robinson, 2002 – *q.v.*). Primary sites were at the Yasuni Research Station, Jatun Sacha Biological Station and Misahualli (Figs 2–4).

Jatun Sacha and the nearby village of Misahualli (8 km NW of Jatun Sacha) are located on the south side and the northern side of the upper Rio Napo respectively, about 20 km east of the base of the Andes. The environment is transitional between the lower slopes of the Andes and Amazon lowland. The area is formed by steep hills crossed by seasonal streams. The soil is mostly a red clay oxisol. Annual precipitation is 3900 mm, fairly evenly distributed throughout the year, though the collecting periods (January 2000 and January 2001) tended to be relatively dry. Around half of Jatun Sacha Reserve is covered with original undisturbed forest, while the remainder is secondary growth; Misahualli (Fig. 4) is mostly surrounded by secondary forest and only about 10 to 15% can be considered as primary forest. The most common plants in the area are: *Adiantum cayennense* Klotzsch, *Asplenium auritum* Swartz, *Anthurium balslevii* Croat, *Bactris gasipaes* H.B.K., *Guzmania acuminata* L.B.Smith, *Becquerelia cymosa* Brongn, *Calathea attenuata* Kennedy, *Heliconia stricta* Huber, *Epidendrum coronatum* Ruiz & Pavón, *Maxillaria tarumanensis* Hoehne, *Schefflera diplodactyla* Harms and *Matelea rivularis* Woodson.

Yasuni Research Station is based at the Yasuni National Park and Biosphere Reserve, which together cover approximately 9820 square kilometres of mainly pristine Amazon lowland rain forest, rivers, lagoons and swamps (Figs 2, 3). The annual precipitation pattern is very similar to Jatun Sacha. The most common plants in the area are: *Alseis lugonis* (L.) Andersson, *Astrocaryum urostachys* Burret, *Guatteria glaberrima* (R.E.) Fr., *Trigynaea triplinervis* D.M. Johnson & N.A. Murray, *Nectandra crassiloba* Rohwer, *Euterpe precatoria* Mart., *Ceiba samauma* (Mart.) K. Schum, *Phragmotheca ecuadorensis* W.S. Alverson, *Duguetia spixiana* Mart., *Oxandra mediocris* Diels, *Aristolochia goudotti* Duch., *Mauritia flexuosa* L.F., *Ceiba pentandra* (L.) Gaertn., *Inga tessmannii* Harms and *Miconia grandifolia* Ule.

Collecting methods, techniques for genitalia preparation and protocols for description are outlined in the preceding paper (Puplesis, Diškus & Robinson, 2002 – *q.v.*). Black and white drawings cannot show the metallic lustre (especially of the lustrous *Manoneura* species) and the coloured iridescence characteristic of most Nepticulidae, and details of such colours have been incorporated into species descriptions.

Genitalia drawings were made by Puplesis using a camera lucida from permanent slides.

ABBREVIATIONS OF INSTITUTIONS

BMNH	The Natural History Museum, London, UK (formerly British Museum (Natural History))
VPU	Vilnius Pedagogical University, Vilnius, Lithuania
USNM	National Museum of Natural History, Washington DC, USA (formerly United States National Museum)
ZMUC	Zoologisk Museum, University of Copenhagen, Copenhagen, Denmark

ACKNOWLEDGEMENTS. See the preceding paper (Puplesis, Diškus & Robinson, 2002) for relevant acknowledgements for assistance, funding and collecting and study permissions.

We are grateful to Mr Artūras Skorupskas (VPU) for making indian-ink drawings of the adults; Mrs Birute Noreikiene (VPU) is thanked for making the drawing of the adult of *Ectoedemia fuscivittata* from Belize.

Arūnas Diškus thanks The Natural History Museum for financial support for studies conducted under the SYS-RESOURCE Programme (project manager Vanessa Pike).

REDESCRIPTIONS OF *MANONEURA BASIDACTYLA* AND *ECTOEDEMIA FUSCIVITTATA*

Manoneura basidactyla (Davis, 1978)

(Figs 6, 9–15, 21)

Oligoneura basidactyla Davis, 1978: 218–219.
Manoneura basidactyla Davis: Puplesis & Robinson, 2000: 22,23, figs 12, 61, 83–85, 207.

MALE (Fig. 6). Forewing length: 1.7–2.1 mm (Central American specimens) and about 2.2 mm (Amazonian specimens). Wingspan: 4.3–4.9 mm. Head: palpi yellowish cream to ochreous cream or cream; frontal tuft orange; collar a large tuft of lamellar yellowish cream scales with golden reflection; eye-caps yellowish cream; antenna brownish grey, ca. 38–44 segments. Thorax, tegulae and forewing fuscous brown with bronze or copper (in Amazonian specimens) iridescence and very strong blue and purple reflections. Distinct postmedian fascia of forewing oblique, yellowish gold. Cilia fuscous, tending be lighter distally. Underside of forewing brown to dark brown (with purple and bluish iridescence in Amazonian specimens). Hindwing lanceolate, very slender, dark brown with strong purple and blue reflections which are stronger on upperside of hindwing; cilia brownish. No androconia on forewing or hindwing. Legs grey to fuscous but tarsi cream. Abdomen black on upperside, blackish grey on underside; genital segments blackish grey, not contrasting with main colour of abdomen.

FEMALE. Similar to male. Forewing length: 2.2–2.4 mm. Wingspan: 5.3–5.4 mm. Antenna ca. 32–38 segments. Legs cream with black lateral shading or mainly fuscous (in Amazonian specimens). Abdomen blackish on upperside but cream or creamy brown on underside. Otherwise as male.

GENITALIA ♂ (Figs 9–14). Capsule ca. 290–305 µm long. Tegumen with short caudally slightly bilobed pseuduncus-like extension. Uncus with strong pointed central process directed anteriorly, and long narrow lateral arms directed posteriorly. Gnathos with small but complex and well-sclerotized v-shaped central region and rather membranous broad lateral arms; shape and sclerotization of central element may vary. Natural position of central pointed process of uncus very closely appressed to posterior excavation of central part of gnathos (appearing to be a single structure) (Fig. 10). Valva ca. 205–215 µm long, relatively narrow in distal half and gradually broadened towards base; apical process long and slender. Transtilla absent, i.e., no transverse bar; bases of valvae with remarkably long and straight apodemes. Vinculum very long and very broad, truncate at anterior end; no anterior excavation or lateral lobes. Aedeagus 236–246 µm long, with two pairs of pointed lateral carinae; no cornuti on vesica. Juxta a band-like sclerite, abruptly broadened basally, fused with aedeagus.

GENITALIA ♀ (Fig. 15). Total length ca. 720–915 µm. Anal papillae undeveloped. S8 and T8 widely rounded. Apophyses posteriores short and complex. Apophyses anteriores very slender, 0.5–0.7 length of apophyses posteriores. Vestibulum sclerotized. Caudal part of corpus bursae very narrow; remaining part ovally broadened; no signa visible. Accessory sac undeveloped, in Central American specimens represented by a small but clearly visible ring-like sclerotization; ductus spermathecae always long and narrow, slightly sinuous.

BIOLOGY. Hostplant: *Coccoloba uvifera* (L.) L., Polygonaceae (for the Caribbean fauna; specimens from Amazon rainforest have not been reared and the hostplant is not established). Adults collected in January, April–May and July. The suggestion that the species might be univoltine (Davis, 1978) is not supported.

DIAGNOSIS. *M. basidactyla* may be distinguished from the other species of the genus (*trinaria*) by the relatively straight valva and distally truncate vincu-

lum; externally it is similar in pattern and iridescence, but *basidactyla* is slightly paler. It differs from other nepticulids from the Neotropical Region (except *Manoneura trinaria*) in the strong purple reflection of the forewing and the large distally truncate vinculum together with the very specialized shape of the gnathos (shared only with *trinaria*).

DISTRIBUTION (Fig. 21). Southwest coast of Florida, Dominica, Belize, Ecuador. It is likely that the species has a wide distribution in tropical forest in the Neotropics.

MATERIAL EXAMINED. **Belize**: Chiquibul Forest Reserve, Las Cuevas, 3♂, 2♀, 3–16.iv.1998 (*Puplesis & Hill*) genitalia slide no. 29120♂, no. 29121♀ (BMNH); 2♂, 1♀, same data, wing venation slide no. AD0314♀ (VPU). **Dominica**: Pont Casse, 1♂, 16.v.1965 (*Davis*) genitalia slide no. Diškus 002 (USNM); Cabrit Swam, 1♂, 1♀, 10–13.v.1965 (*Davis*) (USNM); Springfield Est., 2 specimen (no abdomens), 20–26.vii.1963 (*Flint*) (USNM). **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 1 ♂, genitalia slide no. AD0327 VPU, 1♀, genitalia slide no. AD0326 VPU, 15–25.i.2000 (*Puplesis & Hill*).

Ectoedemia fuscivittata Puplesis & Robinson, 2000

(Figs 7, 8, 16–21)

Ectoedemia fuscivittata Puplesis & Robinson, 2000: 42, figs 39, 154–156, 223.

MALE (Figs 7, 8). Forewing length: 1.7–1.8 mm. Wingspan: 4.1–4.3 mm. Head: palpi cream to ochreous cream; frontal tuft pale ochreous to pale orange-ochreous; collar indistinct, pale ochreous, comprised of piliform scales; eyecaps ochreous cream, moderately large; antenna brownish or greyish to pale brownish ochreous, 42–44 segments. Thorax anteriorly ochreous yellow, elsewhere metallic grey; tegulae ochreous yellowish with few greyish scales anteriorly. Forewing basal three-fifths to fascia metallic grey to ochreous cream (Amazonian specimen) with or without (Amazonian specimen) distinctive blue-green and some indistinct purplish reflection; entire forewing of Amazonian specimen, or, in Belize specimens, narrow area along costa, particularly before fascia and on tornus, and area beyond fascia with ochreous cream scales; distinct postmedian fascia oblique, fuscous brown, but weakly defined in Amazonian specimen; with some dark brown scales in area before cilia. Cilia metallic greyish or dark ochreous cream in Amazonian specimen. Underside of forewing grey-brown or brown-ochreous. Hindwing pale brownish, cilia greyish to brownish grey; a long patch of whitish scales may be visible on basal half of hindwing upperside, however these androconia not always distinctive. Legs cream or ochreous, with or without (Amazonian specimen) grey-fuscous lateral shading. Abdomen fuscous brown on upperside, brown or brownish on underside; genital segments mostly covered by dark (predominantly brown) scales, not contrasting with main colour of abdomen.

FEMALE. Unknown.

GENITALIA ♂ (Figs 16–20). Capsule 268–270 μm long. Pseuduncus small, distinctly rounded and strongly papillated. Dorsal plate of tegumen simple, small. Gnathos with triangular caudal process, slender lateral arms, and small oval central plate. Valva 150–170 μm long, distinctly triangular, with more or less straight inner margin tapering into pointed, caudally directed apical process; in Amazonian specimen apical processes particularly narrow (Fig. 19). Basal margins of valva strongly sclerotized. Transtilla without transverse bar, but with rather long and slender or very slender valval apodemes. Juxta absent, valvae fused via basal membranous joint. Vinculum very small, with very small but distinctly shaped and well-sclerotized lateral lobes; in Amazonian specimen the lobes broader. Anterior excavation of vinculum always very shallow, broad or narrow (Amazonian specimen). Aedeagus 210–235 μm long, abruptly bulged in basal 1/2–2/3 or gradually broadened (Amazonian specimen); without carinae and weakly sclerotized apical part; vesica with some very tiny indistinct cornuti only; strong sclerotization of aedeagal tube in Amazon specimen may appear as a long spine-like cornutus but it is not such (genitalia slide no. AD0328 VPU, Fig. 20).

BIOLOGY. Adults collected in April (Belize) and January (Ecuador).

DIAGNOSIS. Although many species belonging to *Ectoedemia* are not easily distinguishable from each other, *fuscivittata* is an exception: the combination of features such as the caudally directed valval process, basally broadened aedeagus, very short vinculum, and dark oblique forewing fascia make this a very distinctive species. The absence of a transverse transtilla bar in this species sets it apart from all other *Ectoedemia*.

DISTRIBUTION (Fig. 21). Rainforest in Belize and Ecuador.

MATERIAL EXAMINED. **Belize**: Cayo District, Chiquibul Forest Reserve, Las Cuevas, 3♂ [holotype (BMNH) and paratypes (BMNH, VPU)] 3–16.iv.1998 (*Puplesis & Hill*) genitalia slides no. 29107 [holotype], no. AD 0302 [paratype, VPU]. **Ecuador**: Napo Region, SE of Coca, near Rio Tiputini, Yasuni National Park, 260 m, 1 ♂, genitalia slide no. AD0328 VPU, 15–25.i.2000 (*Puplesis & Hill*).

REVISED CHECKLIST OF NEOTROPICAL NEPTICULIDAE

Seventy-four species are now recognized from the Neotropical Region (including most of Mexico, together with the US states of Arizona and Florida) and these are listed in Table 1. Another eight species with a distribution range from the north of Florida into the northern states of the USA should not be considered to be part of the neotropical fauna; *Stigmella nigriverticella* (Chambers), *S. castaneaefoliella* (Chambers), *S. ostryaefoliella* (Clemens), *S. myricafoliella* (Busk), *Ectoedemia clemensella* (Chambers), *E. similella* (Braun), *E. virgulae* (Braun), *E. obrutella* (Zeller) have predominantly boreal distribution ranges and/or hostplants.

DISCUSSION

Definition of species-groups, taxonomic notes

Venation. In studying neotropical Nepticulidae we have met difficulties in using wing venation to clarify the generic position of species. Although wing venation can provide useful characters for generic diagnosis of many Holarctic or South African Nepticulidae (Scoble, 1983; Nieukerken, 1986; Puplesis, 1994), a few Neotropical species show unusually strong reduction of the venation, limiting the wider value of venational features. This is notable in some *Fomoria* such as *F. diskusi* (Puplesis & Robinson, 2000: fig. 64). On the other hand, a few other neotropical species have a less derived venation than Old World members of the same genus. In the forewing of *Enteucha guajavae, Stigmella ovata* and *Acalyptris onorei* R4 and R5 are represented by two separate veins and are not coalescent as is usual in these genera (see Puplesis & Robinson, 2000: fig. 62; Puplesis, Diškus & Robinson, 2002: figs 1, 2). The accepted generic diagnoses of these groups are based upon the Old World taxa and need revision in the light of the morphology of the neotropical representatives.

Stigmella salicis-group. This long-established group contains more than 30 described species worldwide. It was first designated for European species and currently contains 15 described Palaearctic representatives. However, it also has at least two representatives in the Nearctic (known as the '*fuscotibiella*-group'). Puplesis & Robinson (2000) recognized 14 mostly Andean species as belonging here. All Holarctic species (except one on *Vaccinium*) feed on Salicaceae (*Salix, Populus*) while Neotropical taxa feed on Rosaceae (*Rubus*) and Euphorbiaceae *(Acalypha).* The female genitalia of most of the Neotropical species lack the characteristic signum of tiny, dentate chitin plates encircling the bursa that is a derived feature and typical of the Holarctic members of the group; just *olyritis* and *montanotropica* (see Puplesis, Diškus & Robinson, 2002: Fig. 91) have a similar structure on the bursa. The male genitalia of the Neotropical species are similar to those of Holarctic *salicis*-group species. The Holarctic representatives may form a monophyletic entity within the *salicis*-group, defined by the presence of a signum, and derived from a Neotropical-type ancestor.

Stigmella tiliella-group. A new species-group is designated here for two closely related and distinctive species. A rounded valva with a short dorsal process, broadly U-shaped gnathos and a cluster (or clusters) of spine-like cornuti in the aedeagus are characteristic of the male genitalia. The group resembles the Holarctic *paradoxa*-group but differs in the cornuti clusters and gallery mines (which in the *paradoxa*-group are combined, i.e., distinctly blotch-shaped in the second half of the course). The group contains *Stigmella tiliella* (Braun) known from the Nearctic (USA, Kentucky) and *S. kimae* Puplesis & Robinson, 2000 (Belize). The first makes gallery-type mines on *Tilia americana* leaves; the hostplant of the second species is still unknown.

Stigmella barbata-group. The group is newly designated here for species possessing unique plumose scales on the apex (or apical third) of the valva; in contrast to most *Stigmella*, the complement of cornuti in the aedeagus is very weakly developed, the cornuti tiny and weakly sclerotized. The group appears to be endemic to the Neotropics and contains three species: *Stigmella plumosetaeella* Newton & Wilkinson, 1982, *barbata* Puplesis & Robinson, 2000 and *austroamericana* Puplesis & Diškus, 2002; the biology of these species is unknown. The recently discovered Amazonian *austroamericana* appears to be the sister-group of the Central American *barbata* and the two appear to represent an allopatric and vicariant species-pair.

Fomoria. Although some species of *Fomoria* may be clearly grouped as monophyletic units, the taxonomic status of the genus itself is questionable because its monophyly is unproven. The genitalia of *Fomoria* and *Ectoedemia* (sensu stricto) follow the same ground plan, but the uncus (which is entirely reduced in *Ectoedemia*) is fully preserved in *Fomoria* (a plesiomorphy). Vein Cu in the forewing tends to be shortened or completely lacking (apomorphy) in *Fomoria*, but this character is not always consistent, at least among the Neotropical representatives (see above: *Venation*).

Table 1. Distribution of Neotropical Nepticulidae. The USA column includes only species from Arizona and Florida which are recognized as tropical; 'boreal' species with northern distribution ranges and/or temperate hostplants are excluded.

No	Species	USA	Mexico	Belize	Dominica	Guyana	Venezuela	Colombia	Ecuador	Peru	Argentina	Chile
	***ENTEUCHA* Meyrick, 1915**	•		•		•			•	•		
1	*cyanochlora* Meyrick, 1915					•						
2	*gilvafascia* (Davis, 1978)	•										
3	*hilli* Puplesis & Robinson, 2000			•								
4	*contracolorea* Puplesis & Robinson, 2000			•								
5	*terricula* Puplesis & Robinson, 2000									•		
6	*snaddoni* Puplesis & Robinson, 2000			•								
7	*guajavae* Puplesis & Diškus, 2002								•			
8	*acuta* Puplesis & Diškus, 2002								•			
	***MANONEURA* Davis, 1979**	•		•	•		•		•			
9	*basidactyla* (Davis, 1978)	•		•	•				•			
10	*trinaria* Puplesis & Robinson, 2000						•					
	***STIGMELLA* Schrank, 1802**	•	•	•		•		•	•	•	•	•
	The *salicis* species-group							•	•	•	•	•
11	*andina* (Meyrick, 1915)									•		
12	*cuprata* (Meyrick, 1915)									•		
13	*johannis* (Zellller, 1877)							•				
14	*rudis* Puplesis & Robinson, 2000										•	•
15	*marmorea* Puplesis & Robinson, 2000									•		
16	*peruanica* Puplesis & Robinson, 2000									•		
17	*epicosma* (Meyrick, 1915)									•		
18	*schoorli* Puplesis & Robinson, 2000									•		
19	*hamata* Puplesis & Robinson, 2000									•		
20	*imperatoria* Puplesis & Robinson, 2000									•		
21	*olyritis* (Meyrick, 1915)									•		
22	*montanotropica* Puplesis & Diškus, 2002								•			
23	*nubimontana* Puplesis & Diškus, 2002								•			
24	*rubeta* Puplesis & Diškus, 2002								•			
	The *eurydesma* species-group			•		•						
25	*eurydesma* (Meyrick, 1915)					•						
26	*albilamina* Puplesis & Robinson, 2000			•								
27	*fuscilamina* Puplesis & Robinson, 2000			•								
	The *tiliella* species-group			•								
28	*kimae* Puplesis & Robinson, 2000			•								
	The *barbata* species-group	•	•	•					•			
29	*plumosetaeella* Newton & Wilkinson, 1982	•	•									
30	*barbata* Puplesis & Robinson, 2000			•								
31	*austroamericana* Puplesis & Diškus, 2002								•			
	Unattributed to a species-group	•		•							•	
32	*gossypii* (Forbes & Leonard, 1930)	•										
33	*pruinosa* Puplesis & Robinson, 2000			•								
34	*ovata* Puplesis & Robinson, 2000										•	
35	*hylomaga* (Meyrick, 1931)										•	
36	*costalimai* (Bourquin, 1962)										•	
37	*guittonae* (Bourquin, 1962)										•	

Table 1 continued

No	Species	USA	Mexico	Belize	Dominica	Guyana	Venezuela	Colombia	Ecuador	Peru	Argentina	Chile
	***ECTOEDEMIA* Busck, 1907**	•		•					•			
38	*reneella* Wilkinson, 1981	•										
39	*helenella* Wilkinson, 1981	•										
40	*mesoloba* Davis, 1978	•										
41	*species 29105*			•								
42	*fuscivittata* Puplesis & Robinson, 2000			•					•			
	***FOMORIA* Beirne, 1945**			•				•	•			
43	*tabulosa* Puplesis & Diškus, 2002								•			
	The *molybditis* species-group			•				•	•			
44	*molybditis* (Zeller, 1877)							•				
45	*diskusi* Puplesis & Robinson, 2000			•								
46	*species 29122*			•								
47	*repanda* Puplesis & Diškus, 2002								•			
	***ACALYPTRIS* Meyrick, 1921**	•		•					•			
	The *latipennata* species-group			•					•			
48	*latipennata* (Puplesis & Robinson, 2000) **comb.n.**			•								
49	*dividua* Puplesis & Robinson, 2000			•								
50	*ecuadoriana* Puplesis & Diškus, 2002								•			
51	*onorei* Puplesis & Diškus, 2002								•			
	Unattributed to a species-group											
52	*bovicorneus* Puplesis & Robinson, 2000			•								
53	*martinheringi* Puplesis & Robinson, 2000			•								
54	*fortis* Puplesis & Robinson, 2000			•								
55	*hispidus* Puplesis & Robinson, 2000			•								
56	*novenarius* Puplesis & Robinson, 2000			•								
57	*lascuevella* Puplesis & Robinson, 2000			•								
58	*bifidus* Puplesis & Robinson, 2000			•								
59	*trifidus* Puplesis & Robinson, 2000			•								
60	*tenuijuxtus* (Davis, 1978)	•										
61	*unicornis* Puplesis & Robinson, 2000			•								
62	*laxibasis* Puplesis & Robinson, 2000			•								
63	*bicornutus* (Davis, 1978)	•										
64	*species 29135*			•								
65	*platygnathos* Puplesis & Robinson, 2000			•								
66	*species 29140*			•								
67	*basihastatus* Puplesis & Diškus, 2002								•			
68	*pseudohastatus* Puplesis & Diškus, 2002								•			
69	*articulosus* Puplesis & Diškus, 2002								•			
70	*rotundus* Puplesis & Diškus, 2002								•			
71	*amazonius* Puplesis & Diškus, 2002								•			
72	*insolentis* Puplesis & Diškus, 2002								•			
	***GLAUCOLEPIS* Braun, 1917**			•						•		
73	*aerifica* (Meyrick, 1915)									•		
74	*argentosa* Puplesis & Robinson, 2000			•								

Fomoria molybditis-group. The group is newly designated here for species characterized by the outstandingly long transverse bar of the transtilla (apomorphy), broad and very long vinculum, and bilobed valva (often possessing large spine-like processes from the inner side). This distinctive group appears to be endemic to the Neotropics and contains four species: *molybditis* (Zeller, 1877), *diskusi* Puplesis & Robinson, 2000, *species 29122, repanda* Puplesis & Diškus, 2002. The biology of these species remains unknown.

Acalyptris latipennata-group. The group is newly designated here for species characterized by a distinctly broadened (or moderately broad) forewing with a dark oblique fascia, a distinctive paired uncus, and the presence of three very large cornuti at the apex of the aedeagus which tends to be slightly or strongly swollen; the valva of species of this group has an inner spine-like process (or papilla-like extension). This distinctive group appears to be endemic to the Neotropics and contains four species: *latipennata* (Puplesis & Robinson, 2000) (comb.n. – see below), *dividua* Puplesis & Robinson, 2000; *ecuadoriana* Puplesis & Diškus, 2002 and *onorei* Puplesis & Diškus, 2002; the biology of these species is unknown.

Acalyptris latipennata (Puplesis & Robinson) comb.n. Originally this strange-looking species was described as a *Fomoria* (Puplesis & Robinson, 2000). However, the later discovery of related species from Amazonian rainforest (i.e., *ecuadoriana* and *onorei*) indicates, from venational and other characters, that this species is correctly placed in *Acalyptris*, to which genus it is here transferred.

Leaf-mine collecting and hostplant data in equatorial America

There has been little elucidation of nepticulid biology in the Neotropics (Puplesis & Robinson, 2000). Our experience of mine collecting in equatorial America suggests that there are great differences between habitats with respect to diversity and abundance of mines. In lowland Amazon rainforest (such as Yasuni, 260 m) nepticulid mines are extremely difficult to find, and we have never observed mines in abundance although adults were readily attracted to light. In disturbed, mainly secondary premontane rainforest (Misahualli, 500 m) mining larvae were much more diverse and abundant. In progressing from the foothills of the Andes (Tandapi, 1200 m, Baños, 1500–2500) to the high Andes (Papallacta, 3500 m, and the slopes of Vol. Chimborazo, 4200 m) nepticulid mines became more abundant, but the diversity of species dropped significantly above 3000 m.

Hostplants from only eight plant genera belonging to eight families are known for identified species of Nepticulidae from the Neotropical region (Table 2). Records from *Ludwigia* and *Senecio* (Argentina) come from a paper by Bourquin (1962) and have not been confirmed by other authors.

We have obtained some additional data from fieldwork in Ecuador, but as rearings produced only single female adults or cocoons, these host records remain of 'unidentified Nepticulidae':

Rosaceae: *Lachemilla:* bloch-like mines, cocoons cream-white, on southern slopes of Vol. Chimborazo (4100–4200 m) (no. 4733-VPU); *Acaena*: short contorted galleries, on southern slopes of Vol. Chimborazo (4100–4200 m) (no. 4734-VPU); *unidentified plant genus*: blotch-like mines, cocoons yellowish, southern slopes of Vol. Chimborazo (3500–4000 m) (no. 4737-VPU).

Rubiaceae: *Psychotria:* sinuous or contorted gallery mines, Misahualli, 17 km SE of Tena, Amazon rainforest, 450–500 m (no. 4723, 4743-VPU).

Fabaceae: *Erythrina edulis* Triana ex Micheli. Balu: slender sinuous galleries, ochreous cocoons, western foothills of Andes, Bucay, ca. 700 m, (*Acalyptris* sp., 1 female reared-VPU) (no. 4736-VPU); *Inga*: long sinuous leaf-mines (Misahualli 17 km SE of Tena, Amazon rainforest, 450–500 m) are likely to be also Nepticulidae (No 4746-VPU).

Mines on *Bauhinia tarapotensis* Benth. (Fabaceae) (Amazon rainforest, no. 4630C -VPU) and *Cavendishia bracteata* (Ruiz & Pav. ex J.St. – Hil) Hoerold (Ericaceae) (Andes, Baños, ca. 1500 m) (no. 4721 - VPU) cannot be confirmed as of Nepticulidae and may have been produced by representatives of other Lepidoptera families.

Diversity and geography

Dominance of Acalyptris. One of the most unexpected results of investigations of the tropical American Nepticulidae was the discovery of a diverse fauna of *Acalyptris*. During the Belize expedition in 1998, a total of 14 species was found, representing 48% of Nepticulidae recorded from the area. We thought (Puplesis & Robinson, 2000) that the dominance of *Acalyptris* might be a regional (Central American) or a seasonal phenomenon. But sampling in Ecuador (mainly in rainforest) has shown a similar pattern exists there and at a different time of the year. A total of eight species of *Acalyptris* was found, representing 50% of Nepticulidae recorded from the area. Neotropical *Acalyptris* exhibit a remarkable range of morphological structure.

Table 2. Hostplants of Neotropical Nepticulidae.

Plant family	Plant genus	Nepticulidae reared	Remarks/Source
Polygonaceae	*Coccoloba*	*Enteucha gilvafascia, Manoneura basidactyla*	Davis, 1978
Malvaceae	*Gossypium*	*Stigmella gossypii*	Forbes & Leonard, 1930 and Davis, 1978
Euphorbiaceae	*Acalypha*	*Stigmella montanotropica*	
Rosaceae	*Rubus*	*Stigmella nubimontana, S. rubeta*	
Myrtaceae	*Psidium*	*Enteucha guajavae*	Cultivated host
Onagraceae	*Ludwigia*	*Stigmella guittonae*	Bourquin, 1962
Fabaceae	*Lonchocarpus*	*Acalyptris species 29140*	
Asteraceae	*Senecio*	*Stigmella guittonae*	Bourquin, 1962

Endemism of the fauna. The 74 species so far known from the Neotropical region all appear to be endemic at species or even species-group level. However, only a single genus – *Manoneura* – seems to be endemic to the region. Material from the southern part of the continent that has been recently studied superficially by the authors may contain one or two additional genera.

Potential diversity. Sampling of nepticulids in the Neotropical Region has been sparse, despite the vast potential of their habitat, and what we have seen so far is probably just a small fraction of the total. The Belize sample (January 1998: 29 species) and Ecuador sample (January 2000: 17 species) are geographically separated by some 2500 km and contain only two species in common, *Manoneura basidactyla* and *Ectoedemia fuscivittata.* The two Amazon rainforest samples separated by only 140 km (Yasuni, January 2000: 6 species; Jatun Sacha, January 2000: 7 species) have only a single species in common – *Acalyptris insolentis.* Sampling methods and weather conditions were similar at both sites. In the light of this, we would expect further collection and study to expand the known diversity of Nepticulidae in the Neotropical Region to at least 500 species.

Species numbers by country. The number of species known from each neotropical country (Table 1; Fig. 22) currently indicates only collecting and study activity. Only Belize and Ecuador have a species count greater than 15. Despite the suggested high diversity of Nepticulids in the Neotropics, species counts for individual countries are comparable only with the most poorly studied countries of other regions. They are not comparable with the known species diversity of European countries, the product of about 235 years of investigative history that began with the description of *Ectoedemia occultella* by Linnaeus in 1767 (Fig. 23).

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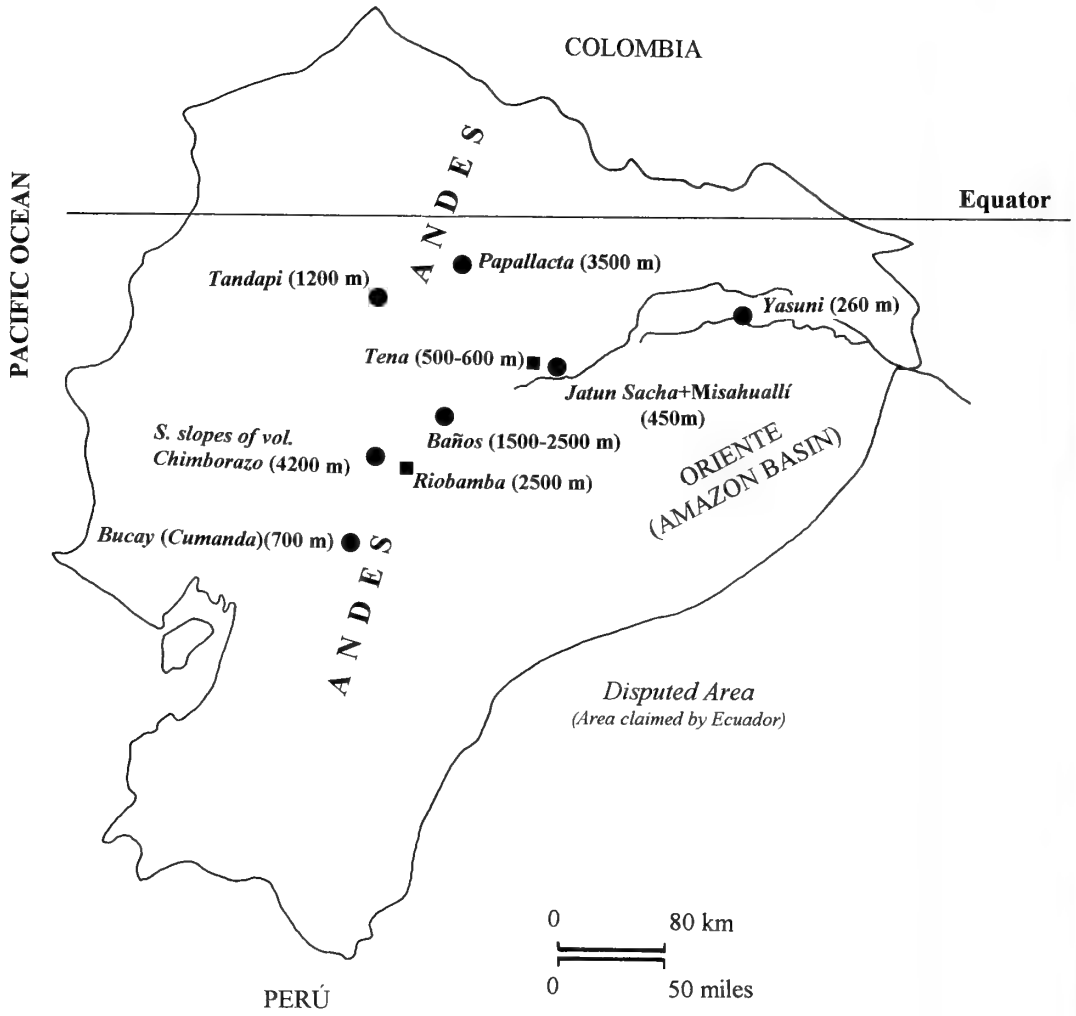
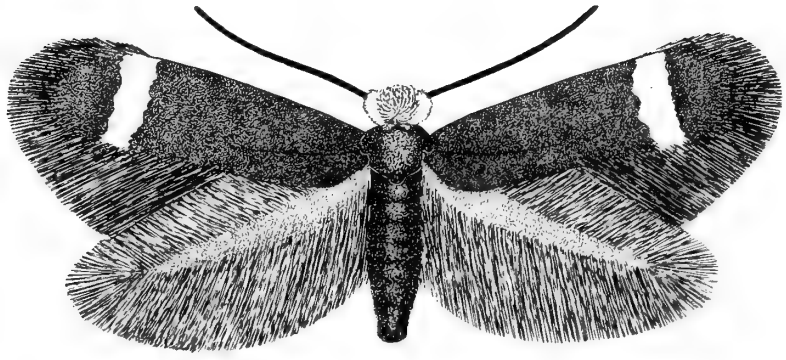


Fig. 1. Map of Ecuador showing collecting localities of 2000 and 2001 fieldwork programmes.

Figs 2–3. Ecuador collecting sites – Yasuni (240 m): 2, view over canopy (photo: Simon Hill); 3, along the Tiputini river.

Figs 4–5. Ecuador collecting sites: 4, Misahualli (450 m), premontane tropical forest; 5, Tandapi, western slopes of the Andes, montane tropical forest.



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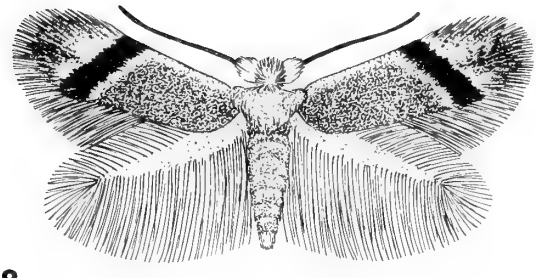

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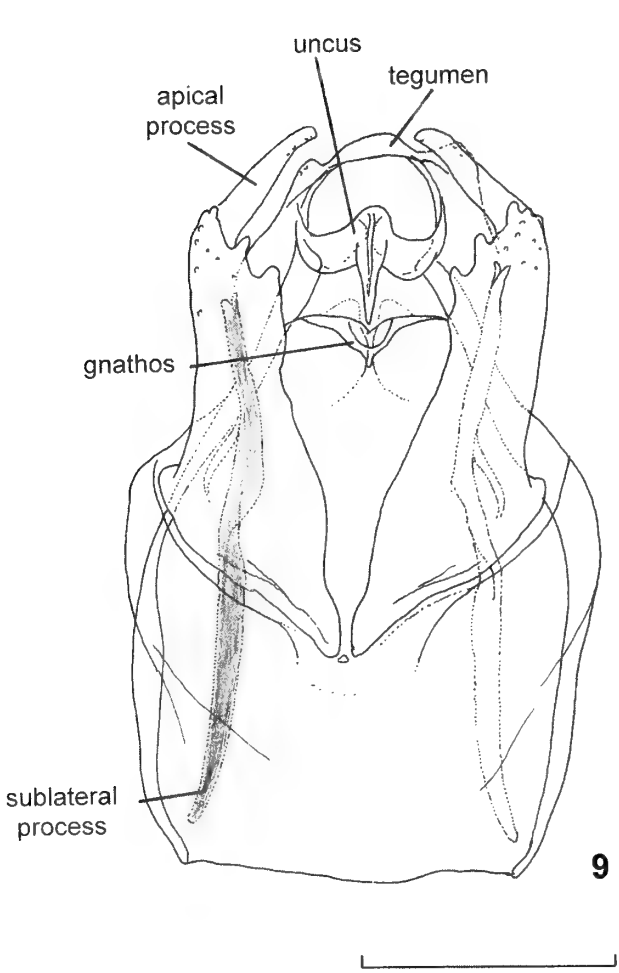
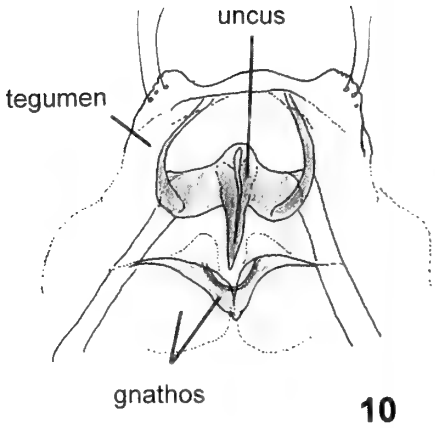
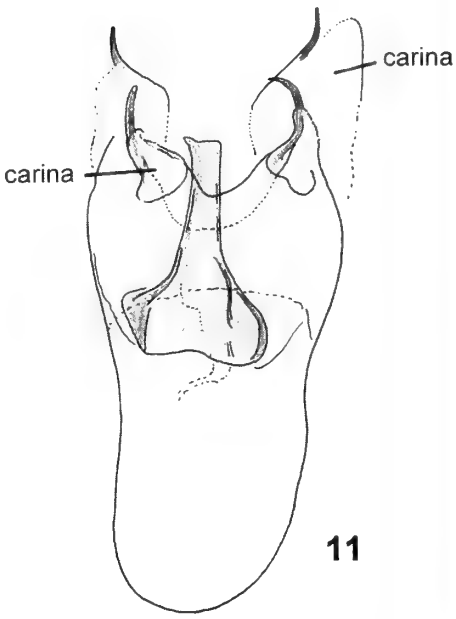
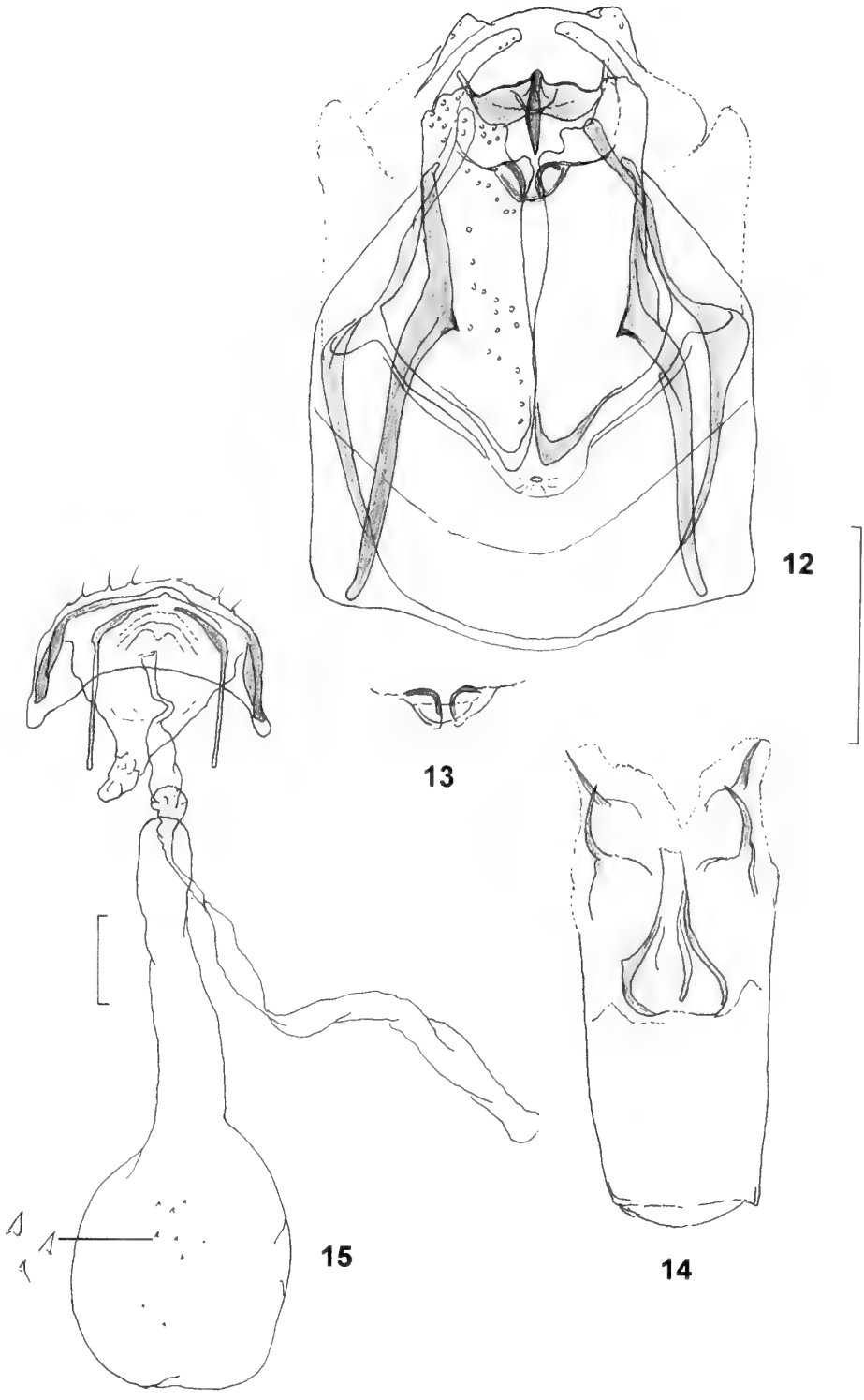
Figs 6–8. Adult Nepticulidae. 6, *Manoneura basidactyla*, Ecuador; 7, *Ectoedemia fuscivittata*, Ecuador; 8, *Ectoedemia fuscivittata*, Belize (type locality).



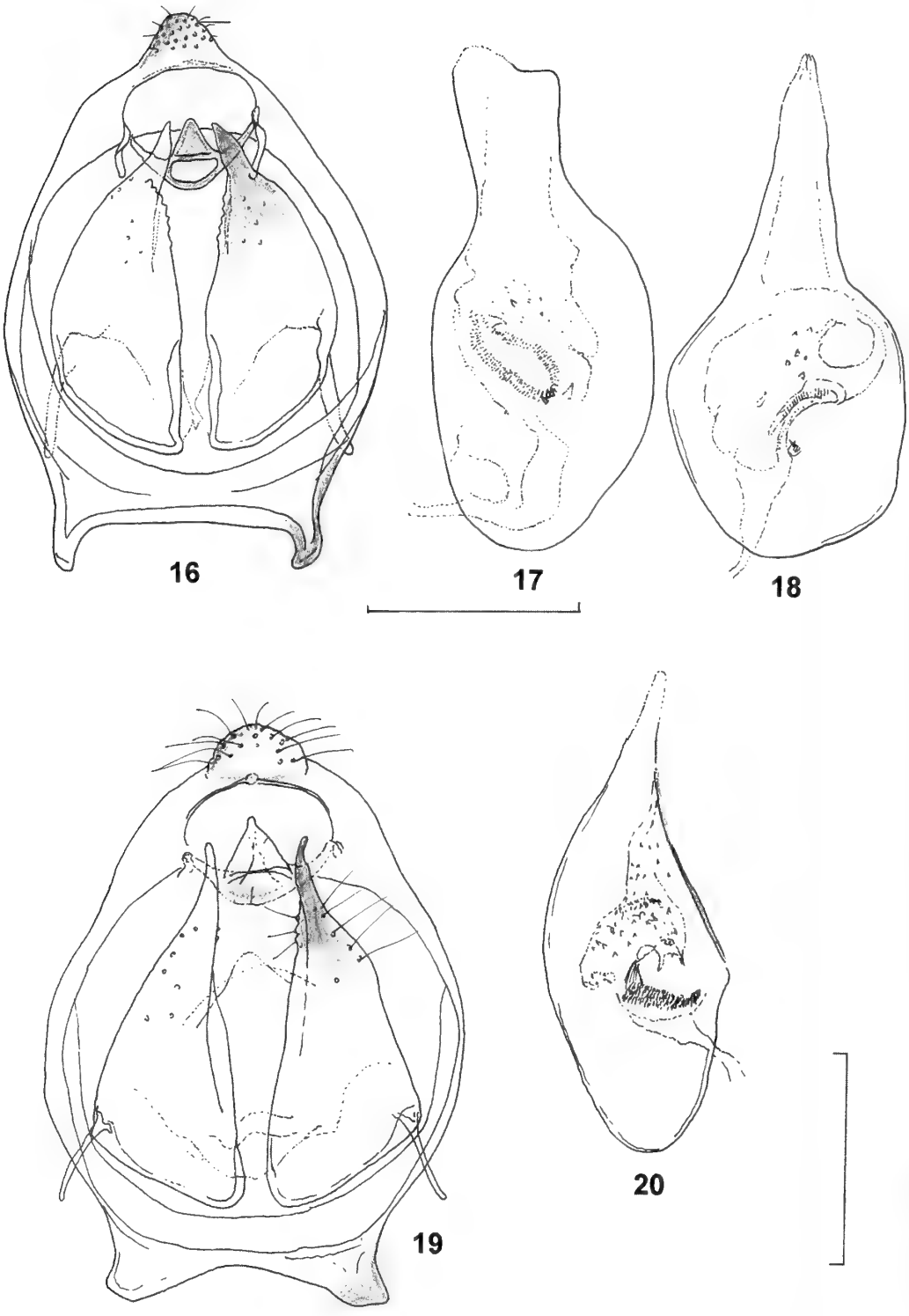




Figs 9–11. Male genitalia of *Manoneura basidactyla*, Belize (29120-BMNH): 9, capsule; 10, gnathos, uncus and tegumen; 11, aedeagus. Scale: 0.1 mm.



Figs 12–15. Genitalia of *Manoneura basidactyla*, Ecuador: 12, male genitalia, capsule (AD0327-VPU); 13, same, gnathos; 14, same, aedeagus; 15, female genitalia (AD0326-VPU). Scale: 0.1 mm.



Figs 16–20. Male genitalia of *Ectoedemia fuscivittata*: 16, holotype, Belize (29107-BMNH), capsule; 17, same, aedeagus; 18, same, paratype (AD0302-VPU); 19, Ecuador (AD0328-VPU), capsule; 20, same, aedeagus. Scale: 0.1 mm.

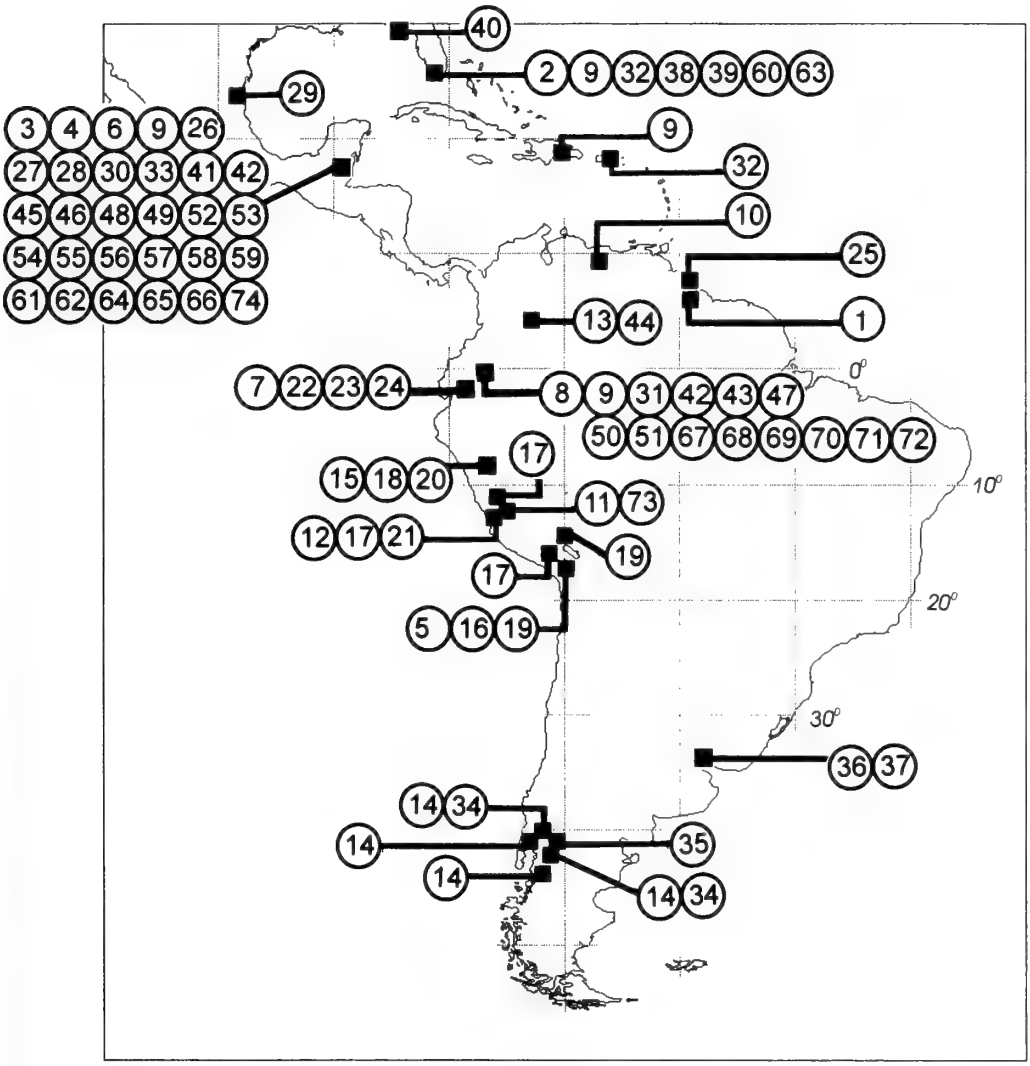


Fig. 21. Distribution map of Nepticulidae species recorded from the Neotropical Region: 1, *Enteucha cyanochlora*; 2, *E. gilvafascia*; 3, *E. hilli*; 4, *E. contracolorea*; 5, *E. terricula*; 6, *E. snaddoni*; 7, *E. guajavae*; 8, *E. acuta*; 9, *Manoneura basidactyla*; 10, *M. trinaria*; 11, *Stigmella andina*; 12, *S. cuprata*; 13, *S. johannis*; 14, *S. rudis*; 15, *S. marmorea*; 16, *S. peruanica*; 17, *S. epicosma*; 18, *S. schoorli*; 19, *S. hamata*; 20, *S. imperatoria*; 21, *S. olyritis*; 22, *S. montanotropica*; 23, *S. nubimontana*; 24, *S. rubeta*; 25, *S. eurydesma*; 26, *S. albilamina*; 27, *S. fuscilamina*; 28, *S. kimae*; 29, *S. plumosetaeella*; 30, *S. barbata*; 31, *S. austroamericana*; 32, *S. gossypii*; 33, *S. pruinosa*; 34, *S. ovata*; 35, *S. hylomaga*; 36, *S. costalimai*; 37, *S. guittonae*; 38, *Ectoedemia reneella*; 39, *E. helenella*; 40, *E. mesoloba*; 41, *E. species 29105*; 42, *E. fuscivittata*; 43, *Fomoria tabulosa*; 44, *F. molybditis*; 45, *F. diskusi*; 46, *F. species 29122*; 47, *F. repanda*; 48, *Acalyptris latipennata*; 49, *A. dividua*; 50, *A. ecuadoriana*; 51, *A. onorei*; 52, *A. bovicorneus*; 53, *A. martinheringi*; 54, *A. fortis*; 55, *A. hispidus*; 56, *A. novenarius*; 57, *A. lascuevella*; 58, *A. bifidus*; 59, *A. trifidus*; 60, *A. tenuijuxtus*; 61, *A. unicornis*; 62, *A. laxibasis*; 63, *A. bicornutus*; 64, *A. species 29135*; 65, *A. platygnathos*; 66, *A. species 29140*; 67, *A. basihastatus*; 68, *A. pseudohastatus*; 69, *A. articulosus*; 70, *A. rotundus*; 71, *A. amazonius*; 72, *A. insolentis*; 73, *Glaucolepis aerifica*; 74, *G. argentosa*.

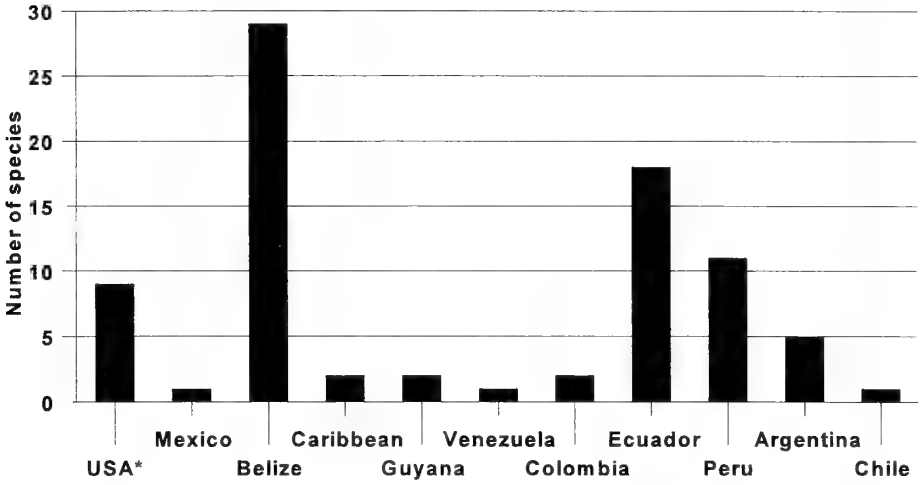


Fig. 22. Numbers of Nepticulidae recorded from the Neotropics. *The figure for the USA includes only species from Arizona and Florida recognized as tropical, and excludes boreal species.

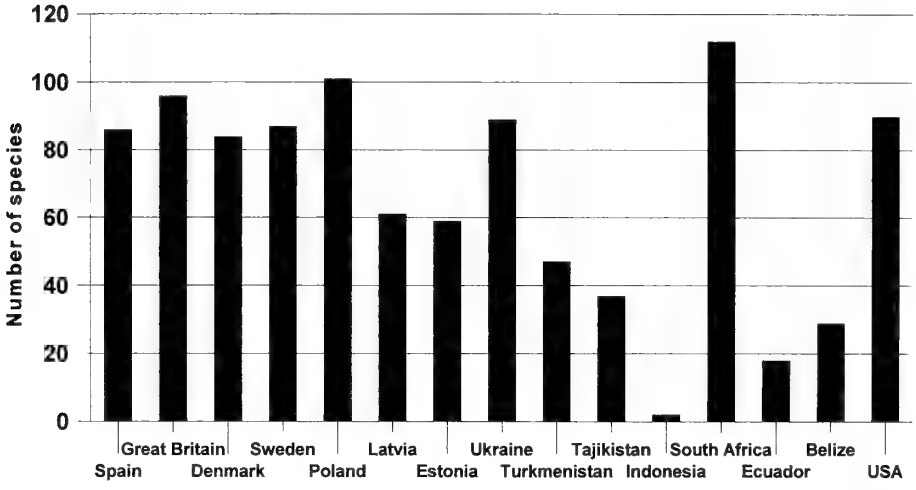


Fig. 23. Numbers of species of Nepticulidae recorded from various countries.

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A review of the genera associated with the tribe Asthenini (Lepidoptera: Geometridae: Larentiinae)

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CONTENTS

SYNOPSIS. The Asthenini (Geometridae, Larentiinae) are reviewed at the generic level. Critical examination of the composition of the tribe has led to the recognition of 18 genera, with the species '*Chalyboclydon*' *flexilinea* Warren unplaced. Species are listed under all of the genera identified as Asthenini; their broad distribution is noted; and remarks on peculiarities are noted. Seven other genera that have been associated with the tribe are also considered, and reasons for their exclusion are given. A lectotype is designated for the non-asthenine species *Chalyboclydon marginata* Warren.

INTRODUCTION

The primary purpose of this paper is to review the genera of the larentiine geometrid tribe Asthenini. Most of the genera occur in the Palaearctic and Oriental regions, with a few genera in Australia and New Guinea, three genera in the Nearctic, one genus in the Afrotropics and one in the Neotropics. Representation is particularly high in China and the Himalayas. Although we are not entirely satisfied with our final 'definition' of the tribe, we hope, at least, that this contribution will provide a material contribution to our understanding of part of the asthenine/eupitheciine complex. It builds on the extensive study of the Chinese species of Larentiinae by Xue & Zhu (1999). The study continues those efforts to produce global generic reviews of selected groups of Geometridae (e.g., Pitkin, 1996; Scoble, 1995; Scoble & Krüger, *in press*). Given the inadequacy of the tribal classification of the subfamily, we believe that taxonomic progress is more likely to be made at the level of genus and species. For examples of recent contributions of this kind see Choi, 2000; Parra, 1991; Parra & Santos-Salas, 1991; Schmidt, 2001; Xue & Zhu, 1999).

We have two specific aims. First, given the lack of an explicit definition of the Asthenini, the tribe is examined critically for coherence, so we use this paper as a means of exploring taxonomic problems. Our concept of the tribe is presented through the description, diagnosis and generic checklist, which follow a section in which significant taxonomic characters are reviewed. Second, despite the shortcomings of the tribal definition, we provide a treatment of the genera and state our reasons for their inclusion in the tribe. Certain genera that have been associated with the Asthenini in the past, or that we ourselves consider close to the tribe, are treated at the end of this work with an explanation as to why they have been excluded from the Asthenini.

Comments on the tribal classification

In reviewing the larentiine tribe Asthenini, we were faced with a question common to virtually all global taxonomic treatments: how inclusive should we be in associating genera with a higher taxon originally defined from relatively few European species? Our approach has been to compare as many potential asthenine taxa as possible against the existing literature and discuss their inclusion in, or their exclusion from, the tribe.

A difficulty in deciding which genera to include was that the tribal classification of Larentiinae as a whole remains significantly unresolved. It has developed largely from a series of regional studies. The Asthenini were established (as subfamily Astheninae) by Warren (1893: 362). Besides associating *Asthena*, *Hydrelia* and *Chalyboclydon* he included a part of the Trichopterygini, but he gave no definition or description of the tribe.

Although L.B. Prout, in his studies of larentiine genera, also never actually described the tribe, many of the genera we associate with the Asthenini today were treated in reasonably close proximity (e.g., in the sections on Larentiinae in Prout, 1912–1916). The group (as 'Astheninae') was more effectively founded by Pierce (1914: 38), whose diagnosis rested on characters of the genitalia, but included just the genera *Minoa* and *Asthena*, for the study was restricted to the British fauna alone. Pierce's diagnosis was based on a reduced uncus, entirely attached to the anal tube, the presence of an extended valval sacculus in the male, and a long evenly spined signum on the corpus bursae of the female. Pierce also noted the presence of labides (arm-like sclerites of the diaphragma) in each species included in the tribe, but did not include these structures in his tribal diagnosis, presumably because they occur elsewhere in Larentiinae, notably in Eupitheciini.

McGuffin (1958), still in a pre-cladistic age, and in a study restricted to larentiine larvae, published a

figure in which Asthenini were represented as the most basal group of Larentiinae from which four other tribes arose directly. In cladistic terminology, the group would be viewed as paraphyletic and, therefore, unsatisfactory. An examination of McGuffin's text, however, suggests that he perceived the group as more phylogenetically coherent. McGuffin restricted his study to Larentiinae of North America and included just the two genera *Hydrelia* and *Venusia*. He suggested that larval morphology demonstrated a close relationship between the two genera. The spinneret was found to be much longer than the labial palpi, and the thoracic claw was described as being almost straight, with the angle of the notch being acute. How far these observations pertain to the Asthenini more widely, and whether the characters are apomorphic, remain unknown. Larvae of most Asthenini are unknown, and our work has been based, inevitably, on adult morphology.

McGuffin's classification was preceded by that of Forbes (1948), which was also restricted to North American Asthenini. Forbes included three genera, *Hydrelia*, *Venusia* and *Trichodezia*, but apart from some comments in a 'table of tribes', he did not give a convincing definition of the tribe. He seems to have based his concept of the group largely on the existence of extended chaetosemata. We have excluded *Trichodezia* from Asthenini, for it has a well-developed uncus.

A list of family-group names of Larentiinae was compiled by Holloway (1997) in his work on the moths of Borneo. Holloway did not distinguish the Asthenini from the Eupitheciini because some of the genera that had been added to the group by McQuillan & Edwards (*in* Nielsen, Edwards & Rangsi, 1996) lack an extended sacculus, a character used to define the tribe by Pierce (1914), and because he considered the distinction between Asthenini and Eupitheciini to be weakly supported.

Chinese species of Larentiinae were treated by Xue & Zhu (1999) in their extensive survey of the subfamily. Many of the genera included in the present paper were discussed there, but tribal definitions were not provided.

Structures of taxonomic note

Uncus, tegumen and anal tube. Typically in Lepidoptera, the anal tube is attached to the tegumen posteriorly and, where an uncus is present, the anal tube diverges at the point at which it articulates with the tegumen. In his description of the Asthenini (as Astheninae), Pierce (1914: 38) stated that 'the uncus is weak and entirely attached to the anal tube which bears a thickened subscaphium'. In most species, the uncus (a sclerite articulated with the posterior end of the tegumen) appears to be absent. Occasionally (as in *Eschatarchia*) a triangular vestige is apparent. In the light of this observation, it is difficult to understand as a general observation Pierce's statement that the uncus is attached to the anal tube in Asthenini. However, where a vestige is present, it is indeed fused entirely with the dorsal surface of the anal tube.

Sclerotizations associated with the diaphragma and anellus. Although the sclerotizations of this region are complex within the Larentiinae and much used in the taxonomy of the subfamily, little has been written on the homologies of the various components. There is a real need for a comparative study of the area across the group. The important sclerotizations in the Asthenini and Eupitheciini are the labides, the transtillae and the juxta.

Each *transtilla* extends from the base of each valva dorsally. In most Asthenini (and, indeed, across the Lepidoptera) these paired structures meet medially and represent the dorsal-most sclerotization of the diaphragm. The transtillae are often not very conspicuous, particularly where the genitalia are mounted ventrally.

The *labides* were said by Pierce (1914) to spring from the points at which the transtillae unite with the costae of the valvae. This is a somewhat narrow view, since there are a number of rod-like structures in Larentiinae that may or may not be homologous with these structures in Asthenini – in, for example, Eupitheciini. Of particular interest in this paper is the comparison between the Eupitheciini and the Asthenini. In Asthenini, the labides usually arise from the base of the valvae, as noted by Pierce, and extend variously (see generic treatments, below). In *Eupithecia*, it does not seem to be have been stated that labides homologous to those in Asthenini actually exist. However, observations on the genus *Poecilasthena* have shed some light on this matter (see below).

In *Eupithecia* the juxta, possibly with other sclerotizations of the diaphragm, is distinctive being shaped like an hourglass (see, e.g., illustrations in Holloway, 1997). The anterior end of each member of a pair of ventral arms lateral to the juxta curve inwards to the medial constriction of the juxta. Structures that appear to be articulated with the posterior ends of the arms meet medially to form what are possible homologues of the asthenine labides.

In *Poecilasthena* although the juxta is flask-shaped, not hourglass-shaped, there occurs what appears to be the homologue of the ventral arms in *Eupithecia*. Each arm continues anteriorly into a somewhat expanded and free membranous structure, which is not united medially with its opposite member. We consider that the arms and their membranous expansions are labides, even though they are not united with the base of the valvae as they are in typical Asthenini. Support for this view comes from observations on *P. paucilinea*, in which what we take to be the ventral arms *do* extend

from the bases of the valvae, and are more strongly sclerotized than normal and less arm-like. Females of both *Poecilasthena* and *Eupithecia* bear a small colliculum within a narrow ductus bursae. Other features of *Poecilasthena*, are, however, much closer to the Asthenini condition, notably the shape of the juxta and the signum. Under this interpretation, the ventral arms in *Eupithecia* are also part of the labides.

Our study of *Poecilasthena* gives further support to the view that the taxonomic association of the Asthenini and Eupitheciini is close. Indeed, like Holloway (1997), who included *Parasthena*, *Poecilasthena*, *Polynesia*, *Eois*, and *Pseudopolynesia* in a broad definition of Eupitheciini, we harbour some doubts that the tribes are distinct.

Corpus bursae. The typical asthenine signum is composed of a dense accumulation of denticles or spines radiating, on both sides, from a central line or ridge formed from the bases of the denticles or spines. An example of a signum showing a combination of denticles, radiating spines and a central ridge is illustrated in Fig. 295 (*Poecilasthena dimorpha*).The signum is usually elongated, but sometimes round or elliptical. In some Asthenini it takes the form of a narrow band. The signum in Asthenini is distinctive, providing, probably, the best defining character for the group. In *Hydrelia*, besides the main signum, a smaller second signum occurs, which is also formed from denticles arranged in the same way. In *Palpoctenidia* the spines are stouter than usual, but the radiating arrangement is the same. In the non-asthenine genus *Pseudostegania* Butler, a signum composed of numerous denticles occurs. However, the arrangement of these differs from the condition in Asthenini for the denticles do not radiate from a central line. The signa in *Sterrhochaeta* Prout also differ. (The type species of this genus, *S. fulgurata* (Warren) is illustrated in Fig. 188.)

In a number of species of Asthenini, the corpus bursae is partly or wholly covered with denticles. Often these denticles are minute, but in some species they are prominent (e.g., as in Fig. 277) with strengthening ridges. These denticles are frequently encountered in *Eupithecia*, but they occur in other genera of Larentiinae such as *Horisme* (see, for example, in Holloway, 1997), in some Sterrhinae and outside the Geometridae. In the Asthenini, these denticles do not occur across individual genera, but are present sometimes in just one species. The taxonomic distribution of these denticles, therefore, renders it difficult to draw wide phylogenetic conclusions from their presence. Nevertheless, when other characters shared by *Eupithecia* and Asthenini are taken into account, the presence of these denticles lends further support for a close association of the taxa.

Venation (Figs 189–192). In most Asthenini the forewing areole is single, but examples of a double areole occur (as in most *Venusia*, in *Bihastina*, and in *Poecilasthena*), and in '*Chalyboclydon*' *flexilinea* and *Palpoctenidia* the areole is absent. Differences between genera also occur in the point at which veins R_1 and R_5 diverge from the common stem in the forewing. In some genera, R_1 diverges before (proximal to) the divergence point of R_5, whereas in others the opposite condition is encountered. In the hindwing, the discocellulars are either markedly angled (biangulate condition) or not so modified. The position of vein M_2 in relation to veins M_1 and M_3, and whether or not M_3 is united at its base (stalked) with CuA_1 are other venational features found to have some taxonomic value.

Layout

A list of species included in each genus of Asthenini is presented with the name of the original genus, if differing from that current, provided in brackets. We have also listed species belonging to some of the non-asthenine genera that are discussed at the end of this paper. References to species listed have not been cited as they are to be found in Scoble (1999), but they are given for type species, which are detailed under the description for each genus.

Depositories of Material

ANIC	The Australian National Collection, Canberra, Australia
BMNH	The Natural History Museum, London, UK
IZAS	Institute of Zoology, Academia Sinica, Beijing, China

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TRIBE ASTHENINI

Astheninae Warren, 1893: 362.

MOTH (Figs 1–177). Generally fairly small compared with other Larentiinae. Body typically slender. *Head.*

Frons often broad and protuberant, but sometimes neither broad nor protuberant. Labial palpi narrow and short, generally not pointed or only weakly pointed. Antenna of male ciliate or smooth, sometimes bipectinate, seldom unipectinate. *Legs* simple: tibial spurs 0–2–4.

Wings generally pale with dark waved transverse lines running from costa of forewing to hind margin of hindwing. Venation as in Figs 189–192. Forewing: usually with areole single, sometimes double, occasionally absent; if areole is absent, vein R never connected to Sc, in contrast with some Eupitheciini. Hindwing: hind margin generally narrow; Sc+R_1 diverging from common stem 3/4 of way along cell; Rs sharing common stem with M_1; 3A absent.

MALE GENITALIA (Figs 193–220; 226–253). Uncus absent or strongly reduced. Anal tube united with tegumen (and uncus vestige, if present); subscaphium often present. Vinculum: extended into broad or narrow saccus. Labides fairly membranous, apex setose. Juxta often broad at base, tapering – sometimes to a slender process posteriorly. Valva: broad, setose, with setae pointing towards base of costa; sacculus usually bearing sclerotized extension, extension sometimes not developed. Anellus: labides present, varying from narrow to broad, or absent; juxta broad or narrow. Aedeagus: narrow; vesica with various sclerotizations.

FEMALE GENITALIA(Figs 268–292). Ductus bursae of constant width, often sclerotized extensively; broader than in *Eois*. Corpus bursae seldom densely denticulate, unlike the condition in Eupitheciini and Trichopterigini, if denticles occur, they do not completely cover corpus bursae; signum distinctive, composed of denticles or spines radiating from central line or ridge formed by their bases; usually somewhat elongated, sometimes in form of narrow band, sometimes almost round; second smaller signum, of same basic composition, sometimes present.

DIAGNOSIS. Asthenines are best distinguished from other Larentiinae by the presence of the distinctive signum. Asthenini share some characters with the tribe Eupitheciini. The combination of extremely narrow and short labial palpi, a generally broad and protuberant frons and relatively broad wings are typical external features of Asthenini. The best diagnostic combination of characters of the genitalia includes the reduced or lost uncus; labides narrow, rather than lobe- or spoon-shaped, and seldom united; and the corpus bursae with a signum (or signa) composed of radiating denticles or spines.

DISTRIBUTION. Asthenini are represented in all the major biogeographical regions. The tribe is at its most diverse in east Asia, but is poorly represented in the Afrotropics and Neotropics.

TAXA INCLUDED. Eighteen genera are included and the species '*Chalyboclydon*' *flexilinea* Warren is unplaced. Two hundred and twenty-seven species group taxa (species and subspecies) are identified as belonging to the tribe.

MATERIAL EXAMINED. About 2900 specimens have been studied: 2558 from the BMNH, and 350 from IZAS. Approximately 400 genitalia slides from the BMNH collection were examined.

Checklist of the genera of Asthenini

Asthena Hübner, [1825] 1816
Hydrelia Hübner [1825] 1816
Agnibesa Moore, 1888
Euchoeca Hübner, [1823] 1816
Epicyme Meyrick, 1885
Eschatarchia Warren, 1894
'*Chalyboclydon*' *flexilinea* Warren, 1898
Palpoctenidia Prout, 1930
Asthenotricha Warren, 1899
Venusia Curtis, 1839
Nomenia Pearsall, 1905 **gen. rev.**
Hastina Moore, 1888
Macrohastina Inoue, 1982
Bihastina Prout, 1916
Leucoctenorrhoe Warren, 1904
Parasthena Warren, 1902
Poecilasthena Warren, 1894
Polynesia Swinhoe, 1892
Anydrelia Prout, 1938

Genera examined and excluded from Asthenini

Minoa Treitschke, 1825
Chalyboclydon Warren, 1893
Cleptocosmia Warren, 1896
Eois Hübner, 1818
Pseudopolynesia Holloway, 1997
Chaetolopha Warren, 1899
Trichodezia Warren, 1895

Key to Genera

1. Forewing usually with R_1 diverging from stem *distal* to divergence point of R_2; if R_1 does not diverge in this way, then either cell of hindwing is no longer than 1/3 of length of hindwing, or discocellulars of forewing are strongly biangulate 2

   Forewing with R_1 diverging from stem *proximal* to divergence point of R5, or united only briefly, or diverging at same point; hindwing cell extending almost to half length of hindwing or beyond; discocellulars of forewing never biangulate 12

2. Cell of hindwing not longer than 1/3 length of hindwing 3

   Cell of hindwing close to or exceeding half length of hindwing 4

3. Forewing with areole absent ..... *'Chalyboclydon' flexilinea*

   Forewing with areole single ..... *Polynesia*

4. Discocellulars strongly biangulate on forewing; male antenna unipectinate, with short pectinations ..... *Nomenia*

   Discocellulars not biangulate on forewing, male antenna never unipectinate 5

5. Antenna in both sexes bipectinate ..... *Leucoctenorrhoe*

   Antenna not bipectinate in either sex 6

6. Discocellulars of hindwing strongly biangulate; male hindwing with hind margin expanded into very large flap which is folded beneath wing and almost reaches to middle of cell ..... *Anydrelia*

   Discocellulars of hindwing not biangulate; male hindwing without this modified flap 7

7. Termen of hindwing with sharp angle, turned upwards at M_3; both wings with fuscous line near the distal margins, that of forewing bent strongly, touching the distal margin medially and enclosing pale marginal patches on upper and lower surfaces ..... *Eschatarchia*

   Termen of hindwing not angled as above; wings lacking fuscous line near distal margins 8

8. Termen of forewing dentate, deeply excavated between R_5 and M_1 9

   Termen of forewing gently curved, lacking tooth or deep excavation 10

9. Frons prominent, broad and rounded; wings dark or pale brown with yellowish lines; vein M_3 never stalked with CuA_1 ..... *Hastina*

   Frons not prominent, nor broad nor rounded; apical area of forewing and distal part of hindwing partly pure white, proximal half of hindwing pale yellowish; vein M_3 sometimes stalked with CuA_1 ..... *Macrohastina*

10. Wings pale greyish to white; hindwing with termen excavated between M_1 and M_3, points at M_1 and M_3 sharp 11

    Wings yellowish brown; hindwing not excavated as described above and lacking point at M_1, termen angled at M_3 but blunt, not sharp ..... *Euchoeca*

11. Small (length of forewing not longer than 10 mm); wings pale greyish, lacking visible white ground colour; male forewing with small anal lobe, male hindwing with posterior margin folded under wing ..... *Parasthena*

    Large (length of forewing not less than 13 mm); white ground colour of wings always visible; male wings lacking such modifications ..... *Agnibesa*

12. Forewing lacking areole; male antenna bipectinate ..... *Palpoctenidia*

    Forewing with 1 or 2 areoles; male antenna not bipectinate 13

13. Discocellulars of hindwing biangulate 14

    Discocellulars of hindwing not biangulate 15

14. Forewing with areole single ..... *Venusia*

    Forewing with areole double ..... *Poecilasthena* (main group and *anthodes* group)

15. Termen of hindwing deeply dentate ..... *Bihastina*

    Termen of hindwing not dentate, smooth or slightly waved, or angled at middle 16

16. Forewing with areole usually double, occasionally single; if areole single, wings white; if areole double, forewing with antemedian, median and double postmedian lines dark brown and running straight below costa; vesica with bundle of cornuti on vesica 17

    Forewing with areole single, markings not as above; vesica without cornuti 18

17. Ground colour of wings pale grey; termen of hindwing weakly dentate at M_1 and M_3, excavated between teeth; male genitalia with coremata; vesica lacking cornuti; proximal edge of sternum A8 of male modified to form 'W' shape ..... *Poecilasthena* (*papuensis* group)

    Ground colour of wings white, termen of hindwing weakly angled medially, seldom dentate and excavated; male genitalia lacking coremata; vesica with cornuti present; sternum A8 unmodified ..... *Asthena*

18. Costa of forewing strongly expanded proximally, or male hindwing with proximal half of costa strongly broadened; hair tuft present on upper surface of costa close to base; anastomosis of $Sc+R_1$ with Rs distinctly less than 3/4 length of hindwing; uncus/tegumen triangular and pointed; labides finger-like, extending to half length of tegumen; anal papillae nearly smooth, distal half of ductus bursae 'Y' shaped 19

    Costa of forewing straight or only very weakly broadened near base, male hindwing lacking hair tuft; anastomosis of $Sc+R_1$ with Rs reaching beyond 3/4 length of hindwing; genitalia variable, but not as described above 20

19. Male hindwing with hair tuft on upper surface of costa close to base; proximal half of hindwing costa strongly broadened ..... *Asthenotricha* (*dentatissima* group)

    Male hindwing lacking hair tuft; hindwing costa not broadened. ..... *Asthenotricha* (*argyridia* group)

20. Frons not broad and protuberant; valva with apex fringed with hair-like scales, which are long and expanded at tips; posterior half of ductus bursae membranous, signum elliptical, with long spines radiating peripherally from denticulate core..... ..... *Epicyme*

    Frons generally broad and distinctly protuberant; if not like this, then genitalia of both sexes different from above ..... *Hydrelia*

Asthena Hübner, [1825] 1816

(Figs 1–15; 189; 193–195; 226–228; 268,269.)

Asthena Hübner, [1825] 1816: 310. Type species: *Geometra candidata* [Denis & Schiffermüller], 1775: 110 (a junior synonym of *Asthena albulata* Hufnagel).

Roessleria Breyer, 1869: xix. Type species: *Geometra candidata* [Denis & Schiffermüller], 1775: 110.

MOTH (1–15). *Head*. Frons neither broad nor protuberant. Labial palpi very slender and short, generally not extending beyond front of head. Antenna of male serrate, with hair tuft in type species and *nymphaeata*, or smooth. *Wings*. White or off-white in most species with pale brown, weak fasciae; appearance pale brown in e.g., *plenaria*; mottled brown in *albosignata*; fasciae bold in *opedogramma* and *tchratchraia*. Venation (Fig. 189) with cell on both wings extending slightly less than half length of wing; forewing with areole usually double, sometimes single; vein R_1 arising proximal to apex of second areole; R_5 arising from apex of second areole or united for short distance with R_{2-4}; hindwing with discocellulars slightly curved, not biangulate, distal margin slightly angled at M_3.

MALE GENITALIA (Figs 193–195; 226–228). Labides in form of well-developed, straight arms, sometimes reduced to very short processes, sometimes absent. Juxta broad, extending anteriorly into a narrow process so that whole appears flask-shaped. Valva: sacculus usually with distinctive double projection of a longer, narrow spine-like process and a shorter, broader process with short hairs at apex, notably complex in *amurensis*; costa margin weakly convex. Aedeagus: vesica with spine-like cornuti. Abdomen: sternum A8 unmodified.

FEMALE GENITALIA (Figs 268,269). Ductus bursae sclerotized throughout length except for very short membranous section. Corpus bursae: signum generally short and broad, composed of radiating denticles; spinose patch often occurring in addition to discrete signum; surface of corpus often partly covered with minute denticles.

DIAGNOSIS. Most species of *Asthena* may be distinguished from species in other asthenine genera by the white ground colour of the wings, but this feature is not universal within the genus. Both *anseraria* and *lassa* resemble superficially certain *Scopula* species (Sterrhinae). Distinguishing characters include the fact that the frons is neither broadened nor protuberant, and the unstalked condition of vein R_1 of the forewing. The most distinctive character is the complex form of the sacculus with its two projections. The presence of cornuti on the vesica of *Asthena* distinguishes it from *Hydrelia* where these structures are absent.

DISTRIBUTION. Across the Palaearctic region and in India.

SPECIES INCLUDED. Twenty-two described. There is an undescribed species from Burma represented by a single, worn male specimen in the BMNH. Genitalia examined: *A. albosignata* (male, female), *albulata* (male, female), *amurensis* (male), *anseraria anseraria* (male, female), *anseraria corculina* (male, female), *hamadryas* (male), *lassa* (male), *nymphaeata* (male, female), *opedogramma* (male, female), *plenaria* (male), *sachaliensis* (female), *melanosticta* (male, female), *octomacularia* (female), *tchratchraria* (female), *undulata* (male, female).

Asthena albidaria (Leech, 1897)

China.

Asthena albosignata (Moore, 1888) *(Idaea?)*

India, China, Kashmir.

Asthena albulata (Hufnagel, 1767) *(Phalaena)*

Geometra candidata [Denis & Schiffermüller], 1775

Widespread in the Palaearctic.

Asthena amurensis (Staudinger, 1897)

Cidaria candidata amurensis Staudinger, 1897.
Asthena hamadryas Inoue, 1976. **Syn. n.**

Russia, Japan, Korea.

Asthena anseraria anseraria (Herrich-Schäffer, 1855) *(Arrhostis?)*

Cidaria soldaria Turati, 1879.

Widespread in the Palaearctic.

Asthena anseraria corculina Butler, 1878

Japan, China.

Asthena lactularia (Herrich-Schäffer, 1855) *(Hydrelia)*

? *albeolata* Rambur, 1866
Asthena nymphulata Guenée, [1858]

France, Spain.

Asthena lassa Prout, 1926

Burma.

Asthena livida (Warren, 1896) comb. n. *(Autallacta)*

India.

REMARKS. This species differs from others in *Asthena*, and its position in the genus is uncertain. The moth is uniformly dark brown rather than white or otherwise pale. Furthermore, the cell on both fore- and hindwing is very short – on the hindwing it is only 1/3 the length of the wing. The free section of vein R_1 of the forewing is unusually long. The male genitalia are

unusual in having an elongated tegumen and narrow, but well developed, curved labides. Both these characters are reminiscent of the condition in *Polynesia*, but the wing pattern is completely different and the saccus is not truncated as in that genus.

Asthena melanosticta Wehrli, 1924

China.

Asthena nymphaeata (Staudinger, 1897) *(Cidaria)*

Acidalia ainoica Matsumura, 1927.

Russia, Japan, Korea, China.

Asthena ochrifasciaria Leech, 1897

Japan.

Asthena octomacularia (Leech, 1897)

China, Japan.

Asthena opedogramma (Prout, 1926) comb. n. *(Hydrelia)*

Burma, China.

REMARKS. This species and *tchratchraria* Oberthür were treated as members of *Hydrelia* by Prout (1926, 1934–39) probably because Prout thought that the areole in the forewing was always single in that genus, whereas in *Asthena* it is double. Having checked all specimens of both species in the BMNH and IZAS, we discovered that the number of areoles varies. In some specimens just a single areole is, indeed, present. But in others, the areole is double on both the right and the left forewing, and in yet others it is double on just the right *or* the left fore wing. When the areole is double, the first (more proximal) areole is very small. The two species share most characters of typical *Asthena* other than the presence, sometimes, of a single areole. The frons is only weakly protuberant, cornuti are present, and the signum is short and broad, as in many *Asthena* species. Unique to the species is the presence of well-sclerotized spines on the lateral parts of the juxta, labides and terminal half of the sacculus.

Asthena plenaria (Leech, 1897) *(Hydrelia)*

China.

Asthena sachaliensis (Matsumura, 1925)

Japan, Russia.

Asthena tchratchraria (Oberthür, 1893) *(Acidalia)*

Burma, China.

(See Remarks under *opedogramma* Prout.)

Asthena undulata (Wileman, 1915) *(Leucoctenorrhoe)*

China.

The *albifera* group

The following four species have a single areole, but the genitalia are very similar to *Asthena* notably in the shapes of the sacculus, juxta, and vinculum. Additional spining occurs on the corpus bursae in addition to the denticulate signum.

The *albifera* group differs from *Hydrelia* in having a pure white ground colour, a narrow and non-protuberant frons, and a bundle of cornuti on the vesica of the aedeagus. All of these characters correspond to those in *Asthena*.

Genitalia examined: *albifera* (male, female), *chionata* (male), *percandidata* (male, female).

Asthena albifera (Walker, 1866) *(Acidalia?)*

Acidalia albogilvaria Morrison, 1874
Corycia triseriata Packard, 1874

North America.

Asthena brunneifasciata (Packard, 1876)

Canada.

Asthena chionata (Lederer, 1870) *(Cidaria)*

Cidaria quadripunctata Biernert, [1871]

Iran.

Asthena percandidata (Christoph, 1893) *(Cidaria)*

Cidaria anseraria candidissima Staudinger, 1897

Transcaucasus, Central Asia.

Species excluded

The following species, which have been associated with *Asthena* in the past, belong neither to that genus, nor to the tribe Asthenini. Genitalia examined: *argentipuncta* (male, female), *argyrorrhytes* (male, female), *aurantiaca* (male), *eurychora* (female), *straminearia* (male, female), *yargongaria* (male).

'Asthena' argentipuncta Warren, 1906 *(Asthena)*

Papua New Guinea.

'Asthena' argyrorrhytes Prout, 1916 *(Asthena)*

Irian Jaya.

***'Asthena' aurantiaca* Prout, 1926** *(Asthena)*

Irian Jaya.

***'Asthena' distinctaria* (Leech, 1897)** *(Hydrelia)*

China.

***'Asthena' eurychora* Prout, 1928** *(Asthena)*

Western Samoa.

***'Asthena' straminearia* (Leech, 1897)** *(Hydrelia)*

China.

***'Asthena' subditaria* Warren, 1906** (*Asthena*)
Papua New Guinea.

***'Asthena' yargongaria* Oberthür, 1916** *(Asthena)*

China.

Hydrelia Hübner, [1825] 1816

(Figs 16–68; 196,197; 229,230; 270.)

Hydrelia Hübner, [1825] 1816: 322. Type species: *Geometra sylvata* [Denis & Schiffermüller], 1775: 109.

Autallacta Warren, 1893: 365. Type species: *Timandra subobliquaria* Moore, 1868: 644.

MOTH (Figs 16–68). *Head*. Frons broad and prominent. Labial palpi very slender and short, generally not extending beyond front of head. Antenna weakly serrate, ciliated in male, simple in female. *Wings*. Rather narrower than in *Asthena* and *Venusia*. Colour variable: most species grey-brown with weak transverse band and lines; some species ochreous; strong transverse line or lines in a few species; some species with yellow ground colour; a few species with wings dark grey-brown with contrasting white markings. Forewing with single areole, varying in size among species; vein R_1 diverging from common stem before (proximal to) point of divergence of R_5. Hindwing: termen sometimes angled medially; discocellulars not biangulate; vein M_3 usually not stalked with CuA_1, but stalked on both wings in a few species.

MALE GENITALIA (Figs 196,197, 229,230). Labides in form of a pair of long, curved, spine-like processes in type species and relatives; processes smaller and membranous in other species or united with opposite member. Juxta variable; narrow and extended, plate-like or reduced to small sclerite between the bases of the valvae. Valva usually narrows to apex; sacculus typically extended into a thumb-like projection, sometimes sacculus not extended. Aedeagus: vesica lacking cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 270). Anal papillae extended to form more attenuated ovipositor in type species and relatives compared with other species, where ovipositor is much flatter. Ductus bursae: antrum sclerotized throughout apart from a narrow membranous break. Corpus bursae often with numerous minute denticles; signum typically elongated, composed of radiating denticles; many species with a small additional signum, similarly composed, at posterior end of corpus; surface of corpus partly or wholly covered with minute denticles.

DIAGNOSIS. Close to *Asthena*, *Venusia* and *Agnibesa*. *Hydrelia* differs from *Asthena* in having a generally broad and strongly prominent frons, in the ground colour of the wings seldom being pure white, in having a single areole on the forewing, in lacking cornuti on the aedeagus, and in having a signum typically elongated and often band-like. *Hydrelia* lacks biangulate discocellulars on the hindwing and in this way differs from *Venusia*. It may be distinguished from *Agnibesa* by several features (see Diagnosis of *Agnibesa*).

DISTRIBUTION. Palaearctic, Nearctic and Oriental Regions.

REMARKS. The integrity of *Hydrelia* as a monophyletic entity remains in doubt, there being no very convincing apomorphy. Wing shape and pattern assist recognition of the genus as it stands now. The male genitalia of the type species *H. sylvata* (Fig. 197), and its relatives differ from those of other species (e.g., as in Fig. 196) and it may eventually be necessary to restrict the genus *Hydrelia* to this group. We do not make such a restriction here since *Hydrelia* is sufficiently coherent and well known to make it counterproductive to split it until a full species-level revisionary study has been undertaken.

Preliminary study has identified several species groups, although we do not treat them as formal taxa at this stage, and nor are the suggested divisions comprehensive.

The *sylvata* group. The type species of *Hydrelia*, *H. sylvata* (D. & S.), which is similar to the Nearctic species *H. lucata* (Guenée), bears a pair of long, narrow and curved labides. The juxta of these species unites, anteriorly, with a long and narrow dorsal sclerite of the diaphragma. The labides are broader and straight in *flammeolaria* (Hufnagel). That *sylvata* and *flammeolaria*, both European species, are closely related is evident from the relatively attenuated ovipositor in each and in the similar shape of the valva. The larval foodplant range overlaps, in that both species occur on *Alnus* (Betulaceae). The Nearctic species *condensata*, *inornata* and *lucata* also belong to this

group. Oriental species that appear to belong with *sylvata* and its relatives include *aurantiaca*, *rufigrisea*, *sericea*, *nepalensis*, *rubrilinea*, ?*lineata*, ?*laetivirga*, *rhodoptera*, *marginepunctata*, *binotata*, *rubricosta*, *sanguiniplaga*, *nisaria*. The following species, which exhibit similarities in wing shape and markings may also be associated, or, may form a separate group: *sericea, rubrilinea, lineata, laetivirga*.

The *aggerata* group. The largest of these species groups, which is Oriental in distribution (mainly Chinese), is a monophyletic assemblage including *aggerata* and its relatives and is defined by several characters. The labides seem to be absent and should not be confused with a pair of setose, membranous projections from the diaphragma. An additional feature, giving some further possible support to the grouping is that the valva is broad with the sacculus projected in such a way as to form a wide, c. 90° angle, with the costa. Unlike the condition in the *sylvata* group, the ovipositor is short and not pointed. Species belonging here include: *aggerata*, *aurantiaca*, *bella*, *bicolorata*, *conspicuaria*, *crocearia*, *ornata*, *pavonica*, *rubrivena* and *subobliquaria*.

The *ungularia* group (Oriental) has a rounded valva that lacks a projection of the sacculus. The dorsal sclerite of the diaphragma is absent. Species identified: *latsaria*, *microptera*, *subtestacea* and *ungularia*.

The valva of *H. impleta* Prout differs in shape.

In *subobliquaria* (Moore) from Bengal, the valva resembles more closely that of the *sylvata* group than that of *aggerata* and its relatives, but the labides, although distinct, are shorter and membranous.

SPECIES INCLUDED. 61 species. Genitalia examined: *aggerata* (male), *aurantiaca* (male, female), *bella* (male, female), *bicolorata* (male, female), *binotata* (male, female), *condensata* (female), *conspicuaria* (male, female), *controversa* (male, female), *crocearia* (male, female), *elegans* (female), *enisaria* (male), *fuscocastanea* (male, female), *impleta* (male), *inornata* (female), *laetivirga* (male), *latsaria* (male), *lineata* (male, female), *lucata* (female), *marginepunctata* (male, female), *microptera* (male, female), *nepalensis* (male, female), *ornata* (male), *pavonica* (male), *rubricosta* (male), *rubrilinea* (male, female), *rubrivena* (male, female), *rufinota* (female), *sericea sericea* (male, female), *subobliquaria* (male, female), *rhodoptera* (male, female), *speciosa* (male), *sanguiniplaga* (male), *subcingulata* (male), *subtestacea* (male), *sylvata* (male), *undularia* (male).

Hydrelia aggerata Prout, 1938

China.

Hydrelia arizana (Wileman, 1911) *(Acidalia)*

China.

Hydrelia aurantiaca Hampson, 1903

China, Nepal.

Hydrelia bella (Wileman, 1916) sp. rev. *(Venusia)*

China.

REMARKS. The species was listed as a synonym of *bicolorata* (Moore) in Scoble (1999), but the genitalia are distinct and it is treated here as a separate species. Male with valva much narrower than in *bicolorata* (Moore), shape intermediate between that species and *aggerata* Prout from W. China. In the female, the signum in *bella* is possibly larger than that in *bicolorata*.

Wileman (1916: 97) cited the type material as: 'A male specimen from Arizan (7300 ft.), September 27th, 1906, a female specimen from Arizan, August, 1908; and another from Rantaizan, May, 1909 (7500).' The 'male' syntype is, in fact, a female, and there is no specimen of the male sex in the type series.

Hydrelia bicauliata Prout, 1914

Japan, China.

Hydrelia bicolorata (Moore, 1868) *(Hyria)*

Eupithecia ferruginaria Moore, 1868.

China, India, Sikkim.

Hydrelia binotata Inoue, 1987

China, Nepal.

Hydrelia castaria (Leech, 1897) *(Plemyria)*

China.

Hydrelia cingulata Hampson, 1896

China.

Hydrelia condensata (Walker, 1862) *(Melanthia)*

U.S.A.

Hydrelia conspicuaria (Leech, 1897) *(Cambogia)*

China.

REMARKS. This species and *H. elegans* (Inoue) were long assigned to *Palpoctenidia*. Both species were described from just a single female holotype. The discovery of a male specimen of *conspicuaria* has enabled us to examine the genitalia of that sex, which shows that it belongs to *Hydrelia*. Furthermore, there is a single small areole on the forewing in both

conspicuaria and *elegans*, which is absent in most specimens of the only species of *Palpoctenidia*.

***Hydrelia controversa* Inoue, 1982**

Nepal.

***Hydrelia crocearia* Hampson, 1896**

China.

***Hydrelia elegans* (Inoue, 1982) comb. n.**

Nepal.

***Hydrelia enisaria* Prout, 1926**

Burma

***Hydrelia flammeolaria* (Hufnagel, 1767)** *(Phalaena)*

Phalaena centrata Fabricius, [1776].
Asthena chibiana Matsumura, 1925.
Geometra flavicata Thunberg, 1784.
Phalaena flavostrigata Donovan, 1806.
Geometra luteata [Denis & Schiffermüller], 1775
Phalaena sinuosata Giorna, 1791

Widely distributed across the Palaearctic from western Europe to Japan.

***Hydrelia flammulata* (Bastelberger, 1911)** *(Cambogia)*

China.

***Hydrelia flavilinea* (Warren, 1893)** *(Cambogia)*

Sikkim, China.

***Hydrelia fuscocastanea* Inoue, 1982**

Nepal.

***Hydrelia gracilipennis* Inoue, 1982**

Japan.

***Hydrelia impleta* Prout, 1938**

China.

***Hydrelia inornata* (Hulst, 1896)**

Tephroclystis inornata Hulst, 1896.
Euchoeca exhumata Pearsall, 1906.

U.S.A.

***Hydrelia laetivirga* Prout, 1934**

China.

***Hydrelia latsaria* (Oberthür, 1893)** *(Acidalia)*

China.

***Hydrelia leucogramma* Wehrli, 1931**

China.

***Hydrelia lineata* (Warren, 1893)** *(Autallacta)*

Sikkim, China, Nepal.

***Hydrelia lucata* (Guenée, [1858])** *(Asthena)*

Canada.

***Hydrelia luteosparsata* Sterneck, 1928**

China.

***Hydrelia marginepunctata* Warren, 1893**

Sikkim, China, Nepal.

***Hydrelia microptera* Inoue, 1987**

Nepal, China.

***Hydrelia musculata* (Staudinger, 1897)** *(Cidaria)*

Russia.

***Hydrelia nepalensis* Inoue, 1987**

Nepal, China.

***Hydrelia nisaria* (Christoph, 1881)** *(Acidalia)*

Hydrelia nisaria japonica Inoue, 1944

Russia, China, Japan, Korea.

***Hydrelia ochrearia* Leech, 1897**

China.

***Hydrelia ornata* (Moore, 1868)** *(Hyria)*

India, Sikkim, Nepal, China.

***Hydrelia parvularia* (Leech, 1897)** *(Plemyria)*

China.

***Hydrelia parvulata* (Staudinger, 1897)** *(Cidaria)*

Russia.

***Hydrelia pavonica* Xue, 1999**

China.

***Hydrelia rhodoptera* Hampson, 1895**

Sikkim, China.

***Hydrelia rubraria* Hampson, 1903**

China (Tibet).

***Hydrelia rubricosta* Inoue, 1892**

Nepal, China.

***Hydrelia rubrilinea* Inoue, 1987**

Nepal, China.

***Hydrelia rubrivena* Wileman, 1911**

China (Taiwan).

REMARKS. The abdomen of the type of *rubraria* Hampson is missing, so we have been unable to confirm the currently accepted identity as valid. *H. rubrivena* may be a junior synonym of *aurantiaca* Hampson. The wing markings are similar but the colour differs between the two species. The male genitalia of both species are also quite similar. In the female, the corpus bursae is smaller in *rubrivena* and the signum shorter and broader. *H. rubraria* has the same markings as both *rubrivena* and *aurantiaca*.

***Hydrelia rufigrisea* (Warren, 1893)** *(Asthena?)*

Sikkim, China.

***Hydrelia rufinota* Hampson, 1896**

India, China.

***Hydrelia sanguiflua* Hampson, 1896**

China.

***Hydrelia sanguiniplaga* Swinhoe, 1902**

China, Burma.

***Hydrelia scotozona* Yazaki, 1995**

Nepal.

***Hydrelia sericea sericea* (Butler, 1880)** *(Noreia)*

China, Nepal, N. E. Himalaya.

***Hydrelia sericea pampesia* Prout, 1938**

Kashmir.

***Hydrelia shioyana* (Matsumura, 1927)** *(Acidalia)*

Hydrelia adesma Prout, 1930.

Japan.

***Hydrelia speciosa* Inoue, 1992**

Nepal.

***Hydrelia subcingulata* Inoue, 1987**

Nepal, China.

***Hydrelia sublatsaria* Wehrli, 1938**

China.

***Hydrelia subobliquaria* (Moore, 1868)** *(Timandra)*

India, China, Nepal, Sikkim.

***Hydrelia subtestacea* Inoue, 1982**

Nepal, China.

***Hydrelia sylvata* ([Denis & Schiffermüller], 1775)** *(Geometra)*

Hydrelia sachalinensis Matsumura, 1925.
Phalaena testaceata Donovan, 1810.

Palaearctic, from western Europe to Japan.

***Hydrelia tenera* (Staudinger, 1897)** *(Cidaria)*

Russia.

***Hydrelia terraenovae* Krogerus, 1954**

Canada.

***Hydrelia ulula* Bastelberger, 1911**

China (Taiwan).

***Hydrelia undularia* (Leech, 1897)** *(Venusia)*

China, Nepal.

***Hydrelia undulosata* (Moore, 1888)** *(Hyria)*

India.

Species excluded

Genitalia examined: *flavidula* (male, female).

***'Hydrelia' flavidula* (Warren, 1907)** *(Hastina)*

Papua New Guinea.

REMARKS. This sexually dimorphic species does not belong to *Hydrelia* nor, indeed, to the Asthenini, although the uncus is absent. The frons is narrow and flat and the antenna in both sexes bears paired hair tufts, which are extremely long in the male. The labides are weak, united medially and bear a pair of setose processes. The valva is very long and narrow, with the

costa strongly sclerotized and with a sharp terminal process; the sacculus lacks a process. The female genitalia are similar to those of *Acolutha* Warren in having a globose corpus bursae covered with *Eupithecia*-like spines and an appendix bursae.

Agnibesa Moore, 1888

(Figs 69–75; 190; 198, 231; 271.)

Agnibesa Moore, 1888: 256. Type species: *Somatina pictaria* Moore, 1868: 645.

MOTH (Figs 69–75). *Head.* Frons almost as prominent as in *Hydrelia*, but less broad. Labial palpi minute. Male antenna ciliated. *Wings.* White, variously marked, all species with some yellow suffusion particularly on forewing. Venation as in Fig. 190. Forewing relatively elongated, with apex not pointed, termen smooth; areole single and small; vein R_1 diverges from stem of R_{2-5} after (i.e., distal to) point of divergence of vein R_5. Hindwing with termen crenulated; discocellulars not biangulate; vein M_2 arising nearer M_1 than M_3.

MALE GENITALIA (Figs 198, 231). Labides expanded at apex. Juxta narrow to moderate. Valva: sacculus extended into short, narrow projection beyond the valva. Aedeagus: vesica bearing numerous minute denticles. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 271). Ductus bursae with strongly sclerotized antrum of varying length. Corpus bursae globose with scattering of denticles or short spines arranged as an ill-defined band across middle; signum composed of radiating denticles, sometimes with second, smaller signum nearer posterior end of corpus.

DIAGNOSIS. The adults of most species of *Agnibesa* are larger than in *Hydrelia* and always have a pure white ground colour. Whereas in *Hydrelia* vein R_1 of the forewing diverges from the common stem before R_5 diverges, in *Agnibesa* R_1 diverges after (distal to) the divergence point of R_5. The vesica of the aedeagus bears many minute denticles in *Agnibesa* but not in *Hydrelia*. The corpus bursae in *Agnibesa* has a conspicuous, largely medial scattering of denticles, which are lacking in *Hydrelia*. *Agnibesa* is distinguished from *Euchoeca* by the fact that the moths are larger, by the narrower forewing, the white ground colour and the presence of minute denticles on the vesica.

DISTRIBUTION. China, India, Nepal, Sikkim.

SPECIES INCLUDED. Six species. Genitalia examined: *pictaria pictaria* (male, female), *pictaria brevibasis* (male), *pleopictaria* (male, female), *plumbeolineata* (male, female), *punctilinearia* (male, female), *recurvilineata recurvilineata* (male, female), *recurvilineata meroplyta* (male, female), *venusta* (male).

Agnibesa pictaria pictaria (Moore, 1868) *(Somatina?)*

India, Nepal, Sikkim, China (Tibet, from the frontier to Nepal to Medog).

Agnibesa pictaria brevibasis Prout, 1938

China (Shanxi, Gansu, Sichuan, Yunnan, Tibet (recorded at Bomi, which is N E of Medog)).

REMARKS. The two subspecies of *pictaria* are geographically separated in Tibet by Mt Namjagbarwa (Xue & Zhu, 1999).

Agnibesa pleopictaria Xue, 1999

China.

Agnibesa plumbeolineata (Hampson, 1895) *(Hydrelia)*

Sikkim, China.

Agnibesa punctilinearia (Leech, 1897) *(Hydrelia)*

China.

Agnibesa recurvilineata recurvilineata Moore, 1888

India, Nepal, Sikkim.

Agnibesa recurvilineata meroplyta Prout, 1938

China.

Agnibesa venusta Warren, 1897

Sikkim, Nepal, China.

Euchoeca Hübner, [1823] 1816

(Figs 76; 199, 232; 272.)

Euchoeca Hübner, [1823] 1816: 298. Type species: *Geometra hepararia* Hübner, [1799] 1796: pl. 11, fig. 58, a junior synonym of *E. nebulata* (Scopoli, 1763: 215).

MOTH (Fig. 76). *Head.* Frons a little less protuberant than in *Hydrelia*. Labial palpi minute, hardly extending beyond frons. Antenna with short cilia. *Wings.* Grey-brown. Forewing almost triangular, costa almost straight, termen weakly convex; areole single, vein R_1 stalked with R_{2-5}, diverging from stem after R_5, which diverges at apex of areole (as in *Agnibesa*). Hindwing: termen smooth, angled at position of vein M_3; discocellulars not biangulate; vein M_2 arising well anterior to middle of discocellulars.

MALE GENITALIA (Figs 199, 232). Saccus broad. Labides narrow, curved, extending beyond tegumen. Juxta in form of a broad plate extending into a slender digitate process. Valva narrow at base, broadening apically into a broader lobe; sacculus extending just beyond margin of valva. Aedeagus: vesica lacking cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 272). Ductus bursae weakly sclerotized. Corpus bursae with two signa and a scattering of minute denticles; signum prominent, long and narrow, composed of radiating denticles; small, approximately round denticulate signum situated posteriorly.

DIAGNOSIS. Unlike the condition in the forewing of *Hydrelia*, in *Euchoeca nebulata* vein R_1 diverges distal to the divergence point of vein R_5. The apex of the forewing is more rounded than in most species of *Hydrelia*. The male genitalia exhibit some similarity to those of *Agnibesa* and *Asthenotricha*, but *E. nebulata* is distinctly smaller than in these other genera and differs also in being almost uniformly grey-brown. The scattered denticles on the corpus bursae of *Euchoeca* are minute and far less prominent than those found in *Agnibesa* or *Asthenotricha*.

REMARKS. Only one species is recorded under this genus. The species, *cichisa* Prout, 1939 (Prout, 1934–1939: 253, pl. 18: c, type specimens from West China: Mt Omei, Gipfel., in BMNH, examined) was placed under *Euchoeca* by Parsons *et al.* (*in* Scoble, 1999) under the mistaken assumption that Prout had described it under that genus. In fact, *cichisa* was originally described under *Eupithecia* where it properly belongs.

DISTRIBUTION. Europe, Transcaucasia, Russia, Japan.

SPECIES INCLUDED. The genus is monotypic. Genitalia examined: *nebulata* (male, female).

Euchoeca nebulata (Scopoli, 1763)
(Phalaena)

Geometra hepararia Hübner, [1799].
Geometra heparata [Denis & Schiffermüller], 1775
Phalaena obliterata Hufnagel, 1767
Phalaena strigata Thunberg, 1788

Widespread in Europe, and across Russia to Japan.

FOODPLANTS. Betulaceae: *Alnus glutinosa*; *Alnus incana*; *Alnus*.

Epicyme Meyrick, 1885

(Figs 77; 200, 233; 273.)

Epicyme Meyrick, 1885: 589. Type species: *Ptychopoda rubropunctaria* Doubleday, 1843: 287. [Replacement name for *Hippolyte* Meyrick.]

Hippolyte Meyrick, 1883: 526. Type species: *Ptychopoda rubropunctaria* Doubleday, 1843. [Junior homonym of *Hippolyte* Leach, [1814] 1830 (Crustacea).]

MOTH (Fig. 77). *Head.* Frons narrow, not prominent. Labial palpi narrow and short. Antenna simple, ciliated in male. *Wings.* Brownish with numerous wavy transverse lines, female with large, darker brown, irregular spots on lower half of forewing at postmedial position. Wing shape and venation of forewing as in *Hydrelia*, but vein R_1, R_{2-4} and R_5 arising independently from near apex of areole, not sharing a common stem. Hindwing: apex pointed, termen weakly angled medially; vein M_3 of the hindwing stalked with CuA_1.

MALE GENITALIA (Figs 200, 233). Labides present as membranous outpushings of diaphragmata (difficult to discern in slide preparations) with numerous setae. Juxta with narrow extension. Valva weakly but distinctively curved; hair-like scales arising from apex; costa weakly sclerotized, broadened slightly at middle; sacculus not extended or otherwise modified. Aedeagus: vesica lacking cornuti.

FEMALE GENITALIA (Fig. 273). Ductus bursae mostly membranous, anterior portion sclerotized. Corpus bursae with small bundle of spines near cervix bursae; signum elliptical, composed of long radiating spines.

DIAGNOSIS. Many external characters are similar to those in *Hydrelia*, but the frons is narrow and not prominent in *Epicyme rubropunctaria*. The genitalia, however, differ strongly: in *Epicyme* the valva bears a series of long, fixed hair-like setae with expanded apices around its distal margin, the sacculus of the valva is not sclerotized and lacks an extension, the ductus bursae is unsclerotized posteriorly, and the signum is composed of long radiating spines rather than denticles. The male genitalia of *E. rubropunctaria* are similar to those of the monotypic Peruvian genus *Leucoctenorrhoe*, but there are many differences between them: notably, in *Leucotenorrhoe* the antenna are bipectinate (in both sexes); vein R_1 of the forewing arises independently from near the apex of the areole; and vein M_3 of the hindwing is stalked with CuA_1.

DISTRIBUTION. Australia, New Zealand.

REMARKS. Unlike most Asthenini, the frons of this species is not prominent, the sacculus of the valva is not extended, and the labides are inconspicuous, membranous outpushings. However, the reduced condition of the labial palpi and the uncus, and the signum with its radiating spines means that the genus is reasonably included in the tribe.

SPECIES INCLUDED. One species is known. Genitalia examined: *rubropunctaria* (male, female).

***Epicyme rubropunctaria* (Doubleday, 1843)**
(Ptychopoda)

Asthena mullata Guenée, 1868.
Asthena risata Guenée, [1858].
Asthena vexata Walker, 1869.

Australia, New Zealand.

Eschatarchia Warren, 1894

(Figs 78; 201, 234; 274.)

Eschatarchia Warren, 1894: 395. Type species: *Eschatarchia lineata* Warren, 1894: 295.

MOTH (Fig. 78). *Head.* Frons not broadened, slightly protuberant. Labial palpi minute, projecting slightly beyond head. Antenna in both sexes ciliate. *Wings* broad, off-white with strong markings at termen; both wings with termen angled at M_3 and crenulated from apex to angle, nearly straight below angle; vein R_1 diverging from the common stem of R_{2-4} beyond (distal to) the divergence point of R_5; venation almost identical to that of *Agnibesa*, but forewing with areole larger.

MALE GENITALIA (Figs 201, 234). Saccus large. Labides broad, as long as the length of tegumen, expanded terminally into relatively membranous head. Juxta slightly constricted medially. Valva broad; sacculus well sclerotized, extending beyond margin, asymmetrical between each valva in shape and size. Aedeagus: vesica with patch of cornuti and three sclerotized plates. Sternum A8 of abdomen unmodified.

FEMALE GENITALIA (Fig. 274). Apophyses anteriores short. Ductus bursae strongly sclerotized to the distal part of corpus bursae. Corpus bursae covered almost entirely with minute denticles; signum composed of radiating denticles.

DIAGNOSIS. The wing colour and pattern of *Eschatarchia lineata* resembles that of *Chalyboclydon marginata* (excluded from Asthenini, see p. 106). The asymmetrical valvae and the wing markings are good distinguishing features of *Eschatarchia*. It is further distinguished from *Hydrelia* by its forewing venation, vein R_1 diverging from the common stem of R_{2-4} beyond (distal to) the divergence point of R_5.

DISTRIBUTION. Japan, China, Burma.

SPECIES INCLUDED. One described species. Genitalia examined: *lineata formosana* (male), *lineata lineata* (male, female), undescribed species from Burma and West China (male).

Eschatarchia lineata Warren, 1894

Hydrelia angularia Leech, 1897
Eschatarchia lineata formosana Inoue, 1970. **Syn. n.**

Japan, China, Burma.

REMARKS. The subspecies *formosana* was described (Inoue, 1970) because of its more deeply incurved submarginal dark line on the forewing and the slightly more pronounced angle of the termen. These characters, however, can be found in certain specimens of the nominate subspecies from Japan, and some of them vary even more strongly. The male genitalia of the type specimens of *lineata* and *formosana* are indistinguishable.

Prout (1934–1939: 180) wrote of a darker 'form' of *lineata* from Burma. The median band on the underside of both wings, which is composed of four dark lines, is complete, not interrupted or reduced. The male genitalia also differ somewhat from *lineata*: the sacculus lobe of the left side is markedly narrower, and the main bundle of cornuti are very weak and small, with the individual spines much shorter. Prout predicted that the form would probably be discovered in West China. We have, indeed, located a male from Sichuan Province, West China, which is quite similar to the specimen from Burma. Given the differences, it seems likely that the form from Burma and West China represents an undescribed species.

'Chalyboclydon' flexilinea Warren, 1898

(Figs 79; 202, 235; 275.)

The generic placement of *flexilinea* is unclear. It is not congeneric with the type species of *Chalyboclydon* Warren (*C. marginata* Warren), with which it was combined in the past. However, given the substantial amount of work that is evidently needed on the Larentiinae, we prefer at this stage neither to force a doubtful recombination with another asthenine genus, nor to describe a new genus for *flexilinea*. Details of *marginata* are provided under *Chalyboclydon* below. The wing markings of *flexilinea* and *marginata* are similar but distinct (compare Figs 79, 180); the venation and genitalia differ markedly.

MOTH (Fig. 79). *Head.* Frons slightly more prominent than in *marginata*, labial palpi shorter. Antenna simple in both sexes. *Wings.* Forewing: apex less produced, termen hardly marked. Hindwing with hind margin elongate and a little incurved, anal angle pointed; termen hardly angled. Venation: forewing with areole absent; stalk of R_{1-5} arising from upper angle of cell; R_1 diverges from common stalk after (distal to) point of divergence of R_5; hindwing with $Sc+R_1$ combined with Rs to near end of cell, Rs stalked with M_1; cell in both wings extremely short, maximum length less than 1/3 of wing length; discocellulars less oblique than in *marginata*; M_2 arising slightly closer to M_1 than to M_3; M_3 stalked with CuA_1, CuA_2 arising near lower angle of cell.

MALE GENITALIA (Figs 202, 235). Saccus broad, with a narrower, nearly quadrate extension. Labides well developed, with bases triangular, apex slightly broadened and setose. Juxta broad. Valva costa simple; sacculus much simpler than in *marginata*, with small spine-like process extending just beyond margin of valva. Aedeagus: vesica with some scattered denticles. Abdomen: sternum A8 unmodified.

FEMALE GENITALIA (Fig. 275). Ductus bursae long, anterior half sclerotized. Corpus bursae long, shorter than ductus bursae, with two small signa composed of radiating denticles, one near cervix bursae and another at middle, dense covering of denticles on side opposite signa. Sternum A7 not modified.

DIAGNOSIS. '*C.*' *flexilinea* differs from *C. marginata* in several ways. The forewing lacks an areole and in the hindwing M_3 is stalked with CuA_1. The very short cell in both wings differs from almost all other genera other than *Cleptocosmia*. In *Cleptocosmia* the palpi are longer and the basal half of the forewing is clothed with erect furry hair in the male. The male and female genitalia are distinctive.

DISTRIBUTION. India, Sikkim, Burma.

Genitalia examined: *flexilinea* (male, female).

'Chalyboclydon' flexilinea Warren, 1898: 22

India, Sikkim, Burma.

REMARKS. The species was described from a single female specimen, labelled as *flexilinea* by Warren and, incorrectly, as *Chalyboclydon marginata* Warren by Prout (for details see below under *Chalyboclydon*).

Palpoctenidia Prout, 1930

(Figs 80, 81; 203, 236; 259; 276.)

Palpoctenidia Prout, 1930: 311. Type species: *Chrysocraspeda phoenicosoma* Swinhoe, 1895: 294.

MOTH (Figs 80,81). *Head.* Frons broad, moderately protuberant in male, flat in female. Labial palpi slender, extending slightly beyond frons. Antenna bipectinate in male, simple in female. *Wings* broad; forewing grey-brown with broad postmedian band nearly reaching termen; apex slightly produced, termen gently rounded, not angled at middle; areole absent in most specimens; vein R_1 diverging from stem of R_{1-5} before (proximal to) point of divergence of R_5; M_1 arising from cell, which is nearly as long as half length of forewing. Hindwing with termen angled at middle; vein $Sc+R_1$ combined with Rs to 3/4 of cell; veins Rs and M_1 sharing short stalk; discocellulars not biangulate; vein M_2 arising well anterior to middle of discocellulars.

MALE GENITALIA (Figs 203, 236, 259). Saccus broad, weakly excavated. Labides short, curved, well-sclerotized with apices swollen and united medially, each element with small teeth projecting ventrally. Juxta: narrowing towards apex. Valva: densely setose at apex; sacculus distinctive, excavated terminally so appearing double pointed, with several strong spines subapically; base with long hairs arising from membranous pouch on each side. Aedeagus weakly curved; vesica lacking cornuti. Sternum A8 (Fig. 259) bearing row of setae along distal margin, otherwise unmodified.

FEMALE GENITALIA (Fig. 276). Bursa copulatrix: ductus bursae short, sclerotized throughout; corpus bursae globose, signum long, narrow and composed of stout radiating spines, arranged more sparsely than in usual condition, and diminishing in size to apex; surface of corpus with scattered minute denticles. Segment A7 with pair of lateral pockets.

DIAGNOSIS. The strong subapical spines on the sacculus and the row of setae along the distal margin of the abdominal sternum A8 in the male distinguish the single species of *Palpoctenidia* from all other genera in the Asthenini. *Palpoctenidia* resembles '*Chalyboclydon*' *flexilinea* in lacking an areole on the forewing and by the similar wing markings, notably the strongly protuberant postmedian band on the forewing. This band almost touches the termen medially whereas in *flexilinea* the band actually meets the termen. *Palpoctenidia* is also clearly distinguished from *flexilinea* by the bipectinate condition of the male antenna and the marked differences in the genitalia.

REMARKS. The excavated sacculus is similar to that found in *Asthena*. Although an areole is absent in most material of *P. phoenicosoma*, in four specimens in the BMNH from 'Rantaizan, Formosa' [Taiwan], collected by Wileman a single small areole is present.

Asthenine features of *Palpoctenidia* include the absence of an uncus and the presence of typically asthenine labides. The extension of the sacculus is notable and much modified. Although the signum is composed of stout spines, their radiating arrangement is merely a modification of the basic asthenine plan.

DISTRIBUTION. China, Japan, India.

SPECIES INCLUDED. One species. Genitalia examined: *phoenicosoma phoenicosoma* (male, female), *p. semilauta* (male).

Palpoctenidia phoenicosoma phoenicosoma (Swinhoe, 1895) *(Chrysocraspeda)*

India, China.

Palpoctenidia phoenicosoma semilauta Prout, 1938

Japan.

Asthenotricha Warren, 1899

(Figs 82–111; 204, 205; 237, 238; 277, 278.)

Asthenotricha Warren, 1899: 34. Type species: *Asthenotricha dentatissima* Warren, 1899: 34.

Astenotricha Debauche, 1938: 40. (An incorrect subsequent spelling.)

MOTH (Figs 82–111). *Head.* Frons less prominent than in *Hydrelia*. Labial palpi stronger and longer than in typical *Hydrelia*. Antenna: ciliated in male. *Wings.* Ochreous to purplish brown, often with broad fascia across forewings and hindwings forming a U in resting posture. Forewing: fairly broad; termen rounded, apex often pointed; tornus rounded; areole single; vein R_1 diverges from R_{2-4} proximal to point at which R_5 diverges; male of *dentatissima* group with patch of modified scales on dorsal and ventral surfaces. Hindwing: relatively broad, termen rounded; male of *dentatissima* group with costa markedly expanded and with large hairpencil on dorsal surface; hindwing unmodified in *argyridia* group; discocellulars not biangulate; anastomosis of $Sc+R_1$ with Rs rather shorter than in most Larentiinae; vein Rs not stalked with M_1 in type species, but stalked in most species.

MALE GENITALIA (Figs 204, 205, 237, 238). Tegumen/?uncus with distinctive, long, narrow anterior extension. Saccus broad, short. Labides in form of a pair of finger-like processes, usually extending to just beyond middle of tegumen. Juxta W-shaped, often with central arm long. Valva: costa straight; sacculus with well-developed finger-like extension. Aedeagus: vesica simple, without cornuti.

FEMALE GENITALIA (Fig. 277, 278). Ductus bursae: antrum with very wide mouth, narrowing so that antrum appears conspicuously Y- or V-shaped; colliculum usually very short and situated distinctively in middle of the membranous duct. Corpus bursae: signum long, narrow or pear-shaped, composed of radiating spines; prominent (*Eupithecia*-like) denticles present or absent from corpus bursae.

DIAGNOSIS. In *Asthenotricha* the most notable distinguishing features are the extended uncus/tegumen, the W-shaped juxta, the Y- or V-shaped antrum and the very short colliculum situated, usually, in the middle of the ductus bursae. The hindwing is broader than in *Hydrelia*, even in those species where it is not markedly expanded in the male.

REMARKS. We have included *Asthenotricha* in the Asthenini despite the presence of well developed labial palpi. What appears to be an uncus is also stronger than is typical for the tribe, and there are *Eupithecia*-like denticles on the corpus bursae of some species. However, the sacculus is extended, the form of the labides fits the condition widely encountered in the tribe, and the signum is typically asthenine, being composed of radiating spines.

DISTRIBUTION. Afrotropics, including Madagascar.

SPECIES INCLUDED. Thirty-four.

The *dentatissima* group

This group is distinguished by the presence of a hair tuft on the hindwing of the male and a broadened costa.

SPECIES INCLUDED. Twenty-six. Genitalia examined: *amblycoma* (male), *anisobapta* (male, female), *barnsae* (male, female), *dentatissima* (male, female), *flavicoma* (male), *lophopterata* (male, female), *malostigma* (male, female), *polydora* (male, female), *proschora* (male, female), *pycnoconia* (male), *serraticornis* (male, female), *torata* (male, female), *tripogonias* (male, female).

Asthenotricha amblycoma Prout, 1935

Equatorial Guinea.

Asthenotricha anisobapta Prout, 1932

Kenya, Uganda.

Asthenotricha ansorgei Warren, 1899

Kenya, Uganda.

Asthenotricha barnsae Prout, 1935

Kenya, Uganda.

Asthenotricha comosissima Herbulot, 1970

Madagascar.

Asthenotricha deficiens Herbulot, 1954

Madagascar.

Asthenotricha dentatissima Warren, 1899

Tanzania, Kenya, Uganda, Zaïre.

Asthenotricha fernandi Prout, 1935

Equatorial Guinea.

Asthenotricha flavicoma Warren, 1899

Cameroon, Uganda, Zaïre.

Asthenotricha furtiva Herbulot, 1960

Madagascar.

Asthenotricha grandis Herbulot, 1997

Rwanda.

***Asthenotricha lophopterata* (Guenée, [1858])** *(Acidalia)*

Madagascar, Reunion.

***Asthenotricha malostigma* Prout, 1921**

Zaïre.

***Asthenotricha nesiotes* Herbulot, 1954**

Madagascar.

***Asthenotricha parabolica* Herbulot, 1954**

Madagascar.

***Asthenotricha polydora* Debauche, 1938** (as *Astenotricha*)

Uganda, Zaïre.

***Asthenotricha proschora* Fletcher, 1958**

Uganda, Zaïre.

***Asthenotricha psephotaenia* Prout, 1935**

Uganda, Zaïre.

***Asthenotricha pycnoconia* Janse, 1933**

South Africa, Uganda.

***Asthenotricha pythia* Debauche, 1938** (as *Astenotricha*)

Zaïre.

***Asthenotricha quadrata* Herbulot, 1960**

Madagascar.

REMARKS. In this species the hind margin of the forewing is not elongate. Both wings are shaped in a similar way to those in *Hydrelia*.

***Asthenotricha semidivisa semidivisa* Warren, 1901**

Cameroon, Uganda.

***Asthenotricha semidivisa euchroma* Prout, 1921**

Zaïre.

***Asthenotricha serraticornis* Warren, 1902**

Kenya, Tanzania, Uganda.

***Asthenotricha straba* Prout, 1921**

Angola, Cameroon, Kenya, Uganda, Zaïre.

***Asthenotricha torata* Prout, 1932**

Madagascar.

REMARKS. This species differs from other species of the genus, as does *tripogonias*, by the forewing of the male, which is folded and bears conspicuous androconia. Prout (1932: 108) expressed his doubts that the species belonged to *Asthenotricha*. However, in both species the male genitalia fit the general pattern exhibited by the type species. Although the corpus bursae bears *Eupithecia*-like denticles, the antrum and colliculum are characteristic of *Asthenotricha*. Females differ from males in colour and markings. Contrary to Prout's description, a hair-tuft is in fact present on the hindwing of males of *torata*, although it is smaller and paler than in other species.

***Asthenotricha tripogonias* Prout, 1926**

Réunion.

The *argyridia* group

In *argyridia* and its relatives, the hair tuft on the hindwing of the male is lacking and the costa of the hindwing is not broadened.

SPECIES INCLUDED. Eight species. Genitalia examined: *argyridia* (male, female), *costalis* (male), *inutilis* (male), *meruana* (male), *sjostedti sjostedti* (male), *strangulata* (male), *unipecten* (male, female).

***Asthenotricha argyridia* (Butler, 1894) comb. n.** *(Cataclysme)*

Eulype? disparata Warren, 1897

Kenya, Rwanda, Uganda.

***Asthenotricha candace* (Prout, 1929) comb. n.** *(Hydrelia)*

Ethiopia.

***Asthenotricha costalis* (Aurivillius, 1910) comb. n.** *(Hydrelia)*

Kenya.

***Asthenotricha inutilis* Warren, 1901**

Cameroon, Kenya, South Africa, Uganda.

***Asthenotricha meruana* (Aurivillius, 1910) comb. n.** *(Hydrelia)*

Tanzania.

***Asthenotricha sjostedti sjostedti* (Aurivillius, 1910) comb. n.**

Hydrelia sjostedti Aurivillius, 1910.

Kenya, Tanzania.

***Asthenotricha sjostedti mionoseista* (Prout, 1921) comb. n.** *(Hydrelia)*

Rwanda, Zaïre.

***Asthenotricha strangulata* Herbulot, 1953**

Kenya.

***Asthenotricha unipecten* (Prout, 1915)** *(Hydrelia)*

Hydrelia unipecten tamsi Prout, 1935.

Kenya, Uganda, Zaïre, São Tome & Principe.

REMARKS. Prout (1915; 1934–1939) noted that the antenna of the male is unipectinate. In fact this condition also occurs in the female, although the pectinations are shorter in this sex. Unipectinate antennae are rare in Larentiinae so this is an unusual character.

Further study is required to assess the taxonomic status of Prout's subspecies *tamsi*.

Venusia Curtis, 1839

(Figs 112–140; 191; 206–208; 239–241; 279–280.)

Venusia Curtis, 1839: 759. Type species: *Venusia cambrica* Curtis, 1839: 759.
Discoloxia Warren, 1895: 105. Type species: *Cidaria obliquisigna* Moore, 1888: 278.

MOTH (Figs 112–140). *Head.* Frons broad, generally protuberant. Labial palpi minute. Antenna of male ciliate or bipectinate with pectinations short. *Wings.* Whitish to grey; forewing usually darker than hindwing; rarely uniformly brown; broad, termen of both wings gently curved, not angled or dentate. Venation as in Fig. 191). Forewing with a single areole, R_1 and R_{2-5} arising from apex of areole, or R_1 diverging after short union with R_{2-5}; vein M_1 diverging from areole; discocellulars curved and oblique, occasionally biangulate. Hindwing with discocellulars biangulate, vein M_2 arising from the second angle, close to M_3.

MALE GENITALIA (Fig. 206–208; 239–241). Saccus generally broader and longer than tegumen. Labides extending from bases of valvae with slightly expanded, setose apices, bases united with those of transtillae. Juxta weakly sclerotized, plate-like, sometimes pointed posteriorly. Valva: usually narrowing to apex rather than rounded; sacculus with prominent extension other than in *dilecta* Yazaki where process is absent. Aedeagus simple, vesica lacking cornuti. Sternum A8 of male not modified.

FEMALE GENITALIA (Figs 279, 280). Ductus bursae weakly sclerotized throughout length other than for a short membrane. Corpus bursae generally globose, often with numerous minute denticles, sometimes dense, or small spines; signum usually long and narrow, sometimes pear-shaped, sometimes small and almost round, composed of radiating denticles, occasionally with additional small signum distally.

DIAGNOSIS. Similar to *Hydrelia*, but the hindwing discocellulars of *Venusia* are distinctly biangulate and sometimes the male antennae are bipectinate. In the female of *Venusia*, the surface of the corpus bursae lacks denticles more often than in *Hydrelia*. In those species of *Venusia* where denticles are present, they tend to be arranged more densely.

DISTRIBUTION. Palaearctic, Nearctic and Oriental regions.

SPECIES INCLUDED. Forty-two described species, one doubtfully included. Genitalia examined: *albinea* (male, female), *apicistrigaria* (female), *balausta* (male, female), *biangulata* (male, female), *blomeri blomeri* (male, female), *cambrica* (male, female), *comptaria* (male, female), *conisaria conisaria* (male, female), *crassisigna* (male, female), *eucosma* (male), *kioudjrouaria* (female), *laria laria* (male, female), *lilacina lilacina* (male, female), *limata* (male, female), *maniata* (male, female), *marmoraria* (male, female), *naparia* (male, female), *nigrifurca* (male, female), *obliquisigna* (male, female), *ochrota* (male), *pallidaria* (male, female), *paradoxa* (male), *pearsalli* (male, female), *planicaput* (male, female), *punctiuncula* (male, female), *purpuraria* (male, female), *roseicosta* (male), *scitularia* (male, female), *scitularia* (male, female), *sikkimensis* (male, female), *tchraria* (male, female), *violettaria* (male, female), *yasudai* (male, female).

***Venusia accentuata* (Prout, 1914)** *(Discoloxia)*

China.

***Venusia albinea* (Prout, 1938)** *(Discoloxia)*

Pakistan.

REMARKS. The female genitalia of this species has a small, almost round signum composed of radiating denticles. Otherwise *albinea* is a typical species of *Venusia*.

***Venusia apicistrigaria* (Djakonov, 1936)** *(Discoloxia)*

China.

***Venusia balausta* Xue, 1999**

China.

***Venusia biangulata* (Sterneck, 1938)** *(Discoloxia)*

China.

***Venusia blomeri blomeri* (Curtis, 1832)** *(Melanippe)*

Cidaria pulchraria Eversmann, 1842.

Widespread in Europe, across Estonia, Latvia, Lithuania, Russia to Japan, China (far N E), and North America.

FOODPLANTS. Ulmaceae: *Ulmus glabra*; *Ulmus*.

***Venusia blomeri euchloe* (Bryk, 1949)** *(Discoloxia)*

Korea.

***Venusia blomeri szechuanensis* Wehrli, 1931**

China (S W).

***Venusia brevipectinata* Prout, 1938**

India.

***Venusia cambrica cambrica* Curtis, 1839**

Venusia cambrica shuotsu Bryk, 1949.
Venusia cambricaria Guenée, [1858] [Emendation of *cambrica* Curtis.]
Hydrelia cambricata Herrich-Schäffer, 1861. [Emendation of *cambrica* Curtis.]
Eubolia erutaria Boisduval, 1840
Acidalia nebulosaria Freyer, 1850
Tephrosia scitularia Walker, 1860

Widespread across the Holarctic region.

FOODPLANTS. Betulaceae: *Alnus incana tenuifolia*; *Alnus rubra*; *Betula*; Ericaceae: *Vaccinium*; Rosaceae: *Amelanchier*; *Malus*; *Sorbus americana*; *Sorbus aucuparia*; *Sorbus*; Salicaceae: *Populus trichocarpa*; *Salix*.

***Venusia cambrica aphrodite* Bryk, 1942**

Russia (Kurile Islands).

***Venusia comptaria* (Walker, 1860)** *(Tephrosia)*

Venusia palumbes Franclemont, 1938.
Larentia perlineata Packard, 1873.
Euchoeca salienta Pearsall, 1905.

Canada, U.S.A.

***Venusia conisaria conisaria* Hampson, 1903**

China, Nepal, Sikkim.

***Venusia conisaria hypoconia* (Prout, 1938)** *(Discoloxia)*

Kashmir.

***Venusia crassisigna* Inoue, 1987**

Nepal, China.

***Venusia dilecta* Yazaki, 1995**

Nepal.

***Venusia eucosma* (Prout, 1914)** *(Discoloxia)*

China.

***Venusia inefficax* (Prout, 1938)** *(Discoloxia)*

China.

***Venusia kasyata* Wiltshire, 1966**

Afghanistan.

***Venusia kioudjrouaria* Oberthür, 1893**

China.

***Venusia laria laria* Oberthür, 1893**

Venusia laria Oberthür, 1893.

China.

***Venusia laria ilara* (Prout, 1938)** *(Discoloxia)*

Japan.

***Venusia lilacina lilacina* (Warren, 1893)** *(Hydrelia)*

Sikkim, Nepal.

***Venusia lilacina melanogramma* Wehrli, 1931 subsp. rev.** *(Venusia (Discoloxia))*

China.

***Venusia lilacina rala* (Prout, 1938)** *(Discoloxia)*

Kashmir.

***Venusia limata* Inoue, 1982**

Nepal.

***Venusia lineata* Wileman, 1916**

China.

***Venusia maniata* Xue, 1999**

China.

***Venusia marmoraria* (Leech, 1897)** *(Hydrelia)*

China.

***Venusia megaspilata* (Warren, 1895)** *(Discoloxia)*

Japan.

***Venusia naparia* Oberthür, 1893**

China.

***Venusia nigrifurca* (Prout, 1926)** *(Discoloxia)*

Burma, China.

***Venusia obliquisigna* (Moore, 1888)** *(Cidaria)*

India, Nepal, China.

***Venusia ochrota* Hampson, 1903**

Venusia roseicosta Yazaki, 1994, **syn. n.**

China, Nepal.

***Venusia pallidaria* Hampson, 1903**

Pakistan.

***Venusia paradoxa* Xue, 1999**

China.

***Venusia participata* (Sauter, 1869)** *(Eupithecia)*

Germany.

***Venusia pearsalli* (Dyar, 1906)** *(Euchoeca)*

Canada, U.S.A.

FOODPLANTS. Aceraceae: *Acer circinatum*; Betulaceae: *Alnus incana tenuifolia*; *Alnus rubra*; *Alnus viridis sinuata*; *Betula*; Cornaceae: *Cornus nuttalli*; Fagaceae: *Quercus garryana*; Rosaceae: *Crataegus*; *Malus*; Salicaceae: *Populus tremuloides*; *Populus trichocarpa*; *Salix*.

***Venusia phasma* (Butler, 1879)** *(Emmelesia)*

Japan.

***Venusia planicaput* Inoue, 1987**

Nepal, China.

***Venusia punctiuncula* Prout, 1938**

China.

***Venusia purpuraria* (Hampson, 1895)**

India.

***Venusia scitula* Xue, 1999**

China.

***Venusia semistrigata semistrigata* (Christoph, 1881)** *(Cidaria)*

Russia.

***Venusia semistrigata expressa* Inoue, 1963**

Japan.

***Venusia sikkimensis* (Warren, 1893)** *(Hydrelia)*

Sikkim, Bhutan, Nepal, India, China.

***Venusia syngenes* Wehrli, 1931** *(Venusia (Discoloxia))*

China.

***Venusia tchraria* Oberthür, 1893**

China.

***Venusia violettaria* Wehrli, 1931** *(Venusia (Discoloxia))*

Venusia (Discoloxia) violettaria kukunoora Wehrli, 1931.

China.

***Venusia yasudai* Inoue, 1987**

Nepal.

Species of uncertain identity

***'Venusia' distrigaria* (Boisduval, 1833)**

Madagascar.

REMARKS. Boisduval (1833: 263) wrote of this species, under the name *Geometra distrigaria* Boisduval 'Elle a le port de la *Bilinearia* [sic] d'Europe, mais elle est un tiers plus petite.' However, there were no Geometridae species from Europe (or from anywhere else) named '*bilinearia*' before 1833. In his checklist to the Lepidoptera of Madagascar, Viette (1990: 248) cited *distrigaria* as unidentified and without the type having been found. Although the species was placed in *Venusia* by Parsons *et al.* (*in* Scoble, 1999), and in the card index to Geometridae in the BMNH, its identity and generic placement remain unclear.

Nomenia Pearsall, 1905 gen. rev.

(Figs 141; 209, 242; 281.)

Nomenia Pearsall, 1905: 126. Type species: *Larentia duodecimlineata* Packard, 1873: 19.

Nomenia Pearsall; Ferguson *in* Hodges *et al.*, 1983: 104. (Listed as a junior synonym of *Venusia* Curtis.)

MOTH (Fig. 141). *Head*. Frons weakly protuberant. Labial palpi short and slender. Antenna: male with a short, single, fasciculate protrusion on each flagellomere; female simple. *Wings*. Usually with bands of multiple transverse lines, sometimes lines not conspicuous; termen smooth. Forewing medium grey; vein R_1 stalked with R_{2-4}, R_5 arising independently from apex of areole, or, rarely, stalked with stem of R_{2-4}; areole single; discocellulars strongly biangulate. Hindwing: pale grey to almost white, distinctly paler than forewing; discocellulars biangulate.

MALE GENITALIA (Figs 209, 242). Saccus smaller than tegumen. Labides extending to apex of tegumen, densely setose laterally. Juxta flask-shaped. Valva: costa densely setose, margin weakly convex; sacculus with long, finger-like extension, and a small, spined hump at base of extension. Aedeagus simple, without cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 281). Bursa copulatrix: ductus bursae sclerotized throughout; corpus bursae lacking signum, covered with *Eupithecia*-like spines except posteriorly, spines smaller towards anterior end of corpus bursae.

DIAGNOSIS. The genitalia of *Nomenia* exhibit a general similarity to *Venusia*, but the genus differs in the presence of a single protrusion on each flagellomere in the male and the presence of setae on the labides. The presence of numerous *Eupithecia*-type spines on the corpus bursae of the female of *Nomenia* and the absence in that sex of a discrete signum clearly distinguishes it from *Venusia*.

REMARKS. The similarities between the male genitalia of *Nomenia* and *Venusia* are notable. However, we prefer to revive *Nomenia* as a separate genus particularly because of the absence of a signum and the presence of typical *Eupithecia*-style denticles on the corpus bursae. Despite the absence of a typical asthenine signum, we retain the genus within the tribe given the close similarity between the genitalia and those of *Venusia*, and because of the reduced labial palpi. The absence of the asthenine signum is, therefore, interpreted as a loss.

DISTRIBUTION. North America.

SPECIES INCLUDED. Two species. Genitalia examined: *duodecimlineata duodecimlineata* (male, female).

Nomenia duodecimlineata duodecimlineata (Packard, 1873) *(Larentia)*

Nomenia unipecta Pearsall, 1906

U.S.A. Type locality: California.

Nomenia duodecimlineata secunda Pearsall, 1906

U.S.A.: Type locality: Colorado.

REMARKS. Listed as a subspecies by Ferguson *in* Hodges *et al.*, 1983: 104.

Nomenia obsoleta Swett, 1916

Canada.

Hastina Moore, 1888

(Figs 142, 143; 192; 210, 243; 282.)

Hastina Moore, 1888: 260. Type species: *Hastina caeruleolineata* Moore, 1888: 260.

MOTH (Fig. 142, 143). *Head*. Frons rounded, prominent. Labial palpi reduced, not significantly extended beyond frons. Antenna simple in both sexes, ciliated. *Wings*. Dark brown with weak yellowish lines (*caeruleolineata*) or pale brown with conspicuous and wider yellow lines (*pluristrigata*). Venation as in Fig. 192. Forewing: broad, apex pointed, termen concave below apex, produced at the end of M_3 and CuA_1, straight below CuA_1; areole single, small, vein R_1 long, stalked with R_{2-4}, vein R_5 not stalked or only very briefly stalked with R_{1-4}, R_1 diverging from the stem well distal to base of R_5. Hindwing: strongly crenulated, with sharp 'teeth' at the end of M_1 and M_3 and excised between them; cell short, discocellulars angled at middle, but not biangulate, vein M_2 arising at about upper 1/4 of discocellulars, M_3 not stalked with CuA_1.

MALE GENITALIA (Fig. 210, 243). Uncus possibly present as a small, triangular vestige at apex of tegumen. Saccus broad, but smaller than in *Hydrelia*. Labides about half length of tegumen, broadening and rounded at apices. Juxta narrow. Valva: narrow, sacculus with a weakly sclerotized, slender spine-like extension. Aedeagus: simple, vesica without cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 282). Ductus bursae long, weakly sclerotized throughout except for a short membranous break at middle; antrum absent. Bursa copulatrix: corpus bursae globose with dense covering of *Eupithecia*-like denticles (*caeruleolineata*) or minute denticles (*pluristrigata*) on anterior half; signum composed of fairly long radiating spines.

DIAGNOSIS. The male genitalia broadly resemble those of *Hydrelia*. *Hastina*, *Macrohastina* and *Bihastina* can be distinguished from other asthenine genera by the strongly dentate termen of both fore- and hindwings. *Hastina* differs from *Macrohastina* by the different wing colour and pattern and the absence of cornuti on the vesica, and from *Bihastina* by differences in the venation and genitalia (see diagnosis under that genus).

REMARKS. The posterior extension of the juxta takes the form of a narrow tongue in *caerulineata*, and it arises clearly from the juxta plate. In *pluristrigata*,

however, the structure is more strongly sclerotized and appears to be derived from a union of sclerites at the base of the valvae. A tongue-like sclerite does occur, confusingly, in *pluristrigata*, but it is not apparently an extension of the juxta as it is a sclerotization of the dorsal diaphragmata (fultura superior).

DISTRIBUTION. Burma, China, India, Japan, Russia.

SPECIES INCLUDED. Three species. Sometimes *caeruleolineata* is treated as subspecies of *subfalcaria*. Genitalia examined: *caeruleolineata* (male, female), *pluristrigata* (male, female).

Hastina caeruleolineata Moore, 1888

Burma, China, India.

Hastina pluristrigata (Moore, 1868) *(Hyria?)*

China, India.

REMARKS. Although the shape of the hindwing of this species is almost the same as in *caeruleolineata*, the genitalia of both sexes are distinctive, the anal papillae being strongly sclerotized and forming a short, pointed ovipositor. It is further distinguished from *caeruleolineata* by the more weakly crenulated condition of the forewing termen.

Hastina subfalcaria (Christoph, 1881) *(Acidalia)*

Japan, Russia.

Macrohastina Inoue, 1982

(Figs 144–146; 211, 244; 283.)

Macrohastina Inoue, 1982: 471. Type species: *Erosia azela* Butler, 1878: 403.

MOTH (Fig. 144–146). Similar to *Hastina* in wing shape, but not colour and pattern. *Head*. Frons neither prominent nor broad. Labial palpi minute, not extending beyond frons. Antenna ciliated. *Wings*. Colour and pattern distinctive, very similar in all three species. Venation as for *Hastina* except: forewing: areole single; hindwing with vein M_2 arising from middle of discocellulars, and vein M_3 stalked or not stalked with CuA_1.

MALE GENITALIA (Figs 211, 244). Saccus similar to that in *Hastina* or slightly shorter. Labides slightly less prominent than in *Hastina*. Juxta narrow. Valva: sacculus produced into a short spine or merely a pointed lobe. Aedeagus: vesica with cornuti in form of spines or denticles.

FEMALE GENITALIA (Fig. 283). Ductus bursae broad posteriorly, narrowing toward middle of length; posterior half strongly sclerotized. Corpus bursae: signum composed of radiating denticles; large patch of prominent *Eupithecia*-style denticles also present in *M. azela* and *M. gemmifera*, minute denticles present in *M. stenozona*.

DIAGNOSIS. The three species have a distinctive and very similar wing colour and pattern making the genus easy to distinguish from all others. The sclerotizations of the corpus bursae are also characteristic.

REMARKS. The three species in this genus are very similar in wing shape, colour and pattern and in genital structure. When describing the genus, Inoue (1982: 471) noted that in *M. azela* and *M. gemmifera* vein M_3 of the hindwing is stalked with CuA_1. However, in *M. stenozona* M_3 is not stalked so the venational character should not be considered diagnostic for the genus. Nevertheless, we retain the genus *Macrohastina* because of other similarities between the three species, although it might be argued that this genus, *Hastina* and *Bihastina* should be treated as synonymous.

DISTRIBUTION. China, Japan, India, Nepal, Burma.

SPECIES INCLUDED. Three species. Genitalia examined: *azela* (male, female), *gemmifera* (male, female), *stenozona* (male, female).

Macrohastina azela (Butler, 1878) *(Erosia)*

Japan.

Macrohastina gemmifera (Moore, 1868) *(Acidalia?)*

India, Nepal, China.

Macrohastina stenozona (Prout, 1926) comb. n. *(Hastina)*

Hastina azela stenozona Prout, 1926.
Hastina stenozona Prout; Xue & Zhu, 1999.

Burma, India, China.

REMARKS. This species differs from the two others in the genus by the following characters: vein M_3 is not stalked with CuA_1 on the hindwing; the sacculus of the valva bears a well-developed extension; cornuti are arranged in two bundles of moderate length spines; the signum is much longer and narrower with denticles on the corpus bursae being very weak and small. However, the wing pattern and colour are extremely similar to the other two species, and *stenozona* would appear therefore to belong to *Macrohastina*.

Bihastina Prout, 1916

(Figs 147–149; 212, 245; 284.)

Bihastina Prout, 1916: 26. Type species: *Bihastina albolucens* Prout, 1916: 26.

MOTH (147–149). *Head*. Frons not protuberant. Labial palpi reduced, narrow, extending slightly beyond frons. Antenna not pectinate in male. *Wings*. Semi-translucent with extensive brown markings; termen of both wings deeply dentate. Forewing: two areoles present; vein R_1 arising before apex of second areole, not sharing stalk with R_{2-4}; vein R_5 arising from apex of second areole together with R_{2-4}. Hindwing: $Sc+R_1$ running close to costa for proximal half, almost touching costa after the cell; discocellulars slightly curved, M_2 arising above middle of cell; vein M_3 not stalked with CuA_1.

MALE GENITALIA (Figs 212, 245). Uncus probably present in form of a broad, squat, membranous structure. Saccus broad. Labides small, weakly sclerotized, with setose apices. Transtillae well-sclerotized, uniting medially. Juxta with broad base and narrower extension. Valva round terminally, without any extension or projection. Aedeagus: vesica lacking cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 284). Ductus bursae: antrum present in form of broad funnel; small colliculum present. Corpus bursae: signum appearing stellate, composed of long radiating spines.

DIAGNOSIS. The shape of the wings is similar to *Hastina* and *Macrohastina*. *Bihastina* differs from both these genera by the semi-translucent white wings marked with brown, the unstalked condition of vein R_1, the presence of two areoles on the forewing, and the rounded rather than elongated shape of the signum.

REMARKS. The structure at the apex of the tegumen is possibly the uncus, although it is membranous and not the typically narrow uncus occurring so widely in Geometridae. The labides are difficult to observe, but appear to be present, although small and inconspicuous, and situated just ventral to the well-sclerotized transtillae which are united to form a strong band dorsal to the aedeagus.

DISTRIBUTION. New Guinea.

SPECIES INCLUDED. Three species. Genitalia examined: *albolucens* (male, female), *subviridata* (male).

Bihastina albolucens Prout, 1916

West Irian.

Bihastina subviridata (Bethune-Baker, 1915) *(Hastina)*

Bihastina mera Prout, 1926.

Papua New Guinea.

Bihastina viridata (Warren, 1906) *(Hastina)*

Papua New Guinea.

Leucoctenorrhoe Warren, 1904

(Figs 150; 213, 246; 285)

Leucoctenorrhoe Warren, 1904: 526. Type species: *Leucoctenorrhoe quadrilinea* Warren, 1904: 527.

MOTH (Fig. 150). *Head*. Frons protuberant as in *Hydrelia*. Labial palpi extremely narrow and short. Antenna in both sexes bipectinate, pectinations very long. *Wings*. White; lines less wavy than in usual Asthenini condition; forewing somewhat narrower and rounder than in most Asthenini. Forewing: areole single, vein R_1 diverging from common stem distal to point at which R_5 diverges; vein M_2 arising slightly closer to M_1 than to M_3 in both fore- and hindwing. Hindwing slightly angled at middle of termen; discocellulars straight, not angled; vein M_1 stalked with Rs; M_3 stalked with CuA_1, length of stalk variable.

MALE GENITALIA (Fig. 213, 246). Labides with broad apices. Juxta flask-shaped. Valva short, broad, rounded, lacking any extension; apex fringed with hair-like scales expanded at their tips, each scale about as long as valva. Aedeagus short and broad; vesica with small sclerotization, lacking spine-like cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 285). Anal papillae short and broad; apophyses strong. Ductus bursae short, with small colliculum. Corpus bursae globose; signum pear-shaped, composed of radiating denticles.

DIAGNOSIS. *Leucoctenorrhoe quadrilinea* is distinguished from *Asthena* by the presence of bipectinate antennae in both sexes and by the different venation. *Leucoctenorrhoe* differs from those other genera in which vein R_1 diverges distal to R_5 on the forewing, and in which hindwing vein M_3 is stalked, by the bipectinate antenna, the long cell on the hindwing and the pure white ground colour of both wings. The male genitalia differ from all other Asthenini notably in the short valva with the presence of long scale-like hairs fringing its apex and the short, broad aedeagus. Although the hairs around the apex of the valva occur also in *Epicyme*, the antennae, venation, aedeagus and female genitalia are different. See diagnosis of *Epicyme*.

REMARKS. The Peruvian *Leucoctenorrhoe quadrilinea* is the only species of Asthenini recorded from the Neotropics.

DISTRIBUTION. Peru.

SPECIES INCLUDED. Monotypic. Genitalia examined: *quadrilinea* (male, female)

Leucoctenorrhoe quadrilinea Warren, 1904

Peru.

Parasthena Warren, 1902

(Figs 151; 214, 247; 260, 261; 286.)

Parasthena Warren, 1902: 361. Type species: *Parasthena flexilinea* Warren, 1902: 362; Holloway, 1997: 183.

MOTH (Fig. 151). *Head.* Frons less broad and prominent than in *Hydrelia*. Antenna simple, nearly smooth in both sexes. Labial palpi minute. *Wings.* Pale grey-brown with darker multiple fasciae and black discal spots. Forewing shaped as in *Hydrelia*, termen weakly angled; male with small anal lobe; cell short and broad; areole single; vein R_5 separate, arising from below angle of areole. Hindwing: male with posterior margin folded under wing; termen slightly produced at M_1 and M_3; cell short and broad, $Sc+R_1$ united with Rs to 3/4 of cell, M_1 stalked with Rs, discocellulars not biangulate.

MALE GENITALIA (Figs 214, 247; 260, 261; 286). Tegumen long and narrow. Saccus short and narrow. Labides short. Juxta flask-shaped. Valva broad, covered with long hairs; sacculus without a projection. Aedeagus: vesica lacking cornuti. Sternum A8 with anterior margin produced into pair of short but conspicuous apodemes; tergum A8 with anterior margin produced into a single conspicuous, medial projection.

FEMALE GENITALIA (Fig. 286). Ductus bursae: antrum leading into short membranous section of ductus; colliculum long and conspicuous. Corpus bursae: oval rather than globose, with scattering of very weak denticles in region of signum; signum prominent, elongated, composed of long radiating spines.

DIAGNOSIS. The genitalia exhibit many similarities to those of *Poecilasthena*: the tegumen is similarly extended and the saccus is short and of a similar shape; the juxta is of the same form; sternum A8 in the male is modified in both genera; and, in the female, the narrowness of the ductus bursae with its associated colliculum are similar. *Parasthena* is, however, distinguished from *Poecilasthena* by having a single areole, an unexpanded costa of the valva, and a prominent colliculum.

REMARKS. Holloway (1997: 183) removed *Parasthena* from synonymy with *Hydrelia*, noting that it lacked certain characters of the Asthenini. It is very close to *Poecilasthena*, but we have not synonymized the genera because of the presence of a single areole and a much larger colliculum in *Parasthena*.

We have also examined further specimens from Seram and Papua New Guinea of material representing what was noted by Holloway (1997: 184) as 'a related, somewhat more strongly marked, undescribed species'. In the forewing, the costa is heavily marked with dark grey, especially toward apex; the termen is more excavated between the apex and vein M_3 than in *flexilinea*; and the angle of the wing is more pronounced. In the hindwing, the termen is more strongly dentate than in *flexilinea*, notably at M_1 and M_3. The median band on the forewing and the postmedian band on both wings are darker than in *flexilinea*. The genitalia, however, are not convincingly different, and we are undecided about the taxonomic status of this material.

DISTRIBUTION. Sulawesi; Philippines; Borneo; Seram; Papua New Guinea.

SPECIES INCLUDED. A single named species. Genitalia examined: *flexilinea* (male, female).

Parasthena flexilinea Warren, 1902

Sulawesi, Philippines, Borneo.

Poecilasthena Warren, 1894

(Figs 152–171; 215–218; 262–265; 287–290, 295)

Poecilasthena Warren, 1894: 394. Type species: *Acidalia pulchraria* Doubleday, 1843: 286.
Astheniodes Hampson, 1903: 647. Type species: *Astheniodes polycymaria* Hampson, 1903a: 648.
Poecilasthena Warren; Holloway, 1997: 182.

MOTH (Figs 152–171). *Head.* Frons narrow, not prominent. Labial palpi minute, extended slightly beyond frons. Antenna simple, with short cilia. *Wings.* Ground colour of fore- and hindwings generally white, marked with numerous transverse lines, pale grey in *papuensis* group; lines usually pale green to greyish green; wings brown in some species. Forewing: triangular; cell with a minute spot; termen slightly curved, anal angle well expressed; cell longer than half-length of wing; areole double; vein R_1 arising from before apex of areole; R_5 arising from apex of areole together with R_{2-4}. Hindwing: termen slightly angled medially, sometimes rounded, anal margin slightly longer than costa, discocellulars strongly biangulate or not biangulate (*papuensis* group).

MALE GENITALIA (Figs 215–218, 262–265). Saccus ranging from broad to narrow. Labides curved, forming a harp-like structure, extending as posteriorly directed, broader membranous projections from base of costa. Juxta flask-shaped. Valva covered with setae; sacculus not extended; costa broadened at middle, setae absent from broadened part of costa; coremata prominent, arising from base of valva, or absent. Aedeagus short; vesica with cornuti arranged in a bundle of short spines, sometimes in two bundles, or cornuti absent. Sternum A8 often with proximal margin produced on each side so appearing W-shaped, sometimes the two extensions long and pointed.

FEMALE GENITALIA (Figs 287–290; 295). Ductus bursae short, with small colliculum at lower part. Corpus bursae usually globose or subglobose, rarely

more elongated; signum round or oval, composed of spines radiating from denticulate core, sometimes with marked medial ridge (as in Fig. 295).

DIAGNOSIS. In most species of *Poecilasthena* the discocellulars of the hindwing are strongly biangulate, unlike the situation in *Asthena*. The two species in the *papuensis* group, where the discocellulars are not biangulate, are distinguished from *Asthena* mainly by differences in the genitalia. In the male, the costa of the valva is broadened and hairless, in many species there are a pair of well developed coremata attached to the base of the valva, and sternum A8 often bears a pair of projections from the anterior margin. In the female, the ductus bursae is membranous other than for a small colliculum, and the signum is often circular, with the spines in the middle being minute and those extending from the margin being very long. *Poecilasthena* exhibits many similarities to *Parasthena* but has a double areole (single in *Parasthena*).

REMARKS. Some variation occurs within the genus. In *pulchraria* and *subpurpureata* (Walker) the saccus is smaller and the sacculus very short with a small needle-like terminal process arising from the base of the valva and separating from it slightly. Coremata are absent and the cornuti are arranged in two bundles. Sternum A8 is weakly modified with both ends of the proximal edge extended proximally.

In *papuensis* and *euthecta*, the discocellulars in the hindwing are not biangulate and tergum A8 of the male has a medial projection extending from the anterior margin. In the female, the antrum is larger and the signum is smaller with the spines at the middle larger and gradually becoming longer toward the edges.

Notable similarities exist between *Poecilasthena* and the Eupitheciini in the form of the labides in the male genitalia and the colliculum in the female genitalia. In *Eupithecia* the juxta is shaped characteristically like an hourglass. The 'lower' (anterior) part of each labides takes the form of a narrow, elbowed rod, one end of which extends into the waist of the hourglass. The 'upper' (posterior) part of the labides, which is less well sclerotized, is broader than the lower section. In *Poecilasthena* the juxta is flask-shaped with a broad anterior element from which extends a narrow, rod-like component. Although the shape of the juxta differs from that present in *Eupithecia*, the labides are notably similar. The anterior sclerite narrows and almost meets the rod-like component of the juxta. The posterior part is broader and more membranous. In the female, the ductus bursae is narrow in *Poecilasthena* and *Eupithecia* (and in *Parasthena*) and there is a small colliculum.

DISTRIBUTION. Australia, Burma, Fiji, Indonesia, Malaysia, New Caledonia, New Zealand, Papua New Guinea, Philippines.

BIOLOGY. Details of life histories were recorded by McFarland (1979: 41,42) for two species (*P. pulchraria* and an undetermined species) and, for *P. pulchraria* by McFarland, 1988: 352–354), and were summarized by Holloway (1997: 182). The larva fed on leaves, flowers and fruits of *Astroloma humifusum* (Epacridaceae, the Australian Heaths), a plant considered likely to be the wild host. The second species (not '*?ischnophrica* Turner' as suggested by McFarland, 1979, see Holloway, 1997), was found feeding on *Leptospermum myrsinoidea*.

SPECIES INCLUDED. 32 species. Genitalia examined: *aedoea* (male), *anthodes* (male), *burmensis* (male), *character* (male, female), *dimorpha* (male, female), *leucydra* (male, female), *nubivaga* (male, female), *papuensis* (male, female), *prouti* (female), *pulchraria* (male, female), *scoliota* (female), *schistaria* (male, female), *subpurpureata* (male, female), *xylocyma* (male, female).

Poecilasthena aedoea Turner, 1926

Australia.

Poecilasthena balioloma (Turner, 1907) *(Asthena)*

Australia.

Poecilasthena burmensis Prout, 1926

Burma.

Poecilasthena character Prout, 1932

Indonesia, Malaysia.

Poecilasthena cisseres Turner, 1933

Australia.

Poecilasthena dimorpha Holloway, 1979

New Caledonia.

REMARKS. This species exhibits features differing from typical *Poecilasthena*. In the forewing, vein R_5 arises from below the apex of the areole, whereas in other species of this genus it typically arises at the apex. The posterior margin of the hindwing is longer than in other species belonging to the genus and the termen is rounded and not angled. In the male, the valva is distinctive being broad with a narrow base and a dense arrangement of long hairs fringing its distal margin. In the female, the corpus bursae is elongated rather than globose or subglobose and the signum is elongated, not rounded.

Poecilasthena euphylla (Meyrick, 1891) *(Asthena)*

Australia.

***Poecilasthena fragilis* Turner, 1942**

Australia.

***Poecilasthena glaucosa* (Lucas, 1888)** (as *Iodis*)

Euchloris (Iodis) microgyna Lower, 1894

Australia.

***Poecilasthena inhaesa* Prout, 1934**

Fiji.

***Poecilasthena iopolia* (Turner, 1926)** *(Eccymatoge)*

Australia.

***Poecilasthena ischnophrica* Turner, 1941**

Australia.

***Poecilasthena leucydra* Prout, 1934**

Fiji, New Caledonia.

***Poecilasthena limnaea* Prout, 1926**

New Guinea.

***Poecilasthena nubivaga* Prout, 1932**

Indonesia (western).

***Poecilasthena oceanias* (Meyrick, 1891)** *(Asthena)*

Australia.

***Poecilasthena panapala* Turner, 1922**

Australia.

***Poecilasthena paucilinea* Warren, 1906**

Papua New Guinea.

***Poecilasthena phaeodryas* Turner, 1931**

Australia.

***Poecilasthena pisicolor* Turner, 1942**

Australia.

***Poecilasthena prouti* West, 1929** (as *Poecilasthenia*)

Philippines.

***Poecilasthena pulchraria* (Doubleday, 1843)** *(Acidalia)*

Asthena ondinata Guenée, [1858]
Chlorochroma plurilineata Walker, 1861
Asthena pulchraria decolor Turner, 1904

New Zealand, Australia.

FOODPLANTS. Epacridaceae: *Astroloma*; *Brachyloma*; *Epacris*; *Monotoca*.

***Poecilasthena scoliota* (Meyrick, 1891)** *(Asthena)*

Australia.

***Poecilasthena sthenommata* Turner, 1922**

Australia.

***Poecilasthena subpurpureata* (Walker, [1863])** *(Asthena)*

Astheniodes polycymaria Hampson, 1903
Acidalia tuhuata Felder & Rogenhofer, 1875

New Zealand.

REMARKS. The holotype of *polycymaria* is labelled as being from India, which, if correct, would give a very peculiar distribution pattern for *subpurpureata*. Comparison of the genitalia of the male holotype of *polycymaria* with those of a specimen of *subpurpureata* from New Zealand shows a remarkable good match between the structures and there seems to be no reason to treat *polycymaria* as a separate species. Prout (1927: 76) regarded the type locality as being 'evidently in error', and it is difficult to dispute that comment.

***Poecilasthena thalassias* (Meyrick, 1891)** *(Asthena)*

Asthena pellucida Lucas, 1892

Australia, Papua New Guinea.

***Poecilasthena urarcha* (Meyrick, 1891)** *(Asthena)*

Australia (including Tasmania).

REMARKS. The wings of this species are green and the termen of the hindwing shows no sign of an angle.

The *papuensis* group

Two species previously assigned to *Asthena* are here transferred to *Poecilasthena*. One of them was originally described under *Hydrelia*. Their association with *Asthena* is explained by the fact that, unlike the condition in other *Poecilasthena*, the discocellulars in the hindwing are not biangulate. However, the genitalia closely resemble those of other *Poecilasthena* and sternum A8 is modified similarly to *Poecilasthena*. See also 'Remarks' under the generic description above.

***Poecilasthena euthecta* (Turner, 1904) comb. n.** *(Asthena)*

Australia.

REMARKS. Nielsen, Edwards & Rangsi (1996) treated this species in *Minoa*. However, the genitalia structures are not consistent with those of *Minoa*.

***Poecilasthena papuensis* (Warren, 1906) comb. n.** *(Hydrelia)*

Papua New Guinea.

The *anthodes* group

The moths of this cohesive species group are brown. The labides are fairly long, nearly extending to the end of the tegumen, the saccus is narrow, coremata extend from the base of each valva and the vesica lacks cornuti. Sternum A8 is markedly elongate being twice the length of the other sterna; the proximal end is rounded, and from 1/3 toward the distal end it become very narrow, before broadening a little distally. Tergum A8 is not modified. The female genitalia are indistinguishable from those of other *Poecilasthena* species.

***Poecilasthena anthodes* (Meyrick, 1891) comb. n.** *(Asthena)*

Australia.

***Poecilasthena schistaria* (Walker, 1861) comb. n.** *(Acidalia)*

New Zealand.

***Poecilasthena xylocyma* (Meyrick, 1891) comb. n.** *(Asthena)*

Australia.

Polynesia Swinhoe, 1892

(Figs 172–174; 219, 252; 291.)

Polynesia Swinhoe, 1892: 4. Type species: *Pomasia sunandava* Walker, 1861: 657; Holloway, 1997: 189.
Placotome Warren, 1894: 395. Type species: *Polynesia truncapex* Swinhoe, 1892: 5.

MOTH (Figs 172–174). *Head*. Frons narrow, not protuberant. Labial palpi long and robust, not slender, extending about 1/4 to 1/3 beyond front of head. Antenna in both sexes simple, with very short cilia. *Legs*. Hind tibia of male with terminal spurs only; hind femur of male expanded and with thick hair pencil in groove. Hind tibia of female with all spurs present. *Wings*. Primrose yellow variously marked with irregular, rufous spots. Forewing with costa somewhat broadened near base, termen very weakly crenulated, slightly produced medially, concave under CuA_2; areole single, small, all radial veins stalked, R_1 diverging from stalk distal to divergence point of R_5; male forewing of *truncapex* truncated so costa appears angled; tip of angle folded over *dorsal* surface. Hindwing: apex rounded, termen produced both at M_1 and CuA_1; cell short, not longer than 1/3 length of hindwing; discocellulars gently curved; M_2 arising a little above middle of discocellulars, Rs and M_1, M_3 and CuA_1 stalked; sometimes underside of male hindwing with hair tuft at base of cell or hair ridge along wing. *Abdomen*. Long and narrow in both sexes; tympanal organ with length exceeding that of first visible sternum (A2); anterior angles of second visible sternum (A3) also produced.

MALE GENITALIA (Figs 219, 252). Saccus quadrate. Tegumen narrow and long, uncus vestigial. Labides prominent, forming long, well-sclerotized, curved spines. Juxta in form of fairly small, irregular plate. Valva fairly broad, simple, setose; sacculus not projecting beyond margin of valva, elbowed terminally, but without terminal projection. Aedeagus simple, cornuti lacking. Last tergum and sternum elongated, sternum usually longer than tergum.

FEMALE GENITALIA (Fig. 291). Ductus bursae membranous posteriorly, with long antrum anteriorly. Corpus bursae: globose; signum composed of radiating denticles; small additional signum present near cervix bursae in *sunandava*.

DIAGNOSIS. This genus is easily distinguished from other Asthenini by the primrose yellow wing colour dotted with irregular rufous spots and the venation. The smooth, large hook-like labides in the male genitalia are highly distinctive.

The wing colour of *Polynesia* is very similar to that of *Pseudopolynesia* Holloway. *Polynesia* is easily distinguished from *Pseudopolynesia* in the structure of the genitalia. The male of *Pseudopolynesia* lacks the conspicuous labides of *Polynesia* and the shape of the tegumen differs between them. In the female of *Pseudopolynesia* there is no signum and the bursa copulatrix is double.

DISTRIBUTION. India, China, Thailand, N.E. Himalaya, Malaysia, Indonesia, Sri Lanka, Papua New Guinea.

REMARKS. The labial palpi are longer than is usual in Asthenini and certain features of the male genitalia are peculiar. However, typical asthenine characters are the reduced uncus, the signum being composed of radiating denticles, and the presence of a small areole on the forewing.

SPECIES INCLUDED. Three species. Genitalia examined: *curtitibia* (male, female), *sunandava* (male, female), *truncapex* (male, female).

Polynesia curtitibia Prout, 1922

India, Thailand, N.E. Himalaya, Malaysia.

Polynesia sunandava (Walker, 1861) *(Pomasia)*

Cambogia? aeriferata Walker, [1863].

Sri Lanka, India, Malaysia, Indonesia, China, Papua New Guinea.

Polynesia truncapex Swinhoe, 1892

India, China, Malaysia, Indonesia.

Anydrelia Prout, 1938

(Figs 175–177; 220, 253; 292.)

Anydrelia Prout, 1938: 177 (see Prout, 1934–1939). Type species: *Brabira plicataria* Leech, 1897: 72.

MOTH (Figs 175–177). *Head.* Frons broad, prominent in male, flat in female. Labial palpi minute, not extended beyond frons. Antenna: weakly serrate in male with short cilia, simple in female. *Wings.* Brown, with darker but weak postmedial band and even weaker subterminal line; hindwing much smaller than forewing in both sexes. Forewing broad, costa much longer than dorsum, apex slightly produced, termen rounded; areole single; vein R_1 and R_{2-5} diverging beyond (distal to) areole; vein R_5 diverging almost at end of areole and proximal to divergence point of R_1; vein M_1 diverging from areole, discocellulars curved, M_2 arising slightly closer to M_1 than to M_2. Hindwing of both sexes markedly smaller than forewing, termen rounded, anal lobe in male expanded and folded under wing, ventral surface with numerous specialized scales, dorsal surface with long hair-scales; $Sc+R_1$ combined with Rs to 3/4 of cell, which is as long as half length of the wing; Rs united for short distance with M_1, M_1 curved downwards, discocellulars strongly biangulate, M_2 arising from the second angle, very near M_3.

MALE GENITALIA (Figs 220, 253). Saccus short. Labides reduced to pair of setose membranous heads. Juxta broad basally, narrowing slightly towards apex, which is divided. Valva broad, with the costa incurved, sacculus not sclerotized, but with a small sharp terminal process arising from just beyond the middle valva. Aedeagus: vesica lacking cornuti. Sternum A8 unmodified.

FEMALE GENITALIA (Fig. 292). Ductus bursae weakly sclerotized throughout. Corpus bursae covered with minute denticles; signum absent.

DIAGNOSIS. This genus is very easy to distinguish from other asthenine genera by the specialized hindwing in the male and by the absence of the asthenine signum in the female. Typical Asthenini characteristics include a broad, protuberant frons, minute labial palpi, a reduced uncus, short labides and a sclerotized ductus bursae.

DISTRIBUTION. China, India, Nepal.

REMARKS. The absence of a typical asthenine signum is interpreted as a loss.

SPECIES INCLUDED. Three species have been described in this genus. Genitalia examined: *distorta* (male, female), *plicataria* (male, female).

Anydrelia dharmsalae (Butler, 1883) *(Ephyra)*

India.

Anydrelia distorta (Hampson, 1895) *(Hydrelia)*

India, Nepal, China.

Anydrelia plicataria (Leech, 1897) *(Brabira)*

China.

GENERA EXAMINED AND EXCLUDED FROM THE ASTHENINI

The following genera exhibit some similarity to the Asthenini, but we have excluded them from the core group for reasons given under each genus. Three of the genera included below are treated in the same detail as those above: *Minoa* Treitschke, which is one of the three genera included by Pierce (1914) in his definition of the Asthenini; *Cleptocosmia* Warren, which was listed by its describer in the original use of the family group name Astheninae; and *Chalyboclydon* Warren, the composition of which is complex (see above).

Minoa Treitschke, 1825

(Figs 178, 179; 221, 254; 267; 293.)

Minoa Treitschke, 1825: 445. Type species: *Geometra euphorbiata* [Denis & Schiffermüller], 1775: 116 (a junior subjective synonym of *Phalaena murinata* Scopoli, 1763: 229).

MOTH (Figs 178, 179). *Head.* Frons not prominent. Labial palpi more rough scaled than in most Asthenini and not strongly reduced. Antenna: male with short cilia. Wings: drab, dark to medium grey-brown or ochreous, margins smooth, not crenulated; costa of forewing short, termen relatively straight. Forewing: areole double; vein R_1 arises from well before apex of second areole, veins R_2, R_{3-4} and R_5 arise, independently, from its apex. Hindwing: discocellulars oblique, not biangulate.

MALE GENITALIA (Figs 221, 254; 267). Saccus rounded. Labides digitate, curved. Juxta in form of a large plate produced posteriorly into a long, finger-like process. Valva distinctive, narrow; costa and sacculus strongly sclerotized each terminating as a spine. Aedeagus: broad; vesica with a single, long cornutus or a single short cornutus subtended by a sclerite. *Abdomen* (Fig. 267) terga and sterna well-sclerotized in both male and female; sternum A8 trapezoidal in male.

FEMALE GENITALIA (Fig. 293). Anal papillae short, membranous. Bursa copulatrix: ductus bursae prominent, broad, strongly and uniformly sclerotized, extending into small corpus bursae, which is suddenly demarcated from remaining membranous corpus; signum, when present, small, composed of a few spines, not of radiating denticles and spines.

DIAGNOSIS. This distinctive genus is recognizable particularly by the uniform wing colour of the moths, the shape of the valva, the form of the ductus bursae, and the strongly sclerotized condition of the sterna and terga of the abdomen in both sexes.

DISTRIBUTION. Europe, including Eastern Europe.

REMARKS. *Minoa* was included in 'Astheninae' by Pierce (1914: 38) in the paper that first defined the group, but there is no sound reason to associate it with the core of the tribe. Although the uncus is reduced and labides are present, the labial palpi are relatively robust, and while the sacculus is extended, the extension does not resemble that typical in Asthenini, indeed, the overall shape of the valva is unusual. The female genitalia are highly distinctive and lack the typical asthenine signum. The tribal association of *Minoa* remains unclear.

Minoa is considered currently to include just one polytypic species. However, a preliminary study of the genitalia of specimens from several localities suggests that there are, in fact, two species. For the purposes of the present paper we accept the identity of the type species as the widespread species, although this requires confirmation. Further study is being undertaken to establish the content of the genus and the names that should be associated with the species involved.

SPECIES INCLUDED. Probably two species, one of which is described. Genitalia examined: *murinata murinata* (male, female), *murinata amylaria* (male, female).

The variation within *Minoa* needs re-examination. There appear to be two species rather than one, although currently one is accepted (Karsholt & Razowski, 1996: 248). One of these species is widespread. Specimens of the other in the collection of the BMNH are from Sicily and Dalmatia. It is likely from an examination of the original description that the widespread species is what is generally perceived to be *murinata*, but this question deserves further study. We have yet to discover if an available name exists for the second species.

Minoa murinata murinata (Scopoli, 1763) *(Phalaena)*

Minoa cyparissaria Mann, 1854.
Geometra euphorbiata [Denis & Schiffermüller], 1775.
Phalaena fuscata Hufnagel, 1767.
Acidalia italicata Millière, 1885.
Phalaena (Geometra) sordiata Linnaeus, 1767.
Ph[alaena] Geom[etra] unicolorata Hübner, [1787].

Widespread in Europe, Russia, Asia Minor, Central Asia.

FOODPLANTS. Euphorbiaceae: *Euphorbia amygdaloides*.

Minoa murinata amylaria Prout, 1914

Alps, Italy.

Minoa murinata limburgia Lempke, 1969

Netherlands.

Minoa murinata lutea Schwingenschuss, 1954

Russia.

Chalyboclydon Warren, 1893

(Figs 180; 222, 256; 294.)

Chalyboclydon Warren, 1893: 366. Type species: *Chalyboclydon marginata* Warren, 1893: 366.

Description of *Chalyboclydon marginata*

MOTH (Figs 180). *Head*. Frons neither broad nor protuberant. Labial palpi slender, reduced, but extending further from head than in most Asthenini genera. Antenna simple in both sexes, ciliated. *Wings*. Broad, off-white with dark markings at termen similar to those in *Eschatarchia lineata*. Forewing broad, apex slightly produced, termen angled medially, weakly crenulated above angle, straight below angle; hindwing with termen angle more marked than in forewing, produced as in *E. marginata*; cell of both wings extending well beyond 1/3 length of wing, discocellulars strongly oblique; forewing with small single areole, R_{1-5} stalked, R_1 diverging from stem after R_5 and well beyond end of areole; hindwing with $Sc+R_1$ combined with Rs for 3/4 length of cell, Rs and M_1 stalked, M_2 arising from above middle of discocellulars, M_3 not stalked.

MALE GENITALIA (Figs 222, 256). Saccus broad. Labides narrow, weakly sclerotized. Juxta narrow. Valva narrow; costa weakly sclerotized, gently convex

medially and with a denticle arising subterminally; sacculus well sclerotized, with broad lobe medially. Aedeagus: vesica with group of cornuti. Abdominal sternum A8 unmodified.

FEMALE GENITALIA (Fig. 294). Ductus bursae short and sclerotized merging with long corpus bursae. Corpus bursae with one signum in form of a prominent band from which extends strong spines; second signum irregular, bearing a number of strong denticles; neither signum composed of radiating denticles or spines. Sternum A7 forming a well-sclerotized, crescent-shaped plate near ostium bursae.

DIAGNOSIS. The wing colour, pattern and venation resemble, to some degree, those features in *Eschatarchia*. In both, the angle in the middle of the hindwing termen is pointed. *Chalyboclydon marginata* may be distinguished by its much longer palpi and the very weakly angled forewing termen. The genitalia differ significantly (compare figures). The wing pattern distinguishes *C. marginata* from other genera.

DISTRIBUTION. India, Sikkim, Burma, China.

REMARKS. The genus lacks the typical asthenine signum, and the valvae are narrower and their sclerotizations more complex than in the Asthenini.

Chalyboclydon was described by Warren (1893: 366) as a monotypic genus, from two localities 'Sikkim' and 'Momeit, Burmah', in a paper including descriptions of various genera and species in the H.J. Elwes collection, housed in the BMNH. Although Warren's description was said to be of the female sex, all three syntypes of *marginata* are males. There is a further specimen, a female, labelled as being from 'Darjiling'.

The species *C. flexilinea* was described later (Warren, 1898: 22) from 'One specimen from the Khasis. Closely allied to but apparently distinct from the Sikkim *marginata*.' This specimen, the holotype, is a male and bears a label, in Warren's hand, 'Chalyboclydon flexilinea Warr Type ♀'. A second label, by Prout, states: 'Chalyboclydon marginata Warr.' Warren gave a figure of 36 mm as the wingspan of the species, which is over 10 mm more than actually is the case for the syntypes of *marginata* and also is much greater than the measurement of *flexilinea*. While Warren's description of *marginata* might fit both species, the colour plate (23: 16) is clearly of *marginata*. Thus despite the confusing label of Prout, and the anomalous wing measurement given by Warren, the identities of the two species do not seem to be in doubt. However, to avoid further confusion, we have fixed the identity of *Chalyboclydon marginata* Warren, see below.

SPECIES INCLUDED. One species known. Genitalia examined: *marginata* (male, female).

Chalyboclydon marginata Warren, 1893

Hydrelia? apicata Wileman, 1916.

REMARKS. To fix the identity of *marginata*, the male syntype housed in the BMNH, illustrated in Fig. 180, and bearing the following label data is here designated as LECTOTYPE: Lectotype; Sikkim. Möller. 1888; Chalyboclydon marginata Warr. Type B&[handwritten by Warren]; Collectio[n] H.J. Elwes; Rothschild Bequest B.M. 1939–1.

DISTRIBUTION. India, Sikkim, Burma, China.

Cleptocosmia Warren, 1896

(Figs 181; 223, 256.)

Cleptocosmia Warren, 1896: 383. Type species: *Cleptocosmia mutabilis* Warren, 1896: 383.

MOTH (Fig. 181). *Head*. Male. Frons flat, not broad. Labial palpi broad and long, projecting well beyond head, with segment 3 strongly elongated. Antenna simple, ciliated. Hindtibia bearing many hair-like scales, with a very long hair tuft at base, the two outer spurs of hind tibia also with hair scales. *Wings*. Orange brown; similar in shape to those of *Chalyboclydon marginata* but with forewing slightly narrower and apex rather more sharply angled; termen weakly angled medially; hindwing weakly angled medially. Forewing with hyaline fovea, and with the basal half of wing clothed with erect hair-like scales creating a fur-like appearance. Venation: cell very short, no longer than 1/3 length of forewing or hindwing; discocellulars nearly straight on forewing, angled and oblique on hindwing; forewing with areole absent, radials stalked with vein R_5 diverging from common stem before (proximal to) divergence point of R_1; R_{1-5} arising before upper angle of cell, M_1 not stalked, M_2 arising slightly closer to M_1 than to M_3; hindwing with $Sc+R_1$ combined with Rs to 3/4 of cell, Rs stalked with M_1, M_3 stalked with CuA_1, CuA_2 arising near lower angle of cell.

Female unknown.

MALE GENITALIA (Fig. 223, 256). Saccus rounded. Labides absent. Juxta broad, weakly sclerotized. Valva: broad, setose; costa with short point extending at middle; sacculus not extended, folded near base of valva and strongly setose. Aedeagus: broad; vesica with two large spines and some small ones.

DIAGNOSIS. *Cleptocosmia mutabilis* may be recognized by the fur-like appearance of the basal half of forewing in the male. The erect, sharp angle at the middle of the costa of the valva, and the presence of two huge spines on the vesica of the aedeagus is also very characteristic. The venation is almost the same as that of '*Chalyboclydon*' *flexilinea*, but, besides the fur-like scaling on the forewing, it can also be distinguish from that genus by long palpi, very weakly marked wings and the form of the male genitalia.

DISTRIBUTION. Australia.

REMARKS. Although Warren originally placed this genus in the 'Astheninae' (i.e., Asthenini), Nielsen, Edwards & Rangsi (1996) excluded it from the tribe by listing it under a heading 'Unplaced to tribe'. The long labial palpi, the normal frons, the hairy hind tibia and forewing are all unusual. The female is unknown, so we are unable to comment on the form of the signum. On balance, however, like Nielsen *et al.* (1996) we are unable to place *Cleptocosmia* to tribe.

The species is know from only the male holotype in the BMNH, and a further male recently discovered in the accessions of the ANIC. We are grateful to Mr E.D. Edwards for searching the ANIC collections.

SPECIES INCLUDED. One species. Genitalia examined: *mutabilis* (male).

Cleptocosmia mutabilis Warren, 1896

Australia.

Eois Hübner, 1818

(Figs 182–184, 224, 257.)

Eois Hübner, 1818: 27. Type species: *Eois russearia* Hübner, 1818: 27.

Cretheis Meyrick, 1886: 192, type species *Cretheis cymatodes* Meyrick, 1886: 193.

In its broadest sense (e.g., Holloway, 1997, and as catalogued in Scoble, 1999), *Eois* is a large genus with c. 250 species, the type species of which was described from Surinam. A list of the generic synonyms is also provided by Holloway (1997: 184), who examined the type species of the names involved. Holloway suggested that despite some doubts that the Old World species of *Eois* might not be congeneric with those from the New World, most species were correctly united under the single genus. The basis of Holloway's argument lies chiefly in the presence of a multispined signum set into the wall of the corpus bursae. *Eois* is certainly in need of a species-level review, an exercise that would help further investigation of the question of its monophyly.

If the suggestion is accepted that *Eois* is monophyletic, with relatively minor adjustment to its composition, the question arises over its position in relation to the Asthenini. Notable asthenine characters include small labial palpi and a strongly reduced/lost uncus. The shape of the valva is also remarkably similar to that in Asthenini. However, unlike the position in Asthenini, labides are absent and the signum is distinctive, differing markedly from that seen in typical Asthenini. Even if the Old World species should be shown not to be congeneric with those of the New World, we would exclude them from the Asthenini because of these features.

Cretheis (Figs 182, 224, 257) is probably a synonym of *Eois* Hübner although the Australian species of *Eois* were included in *Cretheis* by McQuillan & Edwards (*in* Nielsen, Edwards and Rangsi, 1996: 228). As with many species of *Eois* it shares some features of Asthenini, including short, narrow palpi, a strongly reduced uncus, and the presence of a small extension of the sacculus. It was included in the tribe by McQuillan & Edwards (*in* Nielsen, Edwards & Rangsi, 1996: 227), but is excluded here because of the very different signum in the female, which is robust, multispined and has its base usually set in an evagination of the bursa wall. Furthermore, the frons is very narrow.

SPECIES INCLUDED. Two hundred and forty seven species of *Eois* (including those in *Cretheis*) are listed in Scoble (1999). We have not reviewed the species of this large genus, so they are not listed here.

Pseudopolynesia Holloway, 1997

(Figs 185, 225.)

Pseudopolynesia Holloway, 1997: 190. Type-species: *Pomasia amplificata* Walker,1861: 658.

One described species was included in the genus by Holloway (1997), who pointed out that there were at least two in the group, which extends from Sundaland to New Guinea. The remarkable similarity in the colour pattern of *Pseudopolynesia* and *Polynesia* encouraged us to study the genus to see if there was an asthenine association of *Pseudopolynesia*.

The labial palpi are prominent and extended strongly in front of the head. In the male genitalia (Fig. 225), the tegumen is dome-shaped and the uncus appears to be absent. The sclerotizations of the anellus are complex, but labides do not seem to be present. In the female, the signum is absent and the corpus bursae is double with a posterior, spinose component and a flimsy anterior part.

Characters that support the exclusion of *Pseudopolynesia* from the Asthenini are the presence of well-developed labial palpi, the absence of labides, the lack of an extension of the sacculus and the absence of an asthenine signum. While an uncus is absent from Asthenini and *Pseudopolynesia*, this situation is not unique to the tribe and does not define it alone. Denticles are present on the bursa copulatrix of *Pseudopolynesia* and *Eupithecia*, although those in *Pseudopolynesia* are not as robust.

Despite the similarity of the wing colour and pattern to *Polynesia*, other morphological evidence suggests that *Pseudopolynesia* should be excluded from the Asthenini.

DISTRIBUTION. From Sundaland to New Guinea.

REMARKS. For further details see Holloway, 1997.

SPECIES INCLUDED. One species.

Pseudopolynesia amplificata Walker, 1861

Borneo.

Pseudopolynesia hebe Bethune-Baker, 1915

Pseudopolynesia phanoides Debauche
Pseudoploynesia praelustris Prout

New Guinea, Sulawesi, S. Moluccas.

REMARKS. Holloway (1997: 190) suggested that *hebe* and *praelustris*, which were previously described as subspecies of *amplificata*, might better be placed as 'races' of *hebe*.

Chaetolopha Warren, 1899

(Fig. 186.)

Chaetolopha Warren, 1899: 41. Type species: *Scordylia oxyntis* Meyrick, 1891: 817.

The genus was included in the Asthenini by McQuillan & Edwards (*in* Nielsen, Edwards & Rangsi, 1996: 227) and has been revised by Schmidt (*in press*). It includes an assemblage of species with considerable variation in genital structure. In none of these species does the morphology suggest that the genus belongs to Asthenini.

Characters of the type species suggesting that *Chaetolopha* should excluded from Asthenini include a non-protuberant frons and well-developed, rough-scaled labial palpi. The uncus is well-developed. Structures resembling labides are well-sclerotized and arise from a pair of flask-shaped sclerites composing the juxta. We have not observed this rather peculiar arrangement in Asthenini. The sacculus of the valva is not extended. In the female genitalia, the signum is not asthenine.

SPECIES INCLUDED. Six species, all from Australia, are included by Schmidt (*in press*), who has assigned other species previously in *Chaetolopha* to a new genus from Papua New Guinea.

Eleven species were listed in Scoble (1999). We have not reviewed the species, so they are not included here.

Trichodezia Warren, 1895

(Fig. 187.)

Trichodezia Warren, 1895: 119. Type species: *Odezia albovittata* Guenée, [1858]: 520.

Trichodezia was assigned to the Asthenini by Forbes (1948: 131) and listed there by Ferguson *in* Hodges (1983). Characters suggesting that this genus should be excluded from Asthenini include the presence of strong palpi and a well developed uncus. The ductus bursae is extremely short and the corpus bursae has a small signum, but not of the asthenine kind.

A male and female of the type species (*T. albovittata*) were examined.

DISTRIBUTION. North America, Japan, Eurasia.

SPECIES INCLUDED. Five species were listed in Scoble (1999). We have not reviewed the species, so they are not listed here.

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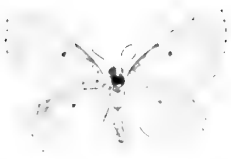

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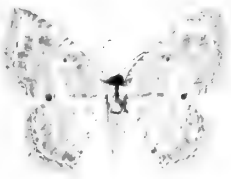

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33 *H. fuscocastanea*

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36 *H. inornata*

37 *H. laetivirga*

38 *H. leucogramma*

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41 *H. marginepunctata*

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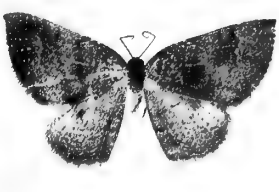

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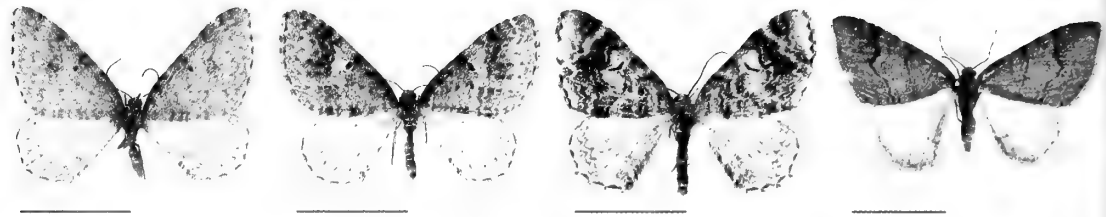

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130 *V. obliquisigna*

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136 *V. purpuraria*

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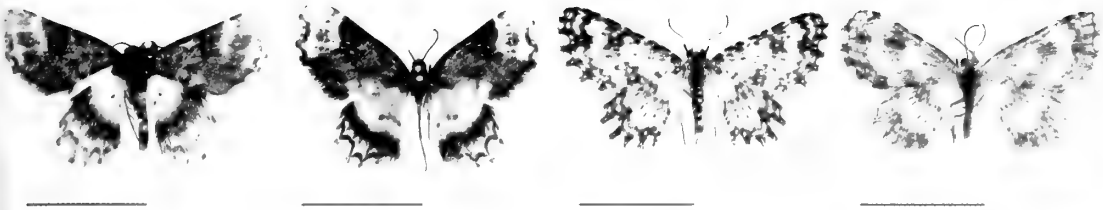

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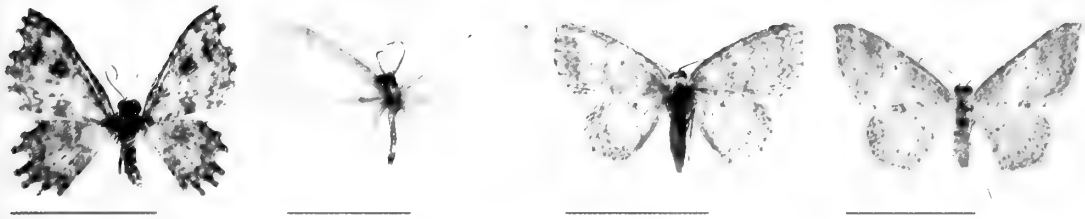

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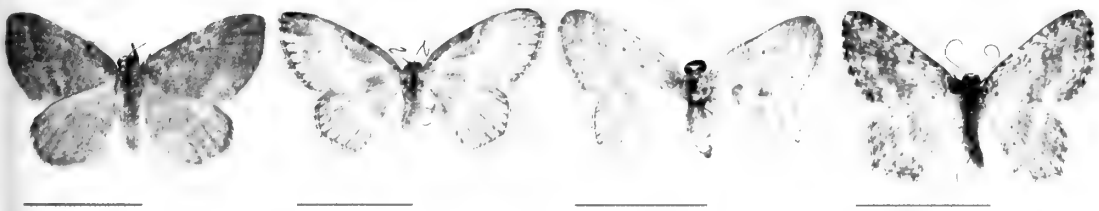

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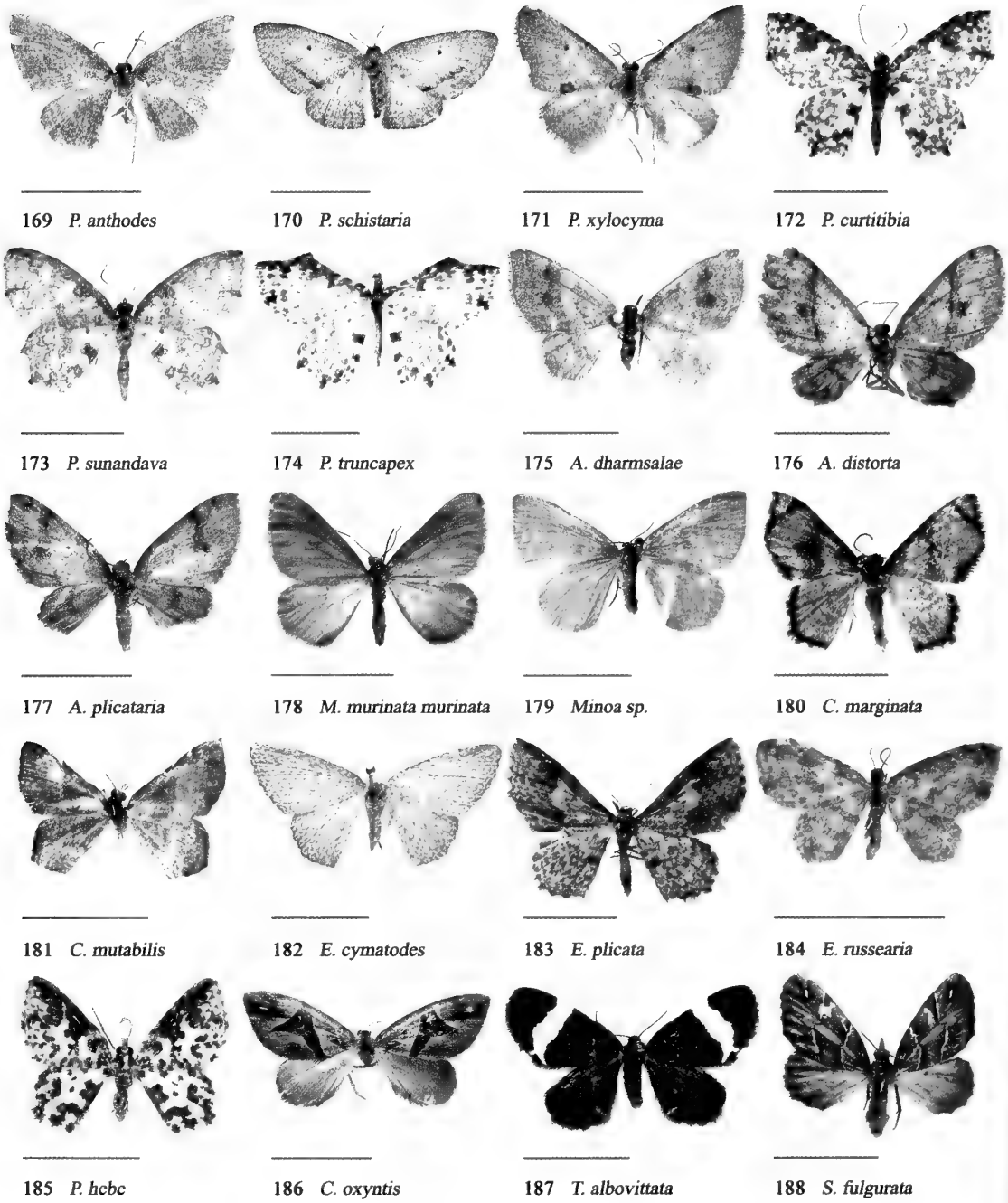

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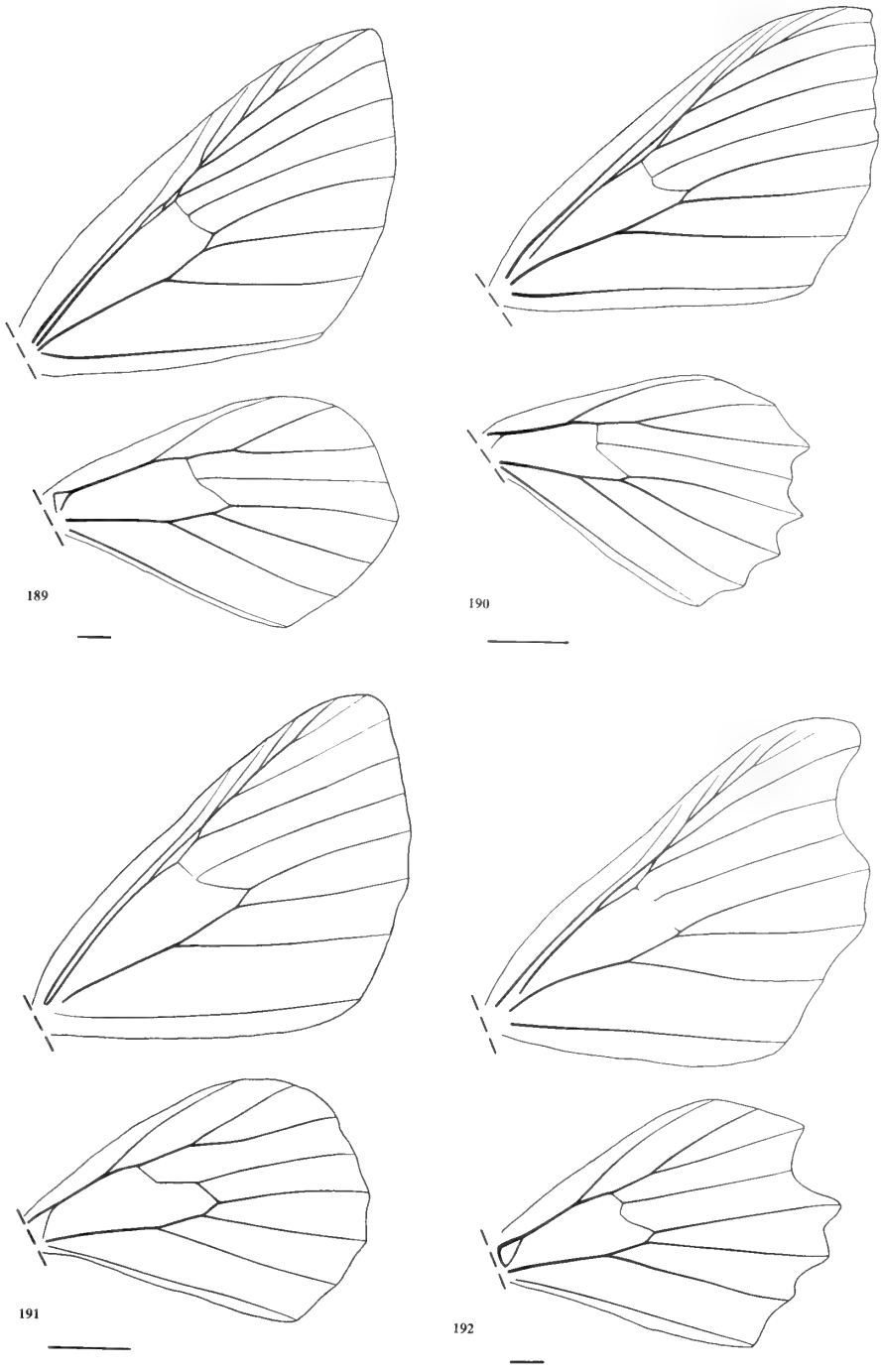

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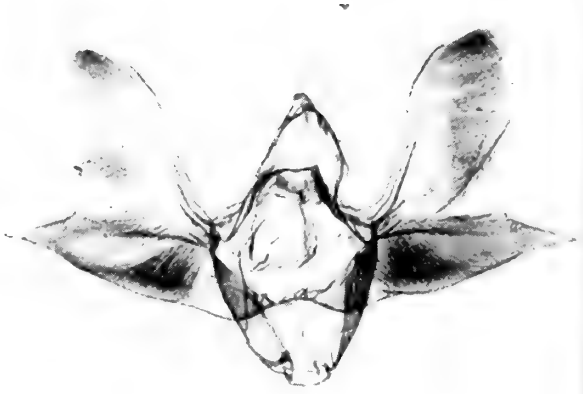
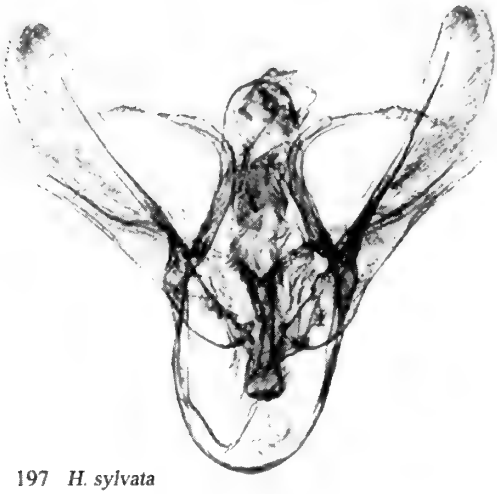
194 *A. opedogramma*

195 *A. undulata*



196 *H. bella*



197 *H. sylvata*

198 *A. pictaria*

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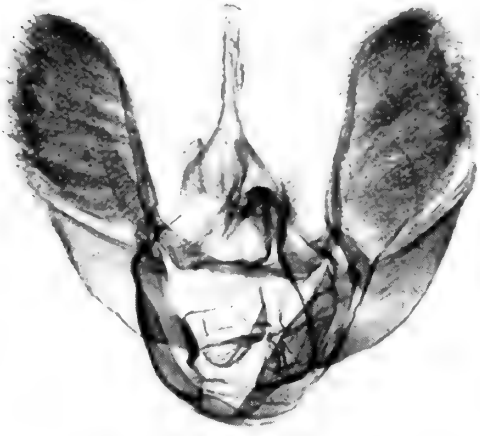
199 *E. nebulata*

200 *E. rubropunctaria*

201 *E. lineata*

202 *"C." flexilinea*

203 *P. phoenicosoma semilauta*



204 *A. dentatissima*

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205 *A. argyridia*

206 *V. cambrica*

207 *V. obliquisigna*

208 *V. ochrota*

209 *N. duodecimlineata*

210 *H. caeruleolineata*

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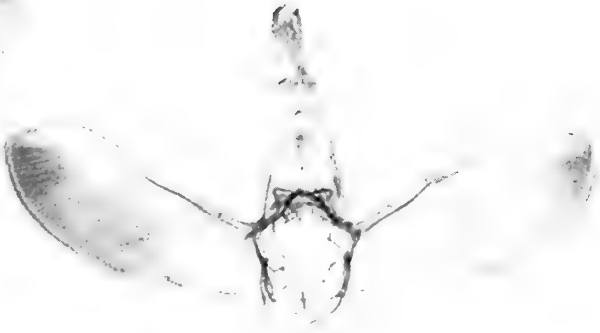
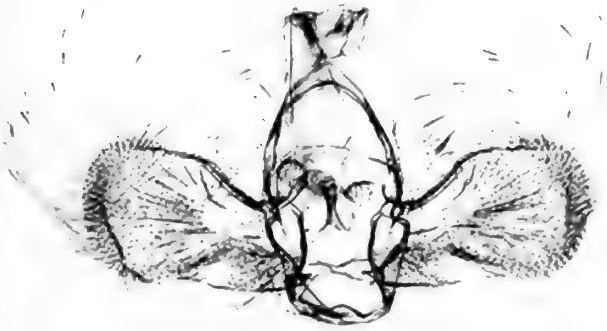
211 *M. azela*



212 *B. albolucens*



213 *L. quadrilinea*

214 *P. flexilinea*

215 *P. dimorpha*

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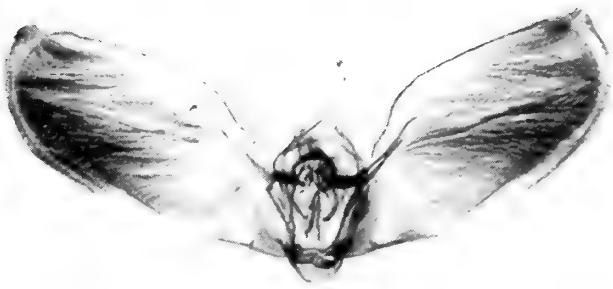
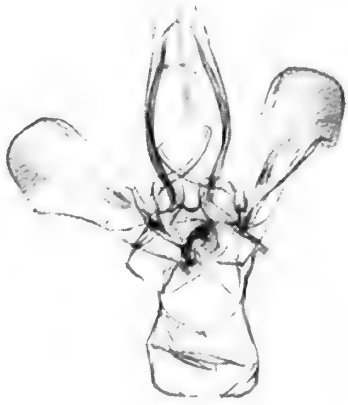


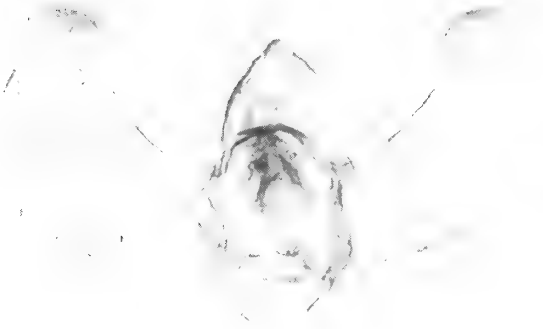
216 *P. pulchraria*

217 *P. papuensis*

218 *P. schistaria*



219 *P. sunandava*



220 *A. plicataria*

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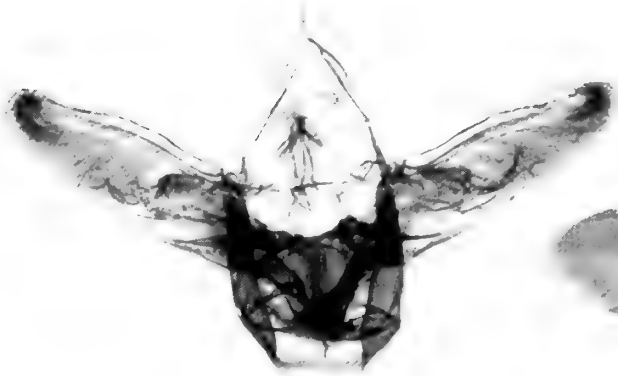

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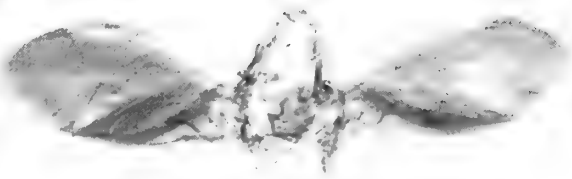
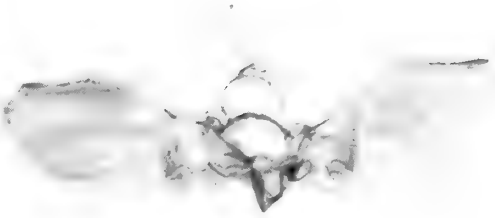


223 *C. mutabilis*



224 *E. cymatodes*

225 *P. hebe*

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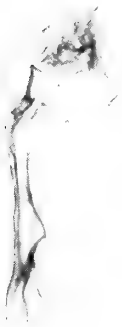
226 *A. albulata*

227 *A. opedogramma*

228 *A. undulata*

229 *H. bella*

230 *H. sylvata*



231 *A. pictaria*

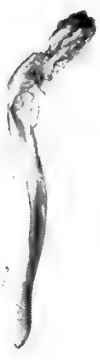
232 *E. nebulata*

233 *E. rubropunctaria*

234 *E. lineata*

235 *"C." flexilinea*

236 *P. phocnicosoma semilauta*



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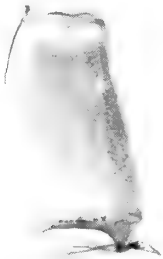

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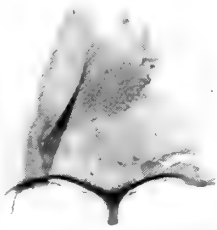

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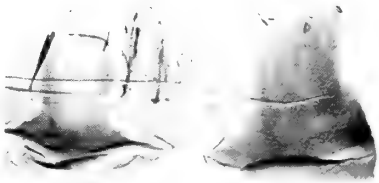

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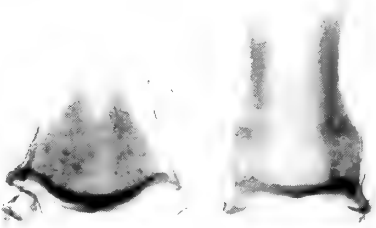

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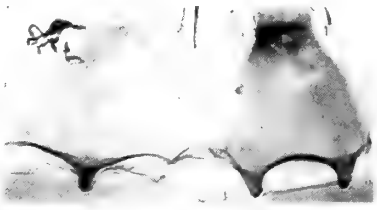

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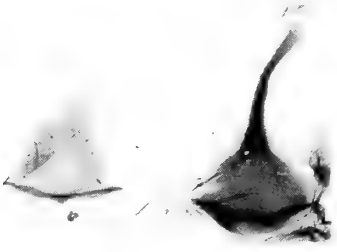

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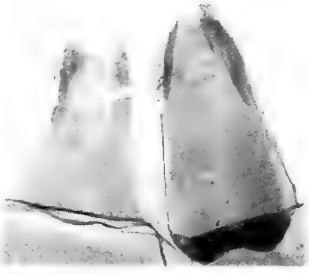

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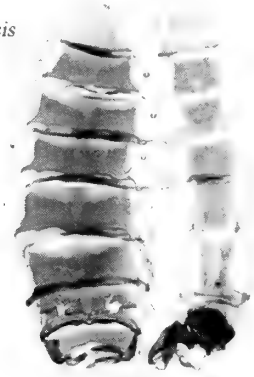

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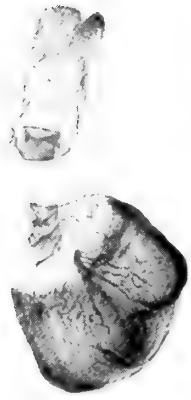

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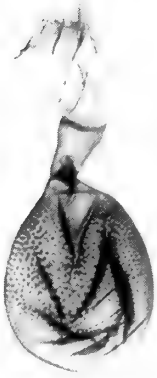

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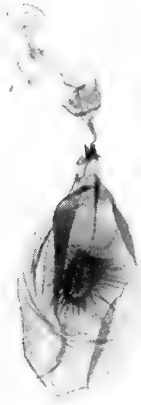

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