

Black and white forewing pattern in Tortricidae (Lepidoptera), with descriptions of new taxa of Neotropical Euliini

Józef RAZOWSKI and Vitor O. BECKER

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Abstract. New type of cryptic forewing pattern is described in Tortricidae. Four new genera (*Lanacerta*, *Subterinebrica*, *Albadea*, *Moneulia*) and 10 new species (*Exoletuncus lobopus*, *E. multimaculatus*, *Subterinebrica impolluta*, *Clarkeria cantamen*, *Netechma consimilis*, *N. cuneifera*, *N. gibberosa*, *N. niveonigra*, *Albadea dea*, *Moneulia monilia*) of Neotropical Euliini illustrating this type of coloration are described.

Key words: Colour pattern, Tortricidae, new taxa, Neotropics.

Józef RAZOWSKI, Institute of Systematics and Evolution of Animals, Polish Academy of Sciences, Sławkowska 17, 31-016 Kraków, Poland.

E-mail: razowski@isez.pan.krakow.pl

Vitor O. BECKER, Research Associate, Departamento de Zoologia, Universidade de Brasília, Caixa Postal 04525, 70919-970 Brasília, DF Brazil.

E-mail: vbecker@rudah.com.br

I. INTRODUCTION

The holotypes of the new species and other material studied was collected by the junior author and is preserved in the Becker Collection. It will eventually be transferred to one of the museums in Brazil. Representatives of a few species originally from V. O. BECKER collection have been kindly donated to the Institute of Systematics and Evolution of Animals PAS, Kraków, Poland.

Abbreviations used:

GS – genitalia slide

[] – the numbers in brackets are the entry number of the specimens in the register book of the above mentioned collection.

A c k n o w l e d g m e n t s. The authors would like to thank Mr. M. KOPEĆ and Mr. K. FIOŁEK, Kraków who kindly made the genitalia slides. Mr. KOPEĆ is the author of the photographs.

II. BLACK AND WHITE TYPE OF FOREWING PATTERN

Among various types of the cryptic coloration of Tortricidae (and other Lepidoptera) the below described seems to be never discussed. It characterizes with white ground colour and black mark-

ings of the forewings developed from the typical tortricine type of pattern (c.f. Figs 1-24). The black colour is represented by a series of medium sized sharp elements resembling the hieroglyphs. The two colours are proportionately distributed and sized and their function is to divide surface of forewing into elements which are weakly visible either on a dark or on a pale ground. In those cases the well visible part forms an abstractive image dissimilar to an animal shape. Similar function of such blotches can be seen in various animals e.g. in a common Palaearctic bird, *Pica pica* LINNAEUS. On the other hand there are similarly arranged black blotches on a green ground colour in other Lepidoptera, e.g. in Palaearctic tortricine moth *Acleris literana* LINNAEUS.

The above described pattern evolved from the typical coloration of Tortricidae, e.a. of its three main elements, viz., basal blotch, median fascia, and terminal markings. Each of them is subdivided into several blotches, situated chiefly along wing edges and in its median area. Other small elements realized in the not transformed pattern are usually atrophied. Also the ground colour which in other tortricines is usually paler than the markings but rather similar in colour becomes clearly white. The evolution of the black and white pattern can easily be observed in the genus *Netechma* RAZOWSKI, 1992 in which grey or brownish suffusions still appear between more or less interrupted elements of marking (cf. Figs 26-29). Also a variation of the degree of infusate areas is observed within the particular species.

It seems interesting that the discussed pattern is to be found in various groups of the Tortricinae and Olethreutinae and in various geographical regions. Some examples are given as follows.

In Euliini it is found in the majority of the species of *Exoletuncus* RAZOWSKI, 1997 and almost all representatives of *Clarkenia* RAZOWSKI, 1988. Black hieroglyphs are arranged species specific or are characteristic of the groups of species. The above mentioned genus *Netechma* has several representatives almost identically coloured as the species of *Exoletuncus* (e.g. *N. gibberosa* sp.n., Fig. 22). In another genus, viz., *Subterinebrica* gen.n. its only species *S. impolluta* sp.n. (Fig. 20) is externally difficult to distinguish from *Exoletuncus*, and the new described *Albadea dea* sp.n. (Fig. 25) resembles the black and white species of *Netechma*.

In Archipini, the Oriental *Neocalyptis aperta* DIAKONOFF has typical pattern of this type, however, all other related species are brownish in coloration. Another example may be "*Tortrix*" *ornithotypha* MEYRICK, 1938 from New Guinea.

Some Afrotropical Olethreutinae, e.g. *Niphadostola asceta* DIAKONOFF, 1989 or Brazilian Olethreutini species, "*Argyroploce*" *intermissa* MEYRICK, 1931 have almost identical coloration. *Crimnologia fletcheri* BRADLEY, 1965 has similarly composed black markings but its ground colour is yellow. It suggests that in this type of pattern the ground colour may vary in shade.

III. DESCRIPTIONS OF NEW TAXA

Exoletuncus lobopus sp. n.

(Fig. 19)

Wing span 17 mm. Head white; labial palpus brown except terminal portion; thorax white, base of tegula and collar black. Costa of forewing gently convex; termen somewhat oblique, rather straight. Ground colour white. Markings black consisting of basal blotch divided into five spots; median fascia with distinctly separate dorsal part, two costal spots and one submedian longitudinal blotch; subapical and terminal markings distinct. Cilia white with indistinct divisions. Hindwing whitish suffused grey and similarly spotted from before middle; cilia brownish creamy.

Female genitalia (Fig. 17): Sterigma large, convex distally, with terminal lobe and subterminal sclerotized fold; ostium submedian with sclerotized distal portion of colliculum; ductus bursae short; ductus seminalis extending from before end of corpus bursae.

Holotype, female: "Brasil: GO[ias], Alto Paraiso, 1300 m, 11 II 1996, V. O. BECKER Col", [98340], GS 22541.

R e m a r k s. Externally it differs from another Brazilian species (*Exoletuncus trilobopus* /MEYRICK, 1926/) in having elongate median marking. A comparison of the genitalia is impossible as the type of this last lacks its abdomen. In this collection there are two specimens from Ecuador which externally resemble *trilobopus* and probably represent a distinct species.

***Lanacerta* gen. n.**

Type-species: *Sciaphila lacertana* ZELLER, 1866.

Coloration of head, thorax and the forewing pattern as in *Exoletuncus*. Venation not examined.

Male genitalia. Uncus and gnathos large, simple; socii rather short, hairy; vinculum slender; valva elongate, with costa well developed; sacculus slender with numerous setae in distal third; transtilla a broad, uniform plate with arch-shaped median portion. Juxta and aedeagus indistinctly seen in the genitalia slide.

Female unknown.

D i s t r i b u t i o n. Colombia.

R e m a r k s. Externally resembling several genera with "black and white" type of pattern but quite different in the genitalia. The uncus and gnathos similar to those in several genera of Neotropical Euliini, e.g. *Proeulia* CLARKE, 1962 or *Transtillaspis* RAZOWSKI, 1987. The setose end part of sacculus was found in some other genera e.g. in *Pseudomeritastis* OBRAZTSOV, 1966 or *Corneulia* RAZOWSKI & BECKER, 1999. However, they represent different lineages. Another putative autapomorphy of this genus is the shape of (broad, arched) transtilla.

***Lanacerta lacertana* (ZELLER, 1866), comb. n.**

Sciaphila lacertana ZELLER, 1866, Stettin. Ent. Ztg., 27: 151, pl. 1, fig. 10. Type-species: "Monte del Eden, Colombia, 9500, 10.20", GS 6409 [BM]; coll. NHML.

Externally very similar to *Exoletuncus artifex* RAZOWSKI, 1997 from Peru but differs in the arrangement of basal and terminal black markings.

Male genitalia (Fig. 1) as described for the genus.

***Subterinebrica* gen. n.**

Type-species: *Subterinebrica impolluta* RAZOWSKI & BECKER, sp.n.

Wings weakly expanding posteriorly; costa somewhat convex; termen weakly oblique, straight.

Venation: In forewing all veins separate; R5 to beneath apex; chorda atrophied; CuA2 rather posterior to base of R1, oppositely.

Male genitalia. Uncus stout; socii short, hairy and bristled; gnathos simple, with slender terminal plate; valva broad, tapering terminally; sacculus slender, with ventral spines; median part of transtilla broad, ovate, armed with thorns; juxta with dorso-lateral horns; aedeagus with large membranous parts; caulis very large.

Female unknown.

D i s t r i b u t i o n. Known from Ecuador.

R e m a r k. This genus resembles *Terinebrica* RAZOWSKI, 1987 having similar distal part of aedeagus and, dorso-lateral processes of juxta. Its autapomorphies are probably the structure of median part of transtilla, the extremely long caulis and the small, setose socii.

Subterinebrica impolluta sp. n.

(Fig. 20)

Head and thorax blackish; front and ends of labial palpi (over 1.5 times diameter of eye), end parts of tegulae and thorax white. Ground colour of forewing white with indistinct glossy greenish hue; markings and termen beyond elements of the former black: Three spots at base, last before mid-dorsum followed by a minute spot and large tornal blotch; curved, S-shaped marking from postbasal part of costa to mid-length of wing subdorsally; two blotches in middle and 2/3 of costa followed by very small subapical spot and a blotch extending from apex of wing, interrupted medially. Hindwing creamy white, creamy in apex area where diffuse grey spots; cilia white creamy. Forewing reverses: Two white spots on blackish ground at costa postmedially and subapically and three white divisions of cilia.

Male genitalia (Figs 2,3) as described for the genus.

Female unknown.

Holotype, male: "Ecuador: Carchí, Maldonado, 2200 m, 9-11 I 1993, V. O. BECKER Col", [105247], not dissected; paratypes, 2 males, same label, [one, GS 22535, in coll. ISEZ] and two males with collection nr. 10334.

Clarkenia cantamen sp. n.

(Fig. 21)

Wing span 16 mm (in paratype 21 mm). Head and thorax white; labial palpus 1.5 diameter of eye, blackish to beyond middle of median joint; base of tegula black. Forewing weakly expanding terminally, termen indistinctly concave. Ground colour silvery white with minute black and grey-black dots. Markings black consisting of small basal blotch at costa, costal spot being a remnant of median fascia and small subapical spot; black spot near mid-dorsum followed by minute spot at tornus; weak additional spots along costa and dorsum. Cilia white, blackish beneath apex of wing and at median part of termen. Hindwing pale brownish grey, whitish basally, with numerous pale brownish grey spots; cilia whitish with some grey scales.

Male genitalia (Figs 4,5): Uncus slender, rather short; valva broad, subovate; dorsal process of sacculus accompanied by a minute subventral process; transtilla narrowing medially, rather weak; aedeagus small with slender ventro-terminal process; three cornuti in vesica.

Holotype, male: "Ecuador: Tung.[urahua], Patate, 3000 m, 7 XII 1972, V.O. BECKER Col", [105253]; GS 22521.

R e m a r k. Another male specimen not included as the paratype differs in larger size, more oblique termen and larger aedeagus with 14 cornuti.

Netechma gibberosa sp. n.

(Fig. 22)

Wing span 22 mm. Thorax white with black collar, tegula indistinctly mixed pinkish. Forewing weakly expanding terminally, termen hardly concave beneath apex. Ground colour snow white. Markings black consisting of numerous spots, remnants of basal blotch, postbasal marks at dorsum, six spots along costa, a subterminal median line and some spots along termen. Cilia white in median part of termen blackish. Hindwing whitish, slightly tinged pale brownish in posterior half of wing, with diffuse brownish spots; cilia white. Reverses: Ochreous creamy spots along costa of forewing; cilia white, blackish at middle part of termen.

Male genitalia (Figs 6,7). Uncus very slender; socii elongate-rounded; valva broad; costa of valva with large rounded postbasal lobe; sacculus broad in basal half, then very slender, setose; me-

dian part of transtilla broad, with apical process; aedeagus rather short with eleven short, capitate cornuti.

Female unknown.

Holotype, male: "Ecuador: Tung.[urahua], Patate, 3000 m, 7 XII 1972, V. O. BECKER Col", [100130]; GS 22540.

R e m a r k. Distinct by coloration in which it rather resembles *Exoletuncus* RAZOWSKI, 1988. In the male genitalia it resembles the species of *Netechma* with variably developed lobe of the costa of valva.

Netechma niveonigra sp. n.

(Fig. 23)

Wing span 19 mm. Head, upper and terminal parts of labial palpus and proximal half of thorax snow white, lateral parts of palpi brownish; base of tegula blackish. Forewing weakly expanding terminally with costa almost straight and termen fairly oblique, straight. Ground colour white with black minute dots scattered all over surface of wing. Markings black consisting of basal blotch preserved at costa and (a trace) at dorsum, subsquare blotch near mid-costa; minute spot at 2/3 of costa and elongate-subsquare blotch extending from apex to 2/3 of termen. Cilia black except at apex and tornus. Hindwing white, creamy tinged brownish in apical third where pale brownish grey dots; cilia whitish.

Female genitalia (Fig. 17): Sterigma large, rounded proximally and laterally, with concave distal edge, fusing with colliculum; this last rather well but not uniformly sclerotized; basal portion of ductus seminalis very broad, sclerotized, curved, then very slender; corpus bursae without sclerites.

Holotype, male: "Ecuador: Loja, Loja, 2750 m, 21 XII 1992, V.O. BECKER Col", [103128]; GS 22522.

R e m a r k s. Externally very distinct by coloration. In the genitalia resembling some species (eg. *N. lojana* RAZOWSKI & BECKER, 2001) with broad, swung basal part of ductus seminalis.

Netechma cuneifera sp. n.

(Fig.24)

Wing span ca 17 mm. Head white, labial palpus ca twice the diameter of eye; thorax white, base of tegula black. Forewing rather not expanding terminally, termen weakly oblique, tolerably straight. Ground colour white with a few black and yellowish dots. Markings black consisting of costal blotch at base (interrupted at costa medially), minute median spot, trace of subapical spot and two larger spots at dorsum: the median larger, subtriangular and subtornal oblique, a remnant of median fascia. Cilia white with blackish division at mid-termen. Hindwing whitish creamy spotted pale brownish creamy, white at base; cilia whitish.

Male genitalia (Figs 8,9): Socii broad, rounded; gnathos rather short, slender; valva broadest medially; sacculus broad with minutely thorny, wedge-shaped subterminal process accompanied by subdorsal slender process; transtilla slender medially; Aedeagus slender; cornuti 11 small and two long spines.

Holotype, male: "Ecuador: Carchi' Maldonado, 2200 m, 9-11 I 1993, V.O. BECKER Col", [105254], not dissected; paratype, male, same label, GS 13537 [coll. ISEZ] and another male from Napo, Baeza 2000 m 29 XII 1992,

Species with intermediate coloration

Albadea gen. n.

Type-species: *Albadea dea* sp.n.

Externally resembling several species of *Netechma* with black and white coloration of forewing, however, without subdivision of median fascia.

Venation: In forewing R5 to beneath apex; in hindwing Rs-M1 and M3-CuA1 stalked to ca 1/3.

Male genitalia. Tegumen high; uncus slender, simple, without hairs or bristles; socius very large, drooping; gnathos arms slender, terminal plate simple, small; vinculum simple, fairly large; Valva long, rather slender, with costa well developed, strongly extending at base dorsally; pulvinus absent; sacculus strong, provided with terminal thorny process directed dorsally; transtilla very large, extending ventrally, with broad median part armed with a pair of thorns; aedeagus simple, slender; no cornuti in vesica.

Female and biology (except for the date of collection) unknown.

D i s t r i b u t i o n: Ecuador.

R e m a r k s. The putative autapomorphies of this genus are the structure of transtilla which to some degree resembles that in *Transtillaspis* RAZOWSKI, 1987.

Albadea dea sp. n.

(Fig.25)

Wing span 13 mm. Head and thorax white; labial palpus ca twice diameter of eye. Forewing ground colour glossy white; markings black consisting of four large costal spots followed by a minute spot before apex, and two subtriangular dorsal blotches, one median, the other subtornal; some black dots scattered over the wing surface. Cilia white with black terminations in postmedian part. Hindwing whitish, creamy in apex area; cilia white.

Male genitalia (Figs 10,11) as described for the genus.

Holotype, male "Ecuador: Carchí, Maldonado, 2200 m, 9-11 I 1993, V.O. BECKER Cd" [105224], GS 22547.

Netechma nigralba RAZOWSKI & BECKER, 2001

Netechma nigralba RAZOWSKI & BECKER, 2001, Acta zool. cracov., **44**(4): 377; figs 47, 68. Type locality: Ecuador: Morona, Imdanza.

Described from one specimen with forewing almost entirely suffused blackish. Now two white, black marked examples found. Their female genitalia almost identical with those of the type. The additional specimens are from different part of Ecuador, viz., from Loja.

Netechma consimilis sp. n.

(Fig. 26)

Wing span 17 mm. Head greyish, white laterally, labial palpus white-grey; thorax white, base of tegula and collar black. Forewing slender with termen moderately oblique, rather straight. Ground colour clear white with blackish dots in terminal part of wing and large grey suffusions in median cell and between three pairs of black marks at costa. Markings black consisting of triangular dorso-basal blotch, elongate submedian blotch at dorsum followed by subtornal and tornal spots; terminal marking median, subtriangular, grey distally; a few black dots at costa near apex. Cilia white densely scaled grey. Hindwing pale brownish creamy spotted brownish except for basal area which is whitish; cilia creamy.

Female genitalia (Fig. 18): Sterigma broad with rounded proximal corners; distal part of colliculum broad, well sclerotized, more proximal portion with some transverse folds; wedge-shaped sclerite from ductus bursae to middle of corpus bursae; latero-basal sac of ductus seminalis weakly sclerotized; accessory bursa in basal part of ductus bursae, dorsally.

Holotype, female: "Ecuador: Loja, Loja, 2750 m, 21 XII 1992, V. O. BECKER Col", [103131]; GS 22529.

R e m a r k s. Externally resembling several species of this genus e.g. *N. nigralba* or *N. indanzana* RAZOWSKI & BECKER, 2001, both Ecuadorian but differs in dorsal markings and genitalia. The presence of grey suffusion of forewing occurs occasionally in other species of this genus and may disappear. In such cases the coloration is purely black and white.

Moneulia gen. n.

Type-species: *Moneulia monilia* sp.n.

Forewing typical euliline, weakly expanding posteriorly, with slightly oblique termen. Markings black and white with large brownish suffusions. Venation: In forewing R5 to beneath apex; remnant of chorda extending beyond base of R1; CuA2 rather opposite this last. In hindwing Rs-M1 stalked to ca 1/3; Ms-CuA1 connate.

Male genitalia. Uncus small, broad; socii broad extending medially and somewhat so ventrally, hairy and scaled; gnathos arm slender, thorny, expanding terminally; vinculum slender; valva elongate with fully developed costa; pulvinus absent; sacculus slender, with small terminal projection; transtilla slender medially; aedeagus slender, curved; caulis minute; one small cornutus found.

Female unknown.

D i s t r i b u t i o n. Ecuador.

R e m a r k s. A monotypical genus externally resembling *Netechma* but probably close to *Helicteulia* RAZOWSKI, 1988 and *Simaenica* RAZOWSKI, 1997 (having similar shapes of the socii and aedeagus). Its putative autapomorphies are the shapes of gnathos and socii.

Moneulia monilia sp. n.

(Fig. 27)

Wing span 17 mm. Head brownish, whiter dorso-medially; labial palpus 1.5 times diameter of eye, white, brown medially; thorax black-brown, end of tegula whitish. Forewing ground colour glossy white strigulated light grey-brown in dorsal third of wing, suffused with same colour in distal third. Markings black-grey with black spots consisting of basal blotch extending dorso-posteriorly, postbasal incomplete fascia originating at costa, median fascia divided into costal triangle and dorsal diffuse, much paler part, subapical blotch and weak subterminal markings; two spots at termen beneath apex. Cilia brownish white with browner divisions. Hindwing translucent, whitish, tinged light brownish terminally. Cilia pale brownish white in apex area, otherwise white.

Male genitalia (Figs 12,13) as described for the genus.

Holotype, male: "Ecuador: Loja, Loja, 2750 m, 21 XII 1992, V.O. BECKER Col", [103133]; GS 22526.

R e m a r k s. Externally very similar to *Helicteulia heos* RAZOWSKI, 1988.

Exoletuncus multimaculatus sp. n.

(Fig. 28)

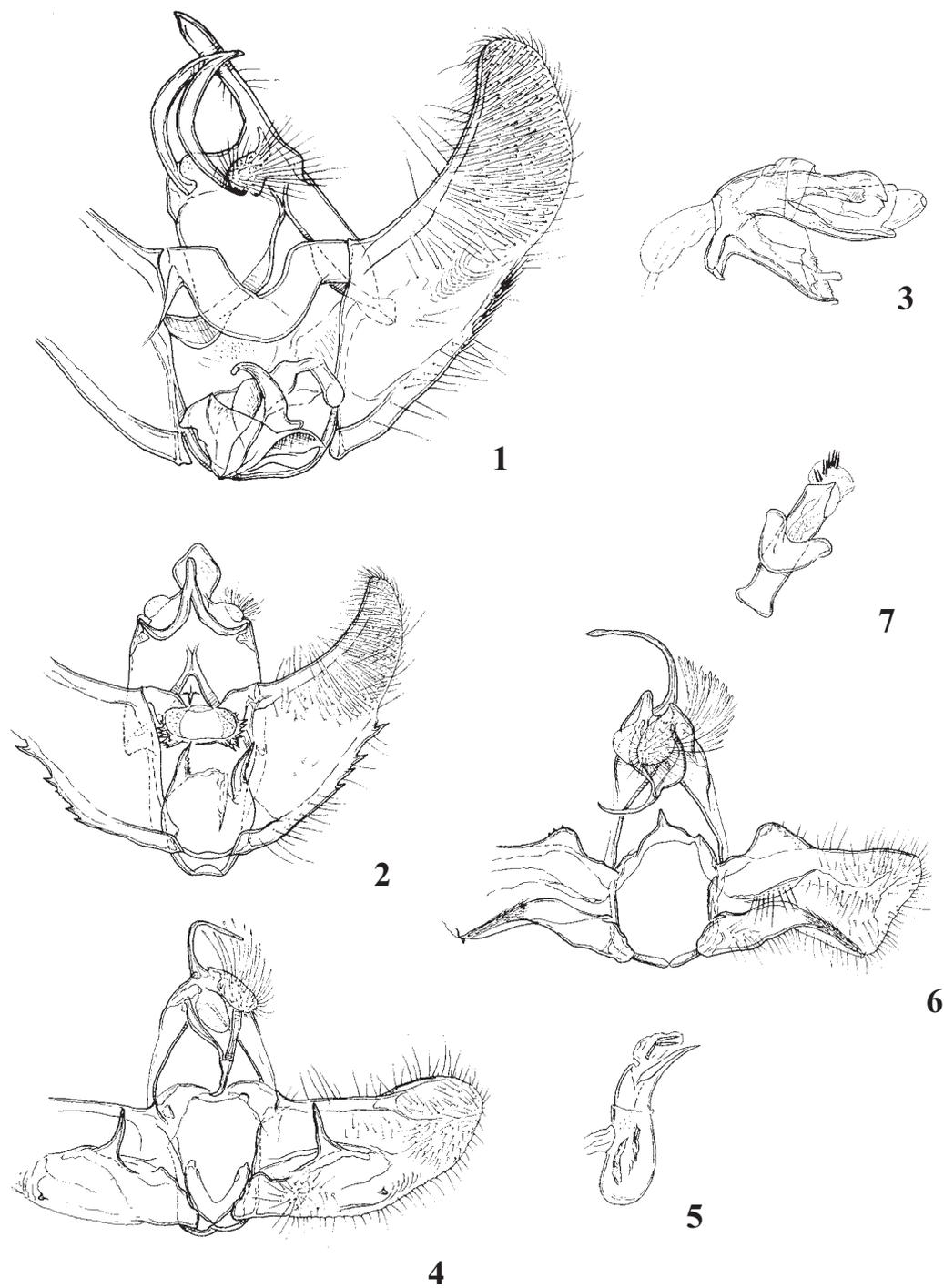
Wing span 25 mm. Head white; labial palpus ca 1.5 times diameter of eye, with median joint brownish along middle; thorax blackish white posteriorly; tegula white with black base and median fascia. Forewing somewhat expanding terminally; termen weakly oblique, hardly convex. Ground colour white. Markings black consisting of numerous dots and spots: at base, in postbasal area mainly at dorsum, in form of median fascia with larger spots at costa and subcostally, with numerous small spots forming subternal marking, subapical, and terminal spots. Fringes white with numerous black divisions. Hindwing creamy white, tinged brownish beyond middle, spotted brownish creamy; cilia whitish with pale brownish median line.

Male genitalia (Figs 14,15): Uncus absent; socii very broad, rounded ventrally; sacculus broadly rounded, with spines; posterior part of valva broad, hairy; costa convex medially; aedeagus slender, tapering terminally; coecum penis very broad.

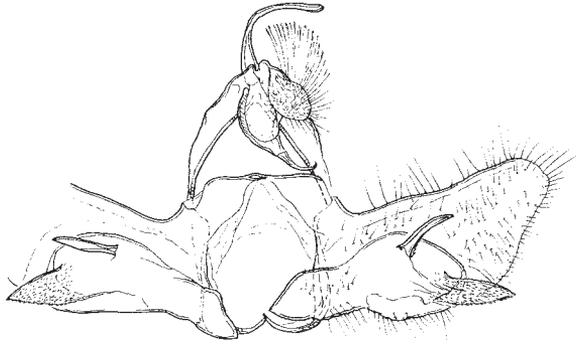
Female genitalia unknown.

Holotype, male: "Ecuador: Carchí, Maldonado, 2200 m, 9-11 I 1993, V. O. BECKER Col", [105246], GS 22534.

R e m a r k s. However, this species has a purely black and white coloration, it differs from the species with the discussed pattern in having small multiplied spots.



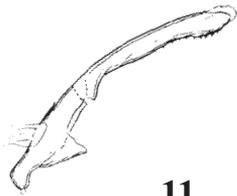
Figs 1-7. Male genitalia: *Lanacerta lacertana* (ZELLER), holotype; 2,3 – *Subterinebrica impolluta* sp.n., paratype; 4,5 – *Clarkenia cantamen* sp.n., holotype; 6,7 – *Netechma gibberosa* sp.n., holotype.



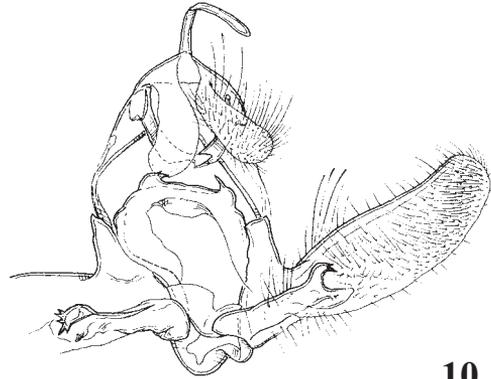
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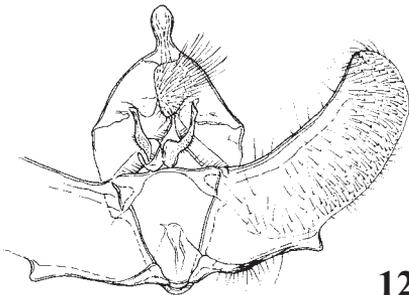
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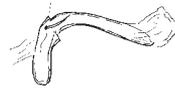
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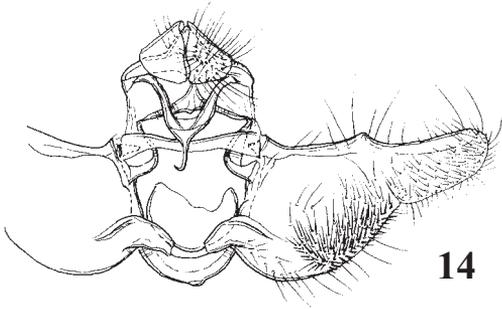


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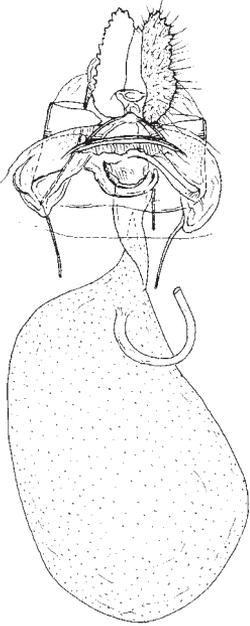
Figs 8-13. Male genitalia: 8,9 – *Netchma cuneifera* sp.n., paratype; 10,11 – *Albadea dea* sp.n., holotype; 12,13 – *Moneulia monilia* sp.n., holotype.



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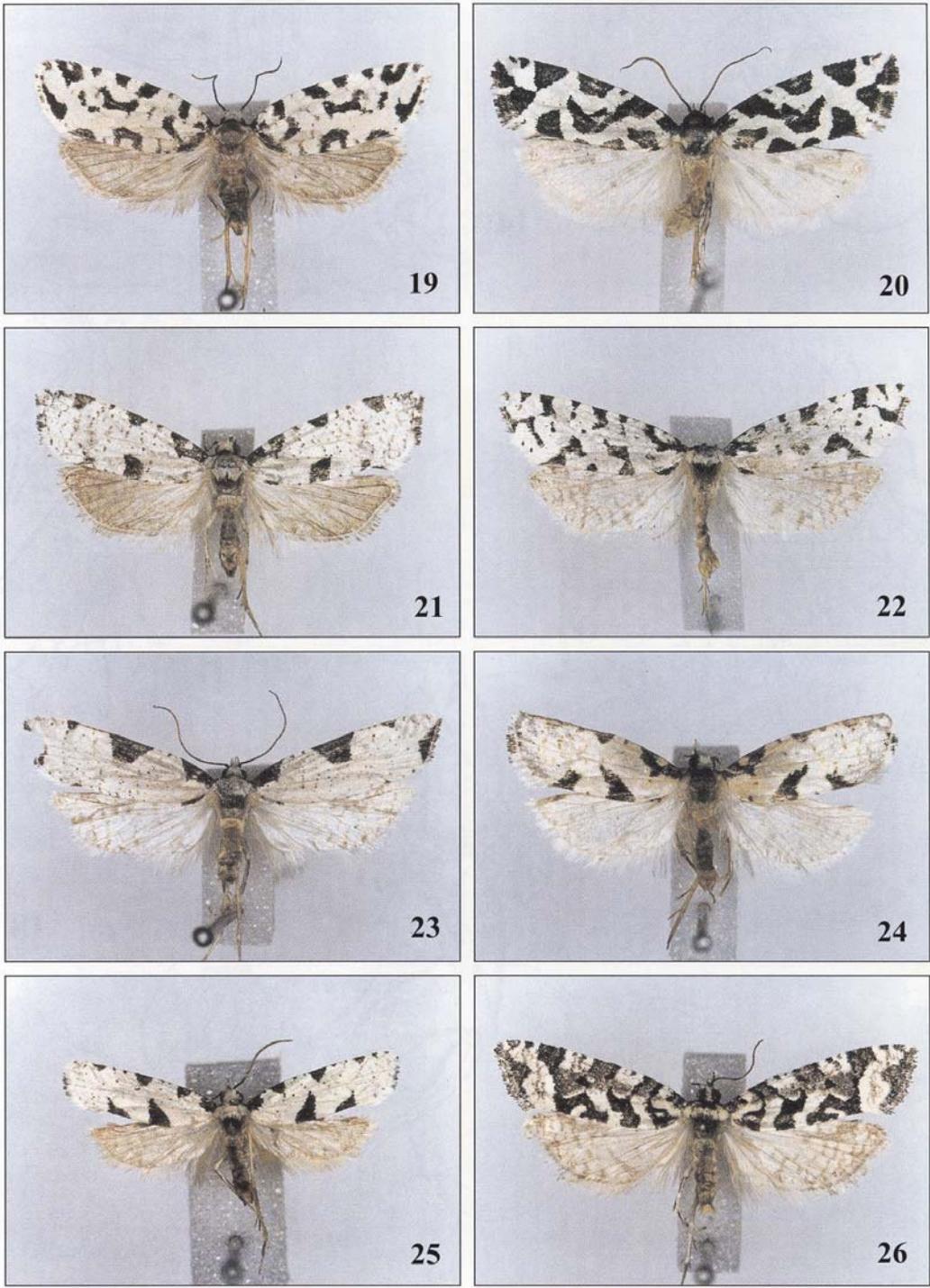


17



18

Figs 14-18. Male and female genitalia: 14,15 – *Exoletuncus multimaculatus* sp.n., holotype, 16 – *Exoletuncus lobopus* sp.n., holotype; 17 – *Netechma niveonigra* sp.n., holotype; 18 – *N. consimilis* sp.n., holotype.



Figs 19-26. Adults: 19 – *Exoletuncus lobopus* sp.n., holotype; 20 – *Subterinebrica impolluta* sp.n., paratype; 21 – *Clarkeulia cantamen* sp.n., holotype; 22 – *Netechma gibberosa* sp.n., holotype; 23 – *N. niveonigra* sp.n., holotype; 24 – *N. cuneifera* sp.n., paratype; 25 – *Albadea alba* sp.n., holotype; 26 – *N. consimilis* sp.n., holotype.



Figs 27,28. Adults: 27 – *Moneulia monilia* sp.n., holotype; 28 – *Exoletuncus multimaculatus* sp.n., holotype.