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Revision of the endemic genus *Perinetella* (Hemiptera: Fulgoromorpha: Flatidae) from Madagascar

Dariusz ŚWIERCZEWSKI[1,*] & Adam STROIŃSKI[2]

[1] Department of Zoology and Animal Ecology, Jan Długosz University, Al. Armii Krajowej 13/15, 42-201 Częstochowa, Poland; e-mail: dswier@ajd.czest.pl

[2] Museum and Institute of Zoology, Polish Academy of Sciences, Wilcza 64, 00-679 Warszawa, Poland; e-mail: adam@miiz.waw.pl

[*] Corresponding author

Abstract. Here we review the endemic flatid genus *Perinetella* Synave, 1956 from central Madagascar, comprising three species, two of which are described as new: *Perinetella nigroflava* Synave, 1956 (type species), *P. fiedleri* sp. nov., and *P. flavomarginata* sp. nov. We provide an identification key and diagnostic illustrations for all species and illustrate the female internal genital structures of *P. nigroflava*.

Key words. Hemiptera, Auchenorrhyncha, Flatinae, planthoppers, entomology, taxonomy, systematics, new species, endemism, Afrotropical Region

Introduction

Madagascar is renowned for its exceptional biota with high species diversity, levels of endemism and rates of deforestation, making it one of the world's most important places for biodiversity conservation (Ganzhorn et al. 2001). The notable degree of species diversity and endemism can be partially explained by the long isolation of Madagascar from Africa (more than 150 million years) and India (less than 90 million years) (Storey et al. 1995). Several alternative mechanisms may have generated local endemism, including allopatric speciation driven by isolation, for example, due to rivers or watersheds (Wilmé et al. 2006); parapatric speciation along environmental gradients (Smith et al. 1997); or ecologically mediated post-speciation range shifts (Losos & Glor 2003). Since human colonization of Madagascar ca. 1500–2000 years ago (Burney 1997), it is estimated that more than 80 percent of Madagascar's original habitat has been destroyed. Most of the island is now composed of secondary (anthropogenic) grasslands, which are depauperate, dominated by pantropical species and burnt annually (Lowry et al. 1997).

Flatidae constitutes one of the largest families within planthoppers (Fulgoromorpha, Hemiptera) distributed worldwide, with 1420 described species in 297 genera covering 2 subfamilies: Flatinae Spinola, 1839 with 13 tribes (Ceryniini Schmidt, 1912; Flatini Schmidt, 1912; Lawanini Melichar, 1923; Nephesini Melichar, 1923; Ormenisini Medler, 2001; Phantiini Melichar, 1923; Phromniini Melichar, 1923; Phyllyphantini Melichar, 1923; Poekillopterini Kirkaldy, 1907; Pseudoflatini Melichar, 1923; Selizini Melichar, 1923; Siphantini Melichar, 1923; Sisciini Melichar, 1923) and Flatoidinae Melichar, 1901 without tribal classification (Bourgoin 2015). Presently, the Flatidae fauna of Madagascar includes, in total, 21 genera with 45 species of Flatinae and 11 genera with 37 species of Flatoidinae (Świerczewski & Stroiński 2013, Mąkol et al. 2014, Stroiński & Świerczewski 2014a,b).

Summarizing, the known Flatidae of Madagascar represent almost 6% of species and 11% of genera of the world fauna of the family. Fifty-six percent of the Madagascan flatid species and 93% of the genera are endemic to the island. In this paper we revise one of the endemic genera, *Perinetella* Synave, 1956, previously monotypic with *Perinetella nigroflava* Synave, 1956 as the type species, and describe additional two new species.

Material and methods

Material. The studied material is deposited in the entomological collections of the following institutions:

CAS	California Academy of Sciences, San Francisco, USA;
IRSNB	Institut royal des Sciences naturelles de Belgique, Brussels, Belgium;
MNHN	Muséum national d'Histoire naturelle, Paris, France;
MZPW	Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw, Poland;
NMPC	National Museum, Prague, Czech Republic.

Label information of all examined species are provided verbatim with each label separated by a double slash (//).

Preparations and illustration. The abdomens of the specimens examined were removed and cleared for 30 min in warm (50°C) 10% KOH solution with a few drops of black chlorazol (CAS No. 1937–37–7) for dying the ectodermic genital ducts based on the method introduced by Carayon (1969) and Bourgoin (1993). Dissections and cleaning of genital structures were performed in distilled water. Final observations and drawings were done in glycerin using a camera lucida attached to a light microscope. All colour images were taken using a Leica MZ 16 stereomicroscope with an IC 3D digital camera; final images were produced using Helicon Focus and Adobe Photoshop software. The SEM photographs of uncoated specimens were taken in the Laboratory of Scanning Microscopy of the Museum and Institute of Zoology, Polish Academy of Sciences (Warsaw), using a HITACHI S-3400N scanning electron microscope under low vacuum conditions.

Measurements and abbreviations. Measurements were made with an ocular micrometer. The following measurements, ratios and their abbreviations were used in this study:

Total length	measured (in dorsal view) from head apex to tegmina apex;
A/B	width of vertex measured at anterior margin/length of vertex measured at midline;
C/E	width of frons at upper margin/length of frons at midline;
D/E	maximum width of frons/length of frons at midline;

F/B	length of pronotum at midline/length of vertex at midline;
G/F	length of mesonotum/length of pronotum at midline;
G/B+F	length of mesonotum/cumulative length of vertex and pronotum at midline;
G/H	length of mesonotum at midline/width of mesonotum between lateral angles;
I/J	length of tegmen measured from the base to the apical margin in median portion/width of tegmen measured from the apex of clavus to the anterior margin.

Terminology. The nomenclature of wing (tegmen) veins follows the interpretation proposed by Bourgoin et al. (2015). Antennal structures are named in accordance with Stroiński et al. (2011). The terminology of the genitalia follows Bourgoin (1988) and Bourgoin & Huang (1990) for the male, and Bourgoin (1993) for the female.

Taxonomy

Perinetella Synave, 1956

Type species. *Perinetella nigroflava* Synave, 1956, designated by monotypy.
Diagnosis. *Perinetella* is similar to the genus *Flatopsis* Melichar, 1902 (both are currently classified in the tribe Lawanini) in the following characters: frons tricarinate with lateral carinae in form of horseshoe, pronotum with postocular eminences conical, mesonotum with three parallel carinae, ScP+RA and RP tegmen veins leaving basal cell at one point. *Perinetella* differs from *Flatopsis* in the following characters: head truncate (conical in *Flatopsis*), apical margin arcuate (straight in *Flatopsis*). A key separating *Perinetella* and *Flatopsis* from other Madagascar Flatinae genera was provided by Synave (1956).
Redescription. ***Head*** with compound eyes, in dorsal view, narrower than thorax (Figs 2, 3, 5, 65). Vertex wider than long at midline, partly covered by pronotum medially (Figs 3, 10, 65). Anterior margin straight, with sharp carina; posterior margin slightly arcuate; lateral margins subparallel and carinate. Disc of vertex without median carina, with two setae near midline and secretory structures (wax pores) (Fig. 8). Frons (Figs 4, 11, 12, 66) just longer than wide, widest below level of antennae, with abundant secretory structures (Figs 15, 16); median carina keel-shaped, reaching or slightly exceeding midlength of frons; lateral carinae obsolete, in form of horseshoe. Disc of frons depressed. Clypeus narrower than frons, convex, without median carina (Figs 11, 66). Rostrum with apical segment distinctly shorter than subapical, apex reaching hind coxae. Compound eyes oval, with small callus at posterior margin; lateral ocelli present near ventral margin of compound eye (Figs 13, 14). Antennal pedicel short, widening distad, with setae and plate organs restricted to concavity at the top and partly on upper surface (Figs 17–22). Sensilla placodea of the clover leaf-like type.

***Thorax*.** Pronotum distinctly longer than vertex at midline (Figs 3, 5, 10, 65), with abundant secretory structures; anterior margin strongly arcuate with shallow median incision, posterior margin concave; disc of pronotum without carinae, with two lateral concavities; postocular eminences conical (Figs 5–7, 13, 65). Mesonotum deltoid, about as long as wide, much longer than cumulative length of vertex and pronotum (Figs 2, 3, 5, 6, 65); with three carinae separated at base, median carina anteriorly obsolete, not reaching scutellum; lateral carinae almost straight, subparallel, reaching posterior margin; scutellum triangular, large and elevated (Figs 3, 6, 25, 65).

Tegmen (Figs 1, 23–27, 64) membranous, elongated and weakly convex, with distinct venation and small bulla located basally between ScRA and RP, with subapical line; apical cells distinctly longer than wide; subapical line of transverse veinlets present in some species; transverse veinlets forming dense irregular net on the whole tegmen. Costal and apical margins weakly arcuate, postclaval sutural margin straight; costal angle rounded, sutural angle rounded or acute and slightly produced. Costal area about the same width as its length, with transverse veinlets, terminating at about the level of end of clavus. Postcostal cell tapering apicad, basally about the same width as costal area, with irregular net of veinlets. ScP+RA and RP veins leaving basal cell at a single point; basal part of ScP+RA elevated, forming small bulla; ScP+RA ending with 4 terminals before costal angle, RP forked after the first fork of MP; CuA fork after MP fork; MP_{3+4} and CuA wave-shaped, CuA terminals ending at postclaval margin. Claval veins Pcu and A1 fused almost anterior to clavus apex; Pcu and A1 veins elevated; transverse veinlets absent. Tubercles concentrated between basal part of ScP+RA and MP veins and on clavus. Almost all veins, except for the basal part, with abundant secretory structures (Fig. 28).

Legs. Femora shorter than tibiae. Hind tibiae weakly arcuate and partly flattened laterally with 2 lateral spines placed in posterior half, apically with row of 7 well-developed teeth. Hind basitarsomere as long as cumulative length of 2nd and 3rd tarsomeres, with row of 8 apical spines and thick setae; second tarsomere with 2 lateral spines and median pad with thick setae. Metafemorotibiotarsal formula 2–7/8/2.

Male terminalia (Figs 29–40, 55–63). Anal tube, in lateral view (Figs 31, 32, 35, 55, 58), elongated and curved; anus placed approximately at midlength; anal tube, in dorsal view (Figs 29, 30, 36, 59), elongated with apical median incision, basal part narrower than apical part. Pygofer, in lateral view (Figs 31, 32, 35, 55, 58), taller than wide; dorsal part distinctly narrower than ventral part, posterior margin arcuate. Posterior-dorsal angle without process. Genital styles (Figs 32, 33, 35, 55, 58) longer than wide, bearing distinct dorsocaudal, long and sharp capitulum. Phallic complex: Periandrium (Figs 37, 38, 56, 57, 60, 61) elongate, narrow, about the same width and weakly upcurved; apically divided by lateral split into dorsal and ventral part; lateral split not reaching the midlength of periandrium; dorsal part longer than ventral part, tapering distally, with lobe on the ventral margin, apically with well sclerotized 2-armed processes; ventral part trilobate, lateral lobes smaller and rounded, median lobe distinctly longer and tapering apically. Aedeagus s. str. (Figs 33, 34, 39, 40, 62, 63) with lateral, well-sclerotized, bulb-like appendages and deep median split, surpassing midlength; ventral margin with distinct spiniferous microsculpture.

Female terminalia (Figs 41–54). Pregenital sternite massive, lateral lobes weakly separated (Figs 45, 47). Anal tube, in lateral view (Figs 43, 44), elongate oval, surpassing end of gonoplac; anus placed dorsally about midlength; anal tube, in dorsal view (Figs 41, 42), pear-shaped, apically with deep and narrow, distal median incision. Gonoplac unilobate, rectangular, laterally flattened (Figs 43–46, 48, 49); lower part with weakly sclerotised area; membranous lobe small, semicircular, placed near posterior-ventral angle; posterior margin with long setae, two rows of well-developed teeth in upper part, one row in lower part (Figs 45–46). Gonapophysis VIII laterally flattened, tapering apically, with sharp irregularly denticulated apex (Fig. 50); basal part of external side with dense chaetae, lower part alongside

ventral margin with microsculptures in form of scales. Endogonocoxal process slightly shorter than gonapophysis VIII, sabre-shaped with spiniferous microsculpture. Gonapophyses IX and gonospiculum bridge as in Figs 51–52. Bursa copulatrix forming single, oval, huge pouch with well-visible cells, without sclerites (Fig. 53). Spermatheca well-developed; *ductus receptaculi* ribbed, about the same length as smooth *diverticulum ductus* (Fig. 54).

Etymology. The genus was named after Périnet – a former name of the Analamazaotra forest in the Andasibe-Mantadia National Park in eastern central Madagascar, the *locus typicus* of the type species. Gender: feminine.

Distribution. Madagascar: former Fianarantsoa, Mahajanga, and Toamasina provinces (Fig. 67).

Key to species of *Perinetella*

1 Head dark brown, with frons black and lateral parts yellowish; pronotum brownish yellow, mesonotum and legs black; abdomen with sternites black and tergites yellow. Tegmen yellowish (Figs 1–4). 2
– Whole body yellowish. Tegmen milky white with costal, apical and postclaval margins yellow (Figs 64–66). ..... ***P. flavomarginata* sp. nov.**
2 Process of dorsal periandrium with two arms oriented ventro-basad; anterior arm single and distinctly shorter than posterior one; posterior arm bifurcate, lower process shorter than upper one (Fig. 37). ..... ***P. nigroflava*** Synave, 1956
– Process of dorsal periandrium with single arm oriented dorso-apicad; anterior margin with broad, widely rounded lobe, oriented basad (Fig. 56). ..... ***P. fiedleri* sp. nov.**

Perinetella nigroflava Synave, 1956

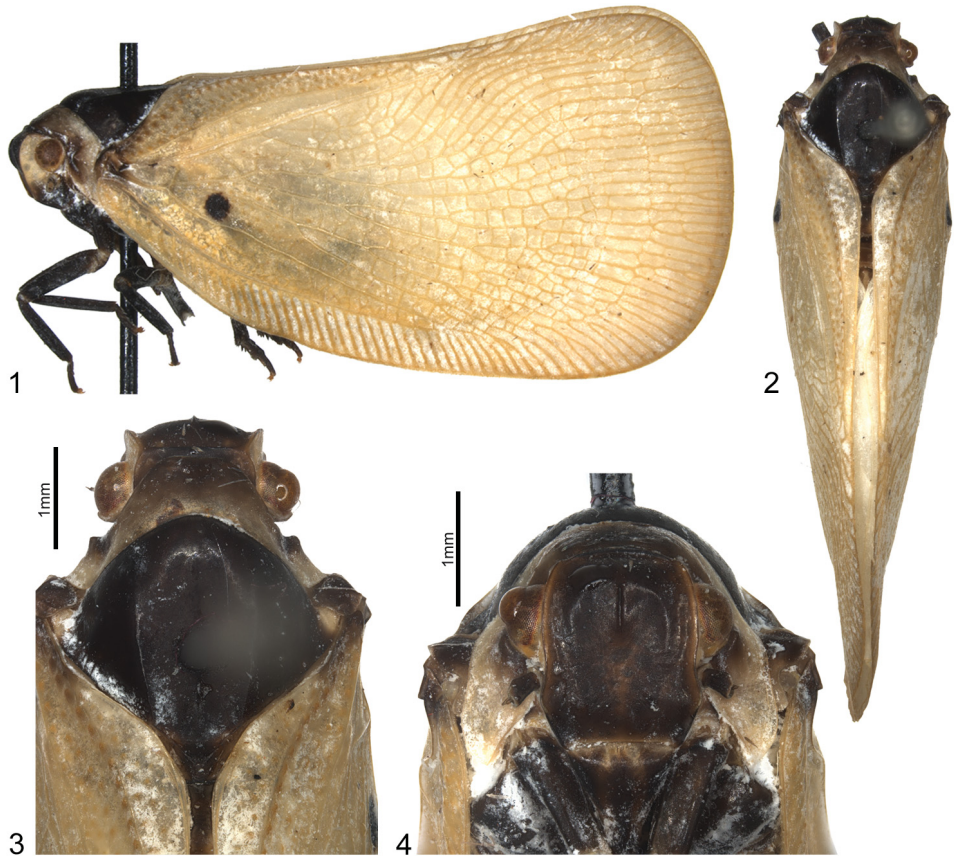
(Figs 1–54, 67)

Type locality. Madagascar, former Toamasina province, Alaotra-Mangoro region, Moramanga district, Andasibe-Mantadia National Park, Analamazaotra forest reserve (= Périnet).

Type material examined. Holotype: ♂, "Perinet // Institut Scientifique Madagascar // Type // H. Synave det., 1955 Perinetella nov. nigroflava nov. // 64 // Lectotype Perinetella nigroflava Synave Desig. J.T. Medler, 1991 // Museum Paris MNHN(EH) 586" (MNHN). Paratypes: 1 ♂ "Perinet // R.I.Sc.N.B.I.G. 20201 // H. Synave det., 1955 Perinetella g. n. nigroflava sp. n. // Paratype // Perinetella nigroflava. Synave."; 1 ♂, same labels but "R.I.Sc.N.B.I.G. 23.285" (both IRSNB).

Additional material examined. 1 ♂, "Perinet // Institut Scientifique Madagascar // H. Synave det., 1963 Perinetella nigroflava Syn. // R.I.Sc.N.B.I.G. 22.889" (IRSNB); 1 ♂, 2 ♀♀ "Environs de Rogez Madagascar" (NMPC); 1 ♂, "MADAGASCAR Centr. Prov. de Moramanga Pèrinet, 10.12.1937 leg. B. Kreczmer et J. Skibiński // ad lucem // Mus. Zool. Polonicum Warszawa 99/50 // MIZ 212660"; 1 ♀, same data but "26.12.1937 // MIZ 212665"; 1 ♂, same data but "31.12.1937 // MIZ 212687"; 1 ♀, same data but "31.12.1937 // MIZ 212692"; 1 ♂, same data but "7.01.1938 // MIZ 212695"; 1 ♀, same data but "7.01.1938 // MIZ 212673"; 1 ♂, same data but "29.01.1938 // las // MIZ 212653"; 1 ♂, same data but "30.01.1938 // MIZ 212686" (all MZPW). 1 ♂, "MADAGASCAR: Province Fianarantsoa, Parc National Ranomafana, Belle Vue at Talatakely, elev 1020m 4–16 May 2003 // 21°15.99'S, 47°25.21' E coll: M. Irwin, R. Harin'Hala California Acad of Sciences malaise, secondary tropical forest MA-02-09C-60 // CASLOT 044694" (CAS).

Diagnosis. *Perinetella nigroflava* is similar to *P. fiedleri* sp. nov. but differs in the following characters: process of periandrium with two arms oriented ventro-basad, anterior arm single



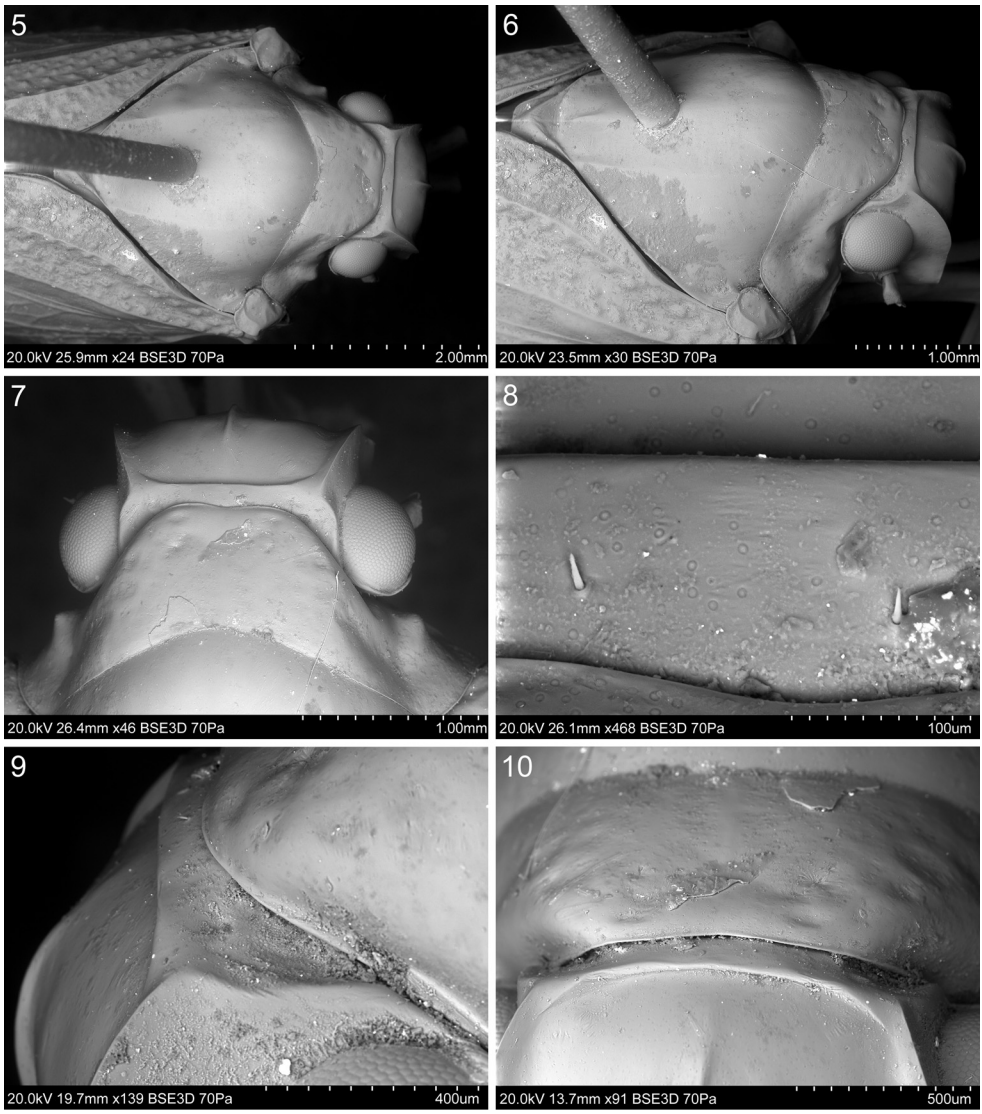
Figs 1–4. *Perinetella nigroflava* Synave, 1956; habitus. 1 – lateral view; 2 – dorsal view; 3 – anterior part, dorsal view; 4 – same, frontal view.

and distinctly shorter than posterior one; posterior arm bifurcate, lower process shorter than upper one (Fig. 37).

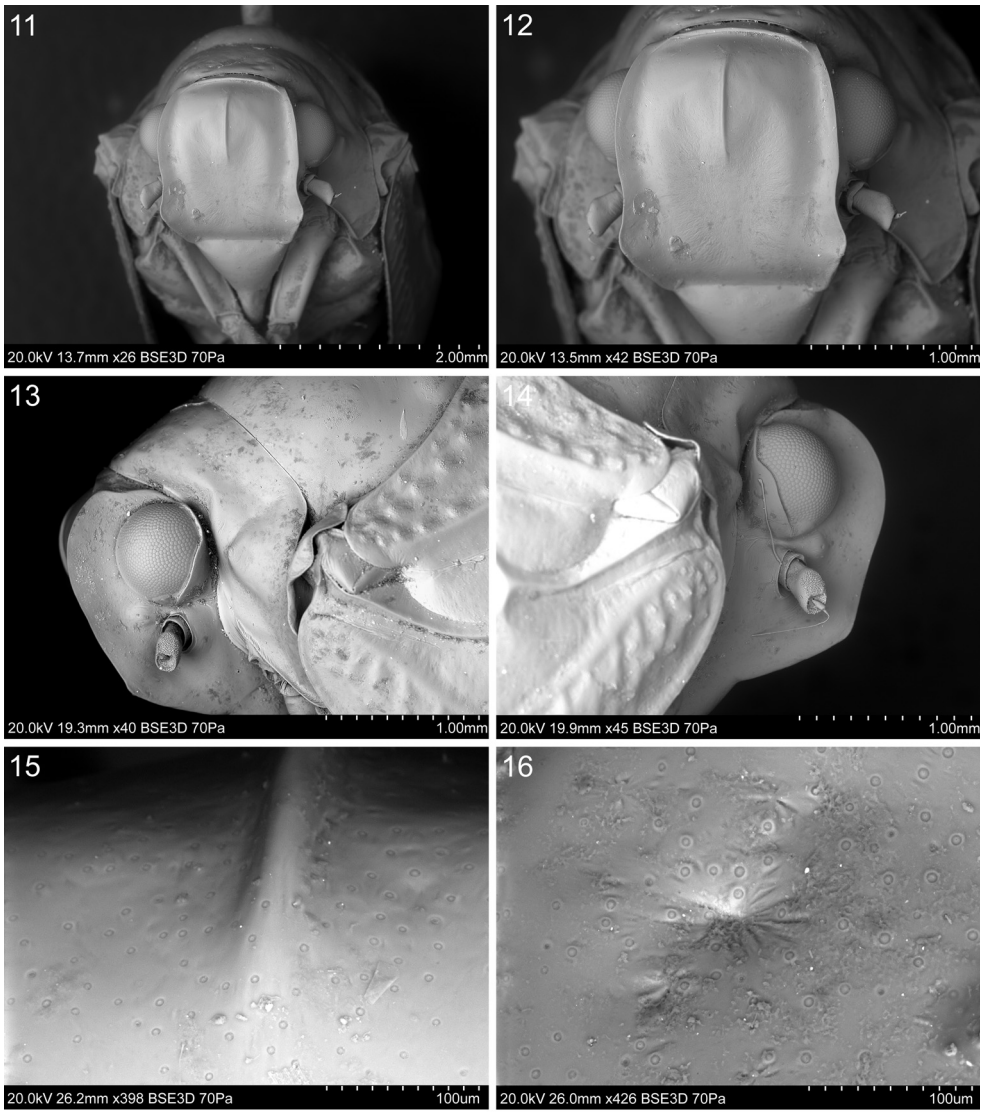
Redescription. ***Measurements.*** Total length: 12.60–14.50 mm. Vertex: A/B 5.43–8.00. Frons: C/E 0.56–0.65; D/E 0.67–0.88. Pronotum: F/B 3.14–4.40. Mesonotum: G/F 4.26–5.14; G/B+F 3.38–4.07; G/H 0.88–1.05. Tegmina: sutural angle rounded, I/J 1.74–1.90.

Coloration. Head dark brown; frons black, lateral parts yellowish. Pronotum brownish-yellow, mesonotum and legs black. Abdomen with sternites black, tergites yellow. Tegmina yellowish with black dot at base (Figs 1–4).

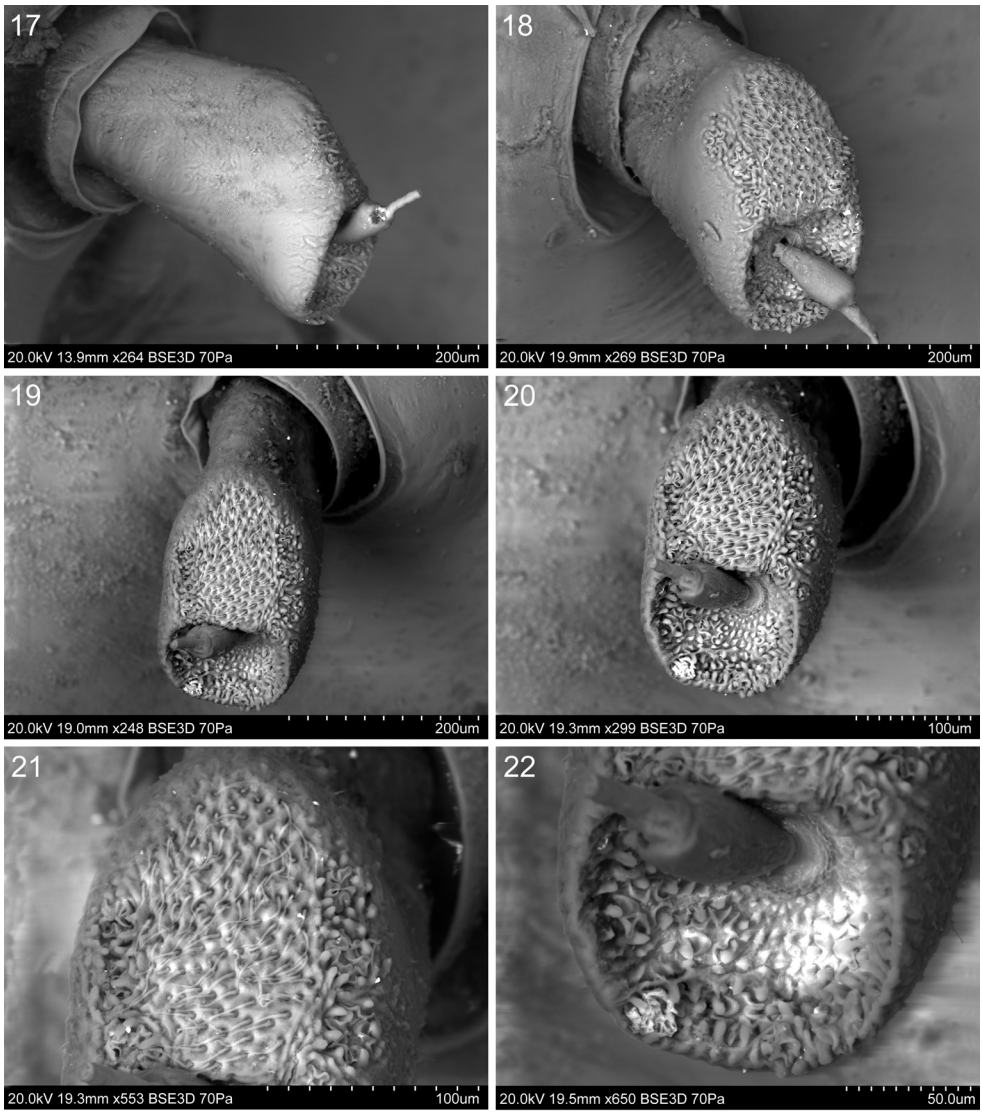
Male terminalia. Anal tube, in lateral view, with apical part widely rounded (Figs 31, 32, 35); in dorsal view, with apical part elongately oval (Figs 29, 30, 36). Genital style with weakly arcuate or almost straight dorsal margin, lower part of posterior margin concave, upper part



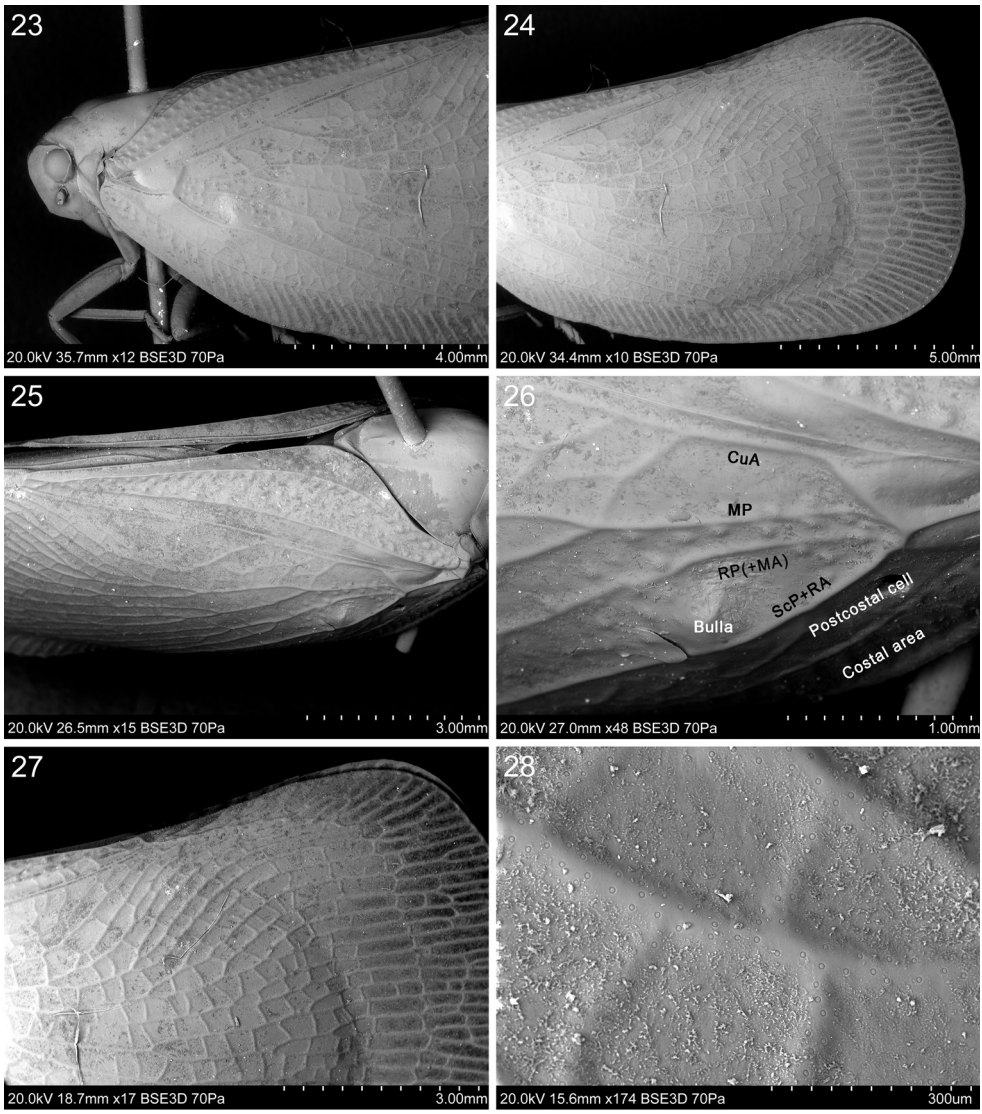
Figs 5–10. *Perinetella nigroflava* Synave, 1956; SEM micrographs. 5 – anterior part, dorsal view; 6 – same, dorso-lateral view (from right); 7 – head and prothorax, dorsal view; 8 – vertex, sensory and secretory structures; 9 – dorsal portion of vertex and anterior portion of pronotum, dorso-lateral view (from left side); 10 – same, frontal view.



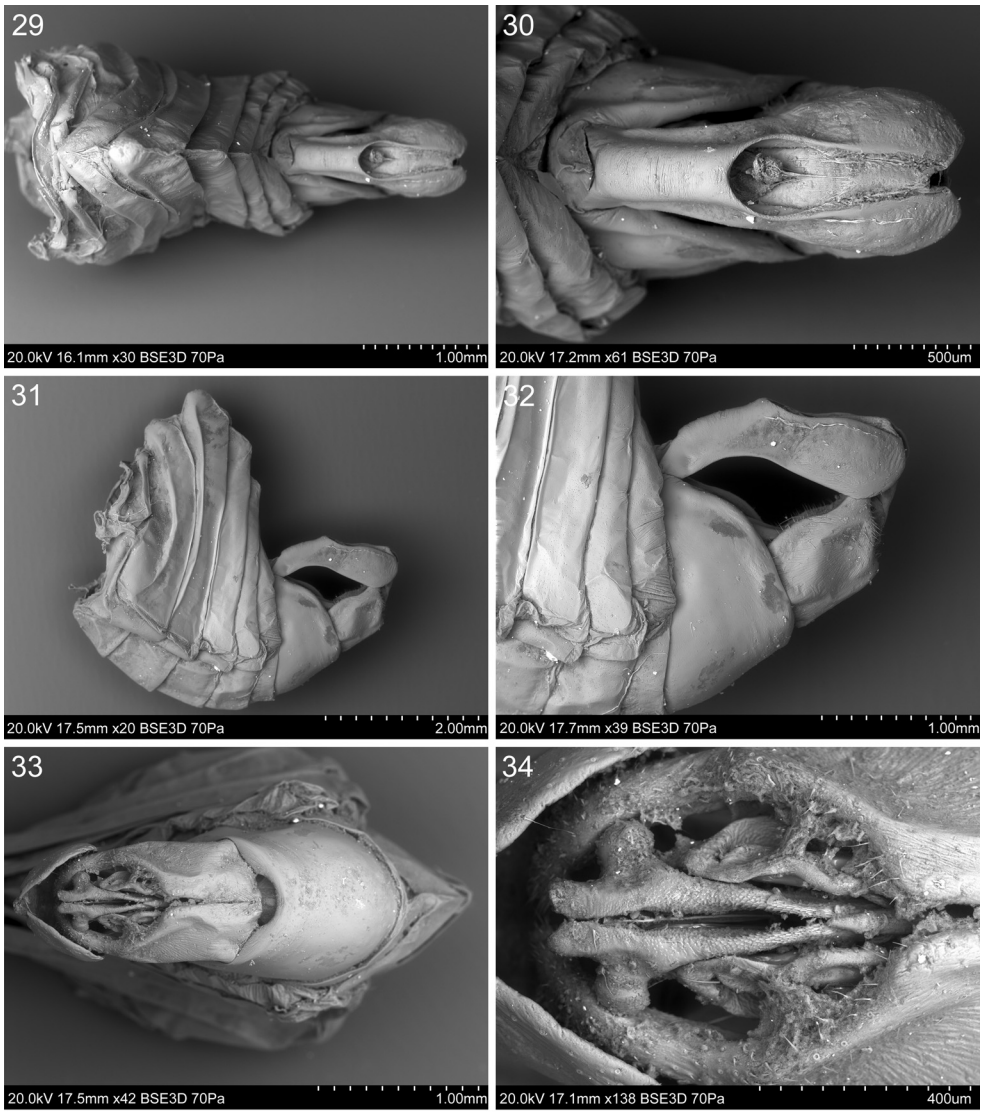
Figs 11–16. *Perinetella nigroflava* Synave, 1956; SEM micrographs. 11, 12 – anterior part, frontal view; 13, 14 – same, left (13) and right (14) lateral views; 15 – upper frons, secretory structures; 16 – anterior pronotum, secretory structures.



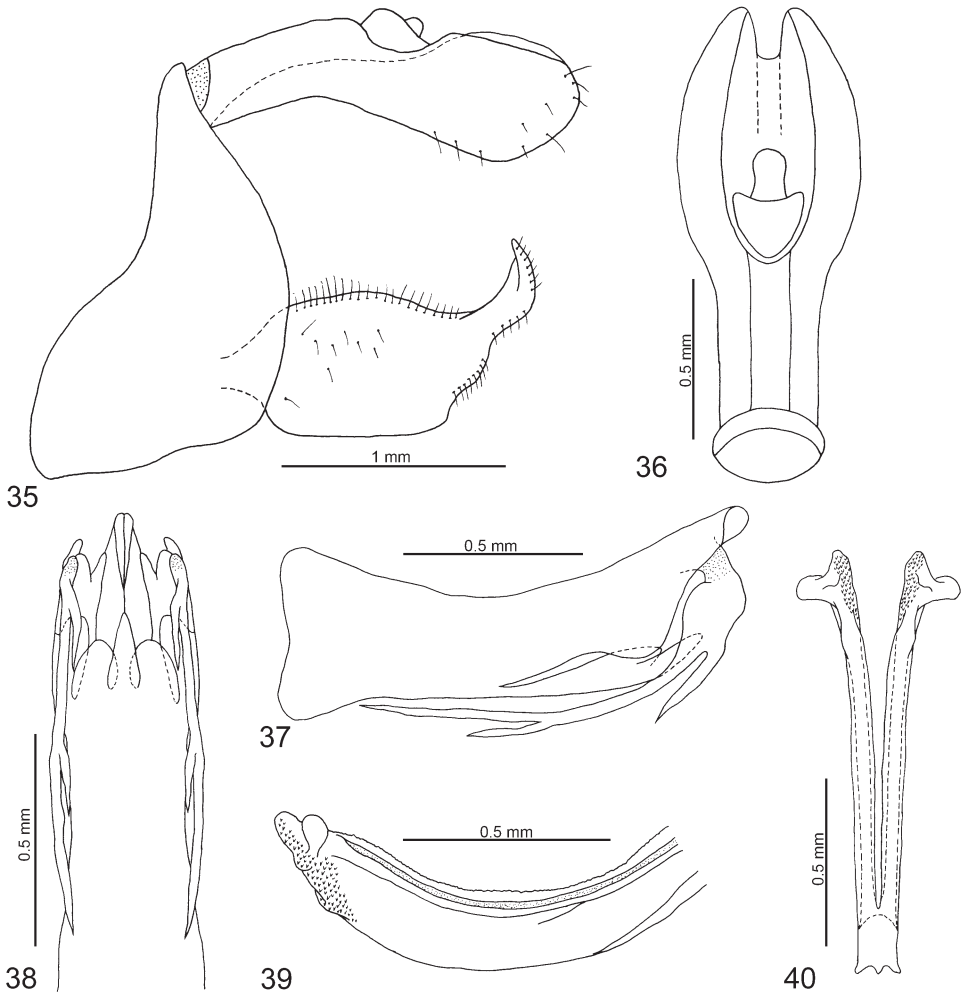
Figs 17–22. *Perinetella nigroflava* Synave, 1956; SEM micrographs. 17 – antenna, frontal view; 18–20 – pedicel, dorsal view; 21, 22 – setae and plate organs: 21 – dorsal surface, 22 – apical concavity.



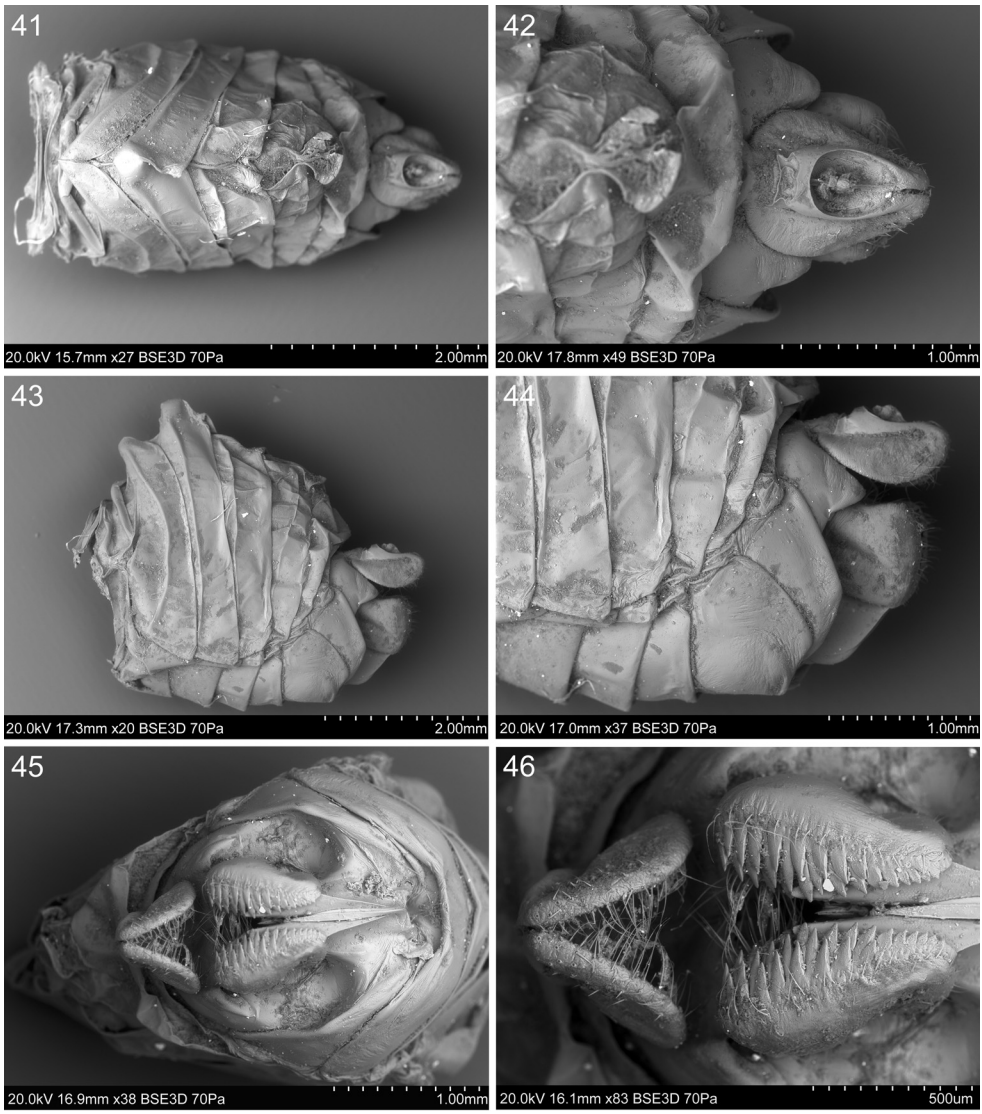
Figs 23–28. *Perinetella nigroflava* Synave, 1956; tegmen, SEM micrographs. 23, 24 – lateral view; 25 – clavus, dorso-lateral view; 26 – basal part, dorso-lateral view (with labelled structures); 27 – apical part; 28 – veins, secretory structures.



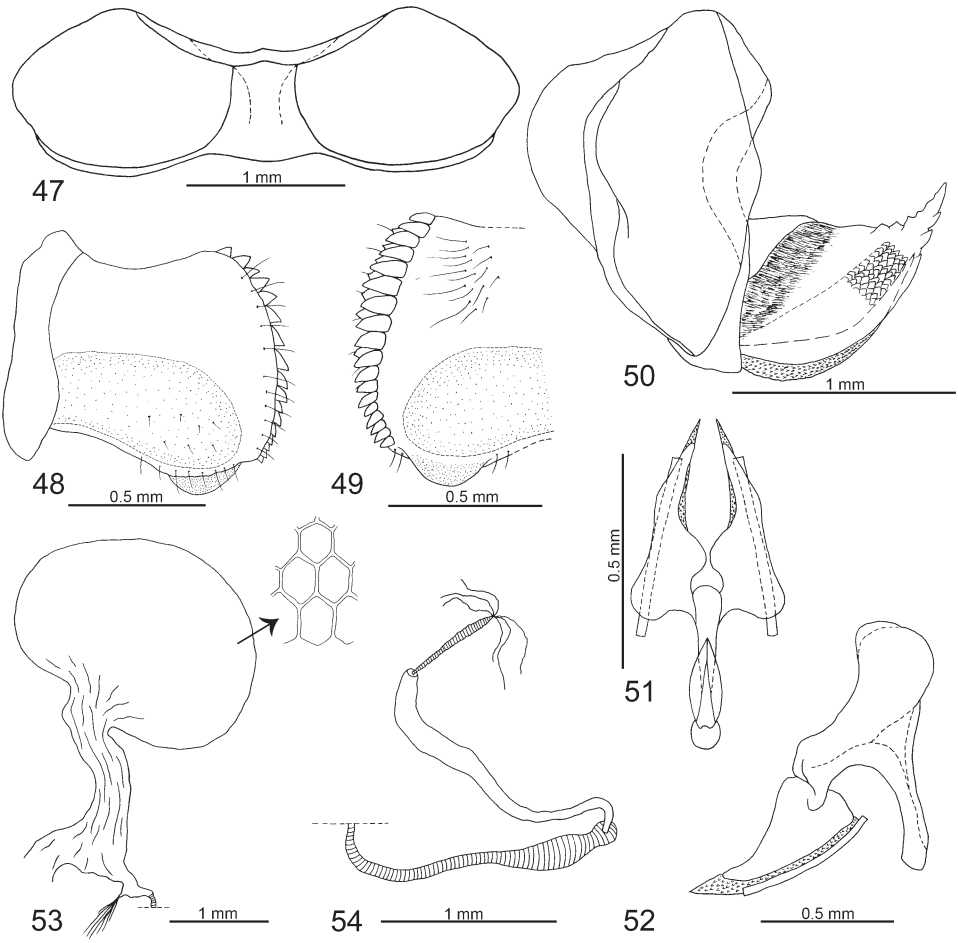
Figs 29–34. *Perinetella nigroflava* Synave, 1956; male, SEM micrographs. 29 – abdomen, dorsal view; 30 – anal tube, dorsal view; 31 – abdomen, lateral view; 32 – terminalia, lateral view; 33 – terminalia, caudal view; 34 – phallic complex, caudal view.



Figs 35–40. *Perinetella nigroflava* Synave, 1956; male. 35 – genital capsule, left lateral view; 36 – anal tube, dorsal view; 37 – periandrium, lateral view; 38 – periandrium, ventral view; 39 – aedeagus, lateral view; 40 – aedeagus, ventral view.



Figs 41–46. *Perinetella nigroflava* Synave, 1956; female, SEM micrographs. 41, 42 – abdomen, dorsal view; 43, 44 – terminalia, lateral view; 45, 46 – terminalia, caudal view.



Figs 47–54. *Perinetella nigroflava* Synave, 1956; female. 47 – pregenital sternite, flattened, ventral view; 48 – gonoplac, right external view; 49 – same, internal view; 50 – gonapophysis VIII, lateral view; 51 – gonapophyses IX and gonospiculum bridge, dorsal view; 52 – same, lateral view; 53 – bursa copulatrix, lateral view; 54 – spermatheca.

convex; ventral margin almost straight; capitulum short and wide (Figs 32, 33, 35). Periandrium (Figs 37, 38) with ventral margin of dorsal part bearing well-developed lobe; apical process of dorsal periandrium with two arms oriented ventro-basad, anterior arm single and distinctly shorter than posterior; posterior arm bifurcate, lower process shorter than upper; posterior arms in some specimens showing asymmetry (not bifurcated).

***Female terminalia*.** Pregenital sternite with anterior margin slightly produced medially and posterior margin weakly arcuate; median part and margins well sclerotized (Fig. 47). Anal tube, in lateral view, with ventral margin distinctly rounded (Figs 43, 44). Gonoplac with weakly sclerotised, elongate area alongside ventral margin (Figs 48, 49).

Etymology. The specific epithet comes from a combination of Latin adjectives: *nigrus* – black and *flavus* – yellow, and reflects the coloration of the species.
Distribution. Madagascar: former Toamasina and Fianarantsoa provinces (Fig. 67).
Remark. Synave (1956) in his original description mentioned four paratypes; however, in his later paper concerning the types in IRSNB, he listed only two (Synave 1980). This information was confirmed by Medler (1993a). We also could examine only these two paratypes in our study.

Perinetella fiedleri sp. nov.
(Figs 55–57, 67)

Type locality. Madagascar, former Antananarivo province, Analamanga region, Ankazobe district, Ambohitantely reserve.
Type material. Holotype: ♂, "CASENT 8107371 // MADAGASCAR: Province Antananarivo, 46 km NE of Ankazobe: Ambohitantely 18° 11.88' S, 47° 16.89' 14 – 29 November 2004 // California Acad of Sciences coll: M. Irwin, R. Harin'Hala malaise trap - in sclerophyl forest elev 700 m MA-27-21" (CAS). Paratype: 1 ♂, same data and labels as the holotype except "CASENT 8107415", "22 Dec 2004 - 6 Jan 2005" and "MA-27-24" (CAS).

Diagnosis. *Perinetella fiedleri* sp. nov. is similar to *P. nigroflava* but differs in the following characters: apical process of dorsal periandrium with single arm oriented dorso-apicad; anterior margin with broad, widely rounded lobe, oriented basad (Fig. 56).
Description. ***Measurements.*** Total length: 12.5–12.8 mm. Vertex: A/B 4.53–4.73. Frons: C/E 0.75; D/E 0.90. Pronotum: F/B 2.33. Mesonotum: G/F 4.71–4.77; G/B+F 3.30–3.34; G/H 1.06–1.10. Tegmina: sutural angle rounded, I/J 1.92–2.09.

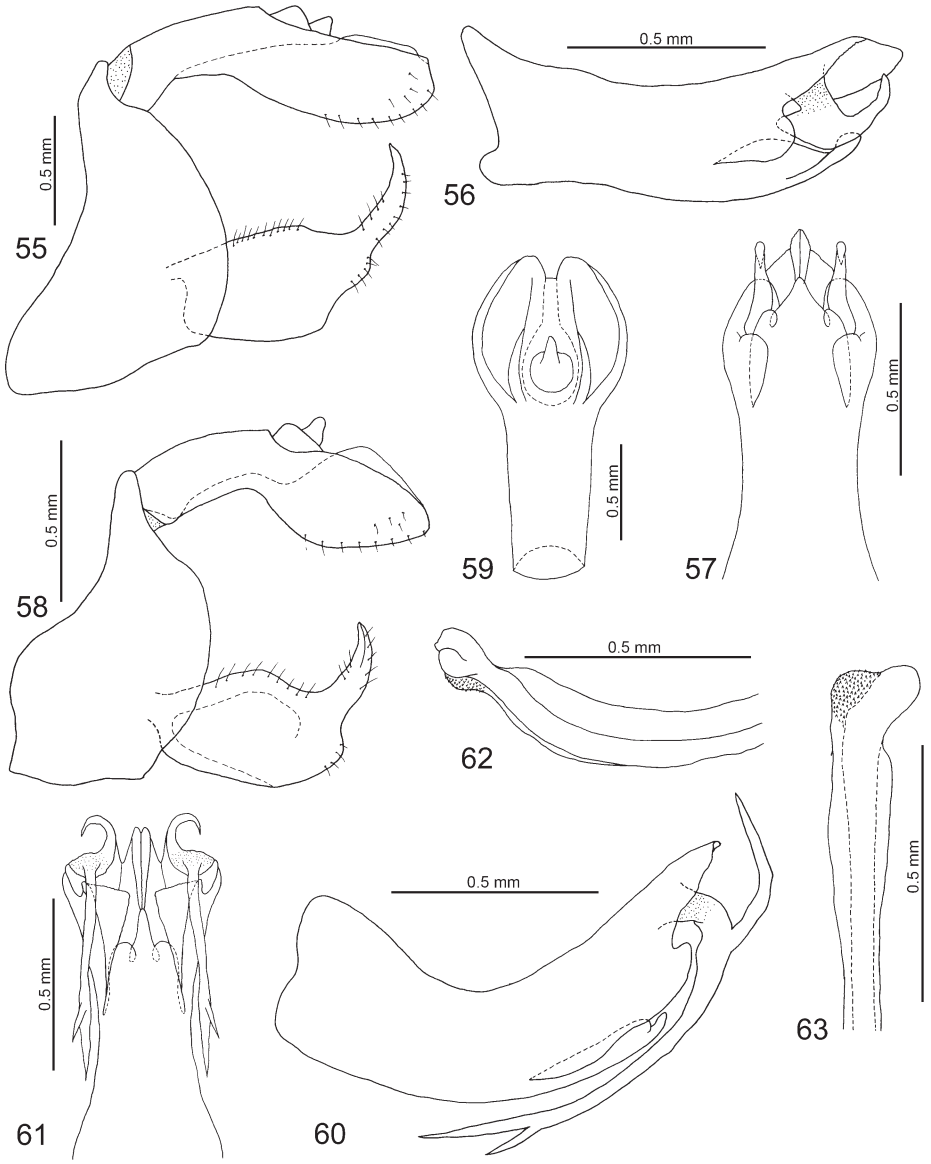
***Coloration*.** Same as in *P. nigroflava*.

***Male terminalia*.** Anal tube, in lateral view, with apical part widely rounded (Fig. 55); in dorsal view, with apical part elongate oval. Genital style with weakly arcuate or almost straight dorsal margin; lower part of posterior margin concave, upper part convex; ventral margin almost straight; capitulum long and sharp (Fig. 55). Periandrium with ventral margin of dorsal part prolonged; apical process of dorsal periandrium with single arm oriented dorso-apicad; anterior margin with broad, widely rounded lobe, oriented basad (Figs 56–57).

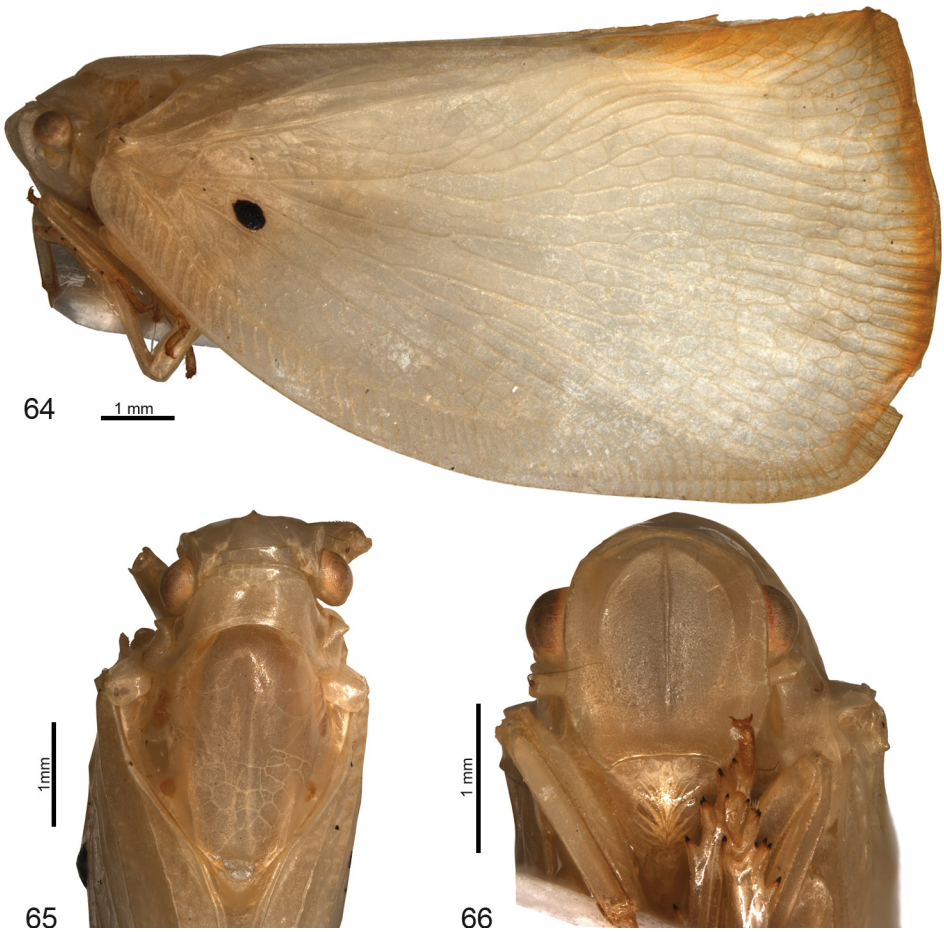
***Female*.** Unknown.
Etymology. The species is named to honour Arkady Fiedler (1894–1985), Polish writer, journalist and adventurer. He depicted his impressions of people and wildlife from the voyages to Madagascar (in 1937, 1965–1966) in several highly readable books.
Distribution. Madagascar: former Antananarivo province (Fig. 67).

Perinetella flavomarginata sp. nov.
(Figs 58–67)

Type locality. Madagascar, former Mahajanga province, Melaky region, Antsalova district, Tsingy de Bemaraha Strict Nature Reserve, Antsingy forest.
Type material. Holotype: ♂, "Andobo 190m forêt Antsingy det Antsalova –II-57 P.Griv. // Flatopsis basipunctata (Schm.) Det. J.T.Medler 1991 // Flatopsis nivea (Signoret) det. J.T. Medler, 2000 // 233" (IRSNB). Paratypes: 1 ♂, "Andobo 190m forêt Antsingy det Antsalova –II-57 P.Griv. // H. Synave det., 1962 Flatopsis // Flatopsis basipunctata (Schm.) Det. J.T.Medler 1991 // Flatopsis nivea (Signoret) det. J.T. Medler, 2000"; 1 ♂, "Andobo 190m forêt Antsingy det Antsalova –II-57 P.Griv. // Plesiotype Phyma basipunctata Schmidt Desig. J.T. Medler, 1991 //



Figs 55–63. *Perinetella* spp., males. 55–57 – *P. fiedleri* sp. nov.: 55 – terminalia, left lateral view; 56 – periandrium, left lateral view; 57 – periandrium, ventral view. 58–63 – *P. flavomarginata* sp. nov.: 58 – terminalia, left lateral view; 59 – anal tube, dorsal view; 60 – periandrium, left lateral view; 61 – periandrium, ventral view; 62 – aedeagus, lateral view; 63 – aedeagus, right part, ventral view.



Figs 64–66. *Perinetella flavomarginata* sp. nov.; habitus, male. 64 – lateral view; 65 – anterior part, dorsal view; 66 – anterior part; frontal view.

Flatopsis basipunctata (Schmidt) Det. J.T.Medler 1991 // Flatopsis nivea (Signoret) det. J.T. Medler, 2000 // 235" (both IRSNB). 1 ♂, "Museum Paris Madagascar 2005 Bourgoin, Ouvrard, Atté, Soulier-Perkins // 21/XI/2005 région lac Alaotra, RN 33 pk 40, 1083 m 17°41 559'S 47°55 521'E // entre Ambakireny et Morano-Chrome, ilots de forêt en bord riv. Mavolava" (MNHN).

Diagnosis. *Perinetella flavomarginata* sp. nov. differs from *P. nigroflava* and *P. fiedleri* sp. nov. in the following characters: coloration, tegmen with its sutural angle acute and slightly produced, male terminalia with apical part of anal tube rounded and lower part of posterior margin of stylus widely rounded.

Description. ***Measurements.*** Total length: 15.3–16.3 mm. Vertex: A/B 7.00–7.83. Frons: C/E 0.66–0.69; D/E 0.86–0.88. Pronotum: F/B 3.67–4.17. Mesonotum: G/F 5.08–5.95; G/B+F 4.10–4.68; G/H 1.06–1.14. Tegmina: sutural angle acute and slightly produced, I/J 1.73–1.80.

Coloration. General coloration milky white. Tegmen with costal, apical and postclaval margins yellow; black dot at the base (Figs 64–66).

Male terminalia. Anal tube, in lateral view, with apical part tapering apicad (Fig. 58); in dorsal view, with apical part rounded (Fig. 59). Genital style with strongly convex dorsal margin, lower part of posterior margin widely rounded, ventral margin weakly arcuate; capitulum long and sharp (Fig. 58). Periandrium with ventral margin of dorsal part with weakly developed lobe; apical process of dorsal periandrium with two arms; anterior arm single and distinctly shorter than posterior one, oriented dorsad; posterior arm bifurcate, oriented ventro-basad, lower process shorter than upper one (Figs 60–61). The specimen from MNHN has partly damaged genital capsule with right apical process of dorsal periandrium missing; left apical process with posterior arm not bifurcated and slightly more widened than in specimens from Andobo.

Female. Unknown.

Etymology. The specific epithet comes from a combination of the Latin adjectives: *flavus* – yellow and *marginatus* – bordered, referring to the coloration of the tegmen.

Distribution. Madagascar: former Toamasina and Mahajanga provinces (Fig. 67).

Remark. After the examination of the holotype (female) of *Phyma basipunctata* Schmidt, 1906 from the collection of the Musée royal de l'Afrique Centrale in Tervuren, we can confirm the statement of Medler (1993b) that *Ph. basipunctata* is a junior synonym of *Flatopsis nivea*

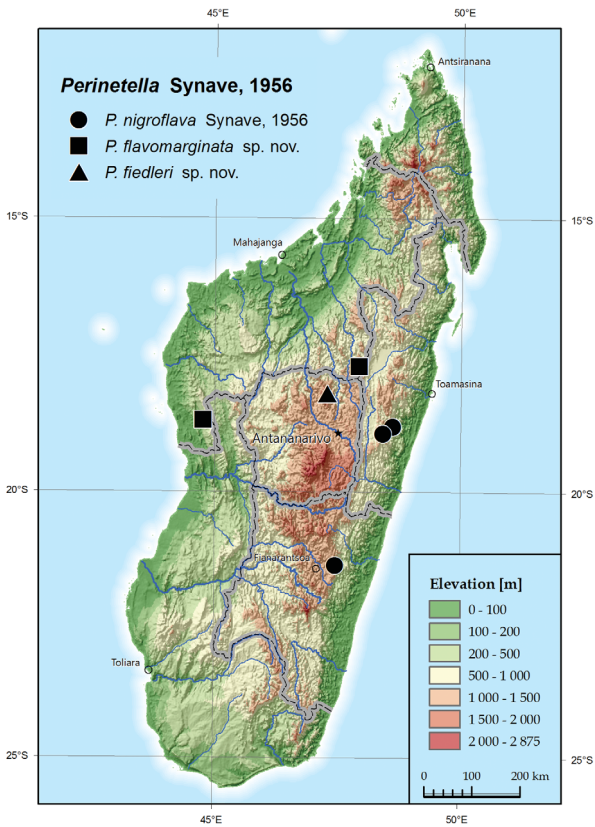


Fig. 67. Distribution of the genus *Perinetella* Synave, 1956 in Madagascar.

(Signoret, 1860). However, the specimens from Andobo (collection of IRSNB) determined by Medler as *Flatopsis nivea* were wrongly assigned to this species and in fact represent *Perinetella flavomarginata* sp. nov.

Discussion

Flatidae seem to be an ecologically important component of Madagascan terrestrial ecosystems and, according to our previous studies, are firmly associated with particular vegetation formations. Thus, this group may serve as an effective indicator of some rare and endangered ecosystems, like e.g., *Phlebopterum tapiae* Świerczewski & Stroiński, 2012 for tapia woodlands (Świerczewski & Stroiński 2012a) or *Latois nigrolineata* Świerczewski & Stroiński, 2012 for littoral forests (Świerczewski & Stroiński 2012b). As for mountain vegetation, species of *Urana* Melichar, 1902 are associated with high mountain rainforest (Stroiński & Świerczewski 2012) and *Peyrierasus philippiae* Stroiński & Świerczewski, 2013 with the montane (*Philippia*) scrubland of Anosyan mountain ranges (Chaînes Anosyennes) (Stroiński & Świerczewski 2013). *Perinetella* Synave, 1956 occurs in central parts of Madagascar, mainly on the eastern side of the mountain ranges. *Perinetella nigroflava* is linked to the eastern band of tropical rainforest, the other two species seem to be associated with mountain habitats. Further studies are needed to precisely describe the distributional and ecological patterns of these flatid species.

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