Genus	Vol. 22(2): 191-203	Wrocław, 31 VII 2011

A new species of the genus *Panormenis* Melichar, 1923 from Madagascar (Hemiptera, Fulgoromorpha: Flatidae)

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Abstract. *Panormenis nigrocostata* n. sp., a new flatid species from Madagascar, is described and illustrated. The internal female genital structures are presented for the genus for the first time.

Key words: entomology, taxonomy, Hemiptera, Fulgoromorpha, Flatidae, *Panormenis*, new species, Madagascar.

INTRODUCTION

The genus *Panormenis* was established by Melichar in 1923 for three species ascribed previously to the genus *Ormenis* Stål: *Ormenis parvula* Melichar, 1902, *Ormenis suturalis* Melichar, 1905 and *Ormenis subclavata* Jacobi, 1917.

Lallemand (1950) transferred into this genus also *Ormenis impunctata* Schmidt, 1906 which was placed by Melichar (1923) in his new genus *Chaetormenis* Melichar, 1923. Medler (1993) following Fennah (1958), who discovered that *Chaetormenis* is a junior synonym of *Ulundia* Distant, 1910, excluded *Ormenis impunctata* from the genus *Panormenis* and treated it as a junior synonym of *Ulundia madagascariensis* Signoret, 1860, claiming the holotypes of both species are conspecific. Furthermore, Metcalf (1955) revealed that the name *Ormenis suturalis* is a homonym and proposed a new name *Panormenis melichari* Metcalf, 1955 for this species. Synave (1956)

suggested that *P. subclavata* might be a synonym of *P. impunctata* and did not put it in his key for distinguishing Madagascan *Panormenis* Melichar, 1923 species. Finally, Synave (1966) after examining the Madagascan flatid material from the Natural History Museum in Basel described additional species under the name *Panormenis keiseri* Synave, 1966.

In the present paper we describe the new species based on the material of a few dozen specimens collected in several localities within the area of the Ranomafana National Park in the eastern part of the island (Fig. 26).

MATERIAL AND METHODS

Material. The studied material comes from the entomological collection of the California Academy of Sciences in San Francisco, USA (Dr N. Penny, curator).

Preparations and illustration. The abdomens of the specimens examined was cut and boiled in 10% KOH with a few drops of black chlorazol 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 Olympus microscopes (SZH10 and BX50). The photos of the habitus were taken using a stereoscopic microscope Leica MZ 16 with IC 3D camera; final images were produced using Synoptics Automontage software. The photos of female genital structures were taken using a light microscope Leica DM5500B with Leica DFC49 camera; final images were created using the Helicon 5.0 software. The SEM photographs of uncoated specimens were taken in the Laboratory of Scanning Microscopy, MIZ PAS (Warsaw), using a scanning microscope HITACHI S-3400N under Low Vacuum conditions.

Measurements and abbreviations. The following measurements and abbreviations were made and used in this study:

Total length – measured (in dorsal view) from the apex of head to the apex of tegmina;

C/E – width of frons at upper margin/length of frons in mid line;

D/E – maximum width of frons/length of frons in mid line;

G/B – length of mesonotum/length of pronotum in mid line;

G/H – length of mesonotum in mid line/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 apex of clavus to the anterior margin.

The nomenclature of the male genitalia follows Bourgoin (1988), Bourgoin & Huang (1990) and for the female genitalia Bourgoin (1993). Vein nomenclature after the interpretation proposed by Szwedo & Żyła (2009).

TAXONOMY

***Panormenis nigrocostata* n. sp.**

Figs 1–26

Etymology

The specific name is derived from Latin words "nigra" and "costa" and refers to the coloration of tegmina – black costal area (Fig. 3).

Diagnosis

Panormenis nigrocostata Str. et Swi., sp. n. differs from other species belonging to the genus by the coloration pattern of tegmina and the structure of periandrium and aedeagus.

Description

Total length 6.0–7.1 mm.

Head. Head with compound eyes (in dorsal view) narrower than thorax (Fig. 2).

Vertex transverse, distinctly wider than long at midline, mostly covered by pronotum; anterior margin almost straight, in median portion distinctly keel-shaped, lateral margins almost straight and parallel, posterior margin arcuate and placed in lateral view a bit lower than anterior margin; disc of vertex with median carina.

Frons (Figs. 1, 5–7) longer than wide, the widest in the line between compound eyes, proportion C/E = 0.86–0.95, proportion D/E = 0.96–1.1; disc of frons unicarinate – median carina keel-shaped and distinctly visible, incomplete at upper and lower parts; lateral margins of frons keel-shaped, without incisions; disc of frons partly convex in the median part.

Antennal segment II (pedicel) wider at apex and a little longer in mid line than wide at apex; sensory organs located at the top of pedicel, in the depression (Figs. 11–13)

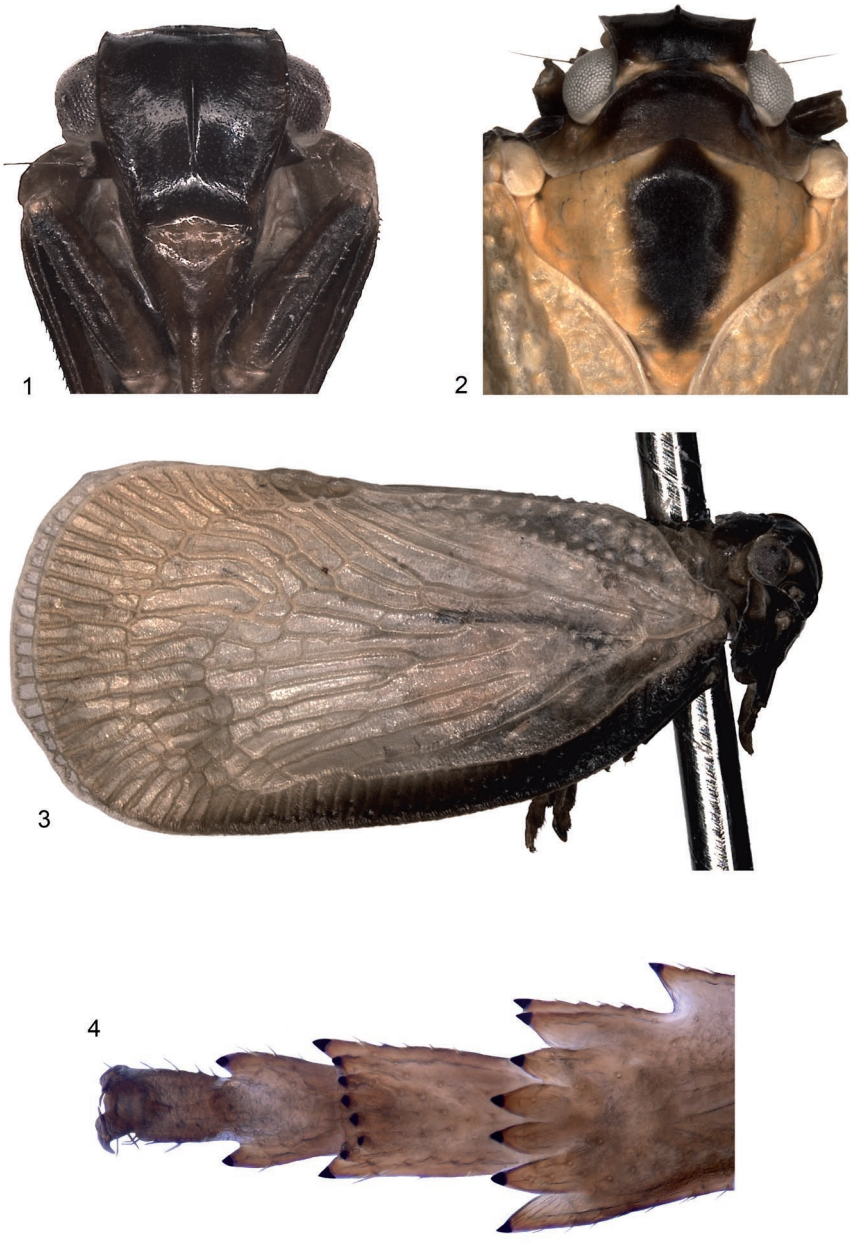
Compound eyes oval, with small callus at posterior and lower posterior margin, lateral ocelli present.

Frontoclypeal suture almost straight (Figs. 1, 5); clypeus without carinae, in median portion weakly convex. Rostrum reaching to the middle of hind coxae; apical part shorter than the basal one.

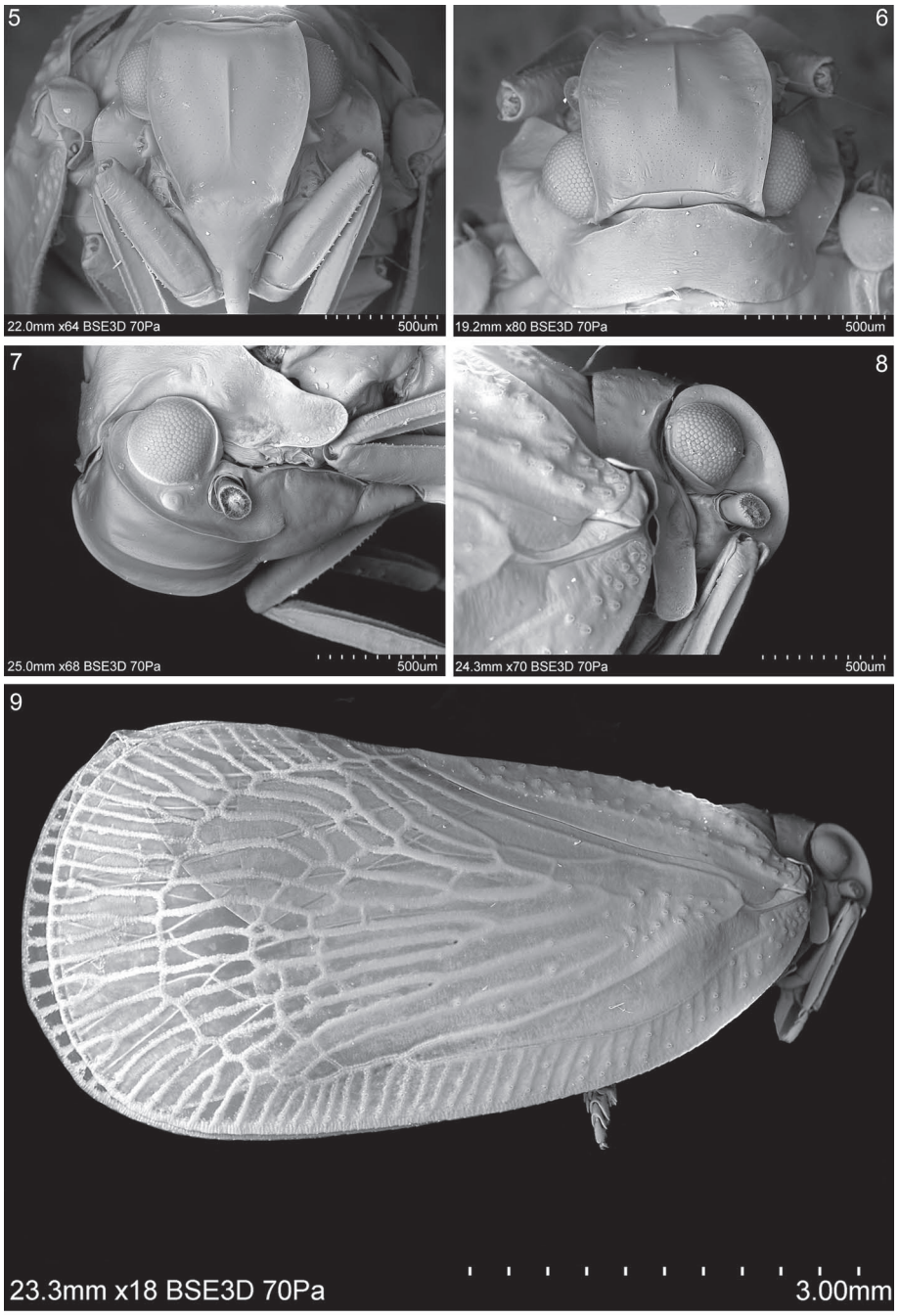
Thorax. Pronotum (Figs. 2, 6) longer in mid line than vertex, partly covering the vertex; anterior margin in lateral view placed a little below the posterior margin (fig. 8); anterior margin in dorsal view straight, posterior margin weakly concave; postocular carinae separated at the base; median carina absent.

Mesonotum deltoid (Fig. 2), proportions: G/B = 3.8–3.8, G/H = 0.92–1.02; lateral angles placed at about 1/3 of the length of mesonotum in mid line; disc of mesonotum flat, with trace of the median carina visible only in a few specimens; lateral carinae absent.

Tegmen (Figs 3, 9) elongated, membranous, flat, surface smooth with narrow and elongate bulla near the basal cell along Sc+RA vein, proportion I/J = 1.86–2.13; costal margin in basal part weakly arcuate, then almost straight; apical angle widely and



1-4. *Panormenis nigrocostata* n. sp.: 1 – anterior part of body, frontal view; 2 – anterior part of body, dorsal view; 3 – habitus, lateral view; 4 – apex of hind tibia and tarsomeres



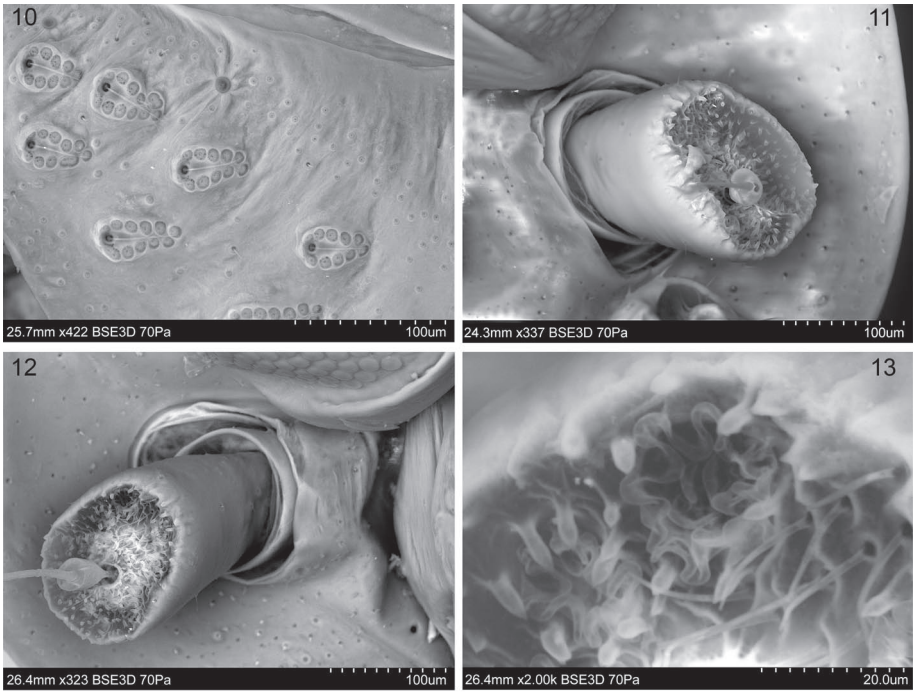
5-9. *Panormenis nigrocostata* n. sp. 5–8 – anterior part of body: 5 – frontal view, 6 – dorsal view; 7 – fronto-lateral view, 8 – lateral view; 9 – habitus, lateral view

bluntly rounded; posterior margin arcuate; sutural angle widely rounded, at about the same level in relation to the apical angle; postclaval sutural margin straight; costal area in basal part as wide as costal cell, then wider than costal cell and with about the same width of its length with dense and numerous transverse veinlets, the end of costal area placed at about the level of the end of clavus; costal cell tapering apicad with a few weakly visible transverse veinlets apically; basal cell somewhat elongated.

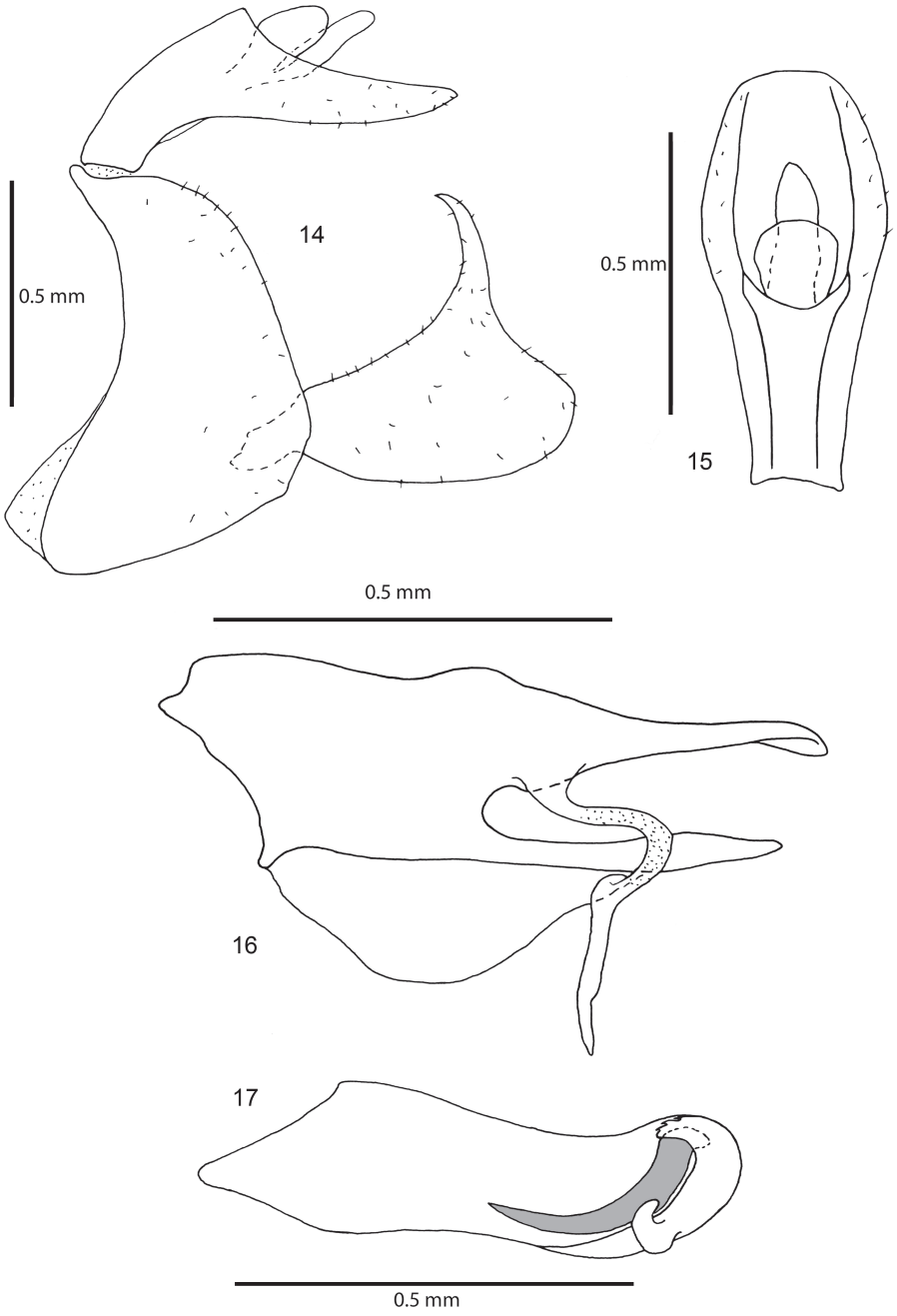
Vein Sc+R arises as short common stem from basal cell, stem Sc+R diverging into Sc+RA and RP very basad, exactly before bulla; Sc+RA ending at costal margin, RP ending at apical angle; vein M leaving basal cell with a long stalk placed very close to Sc+R stem and forking a little after fork RP_{1+2} and RP_{3+4}; veins M_{3+4} curved; fork CuA placed about the level of M fork; branches M_4 and CuA ending at postclaval margin and posteroapical angle.

Tegmina with a few transverse veinlets at basal half, at posterior part with well developed apical line and incomplete subapical line; all cells, apical and subapical ones, distinctly longer than wide.

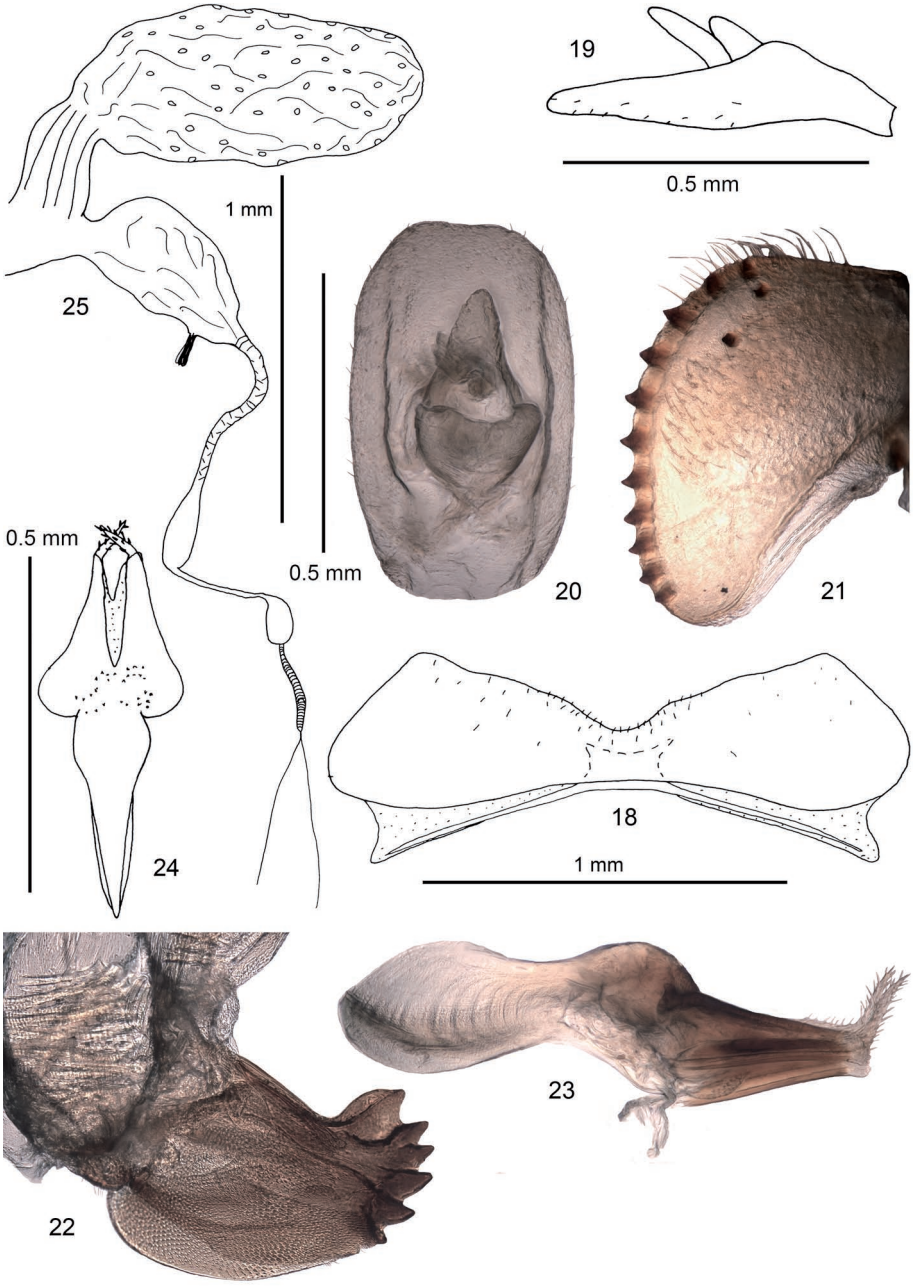
Clavus with tubercles present between claval veins Pcu and A_1. Sensory organs placed in the basal part of the tegmen in a form of single pores with ring-shaped areas (Fig. 10).



10-13. *Panormenis nigrocostata* n. sp. 10 – single pore with ring-shaped areas; 11–12 – antenna; 13 – antennal plate organs



14-17. *Panormenis nigrocostata* n. sp., male. 14 – genital capsule, lateral view; 15 – anal tube, dorsal view; 16 – periandrium, lateral view; 17 – aedeagus, lateral view



18-25. *Panormenis nigrocostata* n. sp., female. 18 – pregenital sternite, flattened; 19 – anal tube, lateral view; 20 – anal tube, dorsal view; 21 – gonoplac, internal view; 22 – gonapophysis VIII, lateral view; 23 – gonapophyses IX and gonospiculum bridge, lateral view; 24 – same, dorsal view; 25 – genital ducts, lateral view

Wing. Vein Sc+R bifurcate, with 2 terminals; fork M placed after Sc+R and CuA forks, with 2 terminals; fork Cu placed about the level of Sc+R fork; CuA_1 with 2 terminals, CuA_2 single or with 2 terminals; 2 transverse veinlets *r-m* and *m-cu* present on apical part.

Fore and middle femur a little longer than tibia, rectangular in cross section, hind femur longer than tibia, partly flattened in distal part and widened; hind tibia (Fig. 4) with 2 lateral spines placed in distal part and a row of apical teeth; basitarsomere with a weakly arcuate row of small teeth, about as long as cumulative length of median and apical tarsomeres; median tarsomere with two lateral teeth and medially placed lobe.

Male (Figs. 14–17). Anal tube (in lateral view, Fig. 14) elongated, with maximum width in the median portion, then tapering apicad; lower margin concave in basal part, then weakly arcuate; anus placed before half the length.

Anal tube (in dorsal view, Fig. 15) distinctly elongated and narrow, club-like, basal margin weakly concave, lateral margin with breaking point after half the length and after the anus; posterior margin weakly convex; anus placed before half the length.

Pygofer (in lateral view, Fig. 14) higher than wide; upper part distinctly narrower than the lower one, dorsal posterior angle without process.

Genital styles (in lateral view, Fig. 14) longer than wide and bearing distinct narrow and sharp capitulum at the end of dorsal margin; upper margin without concavity near the base of the capitulum; ventral margin almost straight, posterior margin distinctly extending posterior margin of capitulum and widely rounded.

Phallic complex. Periandrium (Fig. 16) with long and wide lateral split reaching to about half of total length; dorsal part of periandrium a little longer than lower one, upper margin almost straight without extra structures, lower margin near the end of the split with a single, narrow and strongly curved lateral process oriented ventrally, basal and posterior part of process well sclerotized, median portion membranous; latero-basal part of periandrium smooth; ventral part of periandrium with upper margin straight and without extra structures, lower margin with distinctly developed single keel placed medially; apical portion of upper and lower parts of periandrium unilobate.

Aedeagus s.s. (Fig. 17) with a single, narrow, well sclerotized and smooth process placed latero-apically and oriented basally; aedeagus apically with long and distinctly developed concavity; upper margin of concavity with a few (3–4) membranous teeth, in external lower part with an extra bean-shaped process.

Female (Figs. 18–25). Pregenital sternite (Fig. 18) with elongated and well developed lateral lobes. Anterior margin in median portion weakly arcuate, posterior margin in median portion deeply concave.

Anal tube in lateral view (Fig. 19) elongated, tapering apicad; ventral margin weakly arcuate in median portion; anus placed a little before half the length; anal tube reaching the posterior margin of the gonoplac.

Anal tube in dorsal view (Fig. 20) rectangular; basal margin weakly arcuate, lateral margins almost straight and parallel, posterior margin almost straight; anus placed before half the length.

Gonoplac (Fig. 21) unilobate, tapering ventrad; posterior margin with a row of well developed teeth; in the upper part 2 smaller teeth separated from the apical row.

Gonapophysis VIII (Fig. 22) horizontally flattened, with 6 big teeth at the posterior margin; huge endogonocoxal process with spiniferous microsculpture, tapering apicad.

Gonospiculum as in Figs. 23–24.

Bursa copulatrix (Fig. 25) with single and elongated pouch, the wall without cells and with visible ornamentation. Spermatheca (Fig. 25) well developed; *ductus receptaculi* weakly ribbed in basal part and with smooth, elongated bulla at the apex; *diverticulum ductus* smooth in basal part, distinctly shorter than *ductus receptaculi*, with bubbled bulla at the apex.

Coloration (specimens after the storage in EtOH, Figs. 1–3). Frons black; vertex black with yellow patches at lateral sides; clypeus, lateral parts of head, pronotum, fore and middle legs dark brown to black; mesonotum yellow with elongated black patch in mid line; tegmina yellowish with black costal area; hind legs yellowish to brownish. Abdomen and genital capsule yellow, posterior margin of gonoplac brown.

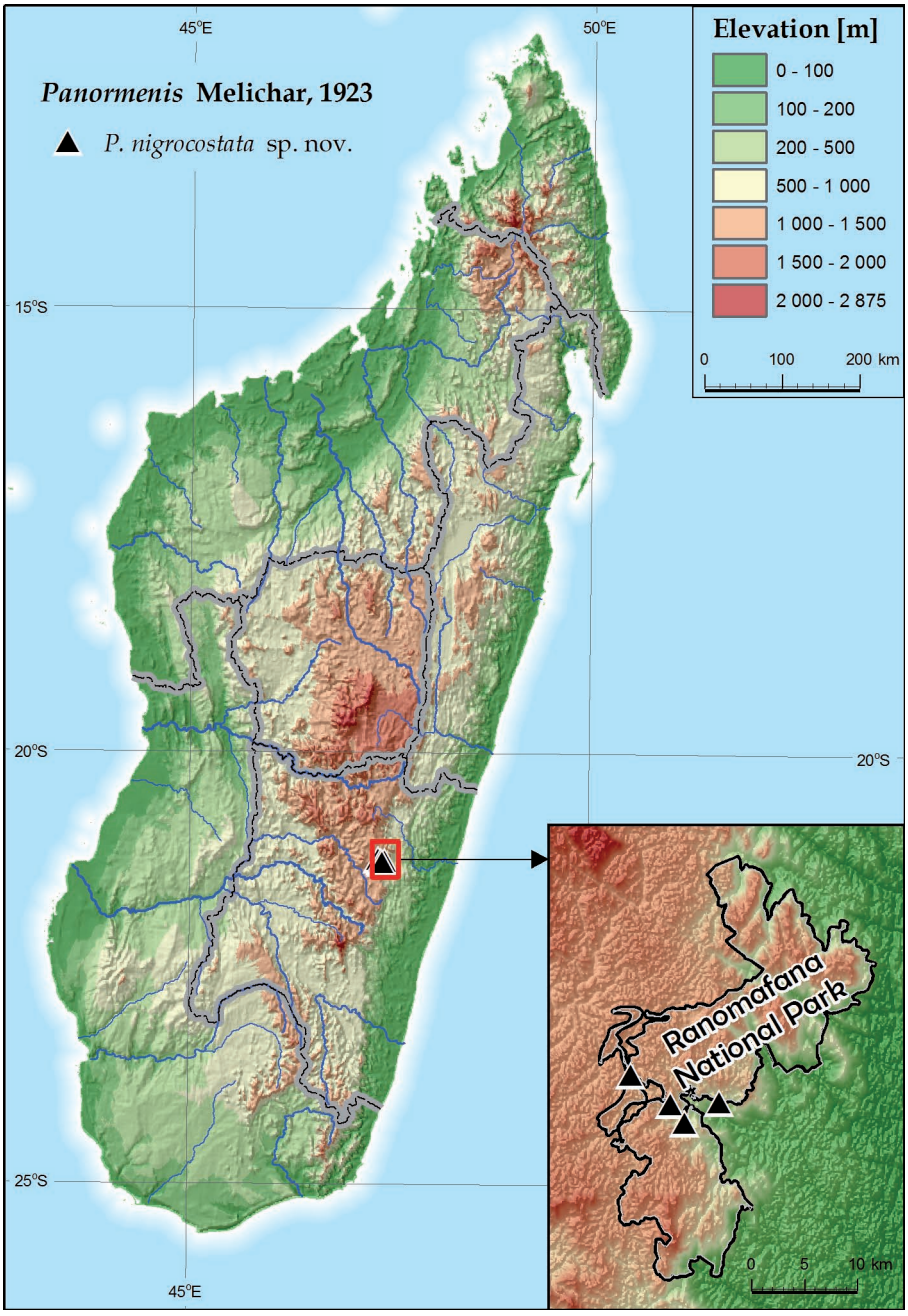
Type material

Holotype, ♂: [Madagascar: Province Fianarantsoa, Parc National Ranomafana, Vohiparara, at broken bridge, el 1110m 28 Nov – 6 Dec 2001], [21° 13.57′S, 47° 22.19′E, collector: R. Harin'Hala California Acad of Sciences malaise trap in high altitude rainforest, MA-02-09A-05], [CASENT 3004910] – (CAS).

Paratypes:

Locality of Vohiparara: [Madagascar: Province Fianarantsoa, Parc National Ranomafana, Vohiparara, at broken bridge, el 1110m 22–28 November 2001], [21° 13.57′S, 47° 22.19′E, collector: R. Harin'Hala California Acad of Sciences malaise trap in high altitude rainforest, MA-02-09A-04]: [CASENT 3007172] – (♂, CAS), [CASENT 3007176] – (♀, CAS); [28 Nov – 6 Dec 2001, MA-02-09A-05]: [CASENT 3004908] – (♂, CAS), [CASENT 3004911] – (♀, MIZ); [15–21 December 2001, MA-02-09A-07]: [CASENT 3007056] – (♂, MIZ), [CASENT 3007058–59] – (2♂♂, CAS); [28 Jan – 4 Feb 2002, MA-02-09A-14]: [CASENT 3007069] – (♂, CAS); [4–12 February 2002, MA-02-09A-15]: [CASENT 3004903] – (♀, CAS); [19–26 February 2002, MA-02-09A-17]: [CASENT 8078685] – (♂, CAS), [CASENT 8078963] – (♀, CAS); [25 May – 4 June 2002, MA-02-09A-30]: [CASENT 8082575] – (♂, CAS); [4–14 June 2002, MA-02-09A-31]: [CASENT 8078708] – (♀, CAS); [15–25 July 2002, MA-02-09A-35]: [CASENT 8078697] – (♀, CAS);

Locality of Belle Vue: [Madagascar: Province Fianarantsoa, Parc National Ranomafana, Belle Vue at Talatakely, elev 1020 m 16 Oct – 8 Nov 2001], [21° 15.99′S, 47° 25.21′E, collector: R. Harin'Hala California Acad of Sciences malaise, secondary tropical forest MA-02-09C-01], [CASLOT 044741] – (♂, ♀, CAS); [8–15 November 2001, MA-02-09C-02]: [CASLOT 044655] – (♂, CAS, ♂, MIZ); [22–28 November 2001, MA-02-09C-04]: [CASENT 3007020] – (♂, CAS), [CASENT 3007024] – (♂, MIZ); [CASENT 3007023, 25] – (2♂♂, CAS); [CASENT 3007175] – (♀, MIZ); [28 Nov – 6 Dec 2001, MA-02-09C-05]: [CASLOT 044742] – (♂, CAS); [6–15 December 2001, MA-02-09C-06]: [CASENT 3007186] – (♂, CAS); [21–28 January 2002, MA-



26. *Panormenis nigrocostata* n. sp., distribution map

02-09C-13]: [CASENT 3004937] – (♂, CAS); [28 Jan – 4 Feb 2002, MA-02-09C-14]: [CASENT 8082522] – (♀, CAS); [31 March – 7 April 2002, [MA-02-09C-23]: [CASENT 3004943] – (♂, CAS); [7–14 April 2002, MA-02-09C-24]: [CASENT 3007116–117] – (2♂♂, CAS); [14–23 April 2002, MA-02-09C-25]: [CASENT 3007137] – (♂, CAS); [28 April – 5 May 2002, MA-02-09C-27]: [CASENT 3007874] – (♀, CAS); [13–23 May 2002, MA-02-09C-29]: [CASENT 3007145] – (♀, CAS); [15–28 May 2003, MA-02-09C-61]: [CASENT 8078623] – (♀, CAS);

Locality of Jirama: [Madagascar: Province Fianarantsoa, Ranomafana, JIRAMA water works, 8–15 November 2001], [21° 14.91´S, 47° 27.13´E, collector: R. Harin'Hala California Acad of Sciences malaise trap near river elev 690 m, MA-02-09D-02]: [CASENT 8078950] – (♂, CAS); [22–28 November 2001, MA-02-09D-04]: [CASENT 8078978] – (♂, MIZ), [CASENT 8078980] – (♂, CAS); [10–14 January 2002, MA-02-09D-11]: [CASENT 3007219] – (♂, CAS); [14–21 January 2002, MA-02-09D-12]: [CASENT 8082397] – (♂, CAS); [21–28 January 2002, MA-02-09D-13]: [CASENT 3007192] – (♂, CAS); [19–26 February 2002, MA-02-09C-17]: [CASENT 8078583] – (♀, CAS); [7–14 April 2002, MA-02-09C-24]: [CASENT 3007118] – (♂, MIZ); [CASENT 3007119] – (♂, CAS);

Locality of Radio Tower: [Madagascar: Province Fianarantsoa, Parc National Ranomafana, radio tower at forest edge, elev 1130 m, 8–15 November 2001], [21° 15.05´S, 47° 24.43´E, collector: R. Harin'Hala California Acad of Sciences malaise, mixed tropical forest, MA-02-09B-02]: [CASENT 3004974] – (♀, CAS), [CASENT 3004976] – (♂, CAS); [15–22 November 2001, MA-02-09B–03]: [CASLOT 044657] – (2♂♂, CAS); [22–28 November 2001, MA-02-09B–04]: [CASLOT 034256] – (♂, CAS); [28 Nov – 6 Dec 2001, MA-02-09A-05]: [CASENT 3004909] – (♀, CAS); [28 Nov – 6 Dec 2001, MA-02-09B-05]: [CASENT 3007158] – (♂, CAS); [6–15 December 2001, MA-02-09B-06]: [CASENT 3007036] – (♀, CAS), [CASENT 3007037] – (♂, CAS), [CAASENT 3007038] – (♂, CAS), [CASENT 3007040] – (♀, CAS); [CASENT 3007043] – (♂, CAS); [6–15 December 2001, MA-02-09B-07]: [CASENT 3007078] – (♂, CAS), [CASENT 3007082] – (♂, CAS); [24 Dec 2001 – 2 January 2002, MA-02-09B-09]: [CASENT 3007159] – (♀, CAS), [CASENT 3007167] – (♂, CAS); [14–21 January 2002, MA-02-09B-12]: [CASENT 3007779] – (♂, CAS); [4–12 March 2002, MA-02-09B-19]: [CASENT 8078912] – (♂, CAS); [12–19 March 2002, MA-02-09B-20]: [CASENT 3007113] – (♂, CAS); [19–26 March 2002, MA-02-09B-21]: [CASENT 8078674] – (♀, CAS), [CASENT 8078690] – (♂, CAS); [26–31 March 2002, MA-02-09B-22]: [CASENT 8078671] – (♀, CAS); [24 June – 5 July 2002, MA-02-09B-33]: [CASENT 8078724] – (♂, CAS), [CASENT 8082034] – (♂, CAS), [CASENT 8082035] – (♀, CAS); [27 Feb – 9 March 2003, MA-02-09B-54]: [CASENT 3008036] – (♀, CAS), [CASENT 3008038] – (♀, MIZ); [CASENT 3008051] – (♂, CAS), [CASENT 3008189] – (♂, MIZ), [CASENT 3008190]– (♀, CAS); [20 March – 3 April 2003, MA-02-09B-56]: [CASLOT 034259] – (♂, CAS); [29 June – 6 July 2003, MA-02-09B-65]: [CASLOT 034261] – (♂, CAS); [6–17 July 2003, MA-02-09B-66]: [CASLOT 034262] – (2♂♂, CAS); [8–18 Oct 2003, MA-02-09B-75]: [CASLOT 034268] – (♀, MIZ); [11–26 May 2004, MA-02-09B-92]: [CASLOT 044671] – (2♂♂, CAS, ♀, MIZ); [7–20 Oct 2004, MA-02-09B-100]: [CASLOT 044717] – (♀, CAS);

[30 Nov – 11 Dec 2004, MA-02-09B-102]: [CASLOT 034275] – (♀, CAS); [24 Nov – 2 Dec 2005, MA-02-09B-131]: [CASLOT 044661] – (♀,CAS); [7–15 February 2006, MA-02-09B-139]: [CASLOT 044656] – (♂, CAS); [18–30 March 2006, MA-02-09B-143]: [CASLOT 044746] – (♂, CAS); [30 March – 14 April 2006, MA-02-09B-114]: [CASLOT 044661] – (♀,CAS); [5–13 June 2006, MA-02-09B-151]: [CASLOT 044658] – (♂, CAS).

DISTRIBUTION

The species is only known from the Ranomafana National Park (Fig. 26) – Fianarantsoa Province, Madagascar.

ACKNOWLEDGEMENTS

We would like to thank Dr Norman PENNY for providing the flatid material from the entomological collection of the California Academy of Sciences in San Francisco (USA) and Dr Jacek SZWEDO (MIZ PAS) for his valuable comments on the manuscript.

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