Acta zoologica cracoviensia, **55**(1): 65-77, Kraków, 31 October, 2012

doi:10.3409/azc.55_1.65

A new species of the genus *Latois* STÅL, 1866 from Madagascar (Hemiptera: Fulgoromorpha: Flatidae)

Dariusz ŚWIERCZEWSKI and Adam STROIŃSKI

Received: 30 March 2012. Accepted: 20 April 2012.

ŚWIERCZEWSKI D., STROIŃSKI A. 2012. A new species of the genus *Latois* STÅL, 1866 from Madagascar (Hemiptera: Fulgoromorpha: Flatidae). *Acta zool. cracov.*, **55B**(1): 65-77.

Abstract. A new species of the family Flatidae *Latois nigrofasciata* sp. n. from Madagascar is described and illustrated.

Key words: Entomology, taxonomy, Hemiptera, Fulgoromorpha, Flatidae, *Latois*, new species, Madagascar.

✉ Dariusz ŚWIERCZEWSKI, Jan Długosz University, Department of Zoology and Animal Ecology, Al. Armii Krajowej 13/15, 42-201 Częstochowa, Poland.
E-mail: dswier@ajd.czest.pl

Adam STROIŃSKI, Museum and Institute of Zoology PAS, Wilcza 64, 00-679 Warsaw, Poland.
E-mail: adam@miiz.waw.pl

I. INTRODUCTION

The flatid planthopper genus *Latois*, endemic to Madagascar, was established by STÅL (1866) for *Nephesa antica* SIGNORET, 1860. Later, KARSCH (1890) in his short paper dedicated to Afrotropical fulgorids described another species *Latois bicoloripes* KARSCH, 1890. MELICHAR (1901) transferred to this genus also *Nephesa suturalis* SIGNORET, 1860 and added further two species: *Latois frontalis* MELICHAR, 1901 and *Latois major* MELICHAR, 1901. Moreover, MELICHAR in his monograph placed *Latois bicoloripes* KARSCH, 1890 as a junior synonym under *Latois suturalis* SIGN. and this synonymy was accepted by METCALF (1957). However, according to MEDLER (1990), 'the synonymy may be overturned when the male status of *suturalis* is determined'. Summarizing, the revision of the genus *Latois* (in prep. by the authors) will clarify the taxonomic position of the mentioned species.

Below a new species of the genus *Latois* from southeastern part of Madagascar is described.

II. MATERIAL AND METHODS

M a t e r i a l. The studied material comes from the collection of the California Academy of Sciences in San Francisco, USA (Dr N. PENNY, curator).

P r e p a r a t i o n s a n d i l l u s t r a t i o n. The abdomens of the specimens examined were cut off and boiled in 10% KOH with a few drops of chlorazol black 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. The photos of the habitus were taken using microscope Leica MZ 16 with digital camera IC 3D; final images were produced using Synoptics Automontage software. The photos of male and female genital structures were taken using a stereoscopic microscope Zeiss Discovery V12 with digital camera AxioCamERc5s; final images were produced with Extended Focus software. The nomenclature of the male genitalia follows BOURGOIN (1988) and BOURGOIN & HUANG (1990), and for the female genitalia BOURGOIN (1993).

M e a s u r e m e n t s a n d a b b r e v i a t i o n s. The following measurements were made and abbreviations used in this study:

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

A/B – width of vertex measured at the anterior margin/length of vertex measured in mid line;

C/E – width of frons between eyes/length of frons in mid line;

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

F/B – length of pronotum in mid line/length of vertex in mid line

G/F – length of mesonotum/length of pronotum in mid line

G/B+F – length of mesonotum/cumulative length of vertex and 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 the apex of clavus to the anterior margin.

Vein nomenclature after interpretation proposed by SZWEDO & ŻYŁA (2009).

Depositories of material are abbreviated as follows:
CAS – California Academy of Sciences, Department of Entomology, San Francisco (USA)
MIZ – Museum and Institute of Zoology PAS, Warszawa (Poland)

III. TAXONOMY

Latois nigrofasciata sp. n.

Figs 1-35

D i a g n o s i s. *Latois nigrofasciata* SWI. et STR. differs from other species belonging to the genus by the pattern of coloration and the structure of periandrium and aedeagus.

E t y m o l o g y. The species was named after dark coloration of the frons.

T y p e m a t e r i a l. Holotype ♂: [MADAGASCAR: Province Fianarantsoa, 50 km S of Farafangana, Mahabo Mananivo, Ampitavananima Forest 17-24 Feb 2007 23°7.79'S, 47°43.02'E], [California Acad of Sciences coll: M. IRWIN, F. PARKER, R. HARIN'HALA elev 34 m malaise trap, in low altitude littoral rainforest, MG-35-06], [CASENT 8113265] – (CAS)

Paratypes (18 ♂♂, 13 ♀♀) – same locality as holotype (contents of labels pinned under the specimen in square brackets): [13-20 Jan 2007], [MG-35-01], [CASENT 8113190] – 1♀ (CAS); [26 Jan-4 Feb 2007], [MG-35-03], [CASENT 8113159] – 1♂ (CAS); [10-17 Feb 2007], [MG-35-05], [CASENT 8113283] – 1♂ (CAS); [17-24 Feb 2007], [MG-35-06], [CASENT 8113270] – 1♂ (CAS); [24 Feb-3 Mar 2007], [MG-35-07], [CASENT 8113247] – 1♂ (CAS); [10-17 March 2007], [MG-35-09], [CASENT 8113200] – 1♂ (CAS); [17-24 March 2007], [MG-35-10], [CASENT 8113194] – 1♀ (CAS); [7-14 April 2007], [MG-35-13], [CASENT 8113298] – 1♂ (CAS); [29 Apr.-6 May 2007], [MG-35-16], [CASENT 8113262] – 1♀ (MIZ); [29 Apr-6 May 2007], [MG-35-16], [CASENT 8113257] – 1♀ (CAS); [6-14 May 2007], [MG-35-17], [CASENT 8113290] – 1♀ (CAS); [14-21 May 2007], [MG-35-18], [CASENT 8113289] – 1♀ (CAS); [2-10 June 2007], [MG-35-17], [CASENT 8113296] – 1♀ (CAS); [2-10 June 2007], [MG-35-21], [CASENT 8113273] – 1♂ (CAS); [2-10 June 2007], [MG-35-21], [CASENT 8113266] – 1♂ (MIZ); [2-10 June 2007], [MG-35-21], [CASENT 8113286] – 1♀ (CAS); [15 June-1 Jul 2007], [MG-35-23], [CASLOT 044461] – 1♀ (CAS); [14-19 July 2007], [MG-35-26], [CASLOT 044595] – 1♂ (CAS); [19-23 July 2007], [MG-35-27], [CASLOT 044497] – 1♀ (CAS); [28 Jul-3 Aug 2007], [MG-35-29], [CASLOT 044470] – 1♂ (CAS); [3-11 Aug 2007], [MG-35-30], [CASLOT 044495] – 1♂ (CAS); [11-27 Aug 2007], [MG-35-31], [CASLOT 044503] – 1♀ (CAS); [11-27 Aug 2007], [MG-35-31], [CASLOT 044530] – 1♂ (CAS); [27 Aug – 6 Sept 2007], [MG-35-32], [CASLOT 044496] – 1♀ 1♂ (MIZ); [13-20 Sept 2007], [MG-35-34], [CASLOT 044523] – 1♀, 2♂♂ (CAS); [27 Sept-4 Oct '07], [MG-35-36], [CASLOT 044598] – 2♂♂ (CAS); [20-27 Dec 2007], [MG-35-45], [CASLOT 044620] – 1♂ (CAS).

D e s c r i p t i o n. Total length: 5.7-6.8 mm.

Head truncate, with compound eyes (in dorsal view) a little narrower than thorax (Figs 3, 5).

Vertex transverse, separated from frons, distinctly wider than long in midline, proportion A/B = 3.64-4.90; posterior part partly covered by pronotum (Figs 3-6, 9); anterior and posterior margins almost straight and parallel, lateral margins straight and parallel; disc of vertex in median portion elevated, without carinae (Figs 4, 8-9).

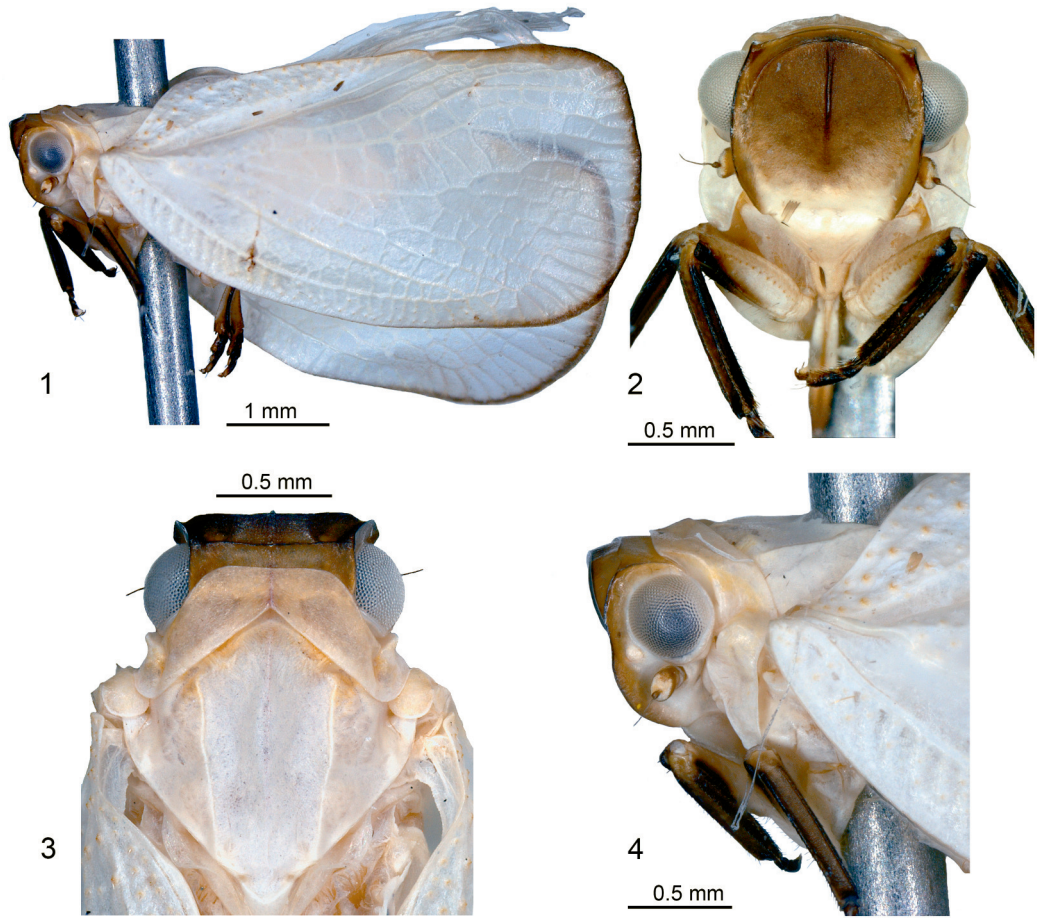
Frons (Figs 2-9) a little longer than wide, the widest at the level of antennae, proportion C/E = 0.95-1.01, proportion D/E = 1.00-1.07; frons with short and wide protrusion in the upper part of head – between anterior margin of vertex and frontal carinae; protrusion with lateral ridges, apex of protrusion (in lateral view) below level of vertex; disc of frons with three well visible, connected at base carinae – median carina reaching to ¾ of frons, lateral carinae shorter than median, in the form of semicircle, not surpassing the lower margin of compound eyes; lateral margins of frons carinate and elevated, in frontal view arcuate, in lateral view with shallow incision about the level of ocelli (Figs 4, 9); disc of frons irregularly rugose, with sensory and excretory organs (Fig. 10); central part (between median and lateral carinae) depressed.

Antennal segment II (pedicel) about as long as wide, wider at apex, sensory organs located at the top of pedicel, in shallow depression and partly at upper surface (Figs 9, 11-14). Compound eyes oval with very small callus at lower posterior margin, lateral ocelli present.

Frontoclypeal suture almost straight; clypeus without carinae, median portion convex (Fig. 2). Rostrum reaching hind coxae; apical part a bit shorter than the basal one.

Thorax. Pronotum (Figs 3, 5-6,9) a bit longer in mid line than vertex (proportion F/B = 1.07-1.50); anterior margin in lateral view a bit lower than posterior margin; anterior margin in dorsal view straight, partly covering posterior margin of vertex; posterior margin of pronotum deeply incised; disc with median carina, lateral pits and postocular eminences.

Mesonotum (Figs 3, 5) deltoid, proportion G/F = 5.00-6.66, G/B+F = 3.00-3.84, G/H = 0.90-1.05; in lateral view at the same level as posterior margin of pronotum; lateral angles placed before 1/2 of the length of mesonotum in mid line; disc of mesonotum with three, separated at base and parallel carinae, reaching the posterior margin.



Figs 1-4. *Latois nigrofasciata* sp. n. 1 – habitus, lateral view; 2-4 – anterior part of body: 2 – frontal view; 3 – dorsal view; 4 – lateral view.

Tegmen (Figs 1, 15-19) subrectangular, membranous, flat, surface smooth, proportion I/J = 1.96-2.20; costal margin – basal part to 1/3 arcuate, posterior part almost straight; costal angle bluntly rounded; apical margin arcuate; sutural angle rounded; postclaval sutural margin straight; costal area narrower than costal cell in midline, about the same width at its length, with dense and numerous transverse veinlets, the end placed a bit after the end of clavus; costal cell tapering apicad, with sparse net of veinlets; basal cell about twice as long as wide.

Longitudinal stem Sc+R arises as extremely short common stem from basal cell, Sc+RA strong and basally elevated, RP extremely weakly visible to the level of the first M fork. M leaving basal cell with a long stalk, but shorter than CuA stalk. First fork of Sc+RA after end of costal area; first fork of RP a little before end of costal area. Location of M_{1+2} fork variable: before, at the same level or a bit after RP fork; M_{3+4} fork before M_{1+2}. CuA diverging after the level of M fork. Sc+RA ending with 2-4 terminals, RP with 4-7 terminals, M_{1+2} with 8-10, M_{3+4} with 8-12 terminals, CuA with 4-7 terminals ending at postclaval margin.

Irregular net of numerous transverse veinlets starting from basal part of tegmen; nodal line absent; one apical line present, apical cells elongated, 3-4 times longer than wide; tubercles present mainly on costal area, between Sc+RA and RP veins and clavus. Claval veins not elevated, connected a little before end of clavus; transverse veinlets absent.

Femora shorter than tibiae; fore and middle tibiae rectangular in cross section with carinate margins; hind tibia arcuate with 2 lateral spines after half of length, row of 6-7 apical teeth in formula 2 (longer) + 5-6 (shorter); basitarsomere (Fig. 20) as long as cumulative length of second and hind tarsomeres, with arcuate line of 7-8 apical teeth, lateral teeth larger than internal ones.

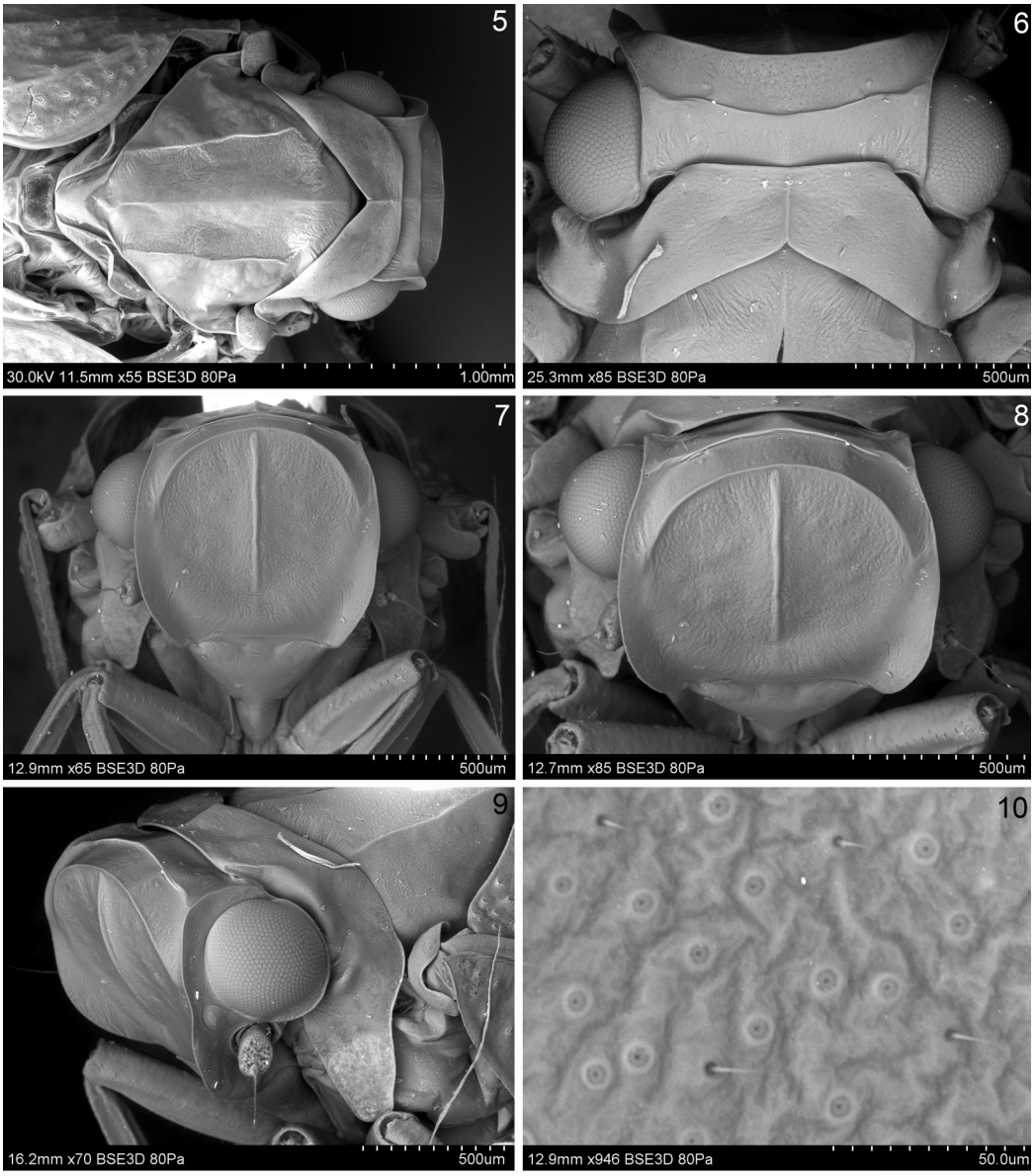
Male (Figs 21-25). Anal tube (in lateral view, Fig. 21) elongated and curved at about a middle point; basal part a bit wider than the apical one; ventral and dorsal margin of basal part subparallel; lower margin of apical part arcuate. Anus placed about the half of length. Anal tube (in dorsal view, Fig. 22) elongated; basal part distinctly narrower than median portion, apical part tapered, shallowly incised medially.

Pygofer (in lateral view, Fig. 21) higher than wide; dorsal part distinctly narrower than the ventral one, posterior margin almost straight. Posterior-dorsal angle without process, bluntly rounded.

Genital styles (in lateral view, in direct observation, Fig. 21) longer than wide and bearing distinct and short capitulum at the end of dorsal margin; ventral and dorsal margins almost straight and parallel, dorsal margin raised before capitulum, ventral margin apically with sharp and short process, posterior margin distinctly ‘broken’ in the upper portion.

Phallic complex: periandrium (Figs 23-24) elongated, basal part a bit wider than apical part; lateral split reaching almost the half of the length of periandrium; dorsal part longer than ventral one divided into two lateral and two dorsal lobes, lateral lobes well-sclerotized and widened with apical short and sharp process, ventral margin of dorsal part with well sclerotised process oriented ventro-basad; base-rounded process bifurcated before the middle, internal arm distinctly shorter than external one; dorsal lobes membranous with spiniferous microsculpture; ventral part shorter than dorsal one, partly membranous, tapering apicad with sharp ending.

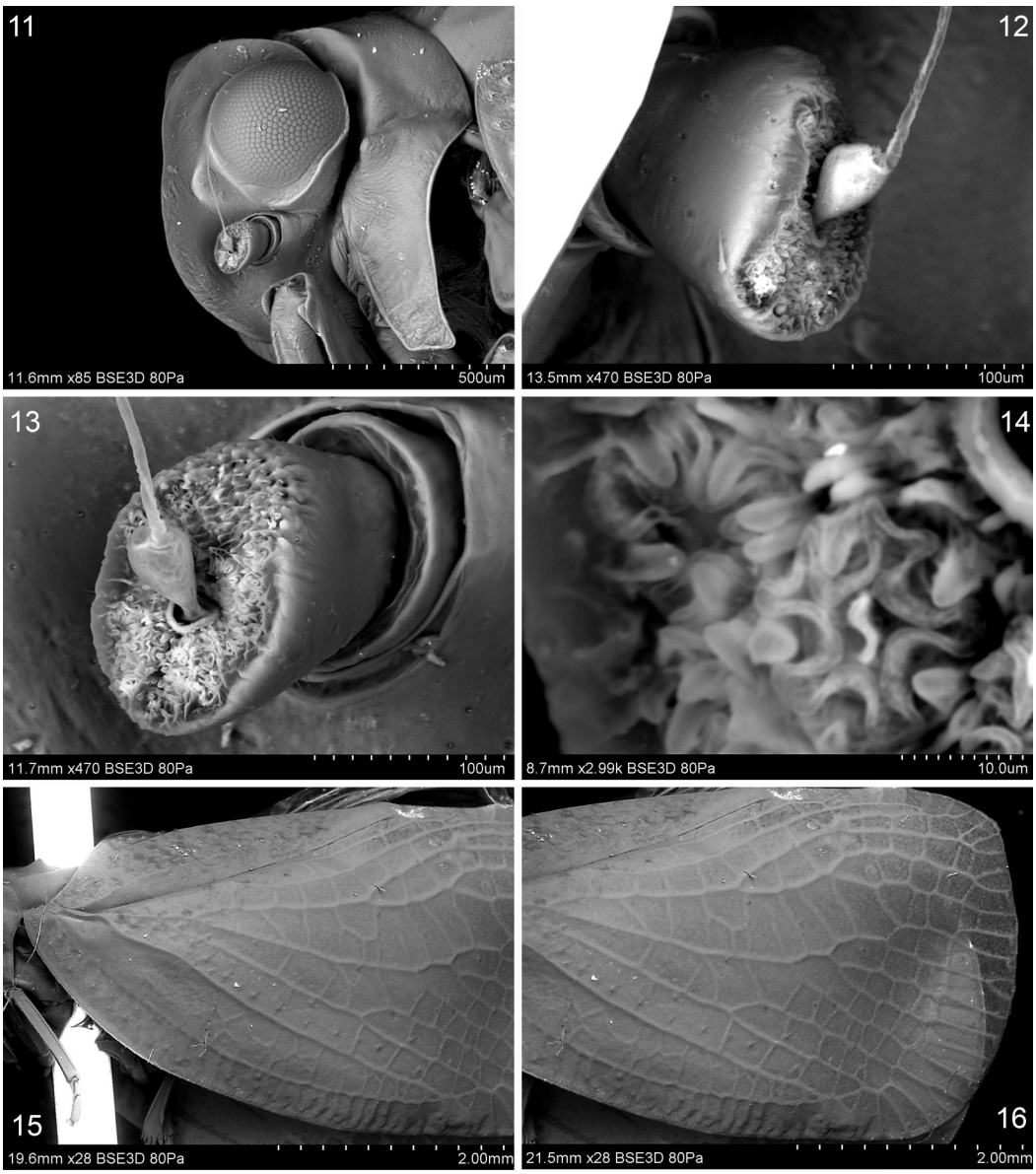
Aedeagus s.s. (Figs 25-26): shaft as long as dorsal part of periandrium, weakly arcuate; posterior-ventral part near the apex with well sclerotized, bulb-like appendage.



Figs 5-10. *Latois nigrofasciata* sp. n. 5-9 – anterior part of body: 5-6 – dorsal view, 7-8 – frontal view, 9 – fronto-lateral view; 10 – sensory and wax pores.

Female (Figs 27-35). Pregenital sternite (Fig. 27) with wide and well sclerotised median portion; lateral parts narrow and weakly separated from median part; anterior margin weakly convex, posterior margin almost straight covered by additional narrow and convex lobe.

Anal tube (in lateral view, Fig. 28) oval; ventral margin strongly arcuate, posterior part bluntly rounded; anus placed at the half of length; anal tube extending a bit beyond the pos-



Figs 11-16. *Latois nigrofasciata* sp. n. 11 – anterior part of body, lateral view; 12-13 – antenna; 14 – antennal plate organs; 15-16 – tegmen.

terior margin of the gonoplac. Anal tube (in dorsal view, Fig. 29) subrectangular; anterior margin weakly concave, posterior margin in median portion with deep, narrow incision; lateral margins subparallel; anus placed at the half of length. Gonoplac unilobate, triangular, oriented ventrad (Fig. 31); posterior margin with row of small and dense teeth; upper part to the level of teeth limit well sclerotised, lower part membranous with numerous

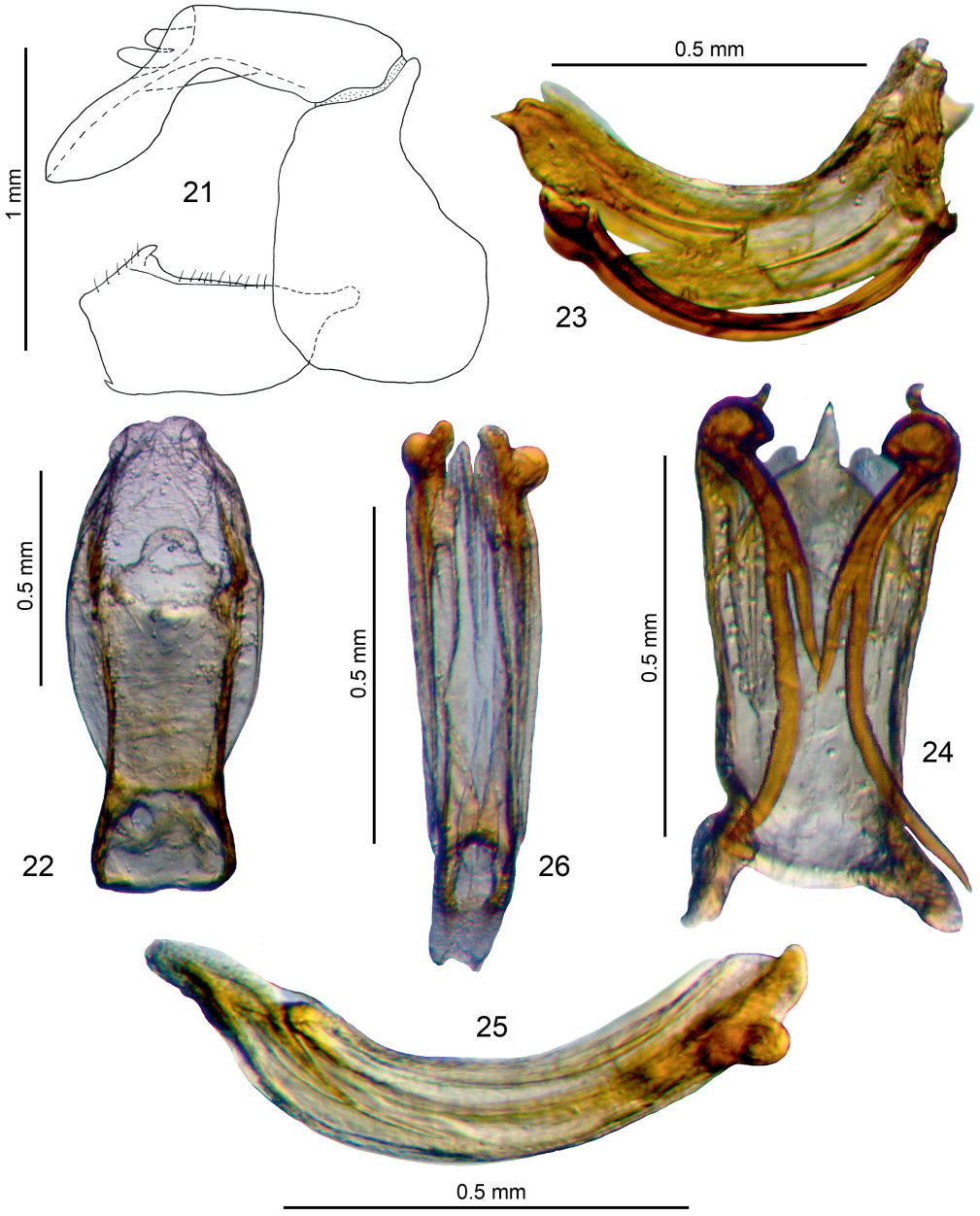
Figs 17-20. *Latois nigrofasciata* sp. n. 17 – basal part of tegmen; 18 – claval part of tegmen; 19 – single pore with ring-shaped area; 20 – apex of hind tibia and tarsomeres.

hair. Gonapophysis VIII (in lateral view of the external side, Fig. 30) spatula-like, oblique in respect to longitudinal body axis; posterior margin with 6 parallel keel-shaped teeth; endogonocoxal process huge, membranous, tapering apicad with spiniferous microsculpture and marginal hairs. Gonospiculum as in Figs 32-33.

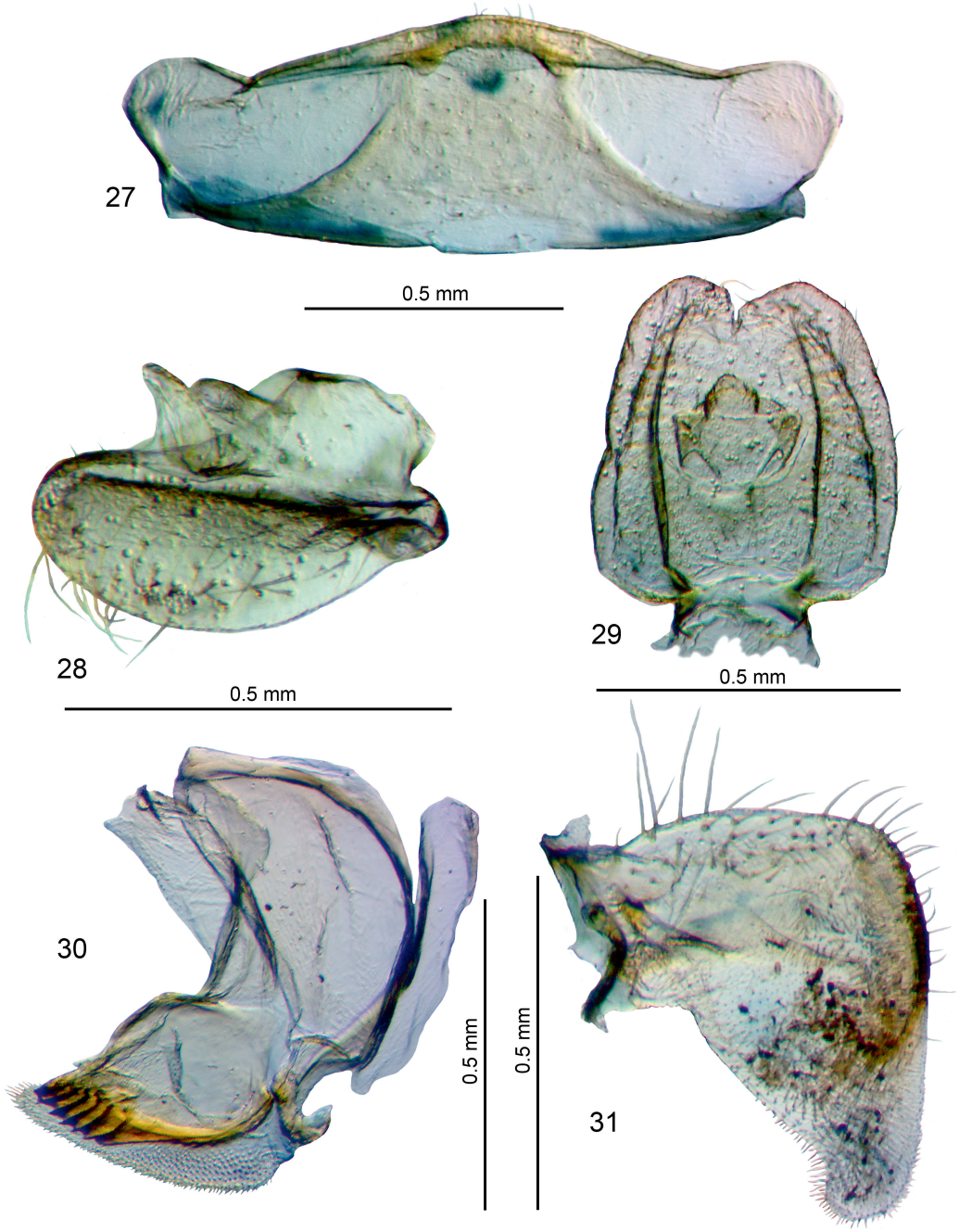
Bursa copulatrix (Fig. 34) with single pouch, elongately oval; cells absent, round sclerotised plates on the whole surface. Spermatheca (Fig. 35) well developed; *ductus receptaculi* shorter than *diverticulum ductus*, with smooth narrow basal part, medially widened and ribbed, tapering apicad; *diverticulum ductus* with smooth, elongated basal part and widened and wrinkled apical part.

Coloration (specimens after the storage in EtOH, Figs 1-4). General coloration milky-white; vertex and frons from dark brown to black, pronotum and mesonotum yellowish, apical part of fore and middle femora, tibiae and tarsi dark brown to black, teeth margin and tarsus of hind tibia dark brown to black; apical margin of tegmen dark brown.

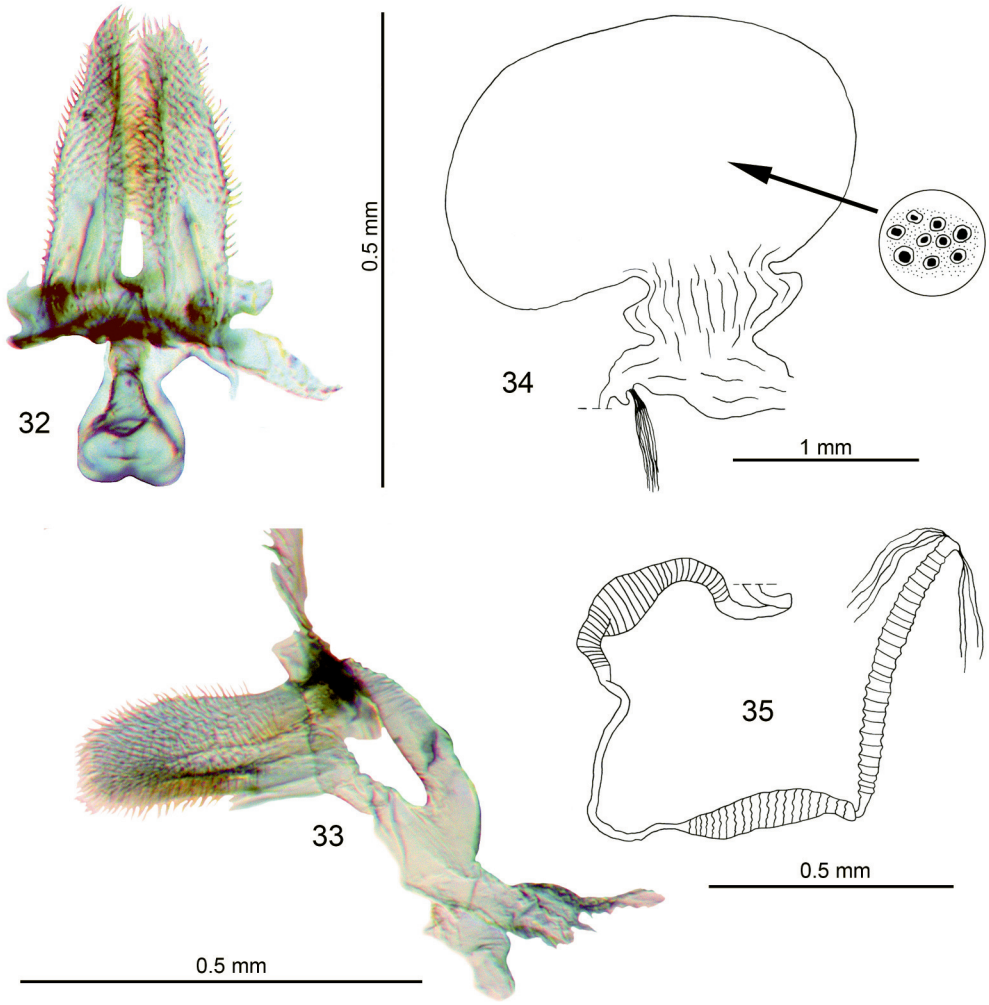
D i s t r i b u t i o n. Madagascar (Province Fianarantsoa). So far *Latois nigrofasciata* is known only from one locality – Ampitavananima Forest near Mahabo Mananivo, in southeastern part of the island.



Figs 21-26. *Latois nigrofasciata* sp. n., male, holotype. 21 – genital capsule, lateral view; 22 – anal tube, dorsal view; 23 – periandrium, lateral view; 24 – periandrium, ventral view; 25 – aedeagus, lateral view; 26 – aedeagus, ventral view.



Figs 27-31. *Latois nigrofasciata* sp. n., female. 27 – pregenital sternite, flattened; 28 – anal tube, lateral view; 29 – anal tube, dorsal view; 30 – gonapophysis VIII, lateral view; 31 – gonoplac, external view.



Figs 33-35. *Latois nigrofasciata* sp. n., female. 32 – gonapophyses IX and gonospiculum bridge, lateral view; 33 – same, dorsal view; 34 – bursa copulatrix, lateral view; 35 – spermatheca.

IV. DISCUSSION

Latois nigrofasciata, together with previously described *Flatopsis medleri* (ŚWIERCZEWSKI & STROIŃSKI 2011), were both collected in littoral forest of southeastern Madagascar. Littoral forests often considered as two separate groups – northern and southern are relatively unexplored and poorly documented ecosystems (DE GOUVENAIN & SILANDER 2003). They are considered to have once formed an uninterrupted, narrow 1600-km band on the sandy plains along the entire Madagascar's eastern coastline (less than 1% of its total land surface) but as a result of anthropogenic activity their cover was dramatically re-

duced to isolated, remnant fragments. Interestingly, the littoral forests are presently one of the smallest and the most diverse habitats in Madagascar (GANZHORN *et al*. 2001). Approximately 13% of Madagascar's total native flora can been found in these ecosystems and over 25% of the 1535 plant species known from littoral forests are endemic to this community (CONSIGLIO *et al*. 2006). With respect to fauna, littoral forest are one of four major areas of ant endemism in Madagascar (FISHER & GIRMAN 2000). For birds, they play an important transitional role between two other major natural habitats – spiny and humid forests (WATSON *et al*. 2005).

After decades of deforestation, littoral forests are still poorly protected and remain one of the most endangered ecosystems in Madagascar (SCHATZ *et al*. 2000). Only 1.5% of the remaining forest fragments are included within the existing protected-areas network, despite the fact that these ecosystems are ranked among the habitat types of highest conservation priority on the island. Summarizing, we predict that the flatid fauna of littoral forests might be of much higher diversity and further explorations are in need regarding this unique forests communities.

A c k n o w l e d g e m e n t s. We would like to thank Dr Norman PENNY for the privilege of studying the flatid material from the entomological collection of the California Academy of Sciences in San Francisco (USA). We also are indebted to the reviewers Dr Vladimir GNEZDILOV and Dr Jacek SZWEDO for providing helpful comments on the manuscript.

REFERENCES

BOURGOIN Th. 1988. A new interpretation of the homologies of the Hemiptera male genitalia, illustrated by the Tettigometridae (Hemiptera, Fulgoromorpha). [In:] C. VIDANO, A. ARZONE (eds) – 6th Auchenorrhyncha Meeting, Turin, Italy, September 7-11, 1987. CN R-IPRA, Turin. Pp. 113-120.

BOURGOIN Th. 1993. Female genitalia in Hemiptera Fulgoromorpha, morphological and phylogenetic data. *Annales de la Société entomologique de France* (N.S.), **29**: 225-244.

BOURGOIN Th., HUANG J. 1990. Morphologie compare des genitalia males des Trypetimorphini et remarques (Hemiptera: Fulgoromorpha: Tropiduchidae). *Annales de la Société entomologique de France* (N.S.), **26**: 555-564.

CARAYON J. 1969. Emploi du noir chlorazol en anatomie microscopique des insectes. *Annales de la Société entomologique de France* (N.S.), **5**: 179-193.

CONSIGLIO T., SCHATZ G. E., MCPHERSON G., LOWRY II P. P., RABENANTOANDRO J., ROGERS Z. S., RABEVOHITRA R., RABEHEVITRA D. 2006. Deforestation and plant diversity of Madagascar's Littoral Forests. *Conservation Biology*, **20**: 1799-1803.

DE GOUVENAIN R. C., SILANDER Jr J. A. 2003. Littoral Forest. [In:] S. M GOODMAN, J. P. BENSTEAD (eds) – The Natural History of Madagascar. The University of Chicago Press, Chicago & London. Pp: 103-109.

FISHER B. L., GIRMAN D. J. 2000. Biogeography of ants in eastern Madagascar. [In:] W. R LOURENCO, S. M. GOODMAN (eds) – Diversité et Endémisme à Madagascar. Mémoires de la Société de Biogéographie, Paris. Pp: 331-344.

GANZHORN J. U., LOWRY II P. P, SCHATZ G. E., SOMMER S. 2001. The biodiversity of Madagascar: one the world's hottest hotspots on its way out. *Oryx*, **35**: 346-348.

KARSCH F. 1890. Afrikanische Fulgoriden. *Berliner Entomologische Zeitschrift*, **35**: 57-70.

MELICHAR L. 1901. Monographie der Acanaloniiden und Flatiden (Homoptera). *Annalen des k.k Naturhistorischen Hofmuseums*, Wien, **16**: 178-258.

METCALF Z. P. 1957. General Catalogue of the Homoptera, Fasc. IV, Part 13, Flatidae. North Carolina State College, Raleigh, N. C., 565 pp.

MEDLER J. T. 1990. Types of Flatidae XIII, lectotype designations and taxonomic notes on African species in the Zoological Museum of the Humboldt-University Berlin (Homoptera, Fulgoroidea). *Deutsche entomologische Zeitschrift* N. F., **37**: 105-118.

SCHATZ G. E., BIRKINSHAW C., LOWRY II P. P. 2000. The endemic plant families of Madagascar project: Integrating taxonomy and conservation. [In:] W. R. LOURENCO, S. M. GOODMAN (eds) – Diversité et Endémisme à Madagascar. Mémoires de la Société de Biogéographie, Paris. Pp: 11-24.

STÅL C. 1866. Hemiptera Homoptera LATR. *Hemiptera Africana*, **4**: 1-276.

SZWEDO J., ŻYŁA D. 2009. New Fulgoridiidae genus from the Upper Jurassic Karabastau deposits, Kazakhstan (Hemiptera: Fulgoromorpha: Fulgoroidea). *Zootaxa*, **2281**: 40-52.

ŚWIERCZEWSKI D., STROIŃSKI A. 2011. *Flatopsis medleri* sp. n. – a new flatid species from Madagascar (Hemiptera: Fulgoromorpha: Flatidae). *Acta zoologica cracoviensia*, 54B(1-2), 23-30. doi:10.3409/azc.54b_1-2.23-30

WATSON J. E. M., WHITTAKER R. J., DAWSON T. P. 2005. The importance of littoral forests remnants for indigenous bird conservation in southeastern Madagascar. *Biodiversity and Conservation*, **14**: 523-545.