PROBOSCIDOPLOCIA A SINGULAR PLURAL (EPHEMEROPTERA: POLYMITARCYIDAE: EUTHYPLOCIINAE)*

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*Aquatic biodiversity of Madagascar 1.

Until now the genus *Proboscidoplocia* DEMOULIN, 1966 was considered monospecific, but intensive light trap samplings have revealed six new species of these giant mayflies. The identity of *P. sikorai* (VAYSSIÈRE, 1895) remains unsolved. The geographical distribution and ecological preferences of these new species increase the bioecological knowledge of the genus.

INTRODUCTION

The endemic Malagasy genus *Proboscidoplocia* was established by DEMOULIN in 1966 and placed in the family Euthyplociidae. It can be distinguished from related genera such as *Campylocia* NEEDHAM & MURPHY, *Euthyplocia* EATON, *Mesoplocia* DEMOULIN and *Polyplocia* LESTAGE by the absence in the imaginal stage of cubital intercalary veins in the forewings, by tarsi with dissimilar claws, and by the shape of the male genital forceps (DEMOULIN, 1966). At least for adult females, the mandibular tusks persist as long unsclerotized projections extending backwards (DEMOULIN, 1970). Reduced mandibular tusks persist in the adult males, but are much smaller than those of the females.

Following the classification proposed by MCCAFFERTY (1991), this genus now belongs to the family Polymitarcyidae and to the subfamily Euthyplociinae.

Until now, this genus was considered monospecific with the type species *Proboscidoplocia sikorai* (VAYSSIÈRE, 1895). Intensive field samplings (450 samples) in different regions of Madagascar allowed us to collect numerous adult specimens. These samplings included new species which are described in this work. Only male imagos are reported here. Females (SARTORI *et al.*, in press) and nymphs will be described later. All specimens were captured with the help of night UV and white light traps.

Holotypes of the new species are deposited in the Museum National d'Histoire Naturelle (MNHN) in Paris; paratypes are housed in the collection of the CNRE, Antananarivo, and in the Musée de Zoologie, Lausanne.

DESCRIPTIONS

Proboscidoplocia billi sp. nov.

The coloring and the body shape of each species of *Proboscidoplocia* are practically the same. General characters (except size) mentioned for *P. billi* will also be valid for the other species.

Male imago

Body bluish-grey. Head transverse bearing three ocelli with blue-blackish base and with clear apex. Vestiges of mandibular tusks small, in contrast to those of females. Thorax with wide pronotum shaped as a trapezoid shield, narrower anteriorly. Wings (Fig. 1) bluish-brown in alcohol. Forewings with numerous cross veins which form with longitudinal veins more or less rectangular cells. Near outer margin of the wings, marginal cells of variable shape, large and few in number. Cubital area without cross veins near margin of wings. Vein CuA with six major sigmoid veins each separated by a single marginal intercalary. Hindwings with vein R_1 clearly serrated in its proximal part then becoming rectilinear beyond $^3/_5$ of wing length; few cells at outer margin of wings. Genitalia (Fig. 2): basal half of penis lobes fused, apical half clearly divergent, V-shaped in distal part. Apex of each lobe hook-shaped with a spine near genital pore. Distal part of penes long compared to those of other species (Table 1). Length and width of the 6th segment of the terminal filament 0.61 and 0.10 mm respectively. Ratio between lengths of terminal filament and cerci 0.75.

Dimensions of holotype: body length: 20.27 mm; cerci: 45.2 mm; terminal filament: 33.7 mm; forewing: 18.43 mm in length, 10.05 mm in width; hindwing: 9.91 mm in length, 6.37 mm in

width; legs: L1: femur = 4.5 mm, tibia = 5.2 mm, tarsus 1= 0.3 mm, tarsus 2 = 2.1 mm, tarsus 3 = 1.2 mm, tarsus 4 = 1.2 mm, tarsus 5 = 0.8 mm, claws = 0.27 mm; L2: femur = 3.2 mm, tibia = 2.9 mm, tarsus + claws = 0.8 mm; L3: femur = 4.2 mm, tibia = 2.6 mm, tarsus + claws = 1.1 mm.

Etymology: this species is dedicated to Prof. W.L. «Bill» Peters (Tallahassee, USA), eminent ephemeroperist and friend.

Material examined

Holotype: 1 male imago, Madagascar, Fianarantsoa Prov., Andringitra Mountain, Sahavatoy Stream, tributary of the Manampatrana Basin (Code station St30-08, sample P0171), 46: 58: 30 E; 22: 12: 50 S, 1210 m a.s.l., 22 November 1993, including four microscopic preparations: genitalia (Euparal), wings G1, G2 (dry), cerci (Euparal), legs G1, G2, G3, D1, D2, D3 (Euparal). Head and body preserved in 75% alcohol. Paratypes: 4 male imagos partly in slide preparations, 8 male imagos in alcohol, same data as the holotype.
FONTAINE (1968) provided good drawings and description of a male imago named by her *P. sikorai* whose genitalia seems close to *P. billi*. We have not examined that specimen and think the identity of *P. sikorai* sensu FONTAINE (1968) will be solved only when new material from the same area will be available. Reference given for this specimen is: Madagascar East, district of Sambava, Réserve Nationale Intégrale XII, Mountain of the Marojejy West, altitude 1600 m, IX/ X-59 (P. Soga).

Distribution and ecology

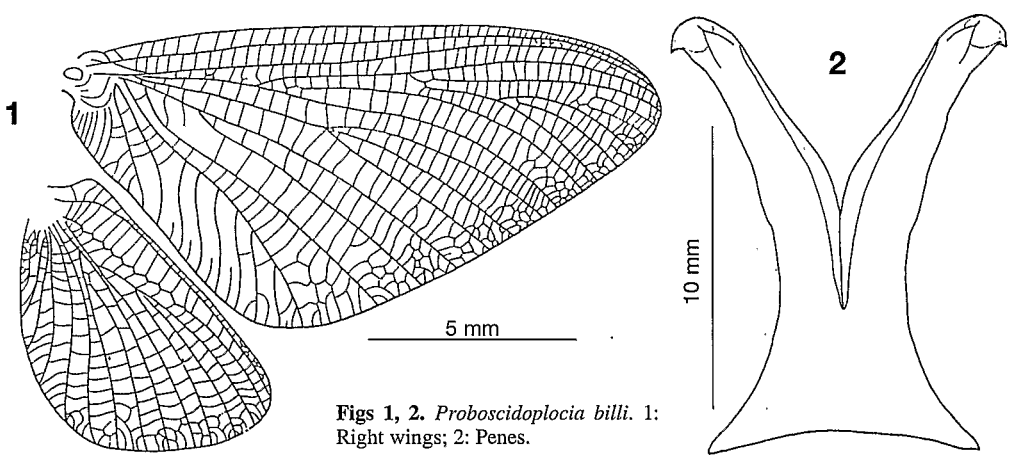
The distribution of this species (Figs 14, 16) is limited to wooded regions at higher altitudes on the Andringitra Mountain. This could explain its absence on the Ankaratra Mountain where the primary forest has been cut.

Among 450 stations sampled all over Madagascar (Fig. 13), this species has been captured only once. The station St30-08, is at an altitude of 1210 m on the eastern slope of Andringitra, in primary forest (see GIBON *et al.*, 1996 for details of vertical distribution). The stream is torrenticolous with a discharge of 1 $m^3 s^{-1}$. Water temperature was 14°C at 18 hours. Male subimagos emerged by the end of the afternoon, then molted; imagos were caught at the very beginning of the night.

Proboscidoplocia vayssierei sp. nov.

Male imago

Body bluish-grey. Wings (Fig. 3) bluish-brown in alcohol. Forewings with small and numerous marginal cells. Cubital area with some small marginal cells between vein CuA and the first sigmoid vein. CuA with six major sigmoid veins each separated by a minor intercalary, themselves separated by very small marginal intercalary. Hindwings with vein R_1 only slightly serrated in its proximal part then becoming rectilinear after $^3/_5$ of wing length. Numerous cells at outer margin of wing. Genitalia (Fig. 4): basal $^2/_3$ of penis lobes fused, apical $^1/_3$ clearly divergent, two lobes anchor-like. Apex of each lobe hook-shaped with a spine near genital pore. Distal part of penes long in comparison to other species, nevertheless shorter than in *P. billi* (Table 1). Length and width of the 6th segment of the terminal filament 0.62 and 0.13 mm respectively. Ratio between lengths of terminal filament and cerci 0.92.
Dimensions of holotype: body length: 17.95 mm; cerci: 45.7 mm; terminal filament: 42.7 mm;



Figs 1, 2. *Proboscidoplocia billi*. 1: Right wings; 2: Penes.

forewing: 16.75 mm in length, 9.38 mm in width; hindwing: 7.91 mm in length, 5.23 mm in width; legs: L1: femur = 3.4 mm, tibia = 4.22 mm, tarsus 1 = 0.4 mm, tarsus 2 = 2.3 mm, tarsus 3 = 1.4 mm, tarsus 4 = 1.1 mm, tarsus 5 = 0.7 mm, claws = 0.27 mm; L2: femur = 2.6 mm, tibia = 2.3 mm, tarsus + claws = 0.9 mm; L3: femur = 3.5 mm, tibia = 2.3 mm, tarsus + claws = 0.9 mm.

Etymology: this species is dedicated to Mr. M. A. Vayssière, eminent ephemeropterist who described the first *Proboscidoplocia.*

Material examined

Holotype: male imago, Madagascar, Fianarantsoa Prov., Andringitra Mountain, tributary of the Sahavatoy Stream, Manampatrana Basin (Station St30-07, sample P0169), 47: 00: 46 E, 22: 13: 28 S, 950 m a.s.l., 21 November 1993, including four slide preparations: wings D1, D2, wings G1, G2 (dry), genitalia (Euparal), legs D1, D2 D3, G1, G2, G3 (Euparal). Head and body preserved in 75% alcohol.

Paratypes: 5 male imagos, partly on microscopic slides, as well as 86 male imagos in alcohol, same data as the holotype; 3 male imagos, partly on microscopic slides, as well as 37 male imagos in alcohol, Andringitra Mountain, Sahanivoraky Stream, Manampatrana Basin (St30-05, sample P0167), 47: 00: 41 E, 22: 13: 33 S, 19 November 1993; 1 male imago, partly on microscopic slides, Andringitra Mountain, Sahavatoy Stream, Manampatrana Basin (St30-06, sample P0168), 47: 00: 50 E, 22: 13: 33 S, 20 November 1993; male imago, partly on microscopic slides, Andringitra Mountain, Iantara Stream, Manampatrana Basin (St30-03, sample P0165), 47: 01: 50 E, 22: 13: 28 S, 17 November 1993.

Distribution and ecology

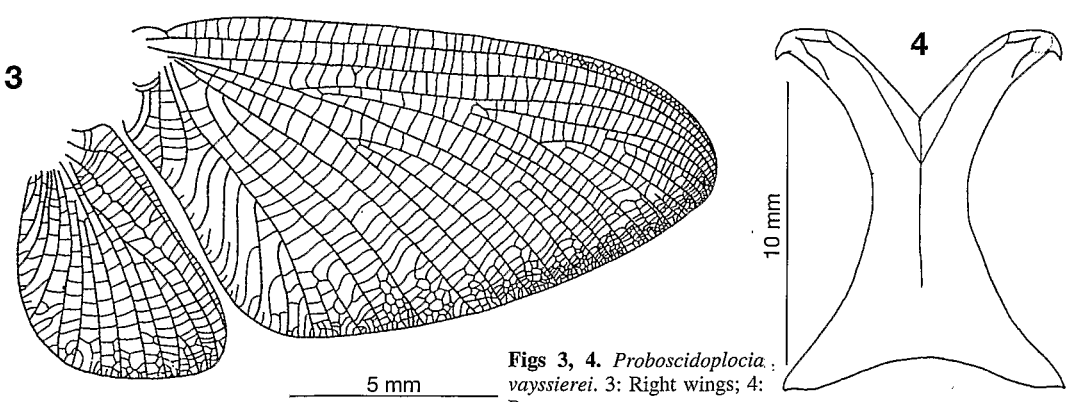
Males of this species have been collected only on the western slopes of the Andringitra Mountain (Figs 14, 16), on six stations of the Manampatrana Basin, between 750 and 1200 m a.s.l. in primary or secondary forest zones (see GIBON *et al.*, 1996 for details of distribution). Water temperature ranged from 16°C to 18°C.

Proboscidoplocia ruffieuxae sp. nov.

Male imago

Body bluish. Wings (Fig. 5) bluish-brown in alcohol. Forewings with marginal cells relatively large and not numerous. Cubital area without a marginal cell between vein CuA and the first sigmoid vein. CuA with five major sigmoid veins, and two minors sigmoid veins at its extremity. Apical three sigmoid veins with a secondary sigmoid vein. Cubital area with only two free marginal veins. Hindwings with vein R_1 moderately serrated from basis to apex. Few cells at outer margin of the wings. Genitalia (Fig. 6): more than basal $^2/_3$ of penis lobes fused. Penis lobes little divergent and thick-set. Apex of each lobe hook-shaped with a spine at border of genital pore. Free branches of penes short (Table 1). Length and width of the 6th segment of the terminal filament 0.40 and 0.13 mm respectively. Ratio between lengths of terminal filament and cerci 0.75.

Dimensions of holotype: body length: 13.00 mm; cerci: 40.6 mm; terminal filament: 30.3 mm; forewing: 14.14 mm in length, 7.43 mm in width; hindwing: 7.04 mm in length, 5.09 mm in width; legs: L1: femur = 3.4 mm, tibia = 3.4 mm, tarsus 1 = 0.5 mm, tarsus 2 = 1.3 mm, tarsus 3 = 0.9 mm, tarsus 4 = 0.9 mm, tarsus 5 = 0.4 mm, claws



Figs 3, 4. *Proboscidoplocia vayssierei.* 3: Right wings; 4: Penes.

= 0.13 mm; L2: femur = 2.4 mm, tibia = 2.2 mm, tarsus + claws = 0.7 mm; L3: femur = 3.2 mm, tibia = 2.2 mm, tarsus + claws = 0.7 mm.

Etymology: this species is dedicated to Ms Laurence Ruffieux, eminent ephemeropterist and friend, working at the Museum of Zoology in Lausanne (Switzerland).

Material examined

Holotype: male imago, Madagascar, Tamatave Prov., Sandragniro River, Rianila Basin (Station St17-20, sample P0258), 48: 51: 22 E, 18: 54: 58 S, 30 m. a.s.l., 5 November 1994, including five slide preparations: genitalia (Euparal); right wings D1, D2 (dry); left wings G1, G2 (dry); legs D1, D2, D3, G1, G2, G3 (Euparal); cerci (Euparal). Body preserved in 75% alcohol.

Paratypes: 2 male imagos, partly on slide preparations, same data and locality as holotype.

Distribution and ecology

This species has been found in a single locality (Figs 14, 17). Sandragniro River flows in a zone of savannah of the Eastern coast, due to deforestation of the rain forest. Water temperature was quite tepid (24°C). Altitude of the station (30 m a.s.l.) is far under the threshold of 800 m mentioned in the literature for the genus *Proboscidoplocia* (FONTAINE, 1968).

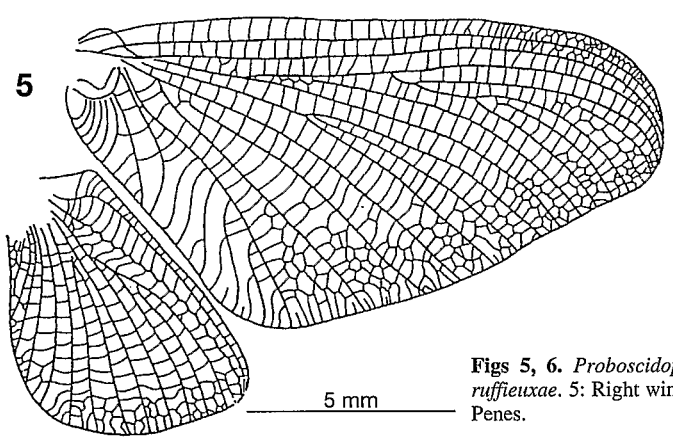
Proboscidoplocia auberti sp. nov.

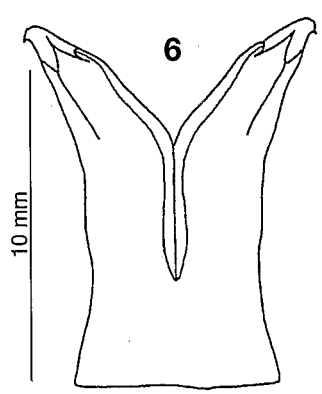
Male imago

Body bluish-grey. Wings (Fig. 7) bluish-brown in alcohol. Forewings with marginal cells of medium size and medium in number. Cubital area without marginal cells between vein CuA and the first sigmoid vein. CuA with only four sigmoid veins, preceded by a small one. Some of them could bear a secondary sigmoid vein. Three to five intercalary veins present. Hindwings with vein R_1 almost not serrated. Few cells at outer margin of the wings. Genitalia (Fig. 8): basal 3/4 of penis lobes fused. Lobes slightly divergent, both thick-set, with base larger than space between apex of lobes. Apex of each lobe hook-shaped with a spine bording genital pore. Distal part of penis lobes short (Table 1). Length and width of the 6th segment of the terminal filament 0.17 and 0.13 mm respectively. Ratio between lengths of terminal filament and cerci 0.40.

Dimensions of holotype: body length: 17.4 mm; cerci: 38.8 mm; terminal filament: 15.6 mm; forewing: 13.9 mm in length, 7.23 mm in width; hindwing: 6.16 mm in length, 4.6 mm in width; legs: L1: femur = 3.2 mm, tibia = 3.4 mm, tarsus 1 = 0.5 mm, tarsus 2 = 1.3 mm, tarsus 3 = 0.9 mm, tarsus 4 = 0.47 mm, tarsus 5 = 0.4 mm, claws = 0.2 mm; L2: femur = 2.4 mm, tibia = 2.3 mm, tarsus + claws = 0.9 mm; L3: femur = 3.2 mm, tibia = 2.1 mm, tarsus + claws = 1.0 mm

Etymology: this species is dedicated to the late J. Aubert, eminent plecopterist, former Director of the Museum of Zoology in Lausanne (Switzerland).





Figs 5, 6. *Proboscidoplocia ruffieuxae*. 5: Right wings; 6: Penes.

Material examined

Holotype: male imago, Madagascar, Tamatave Prov., Ambodirina River, Rianila Basin (Station St17-18, sample P0256), 48: 59: 18 E, 18: 53: 00 S, 30 m a.s.l., 4 November 1994, including six slide preparations: left wings G1, G2 (dry); right wings D1, D2 (dry); genitalia (Euparal); cerci (Euparal); left legs G1, G2, G3 (Euparal); head (Euparal). The body is preserved in 75% alcohol.
Paratype: 1 male imago, same data as holotype with six slide preparations and body in alcohol.

Distribution and ecology

As the previous species, *P. auberti* has been collected only at a single locality (Figs 14, 17). The Ambodirina River flows in an eastern savannah biome resulting from deforestation of the rain forest. Water temperature in November 1994 at 18 hours was 23°C. As for the previous species, the altitude of the station (30 m a.s.l.), is far below the threshold of 800 meters.
The Sandragniro River, as well as the Ambodirina river, belong to the Rianila Basin and are together, geographically close. *P. auberti* and *P. ruffieuxae* are therefore sympatric in the Rianila Basin.

Proboscidoplocia leplattenierae sp. nov.

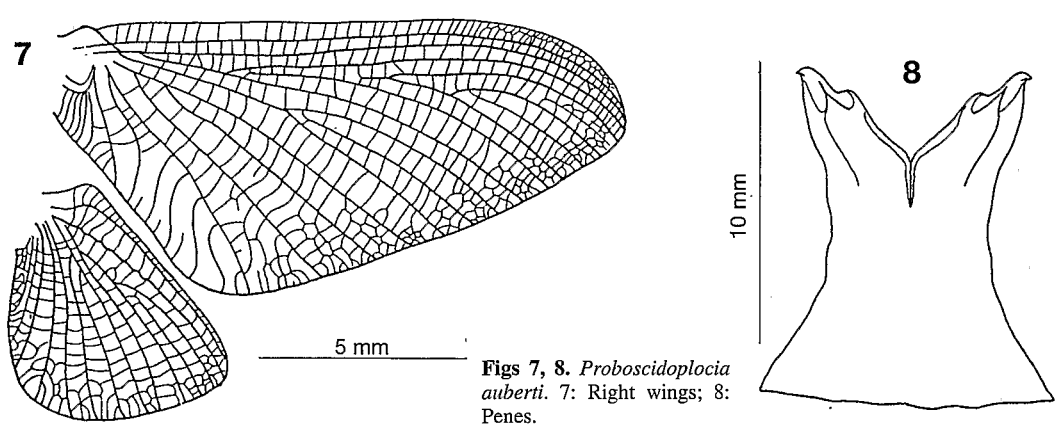
Male imago

Body bluish-grey. Wings (Fig. 9) bluish-brown in alcohol. Forewings with marginal cells of medium size and not numerous. Cubital area with two to three marginal cells between vein CuA and first sigmoid vein at outer margin of wings. CuA with six major sigmoid veins, some of them with one or two secondary veins. Apical three sigmoid veins separated by a small free intercalary vein. Hindwings with vein R_1 rectilinear. A medium number of cells at outer margin of the wings. Genitalia (Fig. 10): basal ¾ of penis lobes fused, apical part almost not divergent with base clearly larger than space between apex of lobes. Apex of each lobe hook-shaped with a spine at border of genital pore. Distal part of penes short (Table 1). Length and width of the 6th segment of the terminal filament 0.40 and 0.13 mm respectively. Ratio between the lengths of terminal filament and cerci 0.65.
Dimensions of holotype: body length: 20.4 mm; cerci: 45.3 mm; terminal filament: 29.3 mm; forewing: 14.5 mm in length, 7.37 mm in width; hindwing: 7.1 mm in length, 5.1 mm in width; legs: L1: femur = 3.3 mm, tibia = 3.2 mm, tarsus 1 = 0.4 mm, tarsus 2 = 1.1 mm, tarsus 3 = 0.8 mm, tarsus 4 = 0.6 mm, tarsus 5 = 0.4 mm, claws = 0.13 mm; L2: femur = 2.3 mm, tibia = 2.3 mm, tarsus + claws = 0.8 mm; L3: femur = 2.9 mm, tibia = 2.1 mm, tarsus + claws = 0.8 mm.

Etymology: this species is dedicated to Mrs. Geneviève L'Eplattenier, working at the Museum of Zoology in Lausanne (Switzerland).

Material examined

Holotype: male imago, Madagascar, Diego-Suarez Prov., Antsamahiky River, Sahankazo Basin (Station St105-04, sample P0299), 49: 24: 52 E, 12: 30: 03 S, 75 m a.s.l., 28 March 1995, including four slide preparations: right and left wings D1, D2, G1, G2 (dry); genitalia (Euparal); cerci (Euparal); legs D1, D2, D3, G1, G2, G3 (Euparal). Body preserved in 75% alcohol.
Paratypes: 3 male imagos, partly on slide preparations, same data as holotype; 5 male imagos, Saharenana River, Saharenana Basin (Station St106-03, n° sample P0361), 49: 16: 38 E, 12: 34: 44 S, 422 m a.s.l., 30 March 95.



Figs 7, 8. *Proboscidoplocia auberti*. 7: Right wings; 8: Penes.

Distribution and ecology

This species has been collected only in the North of the island, on two small basins on the eastern slopes of the Montagne d'Ambre (Figs 14, 15), at altitudes ranging from 75 m to 422 m. The threshold of 800 m does not correspond to a lower limit of distribution. Water temperatures measured at 18 hours were quite warm, ranging from 23 to 27°C. Waters were also turbid.

Proboscidoplocia magdeleinae sp.nov.

Male imago

Body bluish-grey. Wings (Fig. 11) bluish-brown in alcohol. Forewings with large marginal cells and not numerous. Cubital area without marginal cell between vein CuA and first sigmoid vein. CuA with two major sigmoid veins separated by a small intercalary vein, and a small intercalary at apex of CuA. Apical sigmoid vein with a secondary vein. Hindwings with vein R_1 slightly serrated. Very small number of cells on outer margin of wing. Genitalia (Fig. 12): basal 3/5 of penis lobes fused, apical part divergent forming a pronounced V. Distance between apex of penis lobes clearly larger than base of fused portion. Apex of each lobe hook-shaped with a spine at border of genital pore. Distal part of penis lobes moderately long (Table 1). Length and width of the 6th segment of the terminal filament 0.35 and 0.16 mm respectively. Ratio between length of terminal filament and cerci 0.58.
Dimensions of holotype: body length: 21.7 mm; cerci: 45.1 mm; terminal filament: 26.2 mm; forewing: 12.6 mm in length, 3.7 mm in width; hindwing: 6.1 mm in length, 4.5 mm in width; legs: L1: femur = 3.2 mm, tibia = 3.2 mm, tarsus 1 = 0.4 mm, tarsus 2 = 1.1 mm, tarsus 3 = 0.7 mm, tarsus 4 = 0.5 mm, tarsus 5 = 0.4 mm, claws = 0.15 mm; L2: femur = 2.5 mm, tibia = 2.4 mm, tarsus + claws = 0.9 mm; L3: femur = 3.1 mm, tibia = 2.2 mm, tarsus + claws = 0.9 mm.

Etymology: this species is dedicated to Mrs. Magdeleine Avignon (Antananarivo), artist and illustrator of mayflies.

Material examined

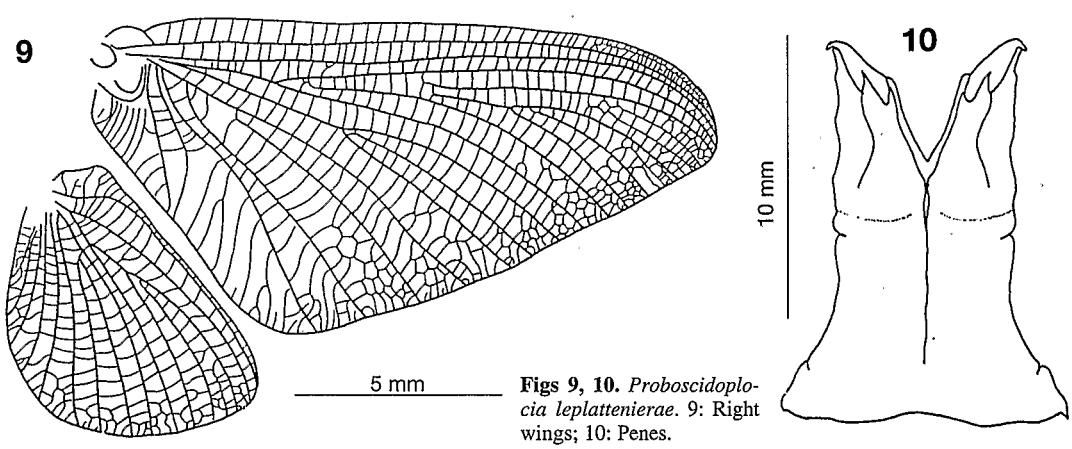
Holotype: male imago, Madagascar, Diego-Suarez Prov., Antsandrangotika River, Sahankazo Basin (Station St105–02, sample n° P0206), 49: 23: 46 E, 12: 28: 40 S, 40 m a.s.l., 4 April 1994, including two slide preparations: genitalia (Euparal); wings (dry). Body preserved in 75% alcohol.

Distribution and ecology

This species has been collected only at the foot of the eastern slope of the Montagne d'Ambre (Figs 14, 15). The Antsandrangotika River is a tributary of the Sahankazo River, as are the Sakaramy River and Antsamahiky River. Two species, *P. magdeleinae* and *P. leplattenierae* are therefore sympatric in the same basin. Water temperature at 18 hours was relatively warm at 25°C.

AFFINITIES

The investigated species can be identified by four main features, i.e. size, wing venation, caudal filaments, and shape of genitalia (see Table 1).



Figs 9, 10. *Proboscidoplocia leplattenierae*. 9: Right wings; 10: Penes.

Size

Among the six species studied, *P. billi, P. leplattenierae* and *P. magdeleinae* are characterized by larger males, their body length exeeding 20 mm; on the other hand, *P. ruffieuxae* possesses the smallest male imago among the genus, with a body length of 13 mm. There is no evident correlation between size of individuals and water temperature since *P. billi* develops in much cooler waters than *P. leplattenierae*. The size of the male imagos of these two species is rather similar. *P. leplattenierae* has the most elongated forewings (length/width ratio 1.96) whereas *P. billi* and *P. vayssierei* have the less one (length/width ratios 1.83 and 1.79 respectively).

Wing venation

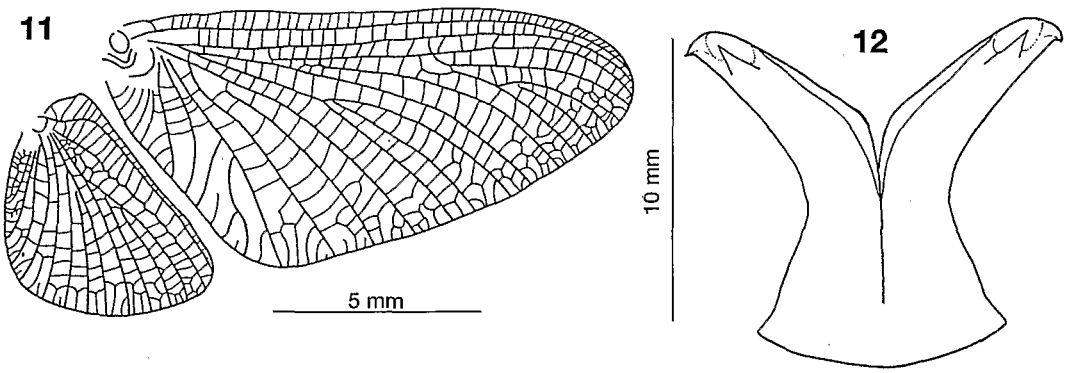
In the forewings, the number of sigmoid veins in the cubital field distinguishes *P. magdeleinae* (3 major veins) from all other species which always have more than 4 sigmoid veins. *P. billi* and *P. vayssierei* can be separated by the number and size of the cells on the outer margin of the wings. The shape of vein R_1 in the hindwings delineates *P. leplattenierae* which is the only species with a smooth vein, whereas all the other species have a clearly serrated vein R_1.

Caudal filaments

The ratio between the terminal filament and the cerci separates the two closely related species *P. ruffieuxae* and *P. auberti*. The terminal filament is clearly shorter than the cerci in *P. auberti* (terminal filament/cerci ratio 0.4), while it reaches 3/4 of the length of the cerci in *P. ruffieuxae*. As caudal filaments are often damaged, another character discriminating both species is the comparative length of the 6th segment of the terminal filament which is almost square (0.17x0.13 mm) in *P. auberti* but more than three times longer than wide (0.40x0.13 mm) in *P. ruffieuxae*. In *P. vayssierei*, the terminal filament is almost as long as the cerci.

Genitalia

On the basis of the general shape of the penes, each species is distinct. *P. vayssierei* is the only one to possess anchor-shape penis lobes. In *P. billi* the penis lobes are fused less than half the total length of the penes. The species could be confused with *P. magdeleinae*, but this latter possesses very divergent lobes (ratio Lp/La <1, see Table 1).
The penis lobes of *P. auberti* are fused along the greatest part of their length compared to those of *P. ruffieuxae*. Moreover, the base of the penes of the first species is broader than the distance between the extremities of the lobes, while that of the second species is less than the distance between the extremities of the lobes. Genitalia of *P. leplattenierae* are similar to those of the two previous species. However, *P. leplattenierae* can be distinguished by the almost straight penis lobes; the space between both apexes is less than the width of the penes base.



Figs 11, 12. *Proboscidoplocia magdeleinae*. 11: Right wings; 12: Penes.

Key to the male imagos of Proboscidoplocia

1 - Ratio of length of terminal filament ≥9/10 length of cerci; numerous, very small marginal cells in outer margin of forewings (Fig. 3); penes anchor-shaped (Fig. 4) *P. vayssierei* sp. nov.

- Length of terminal filament ≤3/4 length of cerci; marginal cells not numerous as above; penes variable, but not anchor-shaped 2

2 - Ratio of length of terminal filament to cerci less than 1/2; 6th segment of the terminal filament almost square *P. auberti* sp. nov.

- Ratio of length of terminal filament to cerci ca. 3/5 to 3/4; length of 6th segment of terminal filament at least twice width 3

3 - Penes apically divergent, distance between apexes greater than width of base of penes (Fig. 12); forewings with 3 sigmoid veins from vein CuA to margin (Fig. 11) *P. magdeleinae* sp. nov.

- Penes straight to slightly divergent, distance between apexes narrower to equal width of base of penes; forewings with more than 4 sigmoid veins from vein CuA to margin 4

4 - Ratio of fused basal portion to total length of penes less than 1/2 (Fig. 2) *P. billi* sp. nov.

- Penes fused basally for more than 1/2 their length 5

5 - Penes lobes almost straight, with width of base greater than space between apexes of lobes (Fig. 10); in hindwings, vein R_1 smooth; body length >18 mm *P. leplattenierae* sp. nov.

- Penes lobes slightly divergent, with width of base narrower than space between apexes of lobes (Fig. 6); in hindwings, vein R_1 serrated; body length <15 mm *P. ruffieuxae* sp. nov.

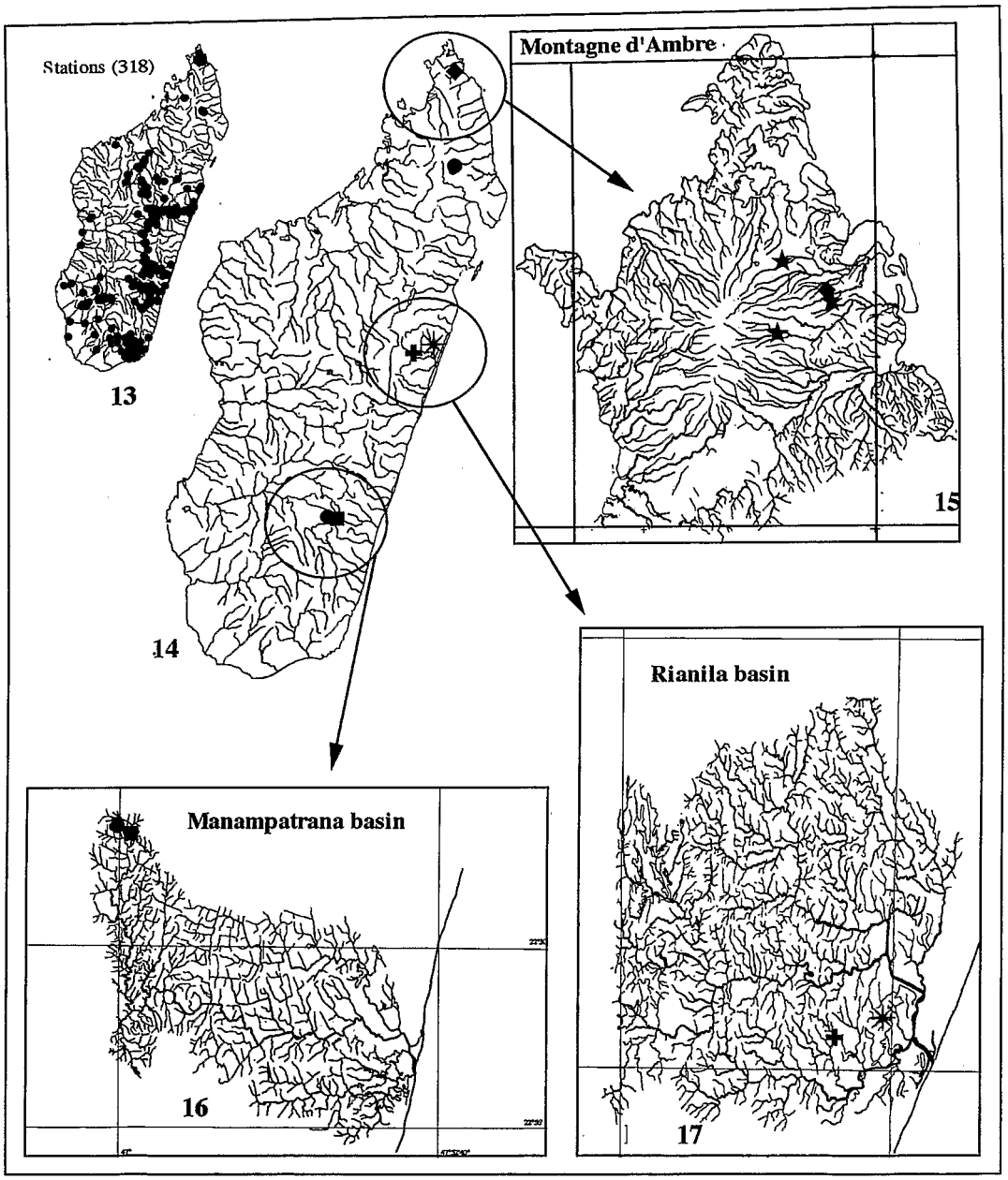
DISCUSSION

Proboscidoplocia nymphs have been collected in several rivers, throughout most of the Malagasy regions. Females have also been collected in numerous stations, in greater numbers than the males. Nevertheless, despite these abundant records, it is difficult to specify the ecology and the river preferences of *Proboscidoplocia*.

The size of streams, translated in discharge, varied from few liters s^{-1} to more than 40 $m^3 \cdot s^{-1}$. The water temperature of the rivers in which we collected the different species varied from 14 to 27°C. The biomes range from the

Table 1. Summary of the most important measurments or ratios for *Proboscidoplocia* species (lengths are in mm, ratios in italics).

Species Dimensions	*billi* mm or ratio	*vayssierei* mm or ratio	*leplattenierae* mm or ratio	*magdeleinae* mm or ratio	*auberti* mm or ratio	*ruffieuxae* mm or ratio
Head width	2.34	2.08	2.72	2.59	2.21	2.24
Pronotum length	1.54	1.50	1.34	1.76	1.38	1.34
Pronotum width	2.40	2.21	2.59	2.72	2.72	2.43
Total body length	20.28	17.95	20.41	21.65	17.40	13.02
Cerci length	45.21	45.76	45.35	45.07	38.77	40.55
Terminal filament length	33.70	42.20	29.32	26.17	15.62	30.28
Ratio term. fil./cerci	0.75	0.92	0.65	0.58	0.40	0.75
length 6th sgmt cerci	0.72	0.70	0.69	0.67	0.67	0.69
width 6th sgmt cerci	0.19	0.14	0.16	0.19	0.20	0.12
length 6th sgmt term. fil.	0.61	0.62	0.40	0.35	0.17	0.40
width 6th sgmt term. fil.	0.10	0.13	0.13	0.16	0.13	0.13
Forewing length (Lf)	18.43	16.75	14.47	12.60	13.87	14.14
Forewing width (wf)	10.05	9.38	7.37	6.70	7.24	7.44
Hindwing length (Lh)	9.92	7.91	7.10	6.10	6.16	7.04
Hindwing width (wh)	6.37	5.23	5.09	4.49	4.62	5.09
Forewing (Lf/wf)	1.83	1.79	1.96	1.88	1.92	1.90
Hindwing Lh/wh)	1.56	1.51	1.39	1.36	1.33	1.38
Lf/Lh	1.86	2.12	2.04	2.07	2.25	2.01
Penes length (Lp)	1.87	1.26	1.16	1.11	1.07	1.18
Distance between apexes (La)	1.42	1.00	0.63	1.24	0.74	0.95
Basal fusion length (Lb)	0.86	0.84	0.82	0.66	0.78	0.77
Lb/Lp	0.46	0.67	0.71	0.59	0.73	0.65
Lp/La	1.32	1.26	1.83	0.90	1.46	1.24



Figs 13-17. Distribution of *Proboscidoplocia* in Madagascar. 13: Stations sampled with evening light traps; 14: Distribution of the six *Proboscidoplocia* species; 15: Distribution of *P. magdeleineae* and *P. leplattenierae* in the hydrographic network of the Montagne d'Ambre; 16: Distribution of *P. ruffieuxae* and *P. auberti* in the Rianila basin; 17: Distribution of *P. billi* and *P. vayssierei* in the Manampatrana basin.

● *Proboscidoplocia billi*; ■ *P. vayssierei*; ✱ *P. ruffieuxae*; + *P. auberti*; ◆ *P. magdeleineae*; ★ *P. leplattenierae.*

primary forest (Andringitra, Marojejy) to the grassy steppe of the East or the West, including zones of primary or secondary forest. Degradation and savannisation of the biomes are associated with increases in water turbidity. One finds therefore *Proboscidoplocia* in streams and rivers with clear or turbid water, quite high in altitude or in the plains, as well as on the eastern or on the western side of the island. The only area where we have not recorded either nymphs or adults of *Proboscidoplocia* is the southwest of Madagascar, where watercourses are warm, sandy, and often temporary.

How many species of *Proboscidoplocia* exist? Studies of the chorionic structure of eggs (SARTORI *et al.*, in press) have distinguished eight species of *Proboscidoplocia*, some belonging to those described in this paper. Combined together, we know of at least ten species in this genus which may be present in Madagascar. Nevertheless, as the imagos are seldom collected because they emerge during few days of the rainy season (a period of a difficult access to rivers), and because there is a strong micro-endemism as well as several sympatries in the genus, it is probable that the number of *Proboscidoplocia* species is greater than ten. Our present study focused on three distinct areas in Madagascar, each with two species: two from Andringitra Mountains (*P. billi, P. vayssierei*), two from the Rianila Basin (*P. auberti, P. ruffieuxae*) and two from the Montagne d'Ambre (*P. magdeleinae, P. leplattenierae*). Therefore, we anticipate that the analysis of samplings from other areas will add new species.

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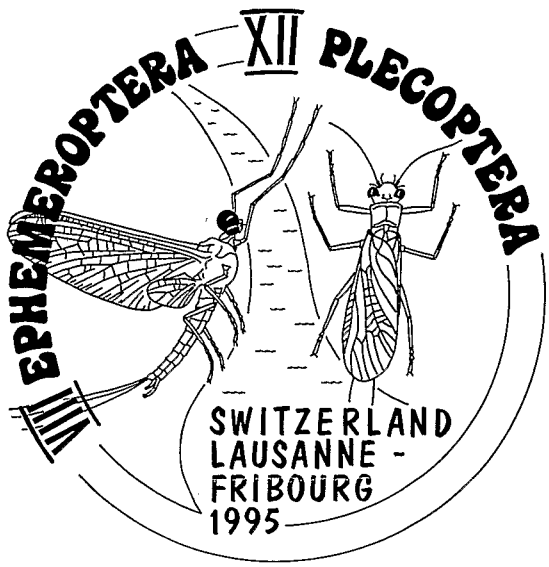

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