



## A new species of *Pseudopannota* (Baetidae: Ephemeroptera) from Madagascar

by

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**Abstract.**—GATTOLLIAT J.-L., 2002. A new species of *Pseudopannota* (Baetidae: Ephemeroptera) from Madagascar. *Bull. Soc. vaud. Sc. nat.* 88.1: 19-29.

The genus *Pseudopannota* Waltz and McCafferty was erected for unusual larvae presenting high modification of the mouthparts and with wing pads partially fused. *Pseudopannota camillae* sp. n. is the second species described from Madagascar, but the first to belong to the subgenus *Hemipannota* Elouard and Gillies. Its distribution appears to be extremely limited. New locality data are provided for the other Malagasy species *Pseudopannota vinckei* (Demoulin).

**Keywords:** Ephemeroptera, Baetidae, *Pseudopannota camillae*, *Pseudopannota vinckei*, new species.

**Résumé.**—GATTOLLIAT J.-L., 2002. Une nouvelle espèce de *Pseudopannota* (Baetidae: Ephemeroptera) de Madagascar. *Bull. Soc. vaud. Sc. nat.* 88.1: 19-29.

Le genre *Pseudopannota* Waltz et McCafferty a été érigé pour des larves présentant des modifications importantes des pièces buccales et dont les fourreaux alaires sont au moins partiellement fusionnés. *Pseudopannota camillae* sp. n. est la seconde espèce du genre décrite de Madagascar, mais la première appartenant au sous-genre *Hemipannota* Elouard et Gillies. Sa distribution est pour l'instant extrêmement limitée. De nouvelles localités de l'autre espèce malgache *Pseudopannota vinckei* (Demoulin) sont données.

**Mots clés:** Ephéméroptères, Baetidae, *Pseudopannota camillae*, *Pseudopannota vinckei*, espèce nouvelle.

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## INTRODUCTION

WALTZ and McCAFFERTY (1987) erected the genus *Pseudopannota* for two unusual African species previously assigned to *Pseudocloeon* Klapálek. The type species was described as *Pseudocloeon bertrandi* by Demoulin (DEMOULIN 1967) based on material collected in Ivory Coast. The second species, *Pseudopannota vinckei* (Demoulin), was described from Madagascar (DEMOULIN 1973). Although the adults were unknown, the larvae appeared to be sufficiently distinct from all other described Baetidae to be considered as a new genus. *Pseudopannota* possesses highly modified filtering mouthparts, medially fused forewing pads, unusual denticulate claws, maxillary palp 3-segmented with third segment much elongated and labial palp 2-segmented with second segment extremely broad (WALTZ and McCAFFERTY 1987, ELOUARD *et al.* 1990).

ELOUARD *et al.* (1990) first described the adults of *Pseudopannota*. They present all the main imaginal apomorphies of the Baeticini such as paired marginal intercalaries and male forceps 3-segmented with basal segment poorly defined. Two new species from West Africa, *P. muganinani* Elouard and Gillies and *P. modesta* Elouard and Gillies were described.

The genus *Pseudopannota* was then divided into two subgenera: *Pseudopannota* s.s. and *Hemipannota* Elouard and Gillies (ELOUARD *et al.* 1990). The subgenus *Pseudopannota* is characterized by larvae of the crawling type, with wing pads fused for at least two thirds of their length forming with the mesonotum a shield covering at least the first abdominal segment. This subgenus includes the type species *Pseudopannota bertrandi*, *P. muganinani* and the Malagasy species *P. vinckei*. The species with larvae of the swimming type and wing pads fused at the base only were included in the subgenus *Hemipannota*. It incorporates *Pseudopannota modesta* and the South African species *Pseudopannota maculosa* Crass, formerly placed in *Pseudocloeon* (CRASS 1947, ELOUARD *et al.* 1990).

Two other species from West Africa, only known at the imaginal stage, *Pseudopannota bergerardi* Elouard and Hideux and *P. sartorii* Elouard and Hideux were assigned to this genus without giving reliable explanations for these attributions (ELOUARD and HIDEUX, 1990). The male genitalia and especially the shape of the sclerotized process between the gonopods seem to indicate that these two species rather belong to the genus *Labiobaetis* Novikova and Kluge, recently, and in my opinion incorrectly (GATTOOLIAT 2001), included in *Pseudocloeon* by LUGO-ORTIZ *et al.* (1999). A new species of *Pseudopannota* from Madagascar is described herein. It is the second Malagasy species but the first assigned to the subgenus *Hemipannota*. New locality data are provided for *Pseudopannota vinckei*.

The ecology and the distribution of the two Malagasy species are discussed. The holotype and paratype are housed in the Museum of Zoology, Lausanne, Switzerland.

*Pseudopannota (Hemipannota) camillae* sp. n.

*Larva.*

Maximal length: Body 5.7 mm. Cerci 4.5 mm. Terminal filament 2.9 mm.

*Head.* Colouration dark brown, except vertex and frons yellow with vermiform marking. Antennae light yellow; pedicellus without distolateral process. Turbinate eyes honey brown.

*Labrum* (fig. 1a) rounded, with an anteromedial emargination, dorsal surface completely covered with thin setae apically, without arc of setae and submedian pair of setae; distal margin bordered with thin simple setae; ventral surface clearly thickened subapically with numerous stout long setae, a sublateral arc of 5 to 6 stout, minute setae and a distomedial arc of numerous thin setae.

*Right mandible* (fig. 1b) with one set of 4 incisors; stout prostheta; pointed projection at the base of prostheta; margin between prostheta and mola crenate, without setae; row of stout long setae under the mola; tuft of setae at apex of mola reduced to three small setae; basal half with dorsally short thin setae.

*Left mandible* (fig. 1c) with one set of 4 incisors; stout prostheta apically with 4 denticles and a comb-shaped structure; margin between prostheta and mola slightly crenate, without setae; tuft of setae at apex of mola reduced to 3 setae; basal half with dorsally short thin setae.

*Hypopharynx* unknown.

*Maxillae* (fig. 1d) with 4 long thin teeth, none of them opposed to the others; row of setae subequal in length to the teeth ending with 4 to 5 long setae, two spine-like setae in middle of row; row of 5 long setae at the base of the crown; row of about 9 stout setae at base of galea; one single stout seta perpendicular to margin of galea; palp 3-segmented, second segment 0.6 x the length of first segment, third segment 1.3 x the length of first segment; second and third segment covered with numerous thin setae, inner margin of third segment concave.

*Labium* (fig. 2) with glossae clearly shorter than paraglossae; glossae stout with very abundant simple thin setae apically, ventral surface with a small group of thin setae and mediodistally with a row of 3 to 4 setae; paraglossae stout, apically flattened, with very abundant long thin simple setae. Labial palp 2-segmented; first segment short; second segment globular, slightly pointed apically, broader than long, ventral surface with very abundant setae apicolaterally, dorsal surface with few setae apicolaterally, first half of outer margin with small stout setae.

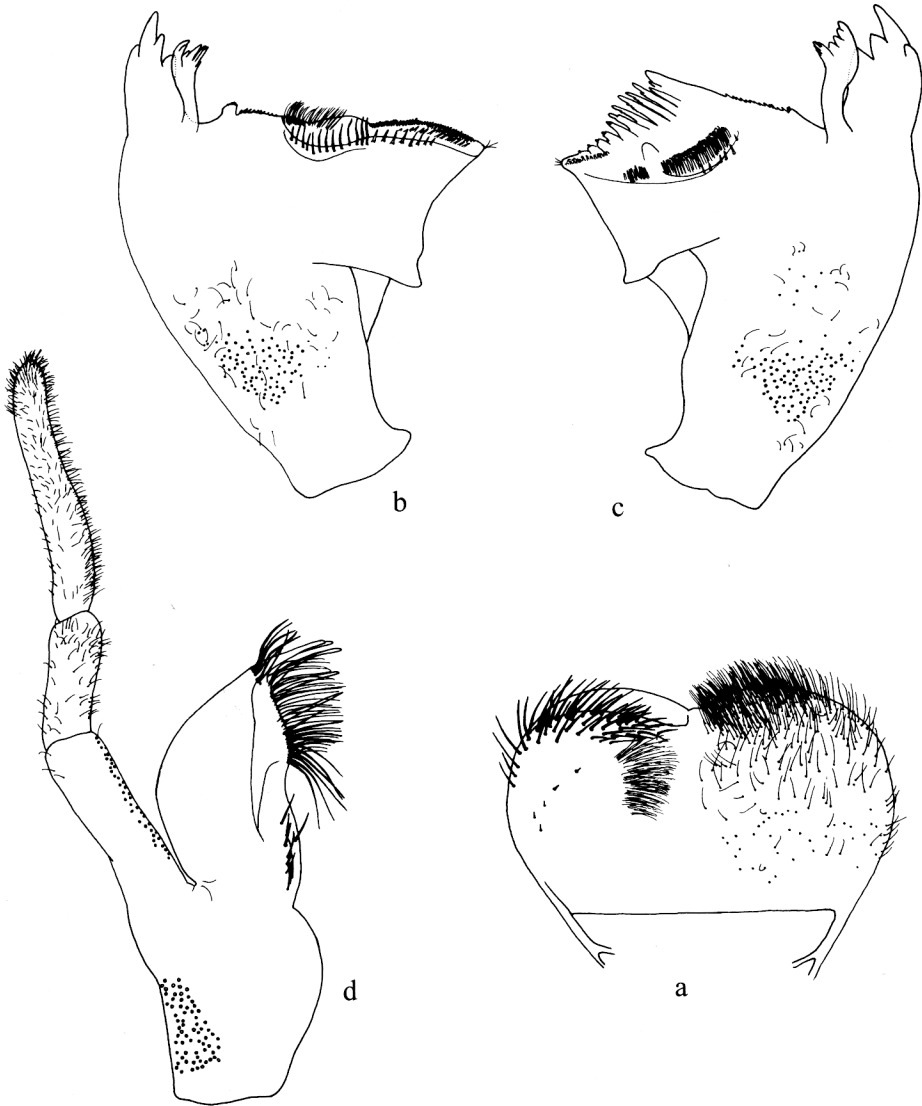


Figure 1.—Larval mouthparts of *Pseudopannota camillae* sp. n.: 1a: labrum (left: ventral; right: dorsal). 1b: right mandible. 1c: left mandible. 1d: right maxilla.



Figure 2.—Labium of *Pseudopannota camillae* sp. n.

*Thorax.* Prothorax dark brown; mesothorax yellow except first third dark brown; metathorax and forewing pads dark brown.

*Hindwing pads* absent.

*Legs* uniformly light yellow.

*Coxa* of forelegs (fig. 3a) without setae.

*Femora* dorsally with a row of about 30 pointed setae and abundant pointed setae subdorsally; apical patch absent; ventral margin with minute blunt setae and few scale bases.

*Tibiae* with only a few minute to small setae ventrally; tibio-patellar suture present.

*Tarsi* without setae dorsally; ventral margin with a row of small pointed setae; tarsal claws (fig. 3b) with one well developed and one small tooth; subapical setae absent.

Second and third legs similar to foreleg.

*Abdomen.* Terga 1 and 2 light brown; terga 3 and 4 yellow with a medio-proximal light brown spot; terga 5 – 8 dark brown; proximal half of tergum 9 light brown, distal half yellow; tergum 10 yellow. Terga with numerous scale bases; posterior margin with pointed spination.

*Sterna* 1–4 yellow; sternum 5 light brown; sterna 6–8 dark brown; sternum 9 yellow, without scale bases; smooth posterior margin without spines.

*Gills* (fig. 3c) present on abdominal segments 2 to 7, without tracheation, with abundant scale bases, short thin setae near the margins; distal half serrated.

*Paraproct* (fig. 3d) with thin setae and about 25 scale bases, margin with 30 to 35 pointed spines; postero-lateral extension without scale bases, pointed spines along margin.

Proximal half of cerci and terminal filament light brown, distal half yellow; cerci crosier-like.

#### *Adults*

Unknown.

#### *Material examined*

Holotype: male larva (P0814), Madagascar, Antongombato bas., Makis riv., Loc. 100 m downstream the Great Waterfall (Amber Mountain Nature Reserve), Long. 49°10'14" E, Lat. 12°29'17" S, Alt. 675 m, 22.03.1999. Gattolliat J.-L. et Rabeantoandro Z.

Paratype: 1 larva (P0201), same locality as holotype, 02.04.1994. Elouard J.-M. and Sartori M.

#### *Etymology*

This species is dedicated to my daughter Camille.

#### *Pseudopannota vinckei* (Demoulin 1973)

#### *Material examined*

3 larvae (P0030), Madagascar, Onilahy bas., Ihazofotsy riv., Loc. Andiolava, Long. 45°37'25" E, Lat. 22°30'18" S, Alt. 900 m, 07.04.1991. ORSTOM, Antananarivo.

8 larvae (P0075), Madagascar, Betsiboka bas., Andriantoany riv., Long. 46°56'23" E, Lat. 17°19'40" S, Alt. 375 m, 27.09.1991. ORSTOM, Antananarivo.

3 larvae (P0084), Madagascar, Menarandra bas., Long. 45°40'11" E, Lat. 24°10'07" S, Alt. 525 m, 11.04.1992. ORSTOM, Antananarivo.

6 larvae (P0086), Madagascar, Mandrare bas., trib. Andratina riv., Loc. Marovotry, Long. 45°59'39" E, Lat. 24°09'37" S, Alt. 280 m, 13.04.1992. ORSTOM, Antananarivo.

1 larva 90a (on slide) and 16 larvae (P0090), Madagascar, Efaho bas., Efaho riv., Loc. Ifarantsa, Long. 46°52'12" E, Lat. 24°55'37" S, Alt. 20 m, 14.04.1992. ORSTOM, Antananarivo.

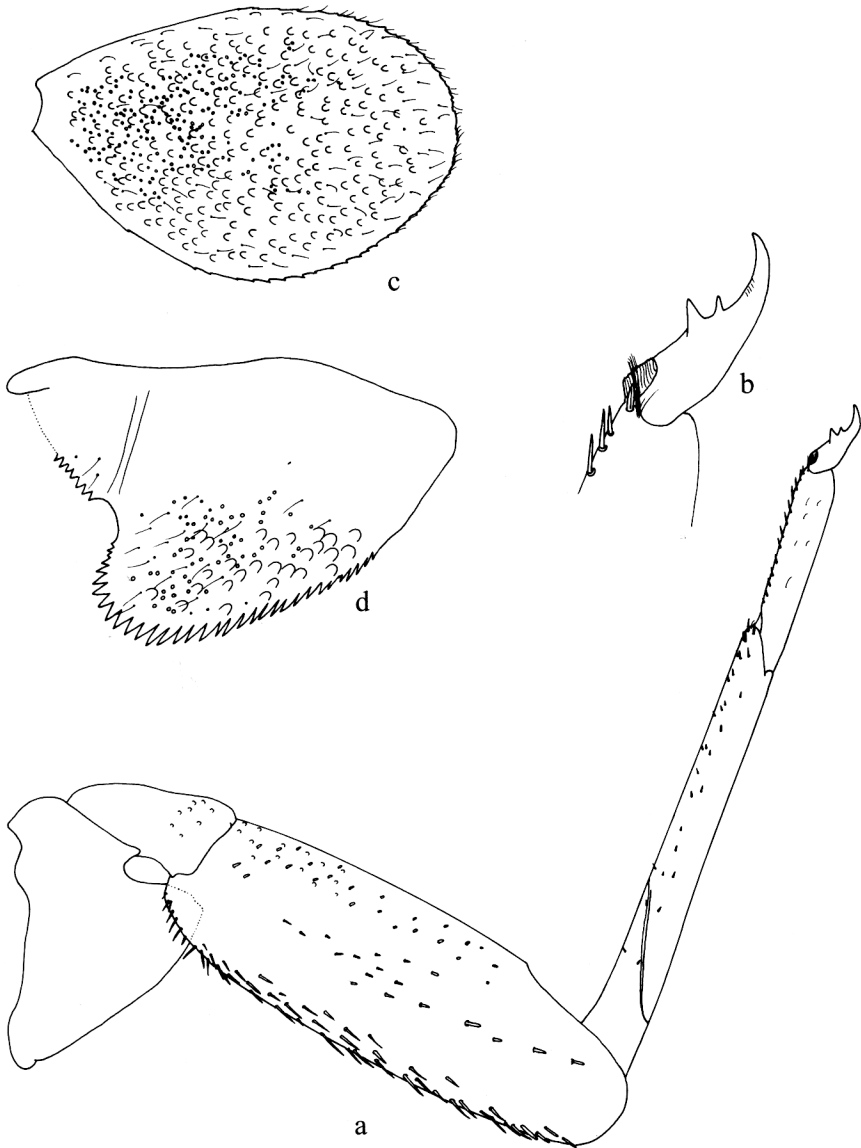


Figure 3.—Larval structures of *Pseudopannota camillae* sp. n.: 3a: foreleg. 3b: tarsal claw. 3c: fourth gill. 3d: paraprot.

1 larva (P0332), Madagascar, Mandrare bas., Mananara riv., Loc. Betanimena, Long. 46°39'20" E, Lat. 24°48'17" S, Alt. 120 m, 23.05.1994. ORSTOM, Antananarivo.

2 larvae 336-2 and 336-3 (on slides), Madagascar, Mandrare bas., Mananara riv., Loc. Ihazofotsy, Long. 46°34'04" E, Lat. 24°49'07" S, Alt. 100 m, 27.05.1994. ORSTOM, Antananarivo.

3 larvae (P0340), Madagascar, Mandrare bas., Marotoko riv., Loc. Hazofotsy, Long. 46°35'46" E, Lat. 24°48'47" S, Alt. 100 m, 02.06.1994. ORSTOM, Antananarivo.

1 larva 342-4 (on slide) and 6 larvae (P0342), Madagascar, Mandrare bas., trib. Mananara riv., Loc. Amboanemba, Long. 46°27'45" E, Lat. 24°40'40" S, Alt. 220 m, 04.06.1994. ORSTOM, Antananarivo.

1 larva (P0345), Madagascar, Mandrare bas., Bezavo riv., Loc. Berohanga near Lotibe, Long. 46°36'07" E, Lat. 24°38'57" S, Alt. 550 m, 06.06.1994. ORSTOM, Antananarivo.

25 larvae (P0347), Madagascar, Mandrare bas., Sahandrojo riv., Loc. Betenina, Long. 46°25'25" E, Lat. 24°25'12" S, Alt. 325 m, 07.06.1994. ORSTOM, Antananarivo.

4 larvae 348-1, 348-2, 348-3 and 348-4 (on slides) and 4 larvae (P0348), Madagascar, Mandrare bas., Aff. de Mandrare riv., Loc. between Tranomaro and Tsivory, Long. 46°24'25" E, Lat. 24°24'27" S, Alt. 280 m, 07.06.1994. ORSTOM, Antananarivo.

3 larvae (P0394), Madagascar, Mananjary bas., Fotobohitra riv., Loc. 1 km from Kianjavato, Long. 47°51'38" E, Lat. 21°22'36" S, Alt. 75 m, 25.05.1995. Gibon F.-M. and Andriambelo Z.P.

3 larvae 415-4, 415-5 and 415-6 (on slides) 25 larvae (P0415), Madagascar, Mandrare bas., Manambolo riv. (trib. Mandrare riv.), Loc. Maromby, Long. 46°34'39" E, Lat. 24°23'36" S, Alt. 345 m, 27.04.1995. Elouard J.-M. and Pilaka T.

1 larva (P0416), Madagascar, Mandrare bas., tri. Abetolo riv., Loc. Esira, Long. 46°41'07" E, Lat. 24°18'00" S, Alt. 400 m, 28.04.1995. Elouard J.-M. et Pilaka T.

2 larvae (P0417), Madagascar, Mandrare bas., Anatanatra riv., Loc. between Esira and Maroasara, Long. 46°39'04" E, Lat. 24°17'37" S, Alt. 325 m, 28.04.1995. Elouard J.-M. and Pilaka T.

1 larva (P0427), Madagascar, Onilahy bas., Sahavatoy riv. (trib. Ilanana riv.), Loc. Ampandrabe, Long. 45°43'45" E, Lat. 22°38'24" S, Alt. 910 m, 26.05.1995. Elouard J.-M. and Oliarinony R.

3 larvae (P0526), Madagascar, Manampanihy bas., Manampanihy riv., Loc. Enosiary, Long. 46°49'19" E, Lat. 24°40'37" S, Alt. 100 m, 21.11.1995. Elouard, J.-M. and Pilaka, T.



1 larva (P0528), same data as P0526, 22.11.1995. Pilaka, T.

1 larva (P0601), Madagascar, Tsiribihina bas., Loc. Tambaro, Long. 45°43'10" E, Lat. 20°25'40" S, Alt. 190 m, 25.05.1996. Elouard J.-M. and Sambatra.

2 larvae (P0697), Madagascar, Rianila bas., Sandrakatrana riv., Loc. Ambodiaviavy, Long. 48°39'45" E, Lat. 18°57'31" S, Alt. 350 m, 26.04.1997. Gattolliat J.-L. and Rochat C.

2 larvae (P0863), Madagascar, same data as P0697, 09.04.1999. Gattolliat J.-L. and Raberiaka N.

#### DISCUSSION

The genus *Pseudopannota* is composed of 6 species: 4 in Africa and 2 in Madagascar. The status of *Pseudopannota bergerardi* and *P. sartorii* remains dubious; as explained above, the placement in the genus *Pseudopannota* of these two species, known only as imagoes, is probably inaccurate. In the larvae, the highly modified filtering mouthparts, the unique claw and the at least partially fused forewing pads allow the distinguishment of *Pseudopannota* from all the other genera. If the imagoes present all the Baeticini features such as double intercalary veins and the shape of the gonopods, they do not possess autapomorphy. Consequently the generic identification remains impossible at the imaginal stage.

*Pseudopannota* appears to be closely related to the African genus *Ophelmatostoma* Waltz and McCafferty. The imagoes are similar and the larvae bear resemblance in the fusion of the forewing pads, the presence of a pointed projection at the base of the right mola and the margin between prosthema and mola of the left mandible crenate. *Ophelmatostoma* differs from *Pseudopannota* and all other genera by the unique development of the labium, especially the glossae and paraglossae greatly elongated (WALTZ and MCCAFFERTY 1987, GILLIES *et al.* 1990). *Pseudopannota* is distinguished from *Ophelmatostoma* by the maxillary 3-segmented with a third segment extremely developed and the broad segment 2 of the labial palp.

*Pseudopannota camillae* clearly belongs to the subgenus *Hemipannota*. It shares all the autapomorphies such as larvae of swimming type and wing pads fused at base only (ELOUARD *et al.* 1990). *Pseudopannota camillae* appears to be extremely close to the two African species *P. modesta* and *P. maculosa*. The shape of the labial palp, the mandibles and the maxillae are similar between the three species. However, *Pseudopannota camillae* differs from *P. modesta* and *P. maculosa* with the tarsal claws having two teeth instead of three in the African species, the glossae clearly reduced, shorter than the paraglossae, 6 pairs of gills (7 in *P. maculosa* but also 6 in *P. modesta*) and the general colouration dark brown with three broad transverse yellow stripes.

The ecology and distribution of the two Malagasy species of *Pseudopannota* are completely different. *Pseudopannota vinckei* was originally described from a single locality of the Onilahy basin (South-Western of Madagascar). It is now known to have a wide distribution, being found in more than twenty localities (fig. 4c). This species is mainly present in the basins of Mandrare, Manampanihy and Onilahy (South of Madagascar). In some localities, it is the most abundant species. It has been also found in very few localities of the Western Coast (Betsiboka and Tsiribihina basins) and Eastern Coast (Mananjary and Rianila basins). In these regions, it is both rare and localized: especially in the Eastern Coastal area, with only 1 or 2 specimens by sample. This species occurs in all kind of streams: from brooklets (0.1 m broad) to rivers (up to 50 m broad). The water depth appears to be an important factor: *Pseudopannota vinckei* was never found in streams with a depth greater than 0.5 m. It prefers slow to moderately fast flow (0.1 to 0.7 m/s). The temperature of the water and the kind of vegetation surrounding the stream seem to have no influence on the presence of this species.

Despite a huge number of samples (more than 1000 samples fig. 4a), *Pseudopannota camillae* has been found only in a single locality. The type-locality is situated in the Amber Mountain Nature Reserve (fig. 4b), one of the most well prospected areas of Madagascar. In 1999, a mission was set up with the main aim being to collect new specimens of *Pseudopannota*

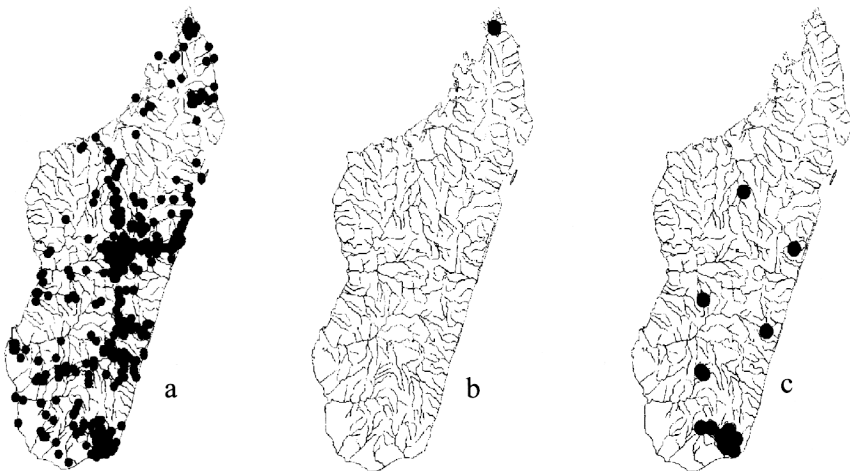


Figure 4.—4a: Samples localities. 4b: Distribution of *Pseudopannota camillae* sp. n.: 4c: Distribution of *Pseudopannota vinckei* (Demoulin).

*camillae*. Despite huge sampling efforts, especially at the type-locality, only one specimen has been found. The unusual shape of the cerci, similar to those of the genus *Ephemera*, could suggest that *Pseudopannota camillae* has a hyporheic habitat. This hypothesis is corroborated by the fact that the two specimens caught were almost ready to moult.

The type-locality is located only 100 meters downstream a great waterfall; it is surrounded by tropical rain forest with very low human impact. The stream is 4 m broad, 0.15 m deep, the flow is quite fast (1.5 m/s) and the water is well oxygenated.

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