

## Contribution to the systematics of the genus *Dabulamanzia* (Ephemeroptera: Baetidae) in Madagascar

J.-L. GATTOLLIAT & M. SARTORI

Museum of Zoology, P.O. Box 448, CH-1000 Lausanne 17, Switzerland;

e-mail: Jean-Luc Gattolliat@ie-zea.unil.ch

**Contribution to the systematics of the genus *Dabulamanzia* (Ephemeroptera: Baetidae) in Madagascar.** - At the present time, the Afro-Malagasy genus *Dabulamanzia* is represented at Madagascar by two species. Three new species *D. gladius*, *D. gigantea* and *D. concolorata* are described at the larval stage. *D. gladius* and *D. gigantea* present a high degree of specialisation of the mandibles and labrum that clearly distinguish them from any other species of *Dabulamanzia*. *D. concolorata* also owns characteristic mouthparts, especially the labrum. A fourth species is described at the imaginal stage, but unnamed as long as its larva remains unknown. The relative position of these new species is discussed.

**Key-words:** Ephemeroptera - Baetidae - *Dabulamanzia* - new species - Madagascar.

### INTRODUCTION

The genus *Dabulamanzia* has been recently erected for some species previously assigned to the *tarsale* group of *Afroptilum* Gillies (Lugo-Ortiz & McCafferty, 1996b). This genus is well defined at the larval stage by the following apomorphies: bulbous segment 3 of the labial palp and a small proximal arc of setae on the tibiae; at the imaginal stage, hindwing with a single hooked spur and a well-developed apophysis at the base of the first segment of the gonopod are the main characters. Some of these characters suggest that *Dabulamanzia* is related to the *Cloeodes* complex, even if the imaginal stage differs greatly by the number of intercalary veins, the presence of hindwing and the shape of the gonopods (Lugo-Ortiz & McCafferty, 1996a).

The first species of *Dabulamanzia* from Madagascar has been recently described (Lugo-Ortiz & McCafferty, 1997c). Its name, *D. improvida* indicates the unexpected discovery of the genus in Madagascar. Since then, an other species has been found in this Island (Gattolliat *et al.*, 1999). Herein we describe three new species and we discuss their position within the genus.

The holotypes and some of the paratypes are housed in the Museum of Zoology, Lausanne, Switzerland. Other paratypes are deposited in the Museum National d'Histoire Naturelle, Paris.



*Dabulamanzia gladius* Gattolliat sp. n.

*Holotype*. Larva, P0861, Madagascar, Rianila Bas., unnamed riv., Loc. road to Lakato, Long. 48°21'48" E, Lat. 19°02'40" S, Alt. 1050m, 8.4.1999. J.-L. Gattolliat and N. Raberiaka.

*Paratypes*. Two larvae same data as holotype. Two larvae, P0693, same locality as holotype, 22.4.1997. J.-L. Gattolliat, C. Rochat and N. Raberiaka. Three larvae, P0862, Madagascar, Rianila Bas., tributary riv. to Sahatandra Riv., Loc. near Ambalafotsy, road to Lakato. Long. 48°21'51" E, Lat. 19°02'22" S, Alt. 1050m, 8.4.1999. J.-L. Gattolliat and N. Raberiaka.

*Other material*. One female larva (91b), Madagascar, Manampanihy Bas., tributary riv. of Manampanihy Riv., Loc. Fenoevo, Long. 46°53'39" E, Lat. 24°41'00" S, Alt. 72m, 15.4.1992. J.-M. Elouard. One larva, P0814, Madagascar, Antongombato Bas., Makis Riv., Loc. 100m downstream of the Great Wasterfall, Long. 49°10'14" E, Lat. 12°29'17" S, Alt. 675m, 22.3.1999. J.-L. Gattolliat and Z. Rabeantoandro.

## LARVA

Maximal length (no mature specimens): Body 6.7 mm. Cerci and terminal filament broken.

*Head*. Coloration almost uniformly light yellow, except brown between the eyes without vermiform marking on vertex and frons. Antennae pale light yellow. Eyes and ocelli black.

Labrum (Fig. 1a) rectangular, with distal margin almost straight, with two kinds of setae, one row of feathered setae (Fig. 1b) and one row of multifid setae (Fig. 1c); dorsally with a continuous arc of about 20 long setae, abundant setae in the proximal half; without setae ventrally.

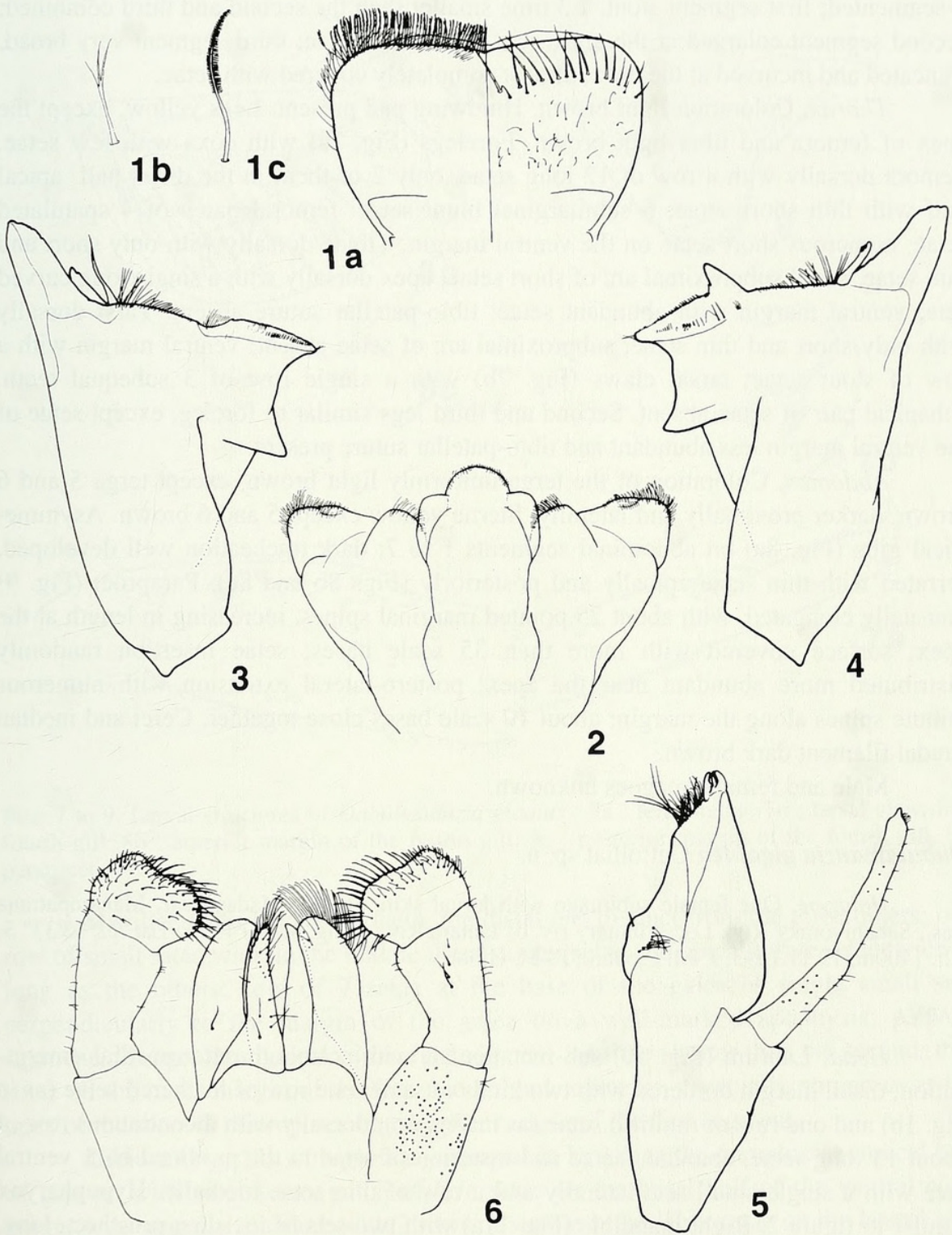
Hypopharynx as in figure 2, lingua with minute thin setae, superlinguae well developed and clearly separated of the lingua.

Right mandible (Fig. 3) with two sets of incisors, the outer formed only by one single well-developed and laterally reinforced tooth and the inner one reduced to a single small tooth; prostheca long and thin, without apical teeth; length of the tuft of setae between prostheca and mola reducing toward the mola; tuft of small setae near the mola well-developed; tuft of setae at the apex of the mola reduced to 2 or 3 setae; basal half without setae dorsally. Left mandible (Fig. 4) with incisors fused in a single tooth; prostheca with 4 teeth, the apical one much more developed; length of the tuft of setae between prostheca and mola reducing toward the mola; tuft of setae at the apex of the mola reduced to 3 setae; basal half without setae dorsally.

Maxillae (Fig. 5) with 4 teeth, the distal one opposed to the three others; 2 rows of setae, the first one formed by abundant small setae and the second by long stout setae ending with 4 twice as long as the others, without pectinate or spine-like setae in the middle of the range; 6 to 7 setae at the base of the galea roughly arranged in a row; 1 single small seta perpendicularly to the margin of the galea; palp 2-segmented as long as the galealacinia, first segment 1.4 time shorter than the second; second segment ending with a small rounded protuberance; thin setae on the external margin of the first and second segments, especially numerous at the apex of the second.

Labium (Fig. 6) with glossae subequal in length to paraglossae, and more slender than them; apical half of glossae with stout setae, long setae randomly distributed on the basal half of the ventral side; paraglossae apically rounded, with 2 rows of simple setae; one simple long seta on the margin of the paraglossae. Labial palp





FIGS 1 to 6. Larval structures of *Dabulamanzia gladius* : 1a : labrum (left : ventral; right : dorsal). 1b : multifid seta of the labrum. 1c : feathered seta of the labrum. 2 : hypopharynx. 3 : right mandible. 4 : left mandible. 5 : left maxilla. 6 : labium.



3-segmented; first segment stout, 1.3 time smaller than the second and third combined; second segment enlarged at the apex, row of about 4 setae; third segment very broad, truncated and incurved at the apex, almost completely covered with setae.

*Thorax.* Coloration light brown. Hindwing pad present. Legs yellow, except the apex of femora and tibia light brown. Forelegs (Fig. 7a) with coxa with few setae. Femora dorsally with a row of 12 long setae, only 2 of them in the distal half, apical half with thin short setae; 6 submarginal blunt setae; femoral patch of 4 spatulated setae; numerous short setae on the ventral margin. Tibiae dorsally with only short and thin setae, small subproximal arc of short setae; apex dorsally with a single long curved seta; ventral margin with abundant setae; tibio-patellar suture absent. Tarsi dorsally with only short and thin setae, subproximal arc of setae absent; ventral margin with a row of stout setae; tarsal claws (Fig. 7b) with a single row of 3 subequal teeth, subapical pair of setae absent. Second and third legs similar to foreleg, except setae of the ventral margin less abundant and tibio-patellar suture present.

*Abdomen.* Coloration of the terga uniformly light brown, except terga 5 and 6 brown, darker proximally and laterally. Sterna yellow except 5 and 6 brown. Asymmetrical gills (Fig. 8a) on abdominal segments 1 to 7; dark tracheation well developed, serrated with thin setae apically and posteriorly (Figs 8b and 8c). Paraproct (Fig. 9) unusually elongated, with about 25 pointed marginal spines, increasing in length at the apex; surface covered with more than 35 scale bases; setae insertion randomly distributed more abundant near the apex; postero-lateral extension with numerous minute spines along the margin; about 10 scale bases close together. Cerci and median caudal filament dark brown.

Male and female imagoes unknown.

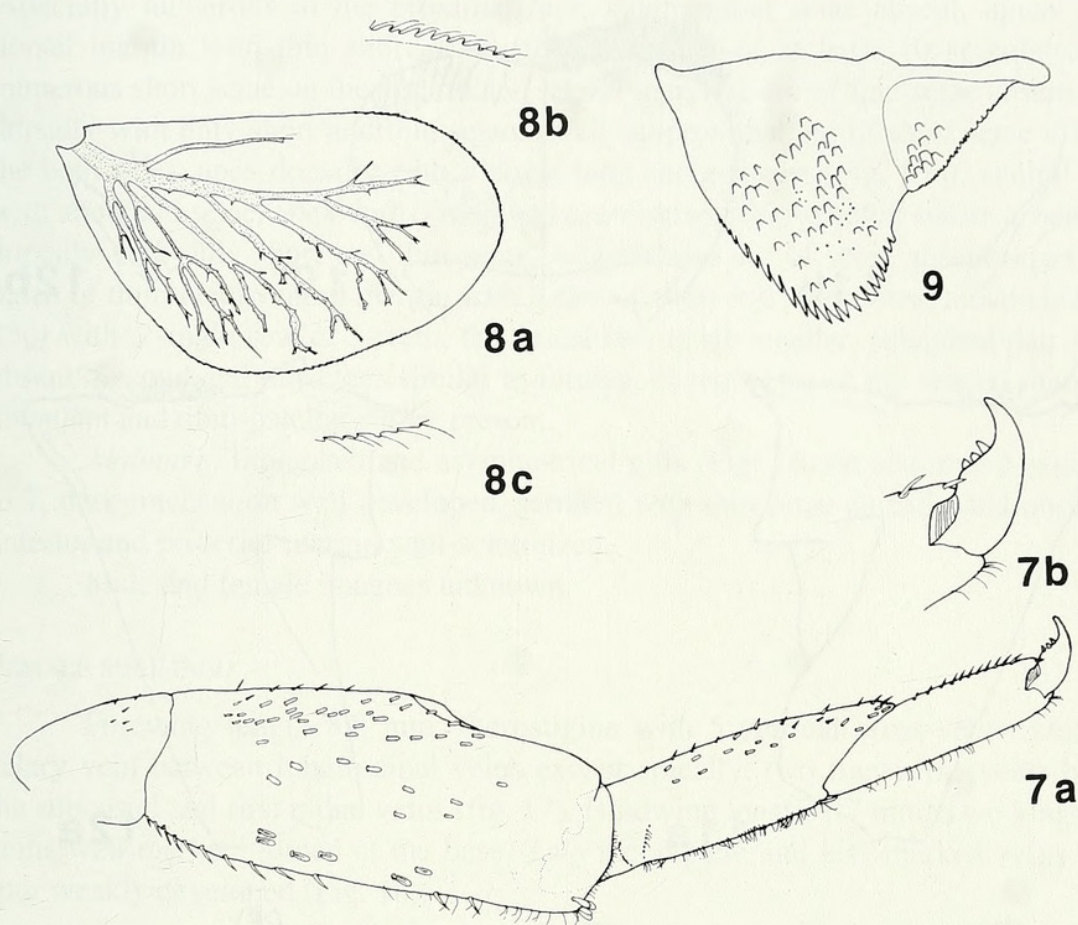
### *Dabulamanzia gigantea* Gattolliat sp. n.

*Holotype.* One female subimago with larval skin, (167a), Madagascar, Manampatrana Bas., Sahanivoraky Riv., Loc. tributary riv. of Iantara Riv., Long. 47°00'41" E, Lat. 22°13'33" S, Alt. 1400m, 19.11.1993. J.-M. Elouard, F.-M. Gibon.

### LARVA

*Head.* Labrum (Fig. 10) sub-rectangular, with a smooth anteromedial emargination; distal margin bordered with two kinds of setae, one row of feathered setae (as in Fig. 1b) and one row of multifid setae (as in Fig. 1c); dorsally with a continuous row of about 15 long setae, abundant setae and insertion of setae in the proximal half; ventral face with a single small seta laterally and a row of thin setae medially. Hypopharynx similar to figure 2. Right mandible (Fig. 11a) with two sets of incisors; prostheca long, thin and unforked, without apical teeth (Fig. 11b); length of the tuft of setae between prostheca and mola reducing toward the mola; tuft of small setae near the mola; tuft of setae at the apex of the mola reduced to 2 or 3 setae; basal half without setae dorsally. Left mandible (Fig. 12a) with incisors fused; prostheca with 4 teeth and the apical much more developed (Fig. 12b); tuft of setae between prostheca and mola present; tuft of setae at the apex of the mola reduced to 3 setae; basal half without setae dorsally.





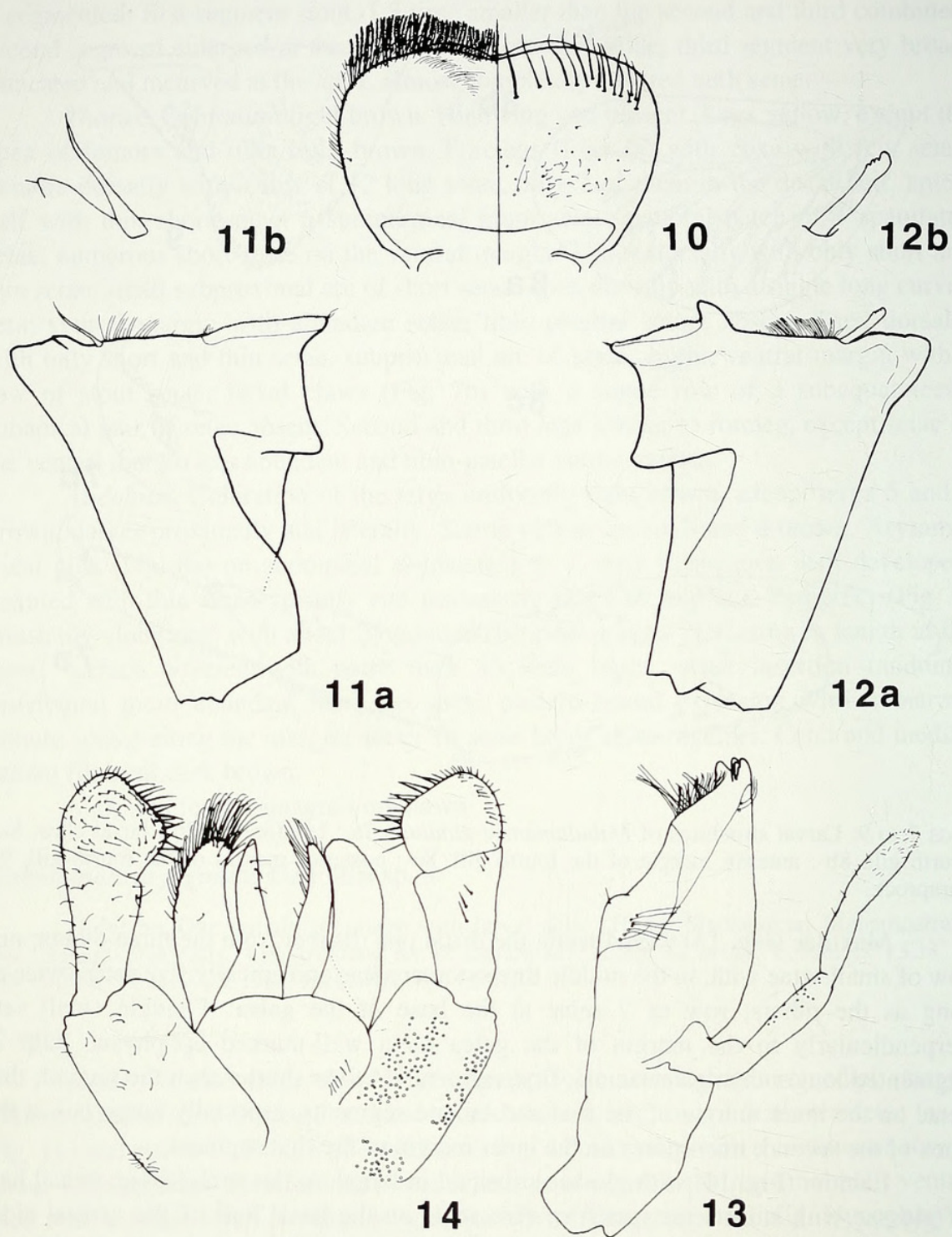
FIGS 7 to 9. Larval structures of *Dabulamanzia gladius* : 7a : left foreleg. 7b : tarsal claw. 8a : fourth gill. 8b : anterior margin of the fourth gill. 8c : posterior margin of the fourth gill. 9 : paraproct.

Maxillae (Fig. 13) with 4 teeth, the distal one distinct from the three others; one row of small setae with, in the middle three stouter setae and apically five setae twice as long as the others; row of 7 setae at the base of the galea; 1 single small seta perpendicularly to the margin of the galea on a well-marked apophysis; palp 2-segmented longer than galealacinia, first segment 1.4 time shorter than the second; thin setae on the inner margin of the first and second segments, especially numerous at the apex of the second; micropores on the inner margin of the first segment.

Labium (Fig. 14) with glossae subequal in length to the paraglossae; apical half of glossae with stout setae, patch of five setae on the basal half of the ventral side; paraglossae apically rounded, with 2 rows of simple setae. Thin setae on the lateral side of the mentum. Labial palp 3-segmented; first segment stout, 1.1 smaller than the second and third combined; second segment much larger at the apex than at the base, dorsally with a row of about 4 setae ending with three smaller setae; third segment broad, apex truncated and substraight, ventrally almost completely covered with setae, much larger apico-laterally.

*Thorax.* Hindwing pad present. Forelegs (Fig. 15a) with coxa covered with few spines and an arc of micropores. Femora with a dorsal row of at least 20 long setae,





FIGS 10 to 14. Larval structures of *Dabulamanzia gigantea* : 10 : labrum (left : ventral; right : dorsal). 11a : right mandible. 11b : right prosthema. 12a : left mandible. 12b : left prosthema. 13 : left maxilla. 14 : labium.



especially numerous in the proximal half, submarginal setae absent, apical half of dorsal margin with thin short setae; femoral patch of at least 10 spatulated setae; numerous short setae on the ventral and lateral margins; arc of fine setae absent. Tibiae dorsally with only short and thin setae, small subproximal arc of short setae visible on the both sides; apex dorsally with a single long curved setae (Fig. 15b); ventral margin with abundant setae, apex with 3 long and acute setae; tibio-patellar suture absent. Tarsi dorsally with only short and thin setae, subproximal arc of setae absent, apex with a patch of thin setae; ventral margin with a row of short and stout setae; tarsal claws (Fig. 15c) with a single row of 5 teeth, the apical two much smaller, subapical pair of setae absent. Second and third legs similar to foreleg, except setae of the ventral margin less abundant and tibio-patellar suture present.

*Abdomen.* Elongated and asymmetrical gills (Fig. 16) on abdominal segments 1 to 7, dark tracheation well-developed, serrated with thin setae apically and posteriorly, anterior and posterior margin well-sclerotized.

Male and female imagoes unknown.

#### FEMALE SUBIMAGO

Forewing length 8.8 mm. Pterostigma with 5 vertical cross-veins. One intercalary vein between longitudinal veins except apically, two transverse veins between the subcostal and first radial veins (fig. 17). Hindwing length 1.7 mm. Two longitudinal veins well-marked, joined at the base. Two incomplete and less marked veins. Single spur weakly developed (Fig. 18).

#### *Dabulamanzia concolorata* Gattolliat sp. n.

*Holotype.* Larva female (818a), Madagascar, Antongombato Bas., Makis Riv., Loc. Camp base WWF, Sacred Waterfall, Long. 49°10'09" E, Lat. 12°31'40" S, Alt. 1075m, 23.3.1999. J.-L. Gattolliat and Z. Rabeantoandro.

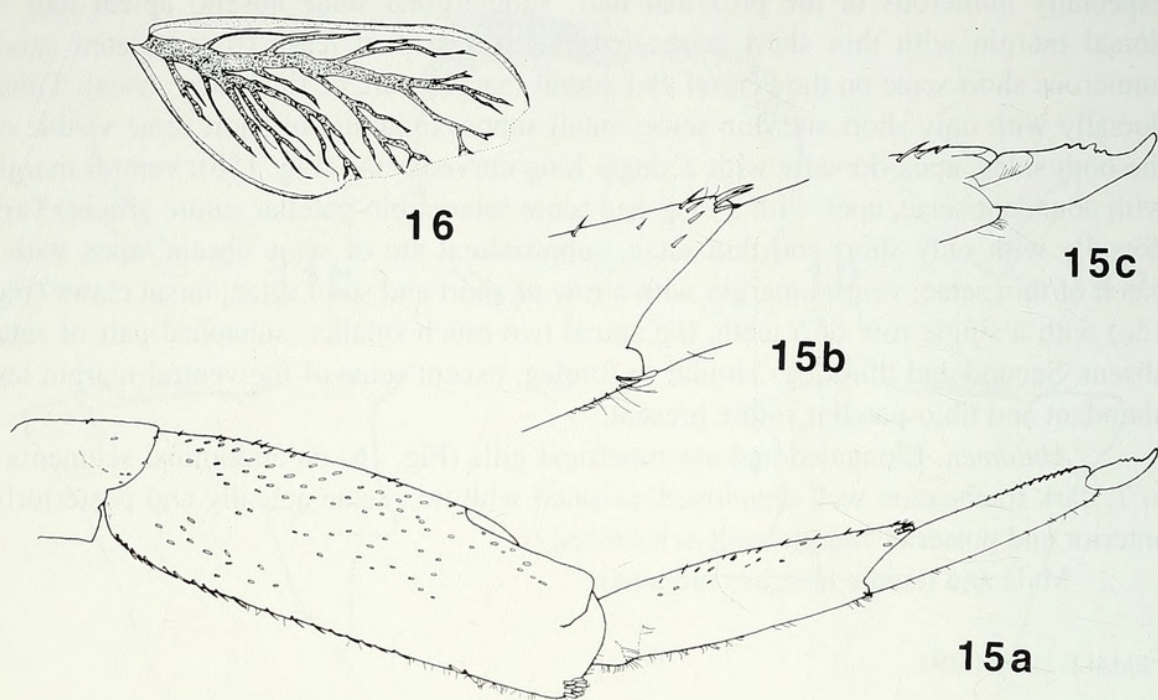
*Paratypes.* Four larvae, same data as holotype. Four larvae, P0810, Madagascar, Antongombato Bas., Makis Riv., Loc. Camp base, 500m downstream of P0818, Long. 49°10'21" E, Lat. 12°31'27" S, Alt. 1030m, 21.3.1999. J.-L. Gattolliat and Z. Rabeantoandro. Two larvae, P0814, Madagascar, Antongombato Bas., Makis Riv., Loc. 100m downstream of the Great Waterfall, Long. 49°10'14" E, Lat. 12°29'17" S, Alt. 675m, 22.3.1999. J.-L. Gattolliat and Z. Rabeantoandro. Two larvae, P0822, same locality as P0814, 24.3.1999. J.-L. Gattolliat and Z. Rabeantoandro.

#### LARVA

Maximal length : Body 7.2 mm. Cerci 2.5 mm. Terminal filament subequal to the cerci.

*Head.* Coloration almost uniformly light yellow, except brown between the eyes without vermiform marking on vertex and frons. Antennae pale light yellow, except scapus and pedicellus light brown. Eyes and ocelli black. Labrum (Fig. 19) narrow, rounded with a narrow anteromedial emargination; distal margin bordered with simple fine setae; without other setae ventrally; dorsally with an arc of five long setae and a submedial setae, few setae in the proximal half. Hypopharynx as in figure 20, lingua

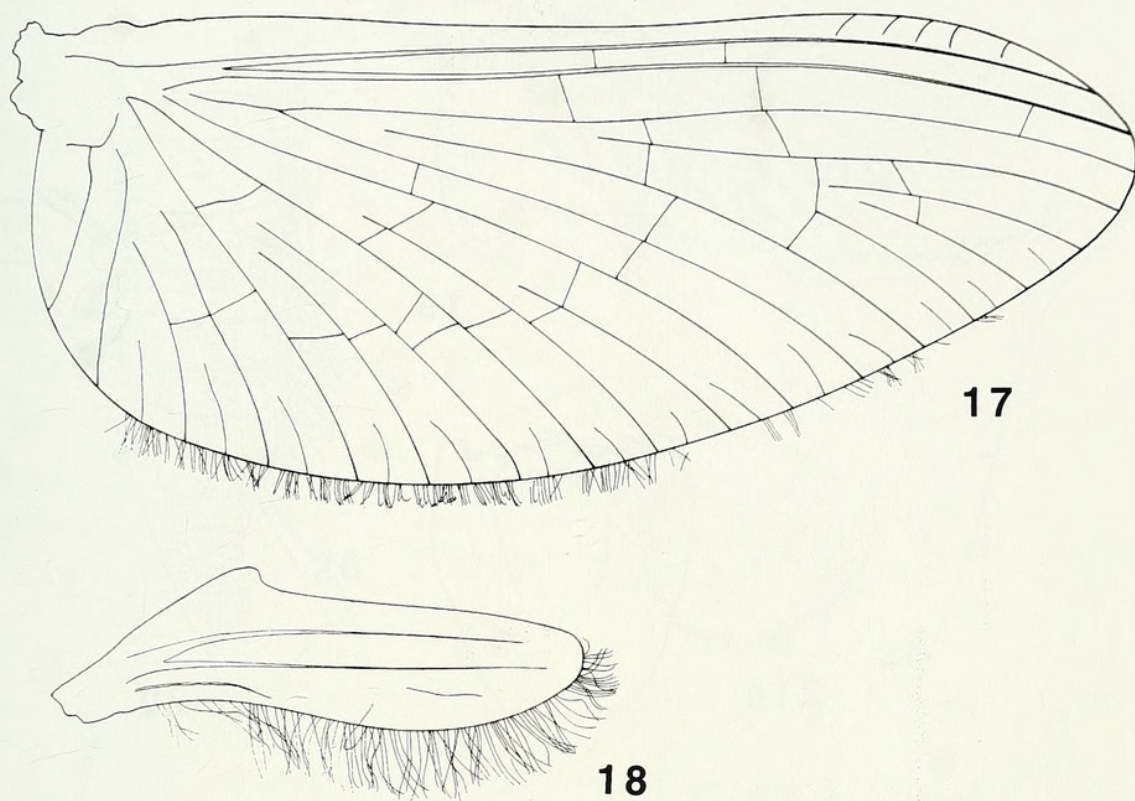




FIGS 15 to 16. Larval structures of *Dabulamanzia gigantea*: 15a: left foreleg. 15b: apex of the foretibia. 15c: tarsal claw. 16: fourth gill (damaged apically).

covered with numerous setae, superlinguae poorly developed. Right mandible (Fig. 21a) with two sets of incisors, slender and turned backwards; prostheca (Fig. 21b) short and stout, with about seven stout setae; the tuft of setae between prostheca and mola quite short; tuft of small setae near the mola well-developed; tuft of setae at the apex of the mola reduced to 2 stout setae; basal half with setae dorsally. Left mandible (Fig. 22), incisors fused to a group of five teeth; prostheca with 4 teeth, the apical one much more developed and a comb-shaped structure; length of the tuft of setae between prostheca and mola reducing toward the mola; tuft of setae at the apex of the mola reduced to 3 setae; basal half with setae dorsally. Maxillae (Fig. 23) with 4 teeth, the distal one opposed to the three others; 2 rows of setae formed by abundant small setae and long stout setae ending with 3 much longer setae, without pectinated or spine-like setae in the middle of the range; 6 to 7 short setae at the base of the galea arranged in a row; a couple of small setae perpendicularly to the margin of the galea; palp 2-segmented, longer than galealacinia, first segment 1.5 time shorter than the second; few thin setae on the external margin of the first and second segments. Labium (Fig. 24) with glossae subequal to paraglossae; apical half of glossae with stout setae, row of setae subparallel to the inner margin; paraglossae apically rounded, with 2 rows of simple setae. Labial palp 3-segmented; first segment stout, 1.25 smaller than the second and third combined; second segment moderately enlarged at the apex, row of about 6 setae; third segment apically rounded, as broad as the apex of the second.



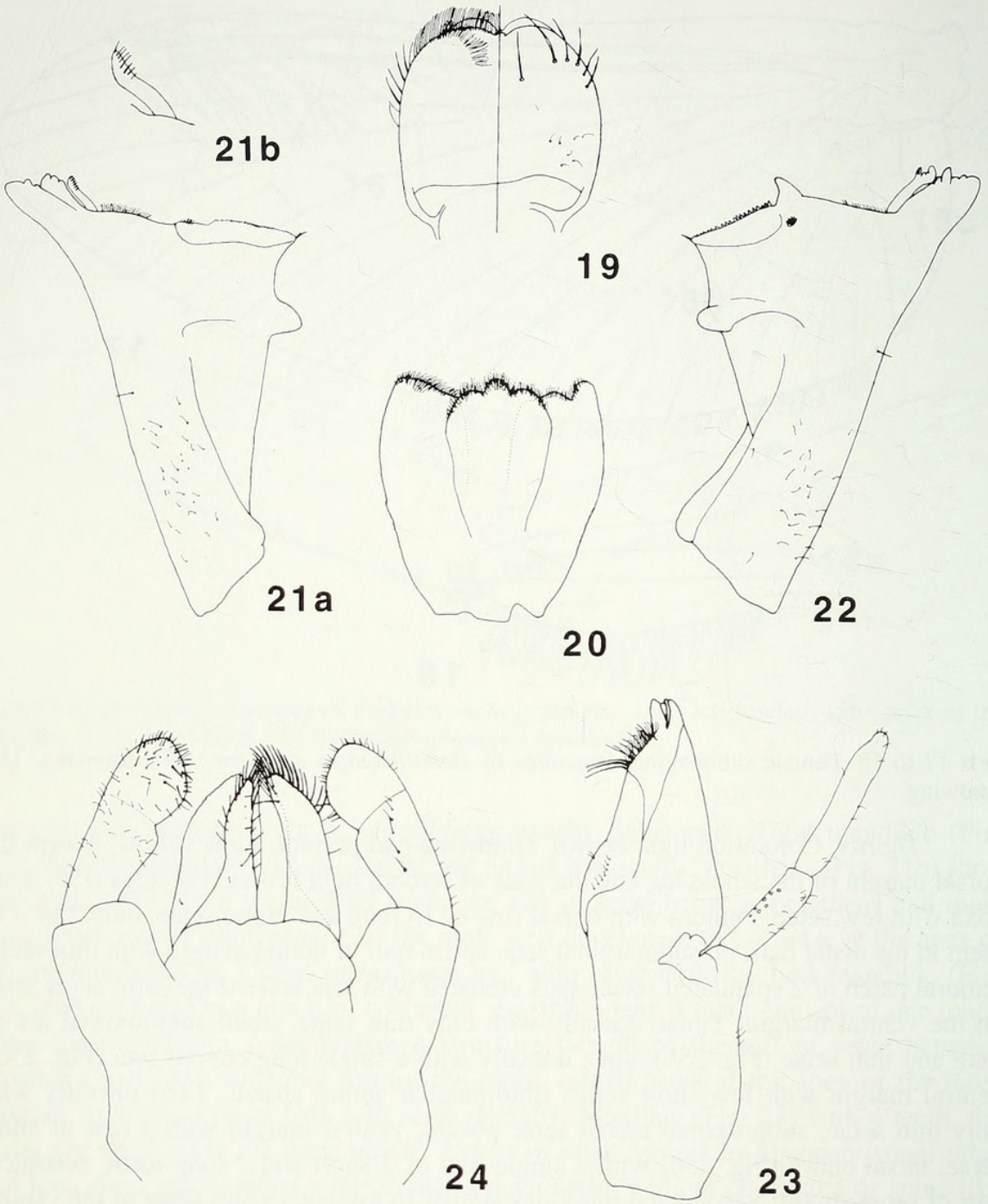


FIGS 17 to 18. Female subimaginal structures of *Dabulamanzia gigantea* : 17 : forewing. 18 : hindwing.

**Thorax.** Coloration light brown. Hindwing pad present. Legs yellow, except the dorsal margin of the whole leg and the apex of femora light brown. Forelegs (Fig. 25a), coxa with few setae. Femora with dorsal row of 13 long and broad setae, only 2 or 3 of them in the distal half, no submarginal seta, apical half of dorsal margin with thin setae; femoral patch of 2 spatulated setae; apex crenated with thin setae (Fig. 25b); short setae on the ventral margin. Tibiae dorsally with only thin setae, small subproximal arc of long and thin setae (Fig. 25b); apex dorsally with a single long curved seta (Fig. 25c); ventral margin with few short setae; tibio-patellar suture absent. Tarsi dorsally with only thin setae, subproximal arc of setae absent; ventral margin with a row of short setae; tarsal claws (Fig. 25d) with a single row of 3 short and 2 long teeth, subapical pair of setae absent. Second and third legs similar to foreleg, except setae of the ventral margin less abundant, tibio-patellar-suture present and the subproximal arc of setae longer.

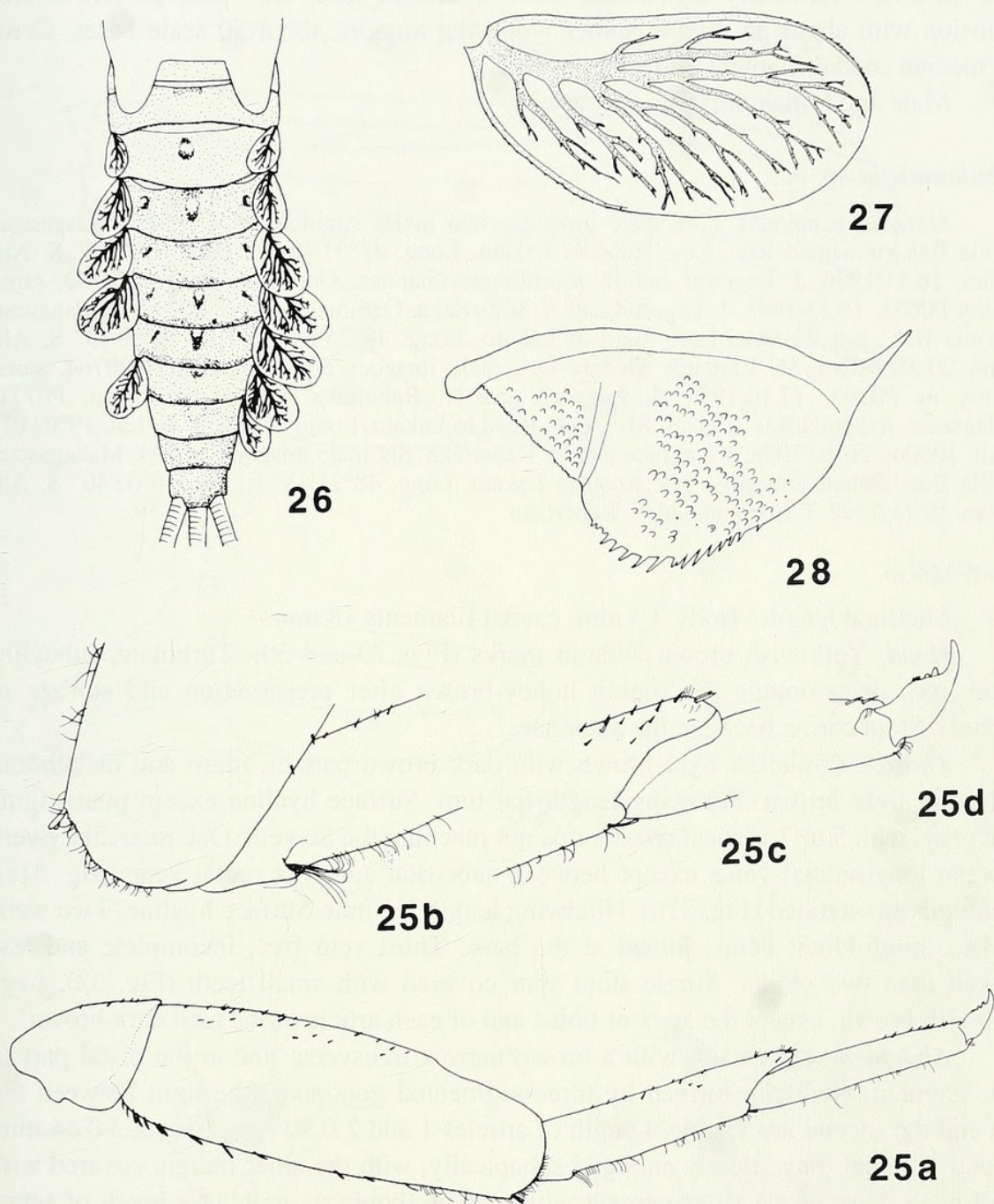
**Abdomen.** Coloration of the terga almost uniformly light brown, except a yellow spot on segments 2 to 9, sometimes surrounded with brown, distal margin darker on segments 4 to 9, segments 3 to 6 with a brown mark laterally (Fig. 26). Sterna yellow except sternite 9 and paraproct light brown. Asymmetrical gills (Fig. 27) on abdominal segments 1 to 7; dark tracheation well developed, apically and posteriorly serrated with thin setae; anterior and to a less extent posterior margin sclerotized. Paraproct (Fig. 28), with about 16 pointed marginal spines; surface covered with more than 80 scale bases;





FIGS 19 to 24. Larval structures of *Dabulamanzia concolorata* : 19 : labrum (left : ventral; right : dorsal). 20 : hypopharynx. 21a : right mandible. 21b : right prostheca. 22 : left mandible. 23 : left maxilla. 24 : labium.





FIGS 25 to 28. Larval structures of *Dabulamanzia concolorata* : 25a : left foreleg. 25b : apex of the forefemur. 25c : apex of the foretibia. 25d : tarsal claw. 26 : abdomen (dorsal view). 27 : fourth gill. 28 : paraproct.



setae insertion randomly distributed more abundant near the apex; postero-lateral extension with about 35 minute spines along the margin; about 30 scale bases. Cerci and median caudal filament uniformly brown.

Male and female imagoes unknown.

### *Dabulamanzia* sp. A

*Material examined.* Five male imagoes, two males subimagoes, P0658, Madagascar, Rianila Bas., unnamed Riv., Loc. Road to Lakato, Long. 48°21'48" E, Lat. 19°02'40" S, Alt. 1050m, 26.11.1996. J. Legrand and D. Ramdriamasimanana. One male imago, P0792, same locality P0658, 18.11.1998. J. Legrand and N. Raberiaka. One male imago, P0292, Madagascar, Sakanila Bas., Lakato Riv., Loc. Road to Lakato, Long. 48°25'08" E, Lat. 19°08'33" S, Alt. 690m, 20.3.1995. J.-M. Elouard. Twenty two male imagoes and subimagoes, P0764, same locality as P0292, 17.10.1998. J. Legrand and N. Raberiaka. One male imago, P0771, Madagascar, Sakanila Bas., Lakato Riv., Loc. Road to Lakato, Long. 48°21'38" E, Lat. 19°03'07" S, Alt. 1050m, 26.10.1998. J. Legrand and N. Raberiaka. Six male imagoes, P0794, Madagascar, Rianila Bas., Sahatandra Riv., Loc Road to Lakato. Long. 48°21'43" E, Lat. 19°02'40" S, Alt. 1050m, 19.11.1998. J. Legrand and N. Raberiaka.

#### MALE IMAGO

Maximal length : Body 7.3 mm; caudal filaments 18 mm.

*Head.* Yellowish brown without marks (Figs 29 and 30). Turbinate, subcylindrical eyes deep orange (becoming honey-brown after preservation and storage in alcohol). Stout carina between the antennae.

*Thorax.* Prothorax light brown with dark brown pattern, meso and metathorax uniformly light brown. Forewing length 6.8 mm. Surface hyaline except pterostigma light grey, with 5 to 7 vertical cross-veins not reaching the Sc vein. One intercalary vein between longitudinal veins except between subcostal and first radial veins (fig. 31a). Costal margin serrated (Fig. 31b). Hindwing length 1.1 mm. Surface hyaline. Two well-marked longitudinal veins, joined at the base. Third vein free, incomplete and less marked than two others. Single stout spur covered with small teeth (Fig. 32). Legs yellowish brown, except the apex of tibiae and of each article of the tarsi dark brown.

*Abdomen* pale cream, with a brown narrow transverse line in the distal part of each segment. Genitalia formed by three-segmented gonopods, the limit between the first and the second not visible. Length of articles 1 and 2 0.50 mm. Article 3 0.14 mm. Second segment long, clearly enlarged subapically, with the inner margin covered with small teeth, base of the first segment with a stout apophysis without a brush of setae. Third segment elongated, with the inner margin incurved (Fig. 33).

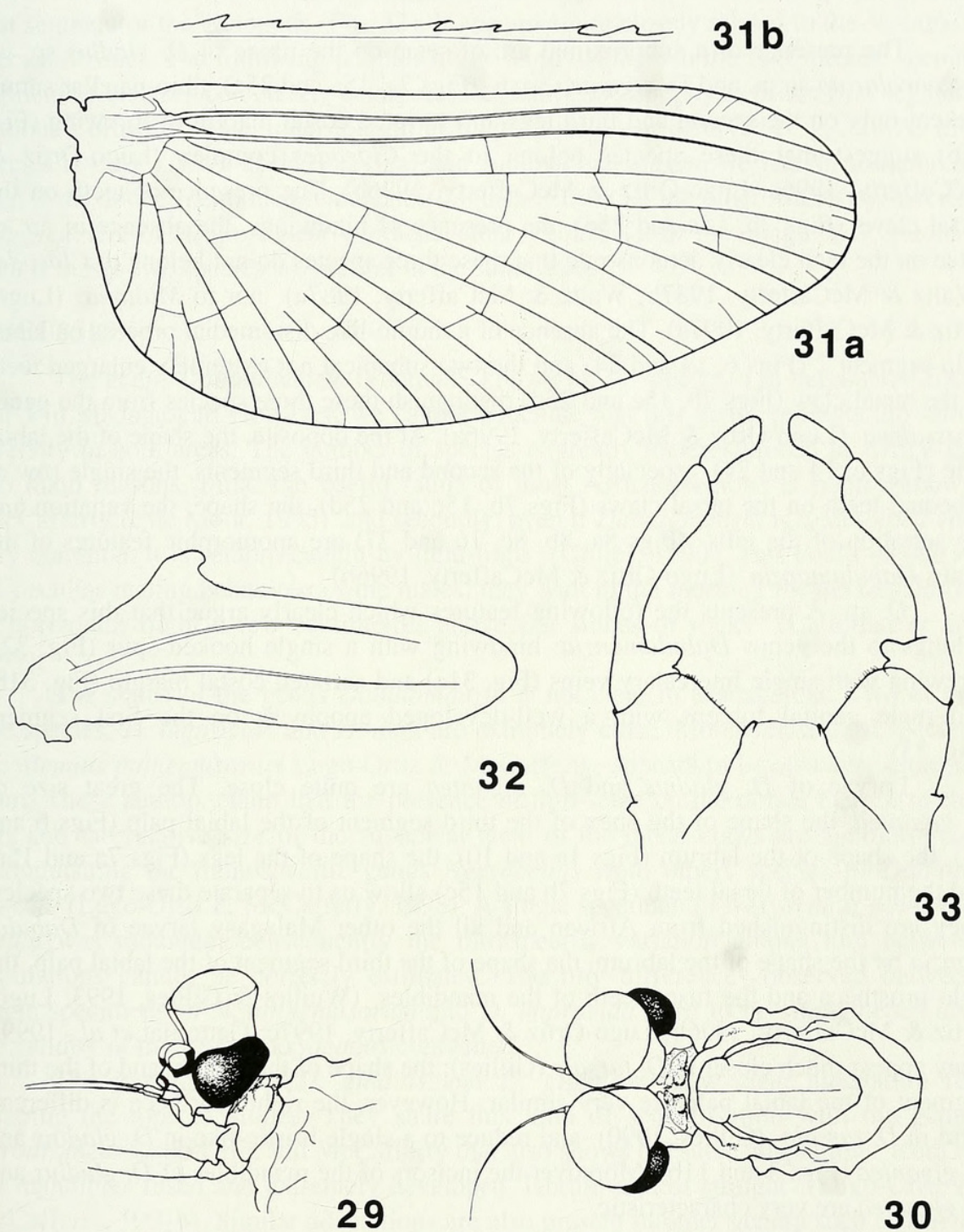
Female imago unknown.

Larva unknown.

#### MALE SUBIMAGO

Similar to the male imago.





FIGS 29 to 33. Male imaginal structures of *Dabulamanzia* sp. A : 29 : head (lateral view). 30 : head (dorsal view). 31a : forewing. 31b : costal margin of the forewing. 32 : hindwing. 33 : genitalia.



## AFFINITIES

The presence of a subproximal arc of setae on the tibiae of *D. gladius* sp. n., *D. concolorata* sp. n. and *D. gigantea* sp. n. (Figs 7a, 15a and 25a), tibio-patellar suture present only on the second and third legs and serrated costal margin of forewing (Fig. 31b) suggest that these species belong to the *Cloeodes* complex (Lugo-Ortiz & McCafferty, 1996a; Lugo-Ortiz & McCafferty, 1996b). The presence of teeth on the tarsal claws (Figs 7b, 15c and 25d), the presence of hindwings, the absence of arc of setae on the tarsi clearly demonstrate that these three species do not belong to *Cloeodes* (Waltz & McCafferty, 1987b; Waltz & McCafferty, 1987a) nor to *Maliqua* (Lugo-Ortiz & McCafferty, 1997a). The absence of a thumb-like distomedial process on labial palp segment 2 (Figs 6, 14 and 24) and the two subapical not extremely enlarged teeth of the tarsal claw (Figs 7b, 15c and 25d) distinguish these three species from the genus *Crassabwa* (Lugo-Ortiz & McCafferty, 1996a). At the opposite, the shape of the labial palp (Figs 6, 14 and 24), especially of the second and third segments, the single row of subequal teeth on the tarsal claws (Figs 7b, 15c and 25d), the shape, the venation and the serration of the gills (Figs 8a, 8b, 8c, 16 and 27) are apomorphic features of the genus *Dabulamanzia* (Lugo-Ortiz & McCafferty, 1996b).

*D. sp. A* presents the following features which clearly argue that this species belongs to the genus *Dabulamanzia*: hindwing with a single hooked spur (Fig. 32), forewing with single intercalary veins (Fig. 31a) and serrated costal margin (Fig. 31b) and male genital forceps with a well-developed apophysis on the first segment (Fig. 33).

Larvae of *D. gladius* and *D. gigantea* are quite close. The great size of *D. gigantea*, the shape of the apex of the third segment of the labial palp (Figs 6 and 14), the shape of the labrum (Figs 1a and 10), the shape of the legs (Figs 7a and 15a) and the number of tarsal teeth (Figs 7b and 15c) allow us to separate these two species. They are distinguished from African and all the other Malagasy larvae of *Dabulamanzia* by the shape of the labrum, the shape of the third segment of the labial palp, the right prostheca and the fused teeth of the mandibles (Wuillot & Gillies, 1993; Lugo-Ortiz & McCafferty, 1996b; Lugo-Ortiz & McCafferty, 1997c; Gattolliat *et al.*, 1999). They appear much closer to *D. tarsale* (Gillies): the shape of the labrum and of the third segment of the labial palp are very similar. However, the right prostheca is different, bifid in *D. tarsale* (Gillies, 1990) and reduce to a single bristle-like in *D. gladius* and *D. gigantea* (Figs 3 and 11b). Moreover the incisors of the mandibles of *D. gladius* and *D. gigantea* are very characteristic.

*D. concolorata* differs clearly from all other species of *Dabulamanzia* by the shape of the labrum (Fig. 19). It is closely related to *D. duci* Gattolliat & Elouard and *D. improvida* Lugo-Ortiz & McCafferty (Lugo-Ortiz & McCafferty, 1997c; Gattolliat *et al.*, 1999). However, it differs from them in the coloration of the abdomen (Fig. 26), the shape of third segment of the labial palp (Fig. 24), the right mandible with incisors slender and turned backwards (Figs 21a and 22) and the maxillae with an unusual couple of small setae perpendicularly to the margin of the galea (instead of a single seta in most of the other species and genera of Baetidae) (Fig. 23).



*D. sp. A* differs from the African species by the shape of the apophysis of the first segment of the gonopods (Fig. 33). It appears more closely related to the Malagasy species *D. duci*. The following features allow us to distinguish the two species: second segment of the gonopod clearly enlarged subapically and apophysis of the first segment without a brush of setae, inner margin of the third segment incurved (Fig. 31). As this species is only known at the imaginal and subimaginal stages, we refrain to name it, even if the above-mentioned features distinguish it from all the other Malagasy species. The great size of *D. sp. A* clearly indicates that it could not be the imago of *D. gladius*, even if these two species are present in the same area.

## DISCUSSION

The genus *Dabulamanzia* is actually known by 11 species, 6 in mainland Africa and 5 in Madagascar. However, we cannot conclude that this genus presents the same diversity in both areas. The number of species is greatly underestimated in Africa for two main reasons. First, the baetid fauna of most African regions is poorly known (McCafferty & de Moor, 1995) and secondly, even if *Dabulamanzia* is widespread and very common, it is seldom caught by light-traps (Gillies, 1990). This could be due to the peculiar mating behaviour of the males: they wait in the morning for the females in an horizontal flight a few centimetres above flat stones or rocks (Gattolliat *et al.*, 1999).

The status of the genus *Dabulamanzia* is not clear in Madagascar. Two of the five species, *D. improvida* and *D. duci* are extremely close. Moreover, a third species, *Nesydemius polhemusorum* Lugo-Ortiz & McCafferty, appears to be also very close to them. These authors claim that the presence of thin setae on the dorsal margin of the legs and the relative size of the subapical teeth of the tarsal claws are apomorphies, distinguishing the monospecific genus *Nesydemius* from others species of *Dabulamanzia* (Lugo-Ortiz & McCafferty, 1998). A single specimen of *Nesydemius polhemusorum* was mounted; consequently the intraspecific variation among and between populations cannot be correctly estimated. The tiny differences observed between single specimens of *N. polhemusorum* and *D. improvida* need to be strengthened and the validity of the genus *Nesydemius* confirmed.

The mouthparts of *D. gladius* and *D. gigantea* show clear adaptation for scraping the tops of stones. They share this kind of specialisation with the genus *Xyrodromeus* Lugo-Ortiz and McCafferty that also shows the same adaptations: teeth of the mandibles fused and extremely developed, labrum almost straight (Lugo-Ortiz & McCafferty, 1997b). Similar adaptations are also present in other genera such as *Baetis* (Müller-Liebenau, 1969). However, they must be strictly considered as a convergence due to the same foraging behaviour. The shape of the labial palp, the maxillae, the subproximal arc of setae on the tibiae and especially the single row of teeth on the tarsal claw clearly distinguish these three genera and demonstrate that they do not belong to the same complex of genera.

Since the remaining species lack apomorphic features and *D. gladius* and *D. gigantea* share with the other *Dabulamanzia* species a number of apomorphies, it is not justified to erect a new genus for these two species.



KEY TO THE MALAGASY SPECIES OF *DABULAMANZIA*

1. Distal margin of the labrum almost straight; mandibles with fused incisors; third segment of the labial palp apically truncated ..... 2
- Distal margin of the labrum with a clear anteromedial emargination, mandibles with incisors not fused; third segment of the labial palp apically rounded or pointed ..... 3
2. Third segment of the labial palp apically concave; labrum almost quadrangular; femora with a dorsal row of about 12 setae ..... *D. gladius*
- Third segment of the labial palp apically straight; labrum more rounded; femora with a dorsal row of at least 20 setae ..... *D. gigantea*
3. Tergae almost uniform light brown; labrum narrow; third segment of the labial palp not broader than the second ..... *D. concolorata*
- At least tergae 3 to 6 brown with 3 lighter median spots, labrum rounded not narrow, third segment of the labial palp broader than the second ..... 4
4. Third segment of the labial palp rounded, second segment of the maxillary palp slender and pointed ..... *D. improvida*
- Third segment of the labial palp slightly pointed, second segment of the maxillary palp as broad as the second ..... *D. duci*

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