Ecology and life history of *Paratomapoderus brachypterus* in Gabon (Coleoptera: Attelabidae)

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Abstract

On the base of data collected during four expeditions in Gabon (West Africa) from 2012 to 2016, the authors provide new information on trophic activity and reproductive behaviour of *Paratomapoderus brachypterus* (Voss, 1926) (Attelabidae: Apoderinae, Hoplapoderini), with emphasis on leaf-roll realisation; host plant, leaf roll, larva and pupa are illustrated for the first time.

Key words: Attelabidae, *Paratomapoderus*, Gabon, *Combretum*, biology, host plant, distribution, Afrotropic.

Introduction

*Tomapoderus* Voss, 1926, *Paratomapoderus* Voss, 1926 and *Parapoderus* Voss 1926 (that Legalov (2007) regards as a synonym of *Paratomapoderus*) are nearly exclusively African genera, together including more than one hundred species. Their systematics is still unclear and is in need of a revision. Voss (1926a, 1926b) subdivided the different lineages nearly exclusively on the base of presence and shape of what he called “abdominal lobes” (“Abdominal­lappen”); however, as demonstrated by Biondi (2005), this character is not stable and is inadequate for a systematic purpose. Furthermore, the high intraspecific variability in the chromatic pattern led in the past to the description of several taxa both as species and infraspecific ranks: this is also the case of *Paratomapoderus brachypterus* (Voss, 1926). Voss (1937: 290) clearly recognised the high variability of this species (“... diese Art in der Färbung sehr veränderlich ist”), however described a number of subspecific taxa (Voss 1926b, 1928, 1937, 1939, 1953).

Concerning African Apoderinae nearly nothing is known about their ecology and ethology and the only information available are restricted to the agronomic implications of some species, with emphasis on the host plants: *Parapoderus fusicollis* (Fabricius, 1792) is reported as a pest on *Eucalyptus maculata* in South Africa (Anonymous 1976); *Parapoderus flavoebenus* (Thomson, 1858) is reported as feeding on *Terminalia superba* and *Khaya ivorenensis* in Cameroon (Foahom 2002), or *Theobroma cacao* in Ghana (Cotterell 1927) and Ivory Coast (Alibert 1951); again in Ivory Coast *Parapoderus clivicollis* (Marshall, 1948) is reported as feeding on *T. cacao* (Alibert 1951). *Tomapoderus (Pseudapoderus) ghesquierei* Voss, 1939, from Democratic Republic of the Congo, feeds on *Crudia* (Fabaceae) (Voss 1939); *Parapoderus pseuderolens* Voss, 1926 is given on *Combretum* sp. in Sierra Leone (Voss 1937). In the collection of the first author one specimen of *Parapoderus balticus* Voss, 1922 from Pretoria (South Africa) shows collecting label that reports *Combretum* sp. as host.

Systematics and distribution

Voss (1926b) described *Parapoderus brachypterus* and in the same year (Voss 1926a) erected the genus *Paratomapoderus*; this species has been then moved by him (Voss 1937) to *Paratomapoderus*.

*Paratomapoderus brachypterus* (Figs 1, 2) is a species associated to rainforests occurring in Cameroon (Voss 1926b), Gabon (Voss 1929), Equatorial Guinea (Voss 1926b), Democratic Republic of the Congo (Voss 1939) and Angola (Voss 1937); all known localities are given in the distribution map (Fig. 3).
Collected specimens: 1 ♂, 1-15 Dec 2013, S. Biondi leg.; 1 ♀, 14-24 Mar 2015, C. Massarone leg.; 4 ♀♀ and 1 ♂, 15-25 Jun 2016, S. Biondi & C. Massarone legg.; 1 ♀ bred from leaf roll, Jun 2016, S. Biondi leg. (all in the private collection of the first author); 1 ♂, 15-25 Jun 2016, E. Ruzzier leg. (deposited in The Natural History Museum, London).

Material and methods

Study site
All nine specimens observed in the field and collected come from the same locality (Fig. 4):
Gabon: Ogooué-Ivindo, Makokou, Ipassa, 500 m, 00.30.43N, 12.48.12E.

Collected specimens: 1 ♂, 1-15 Dec 2013, S. Biondi leg.; 1 ♀, 14-24 Mar 2015, C. Massarone leg.; 4 ♀♀ and 1 ♂, 15-25 Jun 2016, S. Biondi & C. Massarone legg.; 1 ♀ bred from leaf roll, Jun 2016, S. Biondi leg. (all in the private collection of the first author); 1 ♂, 15-25 Jun 2016, E. Ruzzier leg. (deposited in The Natural History Museum, London).
Ecology and life history of *P. brachypetru*

**Fig. 4** – Habitat of *Paratomapoderus brachypterus*: forest track near Ipessa Station (photo S. Biondi).

**Fig. 5** – Host plant bush of *Paratomapoderus brachypterus*: *Combretum Loefl.*, 1758 sp. (Myrtales: Combretaceae) (photo S. Biondi).

**Figs 6-9** – Leaf rolls of *Paratomapoderus brachypterus* on *Combretum* and alimentation holes: 6. leaf rolls with cut from the left and from the right side (photo C. Massarone).
During the 2016 expedition, 67 leaf rolls of *P. brachypterus* were collected; only six were found to contain larvae or pupae and in only one case we were able to obtain the imago (a female). None of the remaining rolls contained viable eggs and in several cases parasitoid damages have been observed. The high mortality rate is probably due to the action of the recently described *Poropoea africana* Laudonia & Viggiani, 2017 (Hymenoptera Trichogrammatidae), emerged from some of the leaf rolls collected in Ipassa (Laudonia et al. 2017).

All adults were collected during the day by hands or by sweeping vegetation. Photos in the environment were done using Canon PowerShot SX40 HS and Pentax K20D equipped with Pentax D FA 100mm Macro objective. About 70 photos of the mounted specimens were taken with Canon EOS 7D and the lens Canon MP-E 65mm f/2.8 1-5x, and were then stacked with Zerene Stacker software. For all photos the post-processing (mostly cleaning) was done with Adobe Photoshop CS6.

**Results**

In all cases observed, the hostplant of *P. brachypterus* is a species of *Combretum* Loefl. (Myrtales, Combretaceae); this shrubby plant is common along tracks and forest paths of the investigated area (Fig. 5). *Paratomapoderus* adult specimens feed of leaves tissues causing circular round holes on the leaf page and rarely affecting leaf ribs (Figs 6–9).

During the day, no adult rolling a leaf has been observed, suggesting that this activity could occur mainly at night. Anyhow, the leaf folding mode is analogous of what observed for many other Apoderinae; particularly, the cutting mode and the leaf roll final structure correspond with what has been observed for *Apoderus coryli* and *Apoderus jekelii* by Egorov (1989) in Russia and by Park in Korea (Park et al. 2014). The leaf is cut at its basal third with a transverse incision; the incision develops from one of the lateral margins (no cut direction preferred) of the leaf up to the central vain (Fig. 6). The apical part is then folded along the central vain and rolled on itself starting from the apex; it is during this process that the egg is deposited. For all cases observed, to each roll corresponds a single egg, larva or pupa. It is worthy noting that no leaf roll has been observed on the soil and no proof exists demonstrating that the central leaf nerve is chopped off after the roll realisation as happens in several members of the family. In this case, the central vain, being partially intact, allows the leaf to maintain fluid circulation, thus preserving turgidity and preventing desiccation. From the egg hatches a larva that develop feeding of the leaf tissues; the mature larva (Fig. 10) is about 10 mm long, apodous and yellow. The pupa, about 6.5 mm long, has the same colour of the larva and

**Figs 10-11** – 10, mature larva of *Paratomapoderus brachypterus* (photo C. Massarone). 11, pupa of *Paratomapoderus brachypterus* in ventral (beginning of pigmentation), dorsal and lateral view (photo C. Massarone).
becomes darker close to the adult emergence (Fig. 11); the adult emerges perforating the wall of the roll. Basing of the short time available for observation during our expeditions, we are not able to establish the precise number of generations that P. brachypterus could have in a year; however fast development of larvae and pupae observed and adult specimens collected during March, June and December, suggest the existence at least of 2-3 generations per year.

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