

Phylogenetic relationships and distribution of the enigmatic semislug *Aillya* (Gastropoda: Aillyidae)



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Introduction

Aillya is an enigmatic African semislug, which was originally classified into the American Amphibuliminae (Orthalicoidea) by Odhner. Later, Baker established a separate family for this group and placed it together with the Succineidae and Athoracophoridae in the suborder Heterurethra. Minichev & Slavoshevskaja subdivided the Heterurethra even into three separate orders and introduced the name Aillyida for the Aillyidae. In contrast, Pilsbry, Solem, Tillier and van Mol supposed that *Aillya* is most closely related to some limacoid groups, i.e. Helicarionidae or Urocyclidae.

We investigated the phylogenetic relationships of *Aillya* based on ITS2 and partial 5.8S and 28S rDNA sequences. Furthermore, we examined the morphology of type specimens and newly collected material to clarify the taxonomy and distribution.

Phylogenetic relationships

Molecular phylogenetic analyses (Fig. 1) of *Aillya* and a selection of representatives of all major stylommatophoran groups based on ITS2 and partial 5.8S and 28S rDNA sequences disproved previous hypotheses that *Aillya* is related to orthalicoid, limacoid or heterurethran groups. Instead, our analysis showed that Aillyidae cluster within the Achatinoidea and forms a well-supported clade with Ferussaciidae. This clade is the sister group of the paraphyletic Subulinidae, in which Thyrophorellidae and Achatinidae are nested. Aillyidae and Ferussaciidae share a transversally oriented kidney, whereas the kidney of other Achatinoidea is longitudinally oriented as in most Stylommatophora. Moreover, both groups possess an anal gland or a glandular anal pouch, which is missing in other Achatinoidea and most other Stylommatophora. These congruities had already been noted by Odhner. However, he did not realize that Aillyidae and Ferussaciidae might actually form a clade. The molecular phylogeny presented here indicates that the mentioned morphological character states are actually synapomorphies of these families. An anal gland and a transversely oriented kidney are also known from *Micractaeon*, which was grouped with Ferussaciidae by Verdcourt and van Bruggen & de Winter, whereas Schileyko established a monotypic family for this taxon. Unfortunately, no molecular data are yet available for this group. *Micractaeon* (Fig. 2) and *Aillya* (Fig. 3) share a shell microsculpture consisting of dents in dense spiral rows. We assume that this is a synapomorphy of these taxa and that Micractaeonidae is the sister group of Aillyidae. Further investigations are necessary to clarify the relationships of the Aillyidae-Micractaeonidae clade to other taxa currently placed within Ferussaciidae.

Distribution

So far, *Aillya* species were only known from western Africa, namely Cameroon, Nigeria and Bioko Island (Fig. 6-7). We report an *Aillya* species from East Africa (Uganda) for the first time (Fig. 7).

Taxonomy

A comparison of the available material indicates that there are at least five *Aillya* species that differ in the shell (Fig. 3), the extension of the mantle lobes (Fig. 4) and the genitalia (Fig. 5).

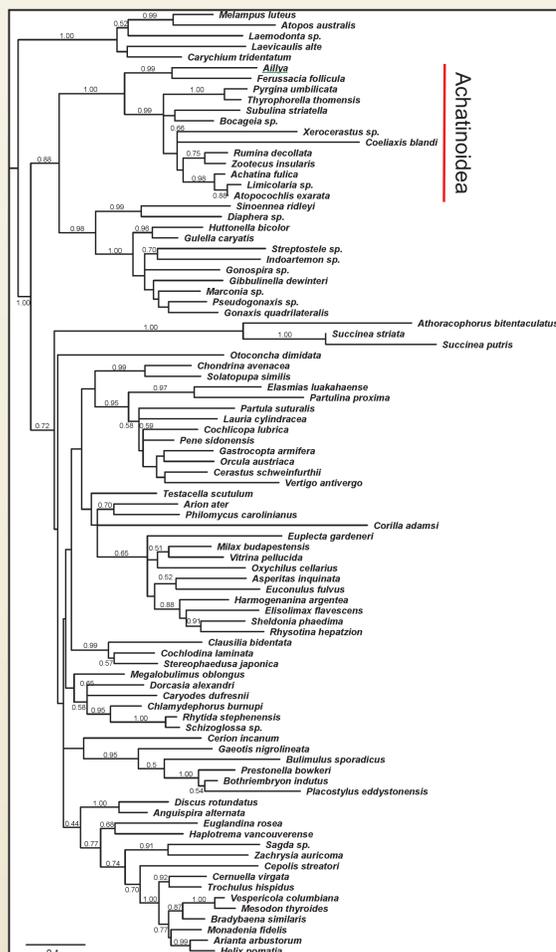


Fig. 1. Maximum likelihood tree based on ITS2 and partial 5.8S and 28S rDNA sequences of *Aillya* and a selection of representatives of all major stylommatophoran groups. Bootstrap values are indicated at the branches.

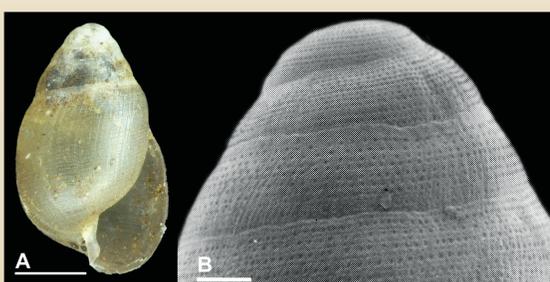


Fig. 2. *Micractaeon koptawellensis* (Germain). A. Shell, Uganda: Echuya Central Forest Reserve, Kanaba (ZMH 53073). B. Shell microsculpture, Zaire (van Bruggen & de Winter 1995). Scale bar = 0.5 mm for A, and 0.1 mm for B.

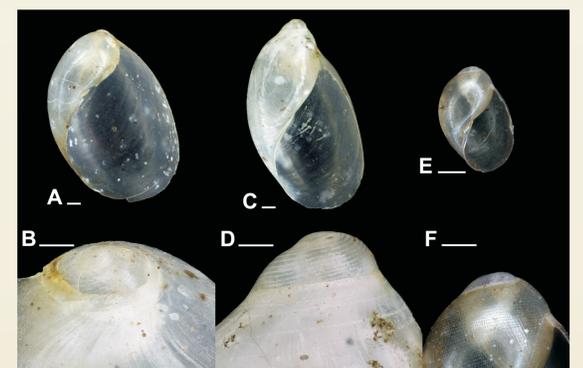


Fig. 3. *Aillya* species, shells. A-B, *Aillya* sp. nov., Equatorial Guinea, Bioko: Moka-Riaba (ZMH). C-D, *Aillya totipunctata* Connolly, Bioko: Moka (ZMH). E-F, *Aillya* sp. (nov.?), Uganda: Budongo Central Forest Reserve, between Karongo and Busingiro (ZMH 52422). Scale bar = 0.5 mm for A, C, E and 0.25 mm for B, D, F.



Fig. 4. *Aillya* species, habitus. A, *Aillya catena* (Spence), Cameroon: Bibundi (syntype of *Aillya camerunensis* Odhner). B, *Aillya* sp. nov., Equatorial Guinea, Bioko: Moka-Riaba (ZMH). C, *Aillya* sp. (nov.?), Uganda: Budongo Central Forest Reserve, between Karongo and Busingiro (ZMH 52422). Scale bar = 1.0 mm.

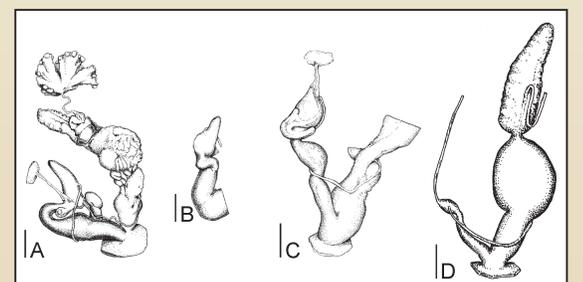


Fig. 5. *Aillya* species, genitalia. A, *Aillya catena* (Spence), Cameroon: Bibundi (syntype of *Aillya camerunensis* Odhner). B, *Aillya totipunctata* Connolly, Bioko: Mongola (MNCN 15.05/53825). C, *Aillya* sp. nov., Equatorial Guinea, Bioko: Moka-Riaba (ZMH). D, *Aillya* sp. (nov.?), Uganda: Mabira Central Forest Reserve, Najembe (ZMH 53196). Scale bar = 1.0 mm for A, B and 0.5 mm for C, D.

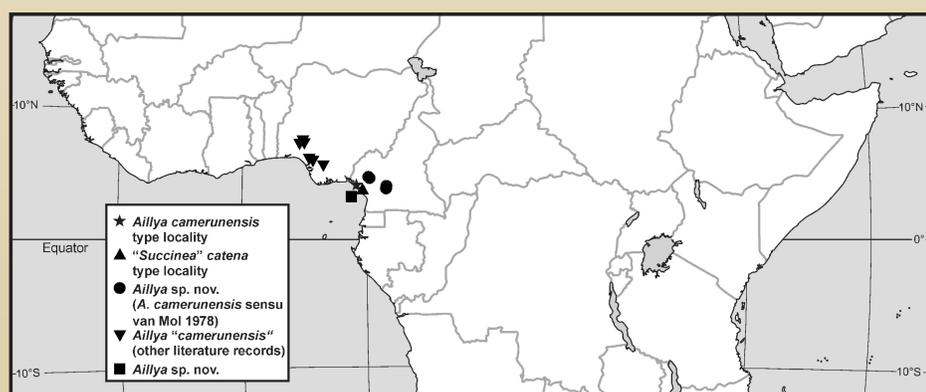


Fig. 6. Distribution of *Aillya* species.

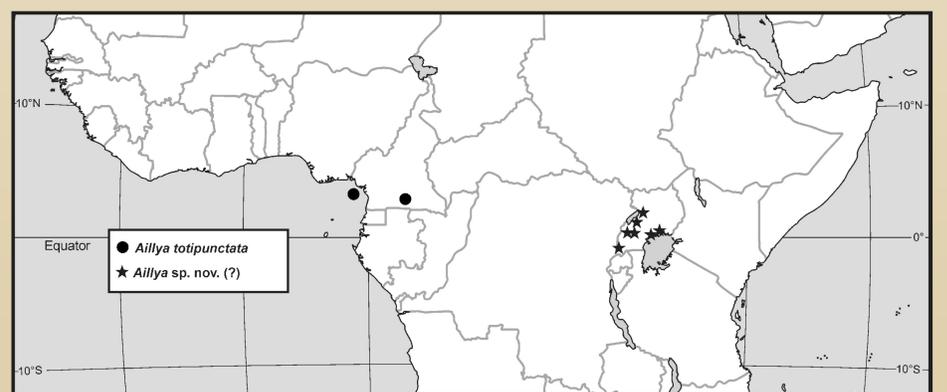


Fig. 7. Distribution of *Aillya* species.