Towards a revision of Scotobiini Solier, 1838 (Coleoptera: Tenebrionidae)

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Introduction

Scotobiini is currently placed in Tenebrioninae, characterized by the visible membranes between abdominal sternites 5-6-7; glandular reservoirs opening near the apex of last visible sternite and aedeagus normally oriented with tegmen dorsal (Doyen & Lawrence, 1979). Most Tenebrioninae species live in mesic places such as temperate and subtropical forests and grasslands; have the 2nd pair of wings and are therefore good fliers (Doyen, 1993). However, some of their tribes, such as is the case of Scotobiini, are abundant in arid and semiarid habitats and have adaptations to live in those climates, like absence of the second pair of wings, strong joints between the elytra and with abdominal sternites and a subelytral cavity to help prevent water loss (Doyen, 1993). Because of their apterism, they have a restricted distribution, so they have been used in biogeographical studies (Silvestro et al., 2012).

Scotobiini is endemic to South America mainly in arid and mesic lands of Ecuador and Galapagos islands, Peru, Bolivia, Chile, Argentina, Uruguay as well as south-eastern Brazil. Its distribution range extends to the south reaching Tierra del Fuego island (Kulzer, 1955).

Objectives

- To contribute to systematic knowledge, phylogenetic and biogeographic of subfamily Tenebrioninae in southern South America.
- To revise the tribe Scotobiini by incorporating new characters from external and internal morphology and male and female genitalia.
- To establish the phylogenetic relationships between the Scotobiini genera.
- To describe larvae to find new characters for differentiating between genera.
- To delimit the distribution patterns of the genera of Scotobiini.

Chronology of the tribe Scotobiini

- 1824- Germar describes the genus *Scotobius* with three new species.
- 1830- Guérin-Méneville describes the genus *Ammophorus* with *A. peruvianus* and states that the genus is closely related to *Nycterinus* Eschscholtz, but both differ remarkably in their antennae.
- 1838- Solier creates the tribe Scotobiini including the genera *Scotobius, Ammophorus*, and the new genera *Leptynoderes*, *Gonogenius* (then synonymous with *Scotobius*), and *Diastoleus*. Solier defines the Scotobites by prothorax longer than head; last antennomere larger than the penultimate and anterior tibiae triangular in external angle.
- 1842- Blanchard describes the insects collected by Alcide d'Orbigny in his journey across South America and creates the genus *Emmallodera*.
- 1859- Lacordaire re-defines the tribe Scotobiini: transfering *Ammophorus* to Nyctoporini, synonymizing *Gonogenius* with *Scotobius* and adding *Emmallodera* and *Psammetichus* Guérin Méneville.
- 1953- Van Dyke reviews the genus *Ammophorus* and describes four species and three subspecies.
- 1955- Kulzer reviews the Scotobiini, describing 20 new species and his concept of the tribe was the inclusion of *Scotobius, Emmallodera, Leptynoderes, Diastoleus, Psammetichus*, and adds a new genus, *Pseudoscotobius*.
- 1976- Marcuzzi synonymized *Pseudoscotobius* with *Phrynocarenum*, transferring *Pseudoscotobius* to the tribe Phrynocarenini.
- 1993- Doyen added *Ammophorus* on the basis of it has external membranes between abdominal sternites 5-6-7, which removes it from Pimeliinae. *Ammophorus* is phenetically similar to Scotobiini, and shares a synapomorphy noticed by Medvedev (1977), the presence on the truncate apex of the last antennomere of clusters on dome-shaped placoid sensoriae and a few are also visible on the rims of preterminal antennomeres.

Future research

Systematic studies on Scotobiini have been done on the basis of characters of the external morphology which are not sufficient for a cladistic study. Therefore, we propose to also analyze characters of internal morphology which have not been previously used such as endocranium, thoracic endosternites, abdominal defensive glands and male and female genital structures. We also propose to incorporate new external characters such as arrangement of dome-shaped placoid sensillae in last three antennomeres (Medvedev, 1977) and to describe larvae to find new characters for differentiating between genera.

Cladistic analyses begin from the hypothesis that the tribe and its five genera are monophyletic and their monophyly will be tested in the analysis of external morphological evidence, adding new characters: of internal morphology, genitalia, antennae and larvae. For character polarization we will use three external groups from other tribes of Tenebrioninae. The analysis will be carried out by applying standard cladistic parsimony analysis procedures with the TNT program. Completion of cladistic analysis of Scotobiini will allow testing evolutionary hypotheses about the relationships between genera.

Results

Currently, Scotobiini contains five genera and 110 species/subspecies characterized by last tarsomere of foreleg with a longitudinal groove on the anterior margin and placoid sensillae on apex of the last antennomere and on rims of preterminal antennomeres.

Diastoleus Solier, with three species, characterized by pronotum wider than elytra, margin of pronotum broadly expanded and bowl-shaped upright, in the anterior edge with a cut deep and narrow, eyes and antennae bases hidden above view.

Fig. 1. Habitus of *Diastoleus collaris.*

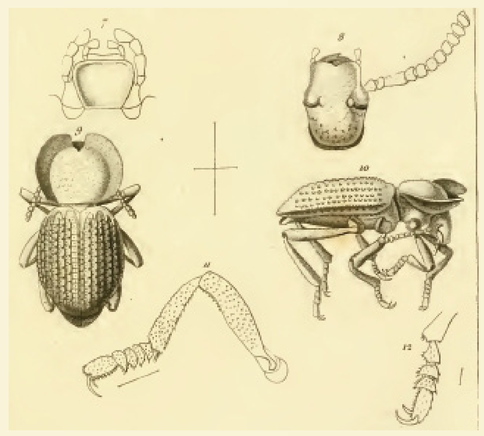

Fig. 2. Body details of *Diastoleus* spp.

Fig. 3. Geographic distribution of genus *Diastoleus*.

Scotobius Germar, with 61 species and seven subspecies: characterized by pronotum narrower than elytra; side edge +/- narrowly truncated and slightly elevated and terminal antennomere raised laterally, tipped; profemora lacking tooth.

Fig. 4. Habitus of *Scotobius punctatus.*

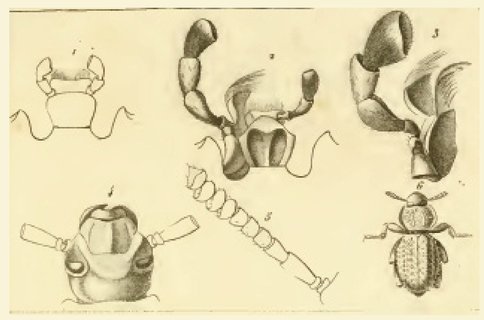

Fig. 5. Body details of *Scotobius* spp.

Fig. 6. Geographic distribution of genus *Scotobius*.

Emmallodera Blanchard with 13 species and three subspecies, characterized by pronotum narrower than elytra; side edge +/- narrowly truncated and slightly elevated; terminal antennomere raised laterally, tipped; profemora with a tooth (spina) protruding sharply.

Fig. 7. Habitus of *Emmallodera rugosa.*

Fig.8. Habitus of *Emmallodera telteca.*

Fig. 9. Geographic distribution of genus *Emmallodera*.

Leptynoderes Solier with five species, characterized by pronotum narrower than elytra, lateral margin raised; last antennomere abruptly truncated; profemora lacking tooth, head prolonged behind the eyes and slender legs.

Fig. 10. Habitus of *Leptynoderes tuberculatus.*

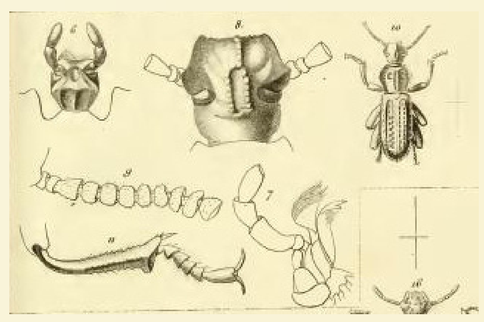

Fig. 11. Body details of *Leptynoderes* spp.

Fig. 12. Geographic distribution of genus *Leptynoderes*.

Ammophorus Guérin-Méneville with 15 species and three subspecies, characterized by pronotum narrower than elytra; terminal antennomere truncated, straight and flat; legs short, robust; tibiae compressed and triangular, slightly extended inwardly; profemora lacking tooth.

Fig. 12. Habitus of *Ammophorus rubripes.*

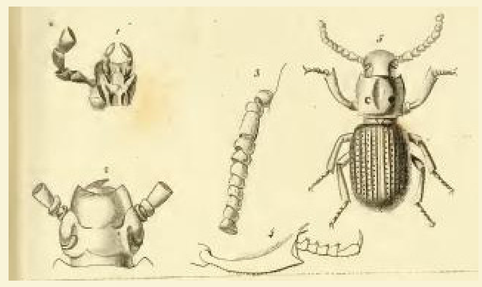

Fig. 14. Body details of *Ammophorus* spp.

Fig. 15. Geographic distribution of genus *Ammophorus.*

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