

A NEW SUBSPECIES OF *TRECHUS FULVUS* DEJEAN, 1831 (*TRECHUS FULVUS MADEIRENSIS* N. SSP.) FROM THE MADEIRA ISLAND WITH SOME BIOGEOGRAPHICAL COMMENTS

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With 4 figures

ABSTRACT. In this account a new subspecies of *Trechus fulvus* DEJEAN, 1831 is described: *Trechus fulvus madeirensis* n. ssp.. The localization of the captures (all in the entrance of a cave) and morphological features led us to the conclusion that the *T. f. madeirensis* n. ssp. is a troglophile. The morphological and biogeographical data support the hypothesis that the new subspecies is a form connected with one of the following continental subspecies: *T. f. maroccanus* ANTOINE, 1928 (North Africa), *T. f. primigenius* JEANNEL, 1920 (Southern parts of Portugal and Spain) or *Trechus f. fulvus* DEJEAN, 1831 (Western Europe).

INTRODUCTION

During a survey on the arthropod fauna from the Madeiran caves, the senior author (A. R. M. SERRANO) had the opportunity to collect six specimens of an undescribed subspecies of *Trechus fulvus* DEJEAN, 1831. D. ERBER, working in the same caves, also collected over twenty specimens of that carabid beetle subspecies. Later, ERBER kindly put at our disposal three specimens for study which we included in the biometry.

All the specimens were collected by means of pitfall trapping and direct searching in the "Gruta dos Cardais" (Thistle Cave) near the village of S. Vicente (northern part of Madeira Island).

Until now only one species of cavernicolous ground-beetle was known from Madeira archipelago, *Thalassophilus pieperi* ERBER, described from other cave but also occurring in "Gruta dos Cardais" (ERBER, pers. comm.). Now the number of cave arthropod species known to occur in Madeira is five (see OROMI, 1993 and SERRANO, 1993), being this number probably far from the reality.

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MATERIAL AND METHODS

All the sampling effort was carried on the lava tube complex of Cardais. This cave system is located in the North part of Madeira island, in the recent volcanic system of S. Vicente (see CARVALHO & BRANDÃO, 1991). The precise location is U.T.M. CB 0831 and the altitude 50-100 m. The vegetation in the area over the cave system is the natural Laurel forest.

Sets of eight baited pitfall traps (radius 70 mm and depth 100 mm) were used to obtain samples of the pavement surface of the cave. Some traps were dug into the ground while others were placed inside cracks. The killing-preserving agent used was Turquin (TURQUIN, 1973). Each pitfall trap had, as an additional attractant, a piece of Danish-Blue cheese, suspended from the edge of the trap.

The traps sampled continuously the epigeal cave fauna between the 29th November 1991 and the 21 July 1993, being emptied two-three months. A total of four carabid beetle specimens were collected. Other two were caught by direct searching on the 25th November 1992.

Trechus fulvus madeirensis n. ssp.

Figs. 1, 2, 3 and 4

Type locality: Madeira Island (Gruta dos Cardais, S. Vicente).

Type material: Holotype: 1 male, 25 Nov. 1992, Gruta dos Cardais - S. Vicente, Madeira (A. SERRANO leg.). Deposited in coll. A. SERRANO, University of Lisbon, Faculty of Sciences; Allotype: 1 female, 20 Febr.-7 May 1992, Gruta dos Cardais - S. Vicente, Madeira (A. SERRANO leg.). Deposited in coll. A. SERRANO, University of Lisbon, Faculty of Sciences; Paratypes: 1 male, May-24 Sept. 1992, Gruta dos Cardais - S. Vicente, Madeira (D. ERBER leg.); 1 male and 1 female, same locality, but 24 Sept.-17 Nov. 1992 (D. ERBER leg.); 6 males and 4 females, same locality, but 17 Nov. 1992-2 Febr. 1993 (D. ERBER leg.); 1 female, same locality, but 25 Nov. 1992 (A. SERRANO leg.); 1 male, same locality, but 25 Nov. 1992-18 Febr. 1993 (A. SERRANO leg.); 5 males and 2 females, same locality, but 2 Febr.- 11 March 1993 (D. ERBER leg.); 1 male and 1 female, same locality, but 20 May-21 Jul. 1993 (A. SERRANO leg.). One male and one female Paratypes, deposited in coll. A. SERRANO, University of Lisbon, Faculty of Sciences. Two males and one female Paratypes, deposited in coll. P. BORGES, University of Azores in Terceira (U.A.T.). Eleven males and six females Paratypes, deposited in coll. D. ERBER, Giessen-Lahn (Germany). One male and one female Paratypes, deposited in coll. of Museu Municipal do Funchal (Madeira).

Diagnosis: recognized by the form of the pronotum (Figs 1 and 3a) and the shape of the aedeagus (Fig. 4a).

DESCRIPTION

Size - Body length: 4,13-5-28 mm (average= 4.90 mm) for males (N=5) and 4,16-4,95 mm (average= 4,70 mm) for females (N=4); **body width:** 1,57-2,11 mm (average=1,92 mm) for males (N=5) and 1,60-2,01 mm (average= 1,88 mm) for females (N=4). **Habitus** as in Fig. 1.

Integument - Body uniformly depigmented, reddish-testaceous. First four segments of the antennae yellowish, being all the others dark yellow to reddish. Appendages yellowish. Median part of labrum darker.

Head - Small, ovate. Frontal furrows deep; labrum with the anterior border slightly concave, with six setae. Eyes well developed and slightly convex (Fig. 2a); temples shorter than the eyes width.

Antennae - Length: 2,08-3,00 mm (average= 2,66 mm) for males (N=5) and 2,24-2,79 mm (average= 2,57 mm) for females (N=4). Elongate, about 0,55x as long as the body length; the 3rd antennomere 1,22x as long as the 2nd.

Pronotum (Fig. 3a) - Convex and transverse, about 1,42x as broad as long (N=9). Widest part in the anterior third. Side margins rounded and slightly curved beyond the hind angles. Anterior angles rounded. Hind angles sharp.

Elytra - Oblong, with rounded shoulders; shoulder with a small tooth. About 1,46x as wide as the pronotum (N=9). Long, distinctly longer [1,52x for males (N=5) and 1,46x for females (N=4)] than broad. Apex rounded. Striae conspicuous with the external ones as punctured as the internal. Recurrent stria connected to the 5th. Interstriae convex. Lateral furrows canaliculate. Apterous.

Chaetotaxy - Elytral setae as in *Trechus fulvus*. Umbilical series normal (4+2+2).

Legs - As in the nominal subspecies.

Aedeagus - As in Fig. 4a; length 1,23 mm; shape as in *T. f. maroccanus*. Internal sac as in the nominal subspecies (*T. f. fulvus*) (Figs. 4c and 4d). Apex as in Fig. 4b. Left paramere with five setae (Fig. 4a).

Derivatio nominis. Named after the island of Madeira, wher the specimens were collected.

Bionomics. It was collected using pitfall traps and by means of intensive search in "Gruta dos Cardais" (Thistle Cave). One specimen was collected in the dark parts of the main linear tube, but the majority were sampled near the entrance of a small ovate-shaped cave located nearby the main tube.

The subspecies of *Trechus Fulvus*

CASALE & LANEYRIE (1982) listed eleven subspecies of *Trechus fulvus* DEJEAN. However, three of these subspecies were synonymized with the nominal subspecies and

with the *T. f. primigenius* by JEANNE & ZABALLOS (1986). Therefore, and according with these authors, the actual number of known *Trechus fulvus* subspecies is nine:

- *Trechus fulvus fulvus* DEJEAN, 1831 (= *perezi* CROTCH, 1869; = *cephalotes* PUTZEYS, 1870; = *rathkei* HELLIESEN, 1892; = *vasconicus* JEANNEL, 1920; = *primigenioides* JEANNE, 1974). Distribution: Western Europe.

- *T. fulvus troglodytes* JEANNEL, 1920. Distribution: Northwest of the North Iberian Mountain Chain.

- *T. fulvus primigenius* JEANNEL, 1920 (= *fulvoides* JEANNE, 1974). Distribution: Southern parts of Portugal and Spain.

- *T. fulvus vernerii* JEANNEL, 1920. Distribution: Southern part of Andaluzia (Spain).

- *T. fulvus andalusiacus* JEANNEL, 1927. Distribution: Andaluzia (Spain).

- *T. fulvus nevadensis* JEANNE, 1967. Distribution: Sierra Nevada (Spain).

- *T. fulvus lapidosus* DAWES, 1949. Distribution: England and France (coasts of the English Channel).

- *T. fulvus maroccanus* ANTOINE, 1928. Distribution: Morocco.

- *T. fulvus madeirensis* n. ssp. . Distribution: Island of Madeira.

From the analysis of the list presented above it can be inferred that this species has an Atlantic type of distribution: littoral coasts of the southwest of Norway, British Isles, Atlantic coasts of France, almost all the Iberian Peninsula, one locality in the North of Morocco and the Island of Madeira.

DISCUSSION

ESPANOL (1965) stated that the southerly subspecies of *T. fulvus* have more cavernicolous ecological affinities and JEANNEL (1927) presented *T. fulvus troglodytes* and *T. fulvus vernerii* as the best adapted subspecies to the cavernicolous life. Following JEANNEL (*op. cit.*), we may affirm that *T. fulvus primigenius* is the archaic subspecies, being macropterous and having well developed eyes.

The development of the eyes of *T. fulvus madeirensis* n. ssp. links this new *taxon* with the lucicolous subspecies. However, all the 26 known specimens were collected in the cavernicolous environment, not only in the entrance perimeter but also in zones with total lack of light. Moreover, no one, to our knowledge, ever collected specimens of this new subspecies in the epigeal habitats of Madeira, in spite of the great collecting effort performed during this century.

Therefore, having in mind the new nomenclature proposed recently for the classification of the terrestrial subsoil fauna in the Canary Islands (ESQUIVEL & COURT, 1992; see also OROMI, 1993), we may consider *T. fulvus madeirensis* n. ssp. as a Troglophile.

The occurrence of a great number of species of epigeal *Trechus* in the lucicolous natural forest environments of Madeira, may eventually explain the reduced distribution of this new *taxon*. *T. f. madeirensis* n. ssp. may probably be the result of an old colonization; so its actual limited distribution in the north of the island may be explained as a relict distribution of a previous and more extensive one. Otherwise, its present distribution may also be a consequence of a more recent colonization, being its spread capacity constrained by diverse ecological factors (e.g. competition). Favouring this second hypothesis is the fact of no specimens being yet known from other cave systems of the island (e.g. Furnas do Cavalum, Machico).

Using the known distribution of the several subspecies of *Trechus fulvus* and basing ourselves on some morphological features, we may establish some connections. Taking in account:

- the index W/L of pronotum, the subspecies *fulvus* and *verneri* are the most similar to *madeirensis* n. ssp.;
- the shape of pronotum, the similarity is again with the nominal subspecies but also with *primigenius* and *andalusiacus*;
- the shape of the aedeagus, is similar to *maroccanus*;
- the internal sac, resembles the nominal subspecies.

Thus, having in mind the actual distribution of the *fulvus* complex and the connections presented before, we may conceive the hypothesis of a colonization by long distance dispersal with origin in the south of the Iberian Peninsula or northern of Africa .

Interestingly, *T. fulvus madeirensis* n. ssp. is the first record of a *taxon* belonging to the *Trechus fulvus* group (*sensu* JEANNEL, 1927) for the Macaronesia. Also noticeable is that this is the first *Trechus* species recorded for the cavernicolous environment of Madeira, but not related to any epigeal known species (all belonging to the *tingitanus* group *sensu* JEANNEL, *op. cit.*).

Therefore, as in the Azores, there is in Madeira a lack of no relict *Trechus* in caves (see BORGES & OROMI, 1991).

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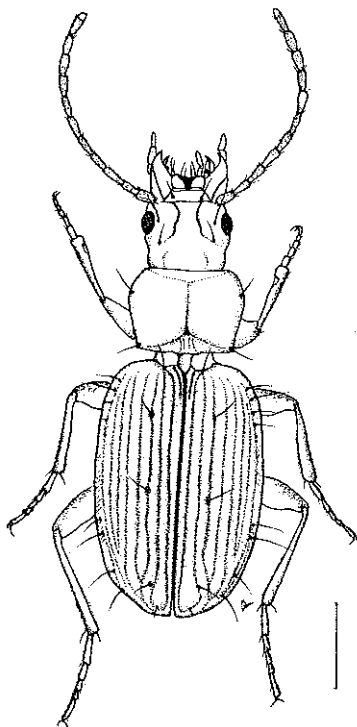


Figure 1 - Dorsal view of *Trechus fulvus madeirensis* n. ssp.: habitus (allotype female). Scale: 1 mm (original drawing by A. R. M. SERRANO).

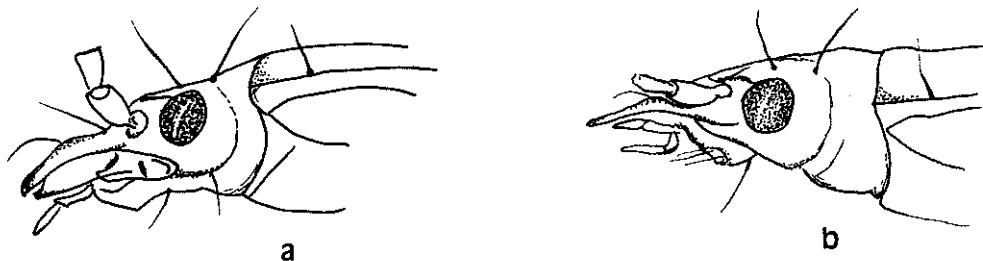


Figure 2 - Lateral view of the head of: a= *Trechus fulvus madeirensis* n. ssp. (holotype male); b= *Trechus fulvus fulvus* DEJEAN, 1831 (Torres Vedras, Continental Portugal). Scale: 1 mm.

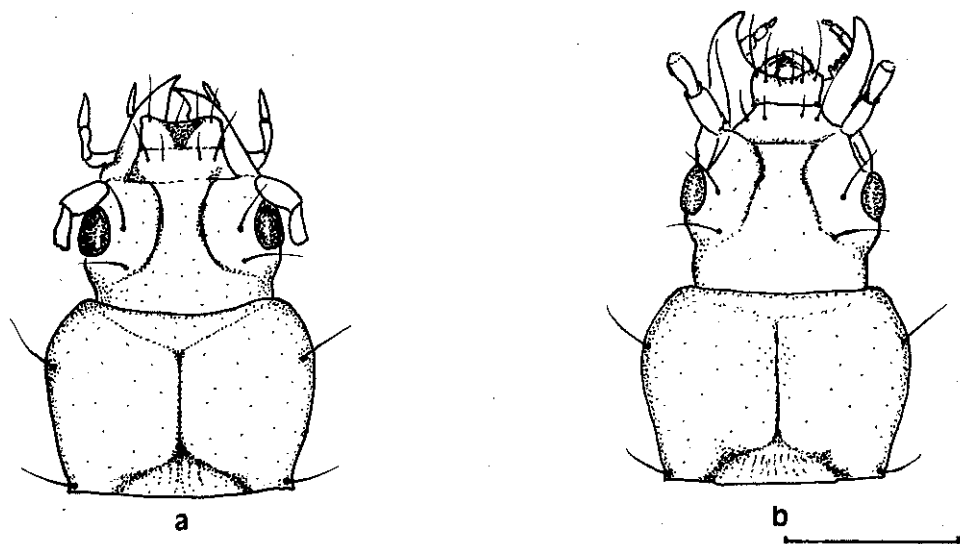


Figure 3 - Pronotum: a= *Trechus fulvus madeirensis* n. ssp.; b= *Trechus fulvus fulvus* DEJEAN, 1831. Scale: 1 mm.

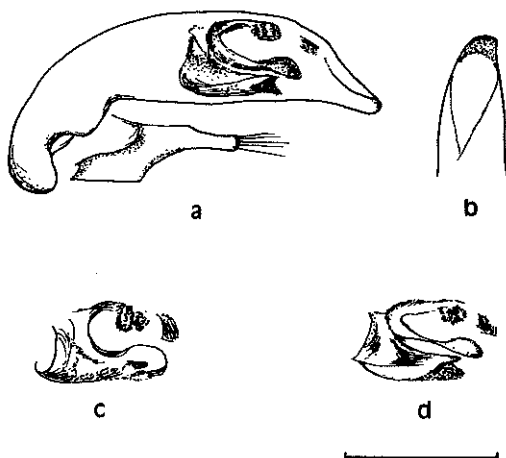


Figure 4 - *Trechus fulvus madeirensis* n. ssp. (holotype male): a= lateral view of aedeagus; b= apex of aedeagus (dorsal view); c= dorso-lateral view of internal sac; d= ventro-lateral view of internal sac. Scale: 0.5 mm.