

First record of *Limnastis galilaeus* Brullé, 1875 and *Parazuphium chevrolati* (Castelnau, 1833) (Coleoptera, Caraboidae) in the subterranean habitat from Southern Dobrudja, Romania

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(With 5 figures)

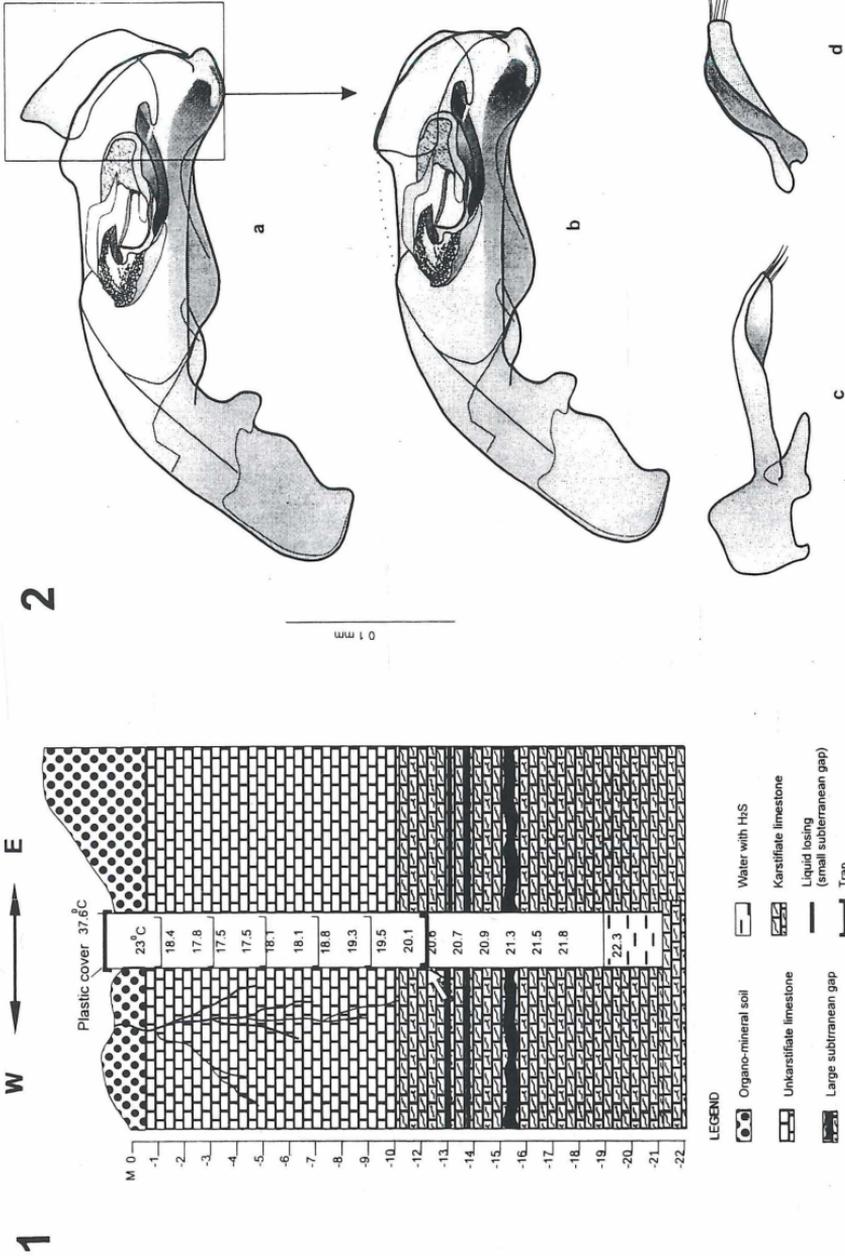
Abstract

Two beetle species belonging to the Trechinae (*Limnastis galilaeus* Brullé, 1875) and Zuphiinae (*Parazuphium chevrolati* Castelnau, 1833) subfamilies are for the first time recorded at 10 to 13 m depth in the subterranean habitat, from Southern Dobrudja, Romania (a thermal environment near to the Black Sea). The male genitalia of both species are described and illustrated. A zoogeographical interpretation of the fauna specific feature from the Southern Dobrudja is proposed.

Introduction

Earlier entomofaunistic studies from Dobrudja (Ienistea 1968, Săvulescu 1959) have demonstrated a characteristic structure in zoogeographic elements of this area. Thus, is remarkable the coexistence of a high percentage of Caspian elements (over 15 %), with Ussuric and Mediterranean elements (Nitzu 1991, 1992). The great number of endemic species and subspecies from this region have determined some zoogeographers to appreciate Dobrudja as a distinct part of the Mediterranean glacial refuge. It was included in the Ponto-Mediterranean subrefuge (G. de Lattin 1967) or in the Pontian region (Pawlowski 1979).

Subsequent investigation in the "Movable Cave" from Southern Dobrudja, situated at 15 m depth (a cave without natural entrance, with thermomineral waters containing H₂S), have led to discovery of new species of cave beetles (Decu *et al.* 1994, Decu & Georgescu 1994, Poggi 1994). More than 20 new species of invertebrates, from deep and superficial underground compartments ("milieu souterrain superficiel" - Juberthie *et al.*, 1981 a, b) in Southern Dobrudja have been described in the last ten years of investigations. This determined us to a more accurate sampling of the fauna inhabiting here. Two interesting species of carabid beetles [*Limnastis galilaeus* Brullé, 1875 and *Parazuphium chevrolati* (Castelnau, 1833)] were for the first time collected from the underground compartment of Dobrudja, at 13 m depth.



Figs 1-2. 1 - Profile of the drilling revealing the placement of traps (arrow indicates the position of the trap in which the species were found); 2 - *L. galliaeus* Brullé (Sardinia, U. Lostia, Coll. Kaufman): a - aedeagus with removed dorso-apical plate; b - the same with the dorso-apical plate in natural position; c - left paramer; d - right paramer.

Materials and Methods

The fauna has been collected from underground habitat using traps with olfactory attractant, placed at different levels in two drillings of 20 and 22 m depth.

One drilling is situated near the fossil passage of the Movable Cave, and the other, in a depression, at 30 m N of the principal passage of the cave. The drillings penetrate a layer of organo-mineral soil with maximum depth of 1 m, and then a thick layer of oolitic and lumachelic limestone, traversed by a dense net of cracks. Eight traps have been placed at each 2 meters depth. The temperature of drillings varies with the exterior temperature in the first two meters, and becomes constant with increasing of the depth (Fig. 1). It takes values between +20 and +20.3 °C, at -10 m (depth where the specimens have been captured), in the estival season, and between +18.5 °C and +19 °C in the hibernal season. Between -19 and -20 m, there exists water containing H₂S with a constant temperature of +22 °C to +22.3 °C. A parallel sampling in the edaphic habitat was made using Barber and light traps. No specimen of *Limnastis* or *Parazuphium* was captured from the surface or from the traps placed in drillings at superior levels.

M a t e r i a l : *L. galilaeus* (Coleoptera, Trechinae). 2 males, 3 females (9 Sept. 1995), at -10 m, in subterranean habitat, Mangalia, Southern Dobrudja. *P. chevrolati* (Coleoptera, Zuphiinae). 1 male, in the same trap with *L. galilaeus*.

The specimens are deposited in the scientific collection of the Speleological Institute "E. Racovitză" in Bucharest; two individuals of *L. galilaeus* are housed in the Zoologisches Museum Hamburg (ZMH Reg. No. 10.1997).

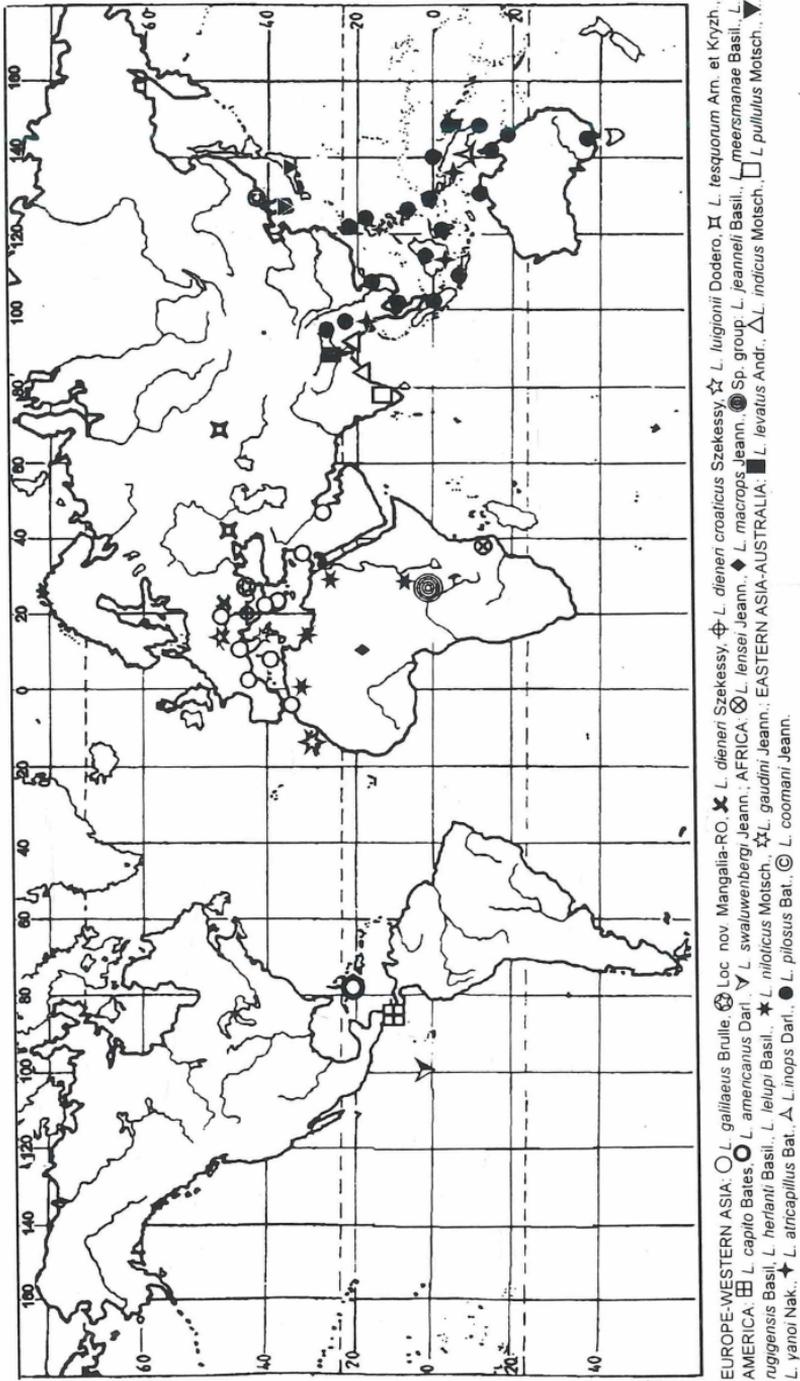
Discussion

R. Jeannel (1932) wrote in his revision of genus *Limnastis*: "Je n'ai pas pu voir de mâles de cette espèce". In consequence, the male genitalia of *L. galilaeus* was not described or illustrated until 1937, when W. Székessy published a drawing of the shape of aedeagus, after a specimen from Korfu.

The specimens from Mangalia, examined at SEM and at dissecting microscope, correspond with the description of *L. galilaeus* given by earlier coleopterologists (Ganglbauer 1892, Porta 1923, Jeannel 1932, 1941, Csiki 1946). They were also compared with 1 male and 1 female of *L. galilaeus* from Sardinia (U. Lostia, coll. Kaufman, Natural History Museum in Vienna).

No essential differences were observed between the male genitalia of the specimens from Mangalia and from Sardinia. They essentially differ from the drawing given by W. Székessy. The aedeagus presents a large, triangular, ventral lobe with a left side insertion [similar to that figured by Jeannel (1932) for *L. pilosus* Bates, 1892], and a smaller ventral lobe, nearer to the basal bulb, with a right side insertion. At the dorso-apical side, between the ostial region and the aedeagal apex, a movable plate could be observed (Fig. 2). Each paramer presents 3 apical setae.

Limnastis galilaeus has a circum-Mediterranean range. Until now only isolated populations have been recorded from Northern Tyrol (Freude, Harde & Lohse 1976) and from Hungary: Budapest, Siðfok (Lake Balaton), Szeget (Csiki 1946). All these sites are situated in hydro-thermal regions (with water sources having temperatures among 20 °C and 25 °C) (Fig. 3). In contrast with formerly recordings, most of them

Fig. 3. Distribution of the genus *Limnastis* Motschulsky.

based on captures at light traps (Jeannel 1932), the specimens of *L. galilaeus* from Mangalia were for the first time collected in the underground compartment (in the net of cracks), near a thermo-sulphurous aquifer from the Pontic region (first recording of species in the Romanian fauna).

The male of *P. chevrolati* captured in the same conditions with *L. galilaeus* is completely pigmentless (white-yellowish), with divergent genae and with reduced eyes. After the external morphology, he corresponds with the description of *Parazuphium chevrolati unicolor* (Germar, 1839). The aedeagus differs from all drawings given by Hurcka & Pulpan (1981), including *P. chevrolati unicolor* (Fig. 4). The males of *P. chevrolati*, captured from different regions of the range, being very rare in the scientific collections, we can not be sure that the differences between genitalia observed by Hurcka & Pulpan *l.c.* (based on few specimens from distant sites) or by us, are the expression of the existence of real subspecies, or express a clinal or an individual variation. Under this restriction, the male of *P. chevrolati* collected from the underground compartment in Mangalia, could belong to a new subspecies. Only a study based on a large series of individuals, collected from different sites of the specific range, could give a precise answer.

P. chevrolati has a Western-Mediterranean range (Fig. 5). Isolated populations have been recorded in Central and Eastern Europe and only from thermal biotops. *Parazuphium chevrolati praepanonicum* (Endrödy, 1958) is known from the Borzsöny Mountains (Hungary), a limestone area with positive thermal anomalies (Hurka & Pulpan 1981). In Romania, the species has been recorded in 1905 and 1908 in Deva-Geoagiu zone (a region with thermomineral aquifer, with a temperature of +28.2 °C to +30 °C) and in Băile Herculane (a thermomineral zone with temperatures varying between +28 °C and +30 °C) (Csiki, 1905-1908, 1946). The male of *P. chevrolati* captured at Mangalia represents the first recording of the species in the underground environment in the Pontic region.

The presence of this two rare species in the underground habitat from Southern Dobrudja could be explained if we refer to some of the abiotic conditions of this area. Southern Dobrudja is a steppe region with a humidity deficit in the estival-autumnal seasons (yearly rainfall 350 mm, evaporation 750 mm). In these conditions the edaphobiont thermo-hygrophil species succeed to survive in micro-refuges offered by the net of cracks from limestone. In this net, near the deep thermomineral aquifer, the humidity and temperature are relatively constant for all periods of the year. We believe that this species (known as hygrophil and edaphobiont species in the rest of their range) has the possibility to make seasonal movings, in the cracks net of limestone. They move toward surface - in spring season, and toward thermomineral underground compartment - in estival to hibernal seasons. This moving could be possible because of the specific features of the karst of "Movile type" as it was described by Constantinescu (1996).

Zusammenfassung

Zwei Laufkäfer-Arten [*Limnastis galilaeus* Brullé, 1875 und *Parazuphium chevrolati* (Castelnau, 1833)] wurden zum ersten Mal in dem unterirdischen Lebensraum (bei 13 m Tiefe), in der Süd-Dobrogea, Rumänien (in einer hydrothermalen Karstzone in der Nähe des Schwarzen Meeres erbeutet. Beide Arten sind in dem mediterran Gebiet verbreitet. Nur selten

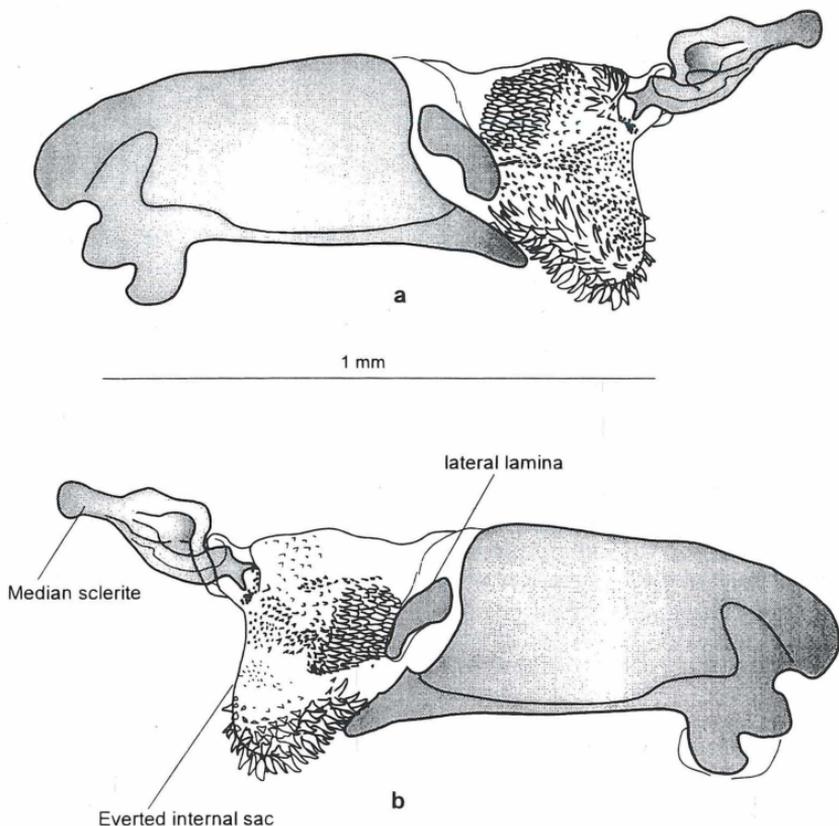
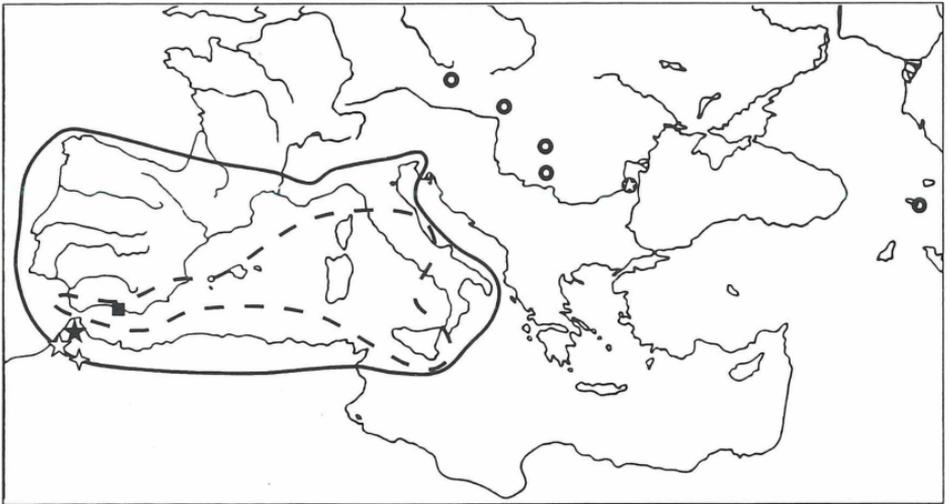


Fig. 4. *P. chevrolati* (Castelnau): aedeagus with everted internal sac; a- left side view; b- right side view.

wurden sie vereinzelt im Mitteleuropa und zwar nur in Zonen mit einem hohen Thermalismus gemeldet. Die männlichen Genitalarmaturen beider Arten sind hier beschrieben. Zum Ende ist eine kurze chorologische und öko-zoogeographische Analyse über die Bedeutung der Anwesenheit dieser Arten in der unterirdischen Fauna der pontischen Region dargestellt.

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● The thermal sites where *P. chevrolati* was found in Central Europe ● Mangalia, RO, Loc. nov. ★ *P. vaucheri* (Vauloger) ■ *P. ramirezi* J. & E. Vives
 ✧ *P. angusticolum* Hurka ☆ *P. punicum* (K & J. Daniel)

Fig. 5. Distribution of the genus *Parazuphium* Jeannel [stippled line: the range of *P. baeticum* Daniel; solid line: the range of *P. chevrolati* (Castelnau)].

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