

FIRST RECORDS FOR THE MESOCAVERNOUS SHALLOW STRATUM (M.S.S.) FROM THE AZORES

by

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I - INTRODUCTION

During a pitfall survey accomplished in the Azores by the author in 1989, 1990 and 1991 (see BORGES, 1992a and in prep.), the mesocavernous shallow stratum - M.S.S. ["Milieu Souterrain Superficiel" sensu JUBERTHIE (1983)] was investigated. The field work in St. Maria was done during the Zoological Expedition of the University of Azores (Department of Biology) between 11th and 19th June 1990.

The presence of the M.S.S. in volcanic islands was only previously described from the Canary Islands (see MEDINA, 1991), also belonging to the same biogeographical region of the Azores, the Macaronesia. The existence of this habitat (in that time named "Superficial Underground Compartment") in the Canary islands was first cited by OROMÍ *et al.*, only in 1986.

The first record of a troglobite from the Azorean M.S.S. was made by BORGES and OROMÍ (1991), referring the presence of the ground-beetle *Trechus terceiranus* Machado in this habitat of Terceira Island.

The goal of the current work is to present a preliminary overview on the occurrence of the mesocavernous shallow stratum (sensu ASHMOLE *et al.*, 1990) in two Azorean islands, the geologically young island of Terceira (0.30 m.y.) (FERAUD *et al.*, 1980) and the oldest island of the archipelago, S. Maria (8.12 m.y.) (ABDEL-MONEM *et al.*, 1975).

II - STUDY AREA

In Terceira the experimental work was performed on the slopes of Serra de Santa Bárbara near Pico Rachado (10 000 years old) (FORJAZ, 1988), U.T.M. 429002-47208. The field site is a ramp in a recent forest track. The altitude is about 530 m.

In S. Maria three different stations were investigated. Two in the slopes of Pico Alto, Pico do Penedo (U.T.M. 409400 / 67106) and Pedreira Vermelha (U.T.M. 409402 / 66908); the third at Poço Grande in the northeastern part of the island (U.T.M. 409505 / 67200). The first two field sites are on the edge of forest tracks and Poço Grande is a small cut in a pasture.

III - SAMPLING METHODS

In Terceira, a set of three pitfall traps sampled the field site continuously from 16th February to 11th August 1990, being emptied fortnightly. The pitfall traps used had a radius of 22 mm and a depth of 80 mm. They were dug into the subsoil as explained by MEDINA (1991). The killing-preserving agent used was a modified formula of the TURQUIN liquid (TURQUIN, 1973) proposed by ASHMOLE and ASHMOLE (1987): 10g chloral hydrate, 5 ml formalin, 5 ml glacial acetic acid, 1 ml detergent and dark beer to 1 litre. A solid bait (Azorean cheese from Pico) was also suspended over the liquid.

In S. Maria, six pitfall traps like those described above remained placed continuously between the 15th June and 20th August 1990. The traps were distributed differently by the three field stations: Pico do Penedo (3), Pedreira Vermelha (2) and Poço Grande (1).

IV - RESULTS AND DISCUSSION

IV. 1 - Types of M.S.S.

Terceira. After some field excursions by the island, it was decided to choose the Pico Rachado area to investigate the existence of the M.S.S. The presence of a recent forest penetration way crossing a vast area of autochthonous vegetation made it the ideal place for this study.

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The pitfall traps were dug in a ramp with excellent conditions for this type of studies. After a careful observation of the geomorphology of the site, it was classified as the "demolished M.S.S." very similar to the french "éboulis de flanc de montagne" (see JUBERTHIE, 1983). We will use the symbols (M.S.S.D.) previously used by MEDINA (1991).

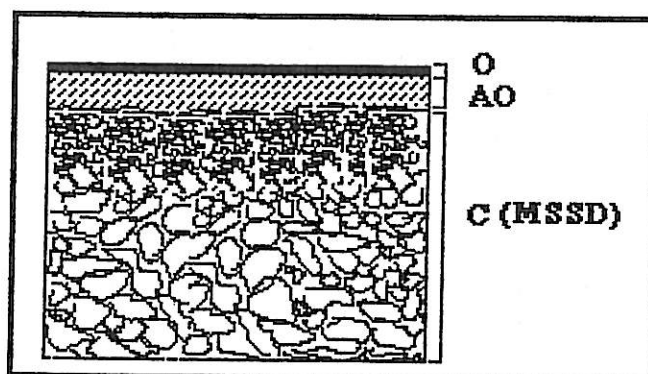


Fig. 1 - Schematic section of soil horizons in the "demolished mesocavernous shallow stratum" from Pico Rachado (Terceira, Azores). O = Organic horizon; AO = A horizon with organic material; C = C horizon (M.S.S.D.).

As we can see from the scheme in Fig. 1, it is not possible to detect the presence of the basaltic parent rock, although it can be well discriminated in the lateral bordering areas. The vegetation is well developed as well as the AO horizon.

The Pico Rachado M.S.S.D. was formed by the accumulation of rock fragments from the lateral slopes. In this C horizon the upper rocks are smaller, slightly resembling the volcanic MSS from the Canaries (M.S.S.V.) (MEDINA, 1991).

S. Maria. During the Zoological Expedition of the University of Azores "S. MARIA-90" we had the opportunity of making a one day field survey of the MSS. As a consequence of that, three field sites were elected and trapped.

The type of M.S.S. found was the typical one (M.S.S.T.) (JUBERTHIE, 1983) being the C horizon formed by the continuous alteration of the basaltic parent rock, extremely compact in its origin, but progressively changing to a typical pattern of cornered rocks separated by empty spaces (MEDINA, 1991).

IV. 2 - The Fauna

As a consequence of the pitfall survey made in the Azorean M.S.S., a total of 6102 specimens of arthropods were collected (4051 in Terceira and 2051 in S. Maria). In Fig. 2 and 3 we can visualize the differential attraction of the arthropods by the pitfall traps used during six months in the M.S.S.D. of Pico Rachado (Terceira) and during two months in the M.S.S.T. of three field sites in S. Maria.

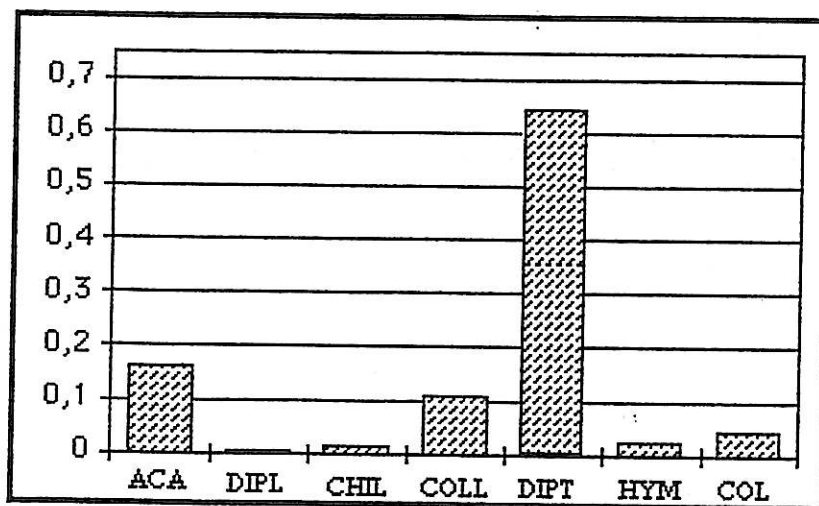


Fig. 2 - Differential attraction of the arthropods by three pitfall traps using during six months in the M.S.S.D. of Pico Rachado (Terceira). ACA = Acari; DIPL = Diplopoda; CHIL = Chilopoda; COLL = Collembola; DIPT = Diptera; HYM = Hymenoptera; COL = Colcoptera.

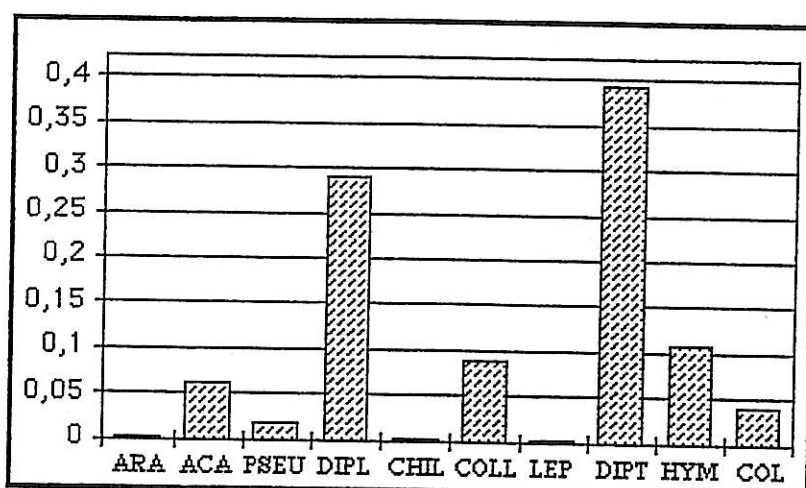


Fig. 3 - Differential attraction of the arthropods by six pitfall traps used during two months in the M.S.S.T. of three field places in S. Maria. ARA = Araneae; ACA = Acari; PSEU = Pseudoscorpiones; DIPL = Diplopoda; CHIL = Chilopoda; COLL = Collembola; LEP = Lepidoptera; DIPT = Diptera; HYM = Hymenoptera; COL = Colcoptera.

The Diptera were the best represented group in the samples, distantly followed by Acari and Collembola in Terceira, and closely followed by Diplopoda in S. Maria. Concerning the Diptera, the species belong mainly to the Phoridae, a family relatively common in caves, that sometimes make an important contribution to the cave fauna.

The majority of the specimens are still unidentified. Nevertheless, some taxa were already object of some particular studies.

Terceira.

- *Lithobius obscurus azoreae* Eason and Ashmole (Chilopoda, Lithobiomorpha)

Commonly found in lava tubes of Terceira, Pico and Faial, the centipede *Lithobius obscurus azoreae* Eason and Ashmole was recently recorded for the M.S.S. of Terceira by EASON and ASHMOLE (1992).

Only few specimens were collected in the M.S.S.D. of Pico Rachado. In Terceira this subspecies was also collected in the following lava tubes: Gruta dos Balcões and Gruta da Madre de Deus.

- *Trechus terceiranus* Machado (Coleoptera, Carabidae)

The troglitic ground-beetle *T. terceiranus* Machado was previously known from only two lava tubes from Terceira (Gruta do Coelho and Gruta dos Balcões) (OROMÍ *et al.*, 1990). It is now reported from two more caves (the volcanic pit Algar do Carvão and the lava tube Gruta do Caldeira) and several specimens were also collected in the Pico Rachado M.S.S.D. This was the first reference to a troglite in the Azorean M.S.S (BORGES and OROMÍ, 1991).

This species is probably largely distributed by all the hypogean environments of Terceira, both in the cave and mesocavernous shallow stratum habitats.

S. Maria.

- Blind Aleocharinae (unidentified genus and species) (Insecta, Coleoptera, Staphylinidae)

On S. Maria in the field site of Pico do Penedo (near Pico Alto) an interesting species of blind Staphylinidae was collected. Only a male was caught. It has some features that resemble an endogean or a troglitic species, such as the absence of eyes and of pigmentation.

Nevertheless, a more detailed study will certainly tell us if the species should be treated, or not, as a true troglite.

- Catopidae (unidentified genus and species) (Coleoptera, Catopidae)

This unidentified genus and species of Catopidae was collected in the Poço Grande M.S.S.T. field site and also in the Pico Alto Climax pattern of autochthonous forest (using pitfall traps). This *taxon* should probably be treated as an endogean species.

According to the last checklists of the Azorean Coleoptera (BORGES, 1990 and 1992b) there are no Catopidae species recorded from this archipelago. Therefore the present species is the first record of the family Catopidae for the Azores.

V - CONCLUSIONS

The M.S.S.D. found in Terceira is more matured than those found in the Canary islands by MEDINA (1991) being the O and AO horizons better developed in the Azorean type.

In S. Maria it is easy to find the typical M.S.S., probably due to the fact that this is the geologically oldest Azorean island.

Most of the species collected in the M.S.S. samples of Terceira and S. Maria can be considered as accidental troglloxenes. Notwithstanding, some troglobitic taxa were also collected and probably future surveys on the Azorean M.S.S. will result in the discovering of more hypogean species.

In conclusion, a more accurate study of the M.S.S. in the islands with no or few lava tubes (e.g. Flores, Corvo, S. Maria and northeast part of S. Miguel) will predictably result in new findings of troglobites and a better knowledge of all the Azorean subterranean fauna.

Acknowledgements. We are very thankful to Prof. P. OROMÍ (La Laguna University, Canary Islands) for his precious comments to the manuscript of this work and to Dr. J. MADRUGA (Dep. Ciências Agrárias, University of Azores) for helping us with valuable information concerning the geology of the field sites. Thanks are also due to Mr. F. PEREIRA (University of Azores, Terceira) and A. SILVA ("OS MONTANHEIROS") for their help during the field work. The former also helped us with the laboratory work. Our work on Santa Maria in June 1990 was partly supported by the University of Azores, Department of Biology.

SUMMARY

Three species of troglobiomorphic arthropods are for the first time recorded for the Mesocavernous Shallow Stratum M.S.S. ("Milieu Souterrain Superficiel" sensu JUBERTHIE) from the Azores. Two species (*Trechus terceiranus* Machado and *Lithobius obscurus azoreae* Eason and Ashmole) occur in young areas (10 000 years old) of Terceira island, for instance on the slopes of Serra de Santa Bárbara. They were previously known only from lava tubes of this island. The third species is an undescribed eyeless Staphylinidae from S. Maria (an island without lava tubes), found in more ancient areas (several million years old).

RESUME

Trois espèces d'Arthropodes troglobiomorphiques ont été pour la première fois récoltées dans le "Milieu Souterrain Superficiel" volcanique des Açores. Deux espèces (*Trechus terceiranus* Machado and *Lithobius obscurus azoreae* Eason and Ashmole) habitent des aires volcaniques jeunes (âgées de 10 000 ans) de l'île Terceira, par exemple sur les versants de la Serra de Santa Bárbara. Ces espèces n'étaient connues jusqu'à ce jour que des tubes de lave de cette île. La troisième espèce est un Staphylinidae anophthalme non décrit de l'île Santa Maria (île sans tube de lave) qui a été trouvé dans les zones les plus anciennes (âgées de plusieurs millions d'années).

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