

NOTES ON THE SYSTEMATICS OF CAVERNICOLOUS ORTHOPTERA OF CRETE

By D. KOLLAROS, K. PARAGAMIAN and A. LEGAKIS

Amongst the species of Orthoptera, there are no strictly cavernicolous animals (trogllobites), but only partly cavernicolous (troglophiles and troglonexes), at least amongst the Greek ones. In Greece, there have been recorded three cavernicolous genera: One genus which belongs to the family Gryllidae (*Discoptila*) and two genera that belong to the family Raphidophoridae (*Dolichopoda* and *Troglophilus*).

Five species have so far been described from Crete: *Dolichopoda paraskevi*, *Troglophilus spinulosus*, *T. roeweri*, *T. petrochilosi* and *Discoptila lindbergi*. Most of them have been based on 2-5 adult specimens from 1-5 caves each. Also, some undescribed new species have been recorded for *Dolichopoda* and *Troglophilus*. The systematics and distribution of these cavernicolous orthopteran species present many problems (concerning mainly the genus *Troglophilus*) because on one hand very few specimens have been examined, while on the other, very few caves have been explored. In order to elucidate these problems, many caves from all over Crete were visited and more than 150 specimens were collected. From the study of their systematic characters, their taxonomy and distribution were revised.

Methods

During our study, we explored 23 caves and cavities, from all over Crete. In 16 of these caves we have found at least one orthopteran species. In Dikteon Andron we have found only one specimen of *Troglophilus* and only a premature female of *Dolichopoda*. We think that the intense touristic exploitation of the cave has provoked a dramatic reduction of the animals' numbers. From the other caves and cavities we have collected a satisfactory number of specimens and have measured many morphometric characters, especially of specimens of the genus *Troglophilus*, which present taxonomic problems.

Results

We have found *Discoptila lindbergi* in two caves for the first time. Their description fits exactly the original description of Chopard (1957). We have recollected specimens of the genus *Dolichopoda* from all the four,

known from the previous records, caves. We have also collected for the first time adult animals of the genus *Dolichopoda* from Peristera and Milatos caves. We don't think that the discrimination of the species of *Dolichopoda* of Crete is possible using the number of teeth on the ovipositor, because it presents a large and almost completely overlapping variability. Boudout-Saltet in her original description of *D. paraskevi* mentions that it had 13 teeth while the unidentified species from Dikteon had 15-16. We found that *D. paraskevi* has from 12 to 15 teeth.

With the genus *Troglophilus* there is a misunderstanding. The geographical separation of Boudout-Saltet is based on the reference of Chopard, who was based in turn on a specimen collected by D. Bate. Reading Bate's article (1913), we have found that she had visited the region of the Monastery of Gonia (in the Dep. of Chania) and not the village Gonia (in the Dep. of Rethimnon). Because of this we cannot say any more that the species *Troglophilus spinulosus* is restricted in central Crete only.

In a review of the *Troglophilus* of Crete the three species were separated by Boudout-Saltet using mainly 4 characters:

- 1) The length of the ovipositor.
- 2) The shape of the teeth of the ovipositors.
- 3) The ratio of the third to fifth maxillary palp segments.
- 4) The presence of keeled tergites... and some others.

Studying a large amount of specimens we started with 30 characters that have been mentioned in the descriptions and decided to keep only 20 because the rest were very subjective. We found that most of the characters are very variable and cannot be used to distinguish the species.

A principal component analysis of all the characters showed that the three principal axes that accounted for 99% of the variation were related to the length of the hind femur, the length of the ovipositor and the number of teeth respectively. According to these three characters, two species can clearly be distinguished. One has no teeth on the ovipositor, the length of the ovipositor ranges from 3-4 mm and the length of the hind femur ranges from 15-16 mm. This corresponds with *T. roeweri*. The other has 8-9 teeth on the ovipositor, the length of the ovipositor is 10 mm and the length of the hind femur ranges from 20-21 mm. This corresponds with *T. spinulosus*.

We have studied the ovipositors' edges of mature females of *T. spinulosus* and *T. petrochilosi* and they present only a small difference. The last two teeth are closer in *T. petrochilosi*. The question is if this unique character is adequate to separate the two species.

The problem will complicate if the type of *T. roeweri* is an immature animal, as it is suspected from previous reserchers because it is smaller and has no teeth on the ovipositor. However we have found caves where no specimens are large (length of hind femur up to 16 mm) and no female had an ovipositor longer than 4 mm. Especially from Agia Paraskevi cave, we have collected animals throughout all the year and we have found no bigger specimens.

Therefore we conclude that there are at least two species but their description must be revised and it must include culturing and cross breeding and other methods.

The coexistence of the three genera in one cave has been confirmed in the caves of Agia Paraskevi and Milatos. This permitted us to study the differentiation of their niches. *Dolichopoda* prefers the interior of the cave, *Discoptila* the middle part and *Troglophilus* prefers places in front and after the entrance. In addition, *Dolichopoda* choose the walls of the cave while *Discoptila* the spaces between the rocks and the stones on the caves floor. *Troglophilus*, which is living at places influenced by the photoperiod, is active during the twilight and the night, especially during the seasons with intense light.

Summary

In order to elucidate the systematic problems of cavernicolous Orthoptera of Crete, many caves from all over Crete were visited and more than 150 specimens were collected. From the study of their systematic characters, their taxonomy and distribution were revised. The dominant cavernicolous Gryllidae species on Crete (*Discoptila lindbergi*) is distributed over all the island. The genus *Dolichopoda* is restricted to central-west Crete only. The possible presence of new species of *Dolichopoda* is discussed. The genus *Troglophilus* is distributed all over the island. Two species are confirmed and their distribution is extended, while the systematic position of the third is doubtful.

Περίληψη

Επισκεφθήκαμε πολλές σπηλιές από όλη την Κρήτη και συλλέξαμε περισσότερα από 150 δείγματα σπηλαιόβιων Ορθοπτέρων. Με βάση τους συστηματικούς τους χαρακτήρες, επιχειρούμε να διαλευκάνουμε τα υπάρχοντα προβλήματα που αφορούν την ταξινόμηση και την εξάπλωσή τους. Το επικρατές σπηλαιόβιο είδος Γρυλλίδων στην Κρήτη, είναι το είδος *Discoptila lindbergi*, που κατανέμεται σ' όλο το νησί. Το γένος *Dolichopoda* είναι περιορισμένο μόνο στην Δυτική και Κεντρική Κρήτη. Εξετάζεται η πιθανή παρουσία νέων ειδών του γένους *Dolichopoda*. Το γένος *Troglophilus* κατανέμενται σε όλο το νησί. Κατά την άποψή μας υπάρχουν δύο είδη με εκτεταμένη εξάπλωση, ενώ η συστηματική θέση του τρίτου είναι αμφίβολη.

BIBLIOGRAPHY

- BATE, D., 1913 – The caves of Crete. In: A. Trevor-Battye. *Camping in Crete*. p.p. 239-253.
 BERON, P. – Aperçu sur la faune cavernicole de la Grèce. *Biol. gallo-hellen.* (in press).
 BOUDOU - SALTET P., 1973 – Les Dolichopodes (Orth. Rhaph.) de Grèce. VIII. Nouvelles espèces de Crète. *Biol. gallo-hellen.* 5(1): 57-63.
 BOUDOU - SALTET, P., 1978 – Sur les Troglophiles (Orth. cavernicoles) de Grèce. *Bull. Soc. Hist. nat. Toulouse*, 114(1-2): 115-121.

- CHOPARD, L., 1921 – Description d'une espèce nouvelle du genre *Troglophilus*. *Bull. Soc. ent. Fr.* p.p. 147-151.
- PARAGAMIAN, K. and LEGAKIS, A., 1986 – Ecological and faunistic investigations of cave Ag. Paraskevi near Skoteino (Crete, Greece). *Rapp. Comm. int. Mer Medit.* 30(2): 99.
- POPOV, A., 1984 – Le genre *Discoptila* Pant. (Orthoptera, Gryllidae). *Biol. gallo-hellen.* 11(1): 65-78.
- WILLEMSE, F., 1984 – *Catalogue of the Orthoptera of Greece*. Fauna Graeciae I. Athens.
- WILLEMSE, F., 1985 – *A key to the Orthoptera species of Greece*. Fauna Graeciae II. Athens.

*Dep. of Biology. University of
Crete. Iraklion. Greece*