

THE CAVE DWELLING ARTHROPODS OF DIM CAVE (TURKEY: ANTALYA: ALANYA)

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ABSTRACT: This study was carried out in order to determine the speleofauna of Dim cave. As a result of the study, totaly 25 taxa were determined. All the taxa determined were firstly reported for this Dim cave; among them, *Meta menardi* and *Neobisium (Ommatoblothrus) epirensis* are new for Turkish fauna.

KEY WORDS: Arthropoda, Biospeleology, Dim Cave, Fauna

INTRODUCTION

The geological formation and variation of Turkey contributes to its own biodiversity. According to the data from MTA (General Directorate of Mineral Research & Exploration), karstic systems that covers 2/5 of the country and caves (thousands of them exist) present a lot of species that passed to underground during the past geological periods and over time have become isolated from the surface.

The first study concerning the fauna of caves of Turkey was made at Yarımburgaz cave (İstanbul) by the Hungarian scientist Colonel Dr. Abdullah Bey, during the year 1865, and these findings were published in 1867 in France (Erguvanlı, 1965).

During the 20th century, studies by foreign scientists were particularly plentiful, however, these studies were not baged on a systematic, purposeful sampling; instead of, identification of the samples by foreign experts that were collected and taken abroad.

The most striking ones amongst them are; French entomologist René Jeannel (1933, 1934, 1947a, 1947b, 1955a, 1955b and 1957) and Italian entomologist Augusto Vigna Taglianti's (1973, 1977, 1978a, 1978b and 1980) on Coleoptera (Insecta), Italian arachnologist Paolo Marcello Brignoli's (1968, 1971, 1972, 1978a, 1978b and 1979) on Araneae (Arachnida); Strouhal (1953a, 1953b, 1963 and 1971), Vandel (1957) and Verhoeff (1936)'s studies on the terrestrial isopods all sampled from Turkish caves .

Cave ecosystems are extremely sensitive ecosystems; and it is well known that the settled fauna of caves that have opened to tourism suffer serious damage (Pulido-Bosch et al., 1997).

The aim of this study is to lead the studies on determining the cave dwelling arthropods of Dim Cave which, in 1996 were hired from the government and in 1998 have opened to the public by the private sector, and ever since is under heavy antropogen effect.

MATERIALS AND METHODS

Dim Cave is at a distance of 145 km. from the city Antalya and 11 km. from the Alanya. The Cave is at a height of 232 metres above sea level and is on the western slope of 1691 metres high Cebel Reis mountain. Dim Cave is a natural and karstic cave. It was formed by the carbonic acid rich rain and snow waters running through the faults and joints dissolving the limestone rocks. Dim Cave is 360 metres long and approximately 10-15 metres in width and height. The interior of the cave is covered by many kinds of dripstone (stalagmites and stalagmites) formations and at present the dripstone formation continues from place to place. At the end of the Cave there is a small lake which is 17 metres deep then the entrance level and approximately 200 m² at the surface. Occurance of the lake depends to the shist level (impermeable) which takes place at the buttom (**fig. 1**).

The sampling studies were made between 2006 June and 2007 September. Directly collected samples from the environment were put into tubes that have 70% ethanol inside, labeled at that moment and then way taken to the laboratory. Samples of soil taken from the cave were put into cloth sacks and carried to the laboratory and transfered into selection mechanism made up of Berlese funnels (**fig. 2**).

During the determination of the specimens; for Araneae (Arthropoda; Arachnida) Brignoli (1968, 1971, 1972, 1978a, 1978b and 1979), Deeleman-Reinhold & Deeleman (1988), Roewer (1959 and 1962); for Pseudoscorpionida (Arthropoda; Arachnida), Manhert (1979), El-Hennawy (1988), Harvey (1990), Henderickx & Vets (2000), Sezek (2003); for Isopoda (Crustaceae; Isopoda) Strouhal (1953a, 1953b, 1963 and 1971); for Chilopoda Zapparoli (1989 and 1994); for Gryllidae and Rhabdiphoridae (Insecta; Orthoptera) Popov (1974), Us (1975) and Rampini & di Russo (2003) were taken as reference. The specimens were deposited in the Arachnology Museum of Turkish Arachnological Society (MTAS).

RESULTS

Kingdom: Animalia
Phylum: Arthropoda
Subphylum: Chelicerata
Classis: Arachnida
Ordo: Araneae

Familia: Filistatidae Ausserer, 1867

Filistata insidiatrix (Forskål, 1775)

General Distribution : Mediterranean

Distribution in Turkey: Hatay: Antakya, Suadiye, Mağaracık (Roewer, 1959)

Familia: Leptonetidae Simon, 1890

Cataleptoneta aesculapii (Brignoli, 1968)

General Distribution: Turkey

Distribution in Turkey: Antalya: Alanya, Damlataş Cave (Brignoli 1968, 1978)

Familia: Pholcidae C. L. Koch, 1851

Hoplopholcus patrizii (Roewer, 1962)

General Distribution: Turkey

Distribution in Turkey: Antalya: Dağ Cave (Roewer, 1962)

Pholcus phalangioides (Fuesslin, 1775)

General Distribution: Cosmopolitan

Distribution in Turkey: Hatay: Samandağ, Mağaracık, Büyük Cave; Diyarbakır: Lice, Korkha Cave (Roewer, 1959)

Familia: Dysderidae C. L. Koch, 1837

Dysdera sp. Latreille, 1804

Harpactea agnoletti Brignoli, 1978

General Distribution: Turkey

Distribution in Turkey: Isparta: İnönü Cave (Brignoli, 1978)

Harpactocrates troglophilus Brignoli, 1978

General Distribution: Turkey

Distribution in Turkey: Isparta: Anamas, Zindan Cave (Brignoli, 1978)

Familia: Nesticidae Simon, 1894

Nesticus cfr. *cellulanus* (Clerck, 1757)

General Distribution: Holarctic

Distribution in Turkey: Hatay: Antakya, Narlıca Cave; Zonguldak: Ereğli, İlksu Cave; Elazığ: Harput, Buzluk Cave; Bitlis: Ahlat, Sultan Seyit Cave (Roewer, 1959)

Familia: Linyphiidae Blackwall, 1859

Troglohyphantes pisidicus Brignoli, 1971

General Distribution: Turkey

Distribution in Turkey: Konya: Beyşehir Lake, Island of Hacı Akif, Hacı Akif Cave (Brignoli, 1971)

Familia: Tetragnathidae Menge, 1866

Meta bourneti Simon, 1922

General Distribution: Europe, Georgia and North Africa

Distribution in Turkey: Yalova: 1. and 2. Soğucak Cave; Bursa: İnkaya köyü, Suini Cave (Roewer, 1959)

Meta menardi (Latreille, 1804)

General Distribution: From Europe to Korea

Distribution in Turkey: New record for Turkish fauna

Familia: Agelesidae C. L. Koch, 1837

Agelescape affinis (Kulczyński, 1911)

General Distribution: Turkey, Syria

Distribution in Turkey: Hatay: Harbiye, Büyük Cave; Bitlis: Ahlat, Sultan Seyit Cave (Roewer, 1959)

Tegenaria percuriosa Brignoli, 1972

General Distribution: Turkey

Distribution in Turkey: Isparta: Anamas, Zindan Cave (Brignoli, 1972, 1978); Isparta: Barla, Barla Cave; Konya: Beyşehir Lake, Island of Hacı Akif, Hacı Akif Cave; Isparta: Anamas, Zindan Cave (Gasparo, 2007)

Familia: Phyxelididae Lehtinen, 1967

Phyxelida anatolica Griswold, 1990

General Distribution: Turkey, Cyprus

Distribution in Turkey: Hatay: Samandağ, Mağaracık, Büyük Cave (Roewer, 1959)

Familia: Salticidae Blackwall, 1841
Hasarius adansoni (Audouin, 1825)
General Distribution: Cosmopolitan
Distribution in Turkey: First observation from Turkish caves

Ordo: Pseudoscorpionida
Subordo: Iocheirata
Superfamilia: Neobisioidea J.C. Chamberlin, 1930
Familia: Neobisiidae J.C. Chamberlin, 1930
Neobisium (Ommatoblothrus) epirensis Henderickx & Vets, 2000
General Distribution: Epirus (Greece)
Distribution in Turkey: New record for Turkish fauna
Neobisium hians (Mahnert, 1979)
General Distribution: Turkey
Distribution in Turkey: Antalya: Döşemealtı, İndağı Cave (Mahnert, 1979)
Neobisium kosswigi (Beier, 1949)
General Distribution: Turkey
Distribution in Turkey: Konya: Beyşehir Lake, Island of Hacı Akif, Hacı Akif Cave (Beier, 1949); Isparta: Kuruçaova, İnönüni Cave, Asarini Cave (Mahnert, 1979)

Subphylum: Myriapoda
Classis: Chilopoda
Ordo: Lithobiomorpha
Familia: Lithobiidae Newport, 1844
Lithobius agilis C. L. Koch, 1847
General Distribution: Europe
Distribution in Turkey: Antalya: Döşemealtı, İndağı Cave (Zapparoli, 1994)
Lithobius erythrocephalus CL Koch, 1847
General Distribution: Macaronesia, Europe, North Africa and Caucasus
Distribution in Turkey: Konya: Beyşehir Lake, Island of Hacı Akif, Hacı Akif Cave; Seydişehir, Ferzene Cave (Zapparoli, 1994)

Subphylum: Crustacea
Classis: Malacostraca
Ordo: Isopoda
Suborder: Oniscidea Latreille, 1802
Familia: Philosciidae Kinahan, 1857
Chaetophiloscia sp. Verhoeff, 1908

Familia: Trichoniscidae Sars, 1899
Trichonethes kosswigi Strouhal, 1953
General Distribution: Turkey
Distribution in Turkey: Denizli: Acıpayam, Dodurga Village, Dodurgalar Cave (Strouhal, 1953)
Trichoniscus sp. Brandt, 1833
Subphylum: Hexapoda

Classis: Insecta
Ordo: Orthoptera
Familia: Gryllidae Bolívar, 1878
Discoptila beroni Popov, 1974
General Distribution: Turkey
Distribution in Turkey: Mersin: Gülnar, a cave which located near to Karatepe village; Antalya: Alanya, Damlataş Cave (Popov, 1974)

Familia: Rhaphidophoridae Brunner von Wattenwyl, 1888
Troglophilus bicakcii Rampini & di Russo 2003
General Distribution: Turkey

Distribution in Turkey: Konya: Beyşehir, Derebucak, Bıçakçı Cave; Çamlık, Dalayman, Balatini Cave; Antalya: Cevizli, Kuyucak, Subaşı Cave (Rampini & di Russo, 2003).

DISCUSSION

As a result of the systematic evaluation of the arthropoda samples collected from Dim Cave, a total of 25 taxa have been determined. Due to the fact that some of the samples characters for identification have not been developed yet or the absence of one-other sex as a sample, some of the specimens could not identified, these are expressed at the genus category. Among the 21 species, *Meta menardi* (Latreille, 1804) (Araneae; Tetragnathidae) and *Neobisium (Ommatoblothrus) epirensis* Henderickx & Vets, 2000 (Pseudoscorpionida; Neobisiidae) are new for Turkish fauna.

M. menardi is a troglophyle species, is a common dweller of the cave ecosystems that prefers to be found in the twilight zone of the caves. (Beron et al., 2004; Smithers 2005). From Europe to the southeast Asia, this species shows a wide distribution. Why this species could not be determined until now, is a result of the rarity of faunistic studies on the habitats that this species prefer (caves, tunnels etc.).

Ommatoblothrus Beier, 1956; composed as a subgenus by Beier (1956) that includes the species of *Neobisium*, that shows the common troglobite characteristics such as longer extremities, pigment loss, absence of eyes or having smaller eyes.

In 1963, only 5 species from this subgenus was known, however today, by the increase of the biospeleological investigations, this number rose to 18 (Henderickx & Vets, 2000). Before, there was not any record of this subgenus from Turkey, *N. (O.) epirensis* is a new record for Turkish fauna.

To understand if this species also shows "Phoresie" for dispersal, as it is very common in Pseudoscorpionida order, more advanced observations are required. Type the location for this species is Epirus (Greece).

Cataleptoneta aesculapii (Brignoli, 1968) (Araneae; Leptonetidae) and *Discoptila beroni* Popov, 1974 (Orthoptera; Gryllidae) are two endemic species that were recorded from Damlataş Cave (Alanya; Antalya) (Brignoli 1968, 1978; Popov 1974). During our field trips in Damlataş Cave, it was not possible to find these two species'. The reason is, probably, use of insecticides by the municipality to eradicate the cockroach existance that is a disturbance factor for the public patients who use the cave for the purpose of speleoteraphy. If it is considered that the type location of *C. aesculapii* is Damlataş Cave, our determination of this species from Dim Cave, is a pleasing fact considering that the species has not disappeared yet. It is known that, when organisms adapted to the cave life are compared with the surface organisms, as a result of their limited biogeographical distribution, they show high levels of endemism (Porter, 2007). As a matter of fact, among the determined species', *C. aesculapii*, *H. patrizii*, *H. agnolettii*, *H. troglophilus*, *T. pisidicus*, *T.*

percuriosa, *Neobisium hians*, *N. kosswigi*, *T. kosswigi* and *D. beroni* are only known from the caves of Turkey.

In his article "Türkiye Kara Isopod'ları Hakkında", Verhoeff (1949), mentions that "The members of familiy Trichoniscidae are very common in Turkish caves". Thus, two different genus of this family determined from the cave, especially large numbers of *T. kosswigi* observed on the walls of the cave.

Among the 25 taxon, species' like *T. pisidicus*, *C. aesculapii*, *N. (O.) epirensis*, *Trichoniscus sp.*, are troglobiont; eyes are totaly dissapeard or reduced, evident depigmentation on the surface of the body has been occurred.

Just as every cave ecosystem, trogloxen species are also observed in Dim Cave (*H. adansonii*). These species are found in caves by chance or in order to hunt over cave animals (Vandel, 1966).

Because there is no study of the fauna of the cave before, we could not have the chance to compare our results with any data that belongs to the period of the cave before it was opened to tourism. By this study, as one of the counted cave rich countries of the world, it is necessary to attract attention to Turkey's speleofauna and it is stressed that speleofauna of our touristic caves is under serious threat originating from antropogenic effects. By the increase of the studies on determining the speleofauna of our caves, we beleieve that many other species will be added to Turkish fauna and the findings will provide a better understanding concerning Anatolian zoogeographical past.

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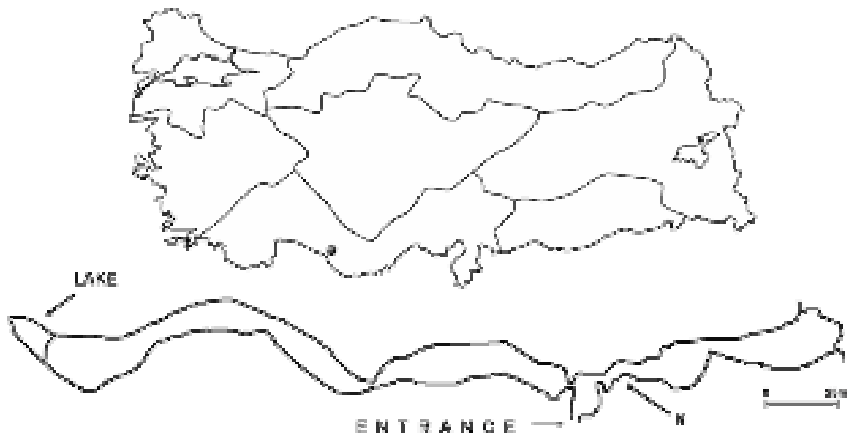


Fig. 1. Map of Dim Cave.

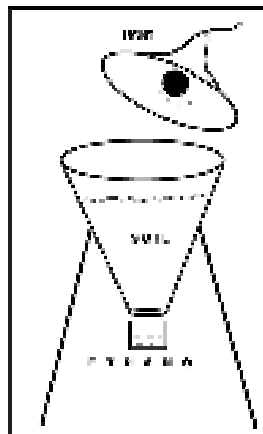


Fig. 2. Berlese Funnel.