SPECIES OF ONISCIDEA AND ARANEAE FROM THE MOVILE CAVE DRILLINGS

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Abstract. 21 species of Oniscidea and 9 species of Araneae are recorded from two drillings made nearby Movile Cave. Also, the authors present their chorology and variation according to depth and season.

1. INTRODUCTION

Dobrogea represents a biogeographic "crossroad" between bioclimatic provinces with a complex character given by the presence of great numbers of Mediterranean, Pontic, Caucasian, etc., elements. And one of the most interesting regions of Dobrogea is the area of the Movile Cave who proved to be particularly interesting from a biological point of view.

Hence the great importance of the Oniscidea and Araneae species collected in two drillings made in the vicinity of the Movile cave.

2. SHORT HISTORY OF THE INVESTIGATIONS CONCERNING THE ONISCIDEA AND ARANEAE OF THE MOVILE CAVE AREA

Although there are nearly 100 scientific papers about the fauna and the various aspects (biology, mineralogy, geomorphology, hydrogeology, chemistry and microbiology) of the area surrounding the Movile Cave, few of them deal with the Oniscidea and Araneae of this area.

In 1989, TABACARU & BOGHEAN described *Trachelipus troglobius* from the Movile Cave and gave an inventary of the Oniscids from Dobrogea. The description by GRUIA, IAVORSCHI & SARBU of a second species of troglobitic terrestrial isopod, *Armadillidium tabacarui*, followed in 1994. Finally, from the air-bells of Movile Cave, GRUIA & GIURGINCA (1998) described *Haplophthalmus movilae*. Unfortunately, *Caucasonethes sp.*, the fourth species of terrestrial isopod found in the cave has not been described yet.

Subsequently, GIURGINCA & VĂNOAICA (2002) recorded the presence of *Chaetophiloscia sicula* – a new species for the Romanian fauna – in the drillings from Movile Cave and in 2003, GIURGINCA & ĆURČIĆ made an inventory of the Oniscidea from Dobrogea. In 2003, TABACARU & GIURGINCA described *Kithironiscus*

Trav. Inst. Spéol. «Émile Racovitza», t. XLVIII, p. 31–43, Bucarest, 2009

dobrogicus, the first species belonging to the family Scleropactidae to be recorded in Romania.

There are only three papers about the Araneae from this area, namely the paper of GEORGESCU (1989), describing the species *Lascona cristiani* (now *Agraecina cristiani*), *Marianana mihaili* (the species was described after only one female) and *Lepthyphantes constantinescui*. In 1992, GEORGESCU AND SÂRBU, described *Iberina caeca* – now *Hahnia caeca*. In a subsequent paper, GEORGESCU (1994) recorded the presence of a new species of *Nesticus* but she could not describe it as she had only juveniles. In a recent field trip, one of us (A.N.) found both the male of *Marianana mihaili* and the female of the new species of *Nesticus* – they will be described in another paper.

As we can see, all these papers deal mainly with the cave isopods and spiders but there is a void of information concerning the Oniscidea and Araneae from the endogeous or the superficial subterranean environment. Our paper presents the oniscid and spiders species from the Movile Cave area drillings and their variation according with the depth and season, therefore adding to the knowledge of the fauna of Oniscidea and Araneae from Dobrogea.

3. MATERIAL AND METHODS

Located on the southern plateau of Dobrogea, about 3 km. east of the Black Sea shore, near the town of Mangalia, the karstic region of Movile occupies a surface of roughly 2 km^2. The exokarst is distinguished by the presence of three depressions ("obane"): the Great Oban, the Small Oban and the Blebea Oban. The drills made in 1986 by I.S.P.I.F., emphasized the presence of a layer of 0.1 to 1 meter deep organo-mineral soil which covers a loessoidic deposit; below this deposit there are lumachellic and oolithic limestones of sarmatian age traversed by a dense net of cracks (CONSTANTINESCU, T., 1995).

The bulk of our material comes from the two drills made by the Geological Institute in October 1994, nearby the entrance of Movile Cave at the request of Dr. V. DECU. The first drill, the Sinkhole Drill, is located 40 meters northward from the cave, in the doline no. 2 (absolute altitude 21.5m); it measures 22.5 meters in depth. The second drill is placed roughly at 10 meters southward from the cave in doline no.1 (absolute altitude 23 m); it measures 24 meters in depth. Both drills came across layers of highly fissurated limestone, the first one at a depth of –11.5 meters and the second one at a depth of –13.5 meters. At a depth of –15.5 meters, the first drill crosses a subterranean empty space (0.5 meters high) (CONSTANTINESCU, T., 1995), while the second drill enters a pillar of the cave. Eight traps with olfactory attractant have been placed at each 3 meters in depth and

investigated periodically. For a more detailed description of the drillings (and the temperatures recorded inside them, see NITZU, 1997).

Another part of our material was collected by hand with a tweezer and with Barber traps (placed in the Great Oban under big rocks and in an artificial microcave – leg. Dr. E. NITZU (1997) and from washed soil from the Kara Oban and the Sulfurous Spring at the Mangalia Horse Farm.

4. RESULTS

24 species of Oniscidea (belonging to 10 families) and 9 species of Aranea (from 5 families) are recorded in Movile drillings. Among the Oniscidea, the best represented are the Plathyarthridae (with 4 species), followed by the Trichoniscidae, the Porcellionidae and the Trachelipidae (each with 3 species), then the Philosciidae and the Armadillidiidae (each with 2 species). The Halophilosciidae, Cylisticidae, Agnaridae and the Scleropactidae are represented by one species, each (Fig. 1).

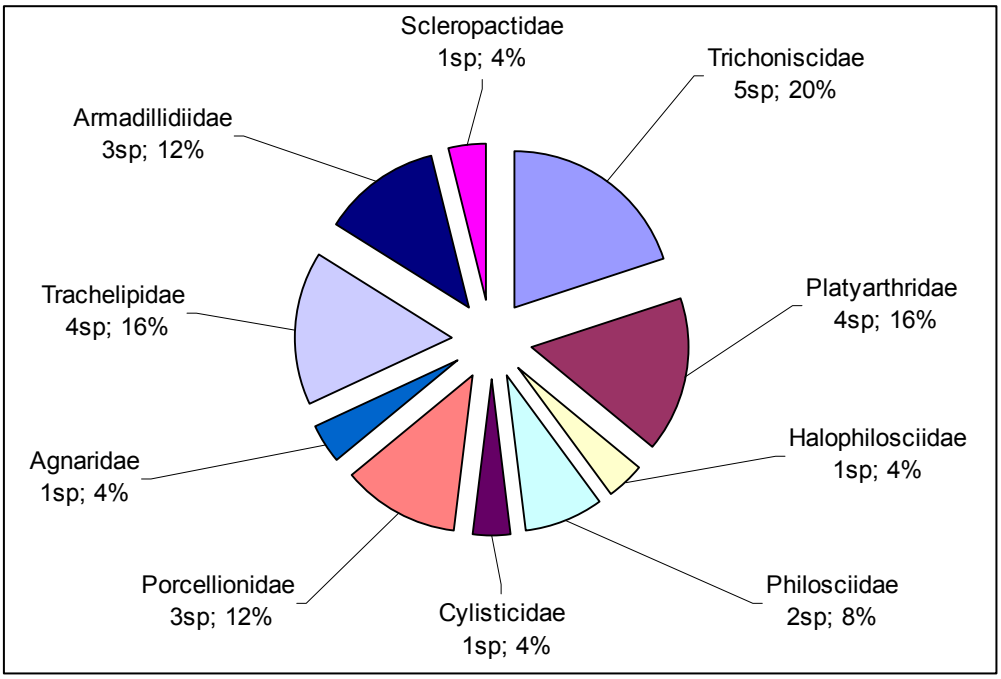

Fig. 1. – Families of Oniscidea from Movile Cave drillings.

Among the Aranea, the Linyphiidae and the Gnaphosiidae are the best represented (the first with 4 and the second with 3 species), all the other families by only one species (see Fig. 2).

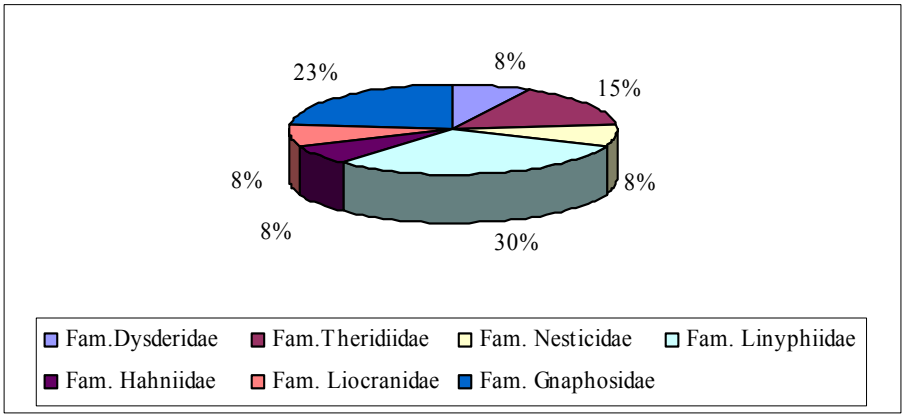

Fig. 2. – Families of Araneae from the Movile Cave drillings.

There are 11 species of Oniscidea recorded from both drillings. As for the Araneae, only two species (*Palliduphantes byzantinus* and *Dysdera crocata*) recorded in both drillings. Four species of Araneae were found only in Movile Cave: *Marianana* mihaili, *Nesticus* sp., *Leptyphantes constantinescui* and *Hahnia caeca*. Also, two species of Aranea (*Agraecina cristiani* and *Dysdera crocata*) are found both in the drillings and in the Movile Cave, a situation unlike that of the Oniscidea, in which case no species from the drillings were recorded in the cave.

For both Oniscidea and Araneae, we established the variation according to depth and season for each drilling. Also, for both groups, the relative abundances and frequencies have been computed for each drilling.

The variation according to depth and season for both drillings are presented in Tables 1 and 2.

Table 1

Variation of the Oniscidea species according to depth and season
(*v=vernal, e=estival, a=autumnal, h=hivernal*)

	Sinkhole Drilling (m)						
Species	–3 v/e/a/h	–6 v/e/a/h	–9 v/e/a/h	–12 v/e/a/h	–15 v/e/a/h	–18 v/e/a/h	–20 v/e/a/h
Platyarthrus coronatus Radu, 1959	x/x/–/–	x/x/x/–					
Chetophiloscia sicula Verhoeff, 1908	x/x/x/x	x/x/x/–	x/x/x/x	x/x/x/x	x/–/x/x	–/–/x/x	

Species	–3 v/e/a/h	–6 v/e/a/h	–9 v/e/a/h	–12 v/e/a/h	–15 v/e/a/h	–18 v/e/a/h	–20 v/e/a/h
Chetophiloscia hastata Verhoeff, 1929	–/x/x/x	–/x/–/–	–/–/x/x				
Trachelipus nodulosus (C.L. Koch, 1838)	x/x/x/–	–/–/x/–			–/x/–/–		
Trachelipus arcuatus Budde-Lund, 1885	–/x/x/x	x/x/–/–	–/–/x/x	–/–/x/x	–/–/x/–	–/–/x/–	
Cylisticus convexus (De Geer, 1778)	x/–/–/–						
Cylisticus sp.			–/x/–/–				
Protracheoniscus sp.	–/x/–/–		–/x/–/–				
Leptotrichus pilosus dobrogicus Radu, 1973	–/x/–/–	–/–/x/–					
Armadillidium vulgare (Latreille, 1804)	–/x/x/x			–/–/x/–			
Porcellionides nitidus Radu, 1951	–/–/x/–				–/–/x/–		
Porcellio laevis Latreille, 1804	–/–/–/x		–/–/–/x	–/–/–/x			
Caucasonetes sp.				x			
Cave Drilling (m)							
Platyarthrus coronatus Radu, 1959	x/x/x/x	–/x/x/–	x/x/x/x	x/x/x/–	–/x/x/–		
Haplophtalmus sp.	x/–/–/–			–/x/–/–			
Chetophiloscia sicula Verhoeff, 1908	x/x/x/x	x/x/x/x	x/x/x/x	x/x/x/x	x/x/x/x	–/x/x/–	
Chetophiloscia hastata Verhoeff, 1929	x/–/x/x		x/–/–/–	x/–/–/–			
Trachelipus arcuatus Budde-Lund, 1885	x/x/–/–		–/x/x/–				
Trachelipus nodulosus (C.L. Koch, 1838)	–/x/–/–	–/x/x/–	x/–/–/–				
Porcellio laevis Latreille, 1804	x/–/x/–	–/–x/–					
Armadillidium vulgare (Latreille, 1804)	x/x/–/–			–/–/x/–			
Protracheoniscus sp.	–/x/–/–		–/–/x/–		–/–/x/–		
Kitironiscus dobrogicus Tabacaru & Giurginca, 2003	–/–/x/x	–/–/x/–					
Porcellionides nitidus Radu, 1951			x/–/–/–			–/–/x/–	

Species	–3 v/e/a/h	–6 v/e/a/h	–9 v/e/a/h	–12 v/e/a/h	–15 v/e/a/h	–18 v/e/a/h	–20 v/e/a/h
12. *Porcellio sp.*			x/–/x/–				
Hyloniscus riparius (C.L. Koch, 1838)			–/x/–/–				
Cylisticus sp.			–/–/x/–				
Cylisticus convexus (De Geer, 1778)				x/–/–/–			

Table 2

Variation of the Araneae species according to depth and season
(*v=vernal, e=estival, a=autumnal, h=hivernal*)

	Sinkhole Drilling (m)						
Species	–3 v/e/a/h	–6 v/e/a/h	–9 v/e/a/h	–12 v/e/a/h	–15 v/e/a/h	–18 v/e/a/h	–20 v/e/a/h
Dysdera crocata C.L. Koch, 1838	x/x/–/–	–/x/–/x	–/–/x/–			–/–/x/–	
Palliduphantes byzantinus Fage, 1931		x/x/–/x	x/–/–/x	x/x/x/x	–/x/–/–	x/x/x/–	x/x/x/x
Palliduphantes insignis (O.P. – Cambridge, 1913)	x/–/–/–	–/–/–/x					
Tenuiphantes tenuis (Blackwall, 1852)	–/x/–/–	–/x/–/–					
Agraecina cristiani (Georgescu, 1989)			–/–/x/–			–/x/–/–	–/x/–/–
Drassyllus praeficus (L. Koch, 1866)	–/x/–/–	–/x/–/–					
Micaria albovitata (Lucas, 1846)		–/x/–/–					
Zelotes erebus (Thorell, 1871)		–/x/–/–		–/x/–/–			
Cave Drilling (m)							
Dysdera crocata C.L. Koch, 1838	–/x/–/–		–/x/–/–				
Achaearanea riparia (Blackwall, 1834)	–/–/x/–						
Palliduphantes byzantinus Fage, 1931		x/x/x/–	x/x/–/x	x/–/–/–	x/x/–/–		x/–/–/–

The relative abundances and frequencies are presented in Tables 3 and 4.

Table 3

Relative abundances (A%) and frequencies (F%) of the species of Oniscidea

Species	Distribution	Soil	Cave Drilling	Sinkhole Drilling	A%		F%	
					CD	SD	CD	SD
Fam. Trichoniscidae 1. *Hyloniscus riparius*	Balcano-Central European		x	–	0.06	–	16.6	–
2. *Trichoniscus pygmaeus*	Holarctic	x	–	–	–	–	–	–
3. *Monocyphoniscus babadagensis*	Endemic	x	–	–	–	–	–	–
4. *Caucasonethes* sp.	–	–	–	–	–	0.25	–	16.6
5. *Haplophthalmus* sp.	–	–	x	–	0.12	–	33.3	
Fam. Platyarthridae 6. *Trichorhina dobrogica*	Endemic	x	–	–	–	–	–	–
7. *Platyarthrus schoebli*	Mediterranean	x	–	–	–	–	–	–
8. *Platyarthrus attanassovi*	Eastern Balcanic	x	–	–	–	–	–	–
9. *Platyarthrus coronatus*	Endemic	x	x	x	2.1	1.02	83.3	33.3
Fam. Philosciidae 10. *Halophiloscia pontica*	Euxinic	x	–	–	–	–	–	–
11. *Chaetophiloscia hastata*	Eastern Mediterranean	x	x	x	7.66	5.01	50	50
12. *Chaetophiloscia sicula*	Mediterranean	–	x	x	87.7	71.7	100	100
Fam. Cylisticidae 13. *Cylisticus convexus*	Cosmopolitan	x	x	x	0.06	0.38	16.6	16.6
14. *Cylisticus* sp.	–	–	x	x	0.06	0.13	16.6	16.6
16. *Leptotrichus pilosus dobrogicus*	Endemic	x	–	x	–	0.25	–	33.3
17. *Porcellio laevis*	Cosmopolitan	x	x	x	0.43	0.89	33.3	50
Fam.Trachelipidae 18. *Protracheoniscus* sp.	–		x	x	0.18	0.25	50	33.3
19. *Trachelipus nodulosus*	Balcano-Central European	x	x	x	0.67	2.05	50	50
20. *Trachelipus arcuatus*	Balcano-Central European	x	x	x	0.24	17.4	33.3	100

Species	Distribution	Soil	Cave Drilling	Sinkhole Drilling	A%		F%	
					CD	SD	CD	SD
21. *Trachelipus waechtleri*	European	x	–	–	–	–	–	–
Fam. Armadillidiidae 22. *Armadillidium vulgare*	Cosmopolitan	x	x	x	0.18	0.5	33.3	33.3
23. A*rmadillidium traiani*	Eastern European	x	–	–	–	–	–	–
Fam. Scleropactidae 24. *Kithironiscus dobrogicus*	Endemic	x	x	–	0.18	–	33.3	–

Table 4

Relative abundances (A%) and frequencies (F%) of the species of Araneae

Species	Distribution	Cave Drilling	Dolina Drilling	Cave	A%		F%	
					CD	SD	CD	SD
Fam. Dysderidae 1. *Dysdera crocata*	Cosmopolitan	x	x	x	20	20	28.5	57.14
Fam. Theridiidae 2. *Achaearanea riparia*	Palearctic	x	–	–	2.5		14.28	–
3. *Marianana mihaili*	Roumania	–	–	x	–	–	–	–
Fam. Nesticidae 4. *Nesticus* sp.	Roumania	–	–	x	–	–	–	–
Fam. Linyphiidae 5. *Lepthyphantes constantinescui*	Roumania	–	–	x	–	–	–	–
7. *Palliduphantes insignis*	Europe	–	x	–		3	–	28.5
8. *Tenuiphantes tenuis*	Europe, North Africa	–	x	–	–	1	–	14.3
Fam. Hahniidae 9. *Hahnia caeca*	Roumania	–	–	x	–	–	–	–
Fam. Liocranidae 10. *Agraecina cristiani*	Roumania	–	x	x	–	5	–	42.9
Fam. Gnaphosidae 11. *Drassylus praeficus*	Europe to Central Asia	–	x	–	–	2	–	28.5
12. *Micaria albovitata*	Palearctic	–	x	–	–	1	–	14.3
13. *Zelotes erebus*	Europe to Georgia	–	x	–	–	2	–	28.5

5. DISCUSSIONS AND CONCLUSIONS

From the relative abundance point of view, both in the Cave and the Sinkhole Drillings, the dominant species of Oniscidea is *Chaetophiloscia sicula*. In the Sinkhole Drilling, the constant species are *Trachelipus arcuatus, Chaetophiloscia hastata* and *Trachelipus nodulosus*. In the Cave Drilling, the constant species are *Chaetophiloscia hastata* and *Trachelipus nodulosus*.

Concerning the Araneae, the dominant species in both drillings are *Palliduphantes byzantinus*, followed by *Dysdera crocata*.

From a zoogeographic point of view, nearly half of the Oniscidea from the Movile Cave area are endemic species (40% of the species). The Cosmopolitan (13%), Balcano-Central European (13%) and Mediterranean (9%) species form an important part of the Oniscidea recorded in the drillings (Fig. 3).

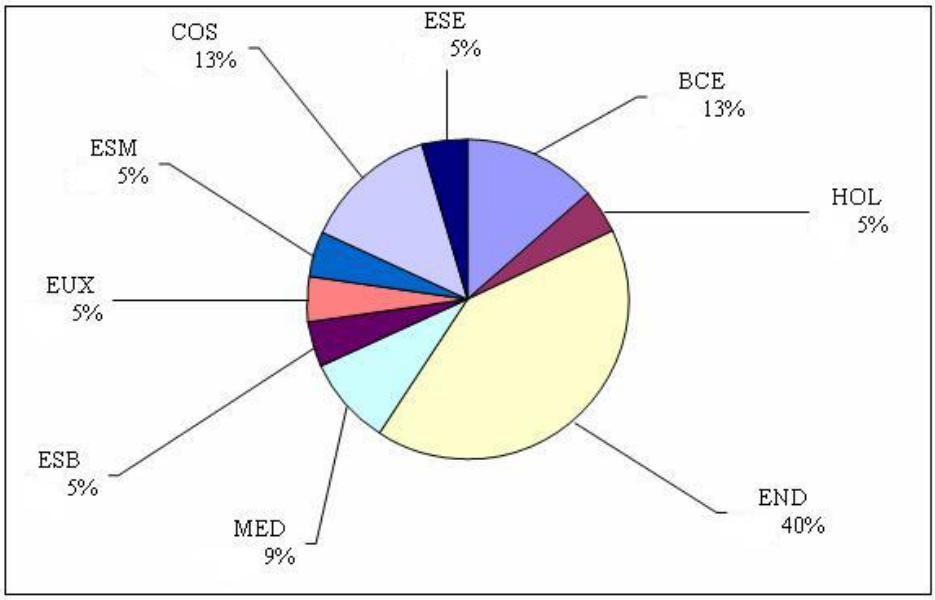

Fig. 3. – Chorotypes of the Isopoda species from Movile Area: **End** – endemic for Dobrogea; **Cos** – cosmopolitan; **Hol** – holarctic; **Bce** – balcano central european; **Esb** – eastern balcanic; **Ese** – eastern european; **Med** – mediterranean; **Esm** – eastern mediterranean; **Eux** – endemic for the Euxinic area.

This high degree of endemicity, mirroring that of the fauna of Oniscidea from Dobrogea, may be explained, as our colleague NITZU (2001) has argued, on the one hand, by particular conditions offered by the karst environments and, on the other hand, by paleoclimatic conditions of Dobrogea which played a role of a glacial refugium, named the Euxinic glacial subrefugium by NITZU (2001).

Similarly, most of the Araneae are endemic for Romania (37% of the species). Next in importance are the Palearctic species (15% of the species) (Fig. 4).

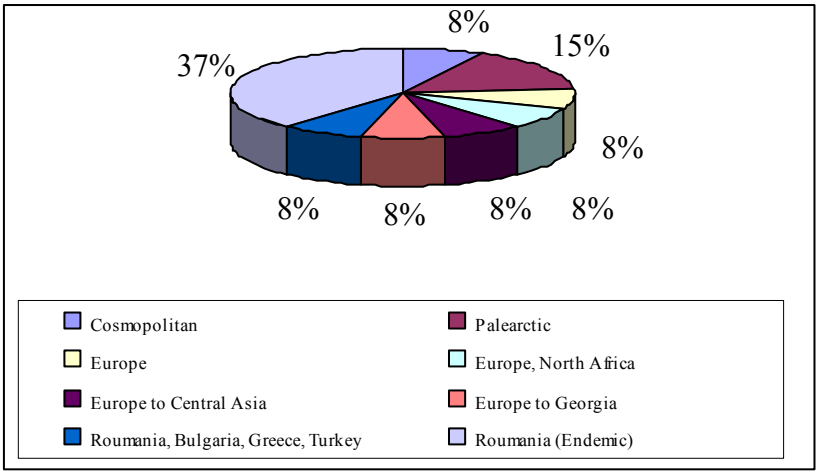

Fig. 4. – Distribution of the Araneae species.

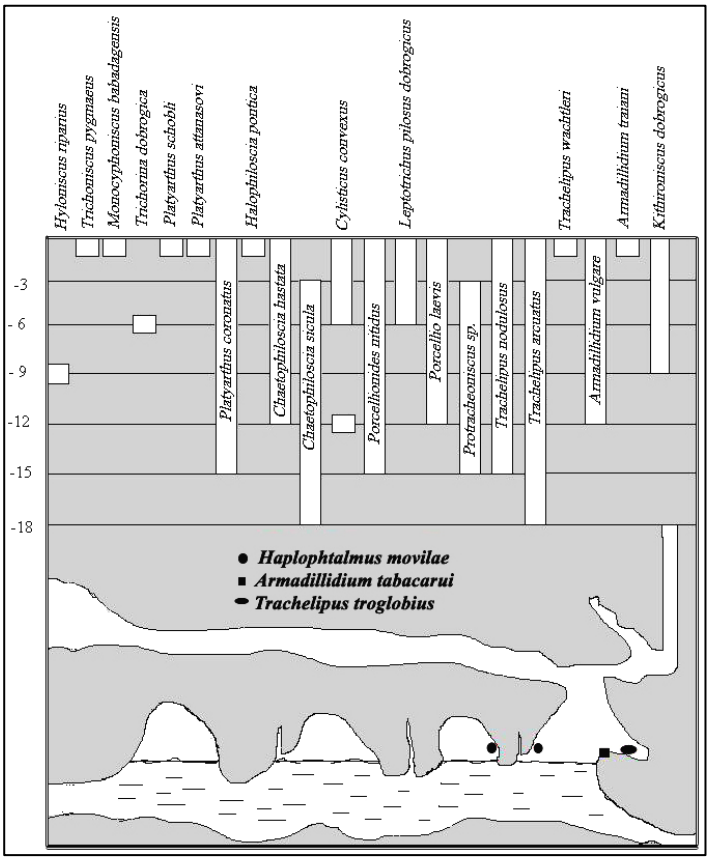

Fig. 5. – Depth repartition of the Oniscidea species from the Movile Cave Drillings.

There are a few important aspects concerning the depth repartition of the Oniscidea and the Araneae species. In the case of the Oniscidea (Fig. 5), only 2 species are found down to –18m, namely *Chaetophiloscia sicula* and *Trachelipus arcuatus*. 4 species are recorded down to –15m: *Platyarthrus coronatus*, *Porcellionides nitidus*, a species of *Protracheoniscus* and *Trachelipus nodulosus*. Most species are found at a depth of –12m. Also, noteworthy is the difference in depth repartition of *Chaetophiloscia hastata* and *Chaetophiloscia sicula*.

Ch. *hastata* was found in the area of Movile cave at the Sulphurous spring in the Kara-Oban and in the Obanul mare. In both sites it was found in the soil under big rocks. In the Movile Cave Drillings, *Ch*. *hastata* descends to –9m in the Sinkhole Drilling and to –12m in the Cave Drilling. Of contrary, until now, we have found *Ch*. *sicula* only in the two drillings. Unlike *Ch*. *hastata*, which can be found near the surface, *Ch*. *sicula* is recorded only from a depth of –3m and descends to –18m in both drillings.

We should add that we did not find yet *Ch*. *sicula* above the depth of –3m. Given their similar size and morphology, this difference in depth repartition is difficult to explain.

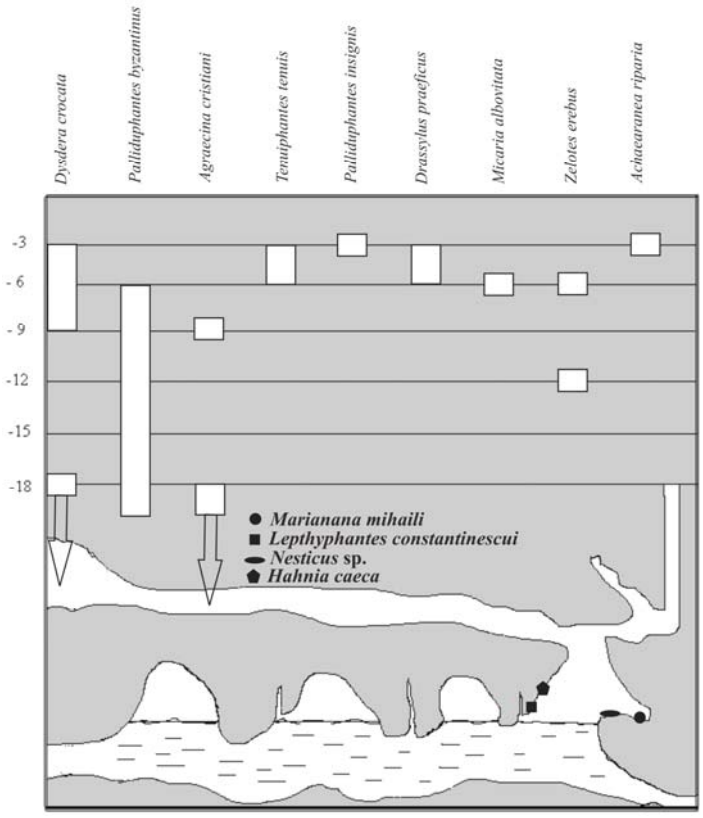

Fig. 6. – Depth repartition of the Aranea species from the Movile Cave Drillings.

The Araneae (Fig. 6) show a very different depth repartition: only 3 species descend lower than –18m: *Dysdera crocata*, *Agraecina cristiani* and *Palliduphantes byzantinus*. Most Araneae species are found at a depth between –3 and –9 m, so their depth repartition is more limited in comparison with that of the Oniscidea. There is a very obvious difference between the species of Oniscidea and the Araneae: two species of Araneae found in the drillings are also recorded inside Movile Cave (namely *Dysdera crocata* and *Agraecina cristiani*), while there is absolutely no species of Oniscidea found both in the drillings and inside the cave.

A number of 8 species of Oniscidea, namely *Trichoniscus pygmaeus*, *Monocyphoniscus babadagensis*, *Trichorhina dobrogica*, *Platyarthrus schoebli*, *Pl.attanassovi*, *Halopholoscia pontica*, *Trachelipus waechtleri* and *Armadillidium traiani*, were not found in the drillings but in the soil above or in the immediate vicinity of the drillings.

Two of these species (*M. babadagensis* and *Tr. dobrogica*) are endemic to Dobrogea, the first species being recorded from both North and South Dobrogea, while the second one only from the South Dobrogea. *T. pygmaeus* has a wider spreading, being a Holarctic species. Among the two species of *Platyarthrus*, *Pl. schoebli* has a Mediterranean spreading and *Pl. attanassovi* a East Balcan spreading. *H. pontica* is recorded only from the Southern Dobrogea and the Bulgarian seaside (so only the Western Black Sea coast). *Trachelipus wachtleri* (considered as synonymous with *Tr. difficilis* by Schmidt in 1997) is recorded from Western, Central and Eastern Europe while *A. traiani* is recorded only from the Republic of Moldavia and from both Northern and Southern Dobrogea.

As a consequence, these species complete and improve our understanding of the Oniscidea from the area of the Movile Cave and from the Southern Dobrogea

It is not yet clear if all the species of Oniscidea and Araneae really live at the above mentioned depths or they just fell from the soil level albeit, given their morphology and the highly fissured nature of the limestone massif, at least some of them might actually live there.

REFERENCES

GIURGINCA, A. VĂNOAICA, L., *Chaetophiloscia sicula Verhoeff, 1908 (Isopoda, Oniscidea: Philosciidae) – a new species for the Romanian fauna*. Trav. Inst. Speol. E. Racoviţă, 1998–1999, **37–38**: 159–166 (2000).

GIURGINCA, A., ĆURČIĆ, S., B., *A check-list of Oniscidea (Isopoda, Crustacea) from Dobruja (Romania)*. Arch. Biol. Sci., **55** (1–2): 39–44 (2003).

GRUIA, M., GIURGINCA, A., *Haplophthalmus movilae (Isopoda, Trichoniscidae), a new troglobitic species from Movile Cave, Dobruja, Romania*. Mitt. Hamb. Mus. Inst., **95**: 133–142 (1998).

GRUIA, M., IAVORSCHI, V., SÂRBU, Ş., *Armadillidium tabacarui (Isopoda: Oniscidea: Armadillididae) a new troglobitic species from a sulfurous cave in Romania*. Proc. Biol. Soc. Wash., **107** (4): 69–106 (1994).

GEORGESCU, M., *Sur trois taxa nouveaux d'Aranéides troglobies de Dobrogea (Roumanie)*. Misc. Speol. Rom., **1**: 85–102 (1989).

GEORGESCU, M., *Sur la présence d'une espèce troglobionte de Nesticus (Araneae, Nesticidae) dans la grotte «Peştera de la Movile» (Dobrogea, Roumanie)*. Trav. Inst. Speol. E. Racoviță, **33**: 85–88 (1994).

GEORGESCU, M., SÂRBU, Ş., *Description d'un nouveau taxon: Iberina caeca de la grotte «Peştera de la Movile» (Araneae – Hahniidae)*. Mém. Biosp., **13**: 139–141 (1992).

NITZU, E., *Edaphicolous, endogeous and subterranean Coleoptera from the Movile karstic area (Southern Dobrogea, Romania)*. Trav. Inst. Speol. E. Racoviță, **36**: 73–98, 1997.

NITZU, E., *Edaphic and subterranean Coleoptera from the Dobrogean karstic areas (Romania). A zoogeographic approach.* Mitt. Hamb. Zool. Mus. Inst., **98**: 131–169 (2001).

SCHMIDT, C., *Revision of the European species of the genus Trachelipus Budde-Lund, 1908 (Crustacea: Isopoda: Oniscidea)*. Zool. Jour. Linn. Soc., **121**: 129–244 (1997).

TABACARU, I., BOGHEAN, V., *Découverte en Dobruja (Roumanie) d'une espèce troglobie du genre Trachelipus (Isopoda, Oniscoidea, Trachelipidae)*. Misc. Speol. Rom., **1**: 53–75 (1989).

TABACARU, I., GIURGINCA, A., *The presence of the family Scleropactidae in Dobrogea. Systematic and zoogeographic remarks*. The Biology of Terrestrial Isopods. Crustaceana Monographs, **5**: 13–22, 2003.

CONSTANTINESCU, T., *Le karst de type Movilé (Mangalia, Dobrogea du Sud, Roumanie)*. Theor. Appl. Karst., **8**: 91–96 (1995).

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