

## Harpacticoida (Crustacea, Copepoda) from caves in Bulgaria

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**Abstract.** The paper summarizes the information concerning the distribution of the harpacticoid fauna in Bulgarian caves. So far, in 56 caves situated in four physiogeographic regions are registered 35 species from 12 genera of the 3 families (Ameiridae, Canthocamptidae and Parastenocarididae). Of all the species found in the caves, 19 are stygobionts, 11 stogophiles and 5 stygoxenes.

**Key words:** Groundwater, Crustaceans, Distribution.

### Introduction

Karst in Bulgaria covers 22.7% of the country's territory and is developed in almost all Bulgarian mountains, the study of which dates back to the end of the 19 century. The cave regions in Bulgaria includes four physiogeographic regions: Danube Plain, Srednogorsko-Thrace region, Stara Planina region and Rilo-Rhodope region (Table 1). We owe the first zoological studies in Bulgarian caves to Academician Buresh, who laid the foundation of biospeleology in Bulgaria. Contribution to the study of the freshwater cave harpacticoid fauna has the research of the German copepodologist V. Klie (1936), who, based on materials of Prof. Valkanov (collected in 1931) from the cave "Temnata dupka" near Lakatnik, reports: *Attheyella (A.) crassa* and *Bryocamptus (Rh.) zschokkei tatrensis*, *Nitokra hibernica* and *Onychocamptus mohammed*. Beron & Gueorgiev (1962) published the first overview of the Bulgarian cave fauna, later supplemented with a second edition Beron & Gueorgiev (1967), Beron (1972). In the period 1988-1996, studies of cave harpacticoid fauna were carried out in the country: Apostolov, 1976, 1991, 1992, 1992a, 1997, 1998, 2000; Bassamakov & Apostolov(1989); Apostolov & Pesce (1991); Mihailova-Neikova (1969), the results of which are summarized in the present publication.

### Material and Methods

All materials on the harpacticoid were provided by Dr. Ivan Pandourski. Samples were collected from rimestone pool, underground streams and rivers in 56 caves by direct water filtration with phreatic net of Cvetkov (1968), plankton nets with a mesh size between 38 and 100  $\mu\text{m}$ , and handheld plankton net.

**Table 1.** Localities of the established harpacticoid species.

No	Caves	Village, town	Coordinates
<b>Danubian Plain</b>			
1	Haidushkata (Bruno-Shushin-ska)	Gortalovo	Pleven district
2	Gortalovska peshtera (Gortalovo 1)	Gortalovo	Pleven district
3	Desni Suhi pech	Dolny Lom	E 22° 46' 49.9" N 43° 29' 42.4"
4	Orlova chuka	Pepelina	E 25° 57' 21.888" N 43° 35' 22.02"
<b>Staroplaninski region</b>			
5	Parnitsite	Bezhanovo	E 24° 25' 55.848" N 43° 12' 0.252"
6	Stresherska Yama	Gorno Ozirovo	E 23° 28' 15.82" N 43° 12' 45.59"
7	Kozarskata	Lakatnik	E 23° 13' 16.0212" N 43° 3' 1.2672"
8	Dushnika	Iskrets	E 23° 14' 6.8856" N 42° 59' 49.4304"
9	Temnata dupka	Lakatnik railway station	E 23° 23' 13.03" N 43° 05' 23.49"
10	Lyastovitsata	Glozhene	E 24° 10' 33.2" N 43° 1' 49.9"
11	Vodna peshtera	Lipnitsa	E 23° 44' 55.32" N 43° 00' 42.84"
12	Belyar	Gorno Ozirovo	E 23° 27' 16.50" N 43° 13' 26.70"
13	Marina dupka	Breze	Sofia district
14	Elata	Zimevitsa	E 23° 16' 29.244" N 43° 2' 6.1152"
15	Drashanska	Drashan	E 23° 54' 23.1" N 43° 15' 19.5"
16	Haidushka (Temnata dupka, Skokovska)	Deventsi	E 24° 7' 17.4" N 43° 18' 1.26"
17	Barki 8	Gorno Ozirovo	E 23° 27' 24.69" N 43° 13' 18.72"
18	Dinevata	Gintsi	E 23° 6' 16.452" N 43° 3' 58.572"
19	Morovitsa	Glozhene	E 24° 10' 46.776" N 42° 57' 55.188"
20	Tizoin (Ponor)	Gubesh	E 23° 4' 23.268" N 43° 5' 18.42"
21	Kalna Matnitsa	Glavatsi	E 23° 20' 47.85" N 43° 15' 54.10"
22	Mishin kamak	Gorna Luca	E 22° 53' 5.244" N 43° 27' 44.748"
23	Barki 14	Gorno Ozirovo	E 23° 27' 23.1" N 43° 13' 10.2"
24	Rushovata (Gradeshnishka)	Glogovo	E 24° 9' 15.3972" N 42° 35' 24.0612"
25	Ponora	Chiren	E 23° 34' 36.012" N 43° 18' 24.4908"
26	Yalovitsa (Ivanova dupka)	Golyama Zhelyazna	Lovech district
27	Gornotozero	Breste	Pleven district
28	Temnata dupka	Karlukovo	E 24° 4' 27.2568" N 43° 10' 28.6536"
29	SuhiPech (Kozarnica)	Oreshets railway station	E 22° 41' 43.26" N 43° 39' 10.24"
30	Grimnina dupka	Cherkasky	Montana district
31	Tsarkveto (Mlada St. Petka)	Breze	Sofia district
32	Svetata voda	Gintsi	Sofia district
33	Zidanka (Peshtera № 19 „Troevratitsa“, Б 40, А 05)	Karlukovo	Lovech district
34	Sedlarkata	Rakita	E 24° 17' 49" N 43° 17' 23"
35	Skoka	Dragana	E 24° 23' 22.7184" N 43° 8' 36.9096"
36	Golyamata Balabanova	Gintsi	E 23° 2' 26" N 43° 8' 4"
37	Malkata Mikrenska	Mikre	Lovech district
38	Yamata	Tserovo	E 23° 19' 43.1724" N 43° 0' 7.5132"
39	Vodnata peshtera	Tserovo	E 23° 20' 31" N 43° 0' 24"
40	Kontrabasa (Bezimenka 22)	Karlukovo	Lovech district
41	Kalenska (Dinenitsa, Peshta)	Kalen	Vratsa district
42	Mandrata (Lazhenska)	Chavdartsa	E 24° 58' 3.432" N 43° 14' 31.524"
<b>Srednogorsko-Thracian region</b>			
43	Haidushka	Zemen	Pernik district
44	Duhlata (Bosneshka)	Bosnek	E 23° 11' 45.132" N 42° 29' 45.168"
45	Zhivata voda	Bosnek	E 23° 12' 8.748" N 42° 31' 30.576"
46	Vreloto - next to a dam Studena	Bosnek	E 42° 30' 55" N 23° 9' 34"
47	Akademik	Bosnek	E 23° 11' 17" N 42° 29' 33"
48	Dzheranitsa	Bosnek	E 23° 12' 19.98" N 42° 29' 59.208"
49	Elovitsa	Elovitsa	E 22° 33' 6.22458" N 42° 44' 4.98869"

Rila-Rhodope Region			
50	Manuilova	Ribnovo	E 23° 46' 57.4" N 41° 42' 50.8"
51	Lednitsata	Gela	E 24° 53' 29.328" N 41° 53' 31.632"
52	Lepenitsa (Dionisieva)	Rakitovo	E 24° 0' 48.7381" N 41° 57' 3.72115"
53	Yagodinska (Imamova dupka)	Yagodina	E24° 19' 46.79328" N 41° 37' 43.56444"
54	Sbirkovata (Barenska dupka)	Progled	Smolyan district
55	Novomahlenska (B02)	Peshtera	Pazardzhik district
56	Gorna Karanska dupka	Yagodina	Smolyan district

## Results

The total number of established species of the order Harpacticoida in the studied caves is 35 from 12 genera of the 3 families: Ameiridae (1 species), Canthocamptidae (31 species), Parastenocarididae (3 species). Of all the species found in the caves, 19 are stygobionts, 11 stygophiles and 5 stygoxenes from 4 physiogeographical regions. In the Stara Planina region, there are the most explored caves – 45 with 24 species registered. Of the caves in the Danube plain, only four caves have been studied, with five species registered, and seven caves with six species from the Rilo-Rhodope region. The low number of species in both areas is due to poor exploration of the known caves and limited areas of karst.

### Registered species and their localities:

- Attheyella (Attheyella) crassa* (Sars G.O., 1863): 5, 9, 32, 38, 39, 41, 47, 52.  
*Attheyella (Attheyella) wierzejskii wierzejskii* (Mrázek, 1893): 11, 16, 23.  
*Bryocamptus (Arcticocamptus) arndti arndti* (Kiefer, 1924): 20, 45.  
*Bryocamptus (Br.) minutus minutus* (Claus, 1863): 6, 39.  
*Bryocamptus (Br.) pygmaeus pygmaeus* (Sars, G.O., 1863): 6, 24, 39, 45, 47.  
*Bryocamptus (Echinocamptus) dacicus* (Chappuis, 1923): 23, 24, 36, 50.  
*Bryocamptus (Echinocamptus) echinatus* (Mrázek, 1893): 20.  
*Bryocamptus (Rheocamptus) spinulosus spinulosus* Borutzky, 1934: 51, 53.  
*Bryocamptus (Rheocamptus) typhlops* (Mrázek, 1894): 1, 14, 15, 18, 19, 26, 41, 44, 45.  
*Bryocamptus (Rheocamptus) zschokkei tatrensis* (Minkiewicz, 1916): 9, 18, 36, 42, 45, 53  
*Bryocamptus (Rheocamptus) zschokkei zschokkei* (Schmeil, 1893): 8, 11, 18, 23, 32, 34, 44, 45, 46, 48, 51, 52, 53, 55.  
*Canthocamptus staphylinus staphylinus* (Jurine, 1820): 20, 24, 43.  
*Ceuthonectes haemusi* Apostolov, 2000: 22.  
*Elaphoidella parapostolovi* Wells, 2007:22.  
*Elaphoidella bulgarica* (Apostolov, 1991): 15, 27.  
*Elaphoidella cavernicola* Apostolov, 1992: 8, 14, 33, 39.  
*Elaphoidella elaphoides elaphoides* (Chappuis, 1924): 8, 54, 56.  
*Elaphoidella elegantula* Wells, 2007: 8, 13, 31.  
*Elaphoidella karamani latifurcata* Apostolov, 1976: 4.  
*Elaphoidella phreatica* (Chappuis, 1925): 26, 45.  
*Elaphoidella pandurskyi* Apostolov, 1992: 8, 47.  
*Elaphoidella stygia* (Apostolov, 1989): 10, 11.  
*Epactophanes richardi richardi* Mrázek, 1893: 48.  
*Maraenobiotus bulbiseta* Bassamakov & Apostolov, 1989: 7, 28, 53.  
*Maraenobiotus parainsignipes* Apostolov, 1991: 8.  
*Maraenobiotus brucei carpaticus* Chappuis, 1928: 29, 36.  
*Moraria (Moraria) poppei* (Mrázek, 1893): 14, 23, 28.  
*Nitocrellopsis intermedia* (Chappuis, 1937): 45.  
*Nitokra hibernica hibernica* (Brady, 1880): 9.  
*Onychocamptus mohammed* (Blanchard & Richard, 1891): 9.  
*Parastenocaris bulgarica* Apostolov, 1993: 8.  
*Parastenocaris curvicauda* Apostolov, 1997: 26.  
*Parastenocaris jeanneli* Chappuis, 1924: 46.  
*Pesceus schmeili schmeili* (Mrázek, 1893): 12, 17, 23, 25.  
*Pilocamptus pilosus* Van Douwe, 1910): 2, 25, 38, 39.

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