

# The Description of Three New Species and Some Data to the Enchytraeid Fauna of the Baradla Cave, Hungary

(Biospeologica Hungarica, XXXIV)

By

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*To Professor Endre Dudich, Ph.D.  
on His 75<sup>th</sup> Birthday*

The "Baradla" stalactive cave at Aggtelek is one of those systems whose fauna is very rich and in the major part already explored. However, the family Enchytraeidae represents a hitherto wholly neglected group. Only one species, *Fridericia bulbosa* (ROSA, 1887), has been found in 1929 (1).

Concerning the cave, it is sufficient to remark that its complete length is 10 km, the temperature 10 °C, and the relative humidity content approaches 100 per cent.

It was in 1966 that I commenced the study of the Enchytraeid fauna of the cave, occasionally collecting samples from ecologically more or less different sites. The extraction of the Enchytraeids was made with O'CONNOR's method (2). Identification was made on live material, and the types subsequently conserved in Bouen. I have not yet finished my investigations, hence I submit only the description of three new species and some data on the Enchytraeid fauna of the cave.

## Sample sites and a list of the species found

**Site No. 1.** About 200 m from the Vöröstó entrance to the cave. (An artificial entrance). The stream flowing here in the cave deposits the leaf and twig debris, carried in the spring, along its clayey shores. Water then recedes more or less, leaving only smaller pools, since it is largely swallowed by the lower cave

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during the drier season. It was in this material consisting of leaf fragments, apparently very favourable to the Enchytraeids, that I found the greatest number of specimens. A further probable cause of this fact is that, together with water and detritus, many Enchytraeids are also carried hither from the external world so that a part of them, finding favourable circumstances, survive and even multiply.

The species found here are:

*Fridericia galba* (HOFFMEISTER, 1843) — 13 May, 1968 (3 specs.); 15 March, 1969 (2); 24 March, 1970 (7). — According to O. NIELSEN and CHRISTENSEN, this species displays a great variability in the number of diverticula of the spermatheca. This holds true also for my material: I found 8 specimens with 3 diverticula, 2 with 4 diverticula, and 2 with 8 diverticula.

*Fridericia ratzeli* (EISEN, 1872) — 21 Oct., 1966 (9); 21 Jan., 1967 (2); 13 May, 1968 (3).

*Fridericia maculata* ISSEL, 1904 — 13 May, 1968 (2).

*Fridericia paroniana* ISSEL, 1904 — 15 April, 1969 (1).

*Fridericia bulbosa* (ROSA, 1887) — 5 April, 1969 (1).

*Fridericia bisetosa* (LEVINSEN, 1884) — 13 May, 1968 (2).

*Achaeta eiseni* VEJDOVSKY, 1877 — 21 Jan., 1967 (2).

*Henlea perpusilla* FRIEND, 1911 — 21 Febr., 1966 (1); 21 Jan., 1967 (4).

*Marionina argentea* (MICHAELSEN, 1889) — 21 Oct., 1966 (4); 24 Nov. 1966 (18); 13 May, 1968 (3); 15 April, 1969 (10); 24 April, 1970 (15).

*Enchytraeus buchholzi* VEJDOVSKY, 1879 — 21 Jan., 1967 (12).

*Enchytraeus lacteus* O. NIELSEN & CHRISTENSEN, 1961 — 15 Nov., 1968 (2); 15 April, 1969 (3).

*Enchytronia christenseni* sp. n. — 15 April, 1969 (9).

*Buchholzia appendiculata* (BUCHHOLZ, 1862) — 13 May, 1968 (1).

*Cernosvitoviella aggtelekiensis* sp. n. — 15 April, 1969 (3); 24 April, 1970 (4).

**Site No. 2.** Decaying bits of wood and the thin clayey crust covering them, at bridge No. 11 (900 m from the entrance at Aggtelek). These are the remains of the wooden bridges constructed in the eighties. They were later replaced by concrete bridges, but the fragments of the former ones had been left there; they began to decay gradually and are often densely interwoven by fungous mycelia. A part of the troglobiont fauna frequently aggregates in these sites (isopods, carnivorous beetles, mites, etc.).

The species found here are:

*Fridericia semisetosa* sp. n. — 21 Jan., 1967 (25 specs.); 23 Febr., 1967 (9); 22 March, 1968 (4); 15 April, 1969 (7); 24 April, 1970 (3).

*Fridericia galba* (HOFFMEISTER, 1843) — 21 Oct., 1966 (2); 21 Jan., 1967 (3); 23 Febr., 1967 (8); 15 April, 1969 (2). — Two individuals show 2 diverticula, the others 3 diverticula of the spermatheca.

*Fridericia paroniana* ISSEL, 1904 — 21 Jan., 1967 (2); 23 Febr. 1967 (1); 24 April, 1970 (2).

*Fridericia bulbosa* (ROSA, 1887) — 23 Febr., 1967 (2); 15 April, 1969 (1).

*Achaeta eiseni* VEJDOVSKY, 1877 — 21 Oct., 1966 (2); 21 Jan., 1967 (2); 23 Febr., 1967 (1); 22 March, 1968 (4); 24 April, 1970 (1).

*Enchytronia christenseni* sp. n. — 22 March, 1968 (2); 24 April, 1970 (1).

*Buchholzia* sp., juv. — 21 Jan., 1967 (13); 23 Febr., 1967 (6); 15 April, 1969 (2); 24 April, 1970 (2).

**Site No. 3.** Scrapings taken from a wooden pole (the remains of the old wooden bridge) on the shore of the stream at bridge No. 11 (900 m from the entrance at Aggtelek). During the high spring waters, also this pole is half submerged in water.

The species found here are:

- Fridericia galba* (HOFFMEISTER, 1843) — 13 May, 1968 (4 specs). — All four individuals have 3 diverticula of the spermatheca.  
*Henlea perpusilla* FRIEND, 1911 — 13 May, 1968 (2).  
*Enchytraeus buchholzi* VEJDOVSKY, 1879 — 15 Febr., 1969 (2).  
*Buchholzia* sp., juv. — 15 Febr., 1969 (6).

**Site No. 4.** Scrapings taken from a smaller pole (the remnant of the old wooden bridge) standing in water at bridge No. 11.

The species found here are:

- Henlea perpusilla* FRIEND, 1911 — 24 Nov., 1966 (2 specs.); 21 Jan., 1967 (3).  
*Marionina argentea* (MICHAELSEN, 1889) — 21 Jan., 1967 (2); 23 Febr., 1967 (3).  
*Enchytronia christenseni* sp. n. — 21 Jan., 1967 (3); 23 Febr., 1967 (2).  
*Cernosvitoviella aggtelekiensis* sp. n. — 21 Jan., 1967 (3).  
*Buchholzia* sp., juv. — 21 Jan., 1967 (6); 23 Febr., 1967 (10).

**Site No. 5.** Pebbly clay sampled on the shore, at bridge No. 11 (900 m from the entrance at Aggtelek).

The species found here are:

- Marionina argentea* (MICHAELSEN, 1889) — 23 Febr., 1967 (2 specs).  
*Cernosvitoviella aggtelekiensis* sp. n. — 23 Febr., 1967 (1).

**Site No. 6.** Gravelly clay sampled on the shore at the so-called "József nádor" pole (608 m from the entrance at Aggtelek).

The species found here are:

- Marionina argentea* (MICHAELSEN, 1889) — 21 Jan., 1967 (4 specs);  
*Cernosvitoviella aggtelekiensis* sp. n. — 21 Jan., 1967 (2); 23 Febr., 1967. (1)

**Site No. 7.** Guano collected in a side-branch (the so-called "Rókalyuk").

The species found here are:

- Enchytraeus buchholzi* VEJDOVSKY, 1879 — 23 Febr., 1967 (114 specs.); 18 Jan., 1968 (3).  
*Buchholzia simplex* O. NIELSEN & CHRISTENSEN, 1963 — 23 Febr., 1967 (2); 25 March, 1970 (1).

*Fridericia semisetosa* sp. n.

(Fig 1)

A small species, about 5–6 mm long, and 0.2–0.24 mm wide. Number of segments: 29–33. Head pore at O/I, dorsal pores beginning with VII. Colour whitish. Setae straight: 1,0–0: (3), 2–2,1. Setae of setal bundles absent beginning with segment VI or occasionally segment VII. In some cases ventral setal bundles comprising 3 setae each in segments VI–XI. Length of setae 20–28  $\mu$ . Cutaneous glands arranged in 2–3 transverse rows per segment, one gland conspicuously bigger; the smaller glands absent from the more posterior segments.

Clitellum situated on XII-1/2 XIII, weakly developed. Glandular cells not arranged in transverse rows.

Brain (Fig. 1 a)  $1\frac{1}{2}$ -2 times as long as wide. Peptonephridium (Fig. 1 b) short, strong, not branching, terminating at about half height of spermathecal ectal duct. Body fluid not containing detached setae. Lymphocytes of two types, in accordance with *Fridericia* type. Dorsal vessel originating in XV-XVI.

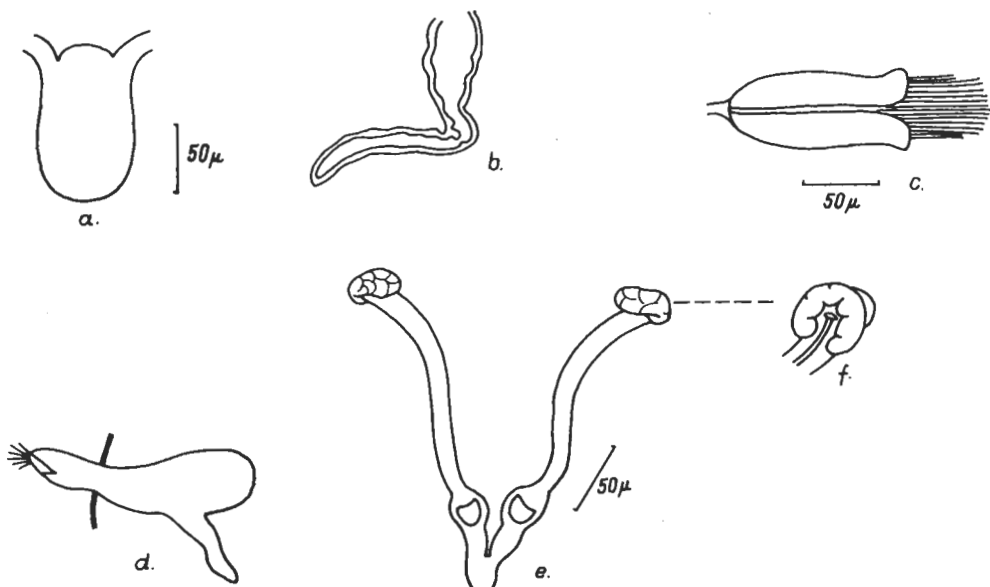


Fig. 1. *Fridericia semisetosa* sp. n. a: brain; b: peptonephridium; c: sperm funnel; d: nephridium; e: spermatheca; f: gland at ectal orifice of spermatheca, view from above

Blood colourless. Nephridia (Fig. 1 d) and septal glands of typical *Fridericia* type. Chloragogen cells present commencing with segment VI, their diameter about  $20\ \mu$ , forming a dense layer posteriorad, filled with brownish granules.

Seminal vesicle absent. Sperm funnel (Fig. 1 c)  $2-2\frac{1}{2}$  times as long as wide, about half as long as diameter of body. Collar indistinct. Efferent duct weakly coiled. Penial bulb small and compact. Spermatheca (Fig. 1 e) bulbiform, without diverticula. Ectal duct about as long as or slightly longer than ampulla; ental ducts of the two spermatheca conjoining and so entering oesophagus. Ectal duct about 5 times as long as diameter of ampulla. Ectal orifice adjoined by a large compact gland, as if embracing it. (Shown in superior view in Fig. 1 f.)

The new species differs from *Fridericia bulbosa* (ROSA, 1887) by the connected spermatheca and the complete absence of detached setae. *Fridericia bulboides* O. NIELSEN & CHRISTENSEN, 1959 possesses four setae in the setal bundles in front of the clitellum, and the peptonephridium is formed also otherwise. The species *Fridericia callosa* (EISEN, 1878), *F. striata* (LEVINSEN, 1884), and *F. caprensis* BELL, 1947, differ also by their higher number of segments and

setae. The number of setae is most characteristic in *Fridericia semisetosa*, while the dorsal bundles are wholly absent beginning with segment VI.

Number of examined specimens: 48.

Occurrence: The species was hitherto found in two localities in Hungary: in site No. 2 in the Baradla Cave at Aggtelek, and recently in a habitat of quite different type, the litter of a *Quercetum cerris* forest, at "Julianna-major, Hársbokorhegy", near Budapest.

Type-specimens: Holotype (F. 1), and Paratypes (P. 2), deposited in the Zoosystematical Institute of the L. Eötvös University, Budapest.

### Genus *Enchytronia* O. NIELSEN & CHRISTENSEN, 1959

The genus *Enchytronia*, based on *Enchytronia parva*, was described by C. O. NIELSEN and B. CHRISTENSEN in 1959. A new species of the genus, collected in the Baradla Cave, differs in two features (spermatheca not fusing entally and the seminal vesicle not missing) from the original description of the genus, hence it must be redescribed.

Diagnosis: Setae straight without nodulus. Head pore at O/I. Dorsal pores absent. Brain longer than wide, convex anteriorly and deeply indented posteriorly, lateral margins converging anteriorad. Paired peptonephridia absent. Transition between oesophagus and intestine at VI/VII. A pair of lateral intestinal diverticula originating at the transition and extending forwards into VI; diverticula communicating separately with intestine through a canal emitting finer branches into body of diverticula. Dorsal vessel arising in XIII. Blood colourless. Nephridia with well developed interstitial tissue; consisting of an anteseptal part with indistinctly demarcated nephrostome and coils of nephridial canal, and an elongate postseptal portion with the efferent duct arising postero-ventrally. Seminal vesicle absent or present. Seminal funnel cylindrical. Vas deferens long and thin. Spermatheca either conjoining entally with each other, and probably also with oesophagus, or joining oesophagus directly and independently.

#### *Enchytronia christenseni* sp. n.

(Fig. 2)

I dedicate the new species to Professor BENT CHRISTENSEN, as a token of my gratitude and esteem.

A small species, about 3.5–4 mm long, and 0.15–0.17 mm wide. Number of segments: 23–27. Head pore at O/I. Dorsal pore absent. Colour whitish. Setae straight, all setal bundles comprising 2 setae each, but segments VIII–XI without dorsal bundles. Length of setae: 21 $\mu$ . Cutaneous glands minute, arranged in 3–4 rows per segment.

Clitellum at XII–1/2 XIII; Weakly developed. The glandular cells arranged in transverse rows.

Brain (Fig. 2 a) about twice as long as wide, convex anteriorly and indented posteriorly. No protonephridia. One pair of lateral intestinal diverticula in VI (Fig 2 d); with a central canal showing a branching ventrally (Fig 2 e). Chloragogen cells present commencing with IV, constituting a thick layer

beginning with VII. Cells 21–28  $\mu$  in diameter, filled with shining oleaginous granules. Lymphocytes (21–28  $\mu$ ) slightly elongated and finely granulous. Dorsal vessel originating in XIII. Blood colourless. Nephridium with well developed interstitial tissue. Efferent duct arising postero-ventrally (Fig. 2 f). Three pairs of septal glands in IV/V–VI/VII; first two pairs dorsally conjoined, third pair free and much elongated. Two pairs of minute secondary glands at IV/V and V/VI.

Seminal vesicle small, situated in XI. Sperm funnel (Fig. 2 c) 2–2.5 times as long as wide, about half as long as width of body. Collar rather high and slightly narrower than width of funnel. Vas deferens long and narrow; penial bulb small

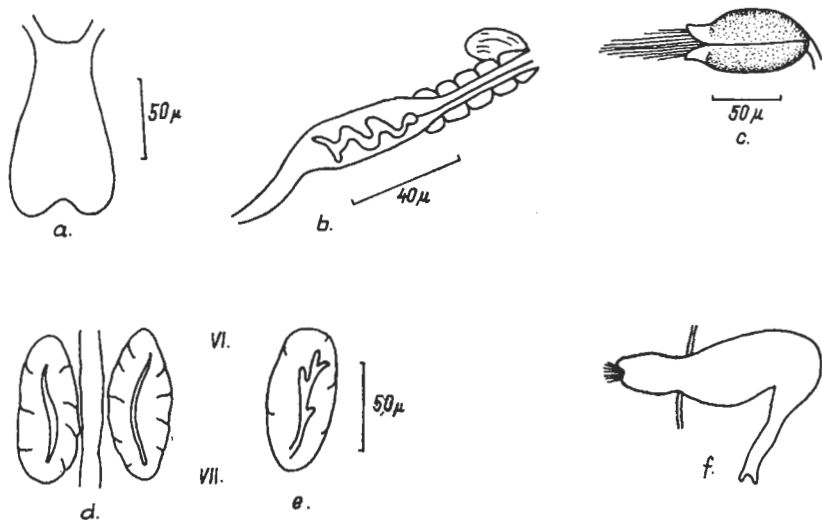


Fig. 2. *Enchytronia christensenii* sp. n. a: brain; b: spermatheca; c: sperm funnel; d: VI–VII intestinal diverticula, dorsal view; e: intestinal diverticula, ventral view; f: nephridium

and compact. Spermatheca (Fig. 2 b) with a long, narrow, much contracted ectal duct, covered with hyaline glands of equal size. A large gland present at ectal orifice. Ectal duct transforming into a cylindrical ampulla about twice as long as wide and slightly shorter than ectal duct; within it a coiled central canal also observable. Ampulla turning into a gradually attenuating ental duct joined with oesophagus in V/VI. Ental ducts of the two spermatheca not interconnected.

*Enchytronia christensenii* sp. n. differs from its two congeners by the absence of the ental fusion of the spermatheca and the presence of the seminal vesicle. From *E. parva* O. NIELSEN & CHRISTENSEN, 1959, it differs also by the dissimilar form of the spermatheca, whereas in *E. annulata* O. NIELSEN & CHRISTENSEN, 1959, the dimensions of the sperm funnel are considerably greater.

Number of examined specimens: 17.

Occurrence: in sites No. 1, 2, 4, of the Baradla Cave at Aggtelek.

Type-specimens: Holotype (E. 1), and Paratypes (P. 1), deposited in the Zoosystematical Institute of the L. Eötvös University, Budapest.

*Cernovitoviella aggtelekiensis* sp. n.

(Fig. 3)

A small species, about 2–3 mm long, and 0.09–0.14 mm wide; very mobile, very contractible. Number of segments: 21–23. Head pore near apex of O. Dorsal pore absent. Colour white or intense white owing to lymphocytes. Setae (Fig. 3 f; see Photograph) with nodulus: 3, 4, 6 — 2, 3, 4: 4, 5, 6, 7, 8, 9 — 3, 4, 6. Length of setae: 35–42  $\mu$ . Body surface secondarily furrowed (see Photograph).

Clitellum at XII-1/2 XIII; glandular cells arranged in transverse rows.

Brain (Fig. 3 a) concave anteriorly and deeply indented posteriorly. Peptonephridia, oesophageal and intestinal diverticula absent. Two primary and

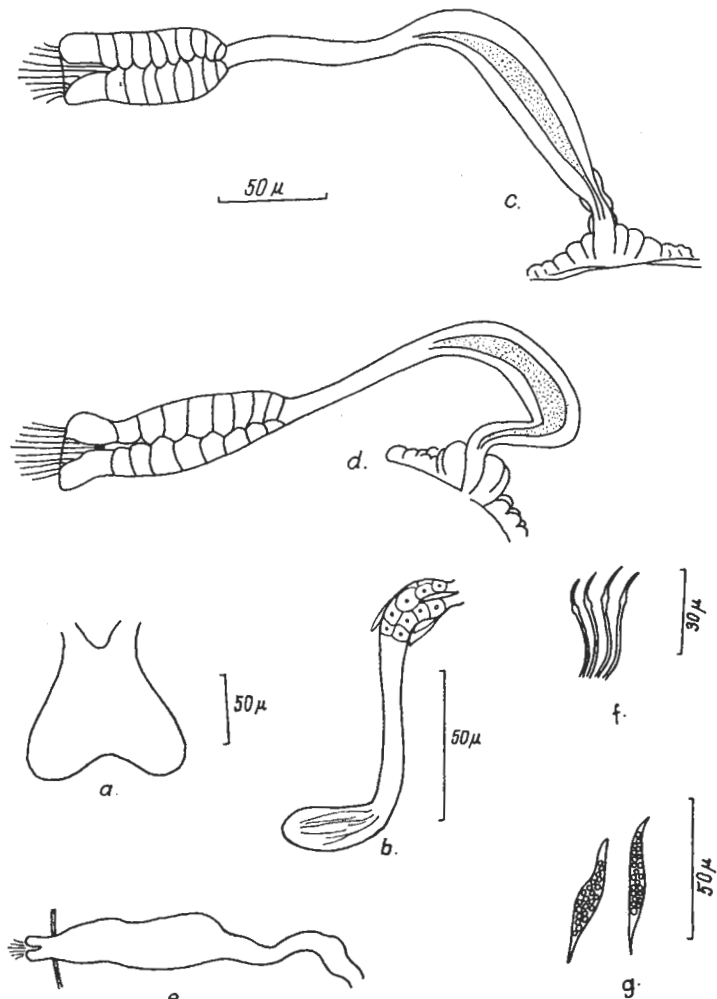


Fig. 3. *Cernovitoviella aggtelekiensis* sp. n. a: brain; b: spermatheca; c and d: sperm funnel; e: nephridium; f: setae; g: lymphocytes

two secondary septal glands present. Lymphocytes (Fig. 3 *g*) spindle shaped, 42–50  $\mu$  long, filled with refractive white granules (dark brown in transmitted light). Dorsal vessel originating in XIV–XV; blood yellowish or slightly pink. Anteseptal portion of nephridium (Fig. 3 *e*) consisting only of funnel; postseptal part elongate and gradually transitional into terminal efferent duct. Interstitial tissue much reduced.

No seminal vesicle. Sperm funnel (Fig. 3 *c*) (see Photograph) 2.5–3 times as long as wide, cylindrical, about half as long as diameter of body. Collar well discernible and as wide as funnel. In certain cases collar slightly wider than funnel, more elongate than in general (Fig. 3 *d*). Central canal well discernible, surrounded by granulated and well developed characteristic cells. Efferent duct about 3–3.5 times as long as length of funnel; initially narrow, contractible, then considerably widened (see Photograph) with a well observable central canal. Male pore with some adjacent, more or less separated, glands. Only a single large mature egg present at a given time. Spermatheca (Fig. 3 *b*) consisting of an oval ampulla, with well discernible spermia, and a very contractible thinner efferent duct turning into a thickened and muscular portion before ectal orifice; this latter site with some badly discernible glands adjoining the duct. Ectal duct about 2.5 times as long as ampulla.

The new species differs from *Cernovitoviella atrata* (BRETSCHER, 1903) and *C. briganta* SPRINGETT, 1969, by its cylindrical sperm funnel; the former also has slightly more setae. *C. briganta* is essentially bigger (4–9 mm, with 28–35 segments) and its spermathecal ampulla extends also much further (to VII), while that of *C. aggtelekiensis* at most to segment VI. *C. carpatica* (BRETSCHER, 1903) differs from the new species mainly by having 3 primary and 3 secondary septal glands, and its spermatheca is also quite differently formed. *C. immota* (KNÖLLNER, 1935) is also bigger (5–7 mm, with 26–28 segments) and displays a further important distinguishing feature: a well-developed seminal vesicle, wholly absent from *C. aggtelekiensis*. The ratio between the spermathecal ampulla and duct is 1.5:1, but 1:2.5 in the new species. The same proportion is 1:1 in *C. tatrensis* (KOWALEWSKI, 1916), and its vas deferens is thick and short.

One of the significant characteristic of *C. aggtelekiensis* is the widening after a short section of its spermathecal duct and then its re-constriction before the orifice. A similar widening appears only in *C. immota* which, however, exists only until the male pore; here, too, the length of the funnel is about equal with the diameter of the body—merely half as long as the width of the body in *C. aggtelekiensis*. The new species is also the smallest one among its known congeners; and its dorsal vessel originates the furthest behind, at segments XIV–XV.

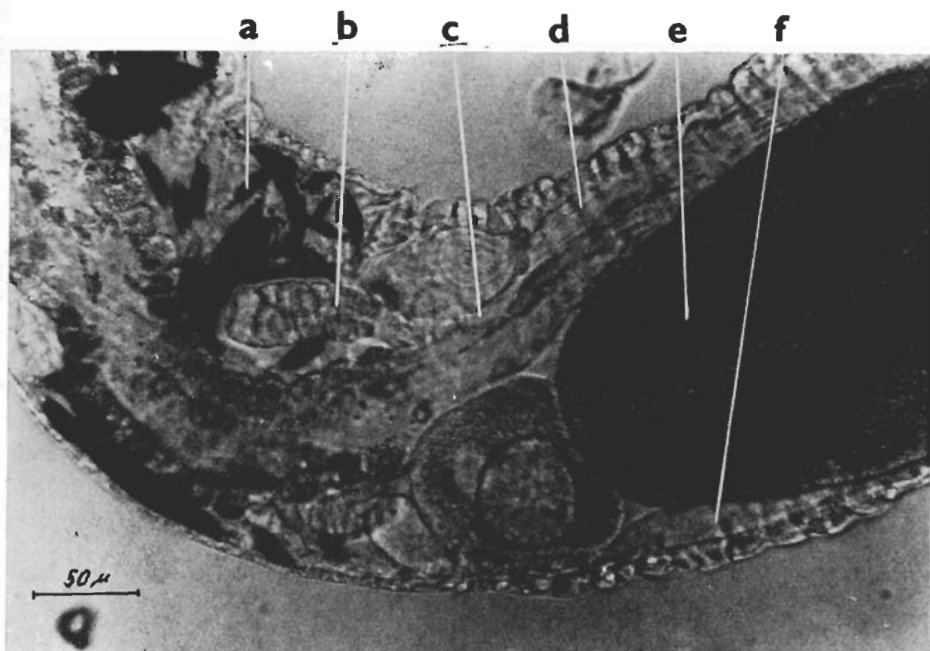
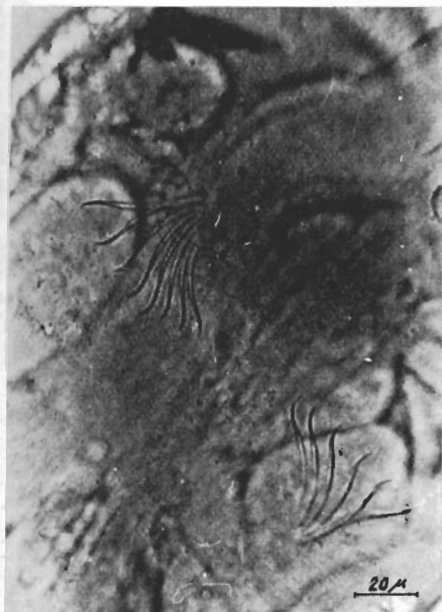
Number of examined specimens: 14.

Occurrence: Sampling sites No. 1, 4, 5, 6, in the Baradla Cave at Aggtelek.

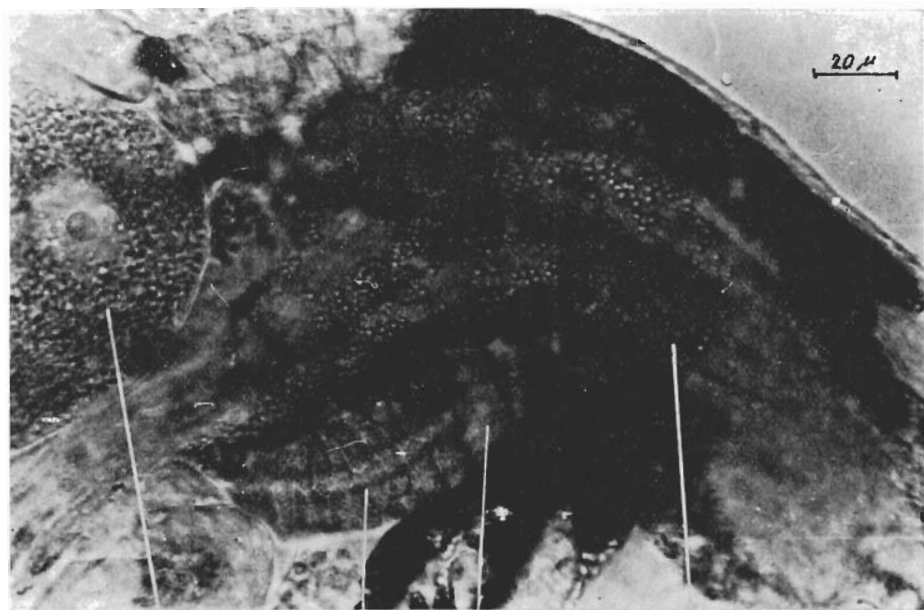
Type-specimens: Holotype (C. 1.), Paratypes (P. 3.), deposited in the Zoosystematical Institute of the L. Eötvös University, Budapest.

It is my pleasant duty to express my gratitude to Professors B. CHRISTENSEN and C. O. NIELSEN for checking my material. I am further indebted to Professor B. CHRISTENSEN for his many advice and extensive support during my stay in Denmark.



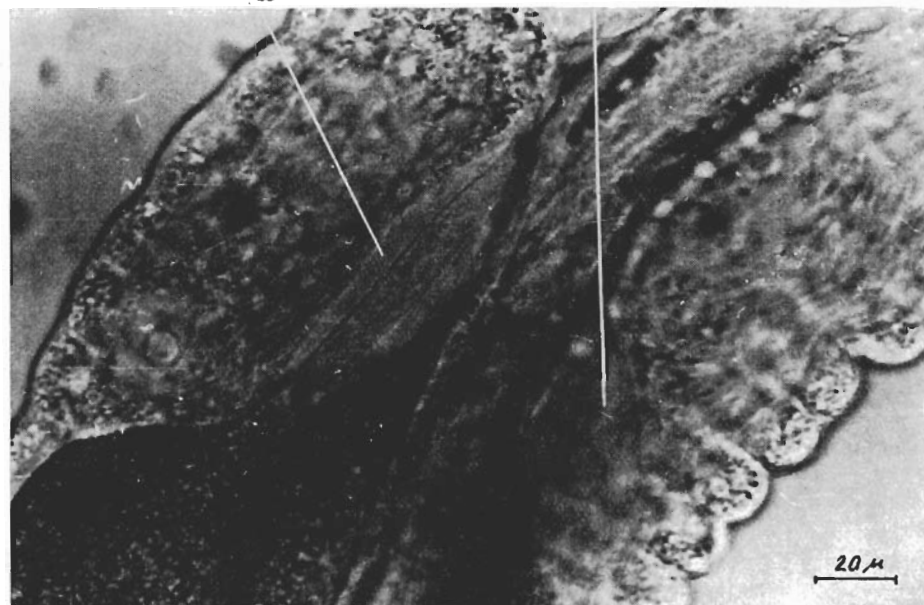


*Cernovitoviella aggtelekiensis* sp. n. — Left, above: setae; right above: secondary segmentation of body surface; below: X—XI—XII. *a*: lymphocytes; *b*: sperm funnel; *c*: thin section of vas deferens; *d* and *f*: widening section of vas deferens; *e*: mature egg. (Photographs made of live material by the author)



a b c d

a b



*Cernovitoviella aggtelekiensis* sp. n. — Above: XI. *a*: egg; *b*: sperm funnel covered with characteristic cells; *c*: collar; *d*: chloragogen cells containing refractive granules; below: XII. *a* and *b*: widening section of vas deferens. (Photographs made of live material by the author)

## Summary

Enchytraeids were collected in seven diverse sites in the stalactite cave "Baradla" at Aggtelek. The habitats represented decaying wood fragments (left in the cave since about 80 years), clay mixed with leaf fragments carried by water into the cave, gravelly clay on the shore of running water, and guano. Investigations resulted in the description of three new species (*Fridericia semisetosa*, *Enchytronia christenseni*, *Cernosvitoviella aggtelekiensis*) and the discovery of 13 further species in the cave. Seven species—*Fridericia bisetosa* (LEVINSEN, 1884), *F. maculata* ISSEL, 1904, *F. paroniana* ISSEL, 1904, *Achaeta eiseni* VEJDOVSKY, 1877, *Henlea perpusilla* FRIEND, 1911, *Enchytraeus lacteus* O. NIELSEN & CHRISTENSEN, 1961, and *Buchholzia simplex* O. NIELSEN & CHRISTENSEN, 1963—proved to be new for the fauna of Hungary.

## ZUSAMMENFASSUNG

### Angaben zur Enchytraeiden-Fauna der Baradla-Höhle in Ungarn, nebst Beschreibung von drei neuen Arten

Die vorliegende Arbeit liefert einen Beitrag zur Kenntnis der Tierwelt der Aggteleker „Baradla“-Tropfsteinhöhle, insofern drei für die Wissenschaft neue Enchytraeiden-Arten (*Fridericia semisetosa*, *Enchytronia christenseni* und *Cernosvitoviella aggtelekiensis* spp. n.) beschrieben werden. Außerdem werden noch 13 Enchytraeiden-Arten angeführt, von denen 7 für die einheimische Fauna neu sind. Es sind dies: *Fridericia bisetosa* (LEVINSEN, 1884), *F. maculata* ISSEL 1904, *F. paroniana* ISSEL, 1904, *Achaeta eiseni* VEJDOVSKY, 1877, *Henlea perpusilla* FRIEND 1911, *Enchytraeus lacteus* O. NIELSEN, CHRISTENSEN 1961, *Buchholzia simplex* O. NIELSEN & CHRISTENSEN 1963.

Die Tiere wurden an verschiedenen Stellen der Höhle gesammelt, u. zw. in morschem Holz (Reste der vor 80 Jahren gebauten Brücken, die seither mit Beton ersetzt wurden), in Laubstreuüberresten, die durch das Wasser eingeschwemmt wurden und sich dort im Lehm abgelagert haben, aus schottrigem Lehm am Ufer von Gewässern und im Guano.

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