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A NEW FRIDERICIA SPECIES (OLIGOCHAETA: ENCHYTRAEIDAE)

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The main phases of spermathecal development are given, based mainly on observations of *Fridericia tubulosa* DÓZSA-FARKAS, 1972. Possibilities of erroneous identification are discussed. The description of *Fridericia reducata* sp. n., showing various degrees of spermathecal degeneration, is submitted.

It has been pointed out by several workers (VEJDOVSKÝ, 1879, 1884; JEGEN, 1920; MICHAELSEN, 1928) that the spermatheca of Enchytraeids is formed by an invagination of the body wall in the groove between segments IV and V. Its type and shape is highly varying per species and genera, displaying also specific characteristics. In the present paper I propose to discuss briefly my observations concerning the development of the spermatheca, and allied problems, of the genus *Fridericia*, as well as to describe a new species found during my studies outlined above.

The majority of Enchytraeids can be identified to species only after the sexual organs have fully developed. However, I succeeded to trace the development of the spermatheca in *Fridericia tubulosa* DÓZSA-FARKAS, 1972, whose juvenile specimens I recognized in a material brought into the laboratory. This was possible only because I was well acquainted with the specific Enchytraeid stock of the soil in question, and of this fauna there was only this species which possessed the characteristic peptonephridia spiralling into striking coils. On this basis, I separated the juvenile animals, of various developmental stages, from the forest rendzina soil sample taken near Budapest, in September, 1970 and kept them in an experimental vessel.

1. In the earliest stage (Fig. 1a), the spermatheca appears as merely a small invaginating saccule, bearing on its apex an irregularly arranged, loose layer of cells. At this stage, there is only a cellular mass of loose construction in the place of the sperm funnel. Nor is the setal chaetotaxy, characteristic of the species, developed at this time; instead of (3),4—2 : 4—(4),2 there appears mostly the 2—2 : 2,(3)—2 formation.

2. At the next stage (Fig. 1b), the spermatheca lengthens and an ectal duct may also be discerned, whose ectal orifice still lacks a gland. The sperm funnel displays rather a cylindrical shape, but the collar is still undeveloped; the organ is thus atypical yet, but the vas deferens may already be seen. The setal bundles now consist of a number of setae characteristic of the species.

3. During further development (Fig. 1c), the ectal duct of the spermatheca lengthens continuously, and the ampulla communicates with the oesophagus. By then, the glands likewise begin to develop at the ectal orifice. At this stage, the sperm funnel is also wholly developed in most individuals, and the completely evolved brown spermia appear in the seminal vesicle. It is this stage which may mislead identifications, since the animal is apparently sexually mature; this problem will be discussed later.

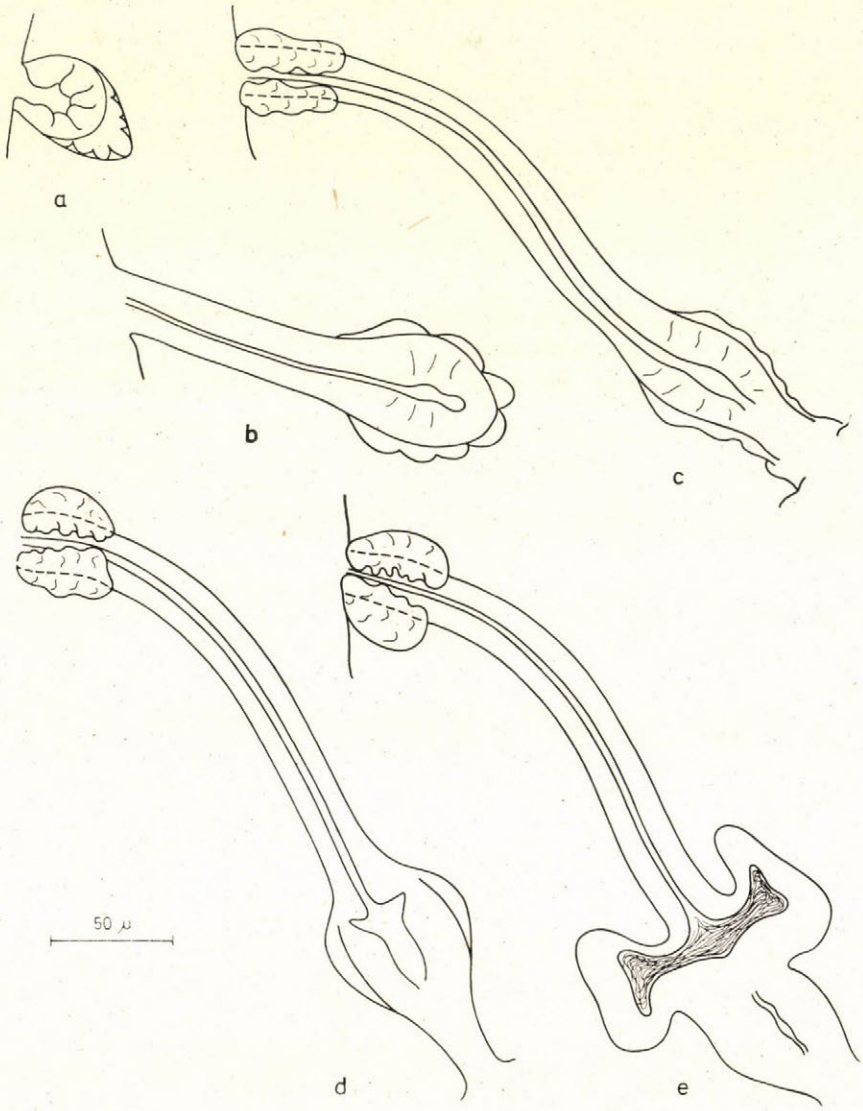

Fig. 1a—e: Developmental stages of the spermatheca in *Fridericia tubulosa*

4. In the subsequent stage (Fig. 1d), two small tubercles appear on the ampulla, the primordia of the developing diverticula. The glands are also completely developed at the ectal orifice.

5. Finally, the spermathecal form characteristic of the species (Fig. 1e) appears by the development of the tubercles; the animal is now sexually mature and identifiable with certainty.

I made no detailed records about the duration of the stages involved, but the typical spermatheca of the sexually mature animals proved that I had in fact separated the juvenile individuals of *Fridericia tubulosa*.

I have observed a similar course of development in other *Fridericia* species, e.g. *F. connata* BRETSCHER, 1902, *F. galba* (HOFFMEISTER, 1843), and *F. semisetosa* DÓZSA-FARKAS, 1970. All observations revealed that the development of the sperm funnel and sperm formation ends somewhat earlier than that of the spermatheca. And at this point attention should again be called to developmental stage (3) in the genus *Fridericia* when the spermathecal ampulla is already connected with the oesophagus, and thus well discernible. This structure is then similar to that found in *Fridericia bulbosa* (ROSA, 1887), *F. bulboides* NIELSEN and CHRISTENSEN, 1959, and in *F. semisetosa*, that is, it consists of a more or less elongated ectal duct and a bulbous ampulla. Since at this stage the sperm funnel is already developed and mature sperms can also be found, the picture is a semblance of sexual maturity — liable to cause misidentifications. But the situation is somewhat alleviated by the fact that there are no sperms in the spermatheca at this stage, nor mature eggs present.

This than is the course of spermathecal development characteristic to the genus *Fridericia*. In some species, however, e.g. *F. paroniana* ISSEL, 1904, abnormal cases of an absent spermatheca (form athecata) may occur (NIELSEN and CHRISTENSEN, 1959). Subsequently, I wish to submit the description of a new species in which the spermatheca appears as a rudimentary organ. Compared to the stages of spermathecal development described above, various grades of rudimentation can be observed in the new species. In the typical forms a state exhibiting the first stage of normal development is encountered, while in some specimens development proceeds further and stops only at the next stage. Thus, the spermatheca of the animal, indisputably relegable by all other features to the genus *Fridericia*, is never connected with the oesophagus. Only one exception is known so far in this respect, i.e., *F. sonorae* EISEN, 1904, whose spermatheca is free and suspended in the body cavity.

Fridericia reducata sp. n. (Figs 2, 3)

Medium-sized species; holotype: 10 mm long and 0.28 mm wide (length of congeners: 10—13 mm, width: 0.23—0.32 mm). Number of segments 45 [paratypes: (42)—48—50—(54)]. Head pore at O/I, dorsal pores beginning

with VI. Colour whitish. Setae straight with a definite ental hook: 1,(2)—0,1 : 2—(2),1. Dorsal setae on segments XV—XXIX absent in holotype, those of paratypes variously absent beginning with segment XV up to segment XL, or present on single segments only appearing again on end of body. Length of setae 30—40 μ, ventral setae shorter beyond clitellum: 20—38 μ, then again longer on end of body. Cutaneous glands 2—3-seriate per segment, transversal, weakly developed. Clitellum on XII—1/2 XIII. Glandular cells arranged in transverse rows.

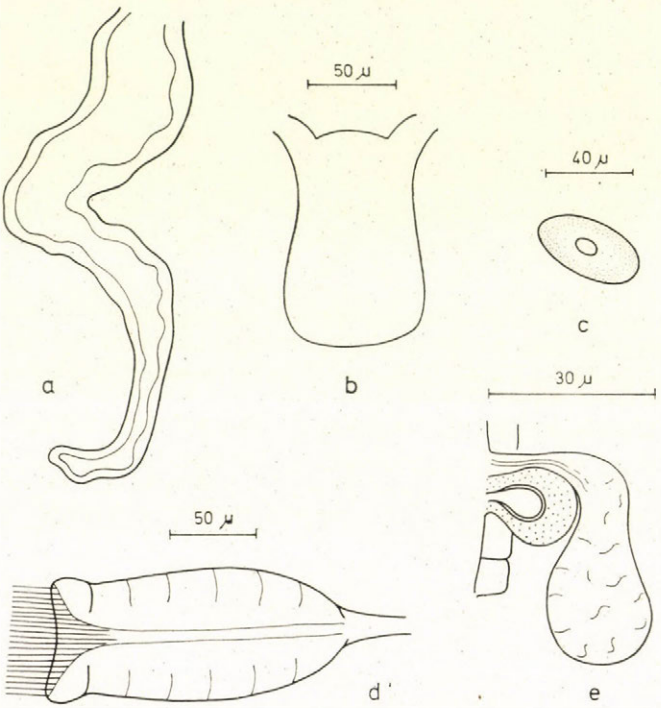

Fig. 2. *Fridericia reducata* sp. n. — a = protonephridium; b = brain; c = lymphocyte with a large nucleus; d = sperm funnel; e = spermatheca

Brain 1.5—2 times longer than wide. Protonephridia (Fig. 2a) short, undivided, terminating in segment VI. Lymphocytes of two types (in accordance with generic characteristic): large, nucleated (Fig. 2c), and small, hyaline, anucleated.

Dorsal vessel in segment XIX (XVIII—XX). Blood colourless. Nephridia and septal glands of *Fridericia* type. Chloragogeneous cells present beginning with segment IV.

Seminal vesicle present in segment XI. Sperm funnel (Fig. 2d) twice (holotype) or twice to thrice (paratypes) longer than wide, about half length of body diameter. Collar well discernible. Efferent duct of medium length,

loosely coiled. Penial bulb medium and compact. Spermatheca rudimentary to various degrees, consisting (also in holotype) of merely a slightly invaginated saccule between segments IV and V, with usually one (holotype) (Fig. 2e), or sometimes two, large, generally pedunculate adjacent glands (Fig. 3b).

There is a smaller number of specimens with a less degenerated spermatheca and in which, if the typical course of spermathecal development described previously is considered, an organ corresponding to developmental

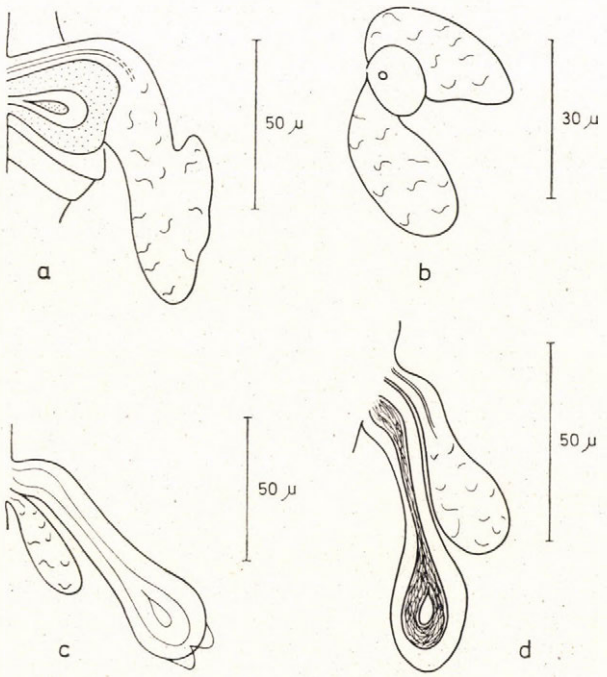

Fig. 3. *Fridericia reducata* sp. n. Variously reduced spermatheca. — a = very reduced type with one large gland; b = superior view, with 2 glands; c = a more developed form; d = least reduced form, with sperms

stage 2 can be found. In these cases, the spermatheca consists of a small sac floating free with its short ectal duct in the body cavity (Fig. 3c), also with the adjacent well-developed gland. There are generally no sperms in the spermatheca; the animals probably propagate parthenogenetically; I was able to observe sperms in the ampulla in one case only, in a specimen with the least degenerated organ (Fig. 3d). However, even in the most developed forms the spermatheca is never connected with the oesophagus. At any given time there is only a single mature egg in the body cavity.

Discussion. — I have pointed out in the introductory remarks that the development of the sperm funnel and spermogenesis precede sperma-

thecal development, and that this may lead to erroneous identifications. This is not the case with the new species, since its spermatheca appears, as described above, even at the time of complete sexual maturity, i.e. when wholly mature eggs are present in the specimens. The situation is not altered even in animals kept alive experimentally for half a year. The only known species in the genus *Fridericia* with a spermatheca disconnected with the oesophagus is *F. sonorae* EISEN, 1904; this latter differs from the new species by the shape and considerably more developed form of the spermatheca, as well as its essentially higher number of setae (6—3 : 6—3). The new species differs also from the athecate form of *F. paroniana* ISSEL, 1904, mentioned by NIELSEN and CHRISTENSEN (1959). Although *Fridericia paroniana* was found at the same locality (DÓZSA-FARKAS, 1970), the specimens differ from the new species by the smaller number of segments (31—35) and the number of setae: (3),4—3 : 4—4,(3). Furthermore, their dorsal vessel originates in segments XIV—XV, and the seminal vesicle is absent.

Number of examined specimens: 10.

Occurrence: Sampling site No. 2, Baradla Cave, Aggtelek, Hungary (DÓZSA-FARKAS, 1970); in decaying bits of wood, 900 m from the entrance at Aggtelek.

Type-material: Holotype (F. 5); paratypes (P. 8), deposited in the Zoosystematical Institute, L. Eötvös University of Sciences, Budapest.

REFERENCES

1. DÓZSA-FARKAS, K. (1970): The Description of three new species and some data to the Enchytraeid Fauna of the Baradla cave, Hungary. — Opusc. Zool. Budapest, **10** (2): 241—251.
2. DÓZSA-FARKAS, K. (1972): Description of three new Fridericia species (Oligochaeta, Enchytraeidae) from Hungarian rendzina soil. — Ann. Univ. Sci. Budapest. Sect. Biol., **14**: 203—209.
3. EISEN, G. (1904): Enchytraeidae of the West Coast of North America. — Harriman Alaska Expedition, Alaska **12**, New York: 1—166.
4. JEGEN, G. (1920): Zur Biologie und Anatomie einiger Enchytraeiden. — Vierteljahrssch. Naturf. Ges., **65**: 100—208.
5. MICHAELSEN, W. (1928): Oligochaeta. — in KÜKENTHAL: Handbuch der Zoologie, **2** (8): 1—112.
6. NIELSEN, C. O. and CHRISTENSEN, B. (1959): The Enchytraeidae, critical revision and taxonomy of European species. — Natura Jutl., **8—9**: 1—160.
7. VEJDOVSKÝ, F. (1879): Beiträge zur vergleichenden Morphologie der Anneliden. — Monographie der Enchytraeiden, Prag: 1—61.
8. VEJDOVSKÝ, F. (1884): System und Morphologie der Oligochaeten. — Prag: 1—172.

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