

## Two New Species of *Fridericia* (Enchytraeidae, Oligochaeta) from Changbaishan Mountain, Jilin Province, China

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Two new enchytraeids from Changbaishan Mountain in north-eastern China are described. Both species lack lateral setae. *Fridericia unisetosa* sp. nov. is diagnosed by the absence of spermathecal diverticula and clitellar gland cells dorsally, while *Fridericia paraunisetosa* sp. nov. is characterized by having 6–8 sessile spermathecal diverticula and dorsal pores from XIII. The only other *Fridericia* species known to lack lateral setae entirely, the North American *F. silvestris* (Leidy, 1882), differs in having a longer body and more setae in each ventral bundle.

**Key Words:** New species, *Fridericia*, Enchytraeidae, Oligochaeta, Changbaishan Mountain, China.

### Introduction

The enchytraeid oligochaetes of China have poorly been studied, only 35 species, 24 terrestrial and 11 marine, having been reported (Cernosvitov 1941; Chen 1959; Liang *et al.* 1979, 1992; Xu *et al.* 1989; Erséus 1990, 1992a, 1992b; Erséus *et al.* 1990; Wang *et al.* in press; Xie *et al.* in press). In 1993, a survey of soil invertebrates of Changbaishan Mountain located in north-eastern China was carried out and many enchytraeids were found in the samples. Among them, two species belonging to *Fridericia* are regarded as new to science. The descriptions of the new species are presented in this paper.

### Material and Methods

Worms were extracted by the wet-funnel method (O'Connor 1962) and fixed in 10% formalin. For microscopical observation, whole worms or dissected specimens were stained in borax carmine or paracarmin and mounted in Canada balsam. Measurements given in the descriptions are based on fixed specimens. Types of the new species are deposited in the Specimen Room of Invertebrates, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan.

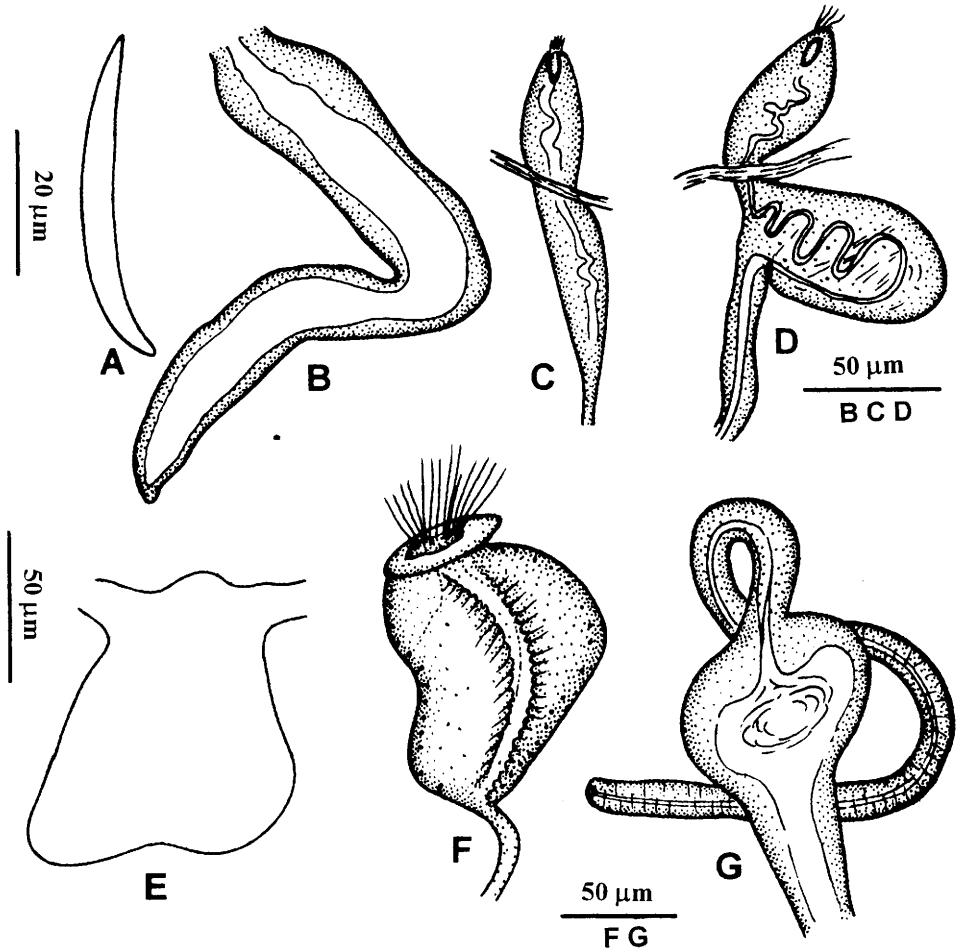


Fig. 1. *Fridericia unisetosa* sp. nov. from Changbaishan Mountain. A, seta in V; B, peptonephridium; C, nephridium in 25/26; D, nephridium in 7/8; E, brain in dorsal view; F, sperm funnel; G, spermatheca.

## Results

### *Fridericia unisetosa* sp. nov.

(Fig. 1)

**Material examined.** Holotype: whole-mounted mature individual, collected August 1993 from Changbaishan Mountain (128°28'E, 42°35'N; 740 m above sea level), Jilin Province, China. Habitat: mixed broadleaf forest, with Korean pine dominant, in brown soil. Paratypes: 3 whole-mounted and 2 dissected individuals, from type locality. Other material: 30 mature individuals preserved in formalin, from type locality.

**Description.** Length 6.5–7.3 mm (holotype, 7.0 mm). Segments 37–55 (holotype,

46). Diameter 0.3-0.5 mm. Epidermal gland cells abundant, transversely arranged in 4-6 rows per segment. Head pore at 0/1. Dorsal pores small, from VII onwards. Lateral setae absent. Ventral setae beginning from II, one seta per bundle throughout. Setae curved, with a slight ental hook (Fig. 1A), 38-45  $\mu\text{m}$  long and ca. 4  $\mu\text{m}$  thick. Spermathecal pores paired, located laterally in 4/5. Clitellum extending over XII and most of XIII, gland cells distributed irregularly and absent in mid-dorsal part. Male pores ventrolateral at mid-XII; female pores inconspicuous, ventral in 12/13. Anus terminal.

Brain trapezoidal (Fig. 1E), protruding anteriorly and concave posteriorly, 89-93  $\mu\text{m}$  in length and 77-80  $\mu\text{m}$  in maximal width. Primary septal glands 3 pairs in IV-VI, anterior two pairs united dorsally. Secondary septal glands absent. Peptonephridia one pair, rod-shaped, unbranched, attached to pharynx ventrolaterally and terminating in posterior of IV (Fig. 1B). Gut dilatation gradual. Chylus cells in XIII-XV. Chloragogen cells scarce, from V onwards. Dorsal vessel originating in XV-XVIII (holotype, XVIII). Nephridia from 6/7 onwards, with 5 pairs in front of clitellum. Anteseptal parts of nephridia large, posteseptal parts elongate, ca. 3-4 times as long as anteseptal ones; efferent duct in anterior segments, originating mid-ventrally, and the rest terminally (Fig. 1C, D). Few detached setae in the coelomic cavity. Coelomocytes oval to round, with regular outline. Nucleate coelomocytes numerous, with evenly distributed granules and several refractile nucleoli, 22-30  $\mu\text{m}$  in diameter; anucleate corpuscles scarce, 6-8  $\mu\text{m}$  in diameter.

Seminal vesicle unpaired, dorsal, unlobed, with anterior distension extending to X, and posterior one to XI. Sperm funnels paired, cylindrical (Fig. 1F), 115-120  $\mu\text{m}$  long and 85-136  $\mu\text{m}$  wide, with a narrow collar (ca. 62  $\mu\text{m}$  wide). Vasa deferentia confined to XII, irregularly coiled. Penial bulbs one pair, hemispherical, 128-140  $\mu\text{m}$  long, 65-72  $\mu\text{m}$  wide, 38-43  $\mu\text{m}$  high. No egg sacs. Only one mature egg present at a time.

Spermathecae in V, each ental duct communicating with oesophagus (Fig. 1G). Ampulla onion-shaped, 77-89  $\mu\text{m}$  in diameter, without diverticulum. Spermatozoa scattered in lumen. Ectal ducts 299-310  $\mu\text{m}$  long and 23-25  $\mu\text{m}$  wide, without accessory glands at ectal pores.

**Remarks.** The new species is easily distinguished from all known species of *Fridericia* except *F. silvestris* (Leidy, 1882) in the absence of lateral setae. However, the new species differs from *F. silvestris* (see Leidy 1882) by having fewer ventral setae in each bundle (2-4 per bundle in *F. silvestris*), and its much shorter body (6.5-7.3 mm in *F. unisetosa*, 19-32 mm in *F. silvestris*).

### *Fridericia paraunisetosa* sp. nov.

(Fig. 2)

**Material examined.** Holotype: whole-mounted mature individual, collected August 1993 from Changbaishan Mountain (128°28'E, 42°35'N; 740 m above sea level), Jilin Province, China. Habitat: mixed broadleaf forest, with Korean pine dominant, in brown soil. Paratypes: 14 whole-mounted and 2 dissected individuals, from type locality. Other material: 34 mature individuals preserved in formalin, from type locality.

**Description.** length 5.0-7.8 mm (holotype, 5.8 mm). Segments 37-55 (holotype,

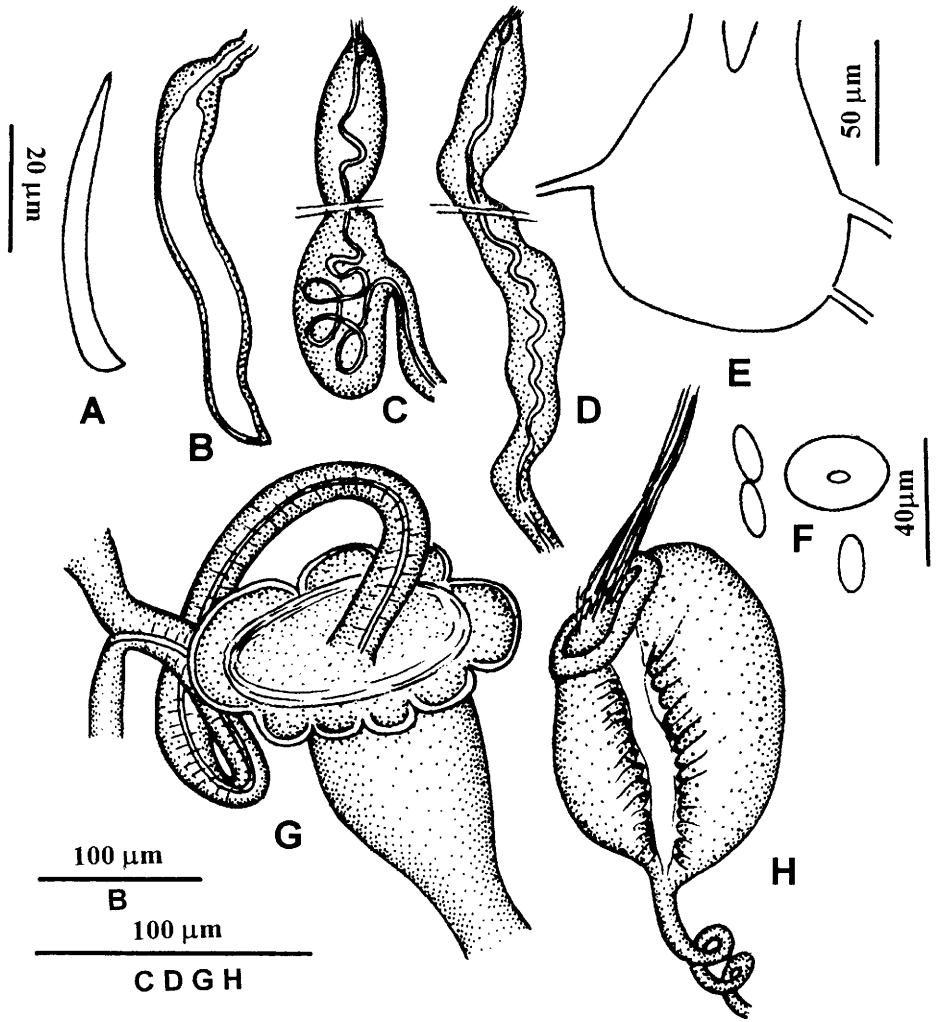


Fig. 2. *Fridericia paraunistosa* sp. nov. from Changbaishan Mountain. A, seta in V; B, pseudonephridium; C, nephridium in 7/8; D, nephridium in 25/26; E, brain in dorsal view; F, coelomocytes; G, spermatheca; H, sperm funnel.

38). Epidermal gland cells numerous, transversely arranged in 3-4 rows per segment. Head pore in 0/1. Dorsal pores from XIII onwards, very small. Lateral setae absent. Ventral setae beginning from II, one per bundle throughout. Setae curved, with a slight ental hook (Fig. 2A), 50-55 μm long and 4-5 μm thick. Spermathecal pores paired, located laterally in 4/5. Clitellum extending over XII and XIII, gland cells distributed irregularly and sparsely on dorsal and ventral sides. Male pores ventrolateral at mid-XII; female pores ventral in 12/13, inconspicuous. Anus terminal.

Brain trapezoidal (Fig. 2E), deeply incised anteriorly and slightly concave pos-

teriorly, 120-125  $\mu\text{m}$  long and 100-105  $\mu\text{m}$  in maximal width. Primary septal glands 3 pairs in IV-VI, all with ventral lobes, anterior two pairs united dorsally. No secondary septal glands. Peptonephridia one pair (Fig. 2B), stout and unbranched, arising ventrolaterally from pharynx and ending in IV. Gut dilatation gradual. Chylus cells in XI-XV (holotype: XII-XIV). Chloragogen cells scarce, from VII onwards. Dorsal vessel originating in XV-XVII. Nephridia from 6/7 onwards, with 5 pairs in front of clitellum. Anteseptal parts of nephridia large, postseptal parts elongate, ca. 3-4 times as long as anteseptal ones; efferent duct in anterior segments originating midventrally, and the rest terminally (Fig. 2C, D). Few detached setae in the coelomic cavity. Coelomocytes with regular outline. Nucleate coelomocytes oval to round, with granules evenly distributed, 30-35  $\mu\text{m}$  in diameter; anucleate corpuscles, spindle-shaped, ca. 20  $\mu\text{m}$  long and 6  $\mu\text{m}$  in maximal width (Fig. 2F).

Seminal vesicle unpaired, unlobed, occupying X-XI. Sperm funnels paired, cylindrical, confined to XII, 130-133  $\mu\text{m}$  long and 89-95  $\mu\text{m}$  wide, with a distinct collar (ca. 58  $\mu\text{m}$  wide) (Fig. 2H). Vasa deferentia confined to XII, irregularly coiled. Penial bulbs one pair, hemispherical, 93-101  $\mu\text{m}$  long, 62-70  $\mu\text{m}$  wide, 43-50  $\mu\text{m}$  high. No egg sacs. One to two mature eggs present at a time.

Spermathecae in V, ventral ducts communicating separately with oesophagus (Fig. 2G). Ampullae conical, 120-150  $\mu\text{m}$  long and 70-100  $\mu\text{m}$  wide, each surrounded by 6-8 sessile diverticula. Diverticula varying in size, largest one ca. 31  $\mu\text{m}$  in diameter. Spermatozoa scattered in lumen of diverticula. Ectal ducts 350-360  $\mu\text{m}$  long and ca. 23  $\mu\text{m}$  wide, without accessory glands at ectal pores.

**Remarks.** Compared to all other known species of *Fridericia*, the new species possessed some unusual features: (1) the brain's deep anterior concavity; (2) the exceptionally large anucleate corpuscles (up to 20  $\mu\text{m}$  long); and (3) the dorsal pores from XIII onwards. The new species somewhat resembles *F. unisetosa*, described above, in lacking lateral setae and in having only a single seta per ventral bundle, but, in addition to the exceptional features listed above, it also differs from *F. unisetosa* in the larger body size and the presence of 6-8 sessile spermathecal diverticula.

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