

Amsterdam Expeditions to the West Indian Islands, Report 31*

TUBIFICIDAE (OLIGOCHAETA) FROM SUBTERRANEAN WATERS, WITH
DESCRIPTION OF TWO NEW GENERA

by

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SUMMARY

Two new genera of the family Tubificidae inhabiting springs, wells and interstitial waters of a brackish lake in the West Indies are described. These are *Spirospermoides stocki* gen. et sp. n. and *Krenedrilus papillatus* gen. et sp. n. A detailed description of the morphological characters and genital organs is provided. A comparison with allied genera and species is also made. The occurrence of some other species of this family has been recorded.

RÉSUMÉ

On donne la description de deux genres nouveaux de la famille des Tubificidae, vivant dans des sources, dans des puits et dans l'eau interstitielle d'un lac saumâtre des Indes Occidentales. Ce sont: *Spirospermoides stocki* gen. et sp. n. et *Krenedrilus papillatus* gen. et sp. n. Une description détaillée des particularités morphologiques et des organes génitaux est donnée. Une comparaison avec les espèces et les genres voisins a été également effectuée. La présence de quelques autres espèces de cette famille est aussi signalée.

1. INTRODUCTION

The oligochaete fauna of subterranean waters of the West Indian Islands and of northern South America has not been investigated so far. The material collected by the Amsterdam Expeditions to the West Indian Islands, which I received through the kindness of Prof. Dr. Jan H. Stock, is very extensive. It includes a few samples collected in the years 1973, 1975, 1976 and numerous samples from the years 1974 and 1978.

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Tubificidae are very common in this material: out of 144 samples with oligochaetes, this family is present in 66 samples. Tubificidae occur in almost all habitats investigated, both natural and artificial. Natural habitats include: springs, karst sources, sinkholes, pools and lakes in caves, and fresh, brackish and marine interstitial waters. Artificial habitats include wells and cisterns.

Most of the specimens are immature, so it is impossible to determine the majority of the species. The specimens are preserved in the collections of the Zoölogisch Museum, Amsterdam (ZMA) and the Polish Academy of Sciences, Kraków (PAS).

2. DESCRIPTION OF THE NEW TAXA

Spirospermoides gen. n.

Diagnosis.— Cutaneous cover thin and wrinkly with circles of small papillae. Hair and pectinate setae in dorsal bundles, only bifid setae in ventral bundles, ventral setae not modified on segment X and absent on segment XI.

Vas deferens long, coiled, not enlarged ectally, with the inner wall ciliated entally, entering atrium apically. Atrium small, crescent-shaped, with inner wall non-ciliated. Prostate gland opening almost apically into the atrium. Ductus ejaculatorius absent. Penis with thick cuticular penis sheath. Spermatheca large, with ovoid ampulla, ectal duct long, coiled. Spermatozeugmata clavate, moderately long.

The new genus is related to the genus *Spirosperma* Eisen, 1879 (see Holmquist, 1978). Differences between these two genera are shown in table I.

Type-species of the genus.— *Spirospermoides stocki* sp. n.

Etymology.— *Spirospermoides* means similar to *Spirosperma*.

***Spirospermoides stocki* sp. n.**
(Figs. 1-3)

Material.— Holotype: mature specimen, whole mount, and 3 paratypes, Amsterdam Expeditions to the West Indian Islands, sta. 78/243, Haiti, Dépt. de l'Ouest, Source du Trou Caiman (18°39'22"N 72°08'23"W), just S. of the road; large, fast-running karst spring; bottom with gravel, roots, leaves; chlorinity 320 mg/l; 10 May 1978. Holotype (ZMA), 3 paratypes (ZMA).

Sta. 78/226: Haiti, Dépt. de l'Ouest, Etang Saumâtre, E.S.E. of village of Fond Parisien (18°29'19"N 71°56'25"W), in interstia of coarse sand on the shore of the lake, just above the waterline near a freshwater pool; chlorinity 110 mg/l; 7 May 1978. Four mature specimens (paratypes) (PAS).

Sta. 78/279: Curaçao, springs of the hamlet of San Pedro (12°15'32"N 69°02'36"W); natural spring, slowly running; bottom of sand; chlorinity 1000 mg/l; 14 May 1978. Four mature specimens (ZMA).

Description.— Length of preserved specimens: 9-13 mm. Number of segments: 54-98. Cutaneous cover thin and wrinkly, small papillae in 2 circles per segment.

Dorsal anterior bundles with 1-2 hair setae 170-250 μ m long and 2-3 pectinate setae 60-75 μ m long, with 2 or 3 thin intermediate teeth (fig. 1A). Dorsal postclitellar bundles with 1 hair seta longer than in the preclitellar segments (340-450 μ m) and 2 pectinate setae 50-75 μ m long. In the terminal segments hair setae short (about 120 μ m) or absent. Ventral anterior bundles with 4-6 bifid setae with distal tooth longer than proximal and distal nodulus (fig. 1B). Ventral postclitellar setae 3-4 per bundle, with equal teeth (fig. 1C). Spermathecal setae unmodified, penial setae absent.

Clitellum on XI-1/2 XII segments. Vas deferens very long, coiled, sometimes extending

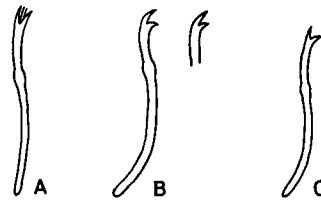


Fig. 1. *Spirospermoides stocki* sp. n.: A, dorsal pectinate seta of preclitellar segment; B, ventral setae of preclitellar segment; C, ventral seta of postclitellar segment.

backward to the 12th segment, with ental part ciliated. Width of ciliated and non-ciliated parts almost the same. Vas deferens entering atrium apically. Atrium small, crescent-shaped, slightly narrowed ectally and entally, with inner wall non-ciliated (fig. 2). Prostate gland medium-sized, opening almost apically into the atrium. Penis large, bend with thick cuticular sheath

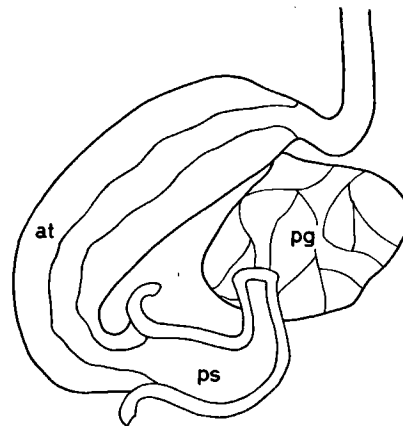


Fig. 2. *Spirospermoides stocki* sp. n., male duct of holotype (at = atrium; pg = prostate gland; ps = penis sheath).

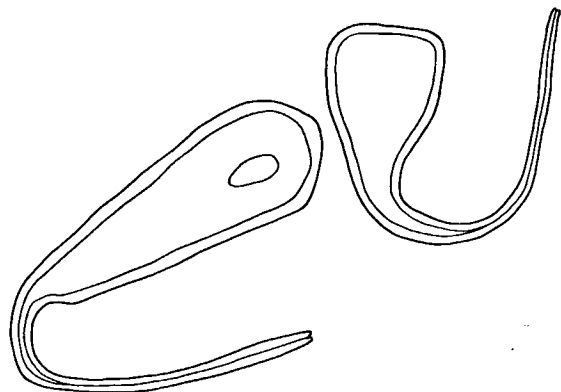


Fig. 3. *Spirospermoides stocki* sp. n., spermatozoegmata.

(fig. 2). Spermatheca large, ampulla ovoid, reaching segment XI (when filled with spermatozoegmata), ectal duct long, coiled. Spermatozoegmata not very long, clavate (fig. 3).

Discussion.— This new species is easily distinguished from all species of the related genus *Spirosperma* Eisen, 1896, viz. from *S. ferox* Eisen, 1896 (see Holmquist, 1978), *S. apapillatus* (Lastochkin & Sokolskaya, 1953) and *S. tenuis* (Hrabe, 1931), by its anatomical characters (see table I) and shape and number of setae. The general characteristics of the

species *Peloscolex superiorensis* Brinkhurst & Cook, 1966, and *P. nerthoides* Brinkhurst, 1965 (sensu Brinkhurst in Brinkhurst & Jamieson, 1971) are similar to those of *Spirospermoides stocki* sp. n., but the shape of the cuticular penis sheath permits to distinguish these species. *Spirospermoides stocki* sp. n. has a large and bent penis sheath, whereas *P. superiorensis* has a long, cylindrical one, and *P. nerthoides* has an elongate, thimble-shaped penis sheath. Moreover, in these two species of *Peloscolex* sensu Brinkhurst (in Brinkhurst & Jamieson, 1971), papillae are absent.

TABLE I
Differences between the genera *Spirosperma* Eisen and *Spirospermoides* gen. n.

	<i>Spirosperma</i> Eisen	<i>Spirospermoides</i> gen. n.
Vas deferens	non-ciliated entally	ciliated entally
Inner wall of atrium	ciliated	non-ciliated
Prostate gland	opening to the atrium above the middle of concave side	opening to the atrium almost apically
Ductus ejaculatorius	long, winding	absent
Spermatozoegmata	long, narrow	moderately short, clavate

Habitat data.— *Spirospermoides stocki* sp. n. occurs in various habitats and substrates with a sandy and gravelly bottom of springs and lacustrine interstitia. It shows high resistance to chlorinity: from 110 mg/l to 1000 mg/l. Associated oligochaete fauna: sta. 78/243 *Stephensoniana trivandran* (Aiyer, 1926), Tubificidae gen. spp. juv., and Enchytraeidae gen. spp. juv.; sta. 78/226 *Pristina synclites* Stephenson, 1925, and Tubificidae gen. spp. juv.; sta. 78/279 *Propappus glandulosus* Michaelsen, 1905, *Achaeta* sp. juv., and Tubificidae gen. spp. juv.

Krenedrilus gen. n.

Diagnosis. — Body wall densely covered with small papillae. Hair and pectinate setae in dor-

sal bundles. Bifid and simple pointed setae in ventral bundles. Spermathecal setae non-modified, penial setae modified. Vas deferens moderately long, entering atrium apically. Atrium tubular with high, non-ciliated inner wall. Prostate gland medium-sized, entering atrium subapically. Penis in penial pouch, without cuticular sheath. Spermatheca large, ovoid, ectal duct long. Spermatozoegmata long and narrow.

Type-species of the genus. — *Krenedrilus papillatus* sp. n.

Etymology. — The proposed name of the genus is composed of the Greek words: $\kappa\rho\acute{\eta}\nu\eta$ (= spring) and $\delta\rho\acute{\iota}\lambda\omicron\varsigma$ (= worm). The specific Latin name, *papillatus*, means covered with papillae.

***Krenedrilus papillatus* sp. n.**

(Figs. 4-7)

Material. — Holotype (mature specimen) and 3 paratypes, also mature specimens with posterior end missing, whole mount (ZMA). Amsterdam Expeditions to the West Indian Islands, sta. 78/316: Venezuela, Distrito Falcón (Paraguana peninsula), Fuente de Miraca (estimated position 11°52'56"N 69°51'32"W); slowly running, natural spring, discharging in a pool; bottom sandy, with roots; chlorinity 910 mg/l; 25 May 1978.

Description. — Small species, about 7 mm long. Body wall densely but finely papillated (fig. 4).

Hair setae 2-3 per bundle anteriorly and 1-2 posteriorly. Length of hair setae increases on the preclitellar segments and it amounts to 140-200 μm on segment III, 200-290 μm on segment V and 370-420 μm on segment VII. In the postclitellar segments the length of hair setae decreases to 200-250 μm . Dorsal crotchets pectinate (fig. 5A), 2-3 per bundle, 37-50 μm long, with long lateral teeth and 2 intermediate teeth, difficult to observe (immersion is needed). Ventral anterior bundles with 4-6 setae, both bifid and single-pointed, 35-45 μm long (fig. 5B). Posterior bundles with 3-4 bifid setae, 37-45 μm long with distal teeth a little shorter than the proximal ones. Sometimes 1 single-pointed seta also present. Segment X with ventral setae non-modified. Segment XI with bundles of modified penial setae, consisting of 5-7 straight setae 62-70 μm long (fig. 5C).

There is a sudden stomach dilatation in segment VII or VIII.

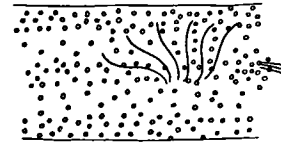


Fig. 4. *Krenedrilus papillatus* sp. n., body wall with papillae.

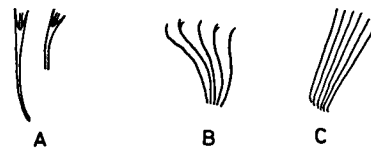


Fig. 5. *Krenedrilus papillatus* sp. n.: A, dorsal pectinate setae of preclitellar segment; B, bundle of ventral setae; C, bundle of penial setae.

Clitellum on segment XI. Vas deferens moderately long, with inner wall non-ciliated, entering apically into the atrium (fig. 6A, B). Atrium tubular, with high non-ciliated cells on the inner wall. Penis small, without cuticular sheath in penial pouch. Prostate gland medium-sized, entering atrium near the ental end. Spermatheca large, the shape of the ampulla varies a little: normally ovoid, sometimes slightly narrowed in the middle part (fig. 7). Ectal duct long. Ampulla filled with long and narrow spermatozeugmata.

Discussion. — The genital organs of *Krenedrilus papillatus* sp. n. are similar to those of the genus *Haber* Holmquist, 1978, and some

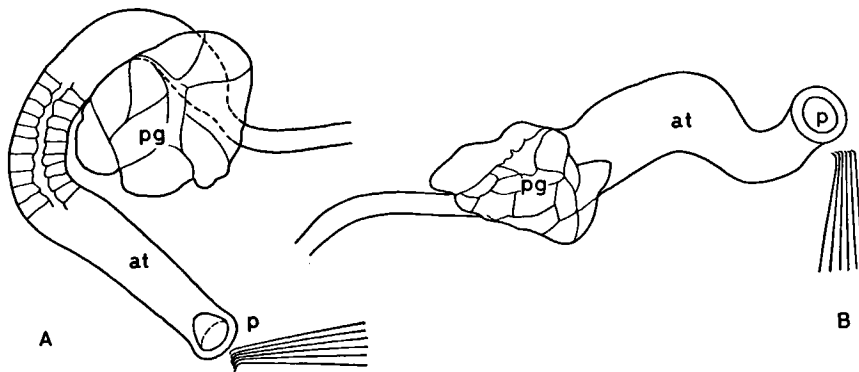


Fig. 6. *Krenedrilus papillatus* sp. n.: A, male duct of holotype; B, male duct of paratype (at = atrium; pg = prostate gland p = penis).

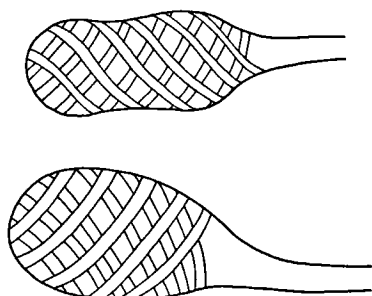


Fig. 7. *Krenedrilus papillatus* sp. n., spermathecae filled with spermatozeugmata.

species of the genus *Isochaeta* Pointner, 1911, but they differ in some important characters (table II). Unfortunately, the description of the genital organs of *Isochaeta* species is incomplete, which renders a comparison difficult. Moreover, the setal formulae of the genera discussed here are quite different (table II). The shape and number of the penial setae of *Krenedrilus* gen. n. is unusual for the subfamily

Tubificinae, while this type of penial setae occurs in Phallodrilinae.

3. NOTES ON OTHER TUBIFICIDAE

Limnodrilus udekemianus Claparède, 1862

Material. — Amsterdam Expeditions to the West Indian Islands, sta. 78/31: Barbuda, Spring Well (near airstrip) (17°38'03"N 61°49'19"W); an open well with fairly clean water; chlorinity 1280 mg/l; 10 April 1978. One specimen (ZMA).

Sta. 78/174: Vieques, well in the village of Monte Santo (estimated position 18°07'51"N 65°27'18"W); well in hut in a small valley; 1 May 1978. Five specimens (ZMA).

Sta. 78/209: Haiti, Dépt. de l'Ouest, spring on the new road from Léogâne to Jacmel, just N. of the boundary between the départements de l'Ouest and du Sud-Est (estimated position 18°21'59"N 72°35'45"W); clear, natural spring with muddy bottom; chlorinity 40 mg/l; 5 May 1978. Three specimens (PAS).

Sta. 78/218: Haiti, Dépt. du Centre, small springs E. of the hamlet of Trianon (= S. of Mirebalais) (estimated position 18°47'31"N 72°06'41"W); natural springs in the

TABLE II

Differences between *Krenedrilus* gen. n. and the genera *Haber* Holmquist, 1978, and *Isochaeta* Pointner, 1911.

	<i>Krenedrilus</i>	<i>Haber</i>	<i>Isochaeta israelis</i> Brinkhurst, 1971	<i>Isochaeta nevadana</i> Brinkhurst, 1965	other <i>Isochaeta</i>
Hair and pectinate setae	present	present	present	present	absent
Simple-pointed setae in ventral bundles	present	absent	absent	absent	absent
Spermathecal setae	unmodified	modified	unmodified	unmodified	in some cases modified
Penial setae	modified	modified	unmodified	unmodified	in some cases modified
Vas deferens	long, not enlarged ectally	long, enlarged ectally	long	short	long
Prostate gland	medium size	medium size	small	small	small
Ductus ejaculatorius	absent	present	?	?	?
Cuticular penis sheath	absent	absent	present	present	in some cases present

bank of a brook; slowly running; bottom loam and sand; chlorinity 90 mg/l; 6 May 1978. One specimen (PAS).

L. udekemianus was found in two springs and two wells with sandy or muddy bottom, at chlorinities ranging from 40-90 mg/l to 1280 mg/l. This is a cosmopolitan species, occurring in various water bodies (including polluted waters), but up to now it was never recorded at such high chlorinities. Almost all specimens are mature: the shape and size of the genital organs are typical of this species.

Embolocephalus velutinus (Grube, 1879)

(Figs. 8-9)

Material. — Amsterdam Expeditions to the West Indian Islands, sta. 78/172: Vieques, village of Monte Santo, open well behind a house (18°07'34"N 65°26'55"W); 1 May 1978. Three specimens (ZMA).

Sta. 78/317: Venezuela, Distrito Falcón (Paraguana peninsula), windpump on well in the village of Miraca (estimated position (11°52'54"N 69°51'34"W); chlorinity 1090 mg/l; 25 May 1978. Two specimens (PAS).

Up to now *E. velutinus* was known from Europe only, where it occurs mainly in subterranean waters, but also in springs, mountain streams and deep lakes with muddy bottom.

Length of preserved specimens: 10-14 mm. Number of segments: 40-45. Body wall densely papillated.

Dorsal bundles consist of only 1 hair seta and 1 or rarely 2 very fine hair-like crotchets. Each ventral bundle consists of 1 single-pointed and 1 bifid seta with reduced distal tooth. The proximal end of the setae are placed in the setal sac (fig. 8). Spermathecal setae modified, penial setae absent. Vas deferens long, coiled, atrium cylindrical, penis without cuticular penis sheath. Spermatheca with very long ampulla, indistinctly set off from the short ectal duct (fig. 9).

Some characters of the specimens examined are different from the previous descriptions. The length of the body, the number of segments and the number of setae in the dorsal bundles are smaller than usual (Brinkhurst, in Brinkhurst & Jamieson, 1971; Kasprzak, 1981).

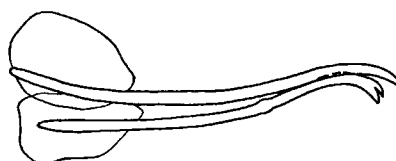


Fig. 8. *Embolocephalus velutinus* (Grube, 1879), bundle of ventral setae.



Fig. 9. *Embolocephalus velutinus* (Grube, 1879), spermatheca.

The ampullae of the spermathecae are very long and the ectal ducts are short, whereas the typical specimens have slightly elongated ampullae and quite long ectal ducts.

The decrease in body size may be caused by unfavourable life conditions, but the reasons for the overgrowth of ampullae are difficult to explain. Probably the accumulation of big masses of spermatozeugmata is profitable to these animals.

ACKNOWLEDGEMENTS

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