

AQUATIC OLIGOCHAETA FROM THE FARTHEST SOUTHEAST OF RUSSIA IV. LUMBRICULIDAE

Tarmo TIMM

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Abstract. A survey of the lumbriculid fauna of the southernmost part of the Primorskiy Territory, Russia, is given. Eight taxa were distinguished in the material, four of them identified to the species level. Three new species are described in this paper, together with a new genus: *Stylodrilus suputensis* sp. n., *Muliercula emendata* gen. n. sp. n., and *M. casta* sp. n., all found in the upper Komarovka Stream in the V. L. Komarov Ussuriysk State Nature Reserve. *S. suputensis* has several very large separate prostate glands instead of a continuous layer of prostatic cells along each atrium. Both new species, tentatively placed in the new genus *Muliercula*, are parthenogenetic, without any male reproductive organs, with a double pair of ovaria and with spermathecae in or near the ovarian segments.

Key words: Oligochaeta, Lumbriculidae, new taxa, zoogeography, Russian Far East.

INTRODUCTION

Lumbriculidae are mostly a Palaearctic and Baikalian family of the freshwater Oligochaeta. They are especially diverse and abundant in cool habitats (Timm 1980). In the Far East, rich local lumbriculid faunas are known on the Japanese Islands and Sakhalin (Yamaguchi 1953; Сокольская 1967), the Kamchatka Peninsula (Michaelsen 1929; Сокольская 1983a), the Chukchi Peninsula (Сокольская 1983b), and in the basins of the rivers Kolyma, Chaun, Anadyr, etc. of the Magadan Region (Морев 1978, 1982, 1983, 1984; Timm 1994a). One species was recently found in Korea (Brinkhurst et al. 1994). All in all, 24 species of Lumbriculidae, mostly endemic, have been recorded from these regions so far: *Lumbriculus illex* Timm et Rodriguez, 1994; *L. japonicus* Yamaguchi, 1936; *L. kolyomensis* Morev, 1982; *L. mukoensis* Yamaguchi, 1953; *L. multiastratus* Yamaguchi, 1937; *L. olgae* Sokolskaja, 1976; *L. sachalinicus* Sokolskaja, 1967; *L. variegatus* (Müller, 1974); *Trichodrilus itchaensis* Sokolskaja, 1973; *Stylodrilus chukotensis* Sokolskaja, 1975; *S. tschaunensis* Morev, 1982; *Hrabea ogumai* Yamaguchi, 1936; *Rhynchelmoides malevici* Sokolskaja, 1983; *R. orientalis* (Yamaguchi, 1936); *Styloscolex distinctus* Morev, 1984; *S. japonicus* Yamaguchi, 1937; *S. levanidovi* (Sokolskaja, 1977); *S. macer* Sokolskaja, 1976; *S. opisthothecus* Sokolskaja, 1969; *S. sokolskajae* Morev, 1978; *S. tetrathecus* Burow, 1931; *S. tubulatus* Timm, 1994;

Kurenkovia magna Sokolskaja, 1969; *Lamprortus ortentalis* Rodriguez, 1994.

Lumbriculidae seem to be scanty in the more southern parts of the Asian continent. Only two widely distributed species, *Lumbriculus variegatus* and *Styloscolex tetraethicus*, have been found in the Amur River and in Manchuria (Сокольская 1958, 1961; Chen 1959), and only an unidentified immature form, probably *L. variegatus*, in the lower Yangtze River (Chen 1940).

I had an opportunity to study oligochaete samples collected by the staff of the Far East Scientific Centre (Vladivostok), mostly in the torrential Komarovka Stream, Primorskiy (Maritime) Territory, Russia, not far from the borders of China and North Korea. Oligochaetes belonging to other families have been described elsewhere (Timm 1990, 1991, 1994b). Four species of Lumbriculidae, all new to science, were identified in the Komarovka Stream (one of them was already published by Timm & Rodriguez 1994) while the identity of four more taxa remained unclear.

MATERIAL AND METHODS

The Komarovka (formerly Suputinka) is a first-order affluent of the Razdol'naya (Suifun) River flowing into the Sea of Japan west of Vladivostok (Fig. 1). The 70-km-long stream drains the southern ranges of the Sikhote-Alin Mountains. The first 18 km, flowing in the submountainous landscape, through the V. L. Komarov Ussuriysk State Nature Reserve (at about 43°50' N, 132°10' E), is clean, while the lower reaches become gradually eutrophicated. The uppermost 36 km was studied in 1983–84



Fig. 1. Location of the study area in the southern Primorskiy Territory (above) and sampling stations 0–11 on the upper 36 km of the Komarovka Stream (below).

by the staff of the Far East Scientific Centre (Vladivostok). Benthos samples were taken monthly from May to November at 12 stations using a Levandov benthometer (a variant of the Surber sampler, capturing area 30×40 cm), a simplified "small benthometer" (25×25 cm), or by the kick-sampling method. In all, 51 samples with oligochaetes were obtained and preserved either in 4% formalin or 70% ethanol. Lumbriculidae were present in 21 samples, with 59 specimens of a total of 1153 oligochaetes. A preliminary survey of this material was presented by Timm (Тимм 1987).

An analogous collection made in 1984 in the adjacent, more torrential Frolovka (Pensau) Stream yielded only two immature lumbriculid specimens of a total of 2192 oligochaetes in 36 samples.

In 1989–90, sampling was conducted in the lower reaches of the Komarovka, in the main Razdol'naya River, and in its affluents. These all are polluted lowland rivers within or near the town of Ussuriysk. A total of 63 samples with 3952 oligochaetes were studied, among them only 7 immature lumbriculids. Two additional single samples in 1986 from the shore of Amurskiy Bay and Popov Island (near Vladivostok) produced 10 more immature specimens.

In total, the material consists of 78 individuals of Lumbriculidae, from 30 samples. Twenty-one individuals were identified down to species level. The rest were either immature or poorly preserved. The worms were studied as whole mounts in glycerol and Canada balsam and also as sections. The type material is maintained at the Võrtsjärv Limnological Station (VLS), Rannu, Estonia.

SYSTEMATIC PART

Stylodrilus suputensis sp. n. (Fig. 2)

Lumbriculidae gen. sp. No 3: THMM (1987: 134)

Holotype. VLS, No 18-1: serial sagittal sections on two slides.

Paratype. VLS, No 18-2: a whole-mounted mature specimen, from type locality.

Type locality. Komarovka Stream, station 5, sample 161, collected 29 May 1984.

Etymology. Derived from the vernacular name of the stream.

Description. Length over 10 mm, more than 32 segments (no complete specimens available). Width up to 0.65 mm. Prostomium roundish. Intersegmental furrows weak, antecitellar segments beginning from V biannulate, with short anterior ring. Setae two per bundle, simple, sigmoid, with distal nodulus, 125–190 μ m long. Clitellum weakly developed, apparently extending over X–XII. Genital apertures (spermathecal pores in X, male pores in XI, female pores in 12/13) externally indistinguishable.

Body wall epithelium about 20 μ m thick (only 22 μ m was measured in the clitellum), layer of circular muscles 8–10 μ m, and longitudinal musculature about 20 μ m thick. Brain in I, small, bipartite; circumpharyngeal connectives proceeding from the ventral side of both halves of brain. Subpharyngeal ganglion in II. Thin-walled buccal cavity in I, small. Pharynx in II–IV, with a thick roof and thin bottom, internally ciliated. Oesophagus in V–VIII, with thick ciliated wall. Pharyngeal glands as loose masses of chromophilous cells on both sides of oesophagus in V–VII. Intestine begins with an abrupt dilatation in IX, compressed in subsequent genital segments. Chloragogen tissue weakly developed, its beginning point not fixed. Nephridia and circulation system not studied.

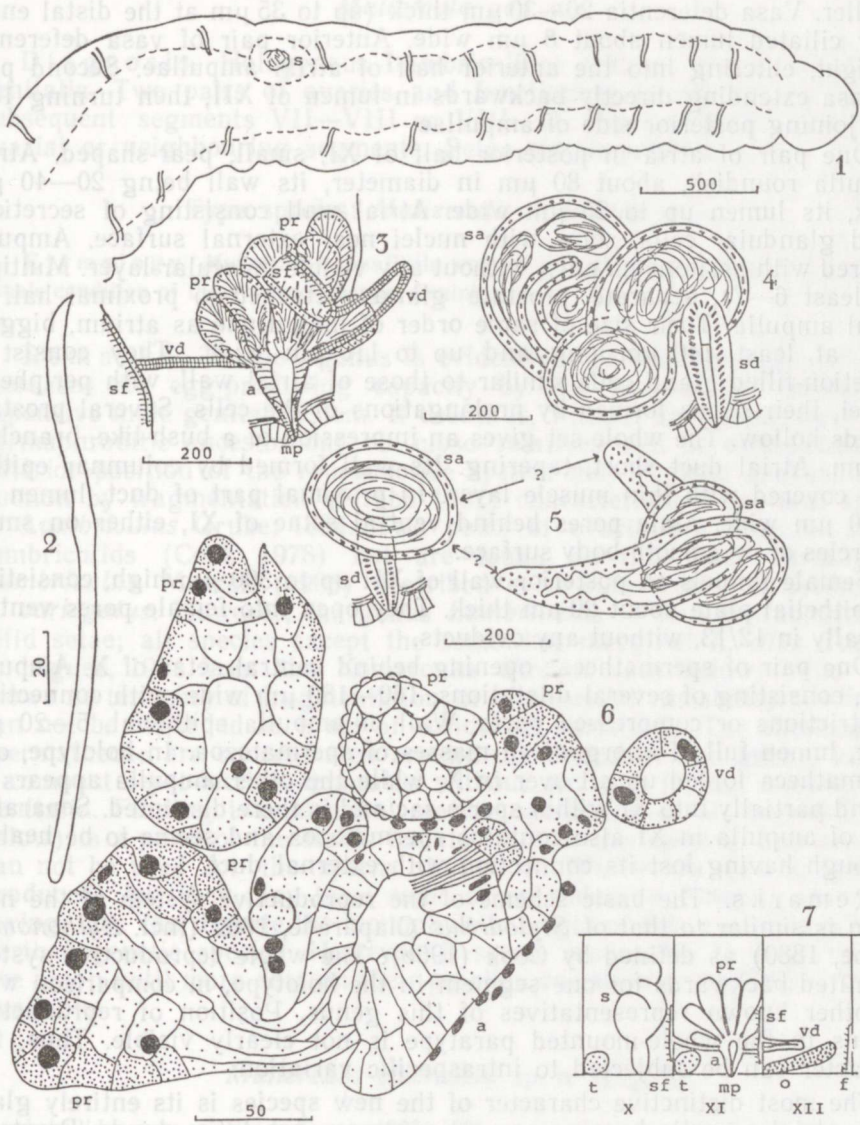


Fig. 2. *Stylodrilus suputensis* sp. n. 1, anterior end and genital region of the paratype; 2, seta; 3, reconstruction of male efferent ducts, holotype; 4 and 5, reconstructions of spermathecae, holotype; 6, section of the male efferent ducts, holotype; 7, diagrammatic scheme of reproductive apparatus of the holotype, all elements paired.

Abbreviations used in Figs. 2–4: a, atrium; b, brain; c, clitellum; ch, chloragogen tissue; e, epidermis; f, female funnel; mp, male pore; o, ovary; pg, pharyngeal glands; pr, prostatic gland; s, spermatheca; sa, spermathecal ampulla; sd, spermathecal duct; sf, sperm funnel; t, testis; vd, vas deferens. VI–XII, numbers of the segments. Scale bars in µm.

One pair of compact testes in XI; another pair evidently in X, but not seen in the holotype (however, spermatozoa were observed in coelom of X). Paired sperm sacs reaching at least XX. Two pairs of sperm funnels, in X and XI (on 10/11 and 11/12, respectively). In the holotype, upper lip of the second pair was up to 200 µm high and 20 µm thick, while funnels of the first pair were unequal, one of them being considerably

smaller. Vasa deferentia 20—30 μm thick (up to 35 μm at the distal end), their ciliated lumen about 8 μm wide. Anterior pair of vasa deferentia straight, entering into the anterior half of atrial ampullae. Second pair of vasa extending directly backwards in lumen of XII, then turning 180° and joining posterior side of ampullae.

One pair of atria in posterior half of XI, small, pear-shaped. Atrial ampulla roundish, about 80 μm in diameter, its wall being 20—40 μm thick, its lumen up to 25 μm wide. Atrial wall consisting of secretion-filled glandular cells, some with nuclei near external surface. Ampulla covered with peritoneum only, without any visible muscular layer. Multiple (at least 6—7), separate prostate glands attached to proximal half of atrial ampulla. Their size of same order of magnitude as atrium, biggest ones at least 140 μm long and up to 110 μm wide. They consist of secretion-filled gland cells similar to those of atrial wall, with peripheral nuclei, their stems formed by prolongations of the cells. Several prostate glands hollow. The whole set gives an impression of a bush-like, branched atrium. Atrial duct short, tapering. Its wall formed by columnar epithelium covered with thin muscle layer. In proximal part of duct, lumen up to 20 μm wide. Male pores behind ventral setae of XI, either on small tubercles or on smooth body surface.

Female funnels on posterior wall of XII up to 300 μm high, consisting of epithelial plate about 20 μm thick. They open into female pores ventrolaterally in 12/13, without any oviducts.

One pair of spermathecae opening behind ventral setae of X. Ampulla long, consisting of several dilatations, 160—180 μm wide, with connecting constrictions or compressed parts. Wall of ampulla epithelial, 5—20 μm thick, lumen full of unorganized masses of spermatozoa. In holotype, one spermatheca folded up all over in X, while the other ampulla appears to extend partially into XI within sperm sac and is there disrupted. Separated part of ampulla in XI also contains spermatozoa and seems to be healed, although having lost its connection with external duct.

Remarks. The basic scheme of the reproductive system of the new taxon is similar to that of *Stylodrilus* Claparède, 1862 (incl. *Bythonomus* Grube, 1880) as defined by Cook (1968). The whole reproductive system is shifted backwards for one segment in the holotype, in comparison with all other known representatives of this genus. Position of reproductive organs in the whole-mounted paratype is not clearly visible. Thus, the character can be subjected to intraspecific variation.

The most distinctive character of the new species is its entirely glandular atrial ampulla bearing several enormous prostatic glands. Prostatic tissue can lie "in discrete masses" in *Stylodrilus* like in some other lumbriculid genera (Cook 1968). Numerous small separate clusters of prostatic cells are depicted e.g. in the Far Eastern species *S. chukotensis* Sokolskaja, 1975 (Сокольская 1975, fig. 4). However, in all these cases atrial wall includes a distinct muscular layer, while the separate prostatic glands are several times smaller than the atrial ampulla.

A tendency of degeneration of the first pair of testes and sperm funnels (which still seem to be functioning) is apparent in segment X of the holotype. The anterior testes are more resorbed than the posterior pair, the anterior sperm funnels are unevenly developed, and the sperm sacs originating from X have already been closed, thus also disrupting the spermathecal ampulla that protrudes into one of them.

Distribution and ecology. Known only from the Komarovka Stream, at the type locality. The station is situated under a broad-leaved forest canopy, on a gravelly bottom at a mean depth of 15—20 cm, the current velocity being 0.5—1 m/s and the maximum water temperature in summer 17.5°C.

Muliercula gen. n.

Diagnosis. Hologynous Lumbriculidae without any trace of male genitalia. Two pairs of ovaries and functioning female funnels in two subsequent segments VII—VIII or VIII—IX. Spermathecae present in ovarian or neighbouring segments. Setae simple-pointed.

Type species: *Muliercula emendata* sp. n.

Etymology. *Muliercula* means 'little woman' in Latin, emphasizing the exceptional female condition of these worms. Gender feminine.

Remarks. The new genus is evidently a parthenogenetic one which increases its egg-producing capacity by the loss of the biologically expensive male genital system. It descends, without any doubt, from some hermaphroditic ancestor but no close relatives can be established. The anterior position of the reproductive system may suggest asexual reproduction by fragmentation (Hrabě 1981) characteristic of several species of *Lumbriculus* Grube, 1884. Two pairs of ovaria are unusual among lumbriculids (Cook 1978) but are found as individual variation in *Lumbriculus*. Mrázek (1906) described even pure female individuals of *L. variegatus*. However, the genus *Lumbriculus* is also characterized by bifid setae; all species except the somewhat marginal *L. illex* Timm et Rodriguez, 1994 from the Komarovka Stream (see below). The latter shows no tendency of fragmentation, or of essential variability. *Muliercula* can not be regarded as a set of accidental variations. The clitellum and spermathecae are concentrated around the ovaria in this genus, forming a compact reproductive apparatus without any gap for the missing male genitalia. Finding two identical mature specimens of *M. emendata* (see below) is a proof of the stable female state in this species. Spermathecae can not be used for the sperm storage in *Muliercula* (as no sperm is produced) but they may have some other, unknown function in cocoon-laying. One can dispute the monophyletic origin of this assemblage of two parthenogenetic species. However, it seems reasonable to treat them as one taxon until more data on their possible variation and affinities become available.

Muliercula emendata sp. n. (Fig. 3)

Lumbriculidae gen. sp. No. 1: ТИММ (1987 : 133)

Holotype. VLS, No. 19-1: serial sagittal sections.

Paratypes. VLS, No. 19-2: serial transverse sections on two slides, from type locality. VLS, No. 19-3: 6 whole-mounted immature specimens on one common slide, from type locality.

Type locality. Komarovka Stream, station 3, sample 189, collected 30 May 1984.

Etymology. From Latin *emendatus*, meaning 'perfect', 'faultless'.

Description. Length over 10 mm, more than 38 segments (no complete specimens available). Width 0.35—0.52 mm. Prostomium elongate, with either tapering or roundish end. Up to 3—4 secondary annuli on some anteclitellar segments. Setae two per bundle, simple, sigmoid, with slightly distal nodulus, usually 90—145 μ m long and 4—5 μ m thick. In foremost dorsal bundles setae often smaller, only 50—60 μ m long and 2 μ m thick, gradually growing larger backwards. Clitellum extending over 1/2VII—X, with indistinct edges. Inconspicuous female pores in 8/9 and 9/10 on the line of ventral setae. Spermathecal pores behind ventral setal bundles of VII and X, on rim of clitellum.

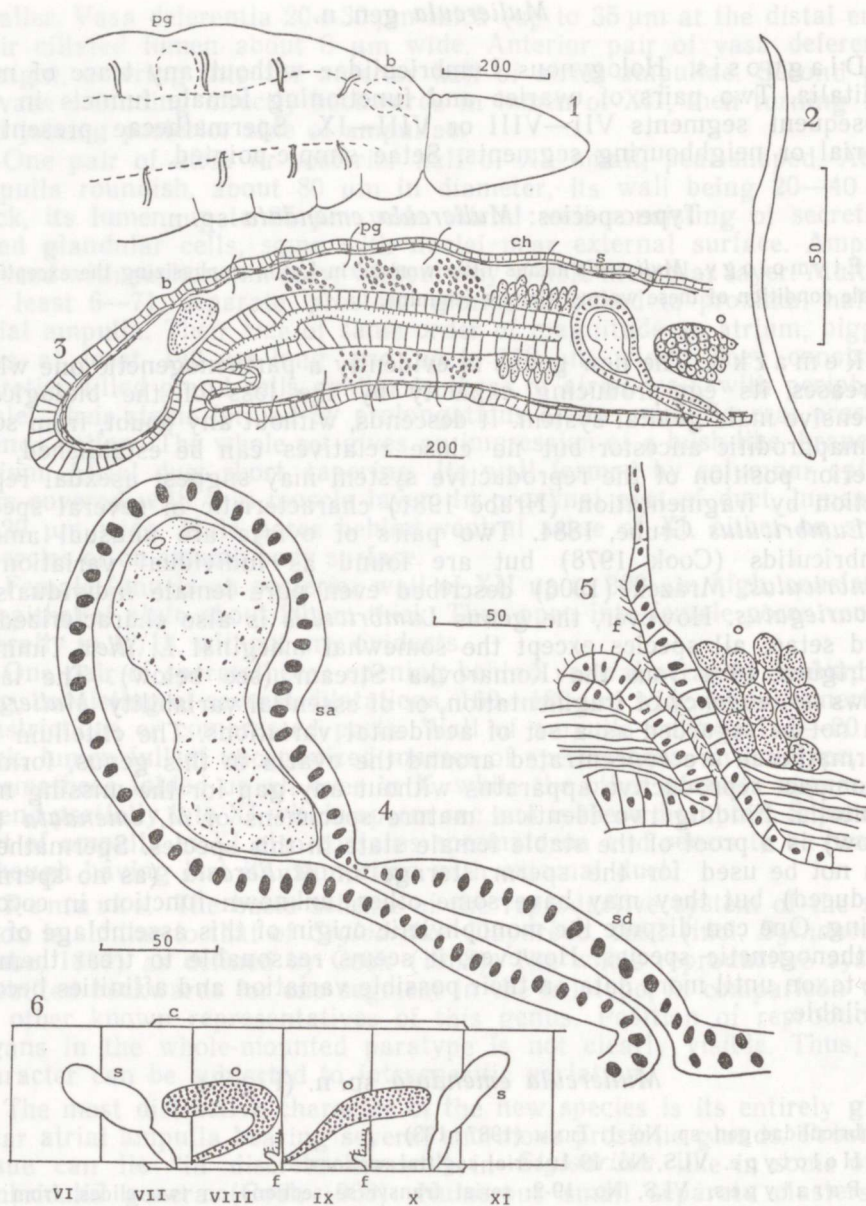


Fig. 3. *Muliercula emendata* sp. n. 1, anterior end of the paratype; 2, seta; 3, schematic sagittal section of the anterior segments, holotype; 4, reconstruction of spermatheca, holotype; 5, reconstruction of female funnel, holotype; 6, diagrammatic scheme of reproductive apparatus, all elements paired.

Abbreviations as in Fig. 2.

Body wall epithelium about 8 μ m thick but 26—36 μ m in clitellum, layer of circular muscles 2—4 μ m, longitudinal musculature 20—40 μ m thick. Brain in I—II, with anterior and posterior ends deeply incised, circumpharyngeal connectives proceeding from the ventral side of both halves. Subpharyngeal ganglion in II. Thin-walled buccal cavity in I—II. Pharynx situated above buccal cavity in I—III, with thickened roof,

internally ciliated. It passes gradually into thick-walled, ciliated oesophagus. Pharyngeal glands as loose masses of chromophilous cells in III—VI, most dense on dissepiments $3/4$ — $5/6$. Thick layer of chloragogen tissue on oesophagus from VI on. Transition between oesophagus and intestine not fixed. Nephridia seen in VII, XI and further backwards, consisting of loosely winding tubulus, $15\text{ }\mu\text{m}$ thick, with $4\text{ }\mu\text{m}$ wide lumen. Dorsal vessel traceable in sections from V backwards. Transverse vessels in antecitellar segments thin, without blind appendages.

Male reproductive organs lacking. Two pairs of long ovaria in VIII and IX. Folded-up ovaria together with separated maturing and ripe eggs filling coelom of VIII and IX as well as egg sacs. Both sectioned specimens with unpaired egg sac in VII; paired posterior egg sacs reaching XIV in holotype, XI and XIII in the sectioned paratype. Small female funnels clinging to posterior wall of VIII and IX, their longer and thinner upper lip up to $80\text{ }\mu\text{m}$ high. Short oviducts within body wall up to 25 — $35\text{ }\mu\text{m}$ wide, their lumen $6\text{ }\mu\text{m}$. Two pairs of spermathecae opening ventrally in posterior quarter of VII and X. They consist of well-distinguished ampulla and duct. Ampullae sacculate, up to $365\text{ }\mu\text{m}$ long, 80 — $120\text{ }\mu\text{m}$ wide, with epithelial wall 10 — $20\text{ }\mu\text{m}$ thick. Ampullae filled with amorphous masses without any cellular structure but containing, besides empty 'bubbles', sparse dark oval bodies, 4 — $5\text{ }\mu\text{m}$ long. Ducts shorter than ampulla, about $150\text{ }\mu\text{m}$ long, 30 — $55\text{ }\mu\text{m}$ wide in its middle part, tapering towards both ends. Wall of ducts consisting of thick epithelium; lumen only 2 — $8\text{ }\mu\text{m}$ wide. Spermathecae either confined to their original segments or protruding partially into a neighbouring segment with their ampullae.

Remarks. The anterior position of the reproductive system is often associated with asexual reproduction in Oligochaeta (Hrabě 1981). However, there is no indication of fragmentation, or the degenerative variability often connected with fragmentation, in *Muliercula emendata*. Both mature individuals studied appeared to be identical.

Distribution and ecology. Known only from the Komarovka Stream, identified with certainty only in the type locality. The station is situated at the lower end of the planarian zone under a broad-leaved forest canopy, on a gravelly bottom at a mean depth of 10 — 15 cm , the current velocity being 0.5 — 1.0 m/s and the maximum water temperature in summer 16.5°C . Unidentifiable lumbriculids possibly belonging to this taxon were found at this and several other stations, too. Besides the type material of *Muliercula emendata* collected in May, unidentifiable fragments of mature lumbriculids were observed at the same station in September and November. The species appears to be exclusively parthenogenetic. Asexual reproduction not fixed.

Muliercula casta sp. n. (Fig. 4)

Holotype. VLS, No. 20-1: serial transverse sections on three slides.

Type locality. Komarovka Stream, station 9, sample 216, collected 1 June 1984.

Etymology. From Latin *castus*, meaning 'chaste', 'virtuous'.

Description. Diameter in anterior part 0.7 mm , in clitellar region 0.9 mm . Prostomium rounded, intersegmental furrows shallow. Setae two per bundle, sigmoid, simple, $190\text{ }\mu\text{m}$ long, $8\text{ }\mu\text{m}$ thick, with nodulus on the distal third. Clitellum on VII—XI, its posterior edge less distinct than the anterior one. Genital pores externally inconspicuous.

Layers of body wall in VI: epithelium $20\text{ }\mu\text{m}$, circular musculature $5\text{ }\mu\text{m}$, longitudinal musculature $25\text{ }\mu\text{m}$. In VII 60 , 8 , and $40\text{ }\mu\text{m}$, respectively. Brain in 0—I bipartite with a narrow connection; circumpharyngeal nerve ring proceeding from ventral side of both halves. Subpharyngeal ganglion beginning in III. Small buccal cavity in I—II. Pharynx thick-

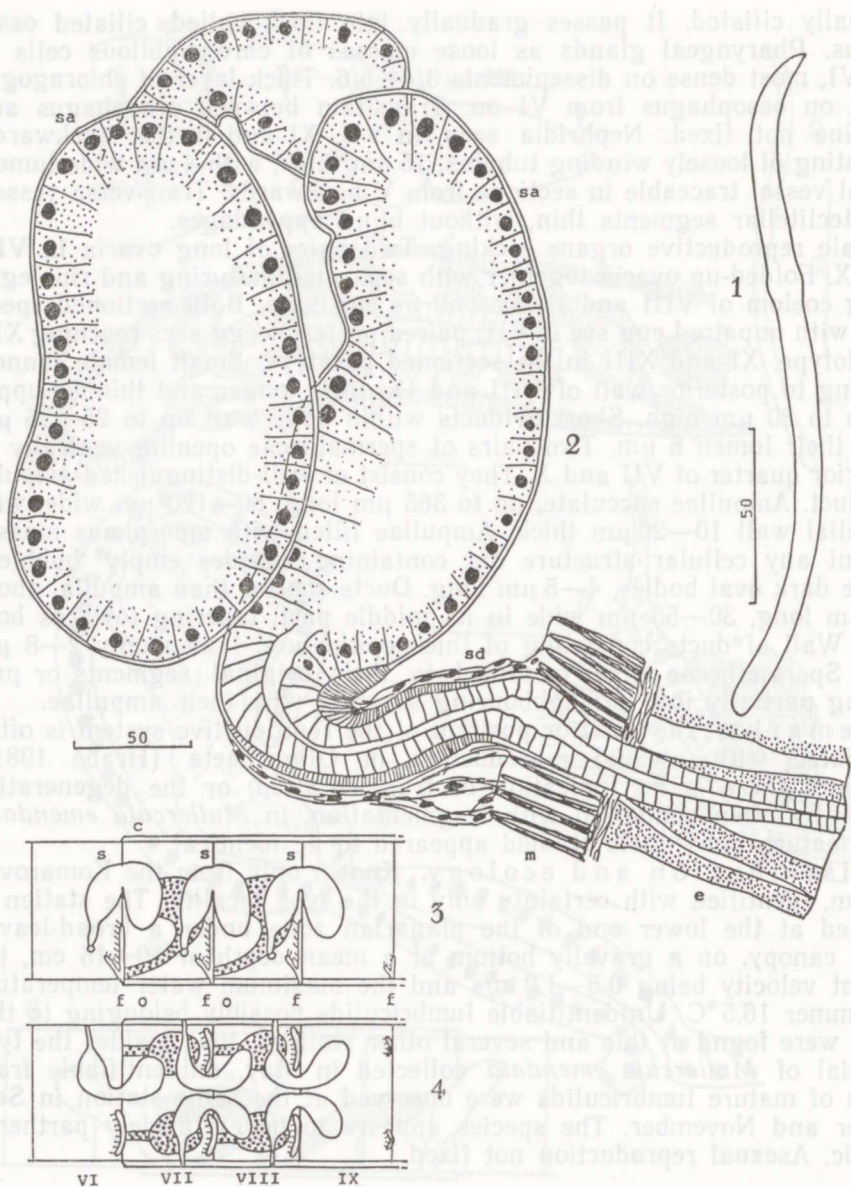


Fig. 4. *Muliercula casta* sp. n. 1, seta; 2, reconstruction of spermatheca, holotype; 3, diagrammatic scheme of reproductive apparatus of the holotype in side view; 3, the same in dorsal view.

Abbreviations as in Fig. 2.

walled but with thin basal wall, ciliated, beginning in I above buccal cavity and continuing to III, then passing gradually into similarly thick-walled and ciliated oesophagus. Pharyngeal glands as masses of chromophilous cells in V—VI and on dissepiments 4/5—6/7. Chloragogen tissue beginning in VII; no clear distinction between oesophagus and intestine. Nephridia as loose bundles of tubuli between intestine and nerve cord starting with X, one unpaired nephridium seen also in IV. Blood circulation system not studied but no large blind appendages or chloragogen-

covered vessels observed, except for dorsal vessel inside intestinal chloragogen layer.

Male reproductive organs lacking. Two pairs of ovaria, in VII and VIII. Paired egg sacs with big yolk-rich eggs reaching XIV. Two pairs of functioning female funnels on 7/8 and 8/9, with upper lip up to 215 μm high and 200 μm broad. They transit gradually into short tapering oviducts (45 μm wide in longitudinal musculature of body wall) before opening as tiny female pores on ventral setal line in corresponding inter-segmental furrows. One additional, full-sized female funnel with its own oviduct was found on one side of 6/7 in the holotype, and a pair of rudimentary funnels on 9/10. In holotype, spermathecae located in VII—VIII (paired) and VI (unpaired, on opposite side of unpaired additional egg funnel). Long sacculate spermathecal ampulla empty, up to 140 μm wide, reaching following segment. Its wall 22—32 μm thick, consisting of glandular epithelium, with crumbly granular inner surface. Ampulla transiting gradually into short external duct, up to 80 μm wide, opening with tiny ventrolateral pore slightly above and behind ventral setae. Wall of spermathecal duct consisting of inner epithelium (12 μm), circular muscle layer (3 μm), and irregular outer longitudinal muscle bundles. Its lumen generally only 5 μm wide, but widening to 12 μm just before penetrating body wall, forming small vestibulum.

Remarks. The odd number of female funnels and spermathecae as well as a relatively anterior position of the reproductive system (if compared to most other lumbriculids) indicate the possible large individual variability in this taxon, probably connected with fragmentation. Unfortunately, only a single incomplete specimen is known so far. It was found together with several individuals of *Lumbriculus illex* (see below) and distinguished from them only after studying its internal structure. Its relationship to the type species of the genus, *Muliercula emendata*, remains unclear since both affinity and convergence can be responsible for the similarity of their hologynous reproductive systems.

Distribution and ecology. Known only from the Komarovka Stream. The type locality is situated in the lower, open, comparatively well-warmed part of the reaches studied in 1983—84, on a stony bottom at a mean depth of 25—30 cm, the current velocity being 0.5—1.2 m/s.

Lumbriculus illex Timm et Rodriguez, 1994

Lumbriculidae gen. sp. No. 2: ТИММ (1987: 134)

Lumbriculus illex: Timm & Rodriguez (1994: 95—100, figs. 1—10)

Ten individuals, eight of them mature, were found at station 9 of the Komarovka Stream together with *Muliercula casta* (see above). They differ from all congeners in their simple-pointed setae while the reproductive system, with thin-walled atria in X and very long spermathecae attached in XII, is somewhat similar to that of *L. sachalinicus* Sokolskaja, 1967.

Lumbriculidae indet.

Most of the lumbriculids collected in the upper reaches of the Komarovka Stream (38 individuals out of 59) in 1983—84 remained unidentified as immature or were too poorly preserved for successful sectioning. The samples from the Frolovka Stream and the lowland waters of the Primorskiy Territory produced only immature individuals (in all 19). This material apparently belongs to a large variety of species. At least four different groups can be distinguished according to their external appearance.

1) Middle-sized worms with simple setae, 100—180 μm long, similar to any of the above-described taxa. They were widely distributed in the Komarovka Stream, including its lower reaches, and found also in the other mountain stream, the Frolovka. Twenty-six individuals from 16 samples belong to this assemblage. In one failed series of sections large spermathecae filled with spermatozoa were observed in X.

2) Small worms, only 2.5—5 mm long and 0.15—0.25 mm wide, their simple setae being from 50—80 up to 80—120 μm long in different populations. Fifteen specimens from 3 samples: a springlet in the Imanny mountain pass, connected with the Komarovka Stream (several individuals were mature); the middle reaches of the Komarovka Stream; and the Razdol'naya River in Ussuriysk.

3) Large worms, 24—63 mm long and 1—2.5 mm wide with setae 164—240 μm long and 8—10 μm thick, in one case (Popov Island) even 200—300 μm and 11 μm , respectively. Distal end of setae hooked and bearing a rudimentary upper tooth. The worms are somewhat similar to a large *Rhynchelmis* but no proboscis was observed. Thirteen immature specimens from four samples: Popov Island; a spring on the shore of Amurskiy Bay; and two samples from the upper reaches of the Komarovka Stream.

4) Middle-sized worms, whose setae have a conspicuous small upper tooth, as is characteristic of many common species of *Lumbriculus* or *Stylodrilus*, the setae being 110—220 μm long. No blind appendages on transversal vessels; in one specimen transversal vessels were covered with chloragogen tissue starting in VIII. Only three immature individuals were found, in three different samples from polluted urban rivers in Ussuriysk (Razdol'naya, Rakovka, and the mouth of the Komarovka Stream).

DISCUSSION

The four nominal species described from the Komarovka Stream apparently form only a small part of the variety of Lumbriculidae inhabiting the Sikhote-Alin Mountains. At least the same number of species remained undescribed in the material, and several unknown taxa may be hidden in the other streams of this region. The assumption is supported by the existence of different associations of other aquatic oligochaetes in the closely situated streams Komarovka and Frolovka (Timm 1990, 1994b).

Lumbriculidae were not abundant in the Komarovka Stream, forming only 5% of the oligochaete material collected in 1983—84. They seem to be confined mostly to the rhithral zone, while they are lacking at the very source (crenal zone), and rare in the lower reaches of the stream. The lowland rivers as well as the higher-situated and very torrential Frolovka Stream appear to be poor in lumbriculids. Some small springs bore lumbriculids, perhaps living in ground waters and emerging accidentally into daylight.

Looking at the neighbouring countries, a diverse lumbriculid fauna has been found on Hokkaido Island and in the north of Honshiu only, while the southern and warmer parts of Japan are devoid of these worms (Yamaguchi 1953). Westwards, in China, Brinkhurst et al. (1990) did not find any lumbriculids, in spite of the intensive sampling for aquatic Oligochaeta in several urbanized areas. Perhaps sampling would give better results in some less densely populated uplands. Even northwards, in the large Amur River, lumbriculids are rare (Сокольская 1958, 1961). Thus, Lumbriculidae are not very common in the Amur-Japanese sub-region of the Sino-Indian zoogeographic region of inland waters (sensu

Timm 1980). Their distribution here is limited spatially and ecologically. However, the high proportion of endemic taxa is evidence of a long-term evolution of the local lumbriculid fauna.

No widely distributed species were identified with certainty in this material. Among the four species described from the Komarovka Stream, *Stylodrilus suputensis* and *Lumbriculus illex* were included in the widely distributed genera, although with some hesitation. A new genus *Muliercula* was recognized for two fully parthenogenetic species devoid of any male genitalia. Their similarity can be convergent, but I decided against naming different monotypic genera before the real affinities of these species are proved.

Altogether 28 nominal species of aquatic oligochaetes are identified now in the samples collected in the Komarovka and Frolovka streams during 1983–84 (Timm 1990, 1991, 1994b; Timm & Rodriguez 1994). Among them, six families are represented: Naididae (with seven species), Tubificidae (seven), Propappidae (one), Enchytraeidae (three), Lumbriculidae (four), and Branchiobdellidae (six). These numbers do not reflect the whole diversity of the fauna since many taxa remained unidentified. Twelve species, or 43% of a total of twenty-eight are described as new for science (two species belonging to Tubificidae, three to Enchytraeidae, four to Lumbriculidae, and three to Branchiobdellidae), apparently being endemic in this region. A maximum degree of endemism is observed in the families of Enchytraeidae and Lumbriculidae.

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VEE-VÄHEHARJASUSSE (*OLIGOCHAETA*)

VEENE KAUG-IDA LÕUNAOSAST

4. *LUMBRICULIDAE*

Tarmo TIMM

Primorje krai lõunaosast, peamiselt Komarovka mägiojast aastail 1983—1990 kogutud väheharjasusside seast leiti neli liiki ja vähemalt neli liigini määramata vormi sugukonnast *Lumbriculidae*. On kirjeldatud kolme teadusele uut liiki: *Stylodrilus suputensis*, *Muliercula emendata* ja *M. casta*, samuti uut perekonda *Muliercula*. Ka neljas määratud liik, *Lumbriculus illex*, on teada vaid Komarovkast. Lõuna-Primorje asub sugukonna levila lõunapiiril. Koos autori varem avaldatud andmetega teiste sugukondade kohta on nüüd Komarovkast ja naaberveekogudest teada 28 liiki väheharjasusse; neist 12, sealhulgas kõik neli *Lumbriculidae* liiki, on endeemilised.

ВОДНЫЕ МАЛОЩЕТИНКОВЫЕ ЧЕРВИ (*OLIGOSCHAETA*) С ДАЛЬНЕГО ВОСТОКА РОССИИ

4. *LUMBRICULIDAE*

Тармо ТИММ

Среди малощетинковых червей, собранных в 1983—1990 гг. в южной части Приморского края, преимущественно в горной речке Комаровка, найдены и определены четыре вида из семейства *Lumbriculidae* и четыре не определенные до вида формы. Три вида (*Stylodrilus supitensis*, *Muliercula emendata* и *M. casta*), а также род *Muliercula* описываются как новые для науки. Четвертый вид (*Lumbriculus illex*) также известен только из Комаровки. Южное Приморье является южной границей ареала семейства. Учитывая опубликованные ранее автором данные по остальным семействам, из Комаровки и соседних водоемов известны 28 номинальных видов малощетинковых червей. Из них 12 видов, в том числе и четыре вида лумбрикулид, являются эндемичными.