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NEW DATA ON THE FAUNA OF AQUATIC OLIGOCHAETA FROM KAMCHATKA

by UNEDITED TRANSLATION

For information only

N.L. Sokol'skaya TRADUCTION NON REVISEE

Information seulement

The aquatic oligochaete fauna of Kamchatka remains little /74\* researched. W. Michaelsen's 1929 article, based on a treatment of materials from the 1908-1909 Kamchatka expedition of the Ryabyshinskii brothers, was the first work devoted to a study of this group on the peninsula. It presents 12 species of oligochaetes, two of which are described as new (Pachydrilus kamtschatkanus Michaelsen and Rhyacodrilus riabuschinskii Michaelsen).

The next work on the oligochaete fauna of Kamchatka appeared after a pause of 30 years (Sokol'skaya, 1961). The collections of I.I. Kurenkov, staff member of the Kamchatka Section of TINRO (Pacific Ocean Scientific Research Institute of Fisheries and Oceanography),

\* Numbers in the right-hand margin refer to the corresponding page in the Russian text.--Translator.

made in water bodies in various parts of the peninsula in 1951-1957 served as the basis for it. This material, small in volume (23 samples, 864 specimens of worms), contributed new information on the oligochaete fauna of Kamchatka; three new species of tubificids were described (Peloscolex kurenkovi Sok., P. kamtschaticus Sok., and P. ringulatus Sok.) and three species of oligochaetes were first determined to be on the peninsula. In subsequent years I.I. Kurenkov continued to collect aquatic oligochaetes on various parts of Kamchatka and adjacent portions of the mainland, which we then analysed (Sokol'skaya, 1964, 1968a, 1969). By 1967, 28 species of oligochaetes had been registered on Kamchatka (Kurenkov, 1967). It became possible to offer a short preliminary zoogeographical sketch of the aquatic oligochaetes of Kamchatka (Sokol'skaya, 1968a).

Besides the collections of I.I. Kurenkov, we also analysed materials on the aquatic oligochaetes of Kamchatka presented to the Zoological Museum of Moscow University by TINRO members R.S. Semko, I.M. Levanidova, and V.Ya. Levanidov. The total volume of material analysed so far amounts to 174 samples (over 5000 worm specimens) from more than 40 water bodies on the peninsula. These materials contained oligochaetes from lakes, rivers, springs, and swamps from all parts of the peninsula and adjacent areas of the mainland (Vyvenka River, Lake Potatgytkhyn, Maino-Pyl'gen Basin). Collections on the peninsula itself included its northern portion (Lake Palanskoe and Palana River in the west; Makar'evskaya River and water bodies of the Kayum River basin in the east), and its central and southern portions.

In the central portion, oligochaete fauna was more fully studied in the Kamchatka River basin, where investigation touched upon

lakes Ushkovskoe, Eul'chinok, Dvukh"yurtochnoe, Kharchinskoe (and its springs), Klyuchevskoe, Sobach'ye, Kurarochnoe (and B. Kurarochnyi Spring), Kamenskoe, Grob, and Katlanach; Prigorodnyi Spring, Roshchiki River, lakes Azabach'ye, Nerpich'ye, and S<sup>o</sup>ldatskoe, and Soldatskaya River. In the western half of the central portion of Kamchatka, collections of oligochaetes were undertaken in the Khairyuzova, Icha, and Oblukovina river basins. Particular attention was devoted to collections in Lake Kronotskoe (approximately 40 bottom and qualitative samples\*). Of the water bodies on the eastern coast of Kamchatka, we should mention Zhupanovskii Liman and the Zhupanova River basin. Oligochaetes were collected in the southern portion of the peninsula from lakes Tolmachevskoe, Kuril'skoe, and Zuikovskie, and from water bodies in the Bol'shaya (particularly in the Karymai spring inflow), Utka (and its springs, the Domashnii and Lisii), and Kikhchik river basins.

Oligochaetes are known, in this fashion, from a significant number of Kamchatka water bodies, although only isolated collections have been made in some of them. The location of the above-mentioned water bodies on Kamchatka are shown in Annexes 1 and 2 to the work of I.I. Kurenkov (1967)<sup>1</sup> cited above.

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<sup>1</sup> I consider it my pleasant duty to cordially thank I.I. Kurenkov, I.M. Levanidova, R.S. Semko, and V.Ya. Levanidov for the interesting material placed at our disposal.

\* "Bottom and qualitative samples" is a literal rendition of the Russian original.--Translator.

SYSTEMATIC SPECIES SURVEY

## FAMILY NAIDIDAE

## Subfamily NAIDINAE

1. Stylaria lacustris (L.)

Occurrence: A swamp on the bank of the Kamchatka River; Lake Kronotskoe (a pool in the Listvenichnaya River delta). The species is noted by Michaelsen (1929) in the Kamchatka River. Three among the 52 worm specimens collected in the swamp on the bank of the Kamchatka River on 11 June 1957 proved to be sexually mature. It is an unusual phenomenon to find sexually mature naidids in the summer months. Naidids usually pass over to sexual reproduction only in the autumn, reproducing by asexual means (paratomy) in summer. The shift in periods of sexual reproduction is probably determined by the particular character of the climatic conditions on Kamchatka. /76

Holarctic species.

2. Slavina appendiculata (d'Udekem)

Occurrence: Lake Kronotskoe, Unana Inlet; Lake Maloe Zuikovskoe. A very widely distributed species known in the Holarctic, the Sino-Indian region, and South America.

3. Vejdovskyella comata (Vejdovsky)

Occurrence: A pool in the Kayum River basin, connected to the river by a channel; Khairyuzova River basin.

Body length of the worms, 1.5-1.75 mm; number of segments, 28. Length of sabre-shaped and hair-shaped setae, 349-420  $\mu$ ; number per bundle, 2-7. Dorsal needle-shaped setae 2-3 per bundle, 84-88  $\mu$  long. Length of ventral setae of segment II, 100-105  $\mu$ ; length of setae in subsequent segments, 80-92  $\mu$ .

Holarctic species.

4. Nais variabilis Piguët.

Occurrence: A pool in the Kayum River basin; Lake Kronotskoe, in the delta of Listvenichnaya River. Length of hair-shaped setae, 210-437  $\mu$ ; length of needle-shaped setae, 51-75  $\mu$ . The species is of world-wide distribution.

5. Nais pardalis Piguët.

Occurrence: Lake Ushkovskoe, terrain: volcanic rocks, pebbles, sand. Species determined on Kamchatka for the first time; common in the Holarctic and South America.

6. Nais barbata Müller.

Occurrence: Lake Ushkovskoe; Lake Kronotskoe, Unana Inlet. Length of hair-shaped setae, 210  $\mu$ ; of needle-shaped setae, 105  $\mu$ ; of ventral setae of segments II-V, 105  $\mu$ , and of following segments, 88  $\mu$ . Penial setae 2-3 per bundle, approximately 100  $\mu$  long. The species is known in the Holarctic and the Sino-Indian region.

7. Nais borutzkii Sokolskaja.

Occurrence: Zhupanovskii Liman. The species is known only from Zhupanovskii Liman and the salt-water Ainskoe Lake on southern Sakhalin (Sokol'skaya, 1964).

8. Specaria josinae (Vejdovsky)

Occurrence: Khairyuzova River basin; Lake Kronotskoe, Uzon and Krodakyg inlets.

Holarctic species.

9. Uncinais uncinata (Oersted)

Occurrence: Khairyuzova River basin; Lake Kronotskoe, Uzon and Krodakyg inlets. Indicated by Michaelsen (1929) for Tarkhovka River and Lake Kultuchskoe.

Holarctic species.

Subfamily PARANAIDINAE

/77

10. Paranais sp.

Occurrence: A warm swamp in the caldera of the Uzon volcano, small stream. A large accumulation of worms - 131 specimens in the sample - was found in the water body indicated (water temperature on 26 April, +21.4°C).

We analysed the features distinguishing Paranais sp. from the Uzon caldera from P. litoralis (Müller) (Sokol'skaya, 1961). The numerous specimens of Paranais sp. that were studied made it possible to determine variation in the number of segments in single individuals (32-39) and the value  $n$  in chains of zooids (17-22).

Subfamily CHAETOGASTRINAE

11. Chaetogaster diaphanus (Gruithuisen)

Occurrence: Lake Kronotskoe (in the delta of the Listvenichnaya River and in Krodakyg Inlet).

Length of setae of segment II, 302-336  $\mu$ ; number in bundle, 5. Length of setae of segment VIII, 273  $\mu$ . Penial setae with traces of bidentation on the distal end, 151  $\mu$  long; the nodule is distal (1:3).

The species is widespread (Holarctic, Sino-Indian region).

FAMILY TUBIFICIDAE<sup>2</sup>

Subfamily TELMATODRILINAE

12. Alexandrovia ringulata (Sokolskaja)

Petoscolex ringulatus Sokolskaja, 1961. Byull. MOIP [Bulletin of the Moscow Society of Naturalists], otd. biologii, LXVI (1), 61-64, Fig. 5.

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<sup>2</sup> The author adopts S. Hrabě's (1963) suggested division of the family Tubificidae into subfamilies.

Occurrence: Water bodies of the Maino-Pyl'gen basin; Lake Potatgytkhyn; a pool in the Kayum River basin; Kamchatka River basin - Prigorodnyi Spring (settlement of Klyuchi), Utka River (Domashnii Spring).

The species was described as Peloscolex ringulatus and was subsequently transferred by S. Hrabě (1964) to the genus Alexandrovina Hrabě, established by him in 1962. We are including drawings of the setae of A. ringulata (Fig. 1), made from the paratype at higher magnifications than were the pictures published when the species was described. Specimens of the species from the Kayum River basin had encrusted coatings of small particles of earth. Length of the spermathecal setae, 147  $\mu$ ; of the dorsal needle-shaped setae, approximately 42  $\mu$ . The species is most often encountered in springs, where it is caught in greater quantities than in other water bodies. The occurrence of A. ringulata at very great depths of 60-98 m in Lake Potatgytkhyn is interesting. Sexually mature individuals were noted in May and August. The species is presently known only on Kamchatka and adjacent portions of the northeastern margin of the Asian mainland. /78

#### Subfamily RHYACODRILINAE

##### 13. Rhyacodrilus coccineus (Vejdovsky)

Occurrence: Lake Palanskoe; Khairyuzova River basin, Kamchatka River basin (Lake Klyuchevskoe, Lake Kamenskoe, Katlanach, Prigorodnyi Spring, Lake Azabach'e, Lake Soldatskoe, Soldatskaya River); Lake Kronotskoe. The species was noted on Kamchatka by Michaelsen (1929) in the Pachikinskie Springs. According to our materials,

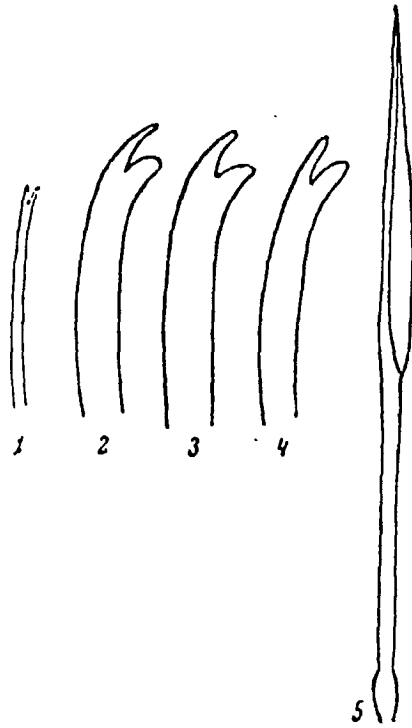


Figure 1: Alexandrovia ringulata (Sokolskaja)

- 1: dorsal needle-shaped seta of segment III  
 2: ventral seta of segment II  
 3 & 4: ventral setae of segment XXIV (PA-4, Zeiss, eyepiece 15X, immersion objective 90)  
 5: spermathecal seta (PA-4, Zeiss, eyepiece 10X, immersion objective 90)

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Rh. coccineus is found in lakes, rivers, and springs on silty and sandy terrain and at depths of from 0.5 to 12 m. Sexually mature worms were noted from 1 to 26 June. The species has a wide geographical distribution (Holarctic, Australia, South Georgia Island).

14. Bothrioneurum vej dovskyanum Stole?

Occurrence: A warm swamp in the caldera of Uzon volcano, small stream (temperature 21.4°C). We had at our disposal a total of eight sexually immature specimens, apparently belonging to the species in question. We judge the worms to belong to B. vej dovskyanum due to the existence of a ciliary recess on the prostomium, the presence of coelomocytes in the body cavity, and the form of the setae. The lack of sexually mature worms forces us to record this species with a question mark. B. vej dovskyanum has been determined on Kamchatka for the first

time. The geographic range of B. vej dovskyanum is still unclear. There are indications of the species' presence in Europe, particularly in Czechoslovakia, where it is common in some rivers (Hrabě, 1934), and in the Danube River basin (Finogenova, 1968). Moreover, according to our materials the species is known in the Maritime Territory (Sokol'skaya, 1968a) and in China (Chen, 1940). This exhausts indications of findings of the species in the Old World and there are grounds for assuming that its geographic range here is interrupted.

R.O. Brinkhurst (1965) has determined B. vej dovskyanum on the American continent in the states of Pennsylvania, Tennessee, Texas, California, and Oregon. We should point out that we are confused by this author's accompanying drawing of the penial seta of the North American specimens of the species (Fig. 9n), differing from the particular drawing given with the description of B. vej dovskyanum. As we wrote earlier (Sokol'skaya, 1968), it is not impossible that the Brazilian B. pyr rum Marcus is identical to B. vej dovskyanum and, in this way, the species would be native to North and South America. If the finding of B. vej dovskyanum on Kamchatka is confirmed, it may be spoken of as the northernmost portion of this species' geographic range.

#### Subfamily TUBIFICINAE

##### 15. Ilyodrilus templetoni (Southern)

1909. Tubifex templetoni Southern. Proc. Roy. Irish Academy, v. XXVII, sect. B, No. 8, 119-182, pl. VIII, 6 A-F. 1964. Tubifex lastočkini Sokolskaja. Coll.: "Ozera yuzhnogo Sakhalina i ikh ikhtiofauna" [The lakes of Southern Sakhalin and their ichthyofauna], MGU Publishing House, 84-89, Fig. 1-5.

1965. Tubifex templetoni Southern. Brinkhurst. Proc. Acad. Nat. Sci. Philadelphia, v. 147, No. 4; 124, Fig. 2 E-G.

1965. Ilyodrilus templetoni (Southern). Hrabě. Publ. Fac. Sci. Univ. J.E. Purkyne, Brno, No. 470: 61-65, Fig. 9-19.

Occurrence: Kamchatka River basin (Lake Azabach'e, Bol'shoi Kurarochnyi Spring, and Lake Soldatskoe); Lake Kronotskoe; Domashnii Spring (Utka River); Khairyuzova River basin.

Length of worm body, 12-16 mm. Length of penial tubes varied within the limits 55-71  $\mu$ . Male pores in place of missing ventral setae of segment XI. The spermatheca apertures on segment X are somewhat more lateral than the ventral setae bundles. The fanshaped setae in the preclitellar section of the body each have 3-5 interjacent denticles; the marginal denticles of the fanshaped setae are identical, with rounded edges. Sexually mature individuals of the species are encountered from May through 1-10 August and in October.

I. templetoni is found on different terrain, most often on mud with sand and on muddy terrain; it is also taken on volcanic pebble. According to the materials from Lake Kronotskoe, the species does not show a preference for particular depths. In different water bodies on Kamchatka it was noted at depths from 10 to 124 m. /80

I. templetoni is a Holarctic species, somewhat rarely observed in the European portion of the USSR and, according to our data, common in Lake Yuzhnyi Sakhalin and on the island of Kunashir.

16. Limnodrilus udekemianus Claparede

Occurrence: Kamchatka River basin: Lakes Azabach'e and Grob; Dal'nyaya River.

Sexually mature worms are observed in the middle of October. It is a widespread species (Holarctic, Sino-Indian region).

17. Limnodrilus helveticus Piguet

Occurrence: Kamchatka River basin (Lake Kamenskoe, Katlanach, Azabach'e, Bol'shoi Kurarochnyi Spring); Lake Kronotskoe; warm swamp in the Uzon caldera.

The species is encountered at various depths in water bodies on the peninsula, from shallow depths (0.08 m) to a depth of over 100 m, and the example distribution in Lake Kronotskoe shows a clear increase in the quantity of worms per sample as depth increases. L. helveticus is found on muds, on mud with an admixture of sand, and on sandy terrain, sometimes on rocks with moss or on ash with plant remains (in the latter two cases, at insignificant depths). Sexually mature individuals of L. helveticus are noted on Kamchatka beginning at the end of April, in May, June, July, August, and in October, with the earliest date of sexual maturity noted in a hot swamp in the Uzon caldera where the water temperature on 26 April 1957 was 21.4°C.

The length of the penial tubules in the Kamchatka specimens of L. helveticus varied from 252 to 340  $\mu$  (the largest tubercles were found in specimens from Lake Kronotskoe, 310  $\mu$ , and from Lake Katlapach, 340  $\mu$ ). The proportions of the penial tubules (ratio of length to width of the base) are also variable (from 4:1 to 6:1).

R.O. Brinkhurst (1965) brought together L. helveticus and two American species, L. monticola Eisen and L. alpestris Eisen, as synonyms of L. profundicola (Verrill). In the diagnosis of L. profundicola given by this author, variations in the proportions of the penial tubercles are shown in the limits 2-7:1, and the drawings of the penial tubercles presented by him are distinguished from each other by the form of the distal end (Brinkhurst, 1965, Fig. 4, k, l, m).

Neither is there any indication of the form of the spermatheca characteristic of L. helveticus in the cited diagnosis (p. 130).

Within the Palearctic we did not encounter specimens of this species in which the length of the penial tubercle failed to exceed the diameter of its base by a factor of at least four, while the form of its distal end did not correspond to drawings "k" and "n" in Brinkhurst's work (Fig. 4). For the present we are therefore retaining the name L. helveticus for the palearctic worms until a special study of this problem is made.

18. Peloscolex kurenkovi Sokolskaja

Occurrence: Khairyuzova River basin; Kamchatka River basin (Lakes Klyuchevskoe, Azabach'e, and Soldatskoe, and Soldatskaya River); Lake Kronotskoe; Dal'nyaya River; Lake Tolmachevskoe; Lake Kambal'noe.

Sexually mature individuals were observed beginning at the end of May, in June, in July, in August, in September, and in October (until the last ten days of the month). The species inhabits different depths (from 0.4 to 60 m) and terrain - from pebble beds in shallow water to muddy terrain at significant depths; it is also encountered on silted volcanic sand. It is more often found in lakes than in rivers; it is encountered in large quantities in lacustrine biotopes.

The abundant material on this species, unknown outside of Kamchatka, that was at our disposal enables us to amplify its description.

Dorsal fanshaped setae are arranged 2-3 per bundle on the anterior segments; their length is 50-60  $\mu$ . The number of interjacent denticles in the fanshaped setae varies from 1 to 3 (Fig. 2); sometimes the interjacent denticles cannot be discerned. The spermathecal setae

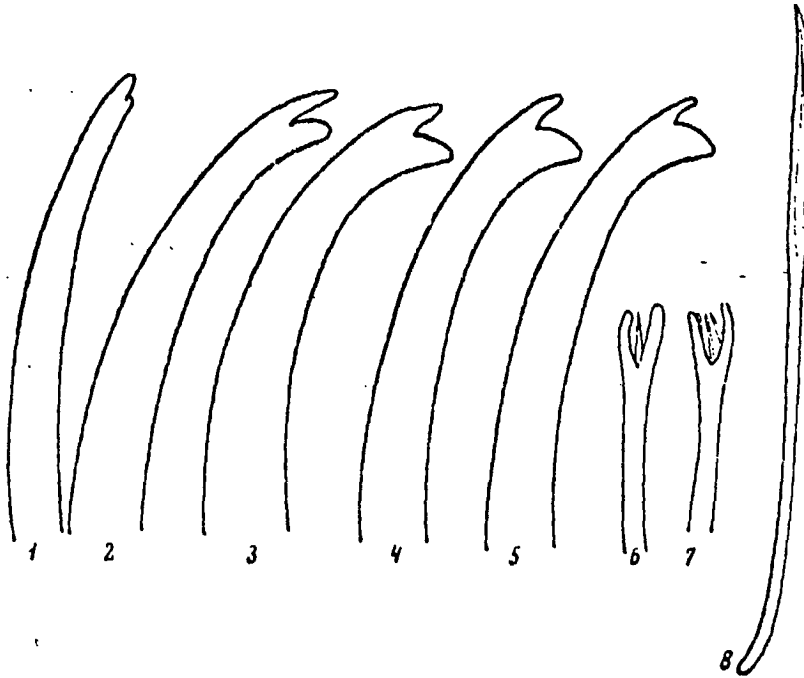


Figure 2: *Peloscolex kurenkovi* Sokolskaja

- 1: ventral seta of segment III
- 2: ventral seta of segment IX
- 3: ventral seta of segment XXIII
- 4-5: ventral seta of the posterior end of the body
- 6-7: dorsal fanshaped setae of segment VII (PA-4, Zeiss, eyepiece 15X, immersion objective 90)
- 8: spermathecal seta (PA-4, Zeiss, eyepiece 10X, objective 40)

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(Fig. 2) are 260-287  $\mu$  long with a thickness at the base of 4.1  $\mu$ . The /82  
 filled ampullae of the spermathecae have a sausage shape; their length  
 is 1.0-1.5 mm, their diameter 227-500  $\mu$ ; the length of the ducts is  
 1.2 mm and their diameter is 70-87  $\mu$ . The duct of the spermatheca  
 forms a small thickening on the distal end in the shape of a bulb.

19. Peloscolex kamtschaticus Sokolskaja

Occurrence: Kamchatka River basin (Lakes Eul'chinok, Dvukh"yurtochnoe, Kharchinskoe, Klyuchevskoe, Sobach'e, Kurarochnoe, Katlanach, Azabach'e, and Soldatskoe, and Soldatskaya River); Lake Kronotskoe; Lake Tolmæhevskoe; Lake Kambal'noe; Lake Maloe Zuikovskoe.

Sexually mature individuals are encountered from the beginning of June, in July, and in the first ten days of October. The species was encountered at various depths (from 0.5 to 60 m) and terrain - on pebbles, sand, and mud. We are presenting a drawing of the setae of P. kamtschaticus, made from the paratype (Fig. 3). Setae with a longer distal denticle are also encountered in the posterior segments.

The species is unknown beyond the confines of Kamchatka.

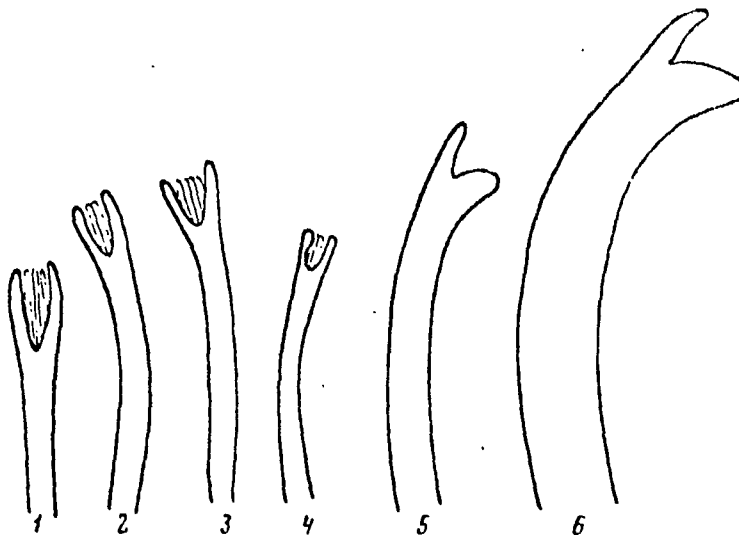


Figure 3: Peloscolex kamtschaticus Sokolskaja

- 1-3: dorsal fanshaped setae of the anterior segments  
 4: dorsal fanshaped seta of the posterior segment  
 5-6: ventral setae of segments IV and XXIV (PA-4, Zeiss, eyepiece 15X, immersion objective 90)

20. Peloscolex sp.

Occurrence: Lake Palanskoe, Palana River; Khairyuzova River basin.

It is represented by only 11 sexually immature specimens (Fig. 4). According to our materials, it is limited in its distribution to water bodies on the western half of the peninsula in the northern and central portions.

The absence of sexually mature individuals did not allow us to answer the question as to whether it belongs to the species P. ferox (Eisen) or to P. nikolskyi Last., similar in their external features. Michaelsen (1929) noted P. ferox in water bodies on Kamchatka. Having examined, however, the specimens determined by Michaelsen that have been preserved in the Zoological Institute of the Academy of Sciences of the USSR as P. ferox [Lake Kuril'skoe (No. 38, 39, 40, 43); Tarkhovka River (No. 44 and 45), Lake Kursin (No. 41 and 42), Lake Azabach'e (No. 46)], we determined that they belong to other species (probably the majority to P. kurenkovi, insofar as the poorly preserved material allows us to judge).

## FAMILY ENCHYTRAEIDAE

21. Propappus arhynchotus Sokolskaja, sp. n.

Propappus volki Michaelsen. Sokolskaya, 1968, Nauchnye doklady vysshei shkoly. Biol. nauki, No. 6, 21.

Occurrence: Zhupanova River basin; Karymai Reach (spring inflow of Bol'shaya River); Kamchatka River basin (springs on the shore of Lake Klyuchevskoe, Lake Azabach'e).

Description: The prostomium is skittle-shaped, large, and turbinate without a probiscus (the ratio of the width of its base to

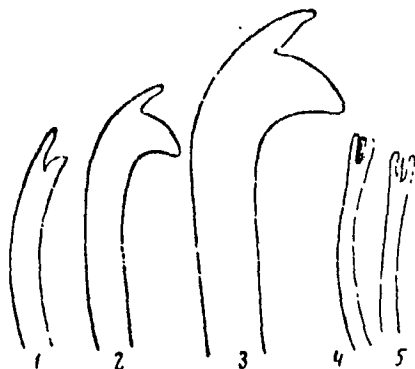


Figure 4: Peloscolex sp.

- 1: ventral seta of segment II
- 2: ventral seta of the posterior section of the body (eyepiece 10X, immersion objective 90)
- 3: ventral seta of the posterior section of the body
- 4-5: dorsal fanshaped setae (PA-4, Zeiss, eyepiece 15X, objective 90)

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it length is 7:8). The cuticle covering the body is thick, with numerous small tubercles irregularly distributed on the prostomium and the anterior segment but taking on a more regular arrangement in the form of transverse rings in the following segments. The intersegmental grooves and the secondary rings (Fig. 5, A) are well defined on segments I-VIII. The ventral and dorsal bundles have S-shaped curved bidentate setae with the distal denticle shorter and thicker than the proximal denticle and with a distal nodule (Fig. 5, B). There are 3-6 (most commonly 3-4) setae per bundle in the anterior (preclitellar) segments and usually 3 setae per bundle in the segments posterior to the clitellum. The length of the setae increases somewhat in the direction of the caudal section of the body. Length of dorsal setae, 55-71  $\mu$ ; ventral setae, 59-76  $\mu$ . There are no modified genital /84

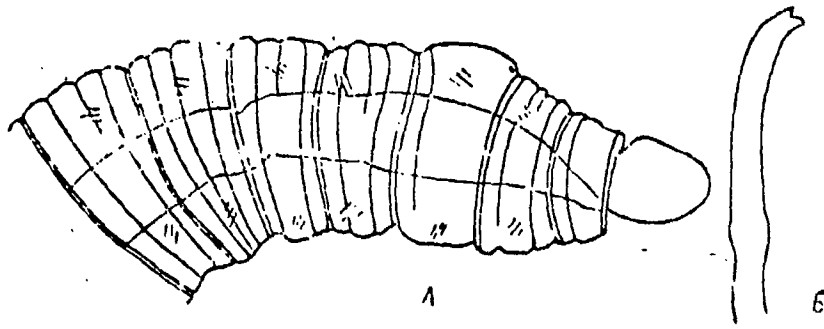


Figure 5: Propappus arhynchotus Sokolskaja, sp. n.

- A: anterior end of the body (PA-4, Zeiss, eyepiece 15X, objective 10)  
 B: dorsal seta of segment II (PA-4, Zeiss, eyepiece 15X, immersion objective 90)

setae. The retort-shaped setal glands consist of 8-10 cells.

Dimensions of setal glands of segments VII-X,  $55 \mu \times 27 \mu$  (determined from longitudinal sections of the worms, stained with Ehrlich's hematoxylin).

Cerebral ganglia with deep posterior notch; there is no anterior notch. Pharynx in segments II and III; the narrow esophagus widens into the intestine at the beginning of segment XV. There are chloragogen cells. The anterior nephridium is in segment V.

Reproductive System: The clitellum is flat and cylindrical on segments XII-XIV (from the intersegmental fissure XI/XII to the end of segment XIV). Paired male pores are on segment XII in front of the ventral bundles of setae in the form of oval orifices. Paired orifices of the spermathecae are on segment IV in the intersegmental fissure III/IV

approximately an equal distance from the lines of the ventral and dorsal setae. Paired testes are in segment XI in the ventral portion of the body. The seminal infundibula are large and open into the cavity of segment XI. The gonoducts are located within the confines of segment XII, forming two loops. The gonoducts are broad with thick glandular walls and a narrow duct. The cross section of the gonoducts and the diameter of the duct gradually widen somewhat in the distal direction. The distal portion of the gonoduct forms an atrium-like enlargement. There is a retractable conical penis. The paired ovaries are in the anterior portion of segment XII. The spermathecae are without diverticula and are not connected with the esophagus. They consist of a small thick-walled oval ampul (length, 76  $\mu$ ; width, 42  $\mu$ ; wall thickness, 6.3  $\mu$ ) resting in segment V and an almost straight passage with thick walls and a wide lumen (length, 160  $\mu$ ; width, 33  $\mu$ ; wall thickness, 8  $\mu$ , clearly separated from the ampul. The ampul and the passage are filled with a mass of spermatozooids.

Body dimensions: length, 6-12 mm; maximum diameter, 0.3-0.4 mm.

Number of segments, 29-40.

The holotype (No. 1001) is preserved in the collection of the Zoological Museum of Moscow University. /85

Occurrence of holotype: Kamchatka, Lake Azabach'e; depth, 7 cm; terrain: gravel and pebbles; 11 August 1964. Col. V.Ya. Levanidov.

The esophagus in P. arhynchotus passes into the mid-gut in segment XV, just as it does in P. volki Michaelsen. The Kamchatka species differs from the latter in a number of features easily permitting differentiation:

- (1) the shape of the prostomium and absence of a probiscus,
- (2) the thickness and sculpture of the cuticle,
- (3) the location of the spermathecal pores in intersegmental fissure III/IV,
- (4) the structure of the spermathecae (short oval ampul not extending beyond segment V).

The palearctic genus Propappus Michaelsen now unites three species: (a) P. volki, widespread in the Palearctic, (b) P. arhynchotus of Kamchatka, and (c) P. glandulosus Michaelsen, known at present only in Baikal and the Enisei (from the mouth of the Angara to the Igarka).

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Table to Determine Species of the Genus Propappus Michaelsen, 1905

- 1 (2). Mid-gut begins in segment VIII. No chloragogen cells.
 

Prostomium without probiscus:

..... P. glandulosus Michaelsen
- 2 (1). Mid-gut begins in segment XV. Chloragogen cells present.
 

Prostomium with or without probiscus:
- 3 (4). Prostomium with probiscus. Spermathecal openings on segment IV anterior to the line of setae and more lateral to the line of ventral setae. Ampul of spermatheca long, tubular, extending posteriad through a number of segments:
 

..... P. volki Michaelsen
- 4 (3). Prostomium without probiscus. Spermathecal openings on segment IV in the anterior intersegmental fissure between the lines of ventral and dorsal setae. Ampul of spermatheca small, oval, resting entirely in segment V:
 

..... P. arhynchotus Sokolskaja

22. Mesenchytraeus armatus Levinsen

Occurrence: Lake Kambal'noe; Kikhchik River. Sexually mature individuals noted at the end of September.

We are presenting some remarks on the morphology of discovered specimens of this species, noted for the first time on Kamchatka. The species is easily differentiated thanks to the presence of so-called gigantic setae in the dorsal bundles of segments V-VII. Body length, 8 mm; body diameter in region of clitellum, 0.45 mm; number of segments, 38. There is no secondary annelism on the anterior segments. The dorsal bundles of segments V, VI, and VII contain one (more commonly) or two very large setae 88-101  $\mu$  long and up to 8  $\mu$  thick /86 with the nodule in a distal position (7:13, 8:13, 6:11). The dorsal bundles of segments II-IV each have 3-4 ordinary setae. In the segments behind the clitellum the dorsal setae are, as a rule, 3 per bundle; their length, 75  $\mu$ ; width, 4  $\mu$ ; module distal (5:13). There are 7-10 setae in each ventral bundle of the anterior (preclitellur) segments; length, approximately 65  $\mu$ ; thickness, 4  $\mu$ ; in the segments behind the clitellum the number of ventral setae is 6-8 per bundle and they are somewhat shorter. The clitellum is on segments XII-XIII. Male pores are in place of the absent ventral setae of segment XII.

The species is known in Europe (Nielsen and Christensen, 1959); it has indicated in particular in the Carpathians by L. Černosvitov (1928). It has been noted for the first time in the Asiatic portion of the USSR.

## FAMILY LUMBRICULIDAE

23. Lumbriculus variegatus (Müller)

Occurrence: Kamchatka River, Soldatskaya River, Lake Kronotskoe.

The species has been indicated on Kamchatka by Michaelsen (1929) in the Kamchatka River basin and Lake Kuril'skoe.

The species is common in the Holarctic.

24. Styloscolex opisthothecus Sokolskaja

Occurrence: Khairyuzova River basin, Icha River (Potereonnaya tributary); Kikhchik River; Utka River (Domashnii Spring); Kamchatka River basin (Prigorodnyi Spring, Lake Soldatskoe, springs; Lake Azabach'e, river source).

Sexually mature individuals were noted in March (beginning on the 11th), April, May, June, July, and August.

S. opisthothecus is a spring form; the few finds of the species in lakes are related to spring openings.

The species is described from Kamchatka. It belongs to an East Asian genus uniting eight species, the majority of which are not known beyond the confines of Lake Baikal (S. baicalensis Mich., S. kolmakowi Burow, S. swarczewskii Burow, S. choryoidalis Isossimoff, S. asymmetricus Isossimoff). S. opisthothecus is very similar morphologically to S. tetrathecus Burow (Burow, 1931), besides Baikal also found northeastern China, and set apart from all other species of the genus, including S. japonicus Yamaguchi from the island of Hokkaido.

25. Kurenkovia magna Sokolskaja

Occurrence: Karymai (spring affluent of the Bol'shaya River).

Sexually mature individuals have been noted in February, May, and October (in different years).

K. magna belongs to a monotypic genus described from Kamchatka, which is distinguished by singular features of the reproductive apparatus, leaving it isolated in the family Lumriculidae (Sokol'skaya, 1969).

## FAMILY HAPLOTAXIDAE

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26. Haplotaxis gordioides (Hartmann)

Occurrence: Kamchatka River basin (Ponomarskaya River);  
Nikolka River, Utka River and its springs, Domashnii and Lisii.

Due to the absence of sexually mature individuals, we place this species under a question mark. It is encountered at shallow depths and on rocky terrain or on sand with gravel. It has been noted by Michaelsen (1929), also under a question mark, in Lakes Glubokoe and Kuril'skoe - in the latter at a significant depth (60 m).

## FAMILY LUMBRICIDAE

27. Eisenia nordenskioldi (Eisen)<sup>3</sup>

Occurrence: Spring on the right bank of Makar'sevskaya River (Litke Inlet). The species was noted in Lake Klyuchevskoe by Michaelsen (1929).

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The list of oligochaetes presented should be supplemented with four species noted on Kamchatka by Michaelsen (1929) but not found by us in the collections treated. These are (a) the naidids Nais communis Pignet and Homochaeta naidina Bretscher, (b) Lumbricillus kamschatkanus (Mich) of the Enchytraeidae, and (c) Bimastus tenuis (Eisen) of the Lumbricidae. We have taken Rhyacodrilus riabuschinskii, described by Michaelsen, as a synonym of Rh. coccineus (Vejdovsky) (Sokol'skaya, 1968). Thus, we now have at our disposal data on findings of 31 species of oligochaetes on the peninsula (Table).

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<sup>3</sup> Determination of T.S. Perel'.

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 Aquatic Oligochaetes of Kamchatka and Their Geographic Distribution
 

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<u>Species Name</u>	<u>Geographic Distribution</u>
Fam. Naididae	
<u>Stylaria lacustris</u> (L.)	Holarctic, Eastern Asia
<u>Slavina appendiculata</u> (d'Udekem)	Cosmopolitan
<u>Vejdovskyella comata</u> (Vejdovsky)	Holarctic
<u>Nais communis</u> Piguet	Cosmopolitan
<u>N. variabilis</u> Piguet	Cosmopolitan
<u>N. pardalis</u> Piguet	Holarctic, South America
<u>N. barbata</u> Müller	Holarctic, Asia
<u>N. borutzkii</u> Sokolskaja	Kamchatka, Sakhalin Island
<u>Specaria josinae</u> (Vejdovsky)	Holarctic
<u>Uncinaiis uncinata</u> (Oersted)	Holarctic
<u>Paranais</u> sp.	--
<u>Homochaeta naidina</u> Bretscher	Paelearctic
<u>Chaetogaster diaphanus</u> (Gruithuisen)	Holarctic, Sino-Indian region
Fam. Tubificidae	
<u>Alexandrovina ringulata</u> (Sokolskaya)	Kamchatka, extreme southeast Asia
<u>Rhyacodrilus coccineus</u> (Vejdovsky) [= <u>Rh. riabuschinskii</u> Michaelsen]	Holarctic, Australia, South Georgia Island
<u>Bothrioneurum vej dovskyanum</u> Stole?	Europe, Maritime Territory, China, North America

<u>Hyodrilus templetoni</u> (Southern)	Holarctic
<u>Limnodrilus udekemianus</u> Claparede	Holarctic, Sino-Indian region
<u>L. helveticus</u> Piguet [= <u>L. profundicola</u> (Verrill)?]	Holarctic?
<u>Peloscolex kurenkovi</u> Sokolskaja	Kamchatka
<u>P. kamtschaticus</u> Sokolskaja	Kamchatka
<u>Peloscolex</u> sp.	--
Fam. Enchytraeidae	
<u>Propappus arhynchotus</u> Sokolskaja	Kamchatka
<u>Mesenchytraeus armatus</u> Levinsen	Palaearctic?
<u>Lumbricillus kamtschatkanus</u> (Michaelson)	Kamchatka
Fam. Lumbriculidae	
<u>Lumbriculus variegatus</u> (Müller)	Holarctic
<u>Staloscolex episthothecus</u> Sokolskaja	Kamchatka
<u>Kurenkovia magna</u> Sokolskaja	Kamchatka
Fam. Haplotaxidae	
<u>Haplotaxis gordioides</u> (Hartmann)?	Holarctic
Fam. Lumbricidae	
<u>Eisenia nordenskiöldi</u> (Eisen)	Eastern Europe, Siberia
<u>Bimastus tenuis</u> (Eisen)	Cosmopolitan

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A significant part of the oligochaetes known on Kamchatka are species with very wide geographic ranges, extending beyond the confines of the Holarctic. Together with the cosmopolitans, they compose about a third of the total number of species (10), the Holarctic species something less (7), and the Palaearctic a total of three.

New data presented in the present work on the distribution of Alexandrovia ringulata compels us to question the endemic character of this species on Kamchatka. A. ringulata is encountered beyond the confines of the peninsula in Lake Potatgytkhyn and northward - in the water bodies of the Maino-Pyl'gen basin. We may assume that the geographic range of the species is wider than its known occurrence and includes the northern regions of Asia, almost unstudied in regard to oligochaete fauna. It should be noted in this regard that a second species of the genus - A. onegensis Hrabě (genus Alexandrovia Hrabě includes two species) - is known only in northern Europe.

Styloscolex opisthothecus and both species of Peloscolex (P. kamtschaticus and P. kurenkovi) occur more widely on the peninsula /89 than the other endemic oligochaetes of Kamchatka. They have been noted in water bodies of the central and southern portions of Kamchatka, in both the western and eastern halves, but they have not been found north of the Kamchatka and Khairyuzova river basins. The latter fact is apparently related to a significant degree to the lower level of investigation of the northern portions of the peninsula.

P. kamtschaticus and P. kurenkovi are the species most common in lakes and rivers, being found at times in massive quantities (up to a hundred specimens in a sample). S. opisthothecus may be considered the dominant species in springs. Propappus arhynchotus is a river and spring form, yielding in frequency of encounter to the three species mentioned above. According to Michaelsen's data, Lumbricillus kamtschatkanus is found only in Lake Kuril'skoe. Sexually immature worms in the collections treated by us, apparently belonging to this species, have been found in a number of water bodies. Kurenkovia magna is so far known only from one body of water (Karymai).

The genetic relations between the oligochaetes endemic to Kamchatka and those of the Palearctic, primarily the fauna of eastern Asia, is not open to doubt. L. kamschatkanus is similar to the North European L. pagenstecheri (Ratzel) (Michaelsen, 1929); P. kamschaticus, to the Amur P. apapillatus Lastockin. P. kurenkovi has some features making it similar to the Palearctic P. velutinus (Grube). The close similarity of S. opisthothecus to the East Asian S. tetrathecus, the most widespread species of the East Asian genus Styloscolex Michaelsen, is indisputable. The American relations of the endemic species of Kamchatka have not yet been disclosed. In this regard, we should note the extremely poor level of research into the oligochaete fauna of Alaska, where one would first look to find elements related to those of Kamchatka. Unfortunately, only one family of oligochaetes on Alaska has been studied in detail - Enchytraeida (Eisen, 1910), scantily represented in the materials handled by us.

Regarding the taxonomic rank of the elements endemic to Kamchatka, which characterizes the extent of endemism, there are different degrees. (1) S. opisthothecus is so similar to S. tetrathecus and so clearly distinct from all other species of the genus (Sokol'skaya, 1969) that it can be called an evolving, emerging species. (2) P. kamschaticus, similar to P. apapillatus, represents the next degree of morphologic species differentiation. (3) P. kurenkovi stands farther from neighboring species. (4) The endemic Kamchatka genus Kurenkovia Sok. is so original that it occupies a special place among the Lumbriculidae, combining in the reproductive system phylogenetically original features of the family with its own original features; this gives us the right to speak of the antiquity of the genus.

A picture is thus sketched of the disparity in the appearance of endemic elements on Kamchatka, the youngest of them apparently most closely related to East Asian fauna (S. opisthothecus, P. kamtschaticus).

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