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E. Parele

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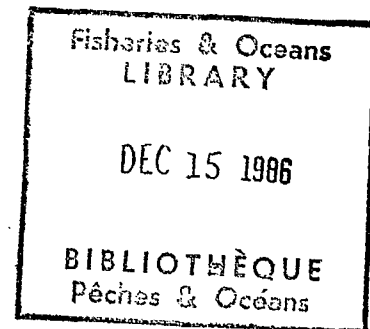
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Oligochaete Fauna of Small Latvian Rivers
Under Conditions of Human Activity

E. Parele

In the Latvian SSR both the large and the small rivers are of major economic importance. The latter are accumulators of waters from the surface runoff and are the principal suppliers of water for large catchment areas. In receiving industrial and domestic sewage from the cities and populated places and also agricultural effluents, they thereby contribute to the widespread occurrence of pollution, with the result that these catchment areas are rapidly becoming eutrophised.

An example of the effect of human eutrophication is the Slocene River, into which sewage is discharged by the town of Tukums, with the result that both it and Lake Valgums, through which it flows, are being polluted.

The Slocene River, being one of the small rivers of the Central Latvian Lowland, is situated on the Talsy- Tukums Uplift: after by-passing Lake Valgums it empties into Lake Kanieris, from where its waters enter the Gulf of Riga by way of an artificial watercourse. Its length is 44 km, the area of the drainage system is 314 km², and the gradient of the river bed is 58 m (Pastors, 1970; Kachalova, 1972).

A study of the oligochaete fauna of the Slocene River was carried out in 1969, 1973 and 1975 in a section of about 15 km in extent, located between Tukums and the inflow of the river into Lake Valgums. The work was executed at three stream gauging stations: upstream and downstream of the town of Tukums and near Lake Valgums.

The purpose of this article is to reflect in a first approximation the species composition and quantitative development of the oligochaetes under the influence of human activity and to make a sanitary assessment of the river.

Samples of benthos were taken by a Petersen bottom sampler with a 0.01 m² area of grip, and also by the removal of stones and their subsequent measurement and calculation of the appropriate coefficient. The material was processed by the generally accepted method (Zhadin, 1956). The saprobity coefficient "D" was used for ascertaining the sanitary condition of the individual stream gauging stations and for rapidly flowing rivers (Kachalova and Parele, 1979).

The long-term studies of the Slocene River show that at both the comparatively clean and the polluted sites the oligochaete fauna is quite poor in species composition, but that it differs markedly with respect to the quantitative indices. Altogether, 19 species of oligochaetes were discovered:

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- Stylaria lacustris* (Linn.), *Dero digitata* (Müller), *Nais barbata* Müller, *N. communis* Piguët, *N. clinguis* Müller, *Rhyacodrilus coccineus* (Vejd.), *Limnodrilus udekemianus* Clap., *L. hoffmeisteri* Clap., *Potamothrix bedoti* (Piguët), *P. hammoniensis* (Mich.), *P. bavaricus* Oschmann, *P. heuscheri* Bretscher, *P. moldaviensis* Vejd. et Mrázek, *Psammoryclides albicola* (Mich.), *P. barbatus* (Grube), *P. moravicus* Hrabč, *Tubifex tubifex* (Müller), *Enchytraeus* sp., *Lumbriculus variegatus* (Müller). These four were dominant: *Limnodrilus hoffmeisteri*, *Potamothrix hammoniensis*, *P. heuscheri* & *Tubifex tubifex*.

The section of the Slocene River lying upstream of Tukums has been artificially straightened and is characterised by shallow water, a sandy-clayey bottom and a slow current (0.14 m/sec). The aquatic vegetation here is poorly developed and consists of three-lobed duckweed and water thyme (Elodeia). The river is moderately polluted, chiefly by effluents from

nearby stock yards and pastures. The zoobenthos of this section is not rich and consists mainly of chironomid larvae, which are supplemented by solitary leeches and small bivalve molluscs. The oligochaete fauna is poorly developed: from 20 to 540 specimens/m² in 1969 and from 200 to 2,810 specimens/m² in 1975. The constant rise in the oligochaete population during the period of the investigations attests to the increasing pollution of the river. The species composition of this section is very sparse and consists of three α -mesosaprobic species: Limnodrilus hoffmeisteri, L. udekemianus and Potamothrix hammoniensis. Judging from the analysis of the benthic organisms, in 1969 the section was still unpolluted whereas by 1975 it was already moderately polluted (see table).

Changes in saprobity of the Slocene River

Год Year	Значения коэффициента — Coefficient values		
	выше г. Тукумса upstream from Tukums	ниже г. Тукумса downstream from Tukums	у оз. Валгумс at Lake Valgums
1969	0,14	0,42	0,28
1975	0,35	0,87	0,44

Within the environs of Tukums and downstream from it (by a distance of 2 km) the Slocene River shows evidence of substantial human influence. Here it is polluted by meat and milk combines, and also by a ceramic plant and a distillery. These enterprises discharge a variety of petroleum products and organic matter into the river. The water in the river is turbid and grey-white in colour, and the sandy-stony soils are covered with a black, oily ooze that has a strong and specific odour. The samples here were taken in various biotopes.

Dominant in this section (downstream from the sewer) were α - meso - and polysaprobic species of benthic organisms, the numbers of which averaged 31,457 specimens/m² in 1973. Of these, 77% or 24,278 specimens/m² fell to the share of oligochaetes represented by α -mesosaprobic Tubificidae. The sanitary conditions there became even worse in the summer of 1975, when, due to a minimal flow of water in the river, dilution of the sewage amounted to 1:15 on the average and the BOR₅* values were high (50.6 to 98.6 mg O₂/l). In fact, the river became a sewer. Of the zoobenthic organisms in this zone, only the hardiest organisms remained: the pelophilous Tubificidae Limnodrilus hoffmeisteri, Potamothrix hammoniensis, P. heuscheri and Tubifex tubifex, but their numbers were 45 times less than in 1973.

Upstream from the sewer, however, where only communal wastes from some houses, containing a great deal of organic matter and nitrogenous compounds, were being discharged into the river, the pelophilous Tubificidae attained massive concentrations: on the average they numbered 112,365 specimens/m² there, or 99.4% of the total number of benthic organisms. On the one hand, this is indicative of an overloading of the river with effluents, and on the other, it suggests that the Tubificidae, by hastening the process of disintegration of decomposing substances, are promoting self-purification of the river. However, given the ever increasing concentrations of sewage and the unchanged water conditions of the summer low-water level, no appreciable improvement is observed in the sanitary-biological condition of the river.

*BPK₅ in the Russian, believed to be an acronym for biochemical oxygen requirement (Tr.).

Altogether, 13 species of oligochaetes were discovered in this section, of which Limnodrilus hoffmeisteri, L. udekemianus, Potamothrix hammoniensis, P. heuscheri and Tubifex tubifex were present in massive concentrations. Such species as Potamothrix bavaricus, P. bedoti, Psammoryctides albicola and P. moravicus were encountered very rarely as solitary individuals. On the whole, the section being discussed is very dirty.

Ten km downstream from Tukums, the species composition and quantitative development of the Oligochaeta alter drastically. In the section near Lake Valgums the waters of the Slocene River, having become largely free of pollution, flow rapidly over a stony bed. The river is shallow here. Among the stones and also on stones overgrown with algae, a benthic fauna that is both quantitatively (10,000-37,000 specimens/m²) and qualitatively (more than 30 species) rich is discovered. In comparison with the preceding section, where heavy human influence was manifested, the concentration of oligochaete worms here decreases and ranges from 231-11,328 specimens/m², or 10-30% of the total number of benthic animals. The dominant oligochaetes are the Naididae species Sylaria lacustris, Nais elinguis, N. barbata, N. communis and the β -mesosaprobic Tubificidae species Potamothrix moldaviensis. Occurring comparatively frequently is Psammoryctides barbatus and also Rhyacodrilus coccineus, which is now rare in Latvia. This is suggestive of the fairly high level of self-purifying processes taking place in the upstream stretch of the river. In the low-water period, however, (1975) the river in this section was not coping fully with the burgeoning intake of sewage. The presence of a comparatively

large number of such ~~α~~-mesosaprobic oligochaetes as Nais barbata, N. communis, Limnodrilus hoffmeisteri and Potamothrix hammoniensis is apparently indicative of the increasing processes of eutrophication. Mordukhai-Boltovskoi (1977) considers an elevation in the biomass of the benthos on account of oligochaetes represented by the Tubificidae, many species of which are developing in large numbers in the presence of organic pollution, to be an index of eutrophication of waters. Thus, during the period studied the sanitary state of the section of the Slocene near Lake Valgums changed from being moderately polluted to polluted.

It is clear from what has been said that, to ensure a good sanitary condition of small rivers, it is necessary to cease discharging raw and poorly treated sewage into them since this is leading to the ecological damaging of these waters.

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THE OLIGOCHAETE FAUNA OF SMALL LATVIAN RIVERS
UNDER CONDITIONS OF HUMAN ACTION

E. PARELE

Summary

The River Slocone was studied during 1969—1975 as a typical representative. 19 oligochaete species were found. Above the town of Tukums the river is dredged, moderately enriched and comparatively poor in zoobenthos (200—2810 oligochaete spec./m² in 1975). Below the sewage effluents 24.278 oligochaete spec./m² were found in 1973, while the number was 45 times less in the dry summer of 1975, when the dilution of sewage became insufficient. *Limnodrilus hoffmeisteri*, *L. udekemianus*, *Potamothrix hammoniensis*, *P. heuscheri*, and *Tubifex tubifex* are the main species in this zone. 10 km downstream this river is partly self-purified, the abundance of oligochaetes being 231—11.328 spec./m² (10—30% of zoobenthos); the species of *Naididae* and *Potamothrix moldaviensis* dominate here. The general degree of enrichment of the river is rising.