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NEMATODES OF LAKE BALATON. III. THE FAUNA IN LATE-SUMMER

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The investigation of the bottom deposits is the best means to obtainan insight into the history of lakes. Organism with hard chitinous and calcareous cuticles are easy to identify even after their death, offering possiblities to draw important conclusions. However, there are many organisms that expire, appear or reproduce according to the changes taking place in the lake and leave behind no traces of their existence to later periods. When studying such organisms determination of the instantaneous situation, which may serve as a useful basis in later investigations, must be established on every occasion.

The Biological Research Institute, Tihany in collaboration with the "Laboratorium für Sedimentforschung", Heidelberg, performed investigations on the bottom deposit of Lake Balaton in early September, 1968. The chemical and sedimentologic analyses of samples were performed by the cooperating Heidelberg Institute (MÜLLER, 1969), and the biological examinations were (TAMÁS, 1971) and are respectively carried out by Hungarian research workers. The present paper forms a part of the above studies. It deals with one group of the animals examined, i.e. the benthic nematodes.

Collecting places, material and methods

175 samples were collected from 7 points of each of the 25 transversal sections in Lake Balaton between September 2—13, 1968 (*Fig. 1*). The soft bottom was collected with the modified Craib bottom-dredge from 180—430 cm depths of water of 18—20° C temperature (PONYI et al., 1967). The samples were taken from a surface of 13 cm^2 each. The detailed description of the circumstances of sample takings is presented elsewhere (TAMÁS, 1971). The three parallel samples taken from the collecting points each were united and preserved in formaline. The nematodes collected were examined in glycerine preparations.

Besides the distribution of nematodes, their quantitative relationships were also examined. Not only the estimates of their absolute numbers in the bottom deposit and their individual numbers (i/m^2) were determined, but also the percentual proportion of species.

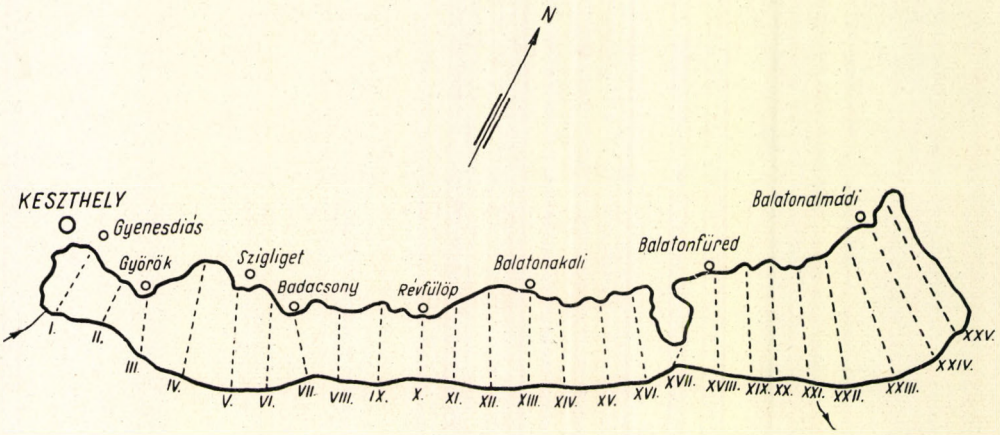

Fig. 1. Sampling sites in Lake Balaton

Calculation of the biomass was based on the method proposed by ANDRÁSSY (1956). He expressed the weight of nematodes in gram (g) unit estimated on the basis of maximum μ values of body width (a) and body length (b) of the animal:

$$g = \frac{a^2 \times b}{16 \times 100\,000}$$

Qualitative investigations

Previous examinations (DADAY, 1897; MESCHKAT, 1934; SOÓS, 1940; ANDRÁSSY, 1954; BIRÓ, 1968; 1969) revealed the presence in the lake of about fifty nematodes. During these investigations 16 of the already known nematodes were found again. *Paraphanolaimus anisitsi*, *Achromadora terricola*, *Dorylaimus helveticus*, *Microlaimus globiceps*, *Tobrilus helveticus* were, however, observed only for the first time in the bottom deposit of the open water of the lake. The examinations showed *Paraphanolaimus anisitsi* and *Microlaimus globiceps* to be new also for the fauna of Hungary (ANDRÁSSY, 1958; MEYL, 1961; GOODEY, 1963).

In the series of samples there were nearly 10 000 nematodes, and the percentual contribution of different species of Nematoda to total individual numbers was the following:

Paraplectonema pedunculatum STR.	36.20%
Paraphanolaimus behningi MIC.	29.20
Monhystera paludicola DE MAN	10.40
Theristus setosus Büts.	9.73
Ironus tenuicaudatus DE MAN	6.30
Tobrilus gracilis BAST.	4.08
Aphanolaimus aquaticus DAD.	1.50
Ethmolaimus pratensis DE MAN	1.49
Paraphanolaimus anisitsi (D.) ANDR.	0.63
Monhystera stagnalis BAST.	0.25
Dorylaimus stagnalis DUJ.	0.16

Prismatolaimus dolichurus De Man	0.08%
Monhystera macramphis Fil.	0.07
Achromadora terricola De Man	0.07
Monhystera andrassyi Biró	0.06
Tobrilus helveticus Hofm.	0.06
Dorylaimus helveticus St.	0.03
Tripyla glomerans Bast.	0.03
Microlaimus globiceps De Man	0.03
Hemicycliophora aquatica Mic.	0.02
Actinolaimus sp. juv.	0.01

Paraphanolaimus anisitsi (Daday) Andrássy, 1968

♀ L = 0,8—85 mm a = 33—35 b = 4,4—4,6 c = 5,7—6,6 V = 46—51%
♂ L = 0,7—0,8 mm a = 36—41 b = 4,8—5,5 c = 7,5—8,7 PO 9—13

Cuticle of the slender animal is 1,5 μ thick, annulated. The annules have a width of 1,7 μ. The lateral field extends from the middle of the oesophagus to the tail, it is narrow and has a width of about 1/25 that of the body. Head offset with 4 thin setae, each about as long as the diameter of head. Amphids large, nearly one head-width long, sigmoid, at the level of the mouth cavity. Mouth cavity barrel shaped, about one head-width long. The secretory gland cell is very large, lies at the end of the oesophagus, but the excretory pore is not visible. The lumen of the intestine is wide, the mid-intestine is well differentiated from the rectum, and is twice as long as the anal width of the body. The subcuticular glands are oval, 19—20 in number, their circular excretory pore lies along the lateral field. Vulva slightly chitinous, vagina 1/2 of the corresponding body-width, gonads paired, reflexed, 4 times as long as the corresponding body-width. Male spicules 26—30 μ long by 4—5 μ wide, slightly bent, with knobbed tips. Gubernaculum "L"-spahed, 6 μ long. Number of the tube-like pre-anal organs 9—13, most frequently 11, each 7—8 μ long. Tail is 6—8 anal-body-width long, its anterior part is stronger, its posterior half tapering where a small terminal duct is present.

This species has been found to occur in Paraguay (Daday, 1905; Andrássy, 1968), Columbia (Riemann, 1971) and Europe. Although the specimen found and identified as *Paraphanolaimus behningi* Mic. 1923, both drawings and description unequivocally bear evidence of its being *Paraphanolaimus anisitsi* (Daday, 1905) Andrássy, 1968 (Daday, 1905; Andrássy, 1968; Biró, 1968).

Microlaimus globiceps De Man, 1880

♀ L = 0,58 mm a = 28 b = 6,3 c = 7,1 V = 52%

Only females were found in our collection. Cuticle annulated, annule 1,5 μ in width. Head broadly rounded with 4 setae 1/2 head-width long. Amphids circular, 4—5 μ = 1/4 head-width in diameter. They lie at one head-width distance from the anterior end of the body. Mouth cavity cup-shaped, dorsal tooth is well visible, subventral teeth are small. Oesophageal bulb 1/5 of the length of oesophagus. Female gonads paired, symmetric, not reflexed. Tail 6 anal-body-width long, with terminal duct.

Mostly soil resident, but also occurs in fresh and brackis waters (Meyl. 1961). Frequent throughout Europe, for Hungary, however, its the first record.

In the bottom deposit not only freshwater species occured but also those preferring moist soils, even species resident of salt soils. Of the nematodes of Lake Balaton the expressely euryek species are f. i.: *Tobrilus gracilis*, *Ethmolaimus pratensis*, *Tripyla glomerans*. With regard to their properties freshwater species are *Paraplectonema pedunculatum*, *Paraphanolaimus behningi*, *Hemicycliophora aquatica*, resident of brackish waters *Theristus setosus*, and that of the soil *Achromadora terricola*.

The number of species of nematodes in Lake Balaton is about the same as in other European lakes, the individual numbers of nematodes are, however, below the average. Number of nematodes in the samples taken from the bottoms of lakes are compared hereunder using MICOLETZKY's (1922) and SCHNEIDER's (1924) data:

Untersee of Lunz	15 ml bottom samples from 30 m depth of water	numbers of nematodes 143
Attersee	,,	100
Grössersee of Plön	,,	138
Untersee of Plön	,,	132

Numbers of nematodes in Lake Balaton are rather small as compared to the above data.

In 15 ml bottom samples taken from 3 m depth of water in Lake Balaton there were 48 nematodes.

With regard to the nematodes of different waters it can be said that each lake has its respective, particular fauna. Some degree of likeness is found mostly between lakes of similar character, but every water body has its particular nematoda fauna. The following examples are to compare the results obtained in Lake Balaton, with the aim to register similarities and differences only:

Species (L)	Lake of Plön	Lake Madü	River Neva	Lake Balaton
Tobrilus gracilis	83%	38%	11%	4%
Monhystera filiformis	10	1		
Ethmolaimus pratensis	4	26		
Monhystera paludicola	1		9	10
Theristus setosus	0.4	6		9
Ironus ignavus		23		
Ironus tenuicaudatus			30	6
Tobrilus stefanski			12	
Tobrilus medius			10	
Dorylaimus stagnalis			2	
Aphanolaimus aquaticus			8	1
Chromadorita leuckarti			7	
Punctodora ratzeburgensis			6	
Paraplectonema pedunculatum				36
Paraphanolaimus behningi				29
Other species	1.6% 4 species	6% 7 species	15% 19 species	5% 14 species

The predominance of *Tobrilus gracilis* in the slightly turbid bottom deposit of 40 m depth of water of the Lake of Plön was observed by MICOLETZKY. The Nematoda fauna of near-by Lake Madü of similar limnological character

was however, different. Lake Balaton with some of its physical properties bears likeness to the middle or much rather the down reaches of streams. Data on such water bodies were presented by FILIPJEV (1929) from the delta of the River Neva. Some of the species recorded also occur in Lake Balaton, only their numbers and respective ratios are different. The original, special properties of Lake Balaton are determined by its shallow water and large surface area.

Quantitative distribution of nematodes

On the basis of samples a chart was constructed on the quantitative distribution of live nematodes inhabiting the bottom of Lake Balaton *(Fig. 2)*. The distribution of particles in the sediment of Lake Balaton was plotted by MÜLLER (1969, p. 607., fig. 2.) on the basis of collections made simultaneously with and from the same sites of our collections. Comparison of the two graphs reveals a parallelism between numbers of nematodes and those of particles below 2 μ. Parallel with the decrease in the amount of small particles there was an increase in number of individuals. A decrease below 10% of the amount of 2 μ fractions did not influence the number of individuals. Generally in areas where fractions below 2 μ occurred in 30—10%, the number of nematodes in the sediment were 5—23 000 i/m^3. In areas where more than 30% of the sediment was of that type, nematodes generally occurred in numbers below 5000 i/m^2.

The cross-section of Lake Balaton is asymmetric. The gentle slope of the southern shore drops abruptly to a depth of about 3 m at about 1 km off shore. This is the so called erosion line. The waves caused by the action of the dominating north-west wind are forcibly broken here, and as a result of the turbulent flow of water sedimentation is of lesser degree. Here these factors formed a good habitat for the nematodes, where they were often observed in numbers even above 20 000 i/m^2. This belt is well observable between Balatonfenyves and Balatonföldvár.

The large number of animals occurring in the area situated parallel with the northern shore of the Bay of Keszthely, is by no means applies in

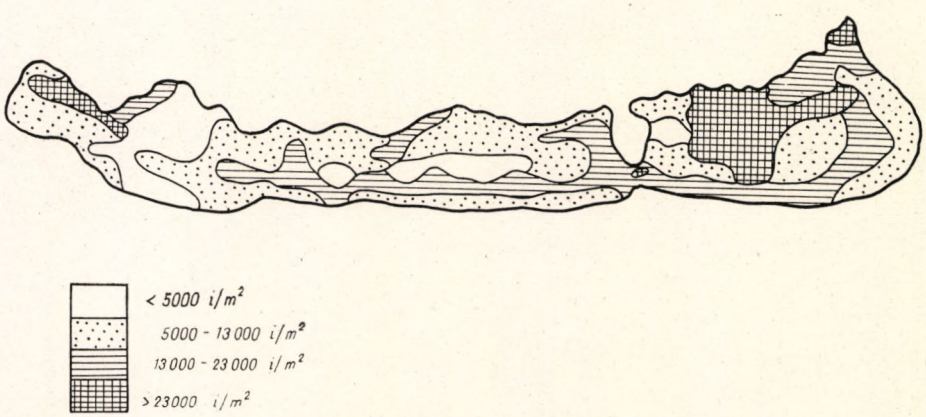

Fig. 2. Total number of nematodes, i/m^2

the case of the Bay of Szigliget. Their distribution follows there a mosaic pattern. East of the Badacsony—Fonyód line, on the northern side smaller numbers, while on the southern side greater numbers were frequent.

As regards distribution of nematodes it could be established that their numbers in the Bay of Szigliget was small, in some places only 2000 i/m². Numbers below 5000 i/m² were also registered along the middle line of Lake Balaton between Balatonszárszó and Balatonboglár and also along the eastern shore of Tihany peninsula. In the greatest part of the south-east basin of the lake their numbers were between 5—13 000 i/m². In some places along the southern shore of the Bay of Keszthely the total number of nematodes was well beyond 35 000 i/m² due to the great contribution of *Paraplectonema pedunculatum*. At the foot of the Csúcs Hill in the area of Tihany peninsula and also off Zánka numbers of 25 000 i/m² were registered. At the deepest point of the lake between Tihany and Szántód, in the so called "kút" they were numerous. Their numbers on both sides of the "well" were 18 000—20 000 i/m², while in the middle, i.e. in the "kút" 38 000 i/m². Difference was also observed in the contribution to population between the individual species: *Theristus setosus*, *Monhystera paludicola*, *Tripyla glomerans* and *Dorylaimus* sp. were more numerous here than in adjacent areas. In the central part of the south-east basin of the lake, i.e. in the area bounded by Csopak—Alsóörs—Siófok—Zamárdi their numbers increased to 25 000—30 000 i/m². Their highest numbers in the lake i.e. 52 000 i/m² was observed in the Bay of Fűzfő.

The algal flora on the surface of the bottom was examined by TAMÁS (1971) *(Fig. 3)*. A preponderance of diatoms (about 95%) on the surface of the sediment was established by her on the basis of the series of samples collected in 1968 simultaneously with and from the same places of our sample takings. The quantitative distribution of algae may be related, allowing for certain limitations, to the particle size of the deposit. Proceeding from the

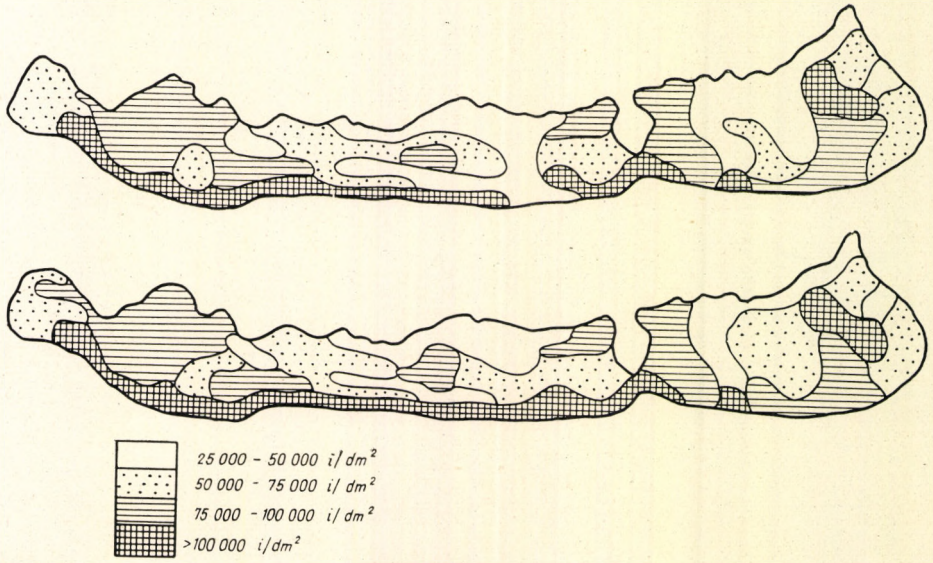

Fig. 3. Total number of Chrysophyta (above) and algae (below) i/m²

southern shore towards the northern one, a decrease in numbers of algae on the bottom surface was observable. Comparing the distribution of diatoms with that of nematodes, it is seen that in areas where number of nematodes was great (above 23 000 i/m²) — the central part of the north-east basin, and the northern part of the Bay of Keszthely — those of diatoms were small (30—60 000 i/dm²). The number of algae belonging to Chrysophyta were 100—150 000 i/dm², occasionally as high as 200 000 i/dm² along the southern shore of the lake. Their numbers may be deemed great in this area, while that of nematodes collected simultaneously was small, only 6000—8000 i/m². At about 1 km distance from the southern shore, along the erosion line the nematodes occurred in numbers as high as 20 000 i/m², while the number of diatoms were only average (70 000 i/dm²) or rather small (30—40 000 i/dm²). In the Bay of Szigliget and along the eastern shore of Tihany peninsula, where the nematodes occurred in small numbers (3—4000 i/m²) the numbers of algae on the bottom surface was average (75—100 000 i/dm²). It may be said in general, that in places where the algae were numerous only few nematodes were found on the bottom surface.

The data on the distribution of nematodes during September, 1968 show that their number was greater in the north-east basin than in the south-west one. Their greeat number, above 23 000 i/m² was found in general near the northern shore, while along the longitudinal centre line of the lake minimum values were obtained.

Maps for the distribution of three species: *Paraplectonema pedunculatum*, *Paraphanolaimus behningi* and *Ironus tenuicaudatus*, found in our series of amples are also presented *(Fig. 4* and *5)*.

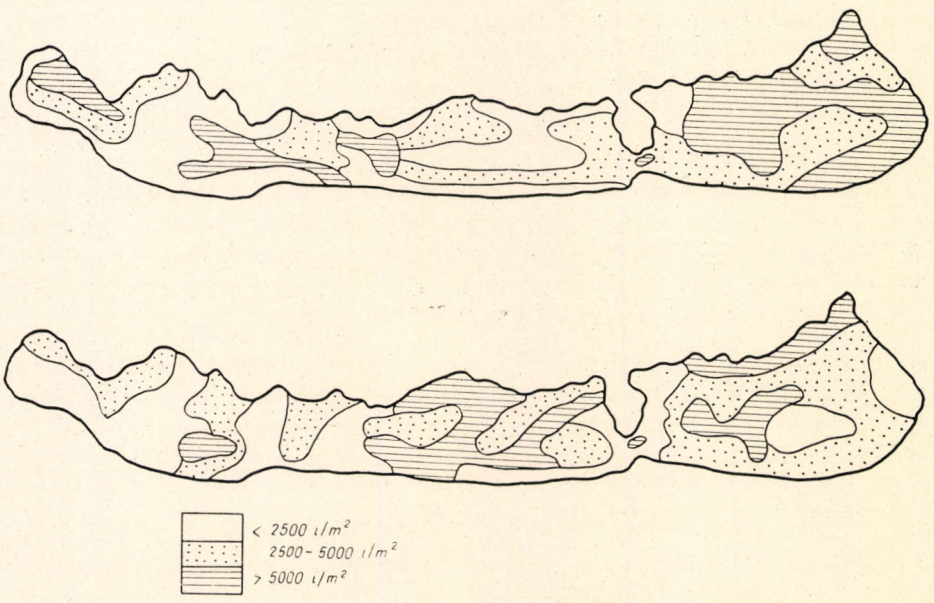

Fig. 4. Total number of *Paraplectonema pedunculatum* S. (above) and *Paraphanolaimus behningi* M. (below), i/m²

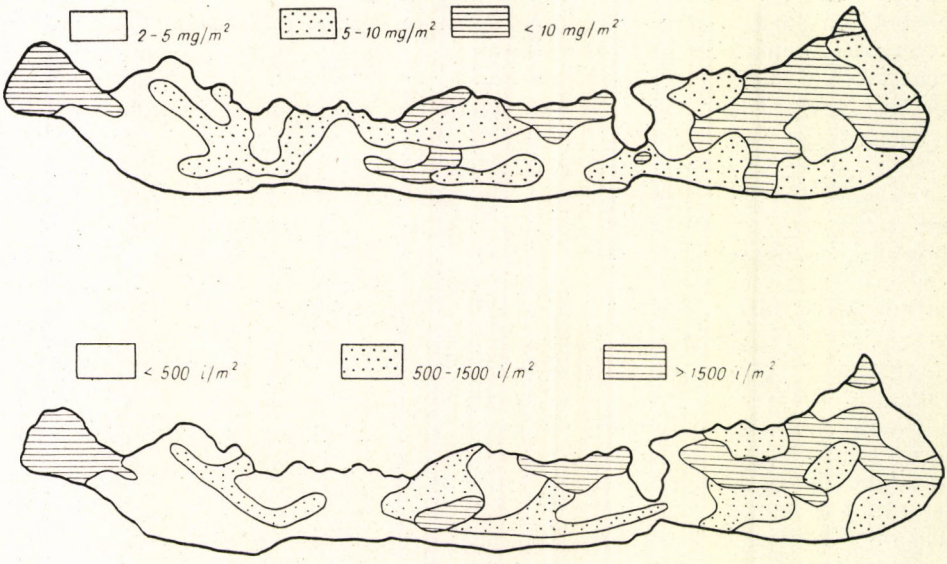

Fig. 5. Biomass of nematodes, mg/m² (above) and total number of *Ironus tenuicaudatus* DM., i/m² (below)

Paraplectonema pedunculatum is resident in the north-east basin and the Bay of Keszthely in particular, where in some places its number may even be as high as 7500 i/m². Only a few specimens of this species were observed along the centre line of Lake Balaton, in the Bay of Szigliget and along the eastern shoreline of Tihany peninsula. It occurred in negligible numbers also in the samples taken at some hundred metre distance off shore, between Szántód and Keszthely. In samples taken parallel with the shore, along the erosion line in particular between Balatonfenyves and Szántód, however, its number was 4—6000 i/m². It was also numerous in the central part of the north-east basin, in the Bay of Fűzfő as well as in the "kút" at Tihany.

To the west of Balatonboglár the number of *Paraphanolaimus behningi* was only at one place reaching 5000 i/m², in other places scarcely exceeding 2—3000 i/m². This species was more frequent to the east of the line between Balatonboglár—Révfülöp, where in some places even numbers beyond 8000 i/m² were also registered. Many specimens were found off Balatonlelle—Balatonszemes and on the northern side of the lake, off Zánka—Akali, in the area at the foot of the Csúcs Hill, in the "kút" at Tihany, from Csopak to Fűzfő and off Széplak and Zamárdi in the bottom of the open water. Along southern Somogy shore, however, only small number occurred between Balatonszentgyörgy and Szántód, around Tihany peninsula and off Siófok.

Ironus tenuicaudatus usually occurred only in the Bay of Keszthely and the north-east basin in numbers beyond 2000 i/m² in general. In the area between Balatonboglár and Tihany along the erosion line and between Balatonlelle and Zánka its number was 1000 i/m², and at some spots even as high

as 2000 i/m². In the middle of the north-east basin and the Bay of Fűzfő it was more numerous (above 2000 i/m²), while in places nearer to the shore its number decreased.

The biomass of Nematoda

Figure 5 illustrates the distribution of the biomass in early September, 1968. The north-east basin and the Bay of Keszthely yielded the greatest biomass of nematodes. Lowest biomass figures were obtained along the Somogy shore between Balatonberény and Balatonföldvár. Low biomass figures were obtained also in the Bay of Szigliget between Badacsony and Fonyód, and along the eastern shore of Tihany peninsula. In the south-west basin biomass was estimated at 5—7 mg/m² in general. Higher values, in some places even as high as 12 mg/m² were found mainly near the northern shore, while the figures obtained in the Bay of Keszthely, off Zánka and Akali were 15—20 mg/m² and 20 mg/m² respectively, and in the area at the foot of the Csúcs Hill 38 mg/m². The biomass values on both sides of and in the Tihany "kút" were 15—16 mg/m² and 23 mg/m² respectively. Biomass of nematodes in the north-east basin was estimated in general at 8—9 mg/m². In the central part of the basin the biomass was 13—17 mg/m², and in the Bay of Fűzfő 61 mg/m², the highest estimate for the lake.

Comparing biomass figures to the distribution of species *Ironus tenuicaudatus*, a parallelism appears between their respective quantitative data. In places where *Ironus tenuicaudatus* occurs in small numbers, the biomass estimates were generally low. A good parallelism was observable, when numbers of *Ironus* increased beyond 2000 i/m², in that case, namely, the biomass figures were also above 12 mg/m². This parallelism is accounted for the "great" weight (1,263 μg) of *Ironus tenuicaudatus*, for the weights of the other nematodes, as seen below in the order of their frequencies, are much smaller, and are never greater or only just as great as 0,1 μg.

Paraplectonema pedunculatum	0.065 μg
Paraphanolaimus behningi	0.086 μg
Monhystera paludicola	0.079 μg
Theristus setosus	0.100 μg

Paraplectonema pedunculatum was the most frequent, 6 times as frequent as *Ironus tenuicaudatus*. Inspite of that, the contribution of the latter to the biomass was decisive because its weight is nearly 20 times that of the former. The occurrence of other "bulky" species *(Tobrilus, Tripyla, Dorylaimus* etc.) was so small that they could not considerably influence the biomass value. It is also true that mostly in places with highest biomass figures the number of species — among others that of *Ironus* — was also greater. A situation different from that was observed only in the "kút" at Tihany, where the number of individuals was above average (38 000 i/m²) and those of *Ironus* relatively low (800 i/m²), and yet biomass values over average, i.e. 23 mg/m² were registered.

The nematodes have been seldom used to indicate water quality. The reason for this must be looked for partly in the unsatisfactory methods and last but not least in the euryek properties of Nematoda. There are, however,

some genera (i.e. *Rhabditis*, *Protorhabditis*, *Pelodera*, *Diplogaster*, *Goffartia*, *Fictor* etc.) that have a preference for strongly saprobic conditions. KOKORDJAK (1969) made a short list of nematodes that were thought by him to be indicator organisms. In this list *Monhystera stagnalis* and *Paraplectonema pedunculatum* are qualified as organisms characterizing alfa- and beta-mezosaprobic waters. These species also occur in Lake Balaton: *Monhystera stagnalis* was resident particularly in the south-west basin, in small numbers, while *Paraplectonema pedunculatum* was very frequent in the whole lake. Lake Balaton is a beta-mesosaprobic fresh-water, and it would be erroneous to conclude on the saprobiologic nature of the lake on such an inadaquate basis as the presence of the two species.

On the basis of quantitative and qualitative distribution of nematodes, or rather the direction of the changes in their number and quality take, it may be said that in the Bay of Keszthely, which is the most eutrophic area of the lake, the higher degree of eutrophy has become stabilized, and as a consequence of this a more intensive eutrophication has started in the Bay of Szigliget lying to the west of the Bay of Keszthely. Some years ago the area best supplied with plant nutrients has extended as far as Györök, today it seems to have progressed as far as the Badacsony—Fonyód line. The surroundings of the line Badacsony—Fonyód has become the boundary line between waters of low and high eutrophy, and both the disappearance of some benthic algae (TAMÁS, 1971) and the more intensive accumulation of mud of higher organic matter content also seem to bear evidence of this.

Summary

The material in our collection provides a picture on the qualitative and quantitative composition of nematodes in the bottom sediment of the open water of Lake Balaton in late-summer 1968.

Two new species were found for the Hungarian fauna: *Microlaimus globiceps* DE MAN and *Paraphanolaimus anisitsi* (DAD.) ANDRÁSSY.

Achromadora terricola DE MAN, *Dorylaimus helveticus* STEINER, *Tobrilus helveticus* HOFM. found in the collections are new species for Lake Balaton.

The most frequent five nematodes were: *Paraplectonema pedunculatum* S., *Paraphanolaimus behningi* M., *Monhystera paludicola* DM., *Theristus setosus* B., *Ironus tenuicaudatus* DM., their distribution, however, in the bottom sediment of the open water was not uniform.

The number of nematodes was greater in the north-east-basin of Lake Balaton (15 000 i/m^2) than in the south-west (10 000 i/m^2). Greater numbers — above 23 000 i/m^2 — were generally found near the northern shore. Along the longitudinal axis of the lake a minimum was observable: 5000 i/m^2.Lowest numbers were recorded for the area of the Bay of Szigliget: 3000 i/m^3.

Comparison of the quantitative distribution of nematodes with that of algae living on the surface of bottom shows that in areas where the diatoms were numerous (150 000—200 000 i/dm^2) only few nematodes (below 5000 i/m^2) were found in general.

Biomass figures of nematodes varied between 5 to 10 mg/m^2. They were the lowest, only 1—2 mg/m^2, in the Bay of Szigliget. Highest values beyond 12 mg/m^2 were measured in the Bay of Keszthely and in the central part of the north-east basin. In the "kút" at Tihany and the Bay of Fűzfő — different

from their surroundings — both the individual number and biomass values of nematodes were great. These observations call the attention to the importance of a more thorough investigation of these areas.

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A BALATON NEMATODÁI. III. FAUNA A NYÁR VÉGÉN

Bíró Kálmán

Összefoglalás

A gyűjteményünkbe került anyag a Balaton nyíltvízi üledékében élő fonálférgek minőségi és mennyiségi összetételét rögzíti 1968 nyarának végén.

A tóból feljegyeztünk 21 fajt, melyek közül az *Achromadora terricola* DE MAN, *Dorylaimus helveticus* STEINER, *Tobrilus helveticus* HOFMÄNNER fajokat most találtuk meg először a Balatonban. Magyarország faunájára nézve két új fajt jegyeztünk fel: *Paraphanolaimus anisitsi* (DADAY, 1905) ANDRÁSSY, 1968 és *Microlaimus globiceps* DE MAN, 1880.

A Balatonban talált fajok számát Európa más tavaihoz viszonyítva átlagosnak, az összegyedszámot viszont az átlagosnál kisebbnek tapasztaltuk.

A leggyakoribb öt fonálféreg a *Paraplectonema pedunculatum* S., *Paraphanolaimus behningi* M., *Monhystera paludicola* DM., *Theristus setosus* B., *Ironus tenuicaudatus* DM. elterjedése a nyíltvíz üledékében nem egyenletes.

A Balaton DNy-i medencéjében 1968 szeptemberében az átlagos egyedszám 10 000 i/m², míg az ÉK-i medencében 15 000 i/m² volt. Magasabb, 23 000 i/m² feletti egyedszámot inkább az É-i part közelében találtunk, a legkisebb egyedszámok a tó hosszanti középvonalában észlelhetők. A somogyi parttal párhuzamos homokpadkán — a turzás vonalában — az egyedszám 20 000 i/m² körül mozgott. A tihanyi „kút"-ban 38 000 i/m², a Fűzfői-öbölben pedig 52 000 i/m² kiemelkedően magas egyedszámot találtunk.

A Balaton üledékének szemcseeloszlási térképét MÜLLER (1969. p. 602., fig. 2.) készítette el. Ennek alapján párhuzam észlelhető a fonálférgek és a 2 μ alatti részecskék mennyisége között. Ahogy csökkent a kisszemcséjű anyag az üledékben, úgy növekedett az egyedszám. Megközelítően azokon a területeken, ahol a 2 μ alatti részecskék 30—10%-ban voltak, az üledékben 5000—23 000 i/m² fonálféreg élt. Azokon a területeken, ahol 30% felett volt az ilyen szemcsenagyságú üledék, az egyedszám 5000 i/m² alá csökkent.

A Balaton üledékének felszínén élő alga-flórát TAMÁS (1971) vizsgálta. Ha a kovamoszatok elterjedését párhuzamba állítjuk a fonálférgek elterjedésével, látható, hogy azokon a területeken, ahol a fonálférgek 23 000 i/m² feletti „nagy" mennyiségben éltek, a kovamoszatok egyedszáma „alacsony" (50 000 egyed/dm²) volt. Általánosságban azt mondhatjuk, hogy többnyire ahol sok alga élt az üledék felszínén (150 000—200 000 egyed/dm²), ott kevés fonálférget találtunk (5000 i/m² alatt).

Gyakori fonálférgek elterjedési térképéről látható, hogy a *Paraplectonema pedunculatum* többnyire az ÉK-i medence és a Keszthelyi-öböl lakója, ahol 7500 egyednél is több élt négyzetméterenként. A *Paraphanolaimus behningi* B.-boglártól Ny-ra 2—3000 i/m², míg K-re 8000 i/m² feletti mennyiségben is előfordult. (4. ábra) Az *Ironus tenuicaudatus* többnyire csak az ÉK-i medencében és a Keszthelyi-öbölben élt 2000 i/m² feletti mennyiségben, másutt 1000 i/m² körüli volt a száma. (5. ábra)

A fonálférgek biomasszája 1968 szeptemberében mind mennyiségében, mind területi eloszlásában változó volt. Magasabb biomasszát a Keszthelyi-öböl É-i részén (15 mg per m²) és az ÉK-i medence középső részén (13 mg/m²) mértünk. A legkisebb értékeket (1—3 mg/m²) a somogyi part mentén, a Szigligeti-öbölben és Badacsony—Fonyód között észleltük. A Balatonban a tihanyi „kút" és a Fűzfői-öböl — a környező területektől eltérően — mind egyedszámban, mind a biomassza mennyiségében jóval gazdagabb volt.

A Balaton DNy-i medencéjében átlagosan 5—7 mg/m², az ÉK-i medencében átlagosan már 10 mg/m² volt a biomassza mennyisége. Megfigyelésünk szerint a biomassza alakulását a „nagytestű" *Ironus tenuicaudatus* befolyásolta a legjobban.