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SYSTEMATIC STUDY OF ARID TERRITORIES

The Structure of a Soil Nematode Community in Dry Steppe Phytocenoses of Vodnyi Island (State Biosphere Reserve Rostovskii) during the Spring Period

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Abstract—This paper presents the results of study of the structure of a soil nematode community from key sites (index plots) on Vodnyi Island of the State Biosphere Reserve Rostovskii in the spring. A total of 76 genera from 41 families and nine orders were identified with 39 species common for 2 months (April–May). A number of characteristics of soil nematode fauna in spring were shown to manifest themselves in the genus diversity, occurrence frequency, and dominance of particular ecological–trophic groups and genera. The total number of species on index plots varied between 17 and 33; with the number of nematodes ranging from 230 to 994 individuals per 100 cm^3 of soil in April and from 134 to 1043 individuals per 100 cm^3 of soil in May. The order Dorylaimida, which included 29 genera, proved to be the most diverse by the genus composition followed by Tylenchida with 19 and Rhabditida with 11 genera. An increase in the number of nematodes from phytotrophic group in the spring was directly related to an increase in the fresh aboveground phytomass, as confirmed by correlation analysis (the coefficient of correlation has very high values: $r_{April} = 0.86$, $r_{May} = 0.96$ at p-level < 0.05).

Keywords: soil nematodes, dry-steppe phytocenoses, geobotanical parameters, ecological–trophic groups, correlation analysis

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Soil-dwelling nematodes are an essential part of soil biota, as well as one of the most diverse and numerous groups of metazoan invertebrates occurring in nearly all soil types. The majority of nematodes inhabit the top 30 cm of soil regardless of the characteristics of its agricultural use (Solov'eva, 1986; Chesunov, 2006; *Kratkii spetskurs* ..., 2011).

Studies of various biological aspects of soil nematodes are both of theoretical and practical value. Zoogeographic and comparative–ecological characteristics of natural soil nematode communities, including experimental research, allow identification of their dispersal pattern and characteristics of the formation of communities of these organisms in various biogeocenoses. Presently, proportions of ecological–trophic nematode groups can serve as a basis for assessment of soil nematological status and environmental monitoring.

Of particular interest to science are nematodological studies in the dry steppe conditions characterized by a pronounced complexity of the soil mantle and vegetation.

Vodnyi Island, which is one of the largest islands in Lake Manych-Gudilo, constitutes a part of Insular Site of the State Biosphere Reserve Rostovskii. In the nature reserve area of the island, the state of the dry-steppe landscapes primarily depends on the natural and climate conditions, as well as fluctuations in a size of unique population of locally dwelling feral horses. The vegetation and soil mantle of the protected steppes are particularly affected by ungulates during dry years (Prishutova, 2010; Nemtseva and Bespalova, 2010).

The specifics of natural conditions on Vodnyi Island are associated with its relative territorial isolation (the minimum width of anabranches is 400 m). The island is situated in a salinized part of the Proletarskoe Water Reservoir, in which dissolved mineral and organic substances amount to 20–30 g/L. Along its shoreline, the island is fringed with salinized soils largely represented by hydromorphic solonchaks. Patches of hydrophilous vegetation in micro- and meso-depressions on meadow-chestnut soils, on the one hand, and patches of semi-desert vegetation on solonetzic chestnut and solonetz are set against the steppe cenoses confined to chestnut soils. The chestnut solonetzic soils account for 40–60% of the total soil complex area (Nemtseva and Bespalova, 2010; Il'ina and Suchko 2019).

The island has long been used as rangeland. After establishment of the nature reserve, the remaining

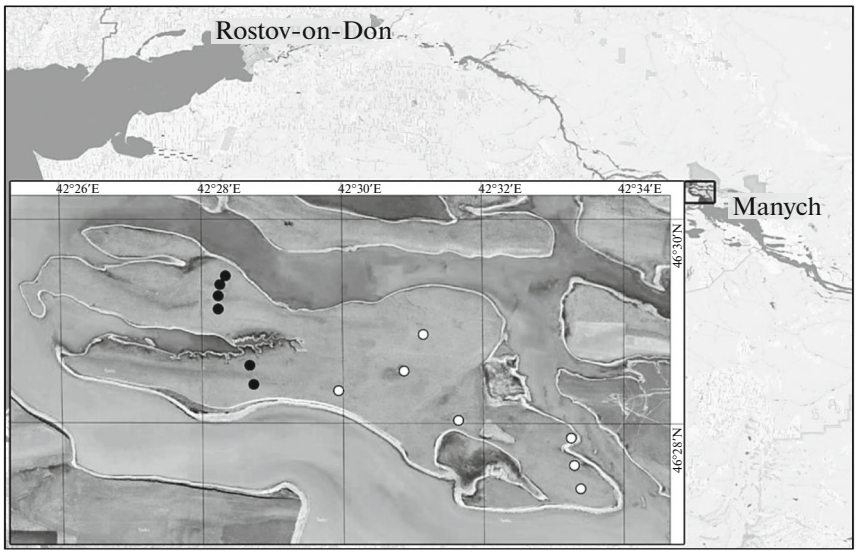

Fig. 1. A map of the index plots on Vodnyi Island. ○ Index plots in April, ● index plots in May.

free-roaming horses formed a feral herd; therefore, protection of natural dry-steppe landscapes is carried out on a conservative grazing regime basis (Prishutova, 2010; Ponomarev and Prishutova, 2017).

Inhomogeneity of the Insular Site vegetation is associated with the local relief characteristics, such as flat-bottom depressions, sinks, slopes of different aspects, and micro-elevations, which determine different moisture conditions; as well as with the formation of ranges of salinized soils. The vegetation of Vodnyi Island features valley dry sod-forming grass and *Artemisia*–sod-forming grass steppes. Precisely from this part, 227 species of vascular plants were recorded of the total of 459 species that occur across the entire nature reserve area and its protective zone (Shmaraev et al., 2006).

The goal of the study was to examine a structure of soil nematode community of Vodnyi Island located in the State Biosphere Reserve Rostovskii. The study objectives included determination of the total number of ecological–trophic groups, the quantitative distribution of identified nematode genera based on the occurrence frequency and dominance in the spring, and finding the relationship between the aboveground fresh phytomass of the vegetation and phytotrophic nematode group size on index plots in the springtime.

Importantly, no similar studies have been conducted to date with respect to the structure of the soil nematode community on Vodnyi Island.

MATERIALS AND METHODS

The studies were conducted in the Zapadnyi Manych River valley on Vodnyi Island (46°28′36″ N, 42°30′09″ E) in the State Biosphere Reserve Rostovskii located in Orlovskii District of Rostov Oblast physically based at the Manych Field Station of the Southern Scientific Center of the Russian Academy of Sciences. On Vodnyi Island, 13 key sites (index plots) were arranged using an ecological–geobotanical profiling method during the spring growth on April 11 and May 14, 2015 (Fig. 1).

Soil sampling and geobotanical description were done from quadrats 100 m^2 in area for each index plot. The ecological-geobotanical investigation, including plant species composition, plant associations, projective cover, herbage (grass stand) height, and the fresh aboveground phytomass, was made using commonly adopted classical methods both by routes and stationary works. Species cover abundance is reported according to the combined scale of Braun-Blanquet (1964). The names of the higher plants are reported based on S.K. Chernyshev (1995). Fresh aboveground phytomass was sampled from a 0.25 m^2 quadrat in three replications followed by weighing in a laboratory setting.

The following species of ephemeral plants and ephemeroids at the flowering stage were identified in the course of geobotanical description of seven index plots in April: mouse-ear chickweed (*Cerastium* sp.), corn speedwell (*Veronica arvensis*), *Gagea* sp., lesser celandine (*Ficaria verna*), jagged chickweed (*Holosteum umbellatum*), desert madwort (*Alyssum turkestanicum* var. *desertorum*), purple mustard (*Chorispora tenella*), common whitlowgrass (*Erophila verna*), claspleaf pennycress (*Microthlaspi perfoliatum*), tuberous valerian (*Valeriana tuberosa*), German madwort (*Asperugo procumbens*), field gromwell (*Buglossoides arvensis*), forget-me-not (*Myosotis micrantha*), and common henbit (*Lamium amplexicaule*). Two species, *Bellevalia sarmatica* and *Tulipa biebersteiniana*, which

are on the Red List of Rostov Oblast (2014), were additionally recorded at the flowering stage.

The total projective cover constituted 50–90% on index plots in April. Grass stand height was 10–15 cm. The species richness averaged 4–7 species per 1 m^2. The fresh aboveground vegetation phytomass averaged 264.86 ± 53.14 g/m^2.

The following species were identified in vegetation of six index plots in May: clasping pepperweed (*Lepidium perfoliatum*), the summer pheasant's-eye (*Adonis aestivalis*), turnip rape (*Brassica campestris*), Turkey wartycabbage (*Bunias orientalis*), *Linaria macroura*, Asian flax (*Linum austriacum*), *Ranunculus illyricus*), *Sameraria cardiocarpa*, and hairy vetch (*Vicia villosa*). Its distinctiveness additionally arises from the flowering needle grasses, *Stipa capillata*, *S. ucrainica*, and *S. pulcherrima*. Common couch (*Elytrigia repens*), desert crested wheatgrass (*Agropyron desertorum*), Volga fescue (*Festuca valesiaca*), *F. pseudodalmatica*, and bulbous bluegrass (*Poa crispa*), as well as *Artemisia* spp., such as, *A. lerchiana*, *A. austriaca*, and *A. marschalliana,* were highly abundant.

In May, total projective cover on index plots constituted 60–80%. Grass stand height was 20–90 cm. Species richness averaged ten species per 1 m^2. Grass species were found to account for 40.84–60.18% of total aboveground phytomass; forbs constituted 37.93–56.72%. Overall, phytomass parameters were significantly higher in May (815.66 ± 108.17 g/m^2), than in April (264.86 ± 53.14 g/m^2). Clasping pepperweed (*Lepidium perfoliatum*) and bulbous bluegrass (*Poa bulbosa*) made up a body of the grass stand on index plots in May.

Soil samples were collected using the methods that allowed obtaining the reliable results with relatively small number of samples (Metlitskii, 1985; Metlitskii and Matveeva, 1975). Nematodes were isolated by Flegg modified technique with a subsequent fixation of the nematodes in 5% heated formalin. Specimens extracted from the soil samples were mounted on permanent slides using standard technique (Hall, 1996); the relative number of nematodes per 100 cm^3 of soil was calculated for each sample. Analysis was performed at a genus level. The identified genera were divided into five ecological–trophic groups according to the Yeates's classification (Yeates et al., 1993); specifically, B for bacterial feeders or bacteriotrophs, M for mycotrophs, O for omnivores, P for predators, and PH for phytotrops, including a nematode group associated with plants (AP), which was intermediate between mycotrophs and phytotrophs. The following parameters were employed to characterize soil nematode fauna:

— The percent proportion of each genus in faunal composition is the number of individuals of a particular genus to the total nematode number. Based on this character, nematode genera are pooled into five groups; specifically, eudominants (10% and more of all detected individuals), dominants (from 5 to 10%), subdominants (from 2 to 5%), recedents (from 1 to 2%), and subrecedents (under 1%) (Solov'eva, 1986).

— Constancy assessment of species composition of nematode fauna was performed based on the species composition constancy index (%), which is a ratio of the number of samples where a species was found to the total number of analyzed samples. According to four grades of the index, species that compose the fauna are divided into accidentals (occur in 25% of samples), accessors (25 to 50%), constants (from 50 to 75%), and euconstants (from 75 to 100% (Solov'eva, 1986).

Statistical analysis of the results. The results were processed using an integrated system of analysis and data management in Statistica 8 (StatSoft, 2012). The notations used within the body of text include (n) for sample sizes and ($x_m \pm SE$) for standard error of the mean. All variables were preliminarily checked for the normality of the distribution (Shapiro–Wilk W-test). The Pearson correlation coefficient (r) and coefficient of determination (R^2) were used in the data analysis. Statistical hypotheses were rejected at the P-level of significance lower than 0.05. Correlation analysis was performed to assess the relationship between the total number of nematodes, as well as phytotrophs and the fresh aboveground phytomass in the spring.

RESULTS AND DISCUSSION

General description of soil nematode fauna on Vodnyi Island in the spring. As a result of sample study, soil nematode genera detected in April and May samples were comparable in the numbers, that is, 55 and 60, respectively. A total of 76 genera from 41 families and nine orders were identified in soil samples collected in the spring; of these, April and May had 39 species in common (Table 1).

Distribution of the number of nematode genera by orders showed that three orders, namely, Dorylaimida, Tylenchida, and Rhabditida, are the most typical of dry-steppe soils of Vodnyi Island in April and May. Genus diversity of soil nematode from the order Tylenchida was higher in May, than in April. Importantly, this parameter practically remained unchanged throughout the spring months for the orders Dorylaimida, Rhabditida, and Aphelenchida. Genera from the orders Enoplida, Alaimida, Mononchida, Araeolaimida, and Monhysterida proved to be low in numbers; they were represented by a few genera (two to four) and occurred in samples randomly. Therefore, the time point of soil sampling over a spring period was found to have an effect on genus diversity in the order Tylenchida, which is largely represented by phytotrophs (Table 1; Fig. 2).

Nematodes found in samples collected in April and May were divided into four groups based on frequency of the occurrence in dry-steppe soils of all index plot

Table 1. Data on the relative number, occurrence, and dominance of individuals from particular genera of soil nematodes on Vodnyi Island in the spring

Genus	Occurrence frequency		Dominance		Number	
	April	May	April	May	April	May
Bacteriotrophs						
Alaimus	–	EC	–	SD	–	13.99
Paramphidelus	–	AC	–	SR	–	2.9
Anaplectus	A	A	SR	SR	4.45	3.55
Cylindrolaimus	–	A	–	SR	–	4.23
Plectus	A	AC	SR	SR	1.51	1.81
Prismatolaimus	A	EC	SR	R	1.82	8.79
Eumonhystera	A	–	SR	–	2.13	–
Geomonhystera	–	C	–	SR	–	2.3
Acrobeles	EC	EC	D	D	34.83	30.53
Acrobeloides	A	EC	SR	R	1.26	10.44
Cephalobus	C	AC	SR	SR	2.75	1.59
Cervidellus	AC	AC	SR	SR	0.91	0.61
Chiloplacus	–	AC	–	SR	–	1.45
Eucephalobus	C	C	SR	SR	5.77	6.49
Heterocephalobus	AC	AC	SR	SR	2.73	1.59
Procephalobus	–	AC	–	SR	–	1.45
Protorhabditis	AC	–	SR	–	2.12	–
Rhabditis	–	AC	–	SR	–	0.2
Rhabditolaimus	AC	–	SR	–	2.73	–
Cephalenchus	AC	A	SR	SR	0.35	1.26
Omnivores						
Actinolaimoides	AC	–	SR	–	4.55	–
Actinolaimus	AC	–	SR	–	2.41	–
Aporcelaimellus	EC	EC	D	D	34.65	58.44
Aporcelaimus	AC	–	SR	–	3.18	–
Ecumenicus	–	AC	–	SR	–	1.81
Enchodelus	AC	AC	SR	SR	0.61	2.43
Eudorylaimus	EC	EC	ED	ED	84.76	66.88
Heterodorus	A	C	SR	R	3.78	8.43
Labronemella	A	–	SR	–	3.08	–
Mesodorylaimus	A	A	SR	SR	3.34	5.42
Metaporcelaimus	–	AC	–	SR	–	3.25
Microdorylaimus	A	C	SR	SR	2.61	1.81
Paraxonchium	A	C	SR	R	3.44	8.75
Prodorylaimus	AC	–	SR	–	1.06	–
Pungentella	AC	–	SR	–	4.81	–
Pungentus	A	–	SR	–	3.53	–
Sectonema	AC	–	SR	–	0.72	–
Thornedia	AC	–	SR	–	0.6	–

Table 1. (Contd.)

Genus	Occurrence frequency		Dominance		Number	
	April	May	April	May	April	May
Mycotrophs						
Aphelenchus	EC	EC	D	SD	35.53	14.86
Paraphelenchus	AC	–	SR	–	0.91	–
Dorylaimoides	–	AC	–	SR	–	1.45
Nothotylenchus	–	AC	–	SR	–	0.20
Phytotrophs						
Aphelenchoides	A	AC	SR	SR	1.01	0.2
Longidorella	EC	EC	SD	SD	14.02	26.81
Longidorus	C	C	SR	R	4.46	6.84
Meloidogyne	–	AC	–	SR	–	2.9
Metaxonchium	–	AC	–	SR	–	1.45
Xiphinema	A	C	SR	R	3.54	8.7
Amplimerlinius	EC	C	ED	R	72.08	10.43
Bitylenchus	A	–	SD	–	17.01	–
Geocenamus	A	C	SD	SD	14.52	19.76
Helicotylenchus	C	EC	ED	ED	64.2	63.95
Merlinius	A	A	R	R	6.62	7.34
Mesocriconema	AC	A	SR	R	0.6	6.92
Paratylenchus	AC	C	SR	SR	0.6	5.86
Pratylenchus	C	C	SD	R	26.93	10.03
Rotylenchus	C	–	SR	–	4.56	–
Tylenchorhynchus	–	C	–	SD	–	23.9
Basiria	–	C	–	R	–	9.59
Coslenchus	A	C	SR	R	2.39	7.19
Ditylenchus	–	A	–	SR	–	6.04
Filenchus	A	A	SR	SR	3.75	2.62
Lelenchus	AC	–	SR	–	0.91	–
Psilenchus	–	C	–	R	–	6.72
Tylenchus	–	A	–	SR	–	2.81
Predators						
Seinura	A	C	SR	SR	5.33	2.05
Discolaimium	A	A	SR	SR	3.32	1.62
Discolaimus	A	C	SR	R	5	9.07
Nygolaimoides	EC	C	SD	SD	14.24	12.78
Nygolaimus	A	EC	SD	D	15.59	36.16
Paravulvus	AC	AC	SR	SR	4.3	1.81
Semitobrilus	–	AC	–	SR	–	1.45
Tripyla	A	AC	SR	SR	3.61	0.65
Trischistosoma	–	AC	–	SR	–	5.8
Clarkus	C	EC	SD	D	22.66	35.86
Mylonchulus	–	AC	–	SR	–	1.45

(EC) euconstant, (C) constant, (A) accessor, (AC) accident, (ED) eudominant, (D) dominant, (SD) subdominant, (R) recedent, and (SR) subrecedent; (line) absent.

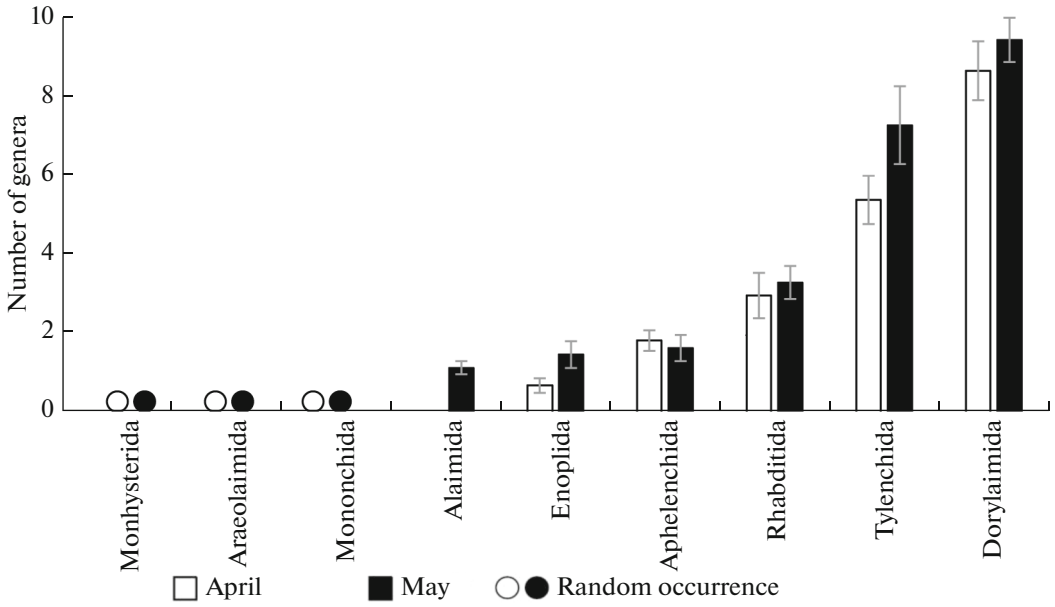

Fig. 2. The genus diversity of orders of nematodes on Vodnyi Island in the spring.

on Vodnyi Island, (Table 2). The characteristics of genus distribution depending on the sampling time point resolve into the following: the number of euconstants and constants proved to be low in April and May (seven genera each); these numbers increased in May (11 genera of euconstants and 18 genera of constants). The most significant genera and genera, constituting groups of euconstants and constants common to different months, included *Acrobeles, Eucephalobus, Aporcelaimellus, Eudorylaimus, Aphelenchus, Longidorella, Longidorus, Amplimerlinius, Helicotylenchus, Pratylenchus, Nygolaimoides,* and *Clarkus*. Accessors proved to be the most numerous group, comprising 23 genera, in April, whereas the same group had the lowest number of genera with ten genera in May. The number of accidentals varied insignificantly throughout the studied spring period and amounted to 18 genera in April and 21 genera in May (Table 2).

The faunal structure of soil nematodes was established to be largely determined by the euconstant and constant groups of genera, which numbered 30 in total, including 35.5% from Dorylaimida, 32.3% from Tylenchida, 12.9% from Rhabditida, 6.5% from Aphelenchida, and 3.2% each was contributed by the

Table 2. The quantitative distribution of identified genera of soil nematodes on Vodnyi Island by the occurrence and dominance groups in the spring

Group	April	May	Entire period
Occurrence frequency			
Euconstant	7	11	8
Constant	7	18	8
Accessor	23	10	17
Accident	18	21	43
Total	55	60	76
Dominance			
Eudominant	3	2	2
Dominant	3	4	3
Subdominant	7	6	7
Recedent	1	14	5
Subrecedent	41	34	59
Total	55	60	76

Table 3. The number of soil nematodes by trophic groups on Vodnyi Island in the spring

Trophic groups	$x_m \pm SE$, ind./100 cm^3 of soil		
	april, $n = 7$	may, $n = 6$	entire period, $n = 13$
Phytotrophs	233.8 ± 56.2	228.7 ± 71.1	231.4 ± 42.7
Omnivores	157.1 ± 32.2	157.2 ± 45.3	157.2 ± 26.0
Predators	74.0 ± 20	108.7 ± 27.5	90.0 ± 16.7
Bacteriotrophs	63.0 ± 16.6	91.9 ± 21.7	76.3 ± 13.5
Mycotrophs	40.2 ± 19.8	19.1 ± 5.4	30.5 ± 11.0
Mean number per samples	**568.2 ± 106**	**605 ± 149.6**	**585.5 ± 85.8**

orders Alaimida, Enoplida, Monhysterida, and Mononchida; no nematodes from the order Araeolaimida were detected. Phytotrophs, omnivores, and predators accounted for 67.8% in the most widely distributed soil nematode genera. Of all detected genera, 37 exhibit selectivity with respect to dates of the soil sampling; thus, 16 genera exclusively occurred in April samples and 21 genera occurred in May.

Frequency of occurrence is an important parameter in the structure of the soil nematode fauna. Thus, the majority of these genera were randomly occurring, in that, over the entire season, 5 of the 37 genera were represented by constants and euconstants in April or May exclusively with one genus (*Rotylenchus*) recorded for April and four genera (*Alaimus*, *Tylenchorhynchus*, *Basiria*, and *Psilenchus*) for May. Therefore, it is evident that genus diversity primarily increased for phytotrophs and was associated with an increase in the amount of the food material in soil in the spring.

Based on the dominance pattern, genera constituting soil nematode fauna of Vodnyi Island in spring were grouped in the following way. Eudominants and dominants included three genera each in April and were roughly equal to the number of genera in May. The group of eudominants and dominants included eight genera; specifically, *Acrobeles, Aporcelaimellus, Eudorylaimus, Aphelenchus, Amplimerlinius, Helicotylenchus, Nygolaimus,* and *Clarkus*. Ten genera were identified in a list of subdominants, including seven in April and six in May (Table 2). Of the represented groups, April and May share nematodes from the genera *Eudorylaimus* and *Helicotylenchus* as eudominants; *Acrobeles* and *Aporcelaimellus* as dominants; and *Longidorella, Geocenamus,* and *Nygolaimoides* as subdominants.

Data on a structure of soil nematode fauna are substantially supplemented by data on the size and proportions of ecological–trophic groups (Table 3; Fig. 3).

In terms of the number of genera, group of phytotrophs was the most diverse (23 genera). This group had numerical superiority over other groups, which sizes per sample averaged 231.4 ind./100 cm^3 of soil and 39.5% of the total number of nematodes. Slightly lower diversity (18 genera) and smaller size occurred in the group of omnivores, which averaged 157.2 ind./100 cm^3 of soil; in proportion to other groups by size, they

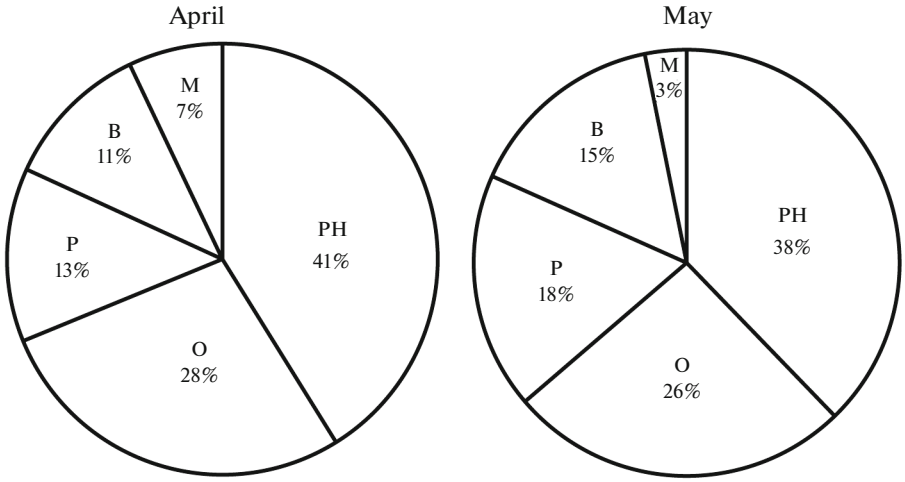

Fig. 3. The proportions of soil nematode ecological-trophic groups of Vodnyi Island by spring months. *Legend*: (B) bacteriotrophs, (M) mycotrophs, (O) omnivores, (P) predators, and (PH) phytotrophs.

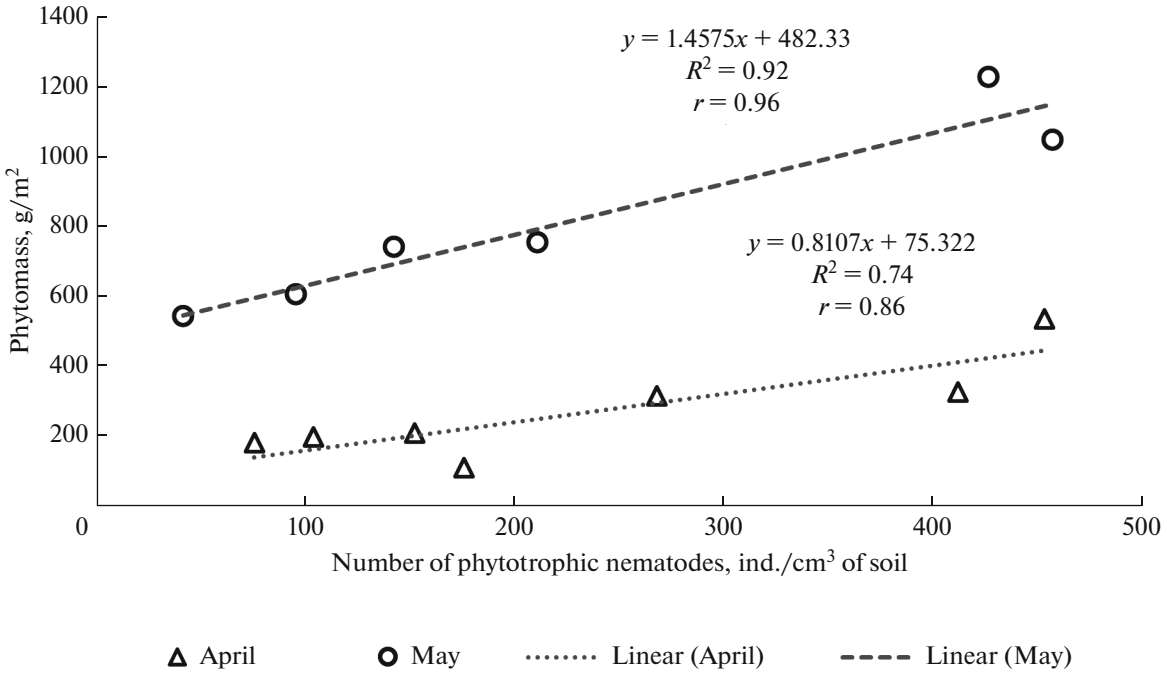

Fig. 4. The relationship between fresh aboveground phytomass and the number of nematodes of phytotrophic group on index plots of Vodnyi Island in the spring.

accounted for 26.8%, which also suggests the dominance of this group. The distribution of ecological–trophic groups where the dominant role is played by groups of phytotrophs and omnivores, which is typical of the dry sod-forming grass and *Artemisia*–sod-forming grass steppes, is associated with high projective cover, species richness, and plant fresh phytomass levels in vegetation communities in the spring (Shmatko, 2013; Shmatko and Il'ina, 2017).

Groups of bacteriotrophs and predators with 76.3 ± 13.5 and 90 ± 16.7 ind./100 cm^3 of soil, respectively, were no more than 15% of the entire trophic group population. There were 20 genera of bacteriotrophs and 11 genera of predators. The smallest and least diverse was mycotrophs, numbering 30.5 ± 11 ind./100 cm^3 of soil (a total of four genera were found over the study period) (Table 3; Fig. 3).

As seen from Table 3 and Fig. 3, the size of the dominant groups, i.e., omnivores and phytotrophs, remained unchanged at different times during the spring period, while their level relative to other groups decreased (by 2–3% on average) in May compared to April.

Groups such as predators and bacteriotrophs appreciably increased in size in May and constituted 18 and 15% of the entire fauna, whereas they did not exceed 13 and 11% in April, respectively. In the group of mycotrophs, the number of nematodes per sample averaged 40.2 ± 19.8 in April and dropped to 19.1 ± 5.4 ind./100 cm^3 of soil in May. This distribution of trophic groups of soil nematodes is most likely associated with variation in the geobotanical parameters of vegetation in the spring months.

Study of the relationship between fresh aboveground phytomass of plants and the number of nematodes in phytotrophic group in the spring. The population parameter in soil nematodes varies depending on climate zones and ecological factors, such as moisture content, temperature, competition, source of food, and others (Solov'eva, 1986; Vetrova, 1980; Gubina, 1982; Ryss, 1982; Hanel, 1994; Brown and Gaugier, 1998). Variation in the soil nematode population is attributed by a number of authors to the growth of plants (Thomas, 1969; Wyss, 1970; Yeates, 1968; Shlepetene, 1986).

Nematodes of the phytotrophic group are microscopic organisms, whose body lengths vary between 300 μm and 8 mm and do not greatly exceed 2 mm (Butorina et al., 2006). In our case, phytotrophs are represented by the dominant group, consisting of the obligate and facultative nematodes, as well as the plant associated nematodes. Therefore, an attempt was made to determine the relationship between fresh aboveground phytomass of vegetation and the number of nematodes in a group of phytotrophs in the spring. Figure 4 shows the results with respect to the correlation dependence of the studied parameters.

An increase in the fresh aboveground phytomass is accompanied by an increase in the number of phytotrophic nematodes in soil samples, which is confirmed by the rather close relationship between the compared parameters, in that, $R^2_{\text{April}} = 0.74$ and R^2_{May}

= 0.92 with very high correlation coefficient, that is, $r_{April} = 0.86$, $r_{May} = 0.96$ at p-level < 0.05.

Assessment of the genus composition in nematodes from phytotrophic group of the investigated index plots revealed that euconstants and constants were represented by six genera in April and 12 genera in May. An increase in active accumulation of vegetative mass of plants in May promoted an increase in the number of nematodes of phytotrophic genera that were rarely encountered or not recorded in May altogether: *Psilenchus, Coslenchus, Basiria, Tylenchorhynchus, Paratylenchus, Geocenamus,* and *Xiphinema*. Additionally, the genera *Longidorella, Longidorus, Amplimerlinius, Helicotylenchus,* and *Pratylenchus* occurred rather regularly throughout the entire spring period. Ten and eight genera of accessors and accidentals, respectively, were identified for April and May; of these, *Tylenchus, Meloidogine, Metaxonchium,* and *Dytylenchus* were recorded exclusively in May, while *Bitylenchus* and Lelenchus occurred only in April (Table 1).

Based on their dominance the genera of the phytotrophic group in the spring were grouped as follows: two and one genera in April and May, respectively, of eudominants, including the genera *Amplimerlinius* and *Helicotylenchus*, with one genus *Helicotylenchus* common to April and May. Dominants were absent. A total of five genera of subdominants were found, including four genera for April (*Longidorella, Bitylenchus, Geocenamus,* and *Pratylenchus*) and three in May (*Longidorella, Geocenamus,* and *Tylenchorhynchus*).

CONCLUSIONS

This is the first study of soil nematode community on Vodnyi Island of the Rostovskii State Biosphere Reserve.

In the spring (April–May) 2015, 76 genera from 41 families and nine orders were identified in a structure of soil nematode community on index plots of Vodnyi Island, of which 39 genera were common to the 2 months.

The total number of species on the index plots varied between 17 and 33 with the population of the nematodes ranging from 230 to 994 individuals per 100 cm^3 of soil in April and from 134 to 1043 individuals per 100 cm^3 of soil in May. The three most diverse orders were found to be Dorylaimida (29 genera), Tylenchida (19 genera), and Rhabditida (11 genera).

A group of phytotrophs consisting of 23 genera proved to be the most diverse among ecological–trophic group and was characterized by the numerical superiority over the others. This group accounted for 41% in April and 38% in May on average of the total number of nematodes in the sample. Omnivores were next in order by dominance and constituted 26.8%. It was established that the dominant groups remain constant throughout spring and have lower values (by 2–3% on average) of the percent proportion-related parameters in May compared to April.

The study revealed that in the spring an increase in fresh aboveground phytomass of plants is accompanied by population growth in nematodes from the phytotrophic group, as confirmed by correlation analysis (the coefficient of correlation has very high values: $r_{April} = 0.86$, $r_{May} = 0.96$ at p-level < 0.05).

Therefore, study of a structure of soil nematodes from dry-steppe phytocenoses of Vodnyi Island established a number of characteristics that manifest themselves in the genus diversity, occurrence frequency, and dominance of particular ecological–trophic groups and genera in nematode fauna.

Integrated research, including work that involves nematode fauna of the steppe and dry-steppe landscapes of the valley, will be continued for the purpose of data acquisition on vertical distribution of soil nematode across profiles of various soils, description of plant communities, and soil parameters of various biotopes.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest. The authors declare that they have no conflicts of interest.

Statement on the welfare of animals. This article does not contain any studies involving animals performed by any of the authors.

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