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The Nematode Fauna Dynamics Peculiarities of Highlands Different Ecosystems (Eastern Georgia)

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***Abstract*—**There was studied dynamic of the number of nematodes fauna of various ecosystems of Gombori Mountain Ridge that belongs to peak of fauna dynamic. The nature of dynamic is in general similar in all six biotypes and the difference is evident only in total number of nematodes.

***Keywords*—**Nematoda, dynamic, highland, ecosystem

I. Introduction

POPULATION dynamics of nematodes and its determinants can be divided into sin-dynamics (dynamics of all nematode species specific habitat), out-dynamics and population dynamics. Comprehensive study of the dynamics of the fauna of nematodes is a complete study of species composition, detection of trophic relations of species and eco groups, decryption of some biology issues and population ecology, the disclosure of specific participation of nematodes in diverse biological and biochemical processes occurring in soil and plants. Nematodes are the largest group of soil micro fauna. According newest data they are over the million. We can ascertain features of fauna dynamic, ecological-physiological character of nematodes with the fauna researches and find out phyletic connections with different ecologic and taxonomic groups [1]. By the view of nematode researches we choose the territory (Tsiv-Gombori Range) with different ecosystems. Because of the ongoing successive processes we decided to study bio-varieties of nematodes of different ecosystem types, numerous, their ecological groups, and use this information of indication of ecosystem's condition in the future.

II. Materials and methods

The range of Tsiv-Gombori is situated in the East of Georgia. It is 90km in length and 22km in width. The research territory from sea level situated from 600 m to 1991 m. The temperature amplitude for year is 2.4 – 24.1 degrees Celsius.

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The amount of sediments in a year is about 700-1000mm. The soils are different types, with 5-6% humus of fine definition of grain structures. Vegetation diversity is characterized with complex florist composition and is caused because of its ecological Paleo-Geographical past. All of these make nematodes distribution into the soil and we foreseen it during the ascertaining taxons, and studying their distribution according to ecosystems. For the stationary observations we choose 6 different ecosystems (phytocenosis). The method of research is unchangeable during the whole period, thus probability of making mistakes is minimal.

III. Result and discussion

In examples, for taxonomic and fauna analyze we ascertained number of nematodes, ratio of fauna similarity, dominants, subdominants, rare species, euconstants and constants, accesses and accidents, and mentioned dynamics of nematode fauna fluctuation. We have identified 34 families and 73 names of 239 nematode species. The new species *Enchodelus georgensis* are described for scientists [2] During the fauna studying in dynamics we revealed increases and decreases in the number of species. We choose one month cycle of 2 years period, from January 2002 to November 2003, for determination of nematode's whole complex in studying biotopes and for taking full picture of fauna complexity.

First ecosystem: oak and hornbeam wood. We identified 125 forms of nematodes, a small number winter peak in February 2002, during several months we can see a small fluctuation of numbers of nematodes and only in January 2003 we can see the numerical peak. A number increase is well seen in spring 2003, we think that it is connected with the temperature rising, hatching the eggs. In the following months there are fluctuations but number is less than in May 2003. The less fluctuation in 2002 is connected with temperature and hydrologic stable regime (Fig. 1)

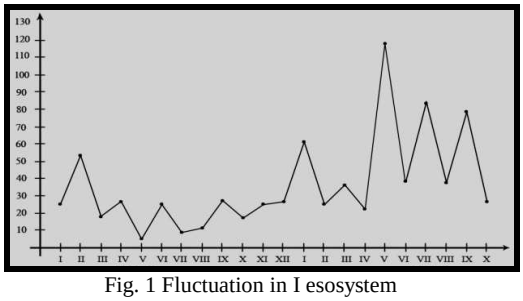

Fig. 1 Fluctuation in I esosystem

Second and therd ecosystems look like for their vegetation cover: oak-hornbeam and hornbeam with dead cover. We identified 95 forms of nematodes in the II ecosystem and 84 ones in the III. In the II ecosystem the nematodes numerous first peak was in February-march 2002. Then their number is decreasing and a small peak is seen in December and is connected with the reproduction process, but because of low temperature it is stopped and after is updated in spring. In May there is a peak and its decrease begins only in August. In October there was an increase of the number. Thus, in second ecosystem were stated winter maximum and autumn minimum of 2002, and winter maximum and spring minimum of 2003 (Fig. 2).

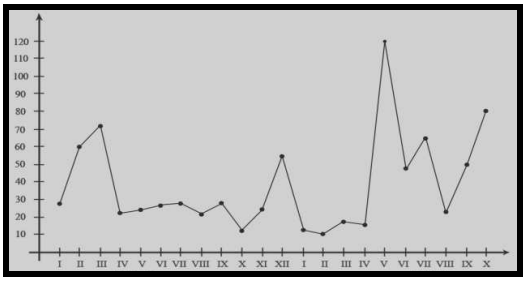
Fig. 2 Fluctuaton in II ecosystem

Now processes in the III ecosystem: the fluctuation of nematodes number was minor in 2002 and only in the autumn of 2003 we can see the growth in number, it was preceded by gradual growth in the months of spring and summer and highest number was in September. We think that humidity was promoting hatching the eggs (Fig. 3).

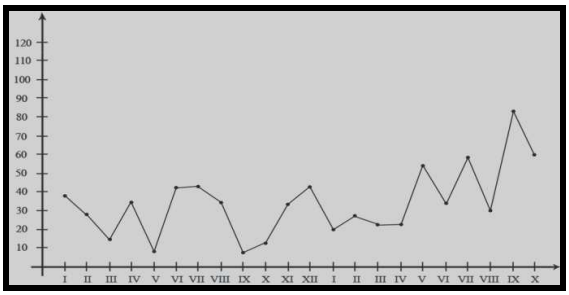
Fig. 3 Fluctuation in III ecosystem

In conclusion we can say that in both cases the main determining factors were temperature and humidity, because these two ecosystems hardly differ from each other.

Fourth ecosystem – artificial pinewood situated on the right bank of riv. Thurdo. There we identified 98 forms of nematodes. We do not see significant fluctuation in the first year but in May 2003 there is a peak. Then number is decreasing gradually and shows the lowest index in August, but in September there is a growth again (Fig. 4).

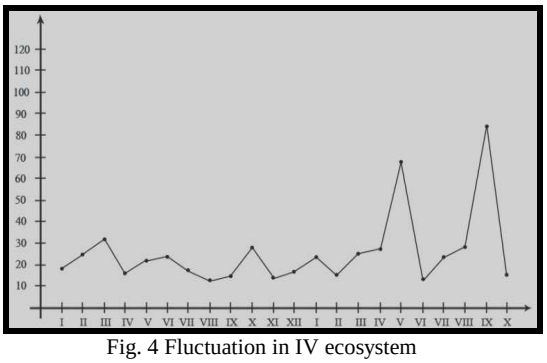
Fig. 4 Fluctuation in IV ecosystem

Fifth ecosystem – we identified 90 forms of nematodes. The first peak was in winter 2002, fluctuation is law in the following months, but we are fixing autumn minimum and spring maximum indexes (Fig. 5).

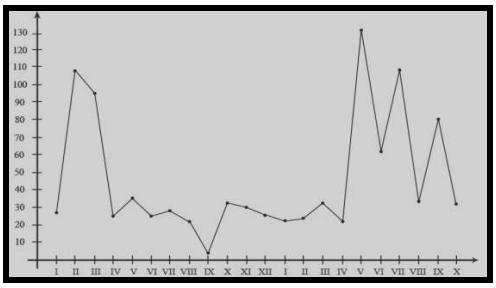
Fig. 5 Fluctuation in V ecosystem

Sixth ecosystem – fruit garden, we identified 63 forms of nematodes. Fluctuation is very law in 2002 but unlike the other ecosystems there is a growth in May, then some kind of depression and a new peak in September. Spring and autumn minimums are stated as well (Fig. 6).

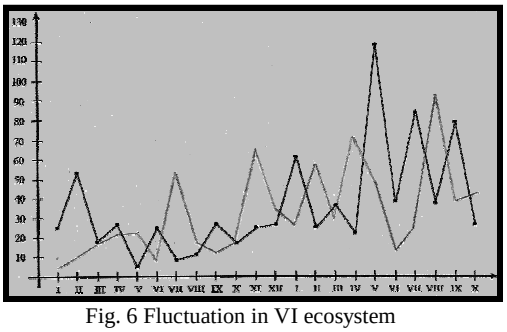
Fig. 6 Fluctuation in VI ecosystem

From this we can see that it is normal to have to peaks on each year in Georgia. In the sixth ecosystem spring and autumn peaks is separated well, these peaks are more or less expressed in the fifth ecosystem. Relatively these peaks are weaker in the first and fourth ecosystems in 2003.

The fact that in first, second, third and fourth ecosystems peaks in spring and autumn of 2002 are not expressed well maybe caused by adverse condition during the nematodes reproduction period. However we can see a small peak in first and second ecosystems.

Our heuristic data confirms that fluctuation number of nematode fauna is connected not only with temperature and humidity, but with soil and other biotic factors with food base ranges.

We have studied dynamic of the number of mature and larvae forms since studying of age structure of fauna makes it possible to establish peculiarities of fauna dynamic. As a rule certain connection between general number and fluctuation of larvae forms can be observed in any soil.

Dominating number of larvae in our materials in fact is not defined. In general dynamic is very well shown that certain part of this dynamic is conditioned by large number of larvae. However if we compare mature and larvae forms, the number of larvae forms only in several cases achieves the number of mature forms. In spite of the fact that low temperature is typical for winter period, the number of larvae in certain cases is near to the number of mature forms. Here we should take into consideration the fact that various species of nematodes differ from each other with productivity, ability to adopt temperature, humidity and trophism. Large number of larvae achieves the peaks of general number in case of wave-like dynamic. This event is very well shown in third and fourth ecosystems.

Sudden changes in environment such as drought, fire, flood, hurricane and other natural events can very often cause catastrophic decrease of population density, that is why the populations that have underwent such influence, are characterized with regular or occasional explosions in the process of number increase and are called opportunistic populations.

The opposite picture gives another group of population that is always in balance with its own (or existing in the environment) recourses. The density of this group is very stable (taking into account that the number of resources in the environment does not change). Such populations are known as balanced populations [3]

The meaning of comparison of opportunistic and balanced populations consists in the fact that ecological factors influencing them and dependent or independent from density, can exert various influence on natural selection and population itself.

Massive catastrophic mortality taking place in the environment during very changeable or unforeseen events, presumable exerts weak influence on total scope of genotypes and phenotypes.

Basing on analyses of our materials we can suppose that large rate of increase in number on the territory that we have studied can even not take place, since in such case fauna nucleus are created by K strategy species and large fluctuation of number is not typical for them. Majority of species revealed by us (orders: Dorylaimida, Tylenchida, Mononchida), other than nematodes (Rhabditida), characterize with low reproduction potential (as a rule there are simultaneously several eggs in females of such species). In addition to the above mentioned lifetime of such species is at least 1 year. That is why these species of nematodes belong to balanced populations that almost do not achieve the number that is typical for opportunistic population.

Representatives of Rhabditida raw were registered in a very little number in our materials. Among these representatives are many opportunistic species (r strategies), which confirms weak fluctuation of number.

IV. Conclusion

The winter and autumn peaks in sixth ecosystem are very well separated from each other. In fact the same picture is revealed in fifth ecosystem . The fact that the spring and autumn peaks of ecosystems first, second, third and fourth, are not very well expressed, points to existence of comparatively unfavorable conditions for reproduction of nematodes.

Fluctuation in number of nematodes is connected not only with influence of temperature and humidity, but also with other soil abiotic and biotic factors, for example with fluctuation of food basis.

Basing on analyze of dynamic of the number of mature and larvae forms we can conclude that very large increase in number in ecosystems that we have studied can be even not revealed since in such case fauna nucleus is created by K strategy species belonging to balanced populations and large fluctuation of number is not typical for them. As to opportunistic species (for example order Rhabditida), they were registered in the materials in a very little number that is confirmed by low rate fluctuation

References

[1] Shesteperov A.A. Karantin phytohelmints (Book style). Moscov, Kolos", 1995, pp. 6-17(Russian).
[2] Eliava I., Tskitishvili E., Bagathuria N. Enchodelus georgiensis sp. nov. (Nematoda, Dorylaimida) from Eastern Georgia. // Bull. of the Georgian National Academy of Scienses, 173, N2, 2006 pp. 368-370.
[3] Pianca E. Evolutional Ecology. (Book style) ,,Mir" 1981, pp 339 (Russian)