Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2020, 10(3), 187-190, doi: 10.15421/2020_152

ORIGINAL ARTICLE

Soil ciliates of the Goygol National Park

V.F. Mammadova*, L.R. Abdullayeva, V.M. Mammadov

Ganja State University
159 Heydar Aliyev avenue, Ganja 429AZ 2001, Azerbaijan

**Corresponding author E-mail: vefa.mamedova74@mail.ru*

Received: 12.06.2020. Accepted: 30.07.2020

We studied the diversity of soil ciliates in the Goygol National Park (Göygöl National Park, Azerbaijan). Our samples were collected from the peripheral and central areas of the park. Analysis of our data proved that species diversity is significantly higher at the plots with minimum human impact. We registered 20 species of soil ciliates in the park area, two of them were found here for the first time - *Amphisiella acuta* Foissner, Agata, Berger, 1982 and *Holostycha australis* Blatterer et Foissner, 1988.

Key words: Soil ciliates; Distribution; Species diversity; Structure, Azerbaijan

Introduction

Soil ciliates are an integral component of natural ecosystems, actively participate in the circulation of substances and significantly affect the soil formation. Therefore, the study of soil ciliates is extremely important. The relevance of this problem connected to the increasing human influence on natural communities (Nikitina, 2000; Prosekin, 2001; Mamadova, 2016). Soil protozoa are the first taxa responding to the environment changes and can be the indicator of soil contamination by the harmful chemicals (Alekperov, 2012). Despite a number of relevant research from this area (Alekperov and Sadikhova, 2005; Sadikhova, 2006; Alekperov and Mamadova, 2015; Mamadova and Mamadov 2020), the soil ciliates of Azerbaijan are still insufficiently studied. These studies were conducted in several natural geographic areas and they considered just some groups of soil ciliates. Moreover, the soil fauna of Goygol National Park has not been studied before. In addition, the Goygol National Park is one of natural area exposed to anthropogenic impact (ecotourism and recreation) and therefore it subject to environmental changes. We supposed that soil ciliates distributed in the park required detail research. Our study of soil proto-fauna was the first detail research conducted in this region.

Materials and Methods

Study area

The park was established in 2008 and situated in the North-Eastern part of the Lesser Caucasus. We conducted the study in the territory of the Goygol State National Park (40°24'39"N 46°19'21"E, 12,755 ha) in 2018 (Figure 1). The park is located at an altitude of 1,100-3,065 m.a.s.l. About of 80 tree and shrub species are distributed in the forests at altitude of 1,100-2,200 m.a.s.l. The average annual temperature is +12-14°C. The average temperature in January is minus 1°C, the average temperature for July-August is +24-25°C. The main human activities are tourism and recreation, which mainly affected the roads and Goygol Lake.

Data collection and processing

The 100 soil samples were collected and processed from eight plots in the territory of Goygol National Park and adjacent areas during 2017-2019 (Figure 2). In addition, we collected and processed about 50 soil samples from forest lands, gardens, and backyards near the settlements to assess and describe the impact of human activities on the pedobionts.

The three sites were located within a triangle of about 100 m from each other. The sampling area of each sample site was about 10 m^2, and ten replicated surface soil samples (0–5 cm) with fine plant roots were collected using the "parallel leaping method". We used a shovel to collect the samples because only surface soil samples (0–5 cm) were needed. The ten replicated surface soil samples were mixed round equably and combined to a composite sample in the field, then immediately collected about 3 kg of this composite sample, and immediately placed inside a sterilized plastic bag, sealed and transferred back to the laboratory. Fresh samples were analyzed immediately; the remaining portions were air-dried for one month and then analyzed.

All samples were qualitatively analyzed following the "non-flooded Petri dish method". About 100–150 g of soil sample was placed in a Petri dish (15 cm in diameter) and saturated with distilled water. The live specimens were observed under a high-power oil-immersion objective with bright field, phase contrast, or differential interference contrast microscopy (magnifications of 40–1000; Nikon E800). The identification, nomenclature and terminology of ciliate species were done according to Alekperov, Mamedova (2015b). The quantitative analysis of soil ciliates was based on the modified "most probable number" (MPN) method employed by Darbyshire et al. (1974).

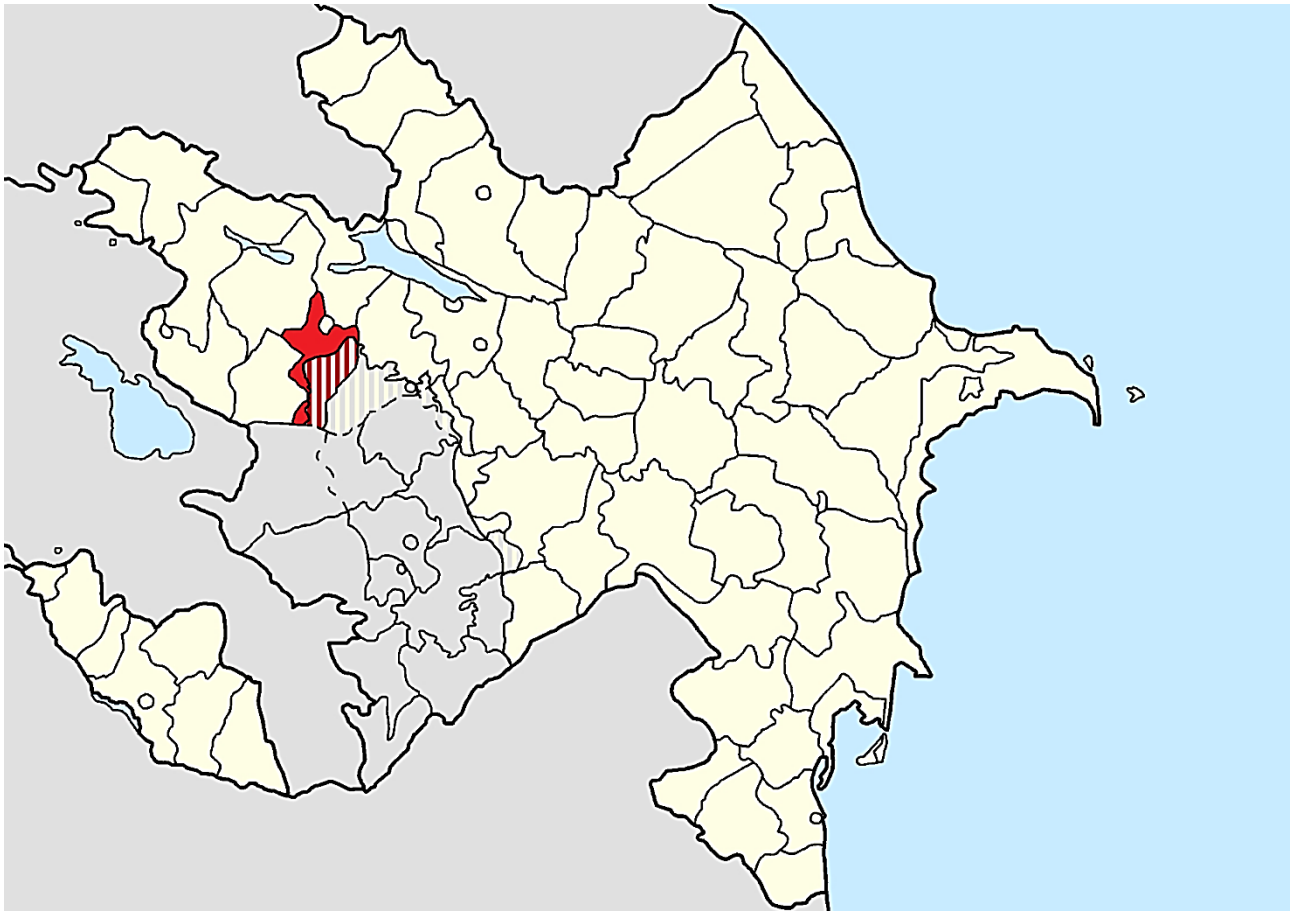

Figure 1. Goygol (Göygöl) National Park location.

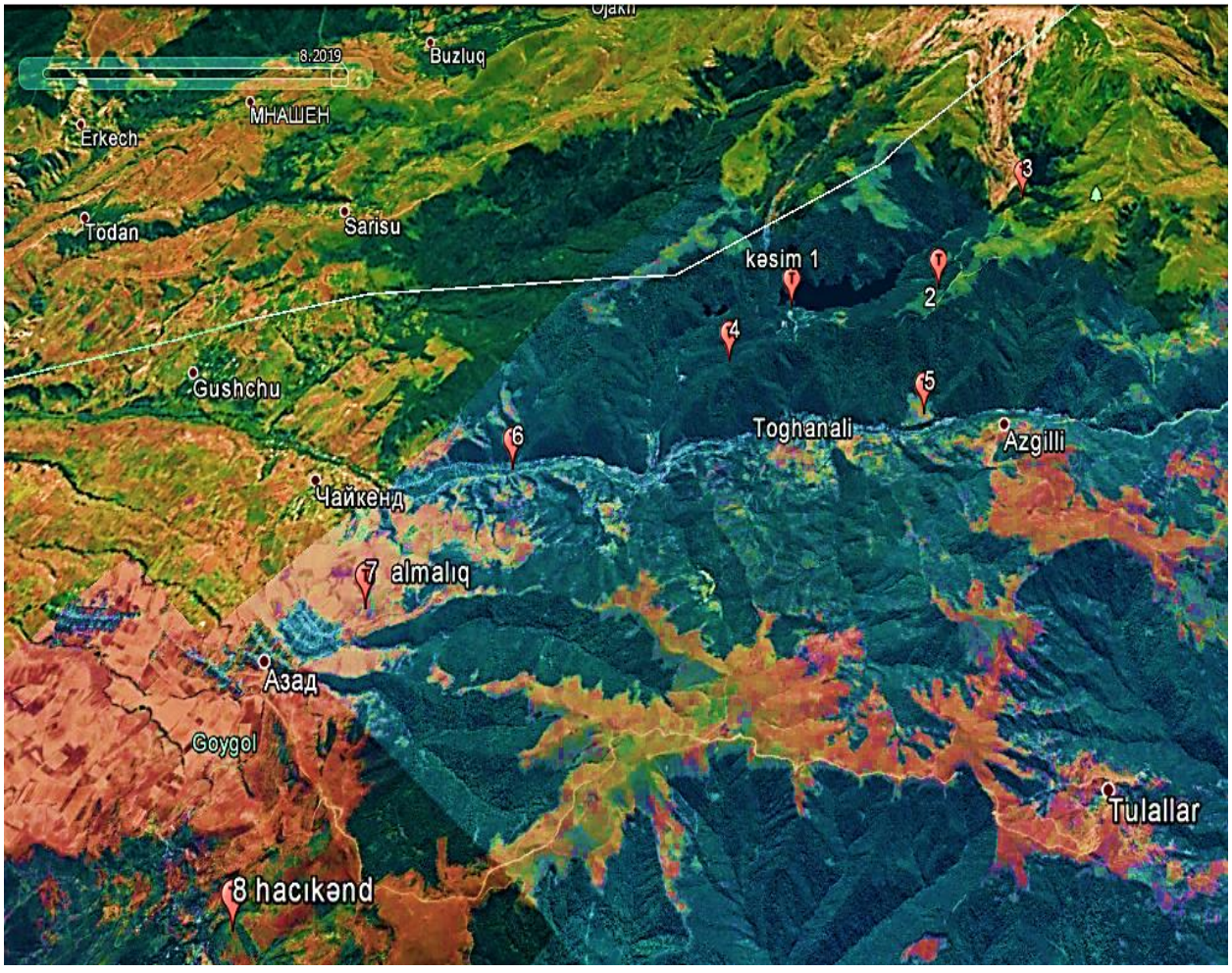

Figure 2. Soil sampling plots in the Goygol National Park

Results

During our research, we registered 20 species of soil ciliates, from which two were found for the first time in the territory of Goygol National Park (Table 1).

Table 1. Taxonomy of soil ciliates, registered in the Goygol National, Park area.

Soil ciliates species	Collection points[1]							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Fam. Blepharismidae Jank. in Small et Lynn, 1985								
1. *B. steini* Kahl, 1932	+	+		+		+		
2. *Phacodinium metchnikoffii* Prowazek,1900		+	+		+	+		
Fam. Amphisiellidae Jank., 1979								
3. **Amphisiella acuta* Foissner, Agata, Berger, 1982		+	+			+		+
Fam. Kahliellidae Tuffrau, 1979								
4. *Kahliella franzii* Foissner, 1982	+	+	+	+	+	+		+
Fam. Oxytrichidae Ehrenberg, 1838								
5. *O. formosa* Alekperov, 1984	+	+	+	+			+	
6. *A. zechmeisterae* Foissner,Berger,Xu and Zechmeister-Boltestern, 2005		+	+		+			+
Fam. Gonostomatidae Small and Lynn,1985								
7. *G. strenua* Engelmann, 1862	+	+	+	+		+	+	
Fam. Keronidae Dujardin, 1840								
8. *Keronopsis wetzeli* Wenzel, 1953	+	+		+	+			+
Fam. Bakuellidae Jankowski, 1979								
9. *B. granulifera* Foissner, Agatha et Berger, 2002	+		+			+		
Fam. Urostylidae Bütschli, 1889								
10. *Holostycha adami* Foissner, 1982	+	+		+				+
11. **H. australis* Blatterer et Foissner, 1988	+				+		+	
12. *H. stueberi* Foissner, 1987	+	+	+			+	+	
13. *H. pullaster* Müller, 1773	+	+			+			+
Fam. Spathidiidae Kahl, 1929								
14. *Spathidium porculus* Penard, 1932	+	+	+	+	+	+	+	
15. *Epispathidium ascendes* (Wenzel), 1965		+		+				+
16. *E. polynucleatum* Foissner, Agatha et Berger, 2002	+	+	+	+		+		+
17. *E. terricola* Foissner, 1986	+	+		+		+	+	+
Fam. Urotrichidae Small et Lynn, 1985								
18. *Urotricha atypica* Alekperov, 1993	+	+		+	+	+		+
Fam. Spirozonidae Kahl, 1926								
19. *S. shoenborni* Foissner, 1986	+	+	+	+	+			+
20. *S. smalli* Alekperov, 1993	+	+	+	+		+	+	
Total:	16	18	12	13	9	12	1	10

Species marked with an asterisk * are new to the park fauna, 1 – see Figure 2 for plots location/.

Conclusion

The Goygol National Park is one of natural area exposed to anthropogenic impact (ecotourism and recreation) and therefore it subject to environmental changes. We supposed that soil ciliates distributed in the park required detail research. Our study of soil proto-fauna was the first detail research conducted in this region.

Acknowledgements

The authors would like to express their gratitude to the local authorities and the Ministry of Ecology and Natural Resources for providing great support.

References

Alekperov, I.Kh., Mamedova, V.F. (2015a). Species composition of the free-living ciliates of the forest soils of the Samur-Yalama National Park of Azerbaijan. J. Appl. Environ. Biol. Sci, 5(5), 178-183.

Alekperov, I.Kh., Mamedova V.F. (2015b). Species diversity of ciliates in forest soils of the Samur-Yalama National park. Vestnik zoologii, 49(2), 451-456. https://doi.org/10.2478/vzoo-2014-005 (in Russian)

Darbyshire, J.F., Wheatley, R.E., Greaves, M.P., Inkson, R.H.E. (1974). A rapid micromethod for estimating bacterial and protozoan populations in soil. Revue d'Ecologie et de Biologie du Sol, 11, 465–475.

Mamedova, V.F (2013). Changes in the structure of the community of infusoria in the territory of the Samur-Yalaminsky National Park and adjacent territories subject to anthropogenic influence. Proceed. V Int. Sc. Conf. "Actual problems of ecology", Karaganda. (in Russian)

Mamedova, V.F. (2016). Principles of modern approach to ecological formation of anthropogenic pollution of water bodies and soil. Proceed. In. Sc. Conf. Actual problems of modern chemistry and biology. Ganja, 12-13 May 2016, IV, 69-74. (in Russian)

Mammedova, V.F, Abdullayeva, L.R, Mammedov, V.M (2019). Pedobiont infuser fauna of Goygol National Park. Journal of Multidisciplinary Engineering Science and Technology, 6(11), 11028-11030.

Nikitina, L.I. (2000). Fauna of soil ciliates of the Bolshevik reserve. Scientific researches in nature reserves of the Amur region. Collection of articles Vladivostok-Khabarovsk, 145-150 (in Russian)

Prosekin, K.A. (2001). On the ecology of soil ciliates in the northeastern Baikal region. Role of protected areas in the conservation of biological diversity of the Baikal region. Irkutsk (in Russian).

Sadykhova, D.A. (2006). Features of the vertical distribution of free-living infusoria in the mountainous soils of the Ismailli reserve. Proceedings of the Azerbaijan National Academy of Sciences. Biological and Medical Sciences, 3-4, 87-93 (in Russian).

Zolotarev, V.A (2011). Methodology and methods of research of the simplest periphyton. Ecology of free-living simple land and aquatic ecosystems. Proceed. Int. Conf. October 17-21, Togliatti, 29. (in Russian)

Citation:

Mammadova, V.F., Abdullayeva, L.R., Mammadov, V.M. (2020). Soil ciliates of the Göygöl National Park. *Ukrainian Journal of Ecology, 10*(3), 187-190.

This work is licensed under a Creative Commons Attribution 4.0. License