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FERNS OF THE KORATEPA RESERVOIR

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Muminov Dildshodjon
student of department of Botany, Samarkand State University

Abstract

In this article, the ferns found around the Karatepa reservoir were studied and their taxonomy was compiled. The condition of the sedges growing around the stream was assessed using mathematical and statistical methods.

Key words

diversity; fern; transect

Introduction

Nowadays, as a result of climate change and increasing human influence on nature, the state of plants in the flora is changing. Zarafshan Valley is a region of special importance in terms of vegetation cover and diversity [2]. The study of plants of the Zarafshan Valley began several years ago, and a list of plants was formed [1,2]. Nowadays, as a result of increasing anthropogenic influences and climate change [10], the assessment of the current state of vegetation cover is becoming important. Plants belonging to the division Polyopodophyta appeared in ancient times [6]. Department representatives are very sensitive to environmental changes. The appearance or disappearance of these plants is closely related to the place of their growth. Amonkoton stream is located in the Urgut biogeographic region [4], and the main part of the stream is used by the population. For this purpose, a study was conducted in the area of the Amonko'ton creek to determine the current condition of the cuttlefish.

Materials & methods

Amonkoton stream begins in the southwestern part of the territory of Zarafshan valley, Urgut biogeographic region (Fig. 2) in the form of several small streams and flows into the Karatepa reservoir. Its starting point is 1860 m above sea level (39°18'12" N and 66° 53'57" N). The discharge point to the Karatepa reservoir is the lowest part of the stream and is located 930 m above sea level (39°24'34"N and 67°01'44"N). The total length of the stream is 24 km.

Vegetation cover was analyzed using transect methods. Transects were placed vertically (vertically) and lengthwise (horizontally). A distance and a location were selected for placing 24 vertical (vertical) and longitudinal (horizontal) transects on the hillside (Fig. 1). 6 transects were randomly selected and set along the stream: steeply and longitudinally on the hillside (Table 1). The length of each horizontal transect is 100 m and the length of the vertical transect is 50 m. Based on the total length of the transects, 20 1m x 1m mats were installed together with the transect. All samples were collected in April, May and June of 2021-2022.

We used QGIS 3.30.0, Google Earth Pro software and data from https://www.diva-gis.org/gdata, https://mapcruzin.com databases to draw the research direction and map.

Table 1. Location, altitude and orient of each transect.

Tr.	Location	Height above sea vel	Orient
I	39°24'20.02"N 67° 1'8.51"E	890-910 m	Latitudinal
II	39°24'12.68" N 67° 0'33.43" E	910-960 m	Altitudinal
III	39°22'40.87" N 66°59'41.26" E	970-1020 m	Altitudinal
IV	39°21'10.20" N 66°59'8.43" E	1060 m	Latitudinal
V	39°19'2.25" N 66°58'58.71" E	1200-1250 m	Altitudinal
VI	39°18'29.59" N 66°56'20.38" E	1385-1390	Latitudinal

Plots were 1 m × 1 m squared. All fern species in the sampling sites were investigated in spring and summer from March to August 2021 and 2022, periods when average monthly temperature and precipitation are mostly stable [7]. The nomenclature follows PPG I [8] and Flora Uzbekistan [9].

QGIS 3.30.0, Google Earth Pro programs, and data from the https://www.diva-gis.org/gdata, https://mapcruzin.com databases were used to draw the research direction and maps (Figure 1,2).

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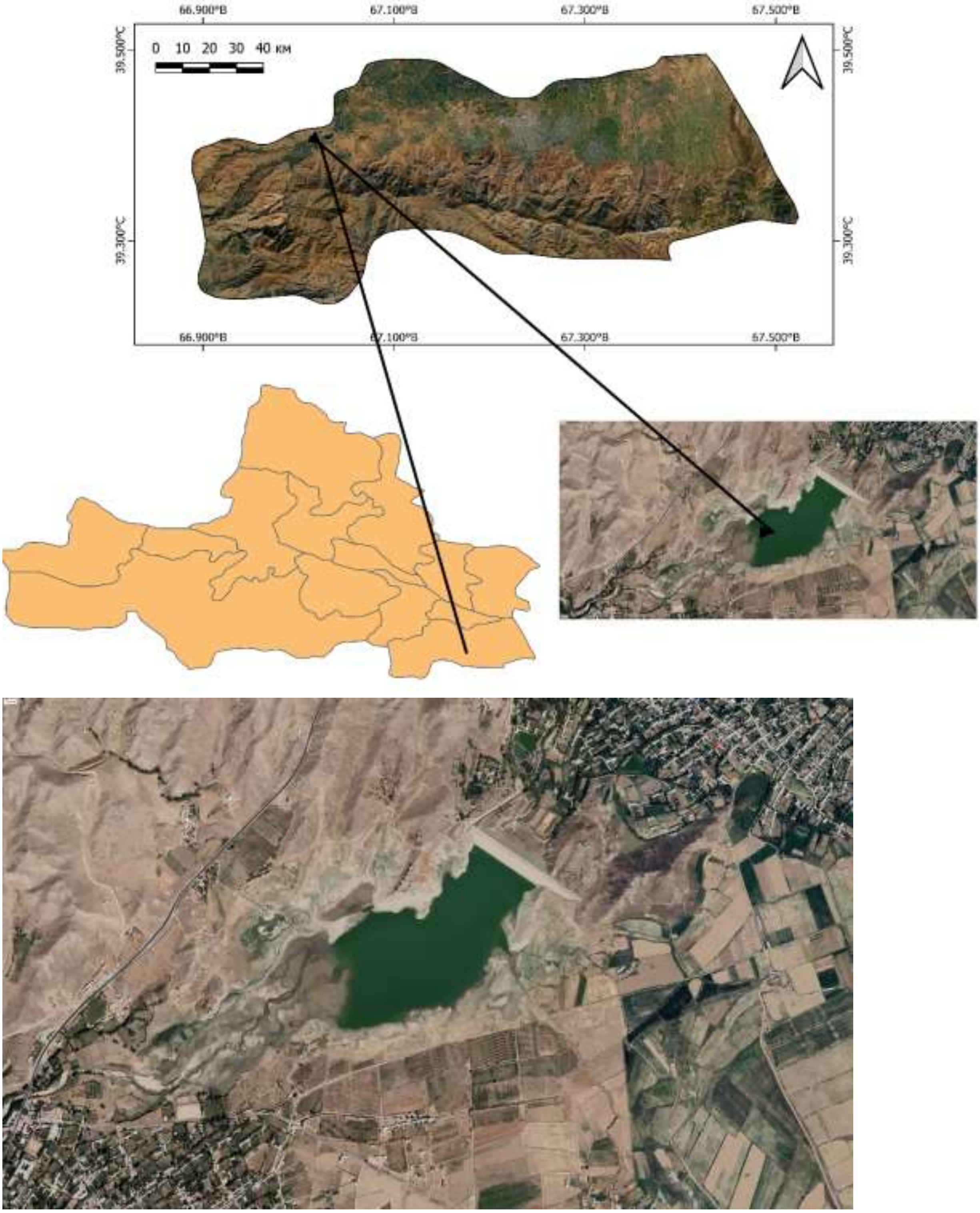

Figure 1,2. Karatepa reservoir

Statistical analyses

In statistical analysis, we used Shannon-Wiener index (*H*), Simpson index (S), Bray-Curtis similarity index, Dominance, Evenness (J). [10, 11, 12].

Results

A

C

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The analytical results are from 490 fern individuals belonging to 7 genera and 6 families (Table 2.)

Table 2. Species in transects

№	Family	Species	Tr. I	Tr. II	Tr. III	Tr. IV	Tr. V	Tr. VI
1	*Equisetaceae* Michx. C.	*Equisetum arvense* L.	20	56	40	34	0	10
2		*Equisetum ramosissimum* Desf.	9	31	78	46	17	0
3	*Pteridaceae* M.Kirchn.	*Adiantum capillus-veneris* L.	5	14	20	0	0	0
4		*Hemionitis persica* (Bory) stenh.	0	0	4	0	0	0
5	*Aspleniaceae* man	*Asplenium haussknechtii* Godet & . ex Milde	0	0	0	3	0	0
6		*Asplenium fontanum* subsp. *lofontanum* (Kossinsky) Reichst. & eller	0	0	0	0	4	0
7		*Asplenium ruta-muraria* L.	0	0	0	3	0	0
8		*Asplenium trichomanes* L.	0	0	2	0	0	0
9		*Asplenium ceterach* L.	0	0	5	0	0	0
10	*Cystopteridaceae* er) Shmakov	*Cystopteris fragilis* (L.) Bernh.	20	7	15	0	0	40
11	*Dryopteridaceae* er	*Dryopteris filix-mas* (L.) Schott	0	0	0	0	0	4
12		*Dryopteris komarovii* Kossinsky	0	0	0	0	2	0
13	*Thelypteridaceae* g ex Pic.Serm.	*Thelypteris palustris* Schott	0	0	0	0	0	1

As a result of the study, 6 families belonging to the Pteridophytes department Equisetaceae, Pteridaceae, Aspleniaceae, Cystopteridaceae, Dryopteridaceae, Thelypteridaceae, 7 families: Equisetum, Adiantum, Hemionitis, Asplenium, Cystopteris, Dryopteris, Thelypteris and 13 plant species: Equisetum arvense, E. ramosissimum, Adiantum capillus-veneris, Hemionitis persica, Asplenium haussknechtii, A. fontanum subsp. pseudofontanum, A. ruta-muraria, A. trichomanes, A. trichomanes, A. ceterach (Ceterach officinarum), Cystopteris fragilis, Dryopteris filix-mas, D. komarovii, Thelypteris palustris were found to grow. The result obtained from the transects is as follows (Table 2), and their probability of meeting or distribution was significantly different from each other. It can be seen from the table that among the plants, Equisetum arvense, E. ramosissimum and Cystopteris fragilis are the most common plants, accounting for 76% of the plants found.

Plots in transect are labeled 1–10 from the bottom to the top of the mountain. Transect II was a closed precipice although IV was open. Transect VI was a mountain ridge. There was a clear correlation between the H index and the altitude. It shows a tendency that fern became the mostly diverse as the altitude increased.

Transect II had a telling correlation. It was a precipice with a closed habitat and vegetative plants. The humidity inside the precipice was relatively high due to good irrigating from the upper site. Most ferns grew well in this condition.

Transect IV was also a precipice but aggregated by fragment rocks, and poverty vegetation. It could not keep groundwater, neither a close and humid habitat. Ferns were seldom discovered in this site.

Transect VI was a mountain ridge which could not maintain water consistently, nor construct a humid habitat. Arid plants were well developed on the ridge compared to ferns.

Plots in transects were labeled 1–10 from the upper to the lower across 100 meters. Transect I was an open river terrace while III and V were closed. The H index was nicely and considerably correlated along the river. Compared to altitudinal transects, the water supply of transects I/III/V seemed sufficient because it was close to the river channel. Closed habitats were constructed in some areas in transect III and V due to developed shrubs and trees. However, transect I did not develop growing precipice vegetation. The main reason would be lack of water in streams.

Though all the six transects existed in a cramped valley of 24 km in length. Bray-Curtis index demonstrated a deviation altitudinally and latitudinally (Table 3). The maximum was 0,818 in latitudinal transect III and IV which defined similar living circumstances of fern and fern allies. The minimum was 0 in V and VI, which determined various circumstances.

Table 3. Similarity in transects

	I	II	III	IV	V	VI
I		0,49	0,546	0,532	0,766	0,516
II			0,308	0,31	0,74	0,791
III				0,36	0,818	0,771
IV					0,689	0,858
V						0
VI						

I, IV, and VI, latitudinal transects; II, III, and V, altitudinal transects

Bray-Curtis indices were calculated to defined in the mini environment in the plots of each transect. The values are listed separately (Table 4). Transects I, II, III, IV, and VI were like in the plots with Bray-Curtis, and the living circumstance of ferns was continuous. In contrast, Bray-Curtis in the plots of transects C and E was approaching 0. This is due to the poor records of target species and the same low humidity in these two places. The results match well with the field investigation.

Conclusion

Some studies have paid attention to altitudinal effect on vascular plants. In the tropical area, studies reveal a hump-shaped pattern with the highest diversity at midaltitudes and then decrease toward both high and low altitudes [13]. The altitude where maximum ferns diversity shows differs somehow among mountain ranges. For example, maximum diversity shows around 1,800 m in both Costa Rica [35] and Mount Kinabalu, Borneo [14], 2,000 m in Bolivia [15], and 2,400 m on Mount Kilimanjaro, Tanzania [16]. Climatically, these gradients corresponded to the upper parts of tropical gradients where richness also lower. Species were comparable between these data sets at the same mean annual temperature. In temperate regions, richness was reported to fewer continuously with elevation or remains roughly constant, such as New Zealand or North America [17].

Last decades, climate change has been largely focused, while environmental disasters have occurred commonly. Powerful land degradation and climate events have been reported for more than recent years. Plants are actively affected by environmental changes too. In response to such ecological declines, this research demonstrates such changes in Zerafshan valley located in the river shared by Urgut region focusing on ferns affected by other environmental factors. From bottom to top of the mountain, precipitation increased while the temperature decreased. Fern and fern allies are positively correlated with height as a result of atmospheric conditions. Species richness increases further accompanied habitat heterogeneity in the valley. Even with no influence of human disturbance, these current appearances are not the original pattern of the areas, indicating another consequence of climate change

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