

# Comparative Analysis of Algoflora of Fergana Valley Water Reservoirs

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**Abstract:** Results of research on taxonomical composition of Andijan, Eskiye and Karkidon reservoirs' algoflora, situated in Fergana Valley of Uzbekistan were given in the paper. Detailed data were given regarding polymorph families, composing a base of algoflora. Species were identified for the first time for algoflora of Uzbekistan.

**Keywords:** algoflora, water reservoirs, taxonomic units, polymorph, groups

## 1. Introduction

A taxonomic structure of algoflora of Uzbekistan' water reservoirs were studied by some algologists [1]; [4]; [7]. Today a part of researches, connected to development of theoretical and practical issues of algology in Uzbekistan is being carried out in reservoirs. Specifically, considerable attention is currently being focused on investigation of algoflora of reservoirs in Fergana valley. Researches, which were carried out from 2006 to 2015, devoted to identification and analysis of species structure of such reservoirs' algoflora as Andijan (Andijan region, Khonobod district), Eskiye (Namangan region, Yangikurgan district) and Karkidon (Fergana region, Quva district) (Figure1). Definition of taxonomic units of this region and a large-scale analysis' implementation are of great importance in composition of a list of Uzbekistan's algoflora. Obtained data, especially, definition of taxonomic units of algoflora, will serve as a base of monitoring studies and drawing up the list of objects of local biodiversity.

of quantitative, seasonal and taxonomic analysis of algoflora. Algological examples points were collected in these observations of Andijan water reservoirs around the year from 2006 to 2015 and from 2011 to 2016 in Karkidon and Eskiye water reservoirs. At the time of collecting examples water temperature was measured by thermometer, water transparency by Secchi disk, pH by pH instrument (pH 262 and pH 340). Planktons were gathered by plankton net GAZ №76. Collected examples were fixed with 4% of formalin. 560 algology examples were collected in the reservoirs. 360 examples from them were used for identifying planktons, 150 from them for identifying benthos and 100 from them for identifying periphytons. Permanent preparations of diatom algoflora were made with methods of Sheshukova V.S (1949) [6].

## 3. Results and Discussion

During investigations which were carried out in 2011-2015, taxonomic units of algoflora of water reservoirs such as Andijan, Eskiye and Karkidon were studied for the first time and 418 species and subspecies were identified in Andijan water reservoir (Table.1).

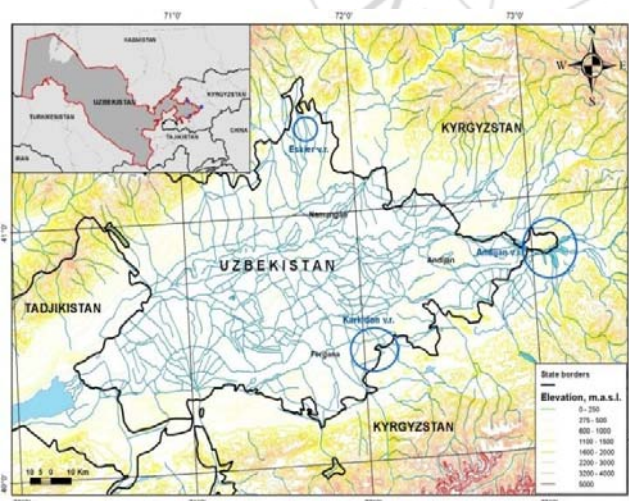


Figure 1: Study areas

Table 1: Taxonomic analysis of Andijan water reservoir's algoflora

Divisions	Number of taxon							
	Classes	Structure	Families	Series	Species	Species sorts		Total:
						Variations	Forms	
Cyanophyta	2	4	16	28	100	-	7	107
Chrysophyta	2	2	2	2	4	1	-	5
Bacillariophyta	2	4	8	29	112	3	-	115
Dinophyta	1	1	1	3	15	-	2	17
Euglenophyta	1	1	2	5	23	-	-	23
Chlorophyta	4	8	21	49	146	5	-	151
Total:	12	20	50	116	400	9	9	418

## 2. Materials and Methods

Generally recognized methods of algology were used during studies of taxonomic units of these reservoirs [2]; [5]. 17 observation points were set in five places of reservoirs for collecting of algological examples of reservoirs and studying

Major part of algoflora of Andijan water reservoir, nearly 89 %, consists of species of Chlorophyta (36,1%), Bacillariophyta (27,7%) and Cyanophyta (25,6%) divisions. Species, relating to Chrysophyta, Dinophyta and Euglenophyta divisions compose 10,6 percent of algoflora.

Pennatophyceae (99 species, 23,68%), Chlorococcophyceae (98 species, 23,44%), Hormogoniophyceae and (90 species, 21,53 %) Euglenophyceae classes (23 species, 5,50%); Chlorococcales (91 species, 21,77%), Raphinales (88 species, 21,05%) and Oscillatoriales orders (63 species, 15,07%); *Oscillatoriaceae*(57 species, 13,63%), *Naviculaceae* (48 species, 11,48%), *Euglenaceae* families (23 species, 5,50%); *Oscillatoria* (21 species 5,02%), *Phormidium*, *Lyngbya* (13 species, 3,11%), *Tetraedron* (8 species, 1,91%) and *Scenedesmus* orders (8 species, 1,91%) are leaders with great number of species in the algoflora. 267 species and subspecies were defined in Eskiyeer water reservoir (Table. 2.).

**Table 2:** Taxonomic analysis of Eskiyeer water reservoir's algoflora

Divi-sions	Number of taxon							
	Classes	Structure	Families	Series	Species	Species sorts		Total:
						Variations	Forms	
Cyanophyta	2	3	10	14	51	2	7	60
Xanthophyta	1	1	1	1	4	-	-	4
Chrysophyta	1	2	3	3	9	1	-	10
Bacillariophyta	2	4	8	24	76	-	-	76
Dinophyta	1	1	1	3	18	-	-	18
Euglenophyta	1	1	2	4	26	-	-	26
Chlorophyta	2	3	13	26	72	1	-	73
Total	10	15	38	75	256	4	7	267

Major part of algoflora of Eskiyeer water reservoir, nearly 78,3% consists of species of Chlorophyta (27,3%), Bacillariophyta (28,5%) and Cyanophyta (22,5%) divisions. Species, relating to Chrysophyta, Xanthophyta, Dinophyta and Euglenophyta divisions composed 21,7 percent of algoflora. Pennatophyceae (60 species, 22,47%), Chlorococcophyceae (61 species, 32,79%), Hormogoniophyceae (35 species, 18,81 %) and Euglenophyceae (10 species, 5,37%) classes; Chlorococcales (59 species, 31,72%), Raphinales (31 species, 16,6%) and Oscillatoriales (21 species, 11,29%) orders; *Oscillatoriaceae*(21 species, 11,29%), *Naviculaceae* (23 species, 12,36%) and *Euglenaceae* families (10 species, 5,37%); *Oscillatoria* (15 species 8,06%), *Ankistrodesmus* (8 species 4,30%) and *Scenedesmus* genera (7 species, 3,76%) are leaders with great number of species in the algoflora. 186 species and subspecies were defined in Karkidon water reservoir (Table.3.).

**Table 3:** Taxonomic analysis of Karkidon water reservoir's algoflora

Divi-sions	Number of taxon							
	Classes	Structure	Families	Series	Species	Species sorts		Total:
						Variations	Forms	
Cyanophyta	2	3	7	10	40	-	4	44
Chrysophyta	1	1	1	1	3	1	-	4
Bacillariophyta	2	3	6	20	52	-	-	52
Dinophyta	1	1	1	3	5	1	-	6
Euglenophyta	1	1	2	4	10	-	-	10
Chlorophyta	2	3	13	28	64	6	-	70
Total	9	12	30	66	174	8	4	186

Major part of algoflora of Karkidon water reservoir, nearly 89,2 %, consists of species of Chlorophyta (37,6%), Bacillariophyta (27,9%) and Cyanophyta (23,7%) divisions. Species, relating to Chrysophyta, Dinophyta and Euglenophyta divisions compose 10,8 percent of algoflora. Pennatophyceae (42 species, 22,58%), Chlorococcophyceae (61 species, 32,79%), Hormogoniophyceae (35 species, 18,81 %) and Euglenophyceae classes (10 species, 5,37%); Chlorococcales (59 species, 31,72%), Raphinales (31 species, 16,6%) and Oscillatoriales orders (21 species, 11,29%); *Oscillatoriaceae*(21 species, 11,29%), *Naviculaceae* (23 species, 12,36%) and *Euglenaceae* families (10 species, 5,37%); *Oscillatoria* (15 species 8,06%), *Ankistrodesmus* (8 species 4,30%), *Scenedesmus* (7 species, 3,76%) and *Navicula* genera (8 species, 4,30 %) are leaders with great number of species in the algoflora.

Comparative analysis of species structure of algoflora of Fergana valley's water reservoirs were done and defined similarity index according to Jaccard coefficient (Kj) [3] (Figure 2, 3.).

Similar species of algoflora of Andijan, Eskiyeer and Karkidonwater reservoirs are 104. Similar species of algoflora of Andijanwater reservoir and Eskiyeerwater reservoir are 75 (17,94%). Similar species of algoflora of water reservoirs as Andijan and Karkidon are 32 (7,65%). Similar species of algoflora of Eskiyeer and Karkidonwater reservoirs are 12 (4,49%). Similar species of algoflora of Andijan and Eskiyeer water reservoirs are nearly 75 and according to Jaccard coefficient (Kj) index is high. The reason for this both water reservoirs, Andijan and Eskiyeer, are provided with water flowing from Western Tien Shan mountain ridge. Similar species of algoflora of Andijan and Karkidonwater reservoirs are nearly 32 and according to Jaccard coefficient (Kj) index is low (0,05). Because Andijanwater reservoir is provided with water from Western Tien Shan mountain ridge and Karkidonwater reservoir is provided from Pamir-Alai mountain ridge.

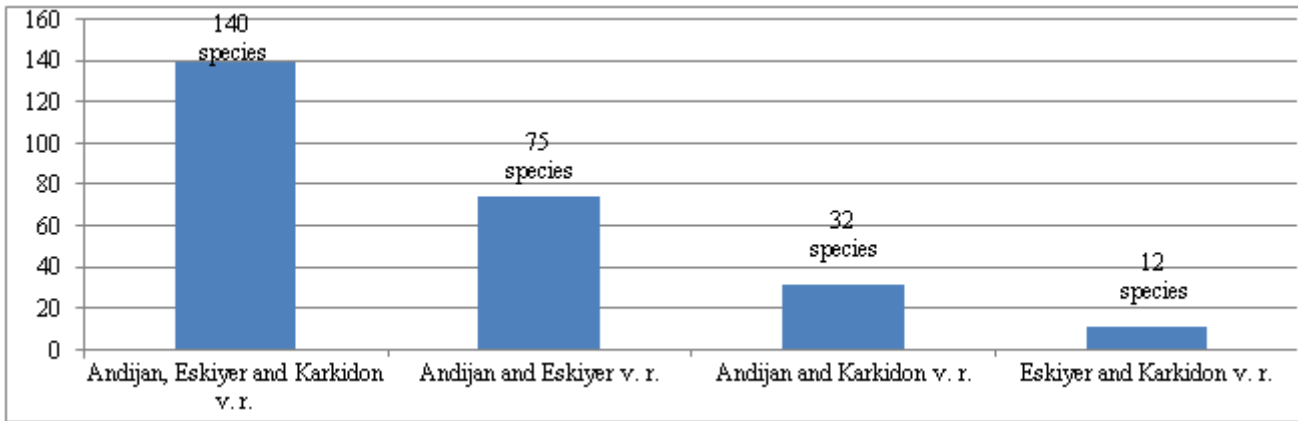


Figure 2: Similar species of algoflora of Fergana valley's water reservoirs

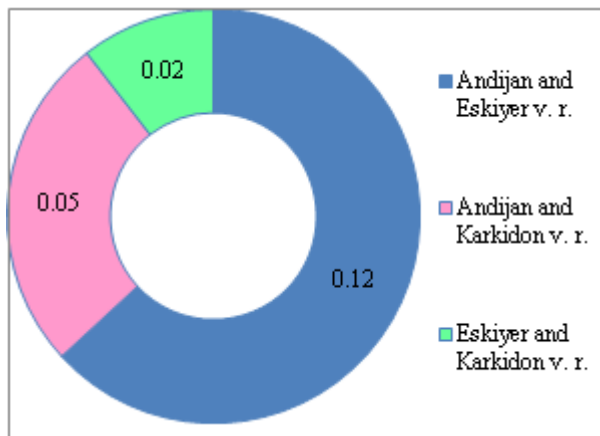


Figure 3: Similarity index of algoflora of Fergana valley's water reservoirs according to Jaccard coefficient

In addition, as a result of a comparative analysis of each water reservoir identified specific types of algoflora (Figure 4.).

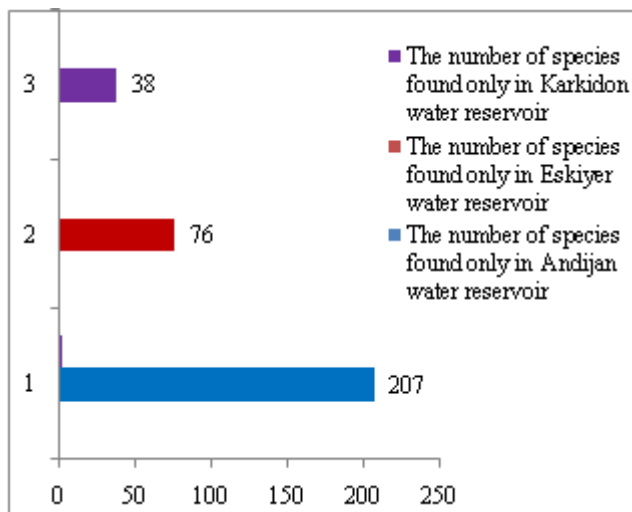


Figure 4: Similar species of algoflora of Fergana valley's water reservoirs.

Species (207) which were founded only in Andijan water reservoir compose nearly half (49,52%) of total algoflora (418). Species (79) which were founded only in Eskiye water reservoir compose 28,46 percent of total algoflora (276) and species (38) which were founded only in Karkidon

water reservoir compose 20,43 percent of total algoflora (186).

The reason of the specific species abundance of Andijan water reservoir's algoflora is a huge size of the field of reservoir and the reason of the abundance of species total number of is low pollution and clouding degree of water because of only mountain water saturation, almost no draining water, low level of mineralization (580-1300 mg/lit).

Comparative analysis was done by the number of similar families of water reservoirs' algoflora. The results showed that similar families of three water reservoirs were 27, similar families of only Andijan and Eskiye water reservoirs' algoflora were 7, they were 3 between Andijan and Karkidon water reservoirs (Table 9). There were not similar families of algoflora of Eskiye and Karkidon reservoirs.

In addition, specific families were studied for each reservoir. Number of families which were founded only in Andijan water reservoir were 13 (15 species) and composed 26 percent of all investigated families (50), 3,16 percent of all species (418). Number of families which were founded only in Eskiye water reservoir were 4 (10 species) and composed 10,52 percent of all researched families (38), 3,74 percent of all species (267) (Table.4, 5.). There were not specific families in Karkidon water reservoir.

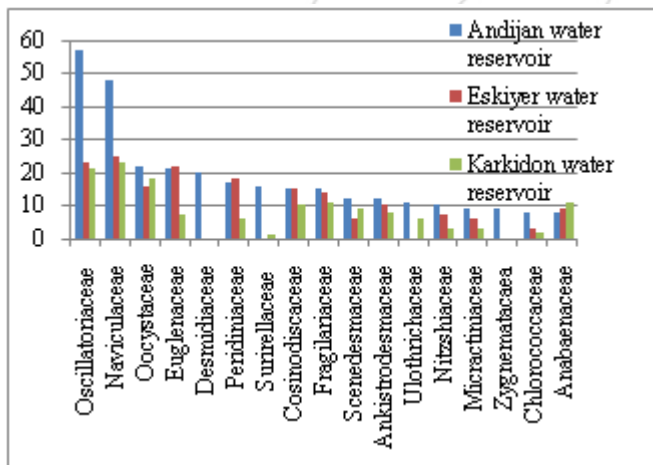
Table 4: The number of similar and specific families of water reservoirs of Fergana valley

Reservoirs	The Number of similar families	Reservoirs	The number of families	Percent of total number of families
Andijan, Eskiye, Karkidon	27	Only Andijan	13	26
Andijan, Eskiye	7	Only Eskiye	4	10,52
Andijan, Karkidon	3	Only Karkidon	-	-

**Table 5:** Specific families of algaeflora of Andijan and Eskiyeer water reservoirs

Andijan reservoir			Eskiyeer reservoir		
Families	Series	Species	Families	Series	Species
<i>Aphanizomenonaceae</i>	1	2	<i>Euchromulnaceae</i>	1	3
<i>Asterococcaeae</i>	1	1	<i>Tabellaria-ceae</i>	1	1
<i>Homoeothri-chaceae</i>	1	1	<i>Tribonema-taceae</i>	1	4
<i>Hydruraceae</i>	1	1	<i>Chrysapsi-daceae</i>	1	2
<i>Desmidiaceae</i>	5	20			
<i>Zygnemata-ceae</i>	3	9			
<i>Coccobac-treaceae</i>	4	6			
<i>Cladophora-ceae</i>	1	2			
<i>Cyanothricha-ceae</i>	1	1			
<i>Nostocaceae</i>	1	2			
<i>Tetraspora-ceae</i>	1	1			
<i>Chlorangiop-sidaceae</i>	3	4			
<i>Schizothricha-ceae</i>	3	5			
Total: 13	26	55-3,16%	Total: 4	4	10-3,74%

Comparative analysis of polymorph families of water reservoirs' algoflora of Fergana valley (Figure 5).



**Figure 5:** Comparative analysis indicators of polymorph families of algoflora of Fergana valley's water reservoirs

Similar polymorph families of algoflora of Andijan and Eskiyeer water reservoirs are 123 (39,67 %), between Andijan and Karkidon water reservoirs are 98 (31,61 %). There were not observed *Desmidiaceae*, *Surirellaceae*, *Ulothricaceae* and *Zygnemataceae* families in Eskiyeer water reservoirs, but they were found in Andijan water reservoir. Families like *Desmidiaceae* and *Zygnemataceae* were identified in Andijan water reservoir but they were not observed in Karkidon water reservoir. These differences determined diversity of compared algoflora.

#### 4. Conclusions

Taxonomic structure of algoflora of Andijan, Eskiyeer and Karkidon water reservoirs were studied for Fergana valley. The results showed that there were founded 418 species and subspecies in Andijan water reservoirs, 267 in

Eskiyeer water reservoir and 186 in Karkidon water reservoir. 7 divisions of taxons form algoflora of Fergana valley water reservoirs. The number of Bacillariophyta division was more 1,9 percent than the number of Cyanophyta division but less 8,6 percent than Chlorophyta division in Andijan water reservoir. The number of Bacillariophyta division was more 6 percent than the number of Cyanophyta division and more 8, 6 percent than the number of Chlorophyta division in Eskiyeer water reservoir. The number of Bacillariophyta division was more 4, 2 percent than the number of Cyanophyta division but less 9, 7 percent than Chlorophyta division in Karkidon water reservoir. Biodiversity between classes were not great. There were 12 classes in Andijan reservoir, 10 classes in Eskiyeer water reservoir and 9 classes in Karkidon water reservoir. There were 20 orders in Andijan water reservoir, 15 orders in Eskiyeer water reservoir, and 12 orders in Karkidon water reservoir. In algoflora *Oscillatoriaceae*, *Naviculaceae*, *Oocystaceae*, *Euglenaceae* are leaders among families with 57, 48, 22 and 21 species, respectively. *Oscillatoria*, *Phormidium* and *Lynghya* are leaders with 21 and 13 species, respectively. The results of comparative analysis gave chance to define relative wealth of algoflora, similar taxon, and specific families and species of each reservoir. The greater distance among compared reservoirs the smaller coefficient generality among them. On the contrary, the closer distance the bigger coefficient generality among them.

#### 5. Acknowledgements

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