

Algae Flora Of The Isfayramsaya River (South Kyrgyzstan)

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ANNOTATIONS: In the article, the authors highlight the physicochemical composition of water, higher plants and the species composition of the flora of the Isfairamsay river algae and their changes in natural zones. Analysis of algae shows that in a long period of time from 1915, 1938-1941 to 2021, there was little change, basically the cold high-mountain river character and the content of the physicochemical composition of the water remained. In the Isfairamsay River, on the territory of alpine, subalpine and forest natural zones, mountain cold-water and rheophilic algae 166 species from the *diatoms*, *green*, *blue-green*, etc. sections have been identified. Algae are important in the life of aquatic organisms, such as herbivorous fish, we propose to use promising algae in the fishery of river and lakes of the Isfairamsay River.

The catchment area of the Isfayramsay River is mainly located high in the mountains of the Alai Range. The Isfairamsay River is fed by snow, glaciers, and partly by groundwater. There are streams, rivers, saz reservoirs, lakes and rocks irrigated with water in the Isfayramsay river basin. The hydrobiological study of high-mountain reservoirs of this basin was carried out by a number of scientists, such as A.S. Uklonsky. from 1915-1916 [4], Korzhenevsky N.L. in 1925 [3], Muzafarov A.M. from 1938 and 1940-1941 [2], Alimjanova Kh.A. and Shayimkulova M.A. in 2018-2021, the study was carried out mainly in the summer months of these years, and year-round observation was carried out in the area of the village of Uch-Kurgan - from July to May. The Isfayramsay River originates high in the snows and glaciers of the Alai Range, in the Tegizbay area, where it is formed from the confluence of small streams flowing down from the mountain slopes [1,2,3,4,5,6,7,8]. Local residents call the river Isfayramsay only after the confluence of the Kichialai river with the river flowing from the Tegizbay passes; according to Korzhanevsky [3], the Isfayramsay river originates in the Tegizbay area. It should be noted that glaciers play a significant role in the feeding of the Isfairamsai River, since the area of glaciation throughout the basin is 106 km² with 57 individual glaciers [3]. The coordinates of the source of the river are 39 ° 42'12 " s. sh. 72 ° 00'48 " E ^{HGRJO}, mouths 40 ° 27'13 " s. sh. 71 ° 48'38 " in. etc. [8].

In the area of the Tegizbay pass, at a distance of 5-6 km, the river has a relatively slow and uniform flow, the speed of which, according to the intentions on July 20 at 16 o'clock, was equal to 1-1.5 m / s, in some places up to 1.8 m / s. The water temperature of the streams under the snow was equal to 2-30 (at 16 o'clock), but already at a distance of 3-4 km in the same hours in the river it increased to 12⁰. The sharp rise in water temperature at a very short distance is explained here by the ingress of water into the river bed from numerous saz pits and lakes located on both banks of the river. The water temperature in pits and lakes on clear

sunny days rises to 20⁰ by noon. The amount of suspended particles was 130 mg / l. The transparency of the water in the river itself and in the saz reservoirs to the bottom.

The fall of the river increases strongly below the Tegizbay plateau to the mouth of the Kichialai river. According to Korzhenevsky [3], over 9 km the river falls by 968 m. Here, the water overflows in a stormy stream over the boulders and flows down the mountainside. At the same time, it foams a lot, but its previous transparency remains, since the bottom of the river is covered with large stones or debris that are difficult to erosion. This site is quite rich in various trees and shrubs. Here, thickets of juniper, mountain ash, birch, various rose hips are common, barberry, honeysuckle, in some places meadowsweet, and shrub cherry are found. A powerful tributary flows into the Isfairamsay River in the Chat area - the Kichialai River had rather turbid water with a transparency of 6-7 cm (July 18-21). Water temperature at 9 o'clock 30 min. was equal to 8⁰1, at an air temperature of 27⁰, pH equal to 7.5. Downstream to the mouth of the Kottabevet River, Isfairamsay flows through a relatively narrow gorge. In the Langar area, the gorge expands noticeably and takes the form of a narrow valley 4-5 km long and up to 1 km wide. Below the Langar, a powerful left tributary, the Surma Tash, flows into Isfairamsay (7 km from the Lyangar drop).

Further, the next large tributary is the Tegirmachsay River, which falls 10 km below the mouth of the Surma-Tash. About the sources of the Tegirmachsay river prof. Korzhanovsky writes as follows: "The source of the Tegirmach River lies in the glacial area of a huge granodiorite massif with elevations from 4500 to 6000 m above sea level" [3]. Tegirmachsay is formed from the confluence of the Kuganda and Urumda streams. The latter originates from the glaciers of the Tegirmach Pass (4529 m). Near the Tegirmach pass, under the very glaciers, there is Lake Zorkul (aka Muzkul or Kattakul). On the right bank of the Urumdy stream, in the Salyk-Tash area, there are springs, streams and saz pits. Here, in the Jahangir stream, which has cold and clear water, the development of *Hydrurus foetidus*, *Ceratonels arcus*, *Diatoma hiemale*, *Cymbella stuxbergii* and other cold-water and rheophilic algae was observed [2].

Further, below Lake Tegirmachkul, to the mouth of the Kashkasu River (left tributary of the Tegirmachsay River) in the forest belt, the Tegirmachsay River flows through a relatively narrow green gorge. Along the banks of the river and its valley, there are dense thickets of various bushes stretching in a narrow strip, consisting of wild rose, barberry, willow, honeysuckle and tree species, most of all birch, poplar, maple, mountain ash, in places juniper. However, the number of birch and mountain ash in the river valley is gradually decreasing, and at the end of it these species completely disappear, while the number of willow and poplar increases. Among shrubs, *tamarix* is quite common here [2].

Below the mouth of the Kashkasu River, the Tegirmachsay River has a width of 2-3 m to 5-6 m and a depth of 20-30 cm to 50-60 cm, and sometimes more. The speed of the water flow on August 9 is 2-2.5 m / s; the water temperature at 11 o'clock - 12⁰5, at the air temperature was 24⁰, on July 15, the water flow speed is equal to 2-2.5 m / s, the water temperature at 11 o'clock 10 minutes. 10⁰2, air 22⁰, pH-7.5, water transparency to the bottom. The river bottom is covered with large stones. Here, only bottom forms of phytoplankton, various parts of higher plants and sand are found in fouling. Fouling samples were identified from green ones - *Ulothrix zonata*, *Ul.variabilis*, *Oedogonium sp.*, *Spirogyra sp.*, *Zygnema sp*

.; from blue-green - *Merismopedia punctata* (in filamentous thickets), *Stratonostoc verrucosum*, *Phormidium favosum*; from diatoms - *Diatoma elongatum var.tenuis*, *Diatoma hiemale*, *Synedra ulna*, *S.vaucheria*, *Cocconeis pediculus*, *Navicula cincta*, *N.cryptocephala*, *N.radiosa*, *Pinnularia microstauron*, *Cymbella affinis*, *C.helvetica var.punctata*, *C.stuxbergii*, *C. ventricosa*, *Didymosphenia geminata*, *Gomphonema olivaceum*, *G. parvulum*, *Nitzschia linearis*, *N. hantzschiana*; from crimson (red algae) - *Bandia atropurpurea*. Thus, in the Tegirmachsay River, cold-water and rheophilic algae are common [2].

Below the village of Chilandy, the Tegirmachsay valley either narrows greatly, acquiring in some places the appearance of a narrow and deep gorge, then expands somewhat. Almost at the very mouth, when leaving the gorge, there are limestone cliffs and giant cauldrons of extinction. The Ifairamsay River below the mouth of the Tegirmach River receives a number of tributaries, in particular the Austan River (right) and the Kul River (left). The Isfayramsay river gorge, starting from the Karavul area, takes the form of a wide valley. Downstream, two more right tributaries flow into Isfayramsay - the rivers Pum and Chauvay. Above the Karavul area, along the banks of the river, you can find thickets of bushes, consisting mainly of shrub willow, tamariks, sea buckthorn, hawthorn, etc. From Karaul to Uch-Kurgan, the river banks are lined with decorative and fruit trees, such as poplar, elm, dzhida, willows, apricots, apples, walnuts, etc. According to Korzhenevsky [3], the total length of the river from Tegizbay to Uch-Kurgan reaches 85.3 km with an average drop of 0.032. The village of Uch-Kurgan is located at an altitude of 980 m above sea level. In this place, according to the data of the hydrometeorological station, the width of the river is on average 20 m, the depth is from 0.5 to 1.75 m, the speed of the current is from 0.6 to 3.71 m / s (on average, 1.5-1.6 m / sec); water consumption from 7 to 84 m³ / s (average 24-31 m³ / s).

Other sources [8] note that Isfayramsay (obsolete Isfayram-Sai, Uzbek Isfayramsoy, Isfayramsoy) is a river in Kyrgyzstan and Uzbekistan in the Syr Darya basin. The length of the river from the source of Tegizbay to Uch-Kurgan is 122 km, the basin area is 2220 km² [1]. It originates in the forts of the Alai ridge. In the upper reaches it is called Tengizbay [1]. It flows northward. The river is part of the Big Fergana Canal system. Near the city of Kuvasay, the channel to them departs from it. XVII Party Congress [2], there are several more canals downstream. To the east of the Kirguli settlement, the river flows into the South Fergana Canal [3]. The food is mainly snow-glacial. The maximum volume of water occurs in May-August, the minimum is December-February. The average water consumption near the village of Uchkurgan in Kyrgyzstan (the beginning of the irrigation fan) is 21.1 m³ / sec [1]. Average water consumption - 21.9 m³ / s.] Isfairam during the full-flowing period, mainly in summer, a stormy stream with chocolate-colored water due to the admixtures of sand and clay. The water is very cold [8].

R. Isfayramsay is more abundant from May to September. Floods take place in June and July, i.e. during the period of intense melting of snow and glaciers in the mountains due to an increase in air temperature. In 1962 and 1973, 1976 and 1977, serious mud-stone mudflows took place on Isfayram, which led to the evacuation of the city of Kuvasay and nearby villages [8]. Daily fluctuations in air temperature also have a strong effect on fluctuations in water levels. Usually, in Uch-Kurgan, an increase in the water level is noticeable by noon, and a decrease at night. At the same time, the transparency of the water decreases to 3-4 cm,

and by the morning it rises to 7-8 cm. It should also be noted that there is a strong decrease in the transparency of water during the flood period, when the amount of suspended particles in one liter of water ranges from 400 to 700-800 mg. In August, the transparency of the water increased from 3-4 cm to 7-10 cm, and in September to 20 cm or more. So, for example, on September 14, it was 19 cm, and on September 17 - 103 cm. In early October, the transparency of the water was to the bottom, and in deep troughs more than 1 m. On November 9, suspended particles were only 27 mg / l. This transparency mainly persists until March, decreasing during rain or when snow melts in the foothills. Since March, it gradually decreases, which is especially noticeable in April (for example, on April 16, it was equal to 29 cm); ph ranges from 7.4 to 7.6, rarely up to 8. Determination of the amount of oxygen dissolved in water was carried out only in the fall. So, for example, on September 17, at a water temperature of 12⁰, there were 10.6 mg of oxygen, i.e. 97.87%; September 18 at a water temperature of 11⁰.1 - 13.27 mg, i.e. 119.8%; November 15 at a water temperature of 6⁰-12.86 mg, i.e. 103%.

It should be noted that the amount of salts dissolved in water during the vegetative period is 2 times less here than in the non-vegetative period. According to A.S. Uklonsky (1925) [4], in the Isfairamsay River at the Uch-Kurgan point in the period from October 1915 to March 1916 there were 231.1 mg / l of dissolved salts, and from April to September 1916 - 493, 4 mg / l. A sharp change in the salt content transforms the reservoir from freshwater to brackish, which also affects the floristic composition of algae.

At the point, field research was carried out by A.M. Muzafarov throughout the year (from June 1940 to May 1941), which allowed him to identify a change in forms. In summer, due to the excessive turbidity of the water, the development of algae does not occur. From the second half of August, i.e. with an increase in the transparency of the water, a greenish bloom could be seen on the underwater and water-moistened rocks, consisting of filamentous green and diatoms. At the end of August and in September, *Cladophora glomeata* appeared on the rocks, which developed well from September to May and almost completely disappeared during the flood period, i.e. in summer. In September, *Prasiola fluviatilis* appeared on large stones flooded with water, in October and November it developed noticeably, in December it began to gradually decrease, and at the end of January it almost completely disappeared. From September, some species of *Oedogonium*, *Spirogyra*, *Zygnema* and other green algae began to develop. Of the blue-green algae, *Stratonostoc verricosum* should be noted, which was found from stones flooded with water from September to March inclusive. On the underwater rocks, in places, there were dark green films of *Phormidium autumnale* and *Ph.favosum*, the latter being preserved until the next flood. From crimson algae from October to April inclusive, *Bangia atropurpurea* was found in significant numbers. Field observations and processing of samples showed that the following algae are common here: Here, the following algae are found: *Stigeoclonium tenue*, *Ulothrix zonata*, rarely *Cladophora fracta*; from blue-green *Calothrix braunii* f.major, less often *C.fusca* and others; diatoms - *Diatoma hiemale* var.mesodon, *Fragilaria crotonensis*, less often *Fr.pinnata*, *Synedra gouldarii* var.telezkoensis, *S.ulna*, *Achnanthes exilis*, *A.linearis*, *A.minutissima* var.cryptocephala, *Navicula gracile*, *N.radiosa*, less often *N.gothlandica*, *Cymbella affinis*, *C.cistula*, less often *C.microcephala*, *C.pusilla*, *C.ventricosa*, *Gomphonema bohemicum*, *G.olivaceum*

var.minutissima, G.parvulum, Nitzschia dissipata. With the growth of Cladophora glomerata on its filaments and on the filaments of other filaments, the development of some algae begins, which usually continues until a new flood. Of these, it should be noted Chamaesiphon curvatus, Ch.incrustans, very rarely Ch.macer, Diatoma elongatum var.tenuis, D.vulgare var.breve, D.vulgare var.ovale, D.vulgare var.productum, Cocconeis pediculus, C.placentula, some species of Fragilaria, Synedra, Gomphonema [2].

With a decrease in water temperature, an increase is observed in the number of such North Alpine and mountain species as Hydrurus foetidus, Ulothrix zonata and some other species of this genus, Prasiola fluviatilis, Oncobyrsa rivularis, Homoeothrix varians, Diatoma hiemale var.mesodon, Ctratoneis arcus var.amphioxysys Synedra goulardii var. telezkoensis, Eucocconeis flexella, Achnanthes linearis, Cymbella angustata, C. laevis, C. stuxbergii, Didymosphenia geminata and other diatoms, Bangia atropurpureae and Batrachospermum monilliforme from scarlet algae.

Thus, in the Isfairamsai River at the Uch-Kurgan point, mountainous, North Alpine cold-wave forms, many rheophilic and some aerophilic algae are common. Among the rheophilic cenoses distinguished (Shirshov, 1935) [7], the development of all three types is observed here; northern, southern plain and rheophilic mountain streams. The development of many alpine and cold-water forms in the foothill area occurred mainly in the second half of autumn, in winter and in the first half of spring. Since late autumn, when the river is fed exclusively by groundwater, there has been an increase in the number of freshwater-brackish-water and even purely brackish-water forms, which is explained by an increase in the amount of salts dissolved in the water. Freshwater brackish water species are characterized by Cocconeis pediculus, Navicula cryptocephala, Cymbella prostrate, C.pusilla, Nitzschia linearis; from brackish - Navicula cryptocephala var.veneta, N.digitoradiata, N.gothlandica, N.peregrina, etc. [2]

In total, in the Isfairamsay River at the Uch-Kurgan point, Muzafarov A.M. identified 153 species and varieties, of which golden - 1, green - 16, blue-green - 22, diatoms - 110, crimson - 4 [2].

We investigated the algae of the Isfairamsay River in 2018-2021. Analyzes show that for a long time from the previous times (1915-1916, 1938-1941, 2018-2021) to the present, the physicochemical composition of water and the composition of algae has not changed much. We have noted 166 species of bottom phytoplankton and fouling algae. Among these we have noted for the first time 13 species of algae, from diatoms - 5, from green - 5 and from blue-green - 3. Mountain water, has always been cold during these times. Usually cold-water, rheophilic algae live in the water. The presence of algae of the Isfairamsay River is the primary producers and is useful for consumers of natural habitats. Of these, a pure culture can be distinguished and cultivated for feeding the herbivorous fish of this reservoir and other lake systems, such as Zorkul and other river systems of the Isfairamsaya River.

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