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Research Article

**INVESTIGATION OF PERIPHYTONS OF ZARIVAR LAKE
IN KURDISTAN PROVINCE*****Mansoure Gholami and Maryam Shapoori****Department of Natural Resources, Sanandaj Branch, Islamic Azad University, Sanandaj, Iran.**Department of Natural Resources, Savadkooch Branch, Islamic Azad University, Savadkooch, Iran***Abstract:***Zarivar lake is one of the most unique fresh water lakes in the world . A lake with delicate and complex ecosystem that is unparalleled in its own .**This lake is located at 2 km from north west of Marivan city and altitude of 1285 m higher than sea surface . Periphytons is a kind of single-celled algae adhered to bed which based on bed type are divided to various cases. In this research , two types of epilithic periphytons and epiphytic periphyton were investigated and identified as well as physio-chemical parameters during the one-year course within 5 stations were investigated Considering the results, was shown that periphyton products was led to a richness in the initial products of Zarivar lake .***Keywords:** *Zarivar lake , Periphytons, Physio-chemical parameters***Corresponding Author:****Mansoureh Gholami,**
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INTRODUCTION:

Zarivar lake is a small lake where located at northwest of Marivan in the geographical coordinates of $35^{\circ},30',31''$ To $35^{\circ},37',6''$ northern altitude and eastern longitude of $46^{\circ},3',52''$ to $46^{\circ},10',47''$. This lake was created due to the extreme erosion of geological structure of the zone and fault and bed area gradually comes down and drainage was done and water storage was provided due to the existence of weak layers in this area and its deposits and totally Marivan region was located in the northern part of Zagros' folding and tectonically located in an active area and its folding related to the mid-Tertiary of geology. Zarivar as an aquatic ecosystem regarding its environment, an important and valuable and qualified environment. Zarivar lake is the only natural lake where is located in the highlands of Zagros that is surrounded by jungle from the fronts of west, east and north as well as around the lake is covered with a dense clumps of aquatic plants that prevents from the progress of human uses to the lake privacy. This lake is considered as a natural reservoir for all types of aquatic plants and animals and water side animals and since, the main origin of its water supply source are the floor-boiling springs, which is less effective by the species transferred from its own watershed. Zarivar is a wetland lake in one of the most important stations of aquatic migratory birds in winter and some of the passing migratory birds in the other seasons and annually accepting 6000 of aquatic migratory birds and due to the natural perspectives and having the paved beach boundaries, A mountainous wall covered of forest, fresh water with sufficient depth and ease of access, have a potential ecotourism power. This lake as an aquatic habitat in terms of breeding the all types of fishes has the completed capacities which considering them could have the economic and leisure benefits in the region. On the other hand, implementation of preparation plans of some of the rural areas for converting to a city, construction of exit zone

entrance, development of animal husbandry and agricultural activities, Tourist facilities and many abnormal interactions and without assessment and capacity detection has led the state of lake to the crisis and creatures of lake is at serious risk; also this lake receiving sewage and effluent of villages on the edge and agricultural wastes contaminated with pesticides and organic materials that decreases the assimilative capacity and utilizable capacity of lake.

METHODS AND MATERIALS:

Area under study and determination of sampling stations

In this research Zarivar lakes locate at Kurdistan province. This lake is 2 km far from the northwest of Marivan city and is at an altitude of 1258 above sea level. Lake area is approximately 2,000 hectares and average water depth of it about 5m and an average volume of water is about 45 million cubic meters (Fig. 1). Water resources of lake will provided through floor-boiling springs and atmospheric precipitation. Sampling was conducted seasonally in the lake of Winter 1389- winter 1390.

Preferred stations for sampling and based on testing and research patrol as well as research objectives were selected using GPS. To select the stations, items such as size, natural and artificial factors affecting the condition of the lake, such as villages, towns and human traffic, the distance from each station to these factors, significant changes in lake conditions and physical, chemical - biological conditions in a way that can be conducted comparisons between the stations. Access and sampling was taken from each station in all seasons

Finally, 5 stations were chosen and determined (Table 1). Thus, this makes it possible to select the number of stations to determine the status of the lake, also study the environmental impact elsewhere.

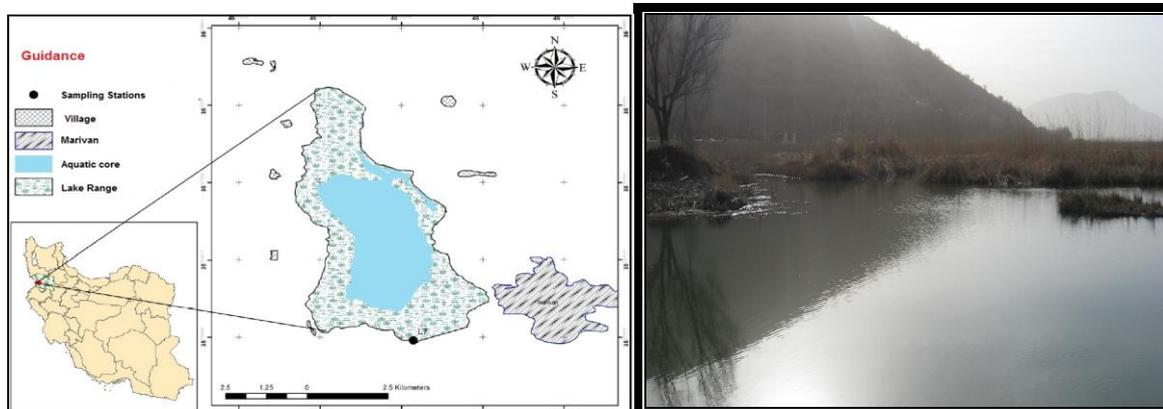


Fig. 1 –A) a view of the geographical location of the lake

1-B) a view of nature of lake in winter 1389

Table 1: Summary of geographical coordinates information of sampling stations

Number of station	Station	Geographical coordinates	
		Eastern width (E)	Northern Length (N)
1	side parallel	046 07 256	35 32 070
2	Lake Center	046 07 843	35 33 011
3	small Zarivar	046 08 413	35 31 595
4	Lake North	046 07 926	35 32 304
5	Lake South	046 07 671	35 31 325

Methods for determining the physio-chemical factors of water resulting from sampling

Methods for determining the physio-chemical factors of water resulting from sampling was used of alcoholic thermometers with an accuracy of 1 c for measuring the temperature of the air and , mercury thermometer with an accuracy of 1 c for measuring the temperature of the water and the pH meter WTW-320 model for assessing water pH.

Also, dissolved oxygen was measured in APHA method. Nutrients , phosphate , silicate , Nitrite and nitrate of water of Cadmium reduction method and Ammonium of indophenol using spectrophotometer model 2000, salinity using hand-held salinity meter and possibly of Silver nitrate method , total suspended T.S.S particles of a liter of water passed though mesh with 45 size and then is heated and weighted at 105 centigrade . total dissolved materials in water i.e, T.D.S - COD , BOD using BOD-meter and COD-meter were measured.

Methods and materials:

To identify the periphytons , their sampling is done by scalpel and brush from stone surfaces and aquatic plants and in fact carved from surfaces ,then washed with water and poured in the specific gallons. To maintain long-lasting is fixed with 4% formalin and transferred to the laboratory . (Fig.2)

In most of the stations , sampling due to the lack of appropriate stones for epiphytic Periphytons was not done and due to the sampling conditions only were fulfilled in the little Zarivar station and stations where were adjacent to the littoral zone .

In these stations , density of aquatic plants was low and thus, Periphyton samples collected from stones of littoral zone was taken . Sampling were taken in three replicates and fixed in 4% formalin and then transferred to the laboratory. Samples were counted and identified using the light microscope and Sedgewick slide.



Fig.2: an image of sampling stages of periphytons

After measuring the abiotic factors and identification of biological factors and recording the information in the specific forms, data for initial processing were transferred to Excel as well as to compare the relation among the under study factors, was used of SPSS and correlation test as well as investigation of spatial and temporal variations of factors under study was performed using the ANOVA & LSD.

The results associated to the physicochemical factors in Zarivar lake

According to the data achieved from the seasonal sampling, the maximum depth of water was observed 870cm in December and its minimum value in September at depth of 260 cm in small Zarivar.

And maximum temperature of lake was observed 29 ° C in September and its minimum value 8 ° C in December.

DISCUSSION AND CONCLUSION:

Table .2: Average of values of physicochemical parameters in Zarivar Lake during a year

	EC	Dissolved oxygen (mgr/Lit) DO	temperatures (°C)	No ₃ Micrograms (per liter)	pH	Sample depth (cm)	Transparenc (cm) e	TP (Micrograms per liter)	TDS (mg/Lit)	TSS (mg/Lit)
Spring	429/6	5/24	25/14	708/8	8/052	451/6	193/8	343	319/93	8/23
summer	414/4	4/74	26	860/2	7/92	429	173	274/98	281/44	8/3
fall	378	6/24	7/8	724/58	7/66	628	219	354/8	411/95	8/48
winter	378/4	6 /11	8	406/66	8/04	554	248/8	283/36	416/8	6/94

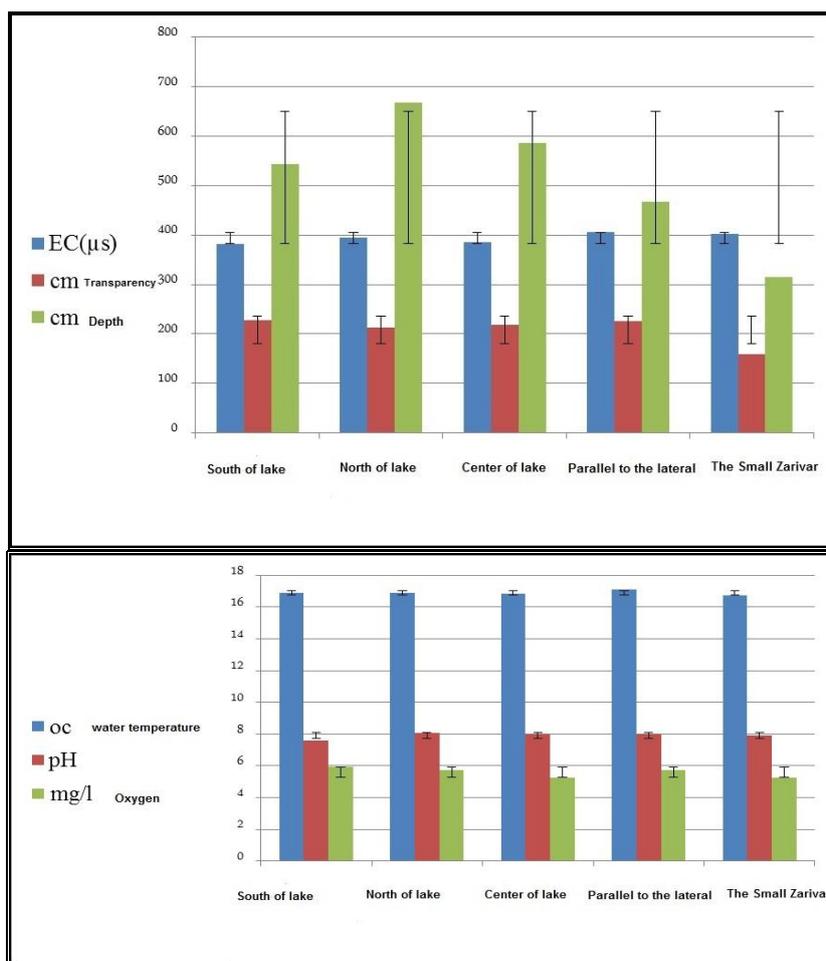


Fig.2 the changes process of physicochemical parameters during a year in Zarivar (in different stations)

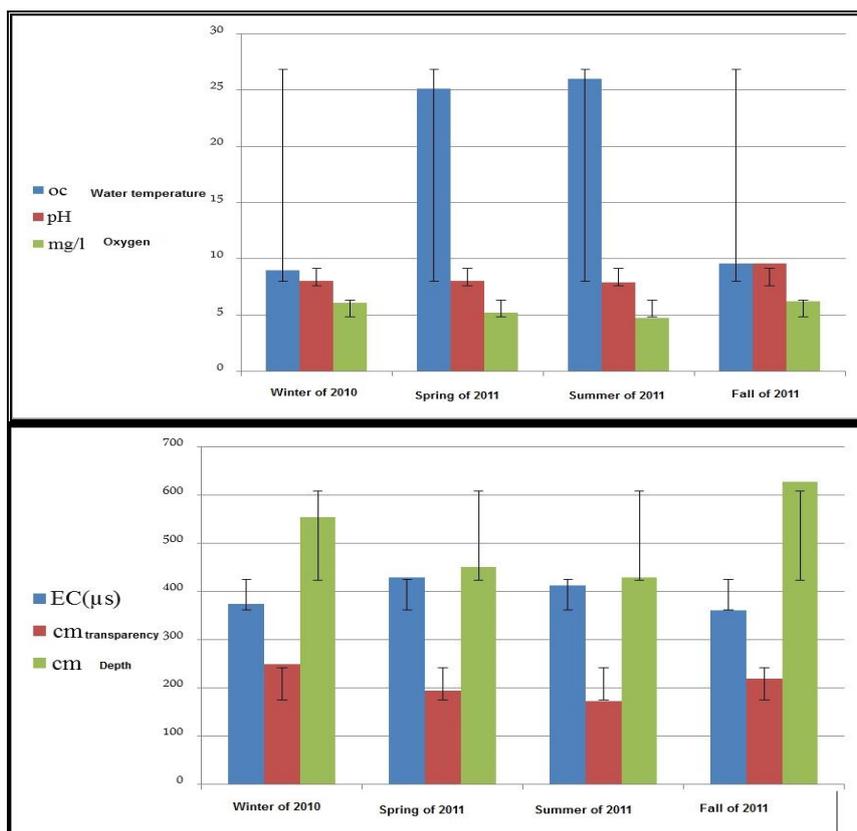


Fig.3: the changes process of physicochemical parameters during a year in Zarivar (within different seasons)

Oxygen concentration of solution with average of 5.58 g/L during the investigation period was between at least 4 mg in September and maximumly 7.1 mg in December.

In the investigation of changes process of soluble oxygen with the lake depth and its transparency, a positive correlation between the oxygen concentration and lagoon depth ($r=P < 0.01$) and another positive correlation between the oxygen concentration and depth of traditional view exist ($r=P < 0.01$).

Investigation of depth of transparency shows that its average during a year was 2.8.65. Its minimum in September (135 cm) and its maximum in March (320 cm) have been observed.

Investigation of pH changes during the research period showed us volatility about 7.918 that its minimum related to the September (7.2) and its maximum related to December and its average during a year was inclined to alkaline.

Results associated to periphytons in the lake of Zarivar

Zarivar lake with an area of 800 hectares, is a shallow lake where surrounded from three

directions by mountains. The southern part of lake is inferior and reaches to the lands of Marivar. Zarivar Lake was 5.38 m and maximum height of it determined as 7.5 m.

Due to compact plantation along the Marivan lake shore, this lake has a vertical shore. A tissue composed of entangled root of reed, along with the wet mud of beach protects this lake from erosion.

According to this issue, the natural fluctuations of water height will not cause any significant changes in its extent.

Surface runoff are countered as one of the most important sources of lake water supply such that annually is about 32 million m³. due to the low depth of lake, the entire water column around this lake has mixed mode and because of this, the Zarivar lake lacks the seasonal temperature layering.

Although in 10-15 years periods due to the severe cold in winter, the lake surface was frozen and layering state was shown inverse. This phenomenon has a negative impact on the environmental conditions and aquatic organisms of lake.

The bed of lake has the silty-clay soft sediments that approximately were covered of plants litters. This situation causes to an increase in the oxygen consumption under the impact of bacterial activities of deep layers of lake water.

Also, entry of springs water in the bed that have the various temperature and oxygen rate and CO₂ conditions with lake body.

Despite this limitations that finally leads to a benthos production capacity of lake, benthos of the whole bed of lake are available to the benthos-eating fishes including common carp and *Carassius auratus*.

Existence of aquatic plants growth in some parts of Zarivar Lake provides an appropriate opportunity to feed the GRASS CARP.

This lake has an high primary phytoplankton products that aspects of microfitte plant growth and peryphyton products give more richness to its primary products such that according to the primary indices of production , will be included among the productive aquatic-bodies.

Ecologically in the aquatic ecosystems, periphyton is considered one of the cycles in the biological chain between the plankton and benthos.

Peryphytons excreted the pollutants and toxic materials after treatment in form of wastes and deposited in the bed and this causes the water to be cleaned. Most types of the fries , white fishes , sturgeons and other fishes also eat these organisms

These organisms play an important role in aquatic ecosystems and an increase in the biological productions and are very effective self-purification phase of the water.

Also plays a very important ecological role in marine ecosystems and are as one of the rings in the biological chain between plankton and benthos.

This group often excels among other biological groups (plankton, benthos, etc.) in terms of numbers and biomass.

Unlike Plankton often fully is not responding to the effects of pollution in rivers at a significant

distance than downstream, Periphyton immediately overreacts below the origin of the contamination.

Because the frequency and nature of Periphyton in a specified location is closely related with the water quality in the area, thus, checking the status of these entities is generally very useful in assessing the conditions existing in the rivers.

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