BIO-MONITORING OF BISHTARAKA LAGOON

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Abstract: *Data on the trophic state of Bishtaraka Lagoon are presented. The Bishtaraka's Lagoon is located in central coastal region of Albania and exists as transitional environments between land and sea. The lagoon covers a surface ca.155 ha Level of trophic state is based on standard methods for analysis of macrophytic vegetation [15] and chlorophyll a content and other photosynthetic pigments of phytoplankton, dissolved oxygen (DO) and biological oxygen demand (BOD), Phosphor contents. Also are measured physic characteristics of waters like temperature, Ph and turbidity of water. Plant communities' evaluation is based on qualitative and quantitative characteristics and is classified through principals of Zurich–Montpellier school. Monitoring of chlorophyll a content and other photosynthetic pigments of phytoplankton, dissolved oxygen (DO) and biological oxygen demand (BOD), phosphor contents, and diatoms species are carried out during a year from April to September 2009. In Lagoon are selected four stations for samples taking. Evaluation of water trophic level is based on classification proposed by Hákannson [4].* ***Oligotrophic****: clear and blue water, with very low levels of nutrients and algae.* ***Mesotrophic****: slightly green water, still clear, moderate levels of nutrients and algae.* ***Eutrophic****: green and murky water, with higher amounts of nutrients and algae.* ***Hypertrophic****: supersaturated in phosphorus and nitrogen, excessive phytoplankton growth, poor water clarity. Flora of Bishtaraka Lagoon belongs to the aquatic macrophytes rooting in sediment. Two main groups are commonly distinguished:* ***Emergent aquatic macrophytes****. Reed (Phragmites australis) is often found in monospecific stands, but also mixed with Typha angustifolia, Scirpus lacustris.* ***Submersed macrophytes****. From this group, in Bishtaraka Lagoon we have registered flowering plants such as Myriophyllum spicatum and Potamogeton pectinatus. The aquatic vegetation strongly influences the light conditions, temperature, oxygen concentration, sedimentation rate and turbulence in the water body. Analyses for determination of dissolved oxygen (DO) and biological oxygen demand (BOD) are realized through Winkler method. Based on the collected data we can evaluate that Bishtaraka Lagoon is characterized by a high trophic state – eutrophic level. Trophy state of Bishtaraka lagoon in four stations in April and September is presented high eutrophy, increasing from April to September.*

Key words: *Emergent aquatic macrophytes, Trophyc state, submersed macrophytes*

INTRODUCTION

Bishtaraka Lagoon is approximately one meter depth. Sand bars partially isolate the lagoon from the Adriatic Sea. The lagoon consists of a number of interrelated habitats. The terrestrial portion includes the sandbar and the surrounding coastal strip. The aquatic portions, which account for more than 90% of the lagoon's surface area, include channels, shallows, mud flats and salt marshes. These varying habitats host a number of organisms and diverse communities. Study area in Lagoon and their coordinates measured with GPS.

MATERIAL AND METHODS

Standard methods for analyses of macrophytic vegetation [1]. Plant communities' evaluation is based on qualitative and quantitative characteristics and is classified through principals of Zurich–Montpellier school. Chlorophyll a content and other photosynthetic pigments of phytoplankton. Evaluation of water trophy level is based on classification proposed by Hákannson [4]. Dissolved oxygen (DO) and biological oxygen demand (BOD). Analyses

for determination of dissolved oxygen (DO) and biological oxygen demand (BOD) are realized through Winkler method.

Figure 1: Map of sampling stations: (Station 1: N 41º 28'16.0" E 019º 30' 17.9);(Station 2: N 41º 28' 20.1" E 019º 30' 13.0'');(Station 3: N 41º 28' 19.3" E 019º 30' 18.1");(Station 4: N 41º 28'19.8" E 019º 30' 12.5).

Physical characteristics of water like temperature, pH and turbidity of water. Based on chlorophyll, trophic states are classified in five levels, (Tab.1) from the low to the high level of the biological productivity.

Table 1

Typical levels of chlorophyll a for different trophic states suggested by Hákanson [4]

Trophic State	**Chlorophyll a (mg/m^3)**
Ultraoligotrophic	< 1
Oligotrophic	< 2.5
Mesotrophic	2.5 - 8
Eutrophic	8 - 25
Hypertrophic	> 25

Chlorophyll a is a good indicator of the total quantity of algae in a water body. Large amounts of algae can decrease the clarity of the water, alter the color of the water (making it greener), reduce dissolved oxygen and alter the pH of the water.

RESULTS AND DISCUSSION

1. FLORA

Flora of Bishtaraka Lagoon belongs to the aquatic macrophytes rooting in sediment. Two main groups are commonly distinguished:

EMERGENT AQUATIC MACROPHYTES

Reed (*Phragmites australis*) is often found in monospecific stands, but also mixed with

Typha angustifolia, Scirpus lacustris.

Emergent macrophytes are rooted in the sediment and may grow to a water depth of ca. 1 m. During the growing season all members of this group produce aerial leaves and flowers. The emergent aquatic *macrophytes* are an interface between the surrounding land and the water. The emergent aquatic *macrophyte* can reduce the external nutrient loading.

SUBMERSED MACROPHYTES

From this group, in Bishtaraka Lagoon we have registered flowering plants such as *Myriophyllum spicatum* and *Potamogeton pectinatus.* The submersed macrophytes complete their life cycle under the water surface and have a central position in the process of internal recycling of materials in the aquatic ecosystem**.**

2. PHYTOPLANKTON

The phytoplankton consists of a large assemblage of microscopic algae. These plants freely move in the water column. Some species become floating after dying most algae sink to the water bottom.

There are many taxonomic groups of phytoplankton algae and their systematic are very complex [6]. Many species of the freshwater planktonic algae belong to the extremely diverse chlorophytes. Other important taxonomic groups that contain phytoplankton algae are (among others) the diatoms (*Bacillariophyceae*), which were dominated by *Cyclotella ocellata, Fragilaria capucina, Navicula tripunctata, Nitzschia palea, Nitzschia closterium, Amphora pediculus* etc.,[8] and the blue-green algae (*Cyanophytes* or *Myxophyceae*).

3. VEGETATION

Eulittoral and littoral Plant communities of this lagoon belongs to *Potametea* and *Phragmito-Magnocaricetea* Class and associations:

Table 2

Macrophytic Vegetation of Bishtaraka lagoon

Associations	**Species**
Assoc. Potamo pectinati-Myriophylletum spicati,	Potamogeton pectinatus, Myriophyllum spicatum
Assoc. Phragmitetum communis	Phragmites australis
Assoc. Typhetum angustifoliae	Typha angustifolia

Assoc. *Potamo pectinati - Myriophylletum spicati* (Tab.2) represents a continued plant community which covers about 70 – 100% of lagoon bottom, and main indicator for evaluation of trophic state. These associations form potameid and *nympheid* belt of lagoon littoral area. Often these associations determine total vegetation of shallow eutrophic lagoon. Their role on lagoons or lakes with level of trophy such as mesotrophic and oligotrophic is very low. Based on characteristics and presence of above mentioned associations and classification [2, 5, 15] we can conclude that trophic state of Bishtaraka Lagoon belongs to eutrophic level. Increase eutrophication from April to September is reflected in these directions:

- High levels of productivity and biomass of the species *Potamogeton pectinatus*, *Phragmites australis* and *Typha angustifolia*.
- Floristic impoverishment of these plant associations. Floristically dominant associations are very poor and often like monodominant plant communities. Disappear of species with narrow ecological amplitude.
- Their replacement by mono-dominant association or species with wide ecological amplitude, [13, 14].
- Species spreader in lagoon *Potamogeton pectinatus*, *Phragmites australis*, *Myriophyllum spicatum* and *Typha angustifolia* belongs to the group of wide ecological amplitude.

- The aquatic vegetation strongly influences the light conditions, temperature, oxygen concentration, sedimentation rate and turbulence in the water body.

EUTROPHICATION

Stages of the eutrophication. Nutrient enrichment. Increased phytoplankton growth, biomass and primary production. Undesirable disturbance to water quality and "balance of organisms". Increased biomass of phytoplankton. Toxic or inedible phytoplankton species. Changes in macrophyte species composition and biomass. Loss of desirable fish species. Decreases in water transparency. Alter the color of the water (making it greener). Dissolved oxygen depletion. Decreases in aesthetic value of the water body.

Figure 2: Bishtaraka Lagoon in April.

Figure 3: Bishtaraka Lagoon in September

Lagoon trophy state according Carlson Criteria. Carlson Index of trophy state is valuable to characterize (TSI) of water ecosystems. Special values of (TSI), (Fig.4) are calculated by equation: TSI for *chlorophyll a* (TSIC) = 9.81*[ln (chlorophyll-a)] + 30.6

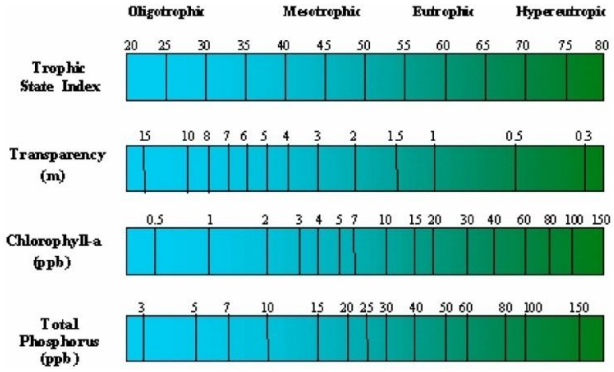

Figure 4: Variation of physic-chemical parameters according *Carlson* index

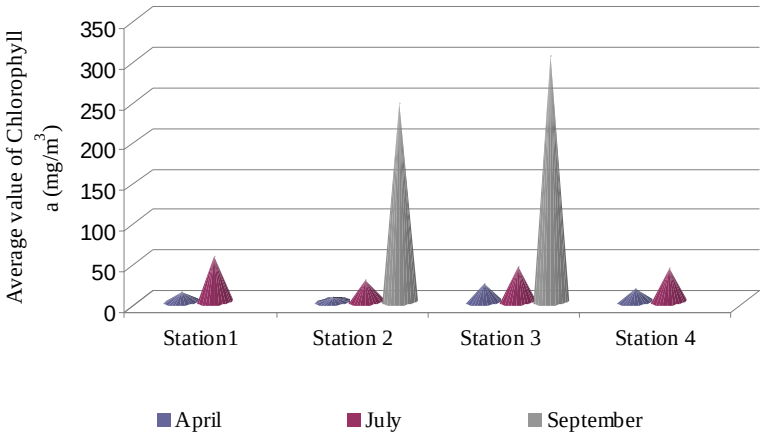

Figure 5: Average value of Chlorophyll (mg/m^3) in Bishtarka Lagoon during April – September 2009.

Trophy state of Bishtaraka lagoon in four stations in April and September is presented high eutrophy, (Fig.5) increasing from April to September. In Station 3 the level of trophy is lower than the three other stations. In September is survey decrease level of water and a green colorification. Chlorophyll a content on water is 8 -10 times higher than two other months April and June.

Trophy state characterized according *Carlson criteria* focused on *Chlorophyll a* show:

- In April TSI index has levels of values between 50-60, they according low eutrophic level.
- In June TSI index has levels of values between 60-70, they according medium

eutrophic level.

- In September TSI index has levels of values between 80-90, they according high or hyper-eutrophic level (Fig.6).

Table 3

Average value of DO, BOD, T°C, pH, in four stations during April to September.

	Station 1			*Station 2*			*Station 3*			*Station 4*		
	April	*June*	*September*	*April*	*June*	*September*	*April*	*June*	*September*	*April*	*June*	*September*
DO	*9.46*	*3.18*		*4.61*	*5.32*	*4.96*	*6.68*	*3.88*	*5.28*	*9.46*	*3.97*	
BOD	*9.14*	*2.88*		*4.07*	*5.66*	*4.87*	*5.41*	*4.27*	*4.84*	*9.72*	*2.38*	
T°C	*20*	*23*		*21*	*23.5*	*22*	*21*	*23.5*	*22*	*20.5*	*23*	
pH	*7*	*7*		*8*	*7.5*	*7.1*	*8*	*7.5*	*7*	*7*	*7*	

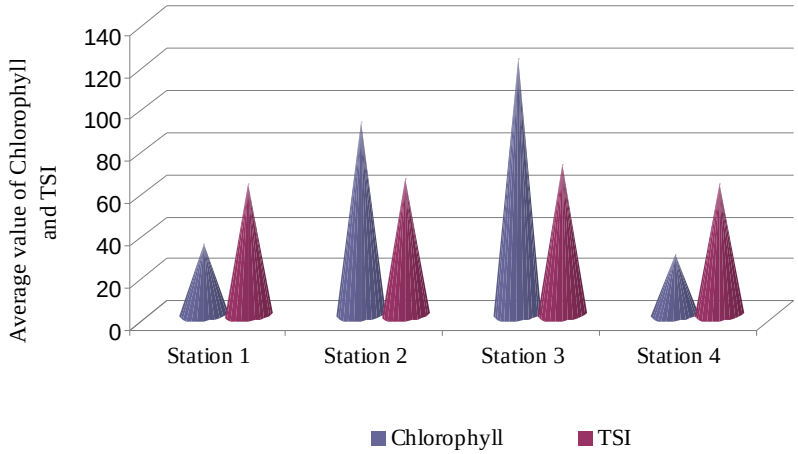

Figure 6: Average value of *Chlorophyll a* and TSI

The most abundant species in Bishtaraka lagoon were: *Cyclotella ocellata* (with TI $_{DIA}$= 2.8 and SI = 2.1); *Amphora pediculus* (TI $_{DIA}$= 2.1 and SI = 2.1); *Fragilaria capucina var. perminuta* (TI $_{DIA}$= 2.1 and SI = 2.5); *Navicula viridula* (TI $_{DIA}$= 3.5 and SI = 2.2); *Nitzschia palea* (TI $_{DIA}$= 3.3 and SI = 2.8) etc. [11,12]. BOD is a measure of the quantity of oxygen consumed by microorganisms during the decomposition of organic matter.

Biological Oxygen Demand (BOD) is measured from April to September. As is shown in table 3, in stations 1 and 4 the level BOD is highest in April and in these two station we cant take examples in September because the level of water was lower. In Station 2 and 3 values are variable. The highest values of dissolved oxygen are in April in Station 1 and 4 and as is shown in Graf lower in stations 2 and 3. These means that is high quantities of

phytoplankton and zooplankton that consume these Oxygen.

CONCLUSIONS

- Increase in the investments for the reconstruction of the communication channel sea - lagoon.
- Increase in fresh water supply through deviation the direction of Tarrini and Erzeni rivers.
- Annually working for cleaning and deepening of lagoon and digging biomass of species such as *Potamogeton pectinatus, Phragmites australis* and *Typha angustifolia.*
- Bishtaraka Lagoon was dominated by eutrophic species like: *Cyclotella ocellata, Amphora pediculus, Navicula viridula, Nitzschia palea* etc.
- The high trophic and saprobic values show the polluted water in lagoon.

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