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CHARACTERIZATION OF PHYSICO-CHEMICAL AND BIOLOGICAL PARAMETERS IN AREAS WITH FISHING POTENTIAL

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Abstract: In the present study, the physico-chemical quality of the water in the Midia coastal area, the Tasaul Lake and the Siutghiol Lake water bodies were analyzed, as integrated sites in the territory of the North Dobrogea FLAG. This study allows establishing the state of favourability of the aquatic ecosystem, focusing on the chlorophyll content as the basis of the trophic level. The premise of a stable ecosystem induces the possibility of developing natural fish resources. An essential attribute in the context of preserving natural heritage and increasing the attractiveness for fishing activities, is the need to evaluate the qualitative and quantitative profile of the phytoplankton and, respectively, the eutrophication indicators. If aquaculture activities will be developed in the analyzed areas in the future, they could increase the economic value of the Romanian sector of the Black Sea. The biological analyzes of the water quality are the basis of the substantiation of some methods of its determination and evaluation. Thus, testing the concentration of chlorophyll, the classes of algae and the photosynthetic activity, are useful for the evaluation of eutrophication in the aquatic environment, but also for the evaluation of productivity in the surface waters studied. At the same time, the determination and evaluation of the physical and chemical parameters of water quality allowed the realization of some correlations with the structure of the biota. In this sense, the analysis methods are based on the use of modern equipment based on real time (in situ) determinations.
Key words: eutrophication, phytoplankton, chlorophyll concentration, sea water, fresh water

1. INTRODUCTION

The restoration of aquatic habitats is essential for sustaining biodiversity and improving fishing conditions. At the national level there are a number of strategies and actions that can improve conditions for fishing, ensuring a healthy ecosystem for future generations. These actions can be implemented at the local and/or regional level, of which we mention a few more important ones: restoring wetlands that can improve habitat for many species and provide a breeding environment for fish; control of invasive species, an essential aspect for maintaining the ecological balance; the implementation of fishing restricted areas that can allow fish populations to regenerate and thrive; monitoring and research that can help identify problems and adapt restoration strategies.

At the national, european and global level there are numerous organizations and associations that focus on the conservation of aquatic resources, the promotion of sustainable fishing and the support of fishing communities. One of the most notable local initiatives in the Dobrogea region is the Dobrogea Nord Local Group Association. The mission of FLAG Dobrogea Nord is to ensure a sustainable development of the fishing activity in the North of Constanța county, based on sustainable activities. Regarding the demand on the fish market, the new statistics show that only 12% of the national consumption of fish products is covered by domestic production, thus there is a commercial need that could be covered in a larger proportion by the domestic market. It is known that at present the aquatic resources are not exploited to their real potential, and the fisheries facilities in the marine area (fishing nets, mariculture) want to be modernized and expanded in order to sustainably diversify the types of resource exploitation (including species currently less exploited, for example, clams). Thus, an analysis of the quality of waters with potential for fish in the northern area of Constanța county, will allow the construction of potentially polluted areas and respectively with better water quality, suitable for increasing the capture of fish resources and/or the development of mariculture.

There are a number of aspects regarding the quality of waters with potential fish, of which we mention:

- identification of polluted areas
- evaluation of water quality parameters
- identifying and protecting areas with good water quality

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- developing best practice strategies to minimize the impact of pollution and maximize fish catches
- effective collaboration between the authorities, the scientific community and local communities to develop plans for the conservation of aquatic resources
- supporting the innovation of new technologies based on digital monitoring systems to make the use of aquatic resources more efficient
- facilitating investments in mariculture to create a sustainable infrastructure
- public education, which is essential to ensure a sustainable management of these ecosystems with potential fish.

Since aquaculture is a large consumer of water, it is preferable to develop it where there are natural resources. However, the big problem that arises is the quality of the aquatic environment which must fulfill required standards in order to function as an environment for the growth and development of the fish resource. It is well known that the quality of natural surface waters, especially lakes, is constantly threatened by pollution through various factors [1], [2], [3].

Among the most serious problems is poor water quality in terms of biological and physico-chemical characteristics. Parameters such as pH, alkalinity, hardness are not toxic to fish directly, but can influence other parameters, sometimes in quite complex ways, increasing the negative effect produced on the fishes. Other physico-chemical parameters such as dissolved oxygen, temperature, ammonia, depending on their value/concentration, can lead to fish death [4]. The main objective of the study is to develop an analysis of the physico-chemical and biological parameters in order to identify the polluting agents that can affect the development of fish resources.

This article contains the analyzes results of the water quality parameters carried out in two seasons in 2024: vernal season and aestival season, following the changes produces among the chemical and biological parameters (temperature increase, dissolved oxygen decrease, phytoplankton development, etc).

Freshwater or marine phytoplankton is the base of the trophic chain in an aquatic ecosystem, with rapid development and a strong ability to adapt to environmental conditions [5]. In this sudy we evaluated the concentration of phytoplankton, as an essential parameter in the proper development of fish resources, by measuring chlorophyll-a from different types of algae found in three sites (lacustrine areas and coastal area in the North of Constanța county).

2. MATERIALS AND METHODS

2.1 Physical-chemical analysed parameters

Variations in physico-chemical parameters have a particularly large impact on the growth and development of fish populations, starting with factors such as temperature, alkalinity, hardness, pH and ending with the concentration of dissolved oxygen, ammonium ions, phosphate, etc [6]. The presence in the water of heavy metals and/or detergents leads to serious imbalances in the metabolic processes of aquatic organisms.

The following physical parameters:

- temperature,
- pH,
- electrical conductivity and
- turbidity

were measured in situ with a waterproof meter wits GPS function (HI-9829 multiparameter) at 1meter depth.

For the dissolved oxygen analyses, the water samples were collected at 1meter depth in Winkler bottles and analysed by iodometric method.

For analysing the other chemical parameters, the samples were collected at 1meter depth in polypropylene containers and kept away from light, prior to analyses.

The parameters analyzed in the laboratory were:

- dissolved oxygen,
- biochemical oxygen demand (BOD_5),
- alkalinity
- total hardness
- cadmium, lead
- ammonium and orto-phosphate ions.

Dissolved oxygen, BOD_5, alkalinity and hardness were analysed using titrimetric methods and specific reagents. For BOD_5, the samples were kept five days at 20^{o}C in a cooler incubator FOC 120I Connect.

Alkalinity was analysed by titration with hydrochloric acid and hardness by titration with ethylenediaminetetraacetic acid disodium salt dihydrate (EDTA).

Cadmium, lead, ammonium and orto-phosphate ions were measured spectrophotometrically with *SpectroquantPharo 300.* Before the spectrophotometric determinations, samples were filtered to remove particulate matter.

Cd determination is based on the Cd ions reaction with 1-(4-nitrophenyl)-3-(4-phenylazophenyl) triazene and lead determination is based on the Pb(II) ions reaction with 4-(2′-pyridylazo) resorcinol. Both analyses take place in alkaline solution, with the formation of a red complex which is measured spectrophotometrically

$N–NH_4^+$- the method is based on the ammonium ions reaction with hypochlorite, in alkaline solution, in order to form a monochloramine. This in turn reacts with a substituted phenol to form a blue indophenol derivate that is determined spectrophotometrically in VIS.

$P–PO_4^{-3}$ - the method is based on the orthophosphate ions reaction with molybdate ions, in acid medium, in order to form a phosphomolybdic complex. This complex is reduced with ascorbic acid to a blue coloured compound which is measured spectrophotometrically [7]

All the spectrophotometrically determinations used are in accordance with ISO 8466-1 and DIN 38402 A51.

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2.2 Evaluation of chlorophyll content

The study of the main groups of primary producers is based on the determination of chlorophyll concentration. Real-time (in situ) measurement technologies are preferred in marine and freshwater ecological monitoring [8], [9]. Since the distribution of phytoplankton in the water is at different depths, the use of equipment for rapid measurement of the fluorescence profile is necessary. The requirements mentioned above are satisfied by the FluoroProbe III analyzer which allows the real-time recording at a depth of up to 100 m, of different classes of algae. The FluoroProbe is switched on by connecting Pins 5 and 6 of the connectors by using the power supply, the converter cable or the auto-start-plug. In situ measurement is done by connecting the auto-start-plug device to the analyser. Thus, the auto-start-plug is used to measure without a PC. Previously, the FluoroProbe needs to be configured accordingly using the measuring cable / RS485 which allows the settings of parameters. Only the parameters marked with the green symbol can be changed. The charge state is indicated by the green color of the LED.

The FluoroProbe III analyzer uses six LEDs for fluorescence excitation for algae differentiation, these LEDs emit light with six fixed wavelengths (370nm, 470nm, 525nm, 570nm, 590nm and 610nm). Due to the fact that algae of the same division contain a similar quantity and quality of photosynthetic pigments, their fluorescence excitation spectrum (with a fixed emission wavelength at 680nm) is significant. Thus, it is possible to differentiate divisions of algae by their fluorescence excitation spectrum. In addition to this, other fluorescing matter (for example, yellow substances) is detected to enhance the accuracy.

The fluorescence signal for each LED is taken and averaged during a certain measurement time. The algae classes detected by the analyser are *Chlorophyceae*, *Cyanophyceae*, *Bacillariophyceae* (*Diatoms*), *Cryptophyceae*.

These measured spectra are retained in the analyzer's memory and can later be sent to a PC computer. The content of algal classes in the sample can thus be analyzed. The measuring results are stored in files in the FluoroProbe. Starting the measurement starts a new file. The maximum file size is 1,754 datasets.

The chlorophyll analyser has integrated two additional temperature and pressure sensors and to calibrate the temperature sensors and the pressure sensor is used the "Sensor" item from the software.

The depth is calculated direct from the pressure.

depth [m] = (pressure [bar] - air-pressure [bar]) * 10 [m/bar]

The analyses are performed at different depths for each site in order to capture important vertical features. The measurements were made in two seasons: vernal season (April) and aestival season (July), which corresponds to a development of phytoplankton. The three analyzed sites are: Midia Navodari Black Sea coastal area, Tasaul Lake and Siutghiol Lake [10].

3. RESULTS AND DISCUSSIONS

3.1 physical-chemical parameters

In table 1 are presented the results of the physical-chemical analyses carried out in the months of April and July for the water samples taken from specified sites.

Table 1. The average values of the physical-chemical investigated parameters

Parameters	Siutghiol Lake		Tasaul Lake		Midia Navodari	
	April	July	April	July	April	July
Temperature (°C)	19.62	27.81	19.54	27.73	18.07	26.72
Turbidity (FNU)	17.9	47.5	19.8	95.2	1.4	1.7
pH	8.99	9.12	9.21	9.31	8.49	8.34
Conductivity (mS/cm)	3.55	3.53	4.24	4.49	23.38	29.64
Alkalinity (mval/l)	6.67	6.48	8.43	8.23	3.14	2.94
Hardness (mval/l)	10.4	10.3	10.3	10.64	44.77	46.62
DO (mg/l)	11.49	8.02	10.05	18.38	12.04	8.33
BOD5 (mg/l)	2.33	3.77	3.54	5.82	1.81	2.55
Cd (mg/l)	0.01	0.012	0.011	0.016	0.006	0.005
Pb (mg/l)	0.03	0.05	0.05	0.04	-	-
$N\text{-}NH_4^+$ (mg/l)	0.32	0.33	0.70	0.67	0.02	0.03
$P\text{-}PO_4^{3-}$ (mg/l)	0.06	0.12	0.07	0.41	0.02	0.02

The evaluation of the physical-chemical parameters of the water quality is important because the aquatic environment must ensure the optimal conditions for the growth and development of the fish.

Temperature influences the growth and development of fish only if it is at the limit of fish tolerance or registers sudden variations. In addition to the fact that it influences metabolism, temperature is closely correlated with the speed of chemical reactions and with the amount of dissolved oxygen [11].

In the present research study, the temperature of all collected samples registered normal values, in correlation with the season and the sampling site. Thus, the lakes water temperature was around 20 °C in April

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and 28 ^{o}C in July, and the sea water temperature was around 18 ^{o}C in April and 27 ^{o}C in July.

The penetration of light into the water is prevented, in general, by the presence of clay particles, which leads to high turbidity and/or planktonic organisms [6]. As a result, the production of oxygen by the aquatic plants is slowed down, which can decrease fish productivity.

The highest turbidity was registered for Tasaul Lake water in July, 95.2 FNU, almost five time higher than in April, 19.8 FNU. For the sea water, the turbidity was very low, around 1.5 FNU.

The pH, which is interdependent with alkalinity, hardness and water content in carbon dioxide, has a profound effect on fish health, the toxicity of ammonia and oxygen availability.

For optimal growth of most freshwater fish species, desirable pH range is 6.5-9.0, but for the most marine animals, a pH range between 7.5 - 8.5 is ideal [1], [11]. Slightly alkaline pH is preferable in waters, as heavy metals are removed by carbonate or bicarbonate precipitates [12].

From this point of view, for the analyzed period of time, it can be said that the sea water fulfills the conditions for the optimal development of the fish resource, because the recorded pH was not higher than 8.5. For Siutghiol and Tasaul lakes water, the analysed samples had close pH values between 8.99 and 9.31, which are higher that limit imposed by Order 161/2006 for surface water (8.5) [13].

Alkalinity and hardness are relatively stable, but can change over time, usually weeks to months, depending on the pH or mineral content of waters. For Siutghiol Lake water, alkalinity was around 6.5 mval/l, for Tasaul Lake water, a bit higher, around 8.2 and for sea water around 3. For each analyzed site, the alkalinity values were close in time, with a difference of at most 0.5 units less from the vernal to the summer season.

The most common components of alkalinity are carbonates, bicarbonates, hydroxides and phosphates. Alkalinity due to carbonate and bicarbonate ions and hardness in surface waters, are produced through the interactions of water, limestone and CO_2. Calcium and magnesium are essential in the biological processes of fish (scale and bone formation, and some metabolic reactions). Fish can absorb calcium and magnesium from the water or from food [6].

Like the alkalinity, the hardness was almost constant over time for all three analyzed sites, recording values around 10 mval/l for lakes water and 45 mval/l for sea water.

Dissolved oxygen plays an important role for the survival, growth and behaviour of aquatic organisms, a dissolved oxygen level of more than 5 mg/l being essential to support good fish production [14], [15].

The most important sources of oxygen in water are photosynthesis by phytoplankton and atmospheric air. The solubility of oxygen in water is low and the level of dissolved oxygen in water depends on temperature, salinity and pressure variations [6], [11].

In vernal season, the concentration of dissolved oxygen in water for all analyzed sites was between 10 and 12 mg/l. Once the temperature increased, the concentration of dissolved oxygen decreased, being around 8 mg/l in the aestival season, with the exception of Tasaul Lake where a very high value of dissolved oxygen was recorded (18.38 mg/l). The high amount of dissolved oxygen in July in Tasaul Lake can be correlated with a high primary production with algal blooms.

The biochemical oxygen demand (CBO_5) represents the amount of total dissolved oxygen utilized by microorganisms for the biodegradation of organic matters present in water, during five days.

The analyses of the biochemical oxygen demand show variation in time and from one site to another. For all the analyzed sites, it can be said that CBO_5 recorded lower values in April and higher values in July. The lowest values were recorded for Black Sea water (1.81 mg/l in April and 2.55 mg/l in July) and the highest values for Tasaul Lake water (3.54 mg/l in April and 5.82 mg/l in July).

Ammonia is a dissolved gas present naturally in surface waters, being the major end product in the breakdown of proteins in fish. Ammonia also results from bacterial decomposition of organic matter such as dead algae and aquatic plants. Assimilation of ammonia by plankton algae is important in reducing the amount of ammonia coming in contact with fish [6].

Total ammonia nitrogen (TAN) is composed of nontoxic (ionized) ammonia (NH_4^+) and toxic (un-ionized) ammonia (NH_3). The percent of total ammonia nitrogen in toxic form increases as the temperature and pH of the water increase. Ammonia is removed by bacteria that convert it into nitrate, process facilitated by maintaining a pH between 7-9 and a temperature between 24-29° C.

The $N\text{-}NH_4^+$ content was quite varied between the sampling sites, but almost constant for the same site in the two seasons in which the samples were taken. The lower values were registered for sea water (0.02 mg/l in April and 0.03 mg/l in July) and the highest for Tasaul Lake water (0.7 mg/l in April and 0.67 mg/l in July).

From the point of view of $N\text{-}NH_4^+$ content, we can say that the sea water and the Siutghiol Lake water are situated in the first class of quality (the concentrations of $N\text{-}NH_4^+$ were lower than 0.4 mg/l) and the Tasaul Lake water is situated in quality class II (the concentrations of $N\text{-}NH_4^+$ were close to 0.8 mg/l), according to Order 161/2006 [13].

Phosphorus is an essential plant nutrient, almost all of the inorganic phosphorus in water being in the form of ortho-phosphate (PO_4^{3-}). This ion is generally present in surface water as attached to living or dead particulate matter [6].

Generally, in natural surface waters, phosphate ion occurs in concentrations less than 0.1 mg/l. Phosphate is considered harmless if we ignore its role in promoting the growth of undesired algae in the water. The

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recommended range of values for the phosphate ion concentration is 0.05-0.3 mg/l and when phosphate concentration exceeds 0.3 mg/l, can lead to eutrophication [11].

For the water of the Black Sea, the content in ortho-phosphate ions was very low (0.02 mg/l) and identical for the two seasons in which the analyses were performed. In vernal season, for the lakes water, the concentration of ortho-phosphate ions was almost the same (0.06 mg/l for Siutgiol Lake and 0.07 mg/l for Tasaul Lake), but in July for the water of the Siutgiol Lake the value was twice as high and for the water of the Tasaul Lake four times as high.

In accordance with Order 161/2006, the results for ortho-phosphate ion concentration place the waters analyzed in first quality class (maximum 0.1 mg/l), except the water from Tasaul Lake in July, when the registered value place it in quality class III (0.4 mg/l) [13].

One of the water important contaminants is the heavy metal pollution. The presence of heavy metals in surface waters raises important problems related, among other things, to their accumulation in fish and the diseases they cause. Some metals, such as arsenic, cadmium, lead, mercury are non-essential elements and are highly toxic for organisms. Adverse effects of cadmium on fish include reproductive problems, high blood pressure and kidney/liver dysfunction and lead bioaccumulation in fish primarily affects the liver, spleen, kidney and gills [16], [17].

For all samples analyzed, regardless of the season, the concentration of cadmium ions was not higher than 0.02 mg/l and the concentration of lead ions was between 0.03 mg/l and 0.05 mg/l. Thus, from the point of view of the content of these two metals, the analyzed waters can be classified in the first quality class, according to Order 161/2006 [13].

3.2 Biological parameters

The long-term development of activities for the analysis of the quality of the pelagic environment allows highlighting the perspectives of growth and fish exploitation, as well as the critical points faced by fishing activities in the Black Sea and lake areas. The representative groups of phytoplankton are analyzed - green algae, cyanobacteria, diatoms and cryptophytes (including the yellow substance), with direct influence on the quality of aquatic life in the bordering area of fishing activities (marine site - Midia Navodari area and lacustrine sites - Tasaul Lake and Siutghiol Lake).

It is known that the dynamics of phytoplankton is influenced by the geographical location of the water bodies as well as the type of water basin. In the temperate zone there is a great difference between the summer and winter seasons. Regardless of the type of water body, in the most cases there is a general model of the dynamics of phytoplankton populations. In this context, we chose to carry out an analysis of phytoplankton dynamics in different ecological successions, based on modern measurements to identify the concentration of chlorophyll in water.

Figures 1 and 2 show the average chlorophyll concentrations recorded in the four groups of phytoplankton, during the two seasons - vernal and aestival.

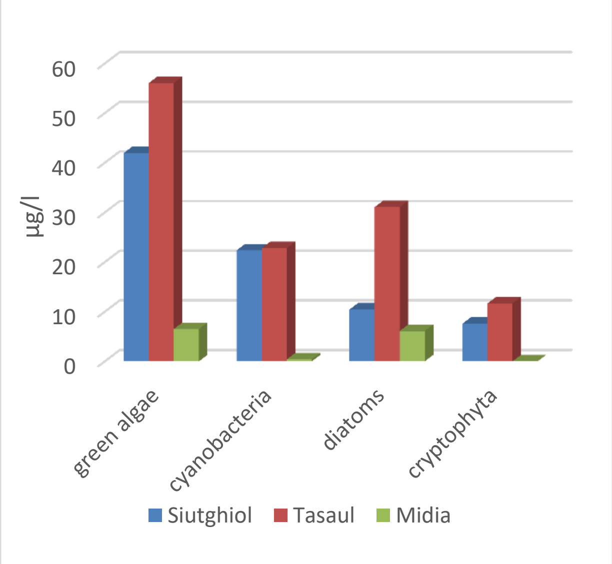

Figure 1 Average chlorophyll concentration in the representative phytoplankton groups (vernal season)

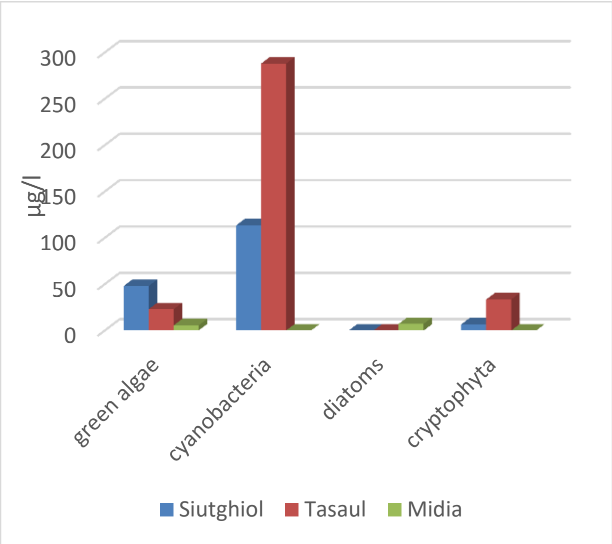

Figure 2 Average chlorophyll concentration in the representative phytoplankton groups (aestival season)

If we draw a parallel between the two seasons, some remarkable differences can be observed, namely:

- in the Siutghiol Lake the group of cyanobacteria recorded a fivefold increase in the average concentration of chlorophyll between the two seasons and, respectively, a reduction of the group of diatoms that was present in the vernal season (10.44 µg/l) followed by its absence in July. Also, the green algae group

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maintained its chlorophyll concentration unchanged in the two seasons. In the Siutghiol Lake for the April, the largest percentage was recorded by the group of green algae 50.95%, followed by cyanobacteria 27.15%; instead, for July, cyanobacteria were dominant with 67.53%, followed by green algae (28.52%).

- in the Tasaul Lake, the cyanobacteria group recorded a thirteen-fold increase in the average chlorophyll concentration between the two seasons, respectively a reduction in the diatom group that was present in the vernal season (13.06 μg/l) followed by its absence in July. Another significant change occurs in the case of green algae, where the concentration of chlorophyll decreased from one season to another (2.5 times). In Tasaul Lake in April, green algae are predominant (46.11%), diatoms, the second group, representing 25.55% of the total phytoplankton; but in July the qualitative structure changes substantially, cyanobacteria dominating (83.64%) followed by green algae (6.63%).

- for the Midia Navodari coastal site, we note the absence of the Cryptophyta group in both seasons. In the Midia area, the group of cyanobacteria was not recorded in July. Diatoms had similar chlorophyll concentrations in the Midia area in the two seasons, registering a slight increase in July compared to April (6.09 μg/l vernal season, 7.18 μg/l aestival season). In the Midia area, the group of green algae dominates (50.07%), followed by diatoms 46.9% for April; respectively, in July the weight of phytoplankton is reversed, dominating diatoms (56.88%) followed by green algae (43.19%).

The difference can be noted regarding the type of water body, the value of the concentration of chlorophyll in green algae being between 4-9 times higher in lakes, compared to the coastal marine environment.

During the vernal season, when spring changes occur in the water column as the wind drives the lake's water volume, these changes mark the beginning of the ecological succession, in which small species that have a high growth rate dominate. During this period, samples can be taken during spring algal blooms, which occur as a result of sudden variations in available nutrients in conjunction with rising water temperatures. At the opposite pole, in the aestival season there is an intensification of phytoplankton development, in summer the dominant species show larger sizes, with a reduced development capacity, which are able to conserve biomass and nutrients. In lake waters, the vernal and estival season represents the period of algal explosions with cyanobacteria, an aspect found in the samples from Siutghiol and Tasaul. Algal blooms generate a series of inconveniences from an aesthetic, ecological and even human health point of view.

In Tasaul Lake in the vernal season, a high correlation was found between the water depth (for measurements up to a maximum depth of 2.3 m) and the concentrations of green algae and cyanobacteria, with R^2=0.76 (fig. 3) and R^2=0.67 (fig. 4), respectively. For diatom and Cryptophyta groups in Tasaul Lake, the correlations with water depth were moderate, R^2=0.55 and R^2=0.42 respectively. A weak correlation of the chlorophyll concentrations of different types of algae with water depth was found for Siutghiol Lake ($0.15<R^2<0.38$), for a maximum depth of 2.0 m, and Midia Navodari Black Sea coastal area ($0.02<R^2<0.14$), for measurements up to a maximum depth of 2.6 m.

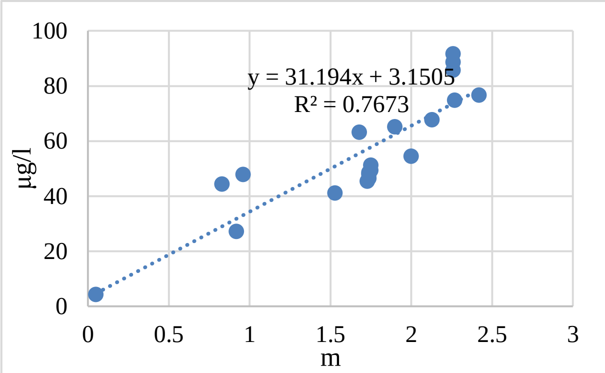

Figure 3 Tasaul Lake-April. Chlorophyll-a concentration in green algae depending on the water depth

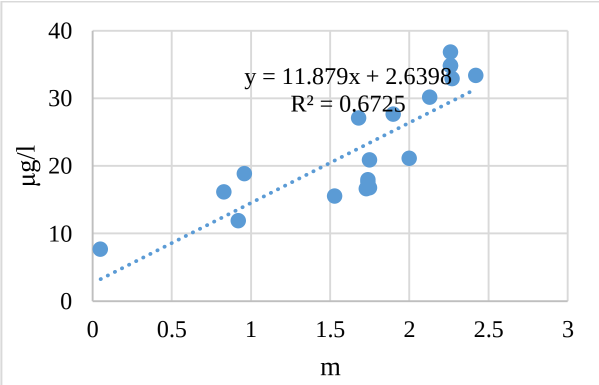

Figure 4 Tasaul Lake - April. Chlorophyll-a concentration in cyanobacteria depending on the water depth

In the summer season, a good and very good correlation was recorded between the water depth and the concentration of green algae in Tasaul Lake (fig. 5) and Midia Navodari Black Sea coastal area (fig. 6). In these locations, the July measurements regarding the concentration of the other types of algae, showed a very weak and weak correlation with depth (R^2=0.11 for Tasaul, and $0.04<R^2<0.28$ for Midia Navodari). In Siutghiol Lake, the correlation between algae concentration and water depth was very weak ($R^2<0.09$).

For most measurements, both in April and July, the highest algal densities were found around 1.5 m depth.

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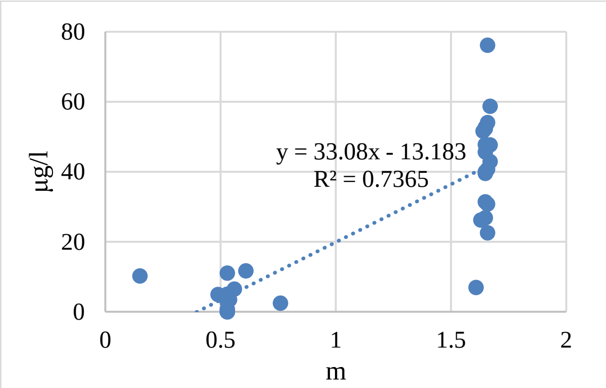

Figure 5 Tasaul Lake - July. Chlorophyll-a concentration in green algae depending on the water depth

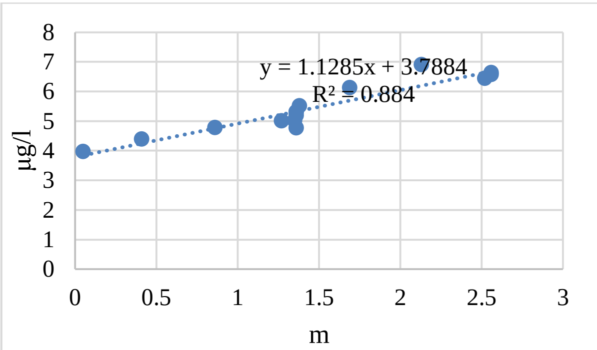

Figure 6 Midia Navodari - July. Chlorophyll-a concentration in green algae depending on the water depth

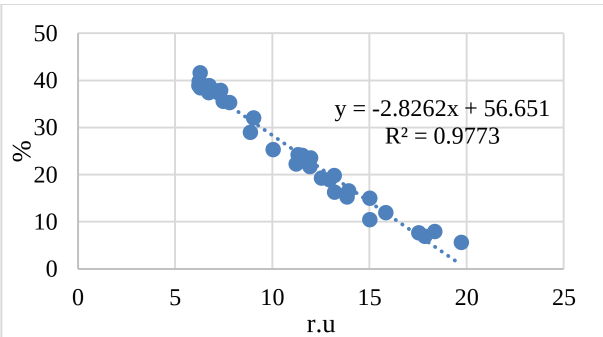

Figure 7 Tasaul Lake - July. The transmittance depending on the yellow substance

The yellow substance originating from detritus and decomposing organic matter has an important role in the transmission of light in the water column, with influence on algal productivity. Except for the April measurements in Siutghiol Lake, for all other measurements a very good correlation was found between the value of the yellow substance and transmittance, $0.95<R^2<0.99$ (fig. 7).

4. CONCLUSIONS

From the point of view of the physical-chemical parameters analyzed, it can be said that, for the time period considered, all the analyzed parameters were within normal limits, with small exceptions in the case of Tasaul Lake (e.g. pH higher than 9). According to the Romanian legislation, the analyzed waters can most often be classified in quality classes 1 and 2, with the exception of Tasaul Lake which, from the point of view of the content of phosphate ions, can be classified in quality class 4.

From the biological parameters point of view, we note the absence of the Cryptophyta group from the analysed water bodies in the Midia Black Sea area and we found it with the greatest abundance in Tasaul Lake. Cryptophytes are often used to feed small zooplankton, which are the food source for small fish in aquaculture.

On the other hand, Diatoms are extremely important components of phytoplankton, the group being one of the biggest contributors to global primary production and being used by specialists to monitor environmental changes over time. Diatoms were constantly found in the Midia Black Sea coastal zone, on the other hand, in the case of lake waters, the group of diatoms was present only in the vernal season. The Cyanophyceae group can proliferate in the presence of excessive nutrients (primarily phosphorus), slow-moving or stagnant water, and heat. In the studied waters, the lakes recorded massive increases in cyanophytes (5 times the case of Siutghiol Lake, respectively 13 times Tasaul Lake). The primary production, as the trophic base in these three water bodies, is strictly linked to the chlorophyll concentration, therefore understanding the mechanisms that influence the variations in algal densities in the three investigated locations will help to make decisions in the application of strategies for the sustainable development of fish stocks. In order to maintain and preserve fish resources, the overall biodiversity of water bodies must be preserved. These involve coherent water quality monitoring strategies and measures for the sustainable exploitation of biological aquatic resources.

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