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Surrounding influence on the Ecological state of the lagoon of Marchica

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Abstract
The lagoon of Marchica is defined as an ecosystem not very deep (8m) which is connected to the sea by a restricted opening. They are cut ponds of the sea by the interposition of an offshore bar and characterized by the absence of current and tide. It is a zone which offers sectors of particular habitats for fauna and the flora. Its biological diversity is important; its food chains are rich and complex. These coastal mediums are the seat of anthropic entries responsible for the increase in the levels of contamination, because of the industrial, agricultural expansion and of the accelerated growth of the population. These modifications have as consequence a change of their ecological stability the not controlled contributions enrich the lagoon and its components in pesticides, hydrocarbons and heavy metals. The organic matter in excess in the lagoonal systems constitutes a source of pollution which generates dysfunctions in the trophic chain.

Keywords: Marchica lagoon, pollution, heavy metal, physicals parameters.

Résumé:
La lagune de Marchica est définie comme un écosystème peu profond (8 m) qui est relié à la mer par une ouverture restreinte. Ce sont des étangs coupés de la mer par l’interposition d’un cordon littoral et caractérisé par l’absence de courant et de marée. C’est une zone qui offre des secteurs d’habitats particuliers pour la faune et la flore. Sa diversité biologique est importante, ses chaînes alimentaires sont riches et complexes. Ces milieux côtiers sont le siège d’entrées anthropiques responsables de l’augmentation des niveaux de contamination, à cause de l’expansion industrielle, agricole et de la croissance accélérée de la population .Ces modifications ont comme conséquence un changement de leur stabilité écologique les apports non contrôlés enrichissent la lagune et ses composantes en pesticides, hydrocarbures et métaux lourds. La matière organique en excès dans les systèmes lagunaires constitue une source de pollution qui engendre des dysfonctionnements dans la chaîne trophique.

Mots-clés : Lagune de Marchica, la pollution, les métaux lourds, les paramètres physiques.

Introduction

The coastal lagoons are defined as not very major ecosystems which are connected to the sea by one or more restricted admissions [1]. They occupy 13% of the world coastal extents. These hydro systems are brackish stretches of water or soft, separated from marine environment by an offshore bar (figure 1). These lakes can be gathered under the name of confined semi intermediate surfaces, the term of intermediate surfaces meaning that two water masses (continental and marine) mix in the same surface [1]. The lagoons are classified in four categories [2] .The lagoons estuariennes: surfaces where the intensities of currents of tides are about equal to those of the river currents; Open lagoons: these types of lagoons are characterized by a very important marling which allows a car dredging of the master keys and thus a permanent food by marine water; Closed semi lagoons: this kind of lagoons is the opposite case of the precedent. Marling is not enough intense to sweep the equipment brought by the littoral drift to the level of the grau. This last is clogged then, which requires the intervention of the man; it is the case of the lagoon Nador; Closed lagoons: they are cut ponds of the sea by the interposition of an offshore bar and characterized by the absence of currents of tide.

The mixture of marine and continental water makes these lakes of the single systems with a great at the same time biological and socio-economic interest. In fact zones offer sectors of particular habitats for fauna and the flora. Their biological diversities are high and their food chains are rich and complex [3]. They are also economically and ecologically important because of their participations in the field of the fishing season and tourism.

Figure 1 : Sight of the lagoon of Marchica &Emplacement of various the taking away of the algae.
In zone A are collected species 1,2,3,4 and 5;
In the zone B are collected species 6,7,8,9, 10 and 12;
In the zone C species 13 is collected;
In the zone D species 11 is collected.

These coastal mediums are the seat of anthropic entries responsible for the increase in the levels of contamination, because of the industrial expansion and of the accelerated growth of the population. In such ecosystems, the biogeochemical processes specific to the lagoons can change the characteristics of the contaminants while making them more toxic at the various watery organizations [4,5] .These modifications have like consequence a change of their ecological stability [6] which results in blooms dephytoplancton [7] and crises anoxic [8] .In addition to organic pollution, the not controlled contributions enrich the lagoon and its components pesticides, hydrocarbons and heavy metals. The matter organique excess in the lagoonal systems constitutes a source of pollution which generates dysfunctions in the trophic chain. In a natural system, biological diversity is raised, and the sediments are naturally organic nitrogen and carbon nouveau riches resulting during sedimentation from the biomass macroalgale [9, 3]. However, certain lagoons receive or not treated urban waste waters but also waste of the aquiculture and agriculture. These contributions anthropic modify the seasonal cycle of the evolution of the algae which proliferate all the year [10].

In the slightly brewed systems, organic equipment is preserved and accumulates by enriching water in nutritive elements and thus out of phosphorus, nitrogenizes and carbon [9] .Excesses in nutritive elements in water are observed besides on a worldwide scale [11] .This generates a modification of the report N/P in water, which controls the succession of the species and thus diversity by supporting or limiting the growth of such or such group of organizations [12].

These strongly productive systems are exposed to eutrophication [4, 13, 9, 14], phenomenon all the more accentuated since the evaporation and the stagnation of water are important. Under these conditions, the degradation of the organic matter leads to a reduction in the dissolved oxygen contents and to the formation of methane and sulphuric acid which induce the mortality of fishes and the development of pathogenic micro-organisms [15] .Moreover, water changes color, and nauseous odors develop, due to the presence of hydrogen sulphide (H2S); this poses a problem for health when the concentrations are high [10].

When the medium is oxidized, sulphur can be mineralized with Fe to form oxides and to capture certain elements traces like Zn, Cu, Pb and Cd [16] .On the other hand, the deoxygenation of the medium causes to reduce and make more soluble toxic substances, to cause their salting out, and to enrich surviving water by it. Heavy Metals are resulting from the industrial activities and urban, and are conveyed in the ecosystems by atmospheric way and by the means as of waterway [17, 18]. These elements can incorporate the sediments, water, the suspended matter and the flora indigenous [19] and also the organizations such as the moulds. These last concentrate these micropolluants and are used like bioindicateurs to supervise the levels of metal pollution in the coastal ecosystems [20].

2. Materials and methods

The taking away of the algae are made on the level of the lagoon of marchica according to the surrounding continental potential influence. The objective of this work is to evaluate the state of pollution of the lagoon of Nador and to release the potential Influences presenting the greatest risks with interval one year (2010 - 2011). The dry matter was made starting from a fresh weight subjected to a temperature (Memmert Drying oven) of 70°C for desiccation and this until a constant dry weight. The acid extraction is done using HCl N/10 during 1 hour 30 minutes with 80 °C in a bath Marie. The proportioning of nitrates and nitrites is done according to the methods of reduction with hydrazine sulphates [21]. Proportioning chlorophylls is carried out according to the method of [22] with dissolution with acetone with 80%. Heavy metals are proportioned in the acid extracts in by spectrophotometry of absorption of flames brought back to standard solutions. The total nitrogen is proportioned according to the method of Kjeldahl after mineralization in Matras followed by hydrolysis during 6 hours. The proteins are proportioned according to the methods described by [23].

Heavy metals gather the elements of which the density exceeds 5g/cm3. Some of these elements are everyday usages but cause diseases (allergy, cancer…) beyond of a given concentration for which they are not biodegradable and accumulate in the organizations.

2.1. Nickel: It is a critical component for the organizations, but which becomes toxic with strong amounts. Nickel causes ignitions of the nasal mucous membranes, bodies respiratory and is known to be carcinogenic. There exists in a natural state associated with sulphides, Fe, Co and Cu (Nor can replace Fe), with oxides and the endogenous rocks. So the content of this element depends on the conditions of pH and oxydo-réduction of the medium. Nor is abundant especially in the basaltic rocks. It can also come from the anthropic activities (batteries, dyes, catalysts).

2.2. Cobalt: It is a critical component for the organizations, but which becomes also toxic beyond certain concentrations. It is employed in various fields (piping, painting, steel, catalyst, fertilizer). This element is associated with sulphides and its concentrations in the medium are dependent on the conditions of oxydo-réduction and the pH. Cobalt is characterized by physicochemical properties close to those of nickel but it is less widespread in the rocks, in comparison with Cr, Ni, Zn and Cu.

2.3. Copper: It is an essential component for the organizations and poison with strong amounts. It is very much used in various fields (electricity, metallurgy, textile, photography, agriculture, fungicides, and tanneries, piping).

2.4. Lead : The most frequent form in the natural environments is Pb^{2+}; its physicochemical characteristics bring closer it to alkaline-earth (Ca^{2+}, Ba^{2+}) and to K. It is not essential for the organizations and its presence with high rates is toxic. Lead is known to block the manufacturing of hemoglobin and to modify the composition of blood. It also acts on the central nervous system and causes lead poisoning. It comes primarily from the fuel, the batteries and painting. This element can be associated with sulphates and carbonates but also with clays and the organic matter according to the pH. This element has many affinities with Cd and Zn.

2.5. Zinc: It is essential for all the organizations and is characterized by its low toxicity compared to the other elements. It very widespread (mining zones), and is used in various fields (metallurgy, printing works, rubber, painting, alloy, battery, agriculture and building). Zn has many affinities with Cd and Pb. and with manganese and iron oxides.

2.6. Cadmium: Element chalcophile, it is used as dye and is frequently in alloys and the batteries. It is very harmful and its compounds with strong amounts can cause cancers. Heavy metals were studied in the sediments of 12 stations distributed on the totality of the lagoon.

3. Results and Discussions

The temperature is a limiting factor of the growth alga. This growth accelerates with the warming of water and the availability of dissolved oxygen. Thus, an increase in the temperature is accompanied by a reduction by the oxygen dissolved in water, which is one of the causes of the development of imbalances in the watery ecosystems. The cycle of variation in the temperature of intra-lagoonal water follows that of the variations of the atmospheric temperatures. Strong seasonal fluctuations are observed in lagoonal water. In winter, the winds, the currents of the tides and the fresh water arrivals generate a mixing of water in the lagoon, which explains the homogeneity of the temperatures in winter. In summer, the mixing of water decreases because of the reduction in contributions of fresh water and one attends the development of micro environments safe from marine currents where the temperature of water is higher.

The comparison of the rates out of nitrates and nitrites show a diversity of accumulation (Table 1). Indeed, the algae of the zone C (figure 1) on the other hand seem to have a high percentage of nitrites their contents nitrates do not vary enormously and are 640,766.7 and 730 respectively for the algae taken in the zones A, B and C. This can be explained by the influence of the contributions of Nador principal city and at the rate of population raised on the algae being in this zone of proximity. The comparison of measurable index of the effectiveness and growth rate of the algae in their Biotope (Table phosphates a nutritive element seems to have a difference between the zones A and C on the one hand and that of the zone B on the other hand. This difference is on average of 4 times.

Table 1: Index of pollution

Index	Description	Phosphates µg/gMS	Nitrates µg / gMF	Nitrites µg/gMF
1	*Flexible-fine-frayed green alga Chaetomorphaaerea*	17.8	640	30.6
2	*Floating green alga*	51.1	780	20.7
3	*Translucent white alga*	5.6	400	22.2
4	*Frayed fine green alga rough aspect Chaetomorohasp*			
5	*Red alga resembling Alsidium*	32.07	740	9
6	*black alga encrusting on Lyngbiamajuscula rock*	2.3	950	12.9
9	*Alsidiumsp*	7.75	880	35.7
10	*Gigartinaacicularis*	9.2	470	15.9
13	*Gracilariavermiculophylla*	25.5	730	48
14	*Janiarubens*	13.2	840	40.8

The contents of proteins constitute 2). Indeed, zones A and B seem to be the most important indication of growth of the algae met this is materialized by a protein totals high rate which is about 6 times compared to the speed of growth of the algae met in the zone C. The rate of chlorophyll of two samples of algae of zones A and B is appreciably the same ones (Table 3) and this rate are rather important by comparison with what is mentioned in the literature.

Table 2: Nitrogen rate on the level of the mass algale

Index	Description	Nitrogenize total mg/gMS	Proteins totals mg/gMF	Soluble proteins Mg/gMF
1	*Flexible-fine-frayed green alga Chaetomorphaaerea*	17.26	107.9	2.4
2	*Floating green alga*	34.6	216.3	4.8
3	*Translucent white alga*	21.8	136.3	3.0
4	*Frayed fine green alga rough aspect Chaetomorohasp*			
5	*Red alga resembling Alsidium*	41	256.25	1.68
6	*black alga encrusting on Lyngbiamajuscula rock*	26.3	164.4	3.6
9	*Alsidiumsp*	28	175	3.6
10	*Gigartinaacicularis*	27.3	170	3.8
13	*Gracilariavermiculophylla*	5.45	29.1	3.71

The physico-chemical analysis of the taken water of the various zones show a light acidity of 0.4 U pH of the zone C compared to the zone A whose pH is neutral. The wealth of saline elements is almost the same one by comparison of the conductivity of the water of zones A and C (Table 4). Indeed, this can be explained by the similar salt rates in the lagoon what seems to mask any temporary wealth by effect of dilution following the climatic variations be-winter and also of the Mediterranean contributions.

Table 3: Comparison of two specific species of different zones

Index	Description	Chlorophylles En µg / g MS
1	***Chaetomorphaaerea***	104.2
9	***Alsidiumsp***	118

Table 4: Physico-chemical parameters of the water in which the taking away was made

Paramètres	pH	Conductivity
1 Chaetomorphaaerea	7.1 à 19.7 °C	118.2 ms à 19.6 °C
5 Alsidiumsp	7.00 à 20.2 °C	122.1 ms à 19.1 °C
13 Gracilariavermiculophylla	6.7 à 20.1 °C	120.2 ms à 19.8 °C
14 Janiarubens	6.6 à 19.0 °C	119.7 ms à 20.3°C

The comparison of the same zone with one year time interval is of a major importance. Indeed table 5 shows a principal difference in evolution on the level of the algae of zone A. the choice of the zone was dictated by the closing of a contact with the Mediterranean. A reduction in the protein rate is an indication of poverty in assimilable elements such as nitrates (table 6) and phosphates in excess (table 7). This reduction is of the order 4 times approximately and is concordant with the reduction in nitrates and nitrite of the order 2 times for nitrates and 4 times for nitrites (table 6). With regard to heavy metals the description of a possible contamination in the lagoon is dependent on the natural referential contents of these heavy elements. It is starting from the data on the substrate [24] which is translated like factor of enrichment [25] .The results of the contents of heavy metals (table 8) show a very low rate of enrichment. This constitutes an index of an improvement of the quality of the living flora in the lagoon during last year's.

Table 5: Comparison between two periods of taking away with interval

Paramètres	**Nitrogenize total mg/gMS 10/11/2010**	**Nitrogenize total mg/gMS 10/28/2011**	**Proteins totals mg/gMF 10/11/2010**	**Proteins totals Mg/gMF 10/28/2011**
1 Chaetomorphaaerea	17.26	3.8	107.9	23.75
5 Alsidiumsp	28	20.7	175	55.4

Table 6: Comparison between two period soft aking away

Paramètres	**Nitrates µg/gMS 11/10/2010**	**Nitrates µg/gMS 28/10/2011**	**Nitrites µg/gMF 11/10/2010**	**Nitrites µg/gMF 28/10/2011**
1 Chaetomorphaaerea	640	480	30.6	5.1
5 Alsidiumsp	880	500	35.7	9.9

Table 7: Comparison between two periods of taking away

Paramètres	**PO4; 11/10/2010 µg/gMS**	**PO4; 28/10/2011 µg/gMS**
1 Chaetomorphaaerea	17.8	8.3
5 Alsidiumsp	7.75	61

Table 8: Heavy metals on the level of the mass algale

Index	**Description**	**Plomb ppm**	**Cobalt ppm**	**Nickel ppm**	**Zinc ppm**	**Fer ppm**	**Cadmium ppm**
1	*Chaetomorphaaerea*	41	0	0	0	0	0
2	*ALgue verte flottante*	118.6	0	0	0	0	0
3	*Algue blanche translucide*	97.5	0	0	0	0	0
4	*Chaetomorohasp*	------	-----	----	----	----	-----
5	*Alsidium*	151.7	0	8.19	0	0	0
6	*Lyngbiamajuscula*	163.4	0	0	0	0	0
7	*Ceramiumsp Ceramiumechinotum*	177	0	0.63	0	0	0
8	*Ulvalactuca*	------	-----	-----	-----	-----	-----
9	*Alsidiumsp*	214.9	0	0	0	0	0
10	*Gigartinaacicularis*	------	----	-----	-----	-----	-----
12	*Grateloupiasp*	139.3	0	0	0	0	0
13	*Gracilariavermiculophylla*	------	-----	-----	-----	----	-----
14	*Janiarubens*	------	-----	-----	-----	----	-----

Conclusion

An evolution in space and time was recorded at the time of the marketing year 2010 and 2011 on the alive algae in the lagoon of Marchica. Referential zone A showed an important improvement as well from the elements point of view of pollution as on the activity of recorded growth. Closing and also the reduced continental contribution improved this quality. Followed by the lagoon of Marchica will be made closely especially with regard to pollution by the herbicides, pesticides and others coming from the agricultural use in the plain of Triffa. Studies synchronized of the impact of green the Morocco project on that of blue Morocco while remaining specific via the flora of Marchica and mainly the algae and also the plants neighboring components its specific ecosystem.

In prospect we intend to introduce a concept concerning the viability of the lagoonal system by the means of follow-up integrated: Impressed pollution in integrity which we will define by the impact of elements of pollution on the integrity of the physiology of the living flora in the Marchica system. Lagoon environment, the study of macrophyte stands used to assess the degree of eutrophication lagoons. An increase this is accompanied by a gradual replacement phanerogam to stand by red algae and green algae then [26].

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