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ORIGINAL ARTICLE

Evaluation of Microbiological Contamination, Physiochemical and metal of Echinoderms and the surrounding substrate in Various locations in western Algeria

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ABSTRACT
Our work was to evaluate the microbiological, physico-chemical and metal contamination of echinoderms and the surrounding substrate at various sites in western Algeria. The search for pathogenic species such as Salmonella leads to knowledge of areas of dangerous pollution. In this framework we have elaborated our work to test the effectiveness of an echinoderm: the sea urchin Paracentrotus lividus to assess the degree of bacterial contamination of sea water. Several sampling campaigns were carried out on The two sites of mostaganem (salamandre and stidia) and the site of ain franin for oran, sampling was monthly and spread over a period of one year, ten sea cucumbers are harvested monthly and about twenty 'Sea urchin', our study on 182 specimens of sea cucumbers and 323 sea urchins at the level of the three different biotopes from the position point of view Ography and fauna and flora component that served both bacteriological and metallic analyzes of the 3 study sites. The statistical treatment of the results shows that the concentrations of the four metals are in decreasing order: Zn> Fr> Cu> Cd at the three sites. The assessment of microbiological and metallic contamination of seawater and sea urchin Paracentrotus lividus and sea cucumber Holothuria tubulosa revealed high levels of contamination by pollutants in the marine environment and their effects Organisms, ecosystems and human health.
Keywords; *Marine pollution, echinoderms, microbiological contamination, heavy metals, Paracentrotus lividus, Sea Cucumber, seawater.*

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INTRODUCTION

Mediterranean fauna and flora have evolved over millions of years into an exceptional combination of temperate and subtropical elements, with a significant proportion (28%) of endemic species [1]. The current variety of climatic and hydrological situations and of the biotopes specific to the Mediterranean explains a great diversity of species due in part to the geological history of the region. 10,000 to 12,000 marine species have been recorded (8,500 species of macroscopic fauna and more than 1,300 plant species) [2, 3]. Many human activities are important sources of degradation of the Mediterranean marine ecosystem. Pollution is only one of the problems that threatens the viability of the Mediterranean as an ecosystem. The alteration and destruction of marine and coastal habitats through inadequate development practices and poor management are also very important problems. Anthropogenic stress on the Mediterranean marine environment can be classified under the following headings Sources of pollution onshore, physical destruction and alteration of habitats, offshore and maritime pollution, and emerging issues [2].

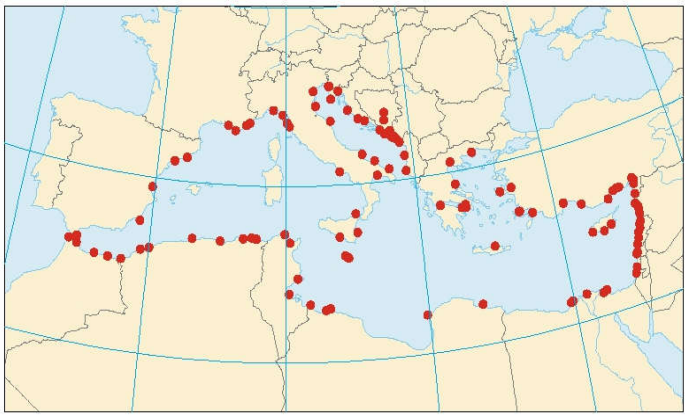

Figure 1: "●Hot spots" of pollution along the Mediterranean coast [4].

Origin of marine pollution: A large proportion of the pollutants discharged into the environment through urban, industrial and agricultural discharges reach the marine environment directly through emissaries, deballasting, offshore drilling or indirectly by runoff, river inputs and Atmosphere. Locally, these inputs can modify the quality of the environment, prevent or slow down the development of certain activities such as aquaculture and tourism [5].

Depending on their nature and origin, pollutants may be in small geographic areas (local pollution) or transported to water or the atmosphere and contaminate the entire planet (global pollution). The vast majority of pollutants are caused by runoff and drainage in watercourses and through infiltration into underground aquifers. When disseminated by wind, pollutants inevitably fall with rainwater, sometimes at great distances from their point of emission [6].

CASE REPORT

Selection of sampling areas: During this study, we selected two sampling areas distant from each other by a distance of 80 km and corresponding to two important fishing ports from the point of view of landing; The Bay of Oran concerning the site of the beach of Ain Franin and the bay of Mostaganem concerning the beach of Stidia and the beach of Salamandre.

Biology of the species: the interest and choice of animal species as bio-indicator species are based both on their validation in international programs for monitoring the marine environment and on their availability in our study area.

Echinoderms, abundantly marine animals, present a great diversity and constitute an important and ancient phylum. The Echinoderms currently living (Crinoids, Holothurians, Starfish, Ophiura, Urchins) have been preceded by many other representatives, now fossils; Of the whole classes which had reached their apogee at the beginning of the primary area are totally extinct. The term "Echinoderms", created by Klein (1734), applies more particularly to the class of the Urchins. Many naturalists studied Echinoderms in the eighteenth century and in the mid-nineteenth century. The research of J. Muller (1840-1850) marks the dawn of truly scientific works [7].

The common sea urchin: *Paracentrotus lividus*, are considered the most important herbivores in the Mediterranean, because high densities cause overgrazing phenomena [8, 9, 10]. In addition, they are consumed by fish or other carnivorous species, and high fish densities could maintain sea urchin populations at medium densities. Thus, Echinoderms could serve as indicators of changes caused by introduced species at the level of the whole trophic chain, and they could signal by their total absence a disturbance of the aquatic environment. In addition to the interest of ecological properties, this zoological group has remarkable methodological advantages. Echinoderms allow relatively easy, inexpensive, rapid, non-destructive and reliable in situ sampling, since they are clearly visible, easy to identify, not very mobile and sufficiently abundant to be statically tested [10].

Figure 2: Common Urchin *Paracentrotus lividus* (Lamarck, 1816).

Sea cucumbers: sea cucumbers have the shape of a more or less elongated cylinder with a circular or pentagonal section. Sea cucumbers are present in all marine environments. They can occupy various biotopes. They are distributed on depths of 180m in the Mediterranean [11]. They constitute the dominant biomass of benthic environments, and their density and biomass are important in the oceanic Posidonia ecosystem [12].

Sea cucumbers are important species in the food chain of temperate ecosystems and coral reefs at different trophic levels [13]. They play an important role: In the "debritus FOOOD WEB" [14]; In the oxygenation of the seabed sediment; It participates actively in the recycling of organic matter by ingestion of sediment; They consume detritus and participate in the biodegradation of organic matter; They represent the major component of the benthic compartment of the ecosystem in Posidonia oceanica of the Mediterranean [15]. Seawater: The main aspects to consider in obtaining a representative water sample are as follows: Selection of the appropriate point for sampling; Strict adherence to sampling procedures; Complete identification of the sample; Preservation of the sample to the laboratory [16].

The bacteriological analyzes of the bacteriological analyzes of this work consisted of the following germs and pathogens: total mesophilic aerobic germs (G.A.M.T), total coliforms, fecal coliforms, faecal streptococci, Staphylococcus aureus, Salmonella. The NPP (most likely) technique in liquid media involves two consecutive tests: the presumptive test: reserved for the search for total coliforms and the confirmation test: called the Mac Kenzie test is reserved for Fecal coliforms from the positive reactions of the presumptive test.

The analyzes of metering of heavy metals: concerning sea urchins and seawater which was carried out first by mineralization: 1 g of fresh weight of each sample (Sea urchin homogenate, sea water) is deposited with 1 ml of water, Nitric acid (HNO3) at 95% purity, the temperature is raised to 95 ° C. for one hour, after cooling, up to 4 ml of double-distilled water is added, this solution is ready for atomic absorption spectrophotometry SAA [17]. The statistical treatment of the results was carried out by the Microsoft Excel ® version 2017 software, in order to compare the average trace metal concentrations between the deferent sampling sites.

At the rate of two samples per month, during one and a half years, several samples of sea urchin and sea water, as well as sea cucumbers and the ambient substrate of different beaches in western Algeria (Salamandre, and Stidia for Mostaganem, Ain Franine For Oran), after the bacteriological analyzes for the sea urchin, sea cucumber and sea water, the analysis of the heavy metric determination for sea urchin and sea water is carried out.

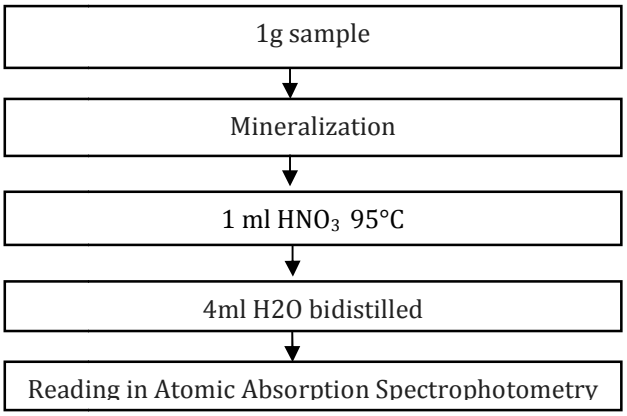

Figure 3: Mineralization and Assay Protocol for Atomic Absorption Spectrophotometry [17].

DISCUSSION

Bacteriological results: we have developed our work to test the efficacy of an Echinoderm: the sea urchin *Paracentrotus lividus* to evaluate the degree of bacterial contamination of sea water, so there To estimate the possibility of the presence of pathogenic germs. For this purpose, a comparative study was carried out between two areas (Oran and Mostaganem), including three sites (Ain Franin, Stidia and Salamandre) on the west coast of Algeria for a period of six months, with two samplings per month .

The histograms below summarize the levels of fecal contamination germs: total coliforms, fecal coliforms, faecal streptococci, total mesophilic aerobic germs, and pathogens: Salmonella, and Staphylococcus aureus, (Figure 4), and at the level of samples of common sea urchin organs *Paracentrotus lividus* (Figure 5), living at the three sites Ain Franin, Stidia and Salamandre.

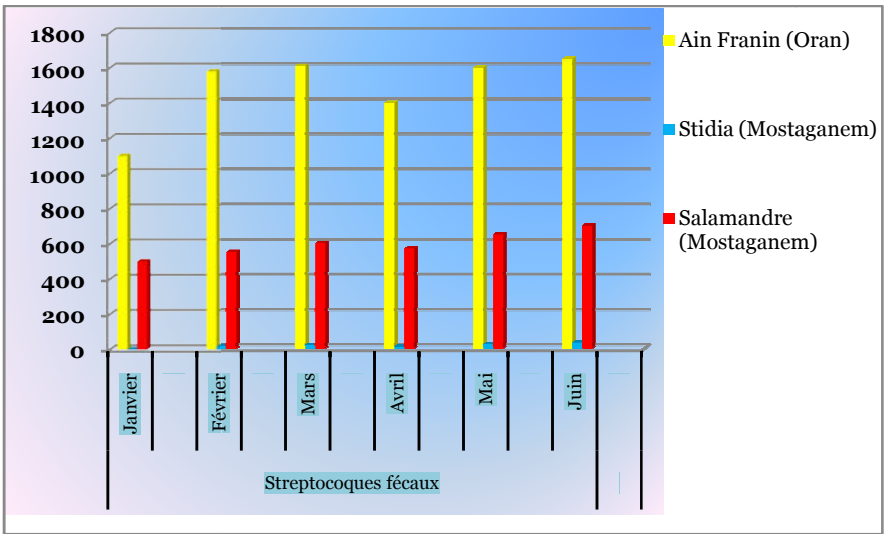

Figure 4: Comparative study of fecal *Streptococcus* in the seawater from the three sites studied for six months.

The presence of pathogenic bacteria such as faecal streptococci in the Ain franin sites is observed in seawater samples by a spike of 1650 germs / 100 ml in June and Salamander 700 germs / 100 ml. On the other hand, an almost total absence of this bacterium in Stidia. It is noted that the bacterial concentrations of the total aerobic flora is the set of microorganisms capable of multiplying in the presence of oxygen at a temperature between 25 ° and 40°C [18].

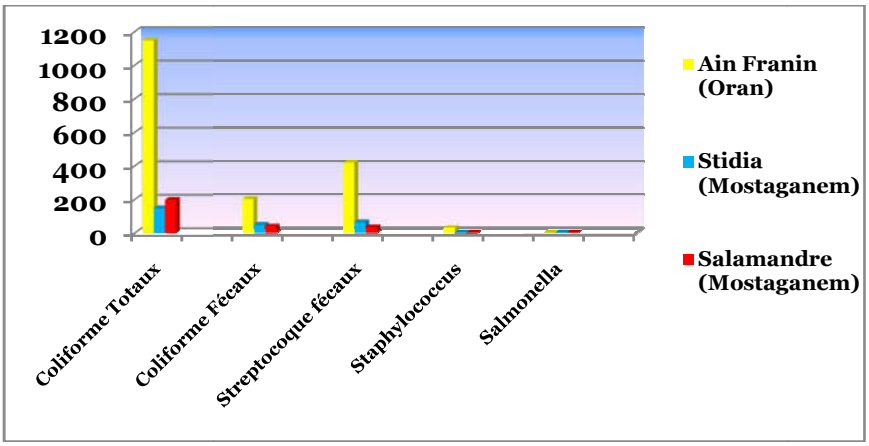

Figure 5: Mean Bacterial Concentrations in Sea urchin Gonads *Paracentrotus lividus* from the three sites studied for six months (germs / 100g).

Total coliforms represent the most widespread bacterial group, which varies during the various months of sampling from 80 germs / 100 g at the Salamander site to 1180 germs / 100 g at the Ain franin site, we note the total absence of Salmonella during All the experimental duration, on the other hand *Staphylococcus aureus* is present at the sites of ain franin with a rate that is not negligible.

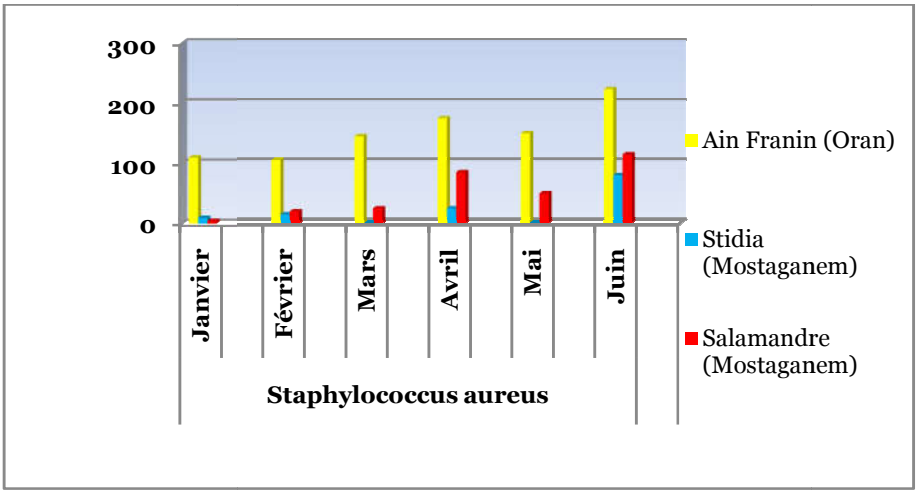

Figure 6: Comparative study of *Staphylococcus aureus* germs in the *Holothuria tubulosa* Holothuria gonads of the three sites studied for six months (germs / 100g).

The bacterial concentrations recorded from the bacteriological analysis of the holothuria taken from the 3 sites fluctuate for the group of bacteria sought staphylococcus which has the order of 225 germs / 100 g in June in Ain franin and 115 germs / 100 g at the salamander site.

Heavy metals assay results: A study of the monitoring of the concentrations of four metal pollutants spread over one year allowed us to evaluate the level of contamination of the common adult sea urchin *Paracentrotus lividus* and its natural habitat sea water.

For the sake of clarity in the development of our results, we calculated the mean ± standard deviation of these heavy metals and, in order to obtain the most reliable reflection of the variation in contamination levels, Observations by a statistical study. In the male and female gonads of this bioindicator, the following pollutants are systematically sought: Copper, Zinc, Iron, and Cadmium, the rates of which have been determined by Atomic Absorption Spectrophotometry. For each pollutant studied, we compared our results with those from the literature referring to the heavy metal contamination of this Echinoderm from different Mediterranean regions. The results and analyzes grouped together in Table 1 revealed the presence of very heterogeneous heavy metal contents and show that the highest concentrations relative to zinc and iron. The latter two (Zn and Fe) are not toxic metals, nevertheless, a high concentration can lead to physiological disorders of the organism [19]. Heavy metals seawater analysis results. Each series of mineralization of our samples is automatically accompanied by a blank and a reference sample from the International Atomic Energy Agency (IAEA), the results of which Are summarized in Table 1.

Table 1: Averages of metallic contents (ppm pf) in the gonads in *Paracentrotus lividus* of Stidia, Salamandre and Ain Franin.

Elements	Reference value A.I.E.A) (Rv) Thon fucus sp	Found value (Fv) (Salamandre, Mostaganem)	Found value (Fv) (Stidia, Mostaganem)	Found value (Fv) (Ain Franin, Oran)
Copper	4,02 (4,35-3,69)	4,43	2,85	12,39
Zinc	137 (150-124)	144	45,5	259,2
Cadmium	0,82 (0,98-0,66)	1,12	0,49	1,39
Iron	171 (175,9-166,1)	63,36	44,2	174,3

The results illustrated in Table 1 show that the order of magnitude of the average Zinc and iron concentrations is evident in the 3 sites since the Zinc average values are almost twice as high in the Ain franin site than in the Site of salamander and much lower at the Stidia site. As for copper, it is present at the Ain franin site with an average concentration of 12.39 mg / kg of PF. For Cadmium, it is slightly higher in Ain franin in *Paracentrotus lividus* with (1.39 mg / kg Of PF).

The statistical treatments of the results show that the concentrations of the four metals are in decreasing order: Zn> Fr> Cd> Cu. These pollutants are better bioaccumulated in *Paracentrotus lividus*, this may be due to transfers of these pollutants during Food intake. The quality and quantity of food have a significant influence on gonadal growth, which determines the maturation of the gonads, so the increase in the metal content is due to the fact that the sea urchin assimilates more food, Maturity of the gonads [20]. Thus the rate of pollutants to raise characterizes the period of laying of the common sea urchin P. Individuals in which the accumulation of surrounding environmental elements toxic or not rise are important can be detrimental to the development of the species.

CONCLUSION

The main danger of bacteriological pollution to sea water is that of recent contamination with sewage that is rich in faecal matter. As a result, untreated sewage discharges pollute the coastline near the coastal towns of Oran; Which has the effect, in particular, of reducing the oxygen content of the water, of increasing the turbidity, of decreasing the growth of bacteria and algae and of aggravating the pollution by microorganisms [21].

Man, the final consumer of marine products and occupying the last link in the food chain, can at any time become a victim of it [22].

At the end of our research, the results obtained leave no doubt as to the reality of the bacteriological pollution of the coast of Oran and even the bay of Mostaganem.

On the other hand, the results obtained at the site of Ain franin show the high concentrations of the test organisms for all the samples, it was noted that the pathogenic organisms Salmonelles and Staphylococcus aureus were detected during this study. This confirms that this marine organism is a good bioindicator of bacterial pollution.

The results of the determination of heavy metals obtained in P. lividus and sea cucumber caught in Oran Bay and Mostaganem reveal a true relationship between marine pollution and their impact on humans through the food chain, which presents a real danger to long term. In order to limit the danger of human contamination, the distribution and fate of contaminants entering marine ecosystems should first be studied. Marine Pollution with all these forms represents a real danger of depopulation of the marine environment; As a result, a major threat to public health.

The determination of heavy metals shows that, in view of the previous results and by comparison with the values found in the literature, the four metals (Cd, Fer, Cu, Zn) are present in the gonads and with different concentrations. This observation reflects the resistance of these pollutants, which confirms that the common urchin *P. lividus* has the status of an excellent bioindicator of metallic pollution [23].

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