2011 3rd International Conference on Chemical, Biological and Environmental Engineering
IPCBEE vol.20 (2011) © (2011) IACSIT Press, Singapore

Survey the Health of Coral Reefs Communities among the Chabahar Island, Iran

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Abstract. Coral bleaching is rapidly developingas a major problem for the healyh of coral reefs worldwide. This study examined the effect of some ecological factors on coral reefs in Chabahar Bay.we measured the coral cover and the linear extention rates at 3 sites in 6 months before and after Monsoon. In order to estimate the loss and damage received by the coral colonies in the area, different methods were applied such as the Direct Observation method(via scuba-diving operation),Line Transect method, and the new method of Coral Watch(Aminirad,2007).The results of the studies revealed the fact of a decrease wthe water s transparency, as well as accumulation of a great deal of sediments in sea bed.A great deal deposits silted over the area, with a thickness up to 5 cm from the joining parts of the corals to the sea bed due to dredging operation, building a secondary breakwater and also diminishing the natural water ciculation in the area. After this event, the corals lost their symbiosis unicelloular algae living in their connecting parts to the sea bed and have turned into white color. There were no significant differences among different geographical areas within the reef tract(Upper, Middle and Lower). The studies made through the Line Transect and Coral Watch are also proving the existence of the pressure and appearing the unwanted agents in the area, which prevents the growth and developing the coral reefs.

Keywords: Chabahar Golf,Coral Reefs,Coral Bleaching, Coral Watch, Line transect, Zooxantellae

1. Introduction

The ecology of corl reef systems and changes in the community structure with respect to stress factors in the environment is one of the fundamental problems in environmentalanalysios(Morelock,2003).

Coral reefs are unique ecosystems in that they harbour an exceptional diversity of motile species.Many of these species have a close association with the coral communities which form the reef framework and contribute to its complex physical structure. A considerable number of studies have investigated the link between coral bleaching events and environmental factors. *Scleractinian* and *Octocorals* form endosymbiosis with single-celled dinoflagellate alge in the genus *symbiodinium*(commonly referred to as *Zooxanthellae*). This association is obligate in most coral species, with the coral host deriving a large proportion of its energy budget from the alge endosymbionts(Muscatine and porter 1977),although nutritional dependence on *Zooxanthellae* is generally lower in octocorals(Fabricius and Klumpp 1995). The *Zooxanthellae* also play a vital role in light-enhanced calcification of *Scleractinian* corals(Barnes and Chalker 1990;Moya etal 2006).In healthy corals , *Zooxanthellae* occur at extremely high densities of ≥10 cells cm of coral surface. During bleaching events, the symbiosis breaks down and *Zooxanthellae* are lost from coral tissues. Consequently, the coral starves unless *Zooxanthellae* densities are covered rapidly and / or the coral has the ability to meet its energy demands through hetrotrophy(Grottoli etal.2006).Siltation occurs not only due to disturbance of the benthic substratum by anthropogeneic activities such as the operation of fishing vessels but also due to natural causes such as monsoon winds. The Chabahar Bay along the southeast coast of Iran is influenced by both southwest and northwest monsoons.Apart from the monsoon

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effect causing siltation, mechanical damage to corals is also done by cyclones at times in this region(Pillia,1975).

Corals are limited by physical factors in the environment, but often exist in areas whereconditions are close to the limit.The reef is a sensitive indicator of environmental stress because of its response to the stress.

2. Material and Methods

Three coral reef stations have been stablished.The Chabahar Bay reefs were monitored as three Zones , Shahid Beheshti jetty,Shahid Kalantari jetty and Tis jetty (Fig1).These areas are located in degree of northen Longitude and 25˚17, 25˚18, 25˚30 degree of eastern latitude.Study areas investigated about one-fifth of the Chabahar Bey. Sites were studied six months (3 months before monsoon and 3 months after monsoon). Sites were investigated either by Direct Observation method (via Scuba-diving operation) and the new method of Coral Watch.Water depths in all sites were between 3 and 7 m.Analyses of data used the software Spss and Excell.

Fig. 1: Map showed the study area at Chabahar Bay

In the study , through diving operation, the above area was examinedonce a week, and all the changes has been indicated. Moreover, the coral colonies have been exercised from the matter of health condition by means of Coral Watch method.In this method , which is widespread during the recent years, and is going to be recognized as the simplest, most accurate and cheapest method of stimation, a colorful table consisting variable colors with different levels of measurements is used.The colonies to be studied are chosen in a completely random way.In order to find out the congestion level of the symbiotic unicellular algae living with corals,the brightest part of a coral bush is firstly selected, and then it is compared to the color ranked chart.Then the code of the relevant color matching the selected part of the coral is registere(Fig2,3,4).The same procedure will also be appied for the darkest part of the coral bush, and the relevant code would be recorded as well.The physical factors of the water such as the transparency, the temprerature, the salinity and dissolved oxygen were also recorded. In this paper it is focused on the asymmetrical pattern of monsoon-forced,surface gravity waves that impinge on reefs facing the Oman Sea and the Chabahar Bay. Metrological data relevant to monsoon forcing(i.e.air temperature,rainfall,hours of bright sunshine,day length and wind velocity and direction)were obtained for the Chabahar Bay .These data are available in hard copy only, and are currently being digitized. In s transparency, Secchi disc was used.The water temperature will also be order to determine of water recorded a digital thermometer taken to the water on the top of the corals.

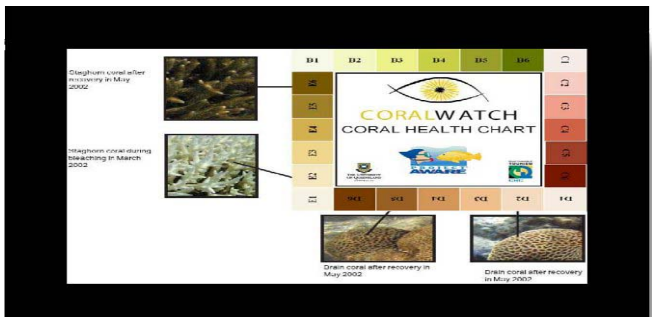

Fig. 2: Coral watch health chart

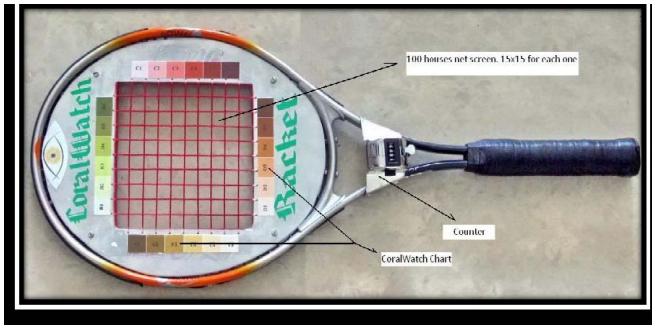

Fig. 3: Coral watch Racket

Fig. 4: CWR in order to counting abnormal parts on a colony

3. Results

The upwelling that occurs during the southwest monsoons provides a thermal refuge for marine life in Chabahar Bay during summer months when other parts of the region are exposed to maximum temperature.In upwelling areas, there are two peaks in sea water temperature during the year.One is in late May and one in October, rarely do these maxima exceed 30C.Temperatures during the upwelling season can fall to 18 C, but generally average 20C.. In contrast, non-upwelling area in the region have a single annual temperature maximum in June, July and Agust of 32-33C. The cool water brought to the surface by the upwelling also contain high level of nutrients and also contain very low levels of dissolved oxygen.The high nutrient conditions stimulate rapid growth of phytoplankton and seaweeds that reduces the amount of light reaching the corals and increases rates of bio-erosion, whereas the periodic anoxia . On the southern coast of the Gulf of Oman, upwelled water remains below a strong thermocline that in trun is pumped up and down by long –shore winds.In shallow water, this rapid pumping of the thermocline induces rapid temperature fluctuations of up to 8C in less than 2 hours.Corals appear unaffected by this rapid fluctuation and its coolingeffect probably serves to reduce the thermal stress, which otherwise could cause bleaching. In the meantime, the results of the surveys made on the water transparency are showing As you can see on figure 5 , the maximum level of transparency observed in Shahid Beheshti jetty was 164.16 cm , In Shahid Kalantari jetty was 169.16 cm and in Tis jetty was 200 cm depth.In this regard, the lowest rate for transparency was observed and indicate during the monsoon.The maximum level of transparency observed in

Shahid Beheshti jetty was 136.6 cm , In Shahid Kalantari jetty was 147.5 cm and in Tis jetty was 160.8 cm depth. The temperature as brought in figure 6 , shows that maximum temperature in monsoon was in Shaid Beheshti jetty 31.76C in Agust, and minimum temperature observed before monsoon in Shahid Kalantari jetty was23.2C in April.

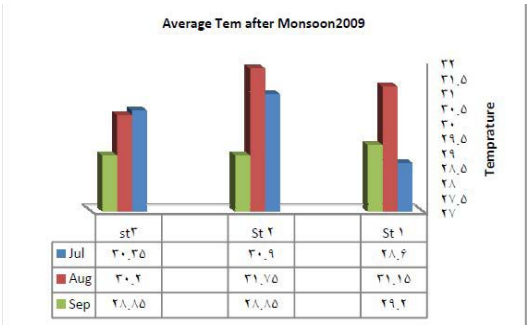

Fig. 6: Average Annual temperature in Monsoon

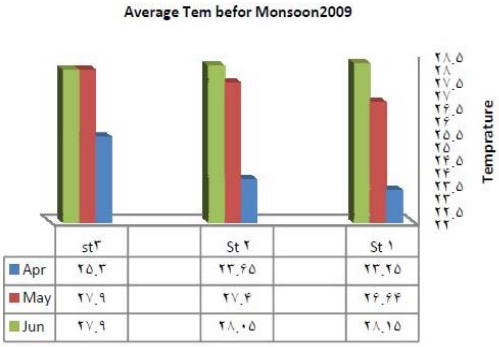

Fig. 5: Average Annual temperature before Monsoon

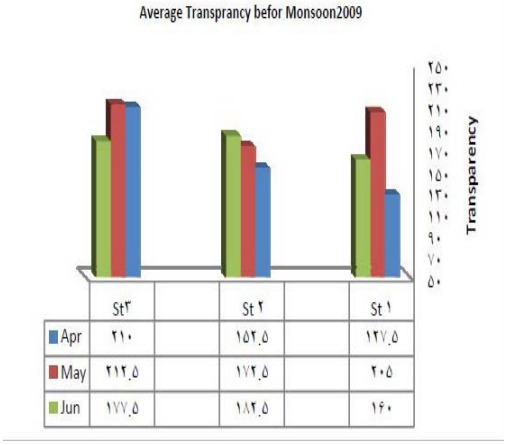

Fig. 8: Average Annual teransparency in Monsoon

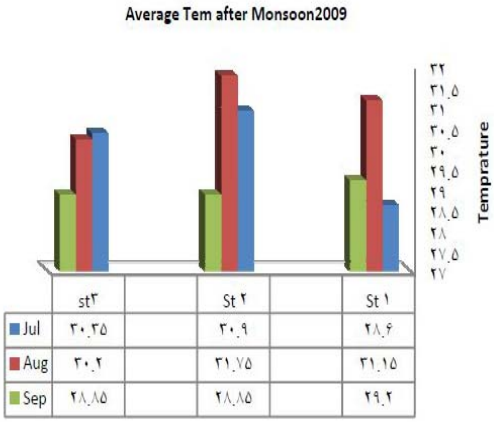

Fig. 7: Average Annual teransparency before Monsoon

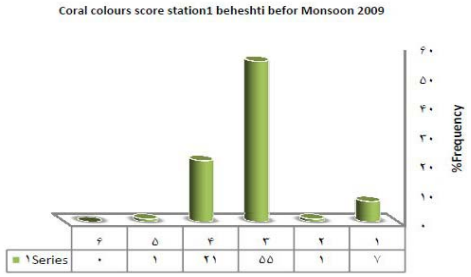

Fig. 10: Coral colours Score station 2 before Monsoon

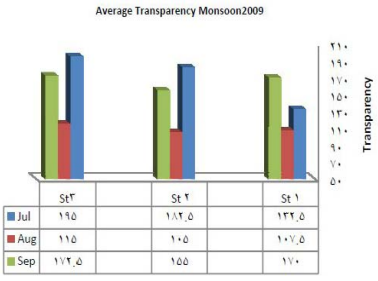

Fig. 9: Coral colours Score station 1 before Monsoon

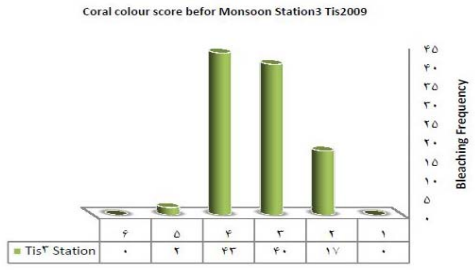

Fig. 12: Coral colours Score station 1 in Monsoon

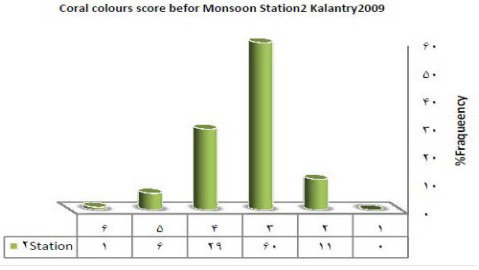

Fig. 11: Coral colours Score station 3 before Monsoon

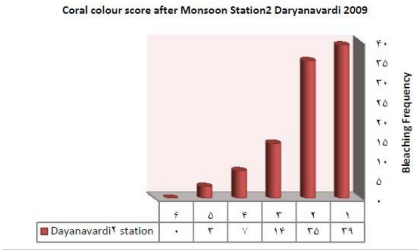

Fig. 14: Coral colours Score station 3 in Monsoon

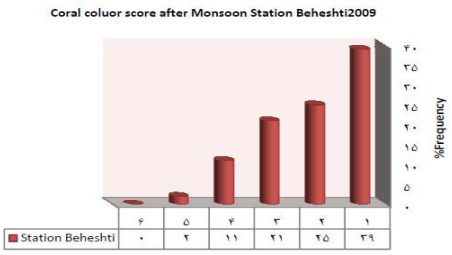

Fig. 13: Coral colours Score station 2 in Monsoon

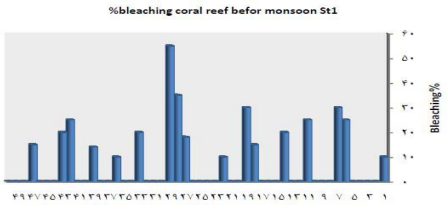

Fig. 16: Pecentage of Bleaching coral reefs in station 2 before Monsoon

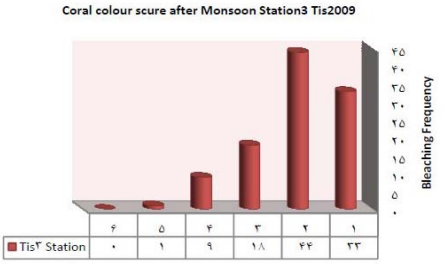

Fig. 15: Pecentage of Bleaching coral reefs in station 1 before Monsoon

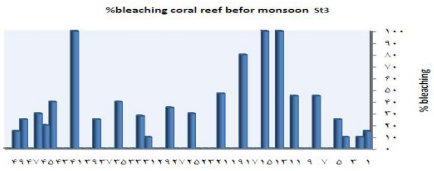

Fig. 18: Pecentage of Bleaching coral reefs in station 1 in Monsoon

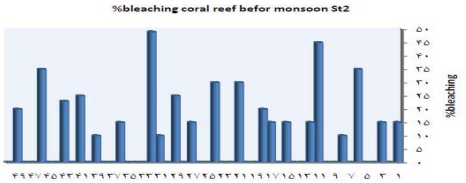

Fig. 17: Pecentage of Bleaching coral reefs in station 3 before Monsoon

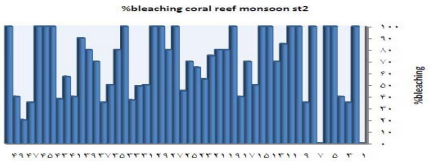

Fig. 20: Pecentage of Bleaching coral reefs in station 3 in Monsoon

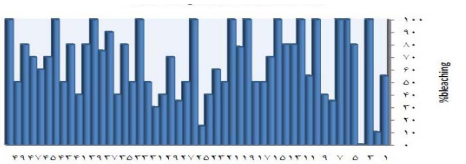

Fig. 19: Pecentage of Bleaching coral reefs in station 2 in Monsoon

4. Conclusion

From the studies result, the major abiotic fauna present on these areas was covered 39% of this life form. Coral present on these areas was hard coral 26.6% compared to Soft coral 10%, 5.5% of the areas covered by Dead Coral, 13.5% of the areas covered by algae, 1.3% of the areas covered by other fauna. Much of the Iranian coast in Gulf of Oman is sedimentary and expose, therefore unsuitable for coral growth [23]. Sediment and pollutant from land and coastal engineering activities resulting in water environment quality deterioration and coral reef damage in this areas. More and more sediments and pollutants come from port construction and breakwater barrier in Chabahar bay. The level of sedimentation has vigorously significant different between 2009 and the year before it. On 2002 a secondary breakwater was established between the Beheshti jetty and the area of growing coral reefs. During the year 2004, the coral reefs in that area faced quite a serious problem due to dredging operation took place in the area, and also the existence of a new breakwater. Concurrent with part construction 1n 2009 a relocation project has been started with a non- professional team that results research team mistakes in coral relocation such as mistake in election of site selection, mistake in bedding and fixing of coral bushes on their bed especially in Lipar area, so it has been resulted to damage coral reef in this area. Also over fishing and using of destructive fishing is caused the15% of Tis area covered by dead coral [2]. Clarifying factors including decline and damage of coral reef is the basis for maintaining ecosystem health, but continues to the subject of much debate and speculation [25].

Poor awareness of the problem and insufficient political will be a casual agent behind damage to coral reef and a threat to their future survival [26]. Strengthening integrated management is the only way to restore and improve Chabahar bay coral reef ecosystem. This area has special protection value for high biodiversity in the past as well as at present, and should be given more attention of management than before. If coral reefs are lost, many coastal population will lose their primary source of food, jobs, cultural heritage and long term prosperity. To conserve these natural treasures, we must reduce human impacts on coral reef by immediately controlling pollution reducing over fishing and increasing protection and sustainable use of our valuable coral reef resources [26].

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