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A New Report of Increase Abundance Ctenophore and Effect of Water Physicochemical Factors on Them in Iran

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Abstract: Ctenophore abundance in Doragh and Ghazaleh estuaries were studied. The Ctenophore were sampled from July 2005 to June 2006. The effects of temperature, salinity, turbidity, BOD5, NO_3, NO_2, PO_4, hardness and pH as water Physicochemical factors were investigated. *Pleurobrachia sp.* was alone jenus that observed in this study. High mean densities of ctenophore were obtained in November and the lowest mean densities were obtained in April. As a result *Pleurobrachia sp.* densities in Doragh creek were negatively correlated with salinity ($P<0.01$, $r=-0.59$) and temperature ($P<0.05$, $r=-0.49$) and *Pleurobrachia sp.* abundance in Ghazaleh creek were negatively correlated with temperature ($P<0.05$, $r=-0.43$).

Key words: *Pleurobrachia sp.* · Abundance · Water Physicochemical factors

INTRODUCTION

Gelatinous zooplankton are an important component of many marine food webs and are thought to be important predators on target species as well [1]. Through these studies there is a growing awareness of the importance of ctenophora, which has been found to be food source for some of fish species and other hand ctenophora typically feed on the same kinds of prey as do many either adult or larval fishes. Ctenophora also plays an extremely important role in the transfer of organic material from primary producers to predators via the food web. For this reason one of the determining factors of commercial fisheries is the production of ctenophora, the population fluctuations and composition of which directly affects fishes and other zooplanktons [2].

By the pulsed nature of their life cycles, gelatinous zooplankton come and go seasonally. Beyond that basic life cycle-driven seasonal change in numbers, several other kinds of events appear to be increasing the numbers of jellies present in some ecosystems. Over recent decades, man's expanding influence on the oceans has begun to cause real change and there is reason to think that in some regions, new blooms of ctenophora are occurring in response to some of the cumulative effects of these impacts [3]. The study of estuary ecosystems is important since human activities play an increasing role in altering these areas.

The issue is not simple and in most cases there are few data to support our perceptions. Although the zooplankton fauna of the Persian Gulf has been studied in some detail (Michel *et al.* [4-6]) the ctenophora have been poorly studied despite their potential importance to the estuaries of Persian Golf.

The first aim in this paper is description of the ctenophora abundance fluctuations in Doragh and Ghazaleh estuaries. The second aim in this paper is what are correlation between abundance of ctenophora and water Physicochemical factors? This paper attempts to trace some reasons in the distribution and fluctuation of ctonophora in these semienclosed marine systems.

MATERIALS AND METHODS

The area mentioned in this study contains four sampling station that to cover two sectors of Mosa estuary (Fig.1) such as western and Eastern estuary from July 2005 to June 2006. The samples were collected Monthly using 300 ìm mesh size plankton net in oblique tow. The net was washed with seawater to collect

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Fig. 1: Map of Mosa creek, 1. Doragh creek, 2. Ghazaleh Creek.

the plankton into a jar. The ctenophora were preserved in 5 % formaldehyde (buffered by sodium glycerophosphate) and were identified to jenus and were counted. The numbers of organisms in each fraction were converted to densities number of individuals m-3. Physical parameters like pH and temperature of the samples were determined on the spot of collection of samples.Chemical parameters like dissolved oxygen, biological oxygen demand, salinity, nitrat, nitrit, hardness, turbidity, phosphate content were analyzed in the laboratory by standard methods as prescribed by National Institute of Oceanography, Goa for seawater analysis and method [7]. Associations between environmental variables were assessed by calculating Spearman's rank correlation coefficient and Non parametric test (Kolmogrov-Smirnov) was utilized to test for normality in the residuals. Comparisons between locations (Doragh and Ghazale estuaries) were performed by using one-way Anova.

RESULTS

Ctenophora were identified only to jenus in this study. *Pleurobrachia sp.* was alone jenus that was observed in this study. High densities of ctenophora were obtained in November and December 2005 with peak abundance in November. Lowest abundance was observed in April 2006. The Fig. 2 showed the total abundance fluctuations throughout the study of the Ctenophora. Temperature readings ranged between 14.9°C and 31.5°C during the months. Minimum readings were recorded on November and maximum reading were recorded on May (Fig.3). Salinity readings ranged between 47.3 and 33.7mg/l during the months. Minimum readings were recorded on December and maximum reading were recorded on Agust (Fig.4). The average salinity was higher in the dry season, most likely because rainwater runoff from the coastal areas into the estuary lowered salinity during the rainy season.

Kolmogrov-Smirnov test showed that abundance distribution of ctenophore was normal. One-way Anova test found that there is no significant differences between 4 station in ctenophore abundance when comparing Doragh and Ghazaleh estuaries during the months($p>0.05$). The results of correlation analysis between abundance of ctenophora and chemical and physical factors of water in Doragh creek determined that ctenophore abundance correlated negatively with salinity (Spearman rank correlationr, $r = -0.59$, $p < 0.01$) (Fig. 4) and temperature ($r=-0.49, p<0.05$) (Fig.5) of water. And also ctenophore abundance correlated negatively with temperature (Spearman rank correlation $r=-0.43$, $p < 0.05$) (Fig. 3) in Ghazaleh creek.

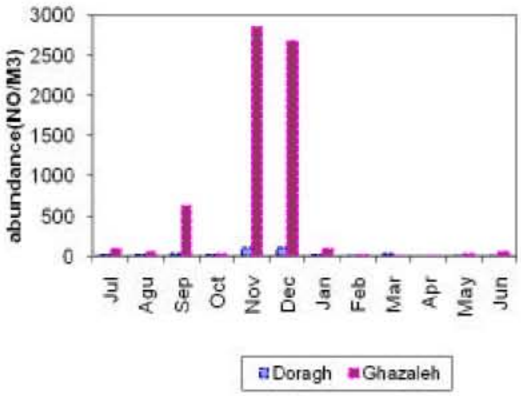

Fig. 2: Abundance of Ctenophore in Doragh and Ghazaleh estuaries between September 2005 and Aguest 2006

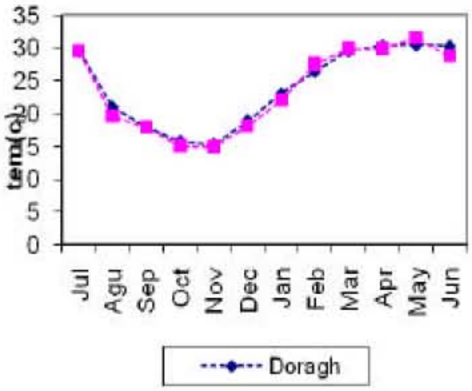

Fig. 3: Changes in the mean temperature In Doragh and Ghazaleh estuaries in the study. and Ghazaleh estuaries in the study

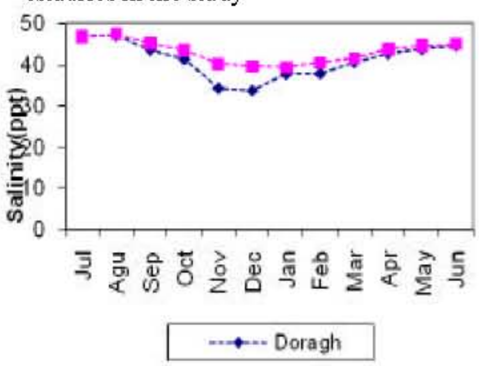

Fig. 4: Changes in the mean salinity In Doragh

DISCUSSION

In the present study *Pleurobrachia sp*. was the main representive jenus. Comparison of the fauna in the late 1990s [8] with this study shows no major change in species composition. Increases in biomass were therefore

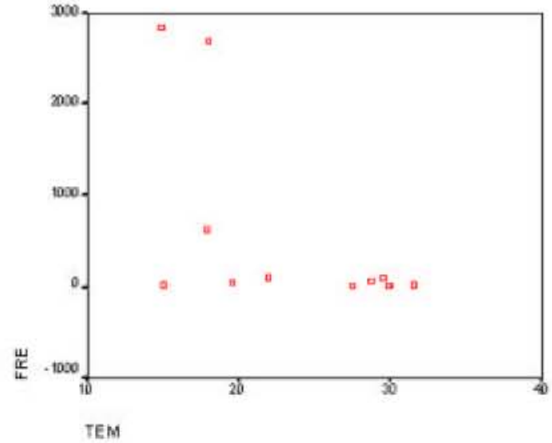

Fig. 5: Relationship between ctenophore abundance and tempreture in Ghazaleh estuary

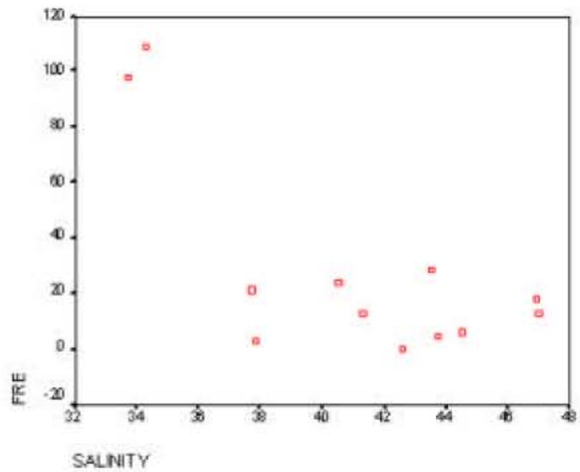

Fig. 6: Relationship between ctenophore abundance and salinity in Doragh estuary

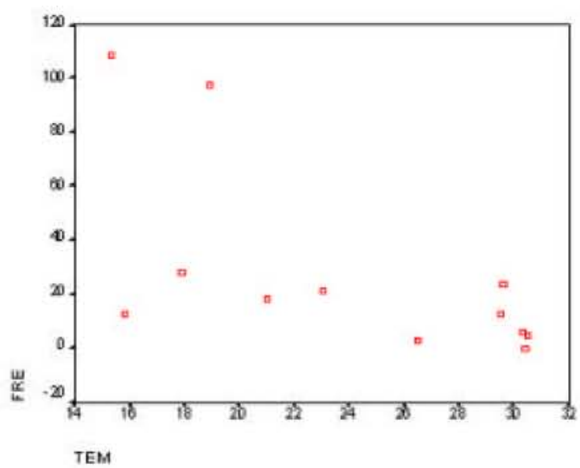

Fig. 7: Relationship between ctenophore abundance and tempreture in Doragh estuary

assumed to be intrinsic to the ecosystem rather than due to invasion by a new species. In this study Abundance of *Pleurobrachia sp.* was low in summer, highest value was recorded 2847 ind/m^3 in winter. Values dropped to zero in April, but in Autumn a repopulation occured. The abundance of total ctenophora was highest during the late winter months when the water salinity and temperatures were at minimum levels. Overall, the abundance of ctenophore in the Ghazaleh estuary was higher than in the Doragh.

The disappearance in summer can be explained by predation or any other factor leading to mortality. We know that ctenophores of the genus Beroe, some scyphozoan medusae, the pelagic polychaete Tomopteris and some species of fish prey on *Pleurobrachia* [9-12]. Scyphomedusae shows its maximal growth period in summer which may also lead to high mortality in *Pleurobrachia* sp. Larvae [13]. The second reason for this was food limitation which seems to be improbable due to low ctenophore abundance in summer, Greve [12] described how young ctenophores are destroyed by adult copepods [12]. This is important because the seasonal plankton cycle in this estuaries exhibits a pronounced copepod peak in summer [14]. Changes of temperature and salinity were good within the ecophysiologic range of this species [15]. Pagès [16] showed that it difficult to put together enough data to even document the apparent recent increase in carnivorous jellies and there is certainly too little data yet to understand the nature or regularity of these apparent fluctuations [16].

In the Kiel Bight variations in the ctenophore stock are primarily caused by advection and do not reflect the biological population cycle of this species [17]. Low abundance in summer is caused by the advection of high salinity from the Persian Gulf. Dauvin [18] showed that the semi-diurnal tidal current was the dominant factor in determining the short-term temporal changes in the community in terms of density and species composition so that zooplankton patches displayed oscillating motion in relation to tidal advection. Although a few species (e.g. *Pleurobrachia sp.*) exhibited higher densities around low tide [18].

Physical conditions of the environment that accompanied it caused differences in the abundances of ctenophore to be observed in this estuaries. Increases in Ctenophora populations in spring that will be detailed in this paper include some cases where native species have increased in local or regional ecosystems. This zone is considered as important economic zone for developing country as Iran where there is a huge petrochemical industry. Pelagic communities that are stressed have reduced species diversity and population sizes of some species are greatly increased which causes periodic pulses in the zooplankton community [19]. Because Zooplankton organisms are considered to be the ecological indicators or bioindicators of water bodies. They can provide information on trends in environmental conditions and how these conditions affect the indicator itself [2].

The stability of the environment is dependent on external stress. A growing number of studies in the tropics have utilized coastal jellies zooplankton communities for water quality assessment and as indices of eutrophication [4,20-22]. Pollution, eutrophication and many anthropogenic alterations of the natural environment have vastly altered in this creeks and Persian Gulf in the past 50 years [14]. As parts of the oceans become increasingly disturbed and overfished, there is some evidence that energy that previously went into production of fishes may be switched over to the production of pelagic cnidaria or ctenophora [23].

Commercial fishing efforts continue to remove top-predator fishes throughout the world oceans [24] and it seems reasonable to watch concomitant trends in jellies zooplankton population. Although cnidaria and ctenophora are low on the phylogenetic tree, they generally feed high on marine food chains, directly competing in many cases with fishes for food. Massive removals of fishes from ecosystems might be expected to open up food resources for gelatinous predators, which seems in some cases to be what has happened [1,25]. This system provides the most graphic example to date of a highly productive ecosystem that has converted from supporting a number of valuable commercial fisheries to having few fishes and high numbers of 'jellyfishes'–medusae and ctenophores. It is unfortunate that we have so little population and ecological data about medusae and ctenophores in the field that we usually cannot presently distinguish between natural fluctuations and long term, possibly irreversible, change. As a result the spatial distrubution of the ctonophora is controlled to a large extent by the physical, biologycal factors of water and human activities in the seas and ctenophore abundance was correlated more to salinity and temperature levels than the other physical factors.

Estuaries are strongly influenced by temporally variable events occurringat their riverine and oceanic boundaries as well as those impinging on the water surface. For example, the river system is affected by variations in precipitation and the coastal ocean by variations in wind patterns [26]. Estuarine responses to this temporal variability are complex and often difficult to understand simply from field observations. especially in a large estuary like these with geographically and morphologically distinct sub-basins.

Suggestions for future studies include a more comparative study of biomass and abundance variations, a closer examination of jellies zooplankton and an extended study of the effect the growing number of developments along the shore have on the jellies zooplankton and hence, the rest of the community in the area. Therefore more effort should be made in the near future to evaluate the existing jellies zooplankton data of Persian Gulf in relation to physical and meteorological changes.

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