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An ecologic and taxonomic study on copepod Communities in Anzali Wetland and Estuarine Region of the Caspian Sea

Leila Lebaschi*[1], Maryam Fallahi[2] and Maryam Shapoori[3]

[1]*Islamic Azad University, Science & Research Branch, Tehran, Iran*
[2]*Inland Water Aquaculture institute, Iranian Fisheries Research Organization (IFRO), Anzali, Iran*
[3]*Department of Natural Resources, Savadkooh Branch, Islamic Azad University, Savadkooh, Iran*

ABSTRACT

Many specious of Caspian Sea fishes immigrate to Anzali wetland for reproduction and also some larvae spend the primary levels of their growth in this wetland. Because of that, Zooplankton has an important role in nutrition in Anzali wetland. Therefore, in this research, the identification of copepods (a major group of zooplankton) was studied in Anzali wetland and estuarine region of the Caspian Sea. The sampling was done from March 2011 to September 2011 at five stations including one station in the Caspian Sea, one station in estuarine region and three stations in Anzali wetland which contains Nahang roga, Sorkhankol and west wetland entry (Abkenar entrance) for comparison of the density of zooplankton in different stations with regard to salinity variation. Six geneses of copepods were identified in this study and also, the density of copepods in Anzali wetland was more than the other regions (significantly in August with 102.77 in per liter) among three regions of the Caspian Sea, Estuary and Wetland, respectively. Physicochemical characteristics such as oxygen, temperature, pH, electrical conductivity (EC) and transparency were measured and relations between densities of copepods with these parameters were identified. Our main conclusions are that physicochemical factors may be responsible for changes on zooplankton community.

Key words: Zooplankton, Physicochemical characteristics, Wetland, Estuary

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INTRODUCTION

Wetlands are among the most important ecosystems on earth. They are considered unique because of their hydrology and their role as ecotones between terrestrial and aquatic ecosystems [1]. These systems are known worldwide as biodiversity refuges and are among the most biologically diverse in the world; in contrast there is huge lake of knowledge regarding wetland biodiversity patterns [2].

Predation by planktivorous fishes plays a key role in structuring the zooplankton community, especially with respect to the size structure, since prey selection is typically size dependent. Thus, when fish predation pressure increases, the largest zooplankters are removed from the community allowing the smallest ones to dominate [3, 4, 5]. In shallow waters, fish predation usually exerts a strong influence on the size structure but also on the taxonomic composition of the zooplankton [6, 7,8]. Macro invertebrate predation may also significantly affect the zooplankton species composition and size distribution, especially when planktivorous fishes are reduced or removed [9, 10, 11]. However, in contrast with fish predation, a decrease of the small zooplankters will be expected when the macro invertebrate predation pressure increases [12,13].In addition to predation, the zooplankton community structure also depends on food abundance and/or quality and, in turn, on competition for this food [14,15,16]. Competition for food is also size-dependent since, under food limitation, the largest species or organisms are usually better competitors and the smallest ones are excluded [3,17,18]. Competitive interactions for food could be reduced if there

is resource partitioning among the coexisting species or, in the case of competitive exclusion, among different development stages of the same species [4, 19].

The Anzali Wetland is registered on the Ramsar Convention Accord in 1975, and it is located on the south-east coast of the Caspian Sea and in northern Iran. This wetland is one of the most ecologically important wetlands among the internationally preserved wetlands in Iran, according to this convention. [20]. The Anzali wetland complex is a large and freshwater lagoon which is fed by several rivers and separated from the Caspian Sea by a dune system. This wetland supports extensive reed beds and it is considered as a valuable habitat for various emerged, submerged and floating plants species. Besides, it is an important ecosystem for nursery habitat and spawning of 49 fish species [21] and a wide variety of breeding and wintering area for 77 bird species [22]. The results of some researches showed that some none biological parameters such as temperature, pH, transparency and oxygen have Influence on abundance of zooplankton [23].

MATERIALS AND METHODS

The sampling was done during seven months with 45-day interval between each sample at five stations. Three stations in Anzali wetland including Nahang roga, Sorkhankol and west wetland entry (Abkenar entrance), one station in estuarine region and the last station was selected in the Caspian Sea. The geographical locations of stations are shown in Table 1.

Table 1: Locations and types of the systems sampled

Sampling site	Name	Type of system	Longitude	Latitude
1	Sea	Sea	49°,27’,31”	37°,29’,05”
2	Estuary	Estuary	49°,27’,43”	37°,28’,43”
3	Nahang roga	Wetland	49°,27’,55”	37°,27’,50”
4	Abkenar entrance	Wetland	49°,24’,44”	37°,26’,23”
5	Sorkhankol	Wetland	49°,27’,06”	37°,25’,06”

Zooplankton was sampled with a 30-µm mesh plankton net hauled from the bottom. Zooplankton was fixed with 4% formalin.15 samples with regard to five stations and three repeats in each station were transferred to laboratory. The samples were analyzed both qualitatively and quantitatively in the laboratory and the result data was analyzed statistically.

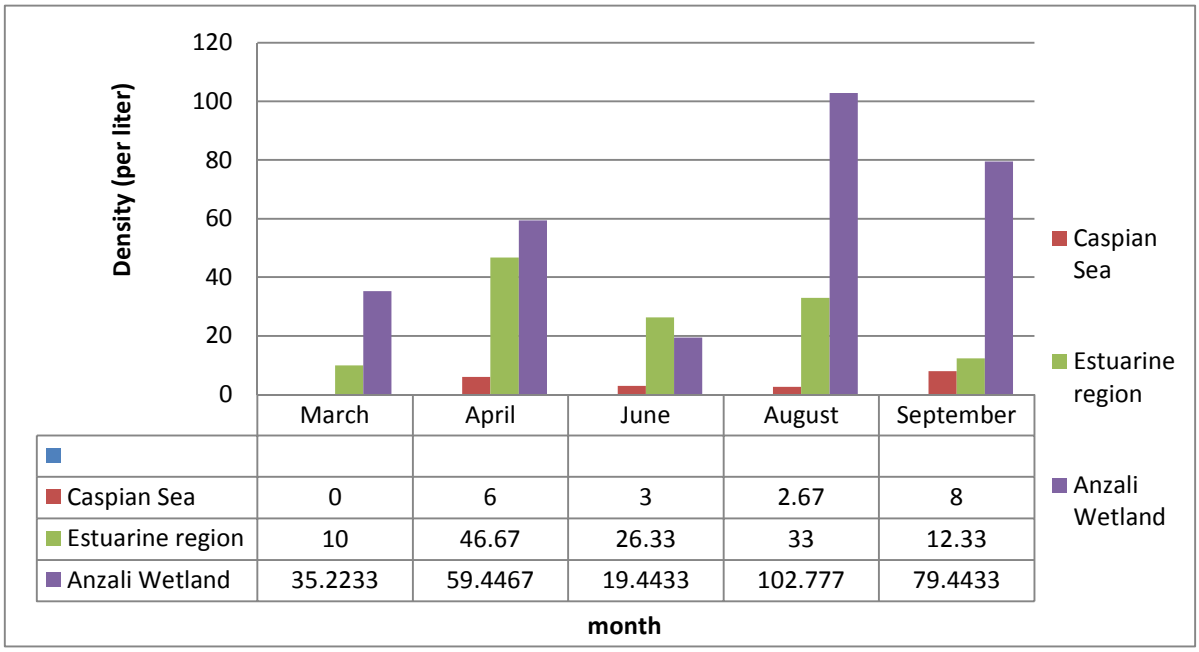
RESULTS

A total of two order, two family and six genera which belong to copepods were determined from five stations. Some of the genera were significantly seen in Anzali Wetland region such as Acanthocyclops sp. and Thermocyclops sp. The geneses that were only seen in Anzali Wetland and Estuarine region were Cyclops sp. and Mesocyclops sp. and significant genus in Caspian Sea and Estuarine region was Acartia sp. (Table 2).

Table 2: List of genera of copepods found in Caspian Sea, Estuarine region and Anzali Wetland (The (+) shows presence and (–) shows absence of copepods)

Phylum	Class	Order	Family	Genus	The locations of stations		
					Caspian Sea	Estuarine region	Anzali Wetland
Arthropoda	Copepoda	Cyclopoida	Cyclopoidae	Mesocyclops	-	+	+
				Acanthocyclops	-	-	+
				Cyclops	-	+	+
				Thermocyclops	-	-	+
				unknown	-	+	+
		Calanoida	Calanoidae	Acartia	+	+	-
		Cyclopoida/ Calanoida	Cyclopoidae/ Calanoidae	Naplius	+	+	+

The density of copepods among three regions (the Caspian Sea, Estuarine region and Anzali wetland) are shown in Figure 1.



	March	April	June	August	September
Caspian Sea	0	6	3	2.67	8
Estuarine region	10	46.67	26.33	33	12.33
Anzali Wetland	35.2233	59.4467	19.4433	102.777	79.4433

Fig 1: The comparison of copepods density in three regions (the Caspian Sea, Estuarine region and Anzali wetland)

The physiochemical factors such as oxygen, temperature, pH, electrical conductivity (EC) and transparency were estimated.

Table 3- Relation between copepods and physicochemical parameters

copepods (N/lit)	Factors
C=67.129-0.197 T r = - 0.316	Transparency (cm)
C= -846.97+107.69 pH r = 0.711	pH
C= -6.735+5.974 DO r = 0.209	Dissolved Oxygen (DO) (mg/lit)
C=74.711-4.387 EC r = -0.409	Electrical conductivity (EC) (mS/cm)
C=35.81+0.529T (air) r = 0.03	Temperature (Air) (°C)
C= -7.016+2.277T (water) r = 0.168	Temperature (Water) (°C)

DISCUSSION

According to the achieved results average of copepods density in the Caspian Sea was 3.93 in per liter, in Estuarine region was 25.66 in per liter and in Anzali wetland was 59.26 in per liter (Fig -1).Obviously, the most density of copepods was seen in Anzali wetland region that the main reason of this result could have been proper salinity for copepods growth in this region. On the other hand, stable and calm environment in wetland and also presence of nutrition rather than other studied regions, could increase the numbers of zooplankton in Anzali wetland. Referring to Fig-1 the density of copepods were more in August than the other months of studying. Basically, the density of copepods class was mostly in highest level in previous researches in July and August because of temperature increasing in these months. Generally, the range of temperature in these months was always suitable for copepods growing in previous scientific researches. Furthermore, the relation between density of copepods with physiochemical factors such as oxygen, temperature and pH were direct and with electrical conductivity (EC) and transparency were inverted. Pallavi and Preeti have also reported Plankton abundance and taxonomic diversity depend Upon the supply of nutrients in natural waters. Temperature directly affects Plankton population. During summer the temperature is high and the plankton Population is also reach to the maximum and when the temperature is low during winter the plankton population is also reach to the minimum [24]. On the whole, the considerable abundance which has seen in Anzali region shows the acceptable conditions in this area such as stable and calm water current, presence of food, etc. These conditions are generally suitable for breeding and growing of zooplankton.

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