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Zooplanktons and Their Seasonal Variations of Kufa River /Euphrates

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Summary:

Four sites were selected in Kufa River for Zooplankton sampling, the sampling was monthly (November 2011 – December 2012), samples were taken by zooplankton net (50 cm in diameter). The net was pulled at medium speed in each sample at the volume of water which passed through the net was estimated to be 0.24 m^3.

Ninety nine taxa of forty six genera belonging to three groups of zooplankton were identified, the Rotifera was the predominant group among the zooplankton, which comprised (41 %) included 13families and 56 taxa, then Cladocera (36%) included 6families and 33taxa, finally Copepoda (23%) included 4families and 10taxa, some biodiversity indexes were calculated too.

KEY WORDS: Rotifera, Copepoda, Cladocera, zooplankton, freshwater, Kufa River

Introduction

Freshwater zooplankton consist mainly from Cladocera, Copepoda and Rotifera (Forró *et al*.,2008).Most zooplankton are microscopic animals (water invertebrates) floating or drifting. Zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter(Park and Shin, 2007). They provide a direct link between primary producers and higher trophic levels such as fish. Nearly all fish depend on zooplankton for food during their larval phases, and some fish continue to eat zooplankton in their entire lives (Madin *et al*., 2001). The aim of this study comes to investigation a check list of zooplankton in Al-Kufa River because there was not study about in this river.

The Study Area

In Iraq, Euphrates River is divided into two main channels, Shatt Al-Hindiya and Shatt Al-Hilla. At Al-Kifl city, Shatt Al-Hindiya is subdivided into two parts: Al-Abassia and Al-Kufa river, the last one extends from Al-Kifl city via Al-Najaf province to Al-Diwania city. The water level in this river undergoes large fluctuations, there are domestic, municipal wastewater and agriculture drainage discharged to the river; in addition to the industrial wastes that come from: the industrial region in Al-Najaf city, all of above have affecting on aquatic organisms. (Arab,2012) . For the purpose of this study,(4) stations have been chosen (Figure 1).

Methodology:

Sample were collected monthly (November 2011 to December 2012) during the morning hours(8-12). For zooplankton studies, plankton net of 50cm diameter and 55 µm mesh size was used. The net was towed behind a boat for10min, at speed (10m/min).The samples were fixed immediately with 4% formalin. As much as possible, identification of zooplankton was depend on many references (Pontin, 1978; Jordi, 2000; Smith,2001; & Thorp and Covich, 2010).

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Results and Discussion

Ninety nine taxa of zooplankton were identified (table:1), *Colurella adriatica, Polyarthra dolichoptera, Leacne luna, Keratella cochlearis*, belonging to (Rotifera); *Bosmina longirostris, Bosmina coregoni* belonging to (Cladocera); and *Cyclop* belonging to (Copepoda) recorded with high frequencies arrived stability degree in the environment of Euphrates River commensurate with the precedent Iraqi studies(Al-Lami, *et al*.,1999; and Rabee,2010), they recorded high frequencies for these species in Iraqi environment. The number of taxa recorded during the study period are different from those who recorded in many Iraqi studies of various waters, such as Al Namrawi(2002) recorded 69 taxa in Euphrates River at the Qadisiya Dam; Rabee(2010) recorded 52 taxa in AL-Tharthar-Euphrates canal and Al Doori(2012) recorded 22 taxa in the artificial lake of Madenat Al-Alaab at Baghdad.

The differences in the number of taxa due to differences in the taxonomic aspects of relating to non-diagnosis of some taxonomic levels of genera and species or differences in environmental conditions and the nature of the studied ecosystems. The size of the mesh of the net played a large role in determining the quality and quantity of zooplankton, as pointed (Salman *et al.,* 1990). In this study, Cladocera represents by 6 families, Bosminidae was mainly dominated. While Copepoda represents by 4 families, Cyclopidae was mainly dominated and Rotifera represents by 13 families, Synchaetidae was mainly dominated. It seems that, the carrying capacity of these families to different environmental conditions at the existing stations helped to sovereignty (figures 2, 3, and 4).

The results, also showed that Rotifera constituted a large proportion of zooplankton in the study area(Figure: 5 and 6) due to possess distinct attributes such as high ability to reproduce and repeat parthenogenesis to its members, small size and the great diversity of feeding (Sampaio *et al*., 2002). However the increase in the density of rotifers in summer corresponds to decrease in water level that concentrated rotifers in shallow waters, high temperature and intensity of sunlight during summer are some of the limiting factors that have been correlated with the growth and abundance of rotifers (Schroder and Schutt2005), further, because of the rise in abundance of phytoplankton as noted Mohammed, (2012)in Kufa river, creates an ideal habitat for growth of the rotifers (Anna and Natalia 2009), Rotifera decline in winter during extreme environmental conditions of winter, the rotifers are known to undergo diapauses ,this results agreed with Al-Doori (2012).

Cladocera was second group in Kufa river, which comprised 36 % of zooplankton (Figure: 5 and 6). The highest densities of Cladocera recorded in the study were during winter months, and there was a significant decrease during summer. These changes in the density may be linked with difference occurring in water temperature during the months, as explained (Gordo *et al*., 1994) the temperature affect significantly in embryos and the level of proliferation of Cladocera, and as explained by the study(Mangalo and Akbar, 1988) the number of Cladocera increase in the water with high concentrations of oxygen in winter.The results showed that Copepoda comprised 23% of zooplankton (figure: 5 and 6). The appearance of this group and its disappearance depends on many environmental factors which can adapt itself to different environmental conditions such as high or low temperature or lack of food, their ability to select prey, avoiding contaminated food (Gretchen *et al*.,2006), also copepodid stages and adults are to undergo diapauses and this also explains the disappearance in some areas or months. This is in agreement with the results Rabee,(2010) and Al-Doori,(2012).

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Figure1: Map of represents study stations on Al-Kufa river. (Source Google earth).

Shannon index represented that summer had diversity more than winter, and station three was highest diversity, while station two was lowest diversity in winter season (figure: 7). Station three was more richness than other stations especially during spring and summer, while station one recorded lowest richness during winter comparative with others (figure: 8)

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Table(1):Shows that the taxa of zooplankton detected at river stations during the study period.

Group	Family	Taxa	Stations of study			
			St.1	St.2	St.3	St.4
Cladocera	Bosminidae	*Bosmina goregoni*	+	+	+	+
		Bosmina longirostris	+	+	+	+
		Bosmina sp.	-	-	+	-
	Chydoridae	*Alona costata*	+	-	+	-
		Alona guttata	+	+	+	+
		Alona monocanthar	+	-	-	-
		Alona rectangular	+	+	+	+
		Alona sp.	+	+	-	-
		Camptocercus rectirostris	+	+	+	+
		Camptocercus sp.	-	+	-	-
		Chydorus sp.	+	-	-	+
		Chydorus sphaericus	+	+	+	+
		Graptoleberis testudinaria	-	-	+	+
		Leydigia acanthocercoides	-	-	+	-
		Pleuroxus sp.	+	-	+	+
		Pleuroxus striatus	-	-	+	-
	Daphniidae	*Ceriodaphnia sp.*	+	+	+	+
		Ceriodaphnia reticulata	+	+	+	+
		Daphnia	-	+	-	-
		Daphnia laevis	+	-	-	-
		Daphnia longiremis	-	-	+	-
		Daphnia longispina	-	-	-	+
		Daphnia pulex	+	+	-	+
		Daphnia similis	-	+	-	-
		Simocephalus	+	-	-	-
		Simocephalus expinosus	+	+	+	+
		Simocephalus vetulus	+	+	+	+
	Hyocryptidae	*Hyocryptus sordidus*	+	+	+	+
	Macrothricidae	*Macrothrix hirsuticornis*	-	-	+	-
	Sididae	*Macrothrix laticornis*	+	+	-	+
		Macrothrix rosea	+	-	+	-
		Diaphanosoma brachyurum	+	+	+	+
		Latonopsis occidentalis	-	+	+	+
Copepoda	Canthocamptidae	*Attbeyella sp.*	+	+	+	+
		Bryocamptus sp.	-	-	-	+
	Centropagidae	*Limnocalanus sp.*	+	-	-	-
	Cyclopidae	*Cyclops sp.*	+	+	+	+
		Cyclops strenuous	+	+	+	+
		Eucyclops sp.	-	-	+	-
		Halicyclops	+	+	-	+
		Macrocyclops sp.	+	+	+	+
	Diaptomidae	*Diaptomus sp.*	+	+	+	+
		Harpacticoid genus	+	+	+	-
		Nauplius	+	+	+	-
		Copepodite	+	+	+	+

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Table(1) continued .

Group	Family	Taxa	Stations of study			
			st.1	St.2	St.3	St.4
Rotifera	Asplanchnidae	*Asplanchna periodontal*	+	-	-	-
	Brachionidae	*Brachionus angularis*	+	-	-	+
		Brachionus calyciflorus	+	+	+	+
		Brachionus falcatus	+	+	-	-
		Brachionus havanaensis	+	+	+	+
		Brachionus plicatilis	+	+	+	+
		Brachionus qudridentata	-	+	-	-
		Brachionus sp.	+	-	+	+
		Kellicottia longispina	-	-	-	+
		keratella cochlaeris	+	+	+	+
		Keratella quadrata	+	+	+	-
		Keratella serrulata	-	+	-	+
		Keratella testudo	+	+	+	+
		Keratella tropica	-	-	+	-
		Keratella valga	+	+	+	+
		Manfredium eudactytotum	-	-	+	+
		Notholca squamula	+	-	+	-
		Platyias quadricornis	+	-	-	-
	Colurellidae	*Colurella adriactica*	+	+	+	+
		Colurella obtuse	+	+	+	+
		Colurella uncinata	-	+	-	+
		Lepadella astacicola	+	-	-	-
		Lepadella ovalis	+	-	-	-
		Lepadella patella	+	+	+	+
	Euchlanidae	*Euchlanis deflexa*	+	-	+	+
		Euchlanis dilatata	+	+	+	-
		Euchlanis pyriformis	-	-	+	-
		Euchlanis sp.	-	-	-	+
		Euchlanis triquetra	-	+	-	-
	Filiniidae	*Filinia longiseta*	+	-	-	-
		Filinia passa	+	-	-	-
	Hexarthridae	*Hexarthra mira*	+	-	-	-
	Lecanidae	*Lecane luna*	+	-	-	+
		Monostyla bulla	+	+	+	+
		Monostyla closterocerca	+	+	+	+
		Monostyla lunaris	+	+	+	+
		Monostyla quadridentata	-	+	-	-
		Monostyla sp.	+	+	+	+
	Notommatidae	*Cephalodella exigua*	-	+	-	+
		Cephalodella gibba	+	+	+	-
		Cephalodella megalocephala	+	-	-	+
		Cephalodella sp.	+	+	+	+
		Monommata grandis	+	-	+	-
	Philodinidae	*Philodina roseola*	+	+	+	+
	Proalidae	*Proales sp.*	-	+	-	-
	Synchaetidae	*Polyarthra dolichoptera*	+	+	+	+
		Polyarthra vulgaris	+	+	+	+
		Synchaeta	+	+	+	+
		Synchaeta oblonga	-	-	+	-
	Trichocercidae	*Trichocerca elongata*	+	+	+	+
		Trichocerca longiseta	+	-	-	+
		Trichocerca porcellus	+	+	+	+
		Trichocerca pusilla	+	+	-	-
		Trichocerca rousseleti	-	-	+	-
	Trichotriidae	*Macrochaetus subqadratus*	+	-	-	-
		Trichotria tetractis	+	+	+	+
		rotifera unknown	-	+	+	-

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Figure 2:Numberof individual/Lof each family in group of Cladocera

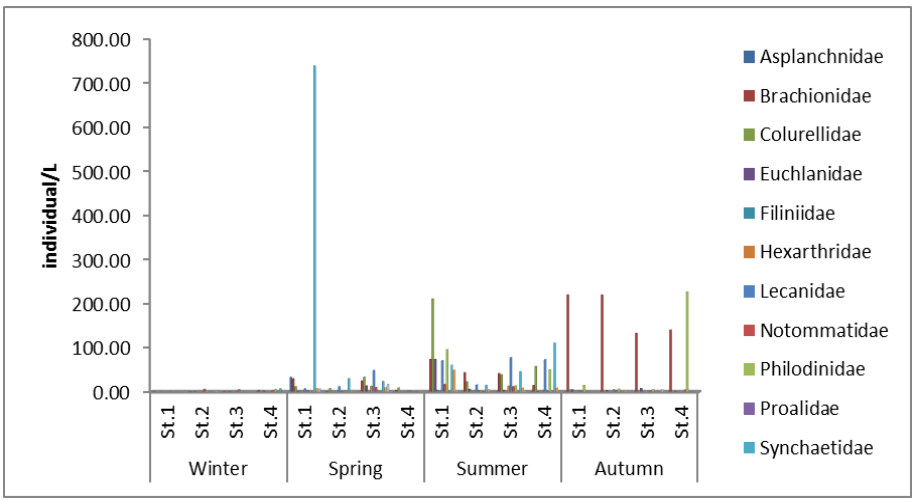

Figure 3: Number of individual /L of each family in group of Copepoda.

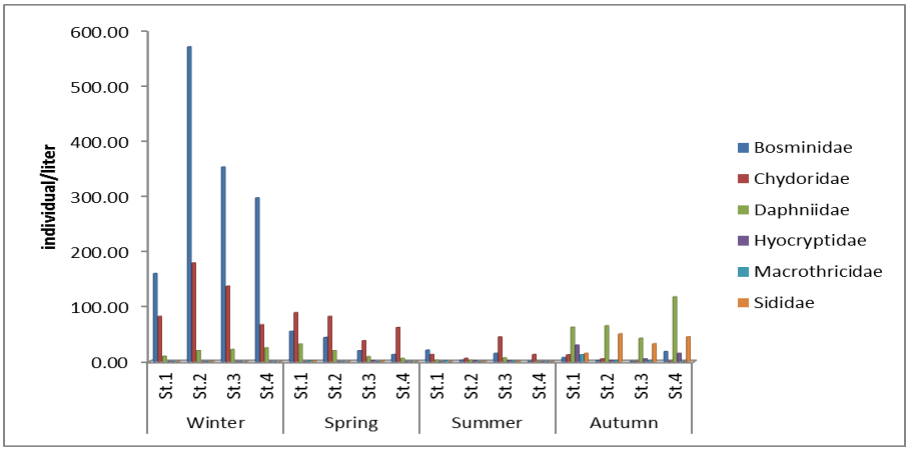

Figure 4: Number of individual /L of each family in group of Rotifera

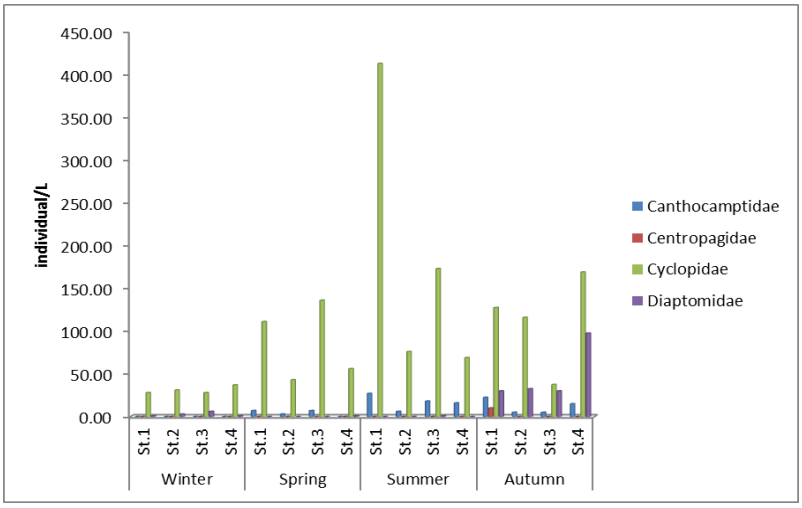

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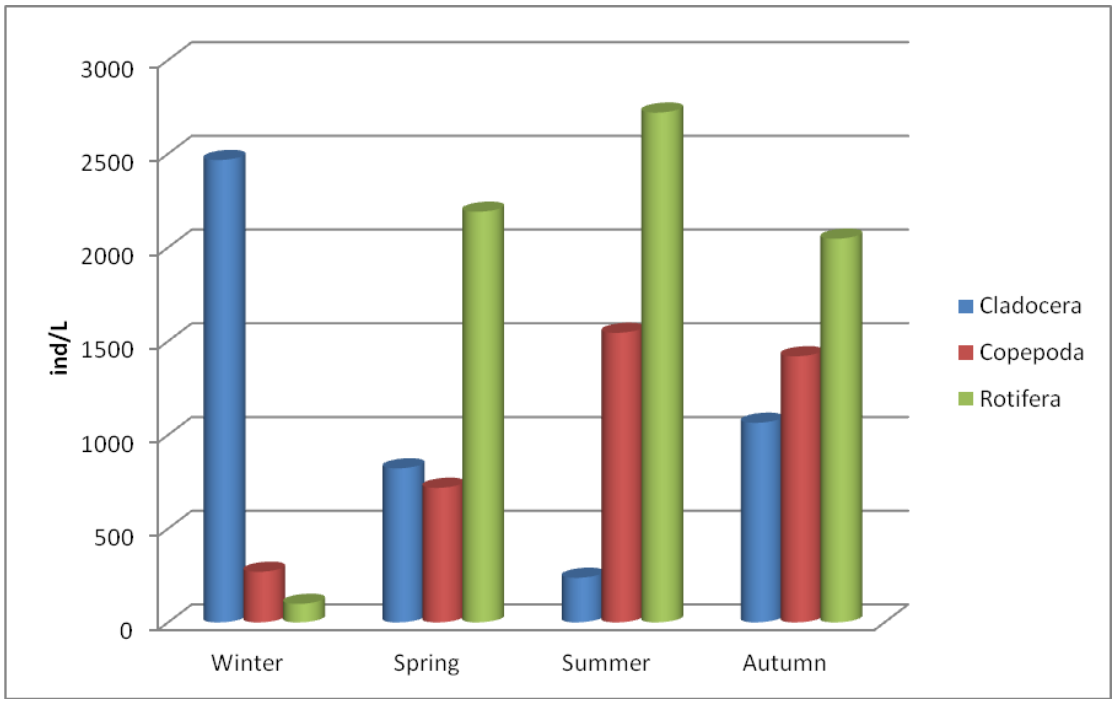
Figure 5: Seasonal variation of total individual of each group of zooplankton



. Figure 6:Percentage of zooplankton in period of study.

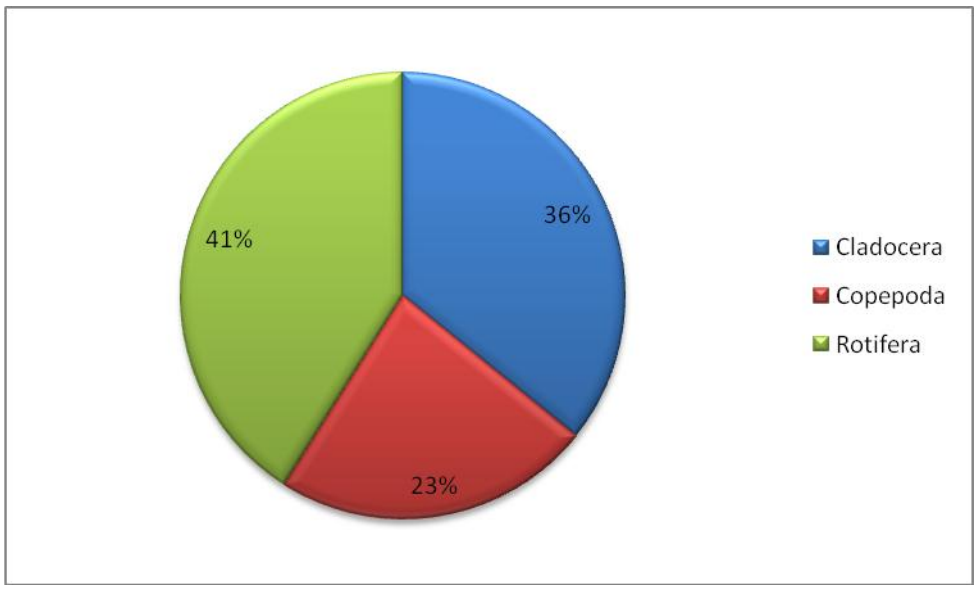


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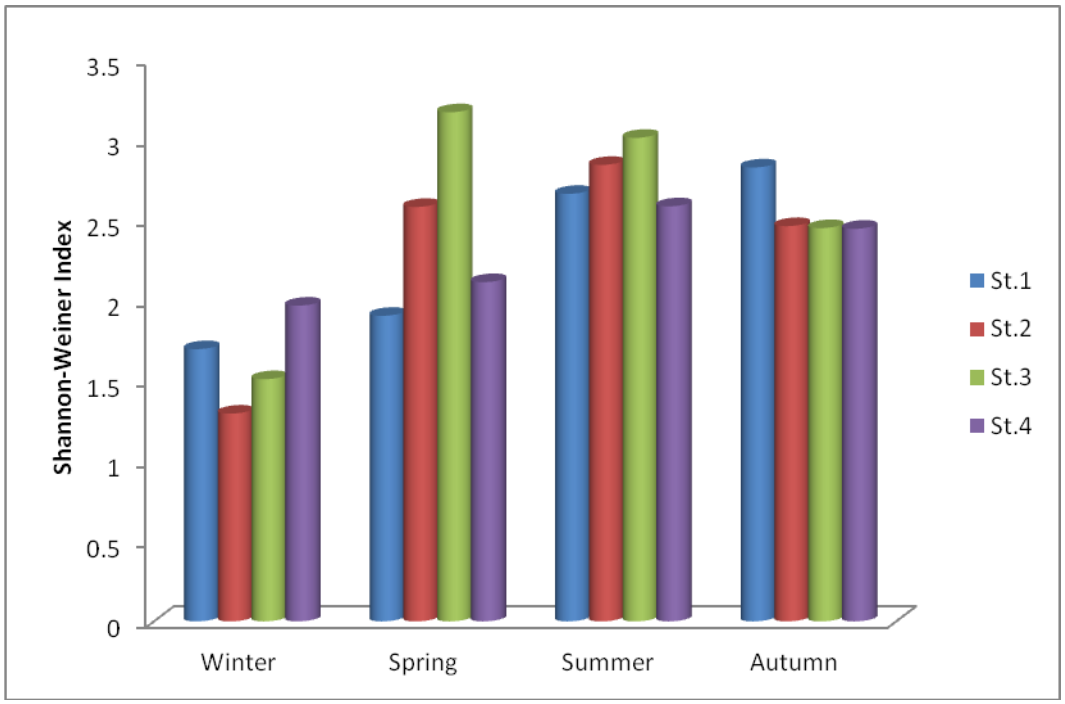
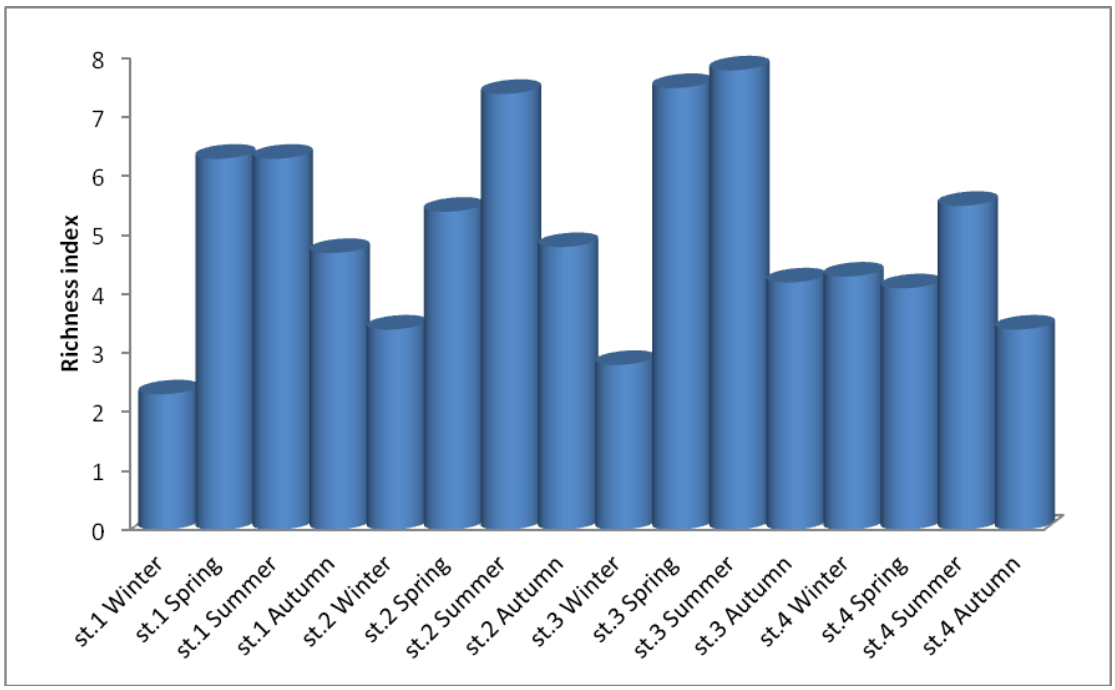
Figure 7: Shannon index in season of study



. Figure 8: Richness index in period of study.



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