

Short communication

Comparison of fish species diversity in Dalaki and Helleh Rivers of the Persis basin in Bushehr Province

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Abstract: Fish species diversity in Dalaki and Helleh Rivers which are parts of the Persis basin of Bushehr Province, was investigated from January 2013 to February 2014. Twelve species belonging to 6 families (Cyprinidae, Sisoridae, Mastacembelidae, Gobiidae, Mugilidae and Sparidae) were identified. The results indicated that Cyprinidae has the most frequencies in Dalaki River and Mugilidae has the most frequencies in Helleh River. Mastacembelidae and Sisoridae families in Dalaki River have the least frequencies and Mastacembelidae and Cyprinidae families have the least frequencies in Helleh River. *Capoeta saadii* with 33% in Dalaki River and *Planiliza abu* with 36% in Helleh River have the most frequencies, *Mastacembelus mastacembelus* and *Glyptothorax silviae* with 2% in Dalaki River and finally *M. mastacembelus* and *Cyprinus carpio* with 1% in Helleh River have the least frequencies. Based on the Shannon species diversity index, the most diversity of species in Dalaki and Helleh Rivers was found to be in July and August 2013.

Keywords: Cyprinidae, Sisoridae, Gobiidae, Mugilidae, Sparidae, Diversity, Identification, Persian Gulf basin.

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Introduction

In the study of aquatic ecosystems, investigation and identification of the fishes are considered first, since their identification are important to know biological aspects and optimal management in sustainable operation of resources (Kaymaram 2000). Fresh water fishes based on their ecological nature are a useful means to study zoogeography and distribution patterns of aquatic animals (Coad 1996). Rivers are the greatest landscape of the earth and considered as the principal factor in urban, rural, agricultural and industrial development and also are important from the viewpoint of biodiversity, fishing and

exploitation of aquatic organisms and tourist attraction (Hynes 1970).

Bushehr Province has a unique nature and ecological capability due to its especial climatic, geographical location and its long perennial border with the Persian Gulf (Rao 1999). Dalaki and Helleh rivers are located in southwest of Iran and are among the permanent rivers of Bushehr Province which harbor well ichthyodiversity (Esmaeili et al. 2015). From a biogeographic point of view, the Iranian plateau is located in the Palearctic region bordering the Oriental and African zones (Coad & Vhlenkin 2004). However, based on its ichthyofaunal

composition, the Iranian plateau borders the eastern Mediterranean (Western Palearctic), the southern Asian (Indo-Oriental), and the Ethiopian regions (Armantrout 1980; Coad 1998; Nalbant & Bianco 1998; Esmaeili et al. 2010, 2015; Teimori et al. 2016).

Nowadays the uncontrolled development of economic activities in different fields such as the development of industries, agriculture, construction activities along rivers and carrying out great plans of water distribution and dam construction, and the entrance of non-native species have caused a threat to biodiversity of the aquatic organisms including marine and fresh water ecosystem fishes. Therefore, necessity of studies concerning this issue is felt more so that identification of fish species diversity in this respect may help their optimum exploitation and protection. Although different studies have been made concerning fish biodiversity of Iranian inland waters (Berg 1949; Berg 1962; Coad 1980; Coad 1985; Coad 1995; Saadati 1977; Abbasi et al. 1998; Abbasi 2005; Coad 2010; Esmaeili et al. 2010, 2015, 2016; Keivany et al. 2016); still, comprehensive studies on aquatic ecosystems are needed to obtain information on fish diversity at three levels (genetic, species and ecosystem). Therefore, this research was carried out to identify and investigate fish diversity of Bushehr Province parts of the Dalaki and Helleh rivers which are located in the Persis basin of the Persian Gulf.

Materials and Methods

The study area: Dalaki and Helleh river tributaries lie at longitude 50° to 52°30'E and latitude 28°20' to 30°10'N. Dalaki River is 115km in length and the length of Helleh River is 87km. The Dalaki river slope is 1.5%, then enters the plain. The length of the study course was 200km and 7 stations along the river were selected based on especial conditions of the rivers and topography of the area (Fig. 1).

Sampling and research method: This research is carried out during 14 months, from January 2013 to February 2014. The gill nets with different meshes

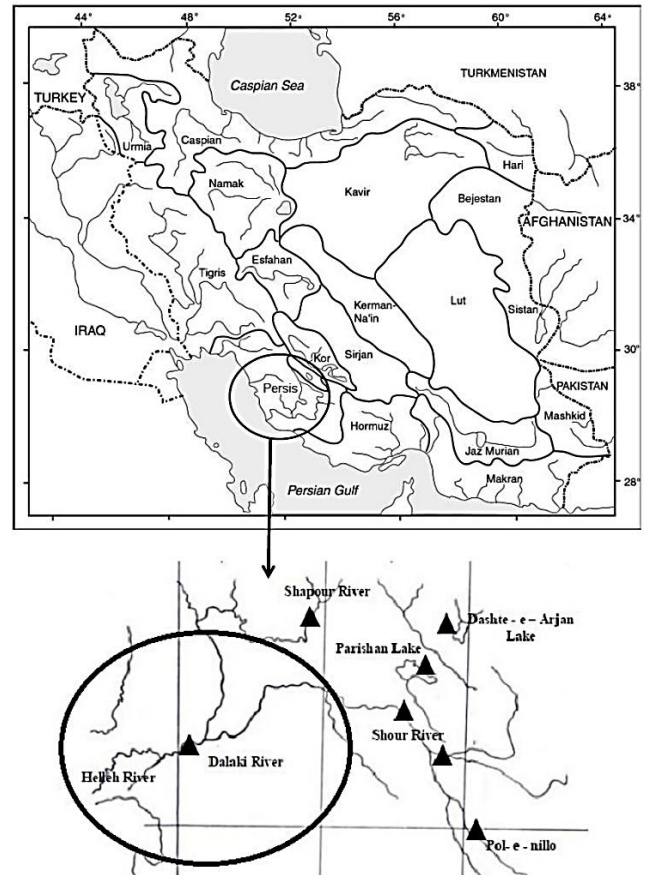


Fig.1. Geographical location of Dalaki and Helleh rivers in the Persis basin of Bushehr Province.

(20, 25, 30, 35 and 45mm) and cast nets were used for monthly sampling. The collected fishes were fixed in 10% formaldehyde and transported to the laboratory and identified using valid identification keys (Coad & Abdoli 1993; Coad 1996, 1998, 2015a, 2015b, 2015c; Esmaeili et al. 2014, 2015). Also the numbers of caught fishes in each stage were recorded in relevant forms. Shannon & Weaver (1949) equation was used to estimate fish species diversity:

$$H = -\sum P_i \ln P_i$$

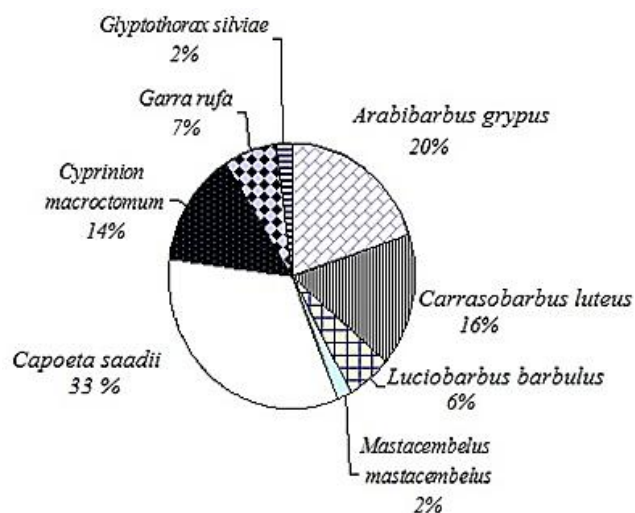
Where H is the Shannon index (species diversity) and P_i is the relative frequency of species I in the considered sample. Systat[®]9.0 and Excel[®]2010 statistical softwares were used for data analysis.

Results and Discussion

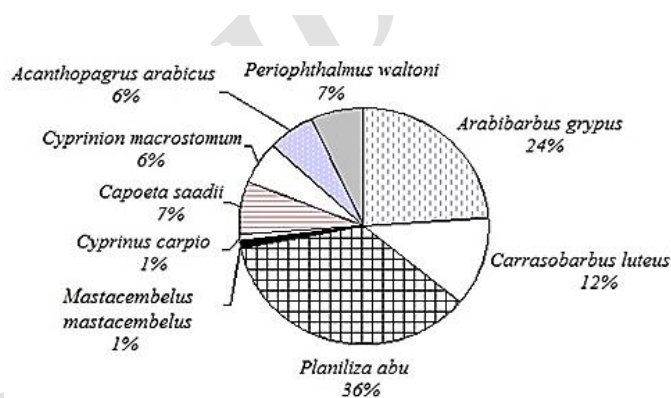
Based on the results, 12 species in 6 families were collected from the Dalaki and Helleh rivers (Table 1).

Table 1. The caught fishes in Dalaki and Helleh Rivers.

Family	Species	Helleh River	Dalaki River
Cyprinidae	<i>Arabibarbus grypus</i> (Heckel, 1843)	+	+
	<i>Capoeta saadii</i> (Heckel, 1847)	+	+
	<i>Carasobarbus luteus</i> (Heckel, 1843)	+	+
	<i>Cyprinion macrostomum</i> Heckel, 1843	+	+
	<i>Cyprinus carpio</i> Linnaeus, 1758	+	-
	<i>Garra rufa</i> (Heckel, 1843)	-	+
	<i>Luciobarbus barbulus</i> (Heckel, 1847)	-	+
Gobiidae	<i>Periophthalmus waltoni</i> Koumans, 1941	+	-
Mastacembelidae	<i>Mastacembelus mastacembelus</i> (Banks & Solander, 1794)	+	+
Mugilidae	<i>Planiliza abu</i> (Heckel, 1843)	+	-
Sisoridae	<i>Glyptothorax silviae</i> Coad, 1981	-	+
Sparidae	<i>Acanthopagrus arabicus</i> Iwatsuki, 2013	+	-

**Fig.2.** Relative frequency of the collected fishes in the Dalaki River.

The Dalaki River harbors 8 fish species that the family Cyprinidae had the most frequency and Mastacembelidae and Sisoridae families with the least frequencies. *Capoeta saadii* with 33% and *Mastacembelus mastacembelus* and *Glyptothorax silviae* with 2% have the most and least frequencies, respectively (Fig. 2). The Helleh River harbors 9 fish species that the family Mugilidae had the most frequency and Mastacembelidae and Cyprinidae families with the least frequencies. *Planiliza abu* with 36% and *M. mastacembelus* and *Cyprinus carpio* with 1% have the most and least frequencies, respectively (Fig. 3). *Luciobarbus barbulus*, *G. silvia* and *Garra rufa* were not collected in Helleh River and

**Fig.3.** Relative frequency of the collected fish in the Helleh River.

Periophthalmus waltoni, *C. carpio*, *P. abu* and *Acanthopagrus arabicus* species were not collected from Dalaki River.

Shannon species diversity index showed that this index reaches its maximum in each station during the warm season i.e. in July and August. The station 7 had the most species diversity, station 4 the most fluctuation among months of the year and station 1 the least species diversity (Fig. 4).

River basins are complex, fulfilling many important functions ranging from the supply of water to households and agriculture to the provision of transport routes. They also provide habitat for different species which provides valuable resources for people e.g. fishing and recreation (Smith & Darwall 2006; Esmaeili et al. 2015). The first step in the management of the natural resources is

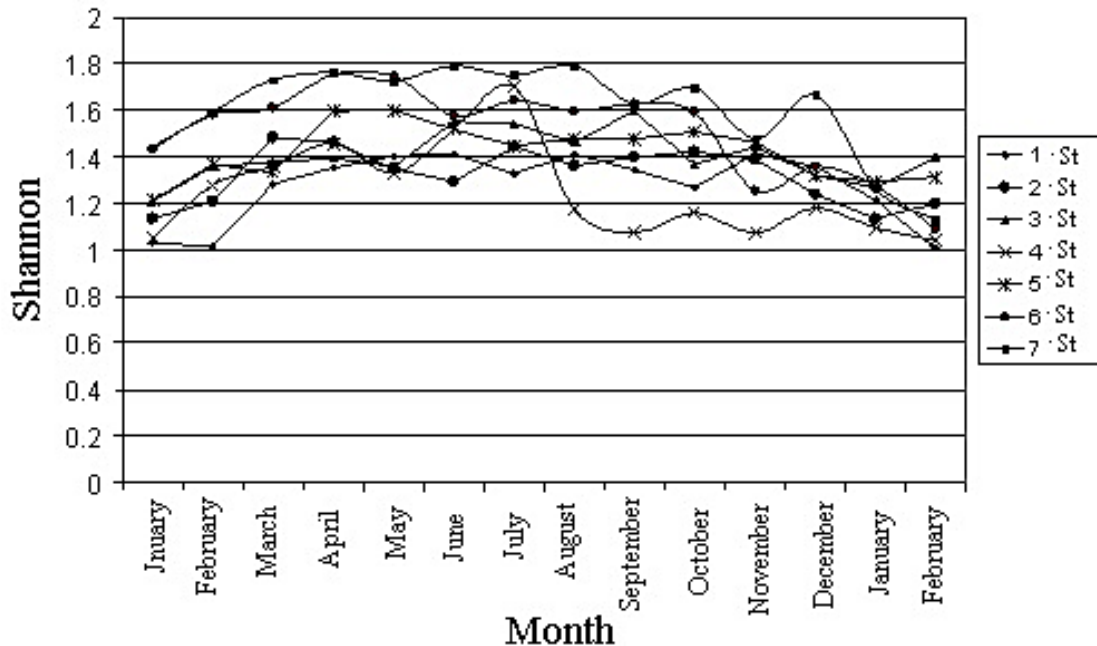


Fig.4. Species diversity index of fishes of Dalaki and Helleh Rivers (January 2013 to February 2014).

understanding different aspects of the natural resources and their eco-bio-hydrological behaviors based on feedback between biotic and non-biotic components (see Bagenal & Tesch 1978) and to do this, study of biodiversity is needed. Iran is one of the arid regions of the world on basis of various definitions of climatic conditions, vegetation types or potential for food production. Due to their high ecological value, monitoring of arid regions is necessary and priority should be given to conservation and management of freshwater ecosystems located in these area. To protect critical services such as flood control and valuable economic and livelihood benefits, all users of freshwater including biodiversity need to be taken into consideration when managing water resources (Esmaili et al. 2015).

Based on the collected fishes in Dalaki and Helleh Rivers, 12 species were identified. Whereas Teimori et al. (2011) reported 6 species from 2 families (*Alburnus mossulensis*, *C. luteus*, *C. saadii*, *Capoeta barroisi*, *L. barbustus* and *M. mastacembelus*) from Helleh and Dalaki rivers. However based on Esmaili et al. (2015) other species, including *Barilius mesopotamicus* (Cyprinidae), *Paraschistura*

nielsenii (Nemacheilidae), *Aphanius dispar* (Cyprinodontidae), *Scartelaos tenuis* and *Boleophthalmus dussumieri* (Gobiidae) are found in the Helleh River, which they did not collected in the present study due to mesh size of the used nets.

As several factors, including eco-bio-hydrological characteristic of the river in different stations and seasons (bed characteristics, water quality, altitude, water depth, migration, destruction of suitable spawning places, pollution, food relations and needs of the organisms and their adaptation to their environment), uncontrolled fishing, and lack of environmental prospective management implementation could be considered as parameters affecting fish species diversity (see Rahel & Hubert 1991; Gido & Brown 1999), hence is suggested that these factors to be considered for understanding biodiversity and to monitor and protect ecosystems of inland waters.

Acknowledgments

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یافته علمی کوتاه

مقایسه تنوع گونه‌ای ماهیان رودخانه‌های دالکی و حله در حوضه پرسیس استان بوشهر

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چکیده: تنوع زیستی ماهیان رودخانه دالکی و حله بوشهر که بخشی از حوضه پرسیس استان بوشهر هستند، از دی ماه سال ۱۳۹۱ تا بهمن ماه سال ۱۳۹۲ در ۷ ایستگاه بررسی شد. در این بررسی، تعداد ۱۲ گونه از ۶ خانواده Sisoridae, Cyprinidae, Mugilidae, Gobiidae, Mastacembelidae و Sparidae شناسایی گردید. نتایج نشان داد که خانواده Cyprinidae در رودخانه دالکی و خانواده Mugilidae در رودخانه حله دارای بیشترین فراوانی و خانواده های Sisoridae و Mastacembelidae در رودخانه دالکی و خانواده های Mastacembelidae و Cyprinidae در رودخانه حله دارای کمترین فراوانی می‌باشند. و در بین گونه‌های صید شده گونه *Capoeta saadii* با ۳۳٪ در رودخانه دالکی و *Planiliza abu* با ۳۶٪ در رودخانه حله بیشترین میزان فراوانی و گونه‌های *Mastacembelus mastacembelus* و *Glyptothorax silviae* با ۲٪ در رودخانه دالکی و *M. mastacembelus* و *Cyprinus carpio* با ۱٪ در رودخانه حله کمترین فراوانی را در بین گونه‌ها دارا می‌باشند. همچنین با توجه به شاخص تنوع گونه‌ای شانون، بیشترین تنوع گونه‌ای در رودخانه دالکی و حله مربوط به ماه‌های تیر و مرداد بود.

کلمات کلیدی: کیورماهیان، گربه ماهیان سیسورید، گاوماهیان، کفال ماهیان، شانک ماهیان، تنوع، شناسایی، خلیج فارس.