IJST (2015) 39A2: 117-121
Iranian Journal of Science & Technology

http://ijsts.shirazu.ac.ir

The ichthyofauna of headwaters of three riverine systems in Kohgiluyeh and Boyer-Ahmad Province in southwest of Iran

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Abstract

This study was conducted to determine taxonomic feature of fishes from the headwaters of three riverine systems in Kohgiluyeh and Boyer-Ahmad province (K & B) in southwestern Iran during 2011 to 2013. Fifteen species belonging to 4 families, and 3 orders from the Karun river system, 10 species belonging to 4 families and 3 orders from the Zohreh river system and 8 species belonging to 2 families and 2 orders from the Jarrahi river system were identified. In total 19 species were collected, including 14 natives, 4 endemics and 1 exotic.

Keywords: Freshwater fish; endemic; exotic; native

1. Introduction

The Iranian plateau is located in the Palearctic zoogeographical region bordering the Oriental and African zones (Coad and Vilenkin, 2004). However, based on its ichthyofauna composition, the Iranian plateau borders the Eastern Mediterranean (Western-Palearctic), the Southern Asian (Indo-Oriental) and the Ethiopian regions (Nalbant and Bianco, 1998; Coad, 1998). Accordingly, it would be expected that the Iranian plateau represents high diversity of freshwater fish species, i.e. approximately 217 confirmed species in 19 exorheic and endorheic basins dominated by cyprinid fishes (Abdoli, 2000; Coad and Vilenkin, 2004; Teimori, 2006; Esmaeili et al., 2007; Esmaeili et al., 2010, 2013, 2014; Gholami et al., 2014), and therefore, it may be considered as a center for the origin of many native species (Esmaeili et al., 2007). Moreover, several parts of this country contain many of local fish endemism (Sadati, 1977; Armantrout, 1980; Coad, 2006; Esmaeili et al., 2007; Esmaeili et al., 2010; Abdoli et al., 2011).

Among the drainage systems, the Caspian Sea basin shows the greatest fish species diversity, followed by the Tigris-Karun, and Persian Gulf basins (Esmaeili et al., 2010; Teimori et al., 2010).

Kohgiluyeh and Boyer-Ahmad (K & B) province in the southwest of Iran is part of the Zagros range and mostly mountainous in topography and it is the source of springs, streams and rivers which drain into three major river systems; Zohreh, Jarrahi and Karun. Headwaters of Zohreh River are located in Fars and Kohgiluyeh and Boyer-Ahmad provinces, from where it flows across the Khuzestan plains and is close to Tigris-Karun River tributaries. The Zohreh River and its tributary the Shul, are over 400 km long and have their headwaters near Kuh-e Barm Firuz at 3673 m (30°25'N, 51°58'E) whose northern flank spawns the Khersan River, a Karun tributary in the Tigris basin. Its basin is estimated to be 15,500 sq km (Coad, 2013). The Jarrahi River and its major tributary (Marun River) feed the Shadegan Marshes which is one the largest Iranian wetlands. The Kārun (Karoun) is Iran's most effluent and largest river by discharge having watershed of 65,230 square kilometers (Coad, 2013). Khersan and Beshar are two tributaries of this river system in Kohgiluyeh and Boyer-Ahmad province.

This study aims to determine taxonomic status and composition of fish fauna of parts of Zohreh, Jarrahi and Karun riverine systems situated in Kohgiluyeh and Boyer-Ahmad province, southwestern Iran which is a basic requirement for a number of environmental and conservational management issues in fluvial ecosystems.

2. Materials and methods

This study was carried out from 2011 to 2013. The fish specimens were collected using an electrofishing gear, dip and cast nets at various stations in the riverine systems in Kohgiluyeh and Boyer-Ahmad province. The samples were fixed

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Received: 20 January 2014 / Accepted: 5 July 2014

and preserved in 10% formalin. Identification of specimens was based on Abdoli (2000) and Coad (2013). The specimens have been deposited in the Zoological Museum and Collection of the Biology Department, Shiraz University (ZM-CBSU).

3. Results

In total 19 species were identified from three river systems including 14 natives, 4 endemics and one exotic. Fifteen species belonging to 4 families, and 3 orders from the upper reaches of Karun river system, 10 species belonging to 4 families, and 3 orders from the Zohreh river system and 8 species belonging to 2 families, and 2 orders from the Jarrahi river system were identified (Tables 1-4). The fish fauna of three river systems were dominated by Cyprinids. Endemic species were *Glyptothorax silviae* found in three river systems, *Paraschistura* sp. found only in Zohreh river system, *Turcineomacheilus hafezi* found only in Karun river system and *Carasobarbus sublimus* (see Borkenhagen and Krupp, 2013) found in both Zohreh and Jarrahi river systems. Only one exotic species (*Onchorhynchus mykiss*) was found in Karun river system. Five native species (*Capoeta* sp., *Garra rufa*, *Cyprinion macrostomum*, *Alburnus mossulensis* and *Capoeta damascina*) were found in three river systems, while *Capoeta aculeata*, *Capoeta trutta*, *Chondrostoma regium*, *Barbus lacerta* and *Squalius lepidus* were found only in Karun river system. *Arabibarbus gryps* was found in Karun and Zohreh river systems and *Mastacembelus mastacembelus* was found only in Zohreh river system (Tables1-4).

Table 1. Distribution of fish species in headwaters of three river systems in Kohgiluyeh and Boyer-Ahmad province (K=Karoun, Z=Zohreh, J=Jarrahi)

Order	Family	Species	K	Z	J
		Alburnus mossulensis	•	•	•
		Barbus lacerta	•		
		Capoeta aculeata	•		
		Capoeta cf. *damascina*	•	•	•
		Capoeta trutta	•		
		Capoeta sp.	•	•	•
		Chondrostoma regium	•		
		Cyprinion macrostomum	•	•	•
Cypriniformes	Cyprinidae	*Garra rufa*	•	•	•
		Carasobarbus sublimus		•	•
		Luciobarbus barbulus			•
		Squalius cf. *lepidus*	•		
		Arabibarbus grypus	•	•	
	Nemacheilidae	*Turcineomacheilus hafezi*	•		
		Paracobitis basharensis	•		
		Paraschistura sp.		•	
Siluriformes	Sisoridae	*Glyptothorax silviae*	•	•	•
Salmoniformes	Salmonidae	*Onchorhynchus mykiss*	•		
Synbranchiformes	Mastacembelidae	*Mastacembelus mastacembelus*		•	

Table 2. Fish diversity of Jarrahi river system in Kohgiluyeh and Boyer-Ahmad province (N= Native, En = Endemic, Ex = Exotic)

Order	Family	species	N	En	Ex
Cypriniformes	Cyprinidae	*Alburnus mossulensis*	•		
		Capoeta damascina	•		
		Capoeta sp.	•		
		Cyprinion macrostomum	•		
		Garra rufa	•		
		Carasobarbus sublimus		•	
		Luciobarbus barbulus	•		
Siluriformes	Sisoridae	*Glyptothorax silviae*		•	

Table 3. Fish diversity of Zohreh river system in Kohgiluyeh and Boyer-Ahmad province (N.= Native, En. = Endemic, Ex. = Exotic)

Order	Family	species	N.	En.	Ex.
Cypriniformes	Cyprinidae	*Alburnus mossulensis*	•		
		Capoeta damascina	•		
		Capoeta sp.	•		
		Cyprinion macrostomum	•		
		Garra rufa	•		
		Carasobarbus sublimus		•	
		Arabibarbus grypus	•		
	Nemacheilidae	*Paraschistura* sp.		•	
Siluriformes	Sisoridae	*Glyptothorax silviae*		•	
Synbranchiformes	Mastacembelidae	*Mastacembelus mastacembelus*	•		

Table 4. Fish diversity of Karun river system in Kohgiluyeh and Boyer-Ahmad province (N.= Native, En. = Endemic, Ex. = Exotic)

Order	Family	Species	N.	En.	Ex.
Cypriniformes	Cyprinidae	*Alburnus mossulensis*	•		
		Barbus lacerta	•		
		Capoeta aculeata	•		
		Capoeta damascina	•		
		Capoeta sp.	•		
		Capoeta trutta	•		
		Chondrostoma regium	•		
		Cyprinion macrostomum	•		
		Garra rufa	•		
		Squalius lepidus	•		
		Arabibarbus grypus	•		
	Nemacheilidae	*Turcineomacheilus hafezi*	•		
		Paracobitis basharensis	•		
Siluriformes	Sisoridae	*Glyptothorax silviae*		•	
Salmoniformes	Salmonidae	*Onchorhynchus mykiss*			•

4. Discussion

Systematic studies of the fishes of Iran at the population, species, and subspecies levels are not yet completed, and many genera and species systematics are not well understood (Coad, 1985; Esmaeili et al., 2010; Borkenhagen and Krupp, 2013). However, exploitation of new area, efficiency of new fishing techniques, availability of molecular markers, ongoing acceptance of phylogenetic species concept in fish description, introduction and translocation of fish species in recent years have enhanced our knowledge regarding the ichthyodiversity of inland fishes of Iran (Borkenhagen and Krupp, 2013, Esmaeili et al., 2010, 2012, 2013, 2014, Gholami et al., 2014, Teimori et al., 2014). Fish surveys and species records are important key factors in improving our knowledge of fishes and assessing the distribution and status of species provide useful information for basic and applied ecology and applying conservation programs.

Recent investigation reveals that headwaters of Zohreh, Jarrahi and Karun rivers are characterised by a great variety of habitats, which are populated by a diverse primary freshwater fish fauna with more species in Karun followed by Zohreh and Jarrahi. Notably, despite the clear differences in terms of area, topography and connectivity, the rivers and spring-streams in three riverine systems, they share several freshwater fish species, i.e. *Garra rufa*, *Cyprinion macrostomum*, *Alburnus mossulensis*, *Capoeta damascina* and *Glyptothorax silviae*. The present-day biogeographies of these freshwater species may indicate connectivity among these rivers in the recent past (their isolation and interconnection processes) which may be due to sea-level change in the Persian Gulf since the time of the last maximum glaciation at about 18 000 yr BP (see Lambeck, 1996). Explanation of the zoogeographic and evolutionary relationships of drainage basins is an important objective of any ichthyological research program that tries to understand population or species distribution and, eventually, speciation processes.

Southern Iran is the main route for movement of animals, especially fish, between the Oriental and Ethiopian biogeographical regions; therefore southern ichthyofauna of Iran is a combination of the Oriental and the Ethiopian (Teimori et al., 2010; Coad, 2013). However it has some Palearctic elements too. Some species, i.e. *Glyptothorax silviae* (Sisoridae), *Mastacembelus mastacembelus* (Mastacembelidae), and *Cyprinion macrostomum* (Cyprinidae) which are found in the area under consideration have Oriental origin, some of them such as *Barbus lacerta* (Cyprinidae) belong to the Ethiopian region and *Squalius lepidus* (Cyprinidae) has Palearctic origin.

Based on the results of this study, the coldwater fish, *Onchorhynchus mykiss* is the only exotic species, found in headwaters of Karun part in K.B. fresh waters which has been introduced as result of escaping from nearby aquaculture facilities (trout farming). High current, coldwater and high water current of tributaries of these rivers did not support establishment of exotic Chinese carp which have been introduced to many Iranian water bodies (see Esmaeili et al., 2010). This reduces impacts of fish introduction on native fishes of the area under consideration.

The decreased water volume, drainage rehabilitation which changes the structure of the system, water pollution from domestic and agricultural sources, droughts and the development of an intensive aquaculture industry with exotic species that may colonize water bodies, are major threats to ichthyofauna of the region. Hence, applying conservation and monitoring programs are highly recommended.

Acknowledgements

We would like to thank, S. Babaei, G. Sayyadzadeh, Y. Bakhshi, S. Mirghiyasi and S. Ghasemian for their help with the fish collection and Shiraz University for financial support.

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