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More Salmonid fish species carried by flood water: The caspian trout, *Salmo caspius* Kessler, 1877 in Shatt Al-Arab River, Iraq

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Abstract
During the 1st quarter of 2019, the northern and middle parts of Iraq received a huge amount of rain due to a harsh storm. The Iraqi cities affected are those located on the tributaries of the river Tigris. The heavy rain also affected the western region of Iran adjacent to Iraq. The resultant flood and wind seemed to have destroyed the aquaculture facilities in Iran and caused an escape of fish of different age groups. This study reports on the presence of one specimen of *Salmo caspius* apparently swept away by the flood into the river at Shatt Al-Arab, Basrah, south Iraq. Further researches are needed to check whether *S. caspius* has adapted to the new environment of the Shatt al-Arab River.

Keywords: Salmonidae, freshwater, environment, new record

1. Introduction
Salmo caspius is an inhabitant of marine, freshwater and brackish waters. Individuals of this species are endemic to the southern Caspian Sea area (Vera *et al*., 2011) [21] and mainly distributed in rivers flowing into the Caspian Sea, including the Aras River basin (Tortonese, 1955; Zamani *et al*., 2009) [19, 22]. The maximum standard length reported the individuals of this species are 1180 mm (Jalali and Amiri, 2009) [8]. This species is an anadromous and adults usually mature in the brackish water and move to the freshwater areas for spawning (Zamani *et al*., 2009) [22].
In the recent decades, the populations of this species have experienced a severe reduction in its locality owing to over-fishing, river pollution, and drought (Abdoli, 2000; Barannik *et al*., 2004; Niksirat and Abdoli, 2009) [1, 4, 16]. This species is anadromous and has been documented to ascend rivers near to its natural habitats for spawning (Vera *et al*., 2011) [21]. Coad (1980) [5] and Kiabi *et al*. (1999) [11] have considered the *Salmo caspius* as an endangered species.
Several conservation programs were initiated by the Iranian government to support the natural populations of this species against extinction (Jalali and Amiri, 2009) [8]. Therefore, several hatcheries were built in the Caspian Sea region (Vera *et al*., 2011) [21] starting in 1962, with stocking of eyed eggs originated from Denmark and later on the release of fingerlings was made in rivers and reservoirs (Mehrabi, 2002) [15]. Saadati (1977) [18] proposed that breeding populations of the *S. caspius* were set in the some Iranian tributaries of the Tigris- Euphrates basin (Dez River and the Ab-e Bazuft). Coad (2017) [7] reported the existence of *S. caspius* from the Karun River basin in Iran, Shatt Al-Arab river tributary.
Shatt Al-Arab River begins from the junction of the Tigris and Euphrates rivers. It is the main river in lower Mesopotamia (Mahmood and Feachem, 1987) [13]. Human activities are based on the presence of the Shatt al-Arab River, they include agricultural, trade and industrial activities, transportation (Partow, 2001) [17]. Such a massive amount of water draining into the Tigris River from the Iranian highlands could wash away numbers of introduced fish from the aquaculture in the region.
One specimen of *S. caspius* was reported by Agha (2017) [2] from the Greater Zab River, one of the tributaries of Tigris River/ Aski-Kalak in the Kurdistan Region, Iraq. Recently, two specimens of the rainbow trout *Oncorhynchus mykiss* were recorded from the lower reaches of Shatt Al-Arab River (Jawad *et al*., 2019) [9]. These three specimens represent the first ever specimens of any salmonid species to be found in the freshwater system of Iraq in general and

in the Shatt al-Arab River, south Iraq, in particular. Salmonidae are absent in the freshwater fish fauna of Iraq and no aquaculture facilities in Iraq stock salmon species (Coad, 2010) [6]. In the present study, one additional specimen of the salmonid *Salmo caspius* was captured in the Shatt Al-Arab River, Basrah, Iraq, which is considered the second salmonid species record from the Shatt al-Arab River.

2. Materials and Methods

In February 2019, one specimen (245 mm TL) of *Salmo caspius* was obtained from the Shatt Al- Arab River at Abu Al-Khaseeb district, Basrah (Fig. 1). The specimen was collected using a gill net by a fishermen operating in the area. At the time of the catch. Body features were measured to the nearest mm using a measuring board and digital caliper, meristic characters which counted employing dissection microscope, and are shown in Table 1. The identification to species level of the specimen was based on Kottelat and Freyhof (2007) [12] and Coad (2017) [7]. The specimen was deposited in the fish collection of the Marine Science Centre, University of Basrah, Basrah, Iraq.

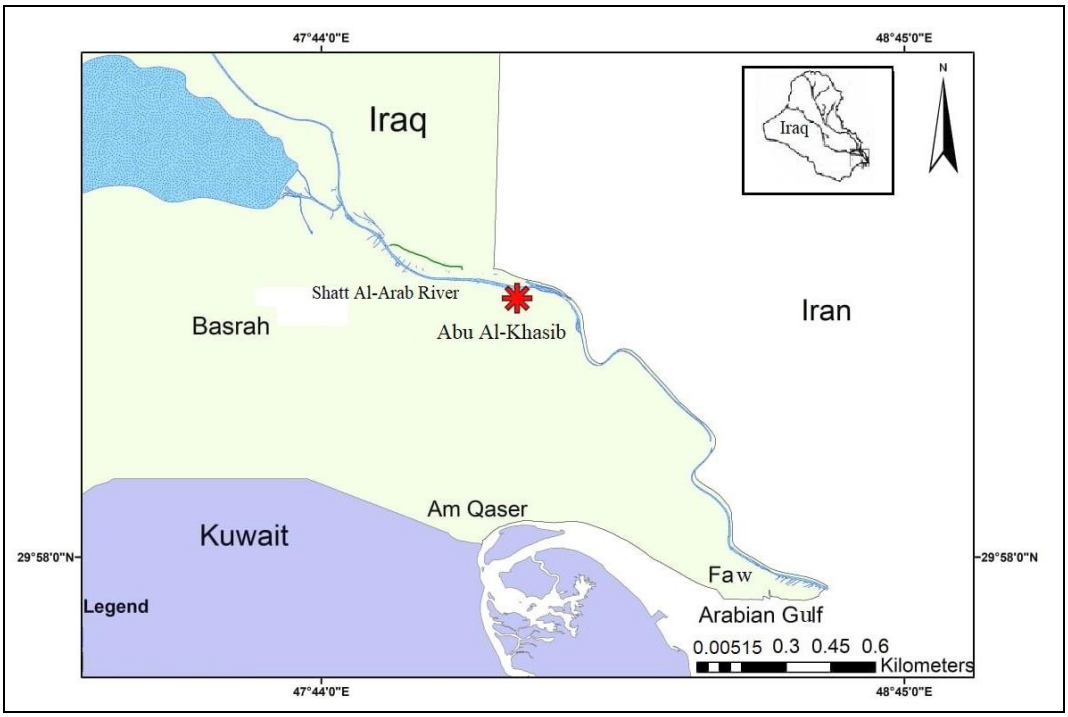

Fig 1: Map showing the collecting area of *Salmo caspius*

3. Results

The morphological characteristics of the specimen of *S. caspius* agree with Kottelat and Freyhof (2007) [12] and Coad (2017) [7]. The specimen showed the following set of characters: The body is elongated and slightly compressed (11.92% SL), eye relatively large (5.07% SL), mouth is terminal, imaginary line passing through the snout is also passing along the ventral edge of the eye, first dorsal fin originates anterior to the base of the pelvic fin, while second dorsal fin originates mid-level of anal fin, body silvery in colour dorsally and white ventrally, head grey dorsally and white ventrally, small dark spots dispersed on upper half of body starting from area posterior to eye until base of caudal fin, no dark spots on caudal fin rays, first dorsal fin with dark marks arranged in vertical lines at base of fin.

The specimen of *S. caspius* examined (Fig. 2) in the present study appeared to be adult as its size (245 mm TL) nearly reaches the maximum size given for this species (240 – 250 mm TL) by Turan *et al*. (2009) [20].

Fig 2: *Salmo caspius*, 245 mm TL collected from Shatt Al-Arab River, Basrah, Iraq.

Table 1: Morphometric and meristic characters of *S. caspius*.

Morphometric characters		
Total length (mm)		245
Standard length [SL] (mm)		202
Depth of body % in SL		21.36
Width of body % in SL		11.92
Length of head % in SL		25.11
Depth of head % in SL		16.28
Width of head % in SL		11.43
Length of snout % in SL		6.13
Eye diameter % in SL		5.07
Interorbital distance % in SL		7.09
Predorsal length % in SL		47.03
Postdorsal length % in SL		16.75
fin % in SL Length of dorsal		13.96
Length of anal fin % in SL		8.74
Length of pectoral fin % in SL		17.24
Length of pelvic fin % in SL		14.58
Caudal peduncle length % in SL		17.09
Caudal peduncle depth % in SL		9.05
Meristic characters		
Dorsal fin rays	3	Unbranched rays
	10	Branched rays
Anal fin rays	3	Unbranched rays
	8	Branched rays
Pectoral fin	1	Unbranched rays
	12	Branched rays
Pelvic fin	1	Unbranched rays
	8	Branched rays
Gill rakers	6	Upper raw
	7	Lower raw

4. Discussion

The specimen of *S. caspius* examined in this study is collected the from Shatt Al-Arab river, southern Iraq and differs from the specimen illustrated by Jalali and Amiri (2009) [8] in having no dark spots on the caudal fin. Such a difference might be due to a different strain of *S. caspius*.

There are two possibilities how the specimen of *S. caspius* reached the Shatt Al-Arab River, south Iraq. First, the specimen might have been swept with the floodwater from Turkey through the Euphrates River and finally have reached the Shatt al-Arab River. Second, the specimen could have been washed with the floodwater into one of the tributaries of the Tigris River in Iran and have been swept into the Tigris River on the Iraqi territory. The first seems improbable, as the specimen would have had to swim a long distance from Turkey to the south of Iraq. To swim such a distance, the specimen would have to be large enough to perform such an activity. The second option is that the specimen reached the Shatt al-Arab River via floodwater of the tributaries of the Tigris River or Karun River, the only tributaries of the Shatt al-Arab River, and this option appears possible and more plausible. The specimen was collected in the Abu Al-Khaseeb area, which is located on the Shatt al-Arab River and south of the confluence of the Karun River and the Shatt al-Arab River. The distance that the specimen of *S. caspius* would have needed to swim in order to reach the Shatt al-Arab River is very short. The second possibility is supported by the fact that aquaculture facilities for *S. caspius* are built on Karun River (Jouladeh-Roudbar *et al*., 2015) [10], which might be the source of escapees of this species during the flood season.

More generally, the presence of such a remarkable specimen in the Iraqi freshwater system after the flood time questions the restrictions in controlling the environment of the rivers and lakes in.

Conclusion

There was only one specimen available for examination, but with its distinctive shape and coloration, the story of the fishermen about a number of individuals from the Shatt al-Arab River is acceptable. Therefore, it is conceivable that a large number of individuals of this species was swept from the aquaculture facilities in Iran with the flood and ended up in the water of the Shatt al-Arab River.

More generally, the presence of such a remarkable specimen in the Iraqi inland waters after the flood time questions the restrictions in controlling the environment of the Iraqi freshwater.

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