Thalassia Salentina
Thalassia Sal. 41 (2019), 119-126
ISSN 0563-3745, e-ISSN 1591-0725
DOI 10.1285/i15910725v41p119
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FLUSHED WITH THE FLOOD: THE RAINBOW TROUT *ONCORHYNCHUS MYKISS* IN THE SHATT AL-ARAB RIVER, BASRAH, IRAQ

SUMMARY

Heavy storms continually persisted throughout the Iranian highlands and Iraq during the last few months. The consequences of the storms were recorded in several cities in Iraq; however, the toughest effects appeared to be in central and northern governorates, primarily regions through which the Tigris River runs, and those areas adjacent to Iran. The flood water, with high speed current seems to destroy and displaced several aquaculture facilities in Iran that propagate several fish species including the rainbow trout *Oncorhynchus mykiss*. This study reports on the presence of specimens of rainbow trout seem to be probably washed away by the flood and ended in the river of Shatt al-Arab, Basrah, south of Iraq. With the harsh environment of Shatt al-Arab River, i.e., unfavourable high salinity and temperature, the question will remain whether the rainbow trout will survive and establish a populations?

Key words: Salmonidae, freshwater, environment, new record, Iran, aquaculture

INTRODUCTION

Shatt Al-Arab River which originates from the convergence of Tigris and Euphrates Rivers is the main surface water source in the lower Mesopotamia and serves around 3 million people, the majority living in Basrah city (Mahmood and Feachem, 1987). The river is widely used for human consumption, agricultural, trade and industrial activities, transportation, electric power plants and recreation. This river suffered from massive regression in water quality related to the decline in rates of discharge from the Tigris and the Euphrates Rivers (Al-

Mahmood *et al*., 2015) as a result of several hydrological projects constructed in the riparian countries (Partow, 2001), and the diversion of the Karun River into Iranian territory (Hameed and Aljorany, 2011). The average rate of discharge in the upstream of the Shatt-al-Arab River was declined from 207m3/s during 1977-1978 to 60m³/s during 2014 (Alaidani, 2014). The decreases of freshwater inflows into the estuary have allowed the saltwater to intrude about 80 km upstream the river mouth (Abdullah *et al*., 2016). The water salinity reaches to 28 ‰ in the mid-region of the river, while reaches up to 30 ‰ at the lower reaches of the river at the Fao city (Al-Tawash *et al*., 2013; Hameed *et al*., 2013; Yaseen *et al*., 2016). A decrease of river discharge into an estuary could lead to increase the tidal range and the wave celerity, and consequent increase in salinity levels (Cai *et al*., 2011). In the last few months, February and up till now, huge amounts of water have entered the tributaries of Tigris River originating from the Iranian highlands (Yadollahie, 2019). The reports released from the Information Office of the Prime Minister of Iraq (MWR, 2019) on the 13 May 2019 showed that the volume of water reached were 2493, 335, and 836 m^3/sec for Mosul, Baghdad and Basrah Cities at the north, mid and south of Iraq respectively (MWR, 109). With such huge amount of water entering the drainages of Tigris River form the Iranian highlands might wash away number of introduced fish specimens that used in aquaculture facilities in the region.

The rainbow Trout, *Oncorhynchus mykiss* (Walbaum, 1792) is an important food and sport fish commonly introduced in cool waters around the world. This species is not present in the Euphrates-Tigris Rivers drainages and it was introduced to Iran, the neighbouring country to Iraq, in the 1960s from Europe although it is a North American species (Armantrout, 1980). Numerous government and private hatcheries in Iran raise and distribute millions of fingerlings annually (Andersskog, 1970; PEtr, 1987). There has also been an attempt to raise this trout in Iraq in November 1968 but the fry used died (Maccrimmon, 1971) and breeding attempts have been made in Turkey (Erençin, 1978) and in Syria in 1964, 1968 and 1977 (Welcomme, 1981; Bronzi, 1983). Floods events carried away the earlier Syrian stocks and indicates how exotics can easily escape aquaculture plants. Further escapes were reported from Turkey, where fish farms around Elazig breed in streams tributary to the Keban Dam (Coad, 1996). Saadati (1977) suggested that a breeding populations and establishment of this fish in the Dez River and the Ab-e Bazuft, Iranian tributaries of the Tigris-Euphrates basin. It was also reported from the Karun River basin in Iran, Shatt al-Arab River tributary (Coad, 2017).

Introduced rainbow trout may compete with native fish species in the Euphrates-Tigris Rivers system for food and spawning grounds although this has not been ascertained in the reality Hatchery Rainbow Trout are subtle to parasites and diseases which can have deleterious effects on native fishes if stock is established in the wild. Enteric redmouth disease is reported from a trout fan

in south Anatolia, Turkey (Timur and Timur, 1991; Coad, 2017). This bacterial disease can infect a wide range of species with significant mortalities.

MATERIAL AND METHODS

On 28th February and 19th May 2019 two specimens of *Oncorhynchus mykiss* were obtained from the lower reaches of Shatt al- Arab River at Umm Al-Rasass Island (30° 18´ 37.76″ N 48° 16´ 21.88″ E) and Al-Mikhraq village (30° 08´ 35.75″ N 48° 21´ 44.34″ E), Basrah (Figure 1a). The specimens were collected using gill net at depth of 3 meters by a fishermen operating the area. The total length of 370 and 243 mm for Umm Al-Rasass Island and Al-Mikhraq village specimens were obtained respectively. At the time of the catch, the two specimens were alive and active trying to release themselves from the net. Body morphometrics were measured using measuring board and are given in Table 1. The identification to species level of the two specimens was based on Kottelat & Freyhof, 2007; Coad, 2017). At the collection site, salinity, water temperature and depth were measured using a WTW cond 3151 (www.wtw.com) instrument.

Table I. Morphometric and meristic characters of the two specimens of Oncorhynchus mykiss collected from two localities at Shatt al-Arab River, Basrah, Iraq.

Characters	Shatt al-Arab River samples n = 2
Morphometric (mm)	
Total length	243, 370
Fork length (% LT)	200 (82.3), 297 (80.3)
Standard length (% LT)	227 (93.4), 319 (86.2)
Head length (% LS)	47.4 (20.9), 49.5 (15.5)
Snout length (% LH)	10 (21.1), 11 (22.2)
Eye diameter (% LH)	12.8 (27.0), 11 (22.2)
Interorbital width (% LH)	7.6 (16.0), 16 (32.2)
Upper jaw length (% LH)	22.1 (46.6), 24 (48.5)
Lower jaw length (% LH)	18.3 (38.6), 19 (38.3)
Predorsal fin length (% LS)	91.6 (40.4), 132 (41.4)
Preadipose fin length (% LS)	163 (71.8), 231 (72.4)
Prepectoral fin length (% LS)	44.2 (19.5), 49.5 (1.96)
Prepelvic fin length (% LS)	101.7 (44.8), 143 (44.8)
Preanal fin length (% LS)	144.7 (63.7), 203 (63.6)
Caudal peduncle length (% LS)	33.4 (4.32), 44 (13.8)
Caudal peduncle width (% LS)	20.8 (9.16), 27.5 (8.62)
Body depth (% LS)	42.6 (18.7), 55 (17.2)

Meristic	
Number of dorsal fin rays	13, 12
Number of anal fin rays	12, 12
Number of pelvic fin rays	11, 10
Number of pectoral fin rays	14, 14
Number of caudal fin rays	19, 19

RESULTS

The morphology and the description of the captured specimens agree with Kottelat and Freyhof, 2007; Coad, 2017). Both specimens had the following morphological characters: an elongated and slightly compressed body; no nuptial tubercles, with trivial variations to head; mouth terminal; small spiracles; eye relatively large; large gill slit; imaginary line passing through the snout is also passing through the middle of the eye; 1st dorsal fin originates anterior to the base of the pelvic fin, while 2nd dorsal fin originates at the mid-level of the anal fin; body silvery in colour dorsally and white ventral sides; head grey dorsally and white ventrally; small dark spots distributed on the upper half of the body starting from the area posterior to eye until the base of the caudal fin; dark spots arranged in lines across the caudal fin rays of both the dorsal and ventral lobe of the fin; inter-soft rays dorsal membrane with dark spots (Fig. 1). The collection occurred at 3 m depth The water temperature was 37°C and salinity ranges 1-1.5‰.

The two specimens of *O. mykiss* examined (Figures 1b, c) in the present study appeared to be juvenile as their total length is about ⅓ - ½ (243 and 370 mm) of the common total length reported for this species (600 mm) by Bristow (1992).

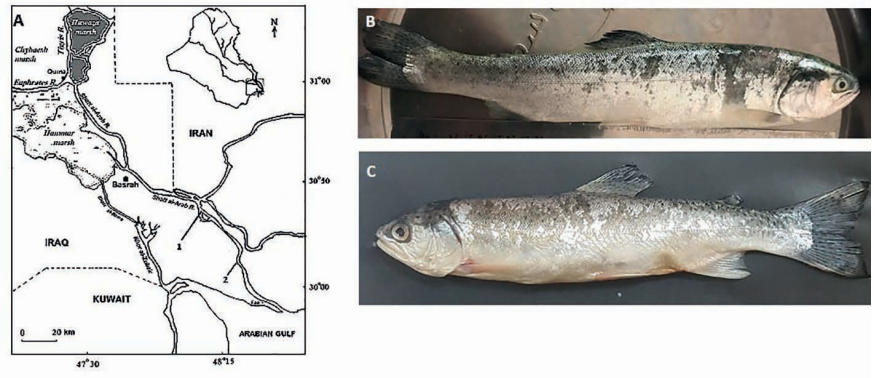

Figure 1. A, map showing the sampling localities; B, *Oncorhynchus mykiss*, 270 mm L_T, locality: Umm Al-Rassas Island); C, *Oncorhynchus mykiss*, 243 mm L_T, locality: Al-Mikhraq village, south of Basrah City, Iraq.

DISCUSSION

The rainbow trout is similar to *Salmo trutta* but differs most obviously in having distinct rows of black dots on the tail fin. *Salvelinus jontinalis* is distinguished by the scales being very small and discreet, body spots being pink, red or cream but not black, the dorsal and tail fins have dusky wavy lines, the lower fins have white leading edges followed by a black margin, and teeth on the vomer bone in the roof of the mouth are restricted to the anterior part (Coad, 1996).

A few months ago, heavy rains and flooding occurred throughout Iraq. Harsh weather is a normal feature of Iraq's winter season, and this most recent episode follows other periods of torrential rainfall in November/December 2018 (REliefweb, 2019). Heavy storms persisted throughout the country during the period from 24-March to 2-April when severe weather finally eased. The effects of the storms were recorded in several cities in Iraq; however, the harshest impacts appeared to be in central and northern governorates, primarily regions through which the Tigris River runs, and those areas adjacent to Iran. At the same time, the Iranian provinces of Lorestan, Khuzestan and Ilam, which border eastern Iraq, were also interested by severe weather (Reliefweb, 2019).

With such severe weather, thousands of cubic meters of water washed the Iranian highland terrains towards the Tigris River tributaries. High water current of the flood can cause damage and displacement to the aquaculture facilities built on the rivers that lead to the drainages of the Tigris River tributaries. Such a kind of event is reported in other regions of the world (Kapetsky, 2000; Rakocy *et al*., 2006).

During the last few decades, Iran has paid a serious intention for aquaculture industry, where the first experiment of this type was performed on the rainbow trout culture near Tehran in Mahisara (Karaj) in 1959 (Kalbassi *et al*., 2013).

Iran has started coldwater fish culture industry in both the private and public sectors. The coldwater fish farming includes the rearing of rainbow trout in raceways (Dorafshan *et al*., 2010). Trout farms are distributed across the centre, northwestern and western parts of the country, mostly in mountainous areas characterized by cool summers and cold winters. An increased number of farms, about 306 to 1200 with improving farming techniques and facilities has boosted annual production of trout from 280 tons in 1978 to more than 62,000 tons by 2008 (Johari and Kalbassi, 2004).

With such a boost in the aquaculture industry in general and the propagation of rainbow trout in particular, it is clear that any destruction of the these rearing facilities by the flood will lead to an enormous escape of fish individuals to the wild and drifted down with current to neighbouring Shatt al Arab River at south of Iraq.

The number of fish specimens that made available for examination is only two, but with the distinctive shape and coloration of this species, it is possible to consider the narrative of the fishermen to be correct about daily collection of more than 50 fish individuals from Shatt al-Arab River by the fishermen. No fish specimens were seen in the local fish market because the fishermen discovered how delicious this species is and took home for their own use. Hence to consider that large number of individuals of this species have escaped from the aquaculture facilities in Iran and washed away with the flood and ended in the water of Shatt al-Arab River.

It not be known whether *Oncorhynchus mykiss* will stand the harsh environment of Shatt al-Arab River, i.e., higher salinity and temperature when the flood receded in the next summer months. The answer for such a question will be soon unveiled and whether this species has the ability to establish a population in the new environment. More generally, the existence of such a noteworthy specimens in the Iraqi freshwater system during the flood time highlights once again the limitations in monitoring the environment of the rivers and lakes in Iraq in order to accommodate the existence of such an important commercial species.

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