Presence of the Non-Indigenous Fish Species, Gibel Carp, *Carassius gibelio* (Family: Cyprinidae) in Basrah Province Freshwater Systems, Iraq

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Abstract

Investigations conducted in the southern Iraq freshwater systems in Basrah Province allowed the authors to collect the gibel carp, *Carassius gibelio* (Bloch, 1782). This finding constitutes the first record of *C. gibelio* from the freshwater systems in Lower Mesopotamia. Finally, possible reasonable actions are proposed related to the exploitation of *C. gibelio* stocks and suggestions are made for the protection of native fish species and their ecosystems.

Keywords: *Carassius gibelio*, first record, Iraq freshwater systems, conservation implications, protective measures

Introduction

The gibel carp, *C. gibelio* (Bloch, 1782), is now found in freshwater systems, ponds and lakes with a wide geographic distribution from northern Europe to Asia (Jiang et al., 1983; Abramenko et al., 1998; Tarakan et al., 2012). The records of *C. gibelio* in some countries may have occurred much earlier, but were delayed in other countries as in the case of Iraq. This might be mainly due to the species' similarity to the native crucian carp *C. carassius*. The documentation on the exotic species is important in order to track their dispersal and appraise threats to native species, endangered species and ecosystems.

The objective of the present study is to confirm the occurrence of *C. gibelio* (Bloch, 1782) in a new locality in Iraq.

Materials and methods

During the period October-November 2011, a total of 30 adult specimens of *C. gibelio*, ranging from 194 to 273 mm in total length (TL) (Fig. 1), were captured using cast nets in a water body about 20 km southeast of Basrah City (Figure 2). All the available specimens were examined fresh, photographed and identified according to Kottelat and Freyhof (2007). All morphometric and meristic characters were taken following Copp and Kováč (2003) and measurements recorded to the lowest millimetre (mm) using a digital calliper, as shown in Table 1. The specimens of *C. gibelio* were deposited in the fish collection of the Marine Science Centre, University of Basrah, Basrah, Iraq.

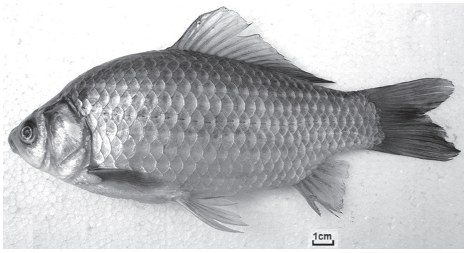

Figure 1: Carassius gibelio, 265 mm total length

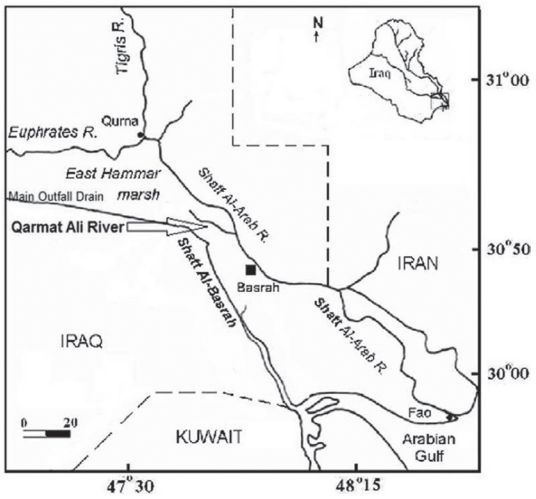

Figure 2: Sampling location where the fish specimens were collected

Table 1: Morphometric measurements and meristic counts of C. gibelio from Basrah Province waters

Morphometric (mm) / Meristic characters	Range	Mean	SD
Total length	194-273	227.8	31.9
Standard length	150-200	169.3	17.6
Body depth % in SL	36.1-42.00	38.2	2.0
Head length % in SL	28.1-29.8	29.1	0.6
Head depth % in SL	19.4-24.7	21.7	1.8
Snout length % in SL	8.1-8.8	8.5	0.3
Eye diameter % in SL	6.1-7.3	6.8	0.5
Interorbital distance % in SL	8.7-10.4	9.2	0.6
Predorsal length % in SL	44.9-49.3	47.3	1.6
Postdorsal length % in SL	14-18.8	16.4	1.8
Dorsal fin length % in SL	38-42.6	39.8	1.4
Anal fin length % in SL	10.7-12.5	11.7	0.7
Pectoral fin length % in SL	17.5-20	18.8	0.8
Pelvic fin length % in SL	19.1-23.2	20.4	1.4
Caudal peduncle length % in SL	15.2-18.9	17.5	1.3
Caudal peduncle depth % in SL	15.2-16.3	15.8	0.4
Meristic characters			
Lateral line	28-31	29.3	1.0
Scales above the lateral line	6-7	6.3	0.5
Scales below the lateral line	5-6	5.1	0.4
Dorsal fin unbranched rays	3-3	3	0
Dorsal fin branched rays	17-18	17.5	0.5
Anal fin unbranched rays	3-3	3	0
Anal fin branched rays	5-5	5	0
Pectoral fin unbranched rays	1-1	1	0
Pectoral fin branched rays	14-17	15.3	1.0
Pelvic fin unbranched rays	1-1	1	0
Pelvic fin branched rays	7-8	7.8	0.4
Number of gill rakers	43-48	45.3	2.5
Total number of vertebrae	30-31	30.6	0.5
Number of pharyngeal teeth	One row 4-4		

Results

Body deep, dorsal profile curved and ventral profiles straight. Head small with terminal mouth. Caudal peduncle deep. Lateral line starts from the posterior-dorsal point of operculum. Ventral fins lie under 2nd or 3rd dorsal fin ray. Anal fin anterior edge lies below the penultimate dorsal fin ray. Pectoral fins never reach anterior edge of dorsal fin. Horizontal line passing through the mouth touches the lower edge of orbit. Scales large. Dorsal and anal fin spines hard and large.

C. gibelio is characterised with a set of characters depending on the external morphology, which distinguish it from the other *Carassius* species given by Kottelat and Freyhof (2007); these are: silvery brown colour, last simple anal and dorsal rays strongly serrated, 37-52 gill rakers, 29-33 lateral line scales, free edge of dorsal concave or straight, 5½ branched anal rays, and peritoneum black. On the other hand, Masson et al. (2011) showed that the operculum of *C. gibelio* is characterised by a plain internal surface with the upper margin composed of small concavities around the posterior dorsal corner of the operculum. *C. gibelio* showed some similarities with *C. carassius* in having a rounded external margin of the cleithrum bone, while in *C. auratus* the external margin of this bone shows a convexity in the middle part of the dorsal limb (Masson et al. 2011).

Discussion

The geographical continuity of the watershed systems of Iraq and Iran makes it possible for freshwater fish species to move freely across the boundaries. The carp farming activities in Iran that include several species of carp are well developed and flourishing (Nash, 1997; Salehi, 2007; Yousefian, 2011). Such activities may be the source of the carp

species entering freshwater systems in Iran (Nash, 1997; Salehi, 2007), which may also be the source for the neighbouring freshwater systems of Iraq.

Introduction of non-native species and human modification of the aquatic environment might seriously affect the native fauna and flora (Gozlan et al., 2010; Tarkan et al., 2012 a,b). Similar to the worldwide pattern (e.g. Xenopoulos et al. (2005), Hermoso and Clavero (2011)), the inland waters of Iraq have clearly faced several drastic changes which included habitat alterations, species introductions and declines in native fish populations (Jawad, 2003; Coad, 2010).

Carassius gibelio (Bloch) is now confirmed as being present in Iraq, after being misidentified with the other two *Carassius* species introduced into Iraq: goldfish, *C. auratus* (L.), and crucian carp, *C. carassius* (L.), but their effects on the native species have not been recognised and confirmed yet.

The policy makers in Iraq concerned with the development of fisheries should consider developing risk assessment tools for several aspects of fisheries management, such as species introductions, establishment possibilities, expansion, biodiversity threats and ecological impacts (Copp et al., 2009; Mastitsky et al., 2010). Choosing the most effective measures that result in sustaining equilibrium in the populations of *C. gibelio* are always considered as priorities. Among these steps are: using the intensive fishing efforts in shallow areas during the spawning season (Paschos et al., 2004) – such an application is successfully adopted by some countries (Perdikaris, 2011); exploiting fully mature fish for the extraction of their pituitaries to stop or reduce the potency and hormonal compatibility (Kosti et al., 2008; Perdikaris et al., 2007; Vavatsikos, 2009); using *C. gibelio* as a protein source in fish meal, livestock and pet food, and production of fish silage (Tatterson and Windsor, 2001); and preventing the importation of new non-native species to protect restoration of native species (Perdikaris, 2011). Enforcements and more active legislations should be in place to control the inland fisheries management (Bobori et al., 2001) and a plan for the protection of native species and their habitats should be implemented (Saunders et al., 2002). On the other hand, Perdikaris (2012) has suggested some indirect measures to cope with the problems that resulted from the introduction of *C. gibelio* in the inland waters; among these are: public education, environmental sensitisation, scientists to cooperate with fisheries management at the governmental level, and call for the policy makers, administrative staff, local societies and fishermen to re-evaluate national legislation regarding the aquatic ecosystems.

In conclusion, the presence of *C. gibelio* in Iraq is considered as a serious threat to native and particularly to endangered freshwater fish species and should be taken seriously. Realistic measures to control the spread of the species and minimise the impacts of invasive species should be cared for. The ultimate result will be to protect and restore inland ecosystems.

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