

Possible Threat for Middle East Inland Water: an Exotic and Invasive Species, *Pterygoplichthys disjunctivus* (Weber, 1991) in Asi River, Turkey (Pisces: Loricariidae)

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Özet: *Orta Doğu iç suları için muhtemel tehdit: Asi Nehri'nde egzotik ve işgalci bir tür Pterygoplichthys disjunctivus (Weber, 1991) (Pisces: Loricariidae).* *Pterygoplichthys disjunctivus* bireyleri Güney Amerika kökenli olup, bu egzotik ve işgalci türü bireyleri Kuzey Amerika ve Uzakdoğu ülkelerine dağılmışlardır. Orta Doğu'da yer alan Asi Nehri'nin Türkiye sınırları dahilinde daha önce kayıtlarda bulunmayan bir *P. disjunctivus* bireyi yakalanmıştır. *P. disjunctivus* Asi Nehri'nde potansiyel olarak işgalci bir tür olabilir. Eğer bu türün bireyleri Asi Nehri'ne yayılırsa, buradaki türlerden *Garra rufa* üyeleri muhtemelen ilk etkilenen doğal türlerden olacaktır. Çünkü *P. disjunctivus* ile aynı trofik düzeyde yer almaktadırlar.

Anahtar Kelimeler: İşgalci türler, Asi Nehri, *Pterygoplichthys disjunctivus*.

Abstract: *Pterygoplichthys disjunctivus* is native to South America and this exotic and invasive species has also been introduced accidentally into North America and the Far East. A *P. disjunctivus* specimen was found in Asi River, Turkey, which is in the Middle East, despite the fact that this species has not been observed in the region before. *P. disjunctivus* is a potentially invasive species of Asi River. It is assumed that if other members of this species were to spread into Asi River, *Garra rufa* members would most probably be the primarily impacted species because they are at the same trophic level as *P. disjunctivus*.

Key Words: Invasive species, Asi River, *Pterygoplichthys disjunctivus*.

Introduction

One of the most dangerous consequences of globalization is an increase in the dispersion of exotic and invasive species all over the world. When an exotic species is introduced into a habitual aquatic system, it affects the ecosystem and also threatens native species that reside within. Principally, indigenous species cannot cope with unfair competition from the exotic species, which possess various ecological advantages, and they fail to survive. There are many examples recorded of exotic species and the ecological impacts of their invasion all over the world, in the Middle East, and also in Turkey (Crivelli 1995, Simberloff 1996, Coad 1996, Adams 1999, Pimentel *et al.* 2000, Saşi and Balık 2003, İnnal and Erk'akan 2006).

The *Pterygoplichthys disjunctivus* genus is endemic to neotropical South America (Armbruster 2001). This widespread invasive species is common in the tropical fish trade and has been introduced not only to North American freshwaters but also to Asian inland waters such as the Philippines, Taiwan, Indonesia, and Singapore by aquarium release or by escaping from aquaculture farms (Page and Robins 2006). However, there has been no record of it so far in the southern part of Turkey or in the Middle East.

Material and Methods

Asi River in the southern part of Turkey (Fig. 1) has a subtropical temperate climate and hosts many temperate

freshwater fish species, including catfishes such as *Clarias gariepinus* and *Mystus halepensis* (Yalçın 1997). The water temperature varies between 21 and 30°C from May to August in Asi River (Yalçın *et al.* 2001). In addition to high temperatures, the rich nutrients enable high production of algae and also a good breeding ground for aquatic invertebrates (Yalçın *et al.*, 2001, Yalçın-Özdilek and Ekmekçi 2006). The environmental factors of Asi River can be described as suitable for habitation and invasion by a tropical nonindigenous species. In this study, a sample was taken from a fisherman who caught it using a basket under the Sükrü Güçlü Bridge (36°11' 33 N - 36°09' 06 E) in Antakya on Asi River in July 2006. The fishermen preserved it by drying (Fig. 2). The specimen was identified in July 2007 with the help of Dr. Jonathan Armbruster. Measurements were made using mechanical callipers to the nearest 0.1 mm. Morphometric and meristic characters were based on the landmarks mentioned in Armbruster (2003) and indicated in Figure 3.

Results and Discussion

The morphometric and meristic characteristics (Tables 1 and 2) indicate that this specimen is a member of *P. disjunctivus*. According to the morphometric and meristic characteristics, this specimen differs from *P. pardalis* and/or *P. anistitsi* by having separate spots on the head and also differs from *P.*

multiradiatus due to conspicuously large spots on the head (Armbruster and Page 2006).

Members of *Pterygoplichthys* are herbivores, feeding on detritus and algae. They are benthic, sticking to streambeds with their suckerlike lips. In addition to their distinctive pattern, this feeding behaviour (cleaning algae from submerged surfaces) makes the *Pterygoplichthys* species popular with home aquarists. Therefore, members of Loricaridae family, including members of this genus, have been commonly imported not only into the United States and Europe, but also into tropical Asia since the mid-20th century (Innes 1948). Probable mechanisms mentioned of their introduction into Asian inland waterways have been aquarium release or escape from aquaculture farms (Page and Robins 2006). The member of this species was likely introduced into Turkish waters in a similar way.

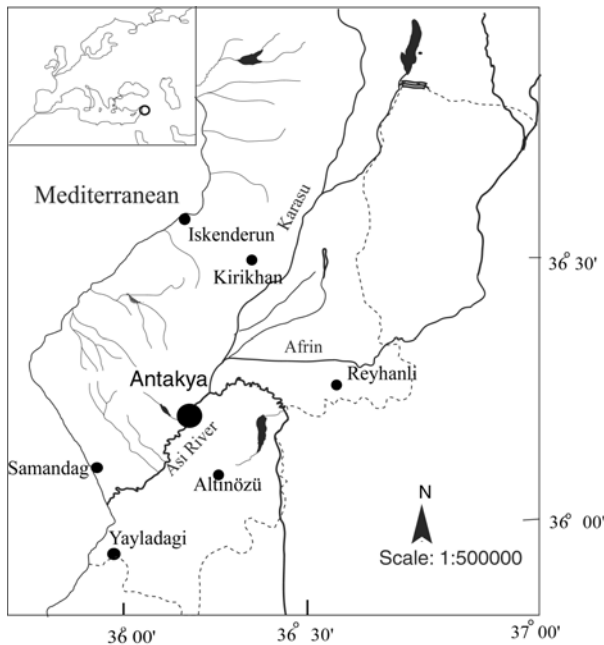


Fig 1. Locality of *Pterygoplichthys disjunctivus* specimen collected from Asi River.

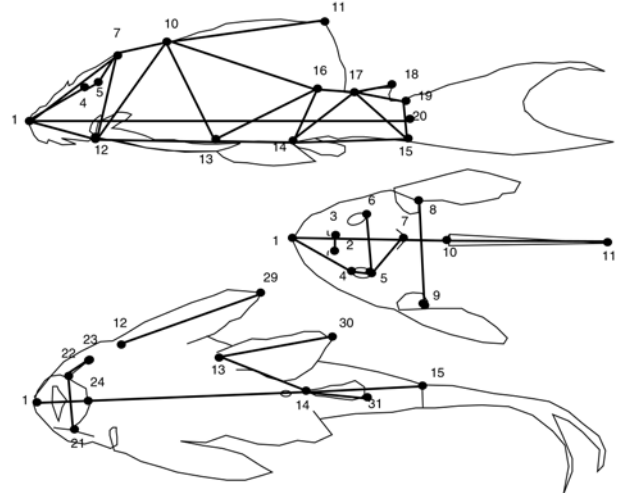


Fig. 2. Landmarks and distances measured (redrawn from Armbruster 2003). Table 1 indicates names of interlandmark distances. See Armbruster (2003) for definitions of landmarks.



Fig. 3. The *Pterygoplichthys disjunctivus* specimen.

Phelps and Walsh (2005) mentioned that *P. disjunctivus* has rapidly expanded its range. Actually, this species was introduced from South America in 1991 and was found widely in Asia within ten years. Such a rapid invasion may be dangerous. Legislative measures should be taken to control the pet trade by countries in the tropics and subtropics.

Table 1. Some metric characteristics of *Pterygoplichthys disjunctivus* specimen. Landmarks were indicated in Figure 2 (L: length, W: width, D: distance).

Landmarks	Metric characters	mm	Landmarks	Metric characters	mm
1-20	Standard L.	203.5	17-18	Adipose-spine L.	15.7
1-10	Predorsal L.	74.2	17-19	Dorsal adipose-caudal D.	29.3
1-7	Head L.	60.3	15-19	Caudal peduncle depth	19.5
7-10	Head-dorsal L.	13.5	15-17	Ventral adipose caudal D.	39.2
8-9	Cleithral width	48.1	14-17	Adipose-anal D.	41.2
1-12	Head pectoral L.	53.6	14-16	Dorsal anal D.	25.0
12-13	Thorax L.	44.1	13-16	Pelvic-dorsal D.	56.8
12-29	Pectoral-spine L.	55.7	1-14	Preanal D.	130.0
13-14	Abdominal L.	46.0	5-7	Head-eye L.	27.0
13-30	Pelvic-spine L.	37.0	4-5	Orbit diameter	8.2
14-15	Postanal L.	72.3	1-4	Snout L.	34.5
14-31	Anal-fin spine L.	10.0	2-3	Internares W.	14.2
10-12	Dorsal pectoral D.	47.5	5-6	Interorbital W.	25.6
10-11	Dorsal spine L.	49.5	7-12	Head depth	34.2
10-13	Dorsal-pelvic D.	37.7	1-24	Mouth L.	17.5
10-16	Dorsal-fin base L.	65.2	21-22	Mouth W.	20.3
16-17	Dorsal-adipose D.	30.0	22-23	Barbel L.	11.9

Table 2. Some meristic characteristics of *Pterygoplichthys disjunctivus* specimen.

Meristic characteristics		Meristic characteristics	
Dorsal fin rays	II-10	Plates on dorsal interradiol membrane	12
Anal fin rays	I-4	Plates on anal interradiol membrane	2
Caudal fin rays	I-14-I	Plates on pectoral interradiol membrane	1
Pectoral fin rays	I-5	Plates on pelvic interradiol membrane	2
Pelvic fin rays	I-5	Postanal plates	14
Lateral line plates	29	Plates between dorsal fin base and adipose fin	7

This study recorded only one specimen. Following its capture, no further specimens have been seen in Asi River. The survival conditions on Asi River were not good for all fish fauna in the 2007 summer season. It was one of the most arid summer seasons of the last decade. Overuse of river water for irrigation and the building of many floodgates across the river caused the deaths of many freshwater fishes due to drying up of the river bed (Demirci and Demirci 2007). If this species did not have the ability to invade rapidly, this record might not be important. However, it is worth noting that even if the present specimen were the only one introduced into Asi River, it was able to survive until it was caught. For this reason, it can be said that Asi River is a suitable habitat for *P. disjunctivus*. However, the river system should be continuously monitored and legal measures should be taken in Turkey to control the number of unwanted exotic species if they exist.

Native fish populations of Asi River system already face problems and are potentially threatened by habitat loss through reduction in summer months by over use of river water for irrigation and decrease in water quality due to agricultural runoff including chemicals and untreated wastewater discharging into different locations along the river length (Yalçın *et al* 2001, Yalçın-Özdilek and Ekmekçi 2006, Yalçın-Özdilek and Solak 2007).

The adverse effects of *Pterygoplichthys* species have mainly been found in alteration of food web dynamics (Nico and Martin 2001). Hoover *et al.* (2004) discussed the adverse effects of *Pterygoplichthys* species found in USA waters such as disruption of aquatic food chains, impact on native species, mortality of endangered shore birds, and changes in aquatic plant communities. Similar negative effects caused by this species on Asi River fauna are to be expected. *G. rufa*, which is the most common native benthic algae feeder in Asi River, has suckerlike lips similar to *Pterygoplichthys* members. The members of *G. rufa* help to reduce high eutrophication levels in Asi River during hot summer days (Yalçın-Özdilek and Ekmekçi 2006). If the *P. disjunctivus* members spread throughout the river system, the cyprinid species *G. rufa*, which is a benthic grazer, has to compete with this species. In other words, *G. rufa* has similar feeding habits and uses similar fauna for feeding. At the same time, *G. rufa* members are possible prey for *C. gariepinus* and the European eel in Asi River. To sum up, *G. rufa* members would have to deal with possible food shortage due to sharing feeding grounds with *P. disjunctivus* members, at the same time as coping with reduced water supply, pollution, and the danger of predators. In ecological means, *P. disjunctivus* members cannot fill the gap of *G. rufa* members as prey for predators due to their

body being too high to swallow.

P. disjunctivus is a potentially invasive species for Asi River, which is located in the Middle East. *C. gariepinus* members, which are of African origin, are already exotic invasive catfish species of Asi River. Members of this species have now spread to many coastal freshwaters of the Mediterranean in Turkey. They are found also in Sakarya River in Central Anatolia (Turan *et al.* 2005). It is likely that *P. disjunctivus* members, due to their rapid invasive character, are a danger for the native fish fauna of some Middle East freshwaters.

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