



Pseudorasbora parva (Temminck & Schlegel, 1846): A New Threat to Fish Biodiversity in Ordu Province (Middle Black Sea Region)

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ABSTRACT

The invasive fish species pose a significant threat to both local fish species and aquatic habitats. During the field surveys, an invasive fish species *Pseudorasbora parva* was found for the first time in Ulugöl (Ordu). In the field studies, 41 *P. parva* individuals from different size groups were captured. Total length (TL), fork length (FL), standard length (SL) and weight (W) of this invasive species which continuously increase distribution in Turkish inland waters were recorded. The average TL, FL, SL and W values of the *P. parva* were 7.24±1.2 cm (3.8-9.4 cm), 6.52±1.1 cm (3.4-8.4 cm), 5.73±0.9 cm (3.0-7.1 cm) and 3.24±1.4 g (0.4415-6.8632 g), respectively. *P. parva* species was reported as the first record in Ordu (Middle Black Sea Region). The increase in the number of *P. parva* individuals in Ulugöl is a great threat to Ordu fish biodiversity.

Keywords: Freshwater fishes, invasive fish species, Topmouth gudgeon, Ordu

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Pseudorasbora parva (Temminck & Schlegel, 1846): Ordu'da (Orta Karadeniz Bölgesi) Balık Biyoçeşitliliğine Yeni Bir Tehdit

Öz: İstilacı balık türleri hem yerel balık türleri hem de akuatik habitatlar için önemli bir tehdit oluşturmaktadır. Yapılan arazi çalışmaları sırasında Ordu ilinde ilk kez Ulugöl'de istilacı bir balık türü olan *Pseudorasbora parva*'ya rastlanmıştır. Arazi çalışmalarında farklı boy gruplarına ait 41 adet *P. parva* bireyleri yakalanmıştır. Türkiye iç sularında yayılış alanını devamlı olarak artıran bu istilacı türün total boy (TB), çatal boy (ÇB), standart boy (SB) ve ağırlıkları (W) kayıt altına alınmıştır. *P. parva* bireylerinin ortalama TB, ÇB, SB and W değerleri sırasıyla 7,24±1,2 cm (3,8-9,4 cm), 6,52±1,1 cm (3,4-8,4 cm), 5,73±0,9 cm (3,0-7,1 cm) ve 3,24±1,4 g (0,4415-6,8632 g) olarak belirlenmiştir. *P. parva* türü Ordu'da (Orta Karadeniz Bölgesi) için ilk kayıt olarak rapor edilmiştir. Ulugöl'de *P. parva* bireylerinin sayılarının artması Ordu balık biyoçeşitliliği için çok büyük bir tehdit oluşturmaktadır.

Anahtar kelimeler: Tatlı su balıkları, istilacı balık türü, Çakıl balığı, Ordu.

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Introduction

Turkey is one of the very rich countries in terms of freshwater ichthyofauna due to the geological position and topographic structure (Tarkan et al. 2015; Çiçek et al. 2018). 409 fish species were reported in the inland water of Turkey. Among these fish species, 194 are endemic and 28 are non-native species for Turkish inland waters (Çiçek et al. 2015; Çiçek et al. 2018).

Maintaining biodiversity in natural and artificial habitats is vital for a sustainable environment and future. The freshwater fish fauna is under threat due

to many different reasons such as numbers of water canals and dams in the system, domestic waste, introduction of invasive species, uncontrolled pesticide use, and habitat degradation (Özuluğ et al. 2013; Tarkan et al. 2015). These activities increase the negative effect of feeding, breeding and sustaining the species of fish which are found naturally in the freshwater source, or cause a decrease in the population or the continuity of the generation (Ekmekçi et al. 2013).

Invasive species have many negative impacts on ecosystem, local and national economies as well as

their negative effects on food and habitat competition, predation, hybridization, disease and parasites transport on native species (Kennard et al. 2005; Ekmekçi and Kırankaya 2006). Easy adaptation to environmental conditions, early sexual maturation, successful reproductive strategies and wide nutritional tolerance play an important role in the success of invasive species spreading into habitats (Carman et al. 2006).

Topmouth gudgeon, *Pseudorasbora parva* (Temminck & Schlegel, 1846) which is a member of the Cyprinidae family, are freshwater fish of Asian origin and they can find in many different freshwater habitats (Banarescu 1999). It is widely spread in lakes and ponds which are very rich in terms of water plants (Kottelat and Freyhof 2007). *P. parva* mouth is upward, small and has no barbels around it. Their caudal fin is homocerc. The most prominent feature is the black band that starts right behind the head and extends to the caudal. During the breeding period, small tubercles are found in the head region of the *P. parva* as in many carp. In addition, during this period, pigmentation on the outer part of the scales becomes darker in males and therefore male and female individuals are more easily discriminated (Froese and Pauly 2018). The species is usually 2 cm to 7.5 cm in length it can reach up to 12.5 cm in length. According to the IUCN criteria, *P. parva* is considered Least Concern (LC) (Huckstorf 2012).

P. parva which is an invasive fish species was reported in the Thrace region in 1982 for the first time in Turkey (Erk'akan 1984). This fish species, which has many invasive features, has spread rapidly to many Turkish freshwater basins (Çetinkaya 2006; Ekmekçi et al. 2013; Özuluğ et al. 2019). However, there is no record of *P. parva* in the freshwater habitats in the Ordu. Unfortunately, a new record has been added to the distribution areas of *P. parva* which is known as one of the most important invasive freshwater fish species of Turkey.

Materials and Methods

Ulugöl is a small lake located in Ulugöl Nature Park in Gökçöy district of Ordu province. Ulugöl has an area of 39 decares with 5-20 m depth at an altitude of 1200 m. This lake is formed as a result of the accumulation of water in the space formed by the landslide mass, the formation form is very different from the landslide lakes in the Black Sea Region (Taş et al. 2010). Carp (*Cyprinus carpio*) and endemic Abant trout (*Salmo abanticus*) which were released in 2007 during the stocking activities trout live in the Ulugöl (Anonymous 2012a; Anonymous 2012b).

The fish samples were captured using the electrosocket at along the Ulugöl lakeshore from the (Ordu) at 40°37'48''N and 37°32'46'' E coordinates (Figure 1). The captured fish samples were brought dead to the Hydrobiology laboratory at Ordu University with the fish transport containers.



Figure 1. Sampling area (adapted from GoogleEarth and Wikipedia).

All fish samples were identified using different studies (Kuru 1980; Kottelat and Freyhof 2007) and identification keys. Then, the sex determinations of these samples were made both microscopically and macroscopically according to their size. Some meristic and metric characters such as fish weight (nearest ± 0.1 g), total length, fork length and standard length (nearest ± 0.1 cm) were measured for each *P. parva* samples. The weight-frequency and length-frequency distributions were determined.

Results

In this study, 41 *P. parva* were caught from different parts of the Ulugöl (Ordu) during the fieldwork (Figure 2). Maximum and minimum values of total length, fork length, standard length and weight of the samples with mean and standard deviation 3.8 cm and 9.4 cm (7.24 ± 1.2), 3.4 cm and 8.4 cm (6.52 ± 1.1), 3.0 cm and 7.1 cm (5.73 ± 0.9) and 0.4415-6.8632 g (3.24 ± 1.4), respectively. The male and female *P. parva* samples from Ulugöl are shown in Figure 2.

It was determined that *P. parva* fish samples from Ulugöl were 60.97% female and 39.03% male. As a result of t-test, there was no statistical difference between weight and length values of male and female samples ($P > 0.05$).



Figure 2. *P. parva* samples captured during sampling.

P. parva fish fin rays formulas are determined as

Anal: III 6, Dorsal: II-III 7-8, Pektoral: I 8-12, and Ventral: I 7-8. The line lateral scales of the samples are between 36-40 and the pharyngeal teeth are 5-5. In the current study, we also examined the length and weight frequency of this invasive fish species. The weight-frequency and length-frequency distributions were presented in Figure 3.

Discussion

The introduction of invasive fish species into new aquatic environments in different pathways such as natural introduction, human introduction and involuntary introduction has dramatically increased the damage to these habitats. The existence of *P. parva* invasive species was recorded for the first time in Ulugöl (Ordu). The determination of the presence of *P. parva* is a major problem for both Ulugöl natural life and Ordu fish biodiversity. Male and female individuals belonging to different size groups have been captured (Figure 2). It proves that this species adapts to the Ulugöl and has successfully bred in the Ulugöl. Although 41 samples were captured in the sampling period, they were visually observed in an excessive amount of this species.

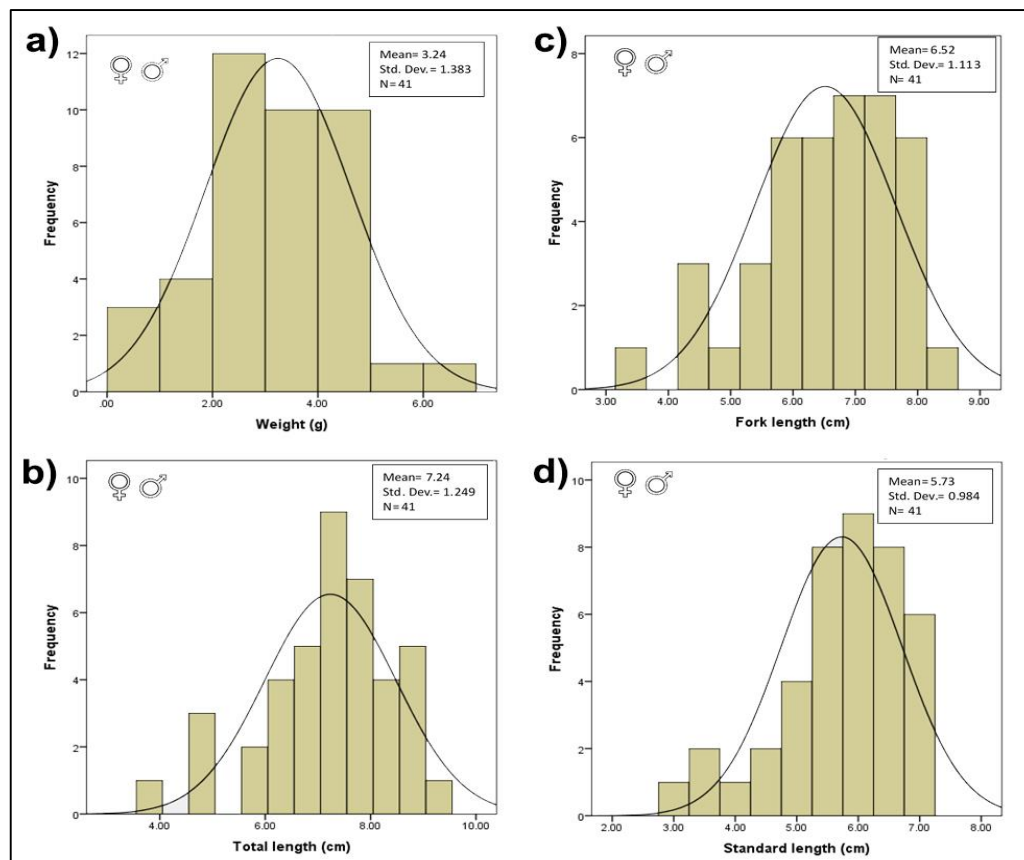


Figure 3. The weight-frequency and length-frequency distributions of *P. parva* from Ulugöl (Ordu).

P. parva can easily settle when transported to a reservoir in any way and it can be destructive for the other fish species due to its parasites (Andreou and Gozlan 2016). *P. parva* have also negative impacts

on the native fish fauna via competition foods, spawning areas, and other sources (Ekmekçi et al. 2013). *C. carpio* and *S. abanticus* inhabited in the Ulugöl (Anonymous 2012a; Anonymous 2012b).

Therefore, it is important to investigate the relationship of *P. parva* with *C. carpio* and *S. abanticus* in Ulugöl fish fauna and its effects on these economic fish species. In many studies, control activities were focused on the destruction of *P. parva* from natural waters in some European countries, especially in the UK (Britton and

Brazier 2006; Britton et al. 2010).

This is the new record for the distribution of *P. parva* in Ordu inland waters. Since 1984, *P. parva* has expanded the distribution areas within 35 years and has established successful populations in Turkish inland waters. In the studies it is clear that *P. parva* quickly spread to Turkey inland waters (Table 1).

Table 1. Distribution areas of *P. parva* in Turkey.

Locations	References	Locations	References
Meriç River (Edirne)	Erk'akan 1984	Yenice Dam (Eskişehir)	Yeğen et al. 2015
Aksu River (Antalya)	Wildekamp et al. 1997	Bahçecik Pond (Eskişehir)	Yeğen et al. 2015
Karacaören I Reservoirs (Isparta-Burdur)	Becer & İkiz 2001	Erenköy Pond (Eskişehir)	Yeğen et al. 2015
Topçam Dam Lake (Büyük Menderes)	Şaşı & Balık 2003	Günyüzü II Pond (Eskişehir)	Yeğen et al. 2015
Dipsiz-Çine Stream (Aydın)	Barlas & Dirican 2004	Koçaş II Pond (Eskişehir)	Yeğen et al. 2015
Karacaören II Reservoirs (Isparta-Burdur)	Küçük & İkiz 2004	Mercan Pond (Eskişehir)	Yeğen et al. 2015
Sarıyar Dam Lake (Ankara)	Ekmekçi & Kırankaya 2006	Akın Creek (Eskişehir)	Yeğen et al. 2015
Yortanlı Creek (Bakırçay Havzası)	Ekmekçi & Kırankaya 2006	Porsuk River (Eskişehir)	Yeğen et al. 2015
Filyos- Devrek Creek (Zonguldak)	İnnal & Erk'akan 2006	Çavdarhisar Dam (Kütahya)	Yeğen et al. 2015
Gölcük Lake (Isparta)	Yeğen et al. 2006	Enne Dam (Kütahya)	Yeğen et al. 2015
Sarıçay (Muğla)	Yılmaz et al. 2006	Kayaboğazı Dam (Kütahya)	Yeğen et al. 2015
Bekdiğin Pond (Samsun)	Uğurlu & Polat 2007	Söğüt Dam (Kütahya)	Yeğen et al. 2015
Ağaçköy Stream (Batı Karadeniz)	İlhan & Balık 2008	Doğuşah Pond (Kütahya)	Yeğen et al. 2015
Felek Stream (Batı Karadeniz)	İlhan & Balık 2008	Dumlupınar Pond (Kütahya)	Yeğen et al. 2015
Hirfanlı Dame Lake (Kırşehir)	Kırankaya et al. 2009	Pazarlar Pond (Kütahya)	Yeğen et al. 2015
Akgöl (Sinop)	Yardım & Erdem 2010	Sekiören Pond (Kütahya)	Yeğen et al. 2015
Gönen Stream (Balıkesir)	İlhan et al. 2012	Altıntaş Pond (Uşak)	Yeğen et al. 2015
Beyşehir Lake (Konya)	Meke et al. 2012	Göğem Pond (Uşak)	Yeğen et al. 2015
Gelingüllü Dam Lake (Yozgat)	Özdilek et al. 2013	Gökçeada (Çanakkale)	Bakaç et al. 2017
Ulubat Lake (Bursa)	Çınar et al. 2013	Demirköprü Reservoir (Manisa)	Karakuş et al. 2017
Marmara Lake (Manisa)	İlhan & Sarı 2013	Afşar Reservoir (Manisa)	Karakuş et al. 2017
Ula Reservoir (Muğla)	Keskin et al. 2013	Görde Stream (Manisa)	Karakuş et al. 2017
Bayraktar Reservoir (İzmit)	Keskin et al. 2013	Gediz River (Manisa)	Karakuş et al. 2017
Kirazoğlu Reservoir (İzmit)	Keskin et al. 2013	Demirci Stream (Manisa)	Karakuş et al. 2017
Davuldere Reservoir (İzmit)	Keskin et al. 2013	Kemerdamları Drainage (Manisa)	Karakuş et al. 2017
Meyil Lake (Konya)	Özuluğ et al. 2013	Gödet Creek (Karaman)	Küçük et al. 2018
Evri Stream (Kahramanmaraş)	Özuluğ et al. 2013	Gödet Reservoir (Karaman)	Küçük et al. 2018
Kemer Reservoir (Aydın)	Şaşı & Berber 2013	Deliçay Reservoir (Karaman)	Küçük et al. 2018
Topçam Reservoir (Aydın)	Şaşı & Berber 2013	İbrala Reservoir (Karaman)	Küçük et al. 2018
Lake Eğirdir (Isparta)	Yerli et al. 2013	Ayrancı Reservoir (Karaman)	Küçük et al. 2018
Moğan Lake (Ankara)	Özeren & Arslan 2014	Abdürrahimköyü Stream (Marmara Basını)	Özuluğ et al. 2019
Dodurga Dam (Bilecik)	Yeğen et al. 2015	Anaçay Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Kızıldamlar Dam (Bilecik)	Yeğen et al. 2015	Kocaçay Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Küçükelmali Pond (Bilecik)	Yeğen et al. 2015	Kovakçeşme Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Onaç Dam (Burdur)	Yeğen et al. 2015	Muzalı Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Çatören Dam (Eskişehir)	Yeğen et al. 2015	Sazlıdere Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Gökçekaya Dam (Eskişehir)	Yeğen et al. 2015	Seymendere Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Kaymaz Dam (Eskişehir)	Yeğen et al. 2015	Uzunçay Stream (Meriç-Ergene Basını)	Özuluğ et al. 2019
Kunduzlar Dam (Eskişehir)	Yeğen et al. 2015	Ulugöl (Ordu)	This Study

P. parva was accidentally introduced into the Ulugöl in the course of stocking with *C. carpio*. In addition, many amateur fishing activities are carried out in Ulugöl, and local and traditional fishing competitions with competitors from different regions are organized. It is thought that *P. parva* may be spread by hunting or fishing activities used in different watersheds. In order to prevent the spread of this fish species in the inland waters of Ordu, flyers and leaflets can be a useful way of promoting public awareness about the invasive fish. In addition, people and fishermen in that area should be informed about the fishing gear used in fishing in Ulugöl not to be used in other ecosystems.

Invasive freshwater fish species continue to increase steadily in many freshwater habitats (İnnal 2012). There are many reasons for the high success of *P. parva* species in the Turkish inland waters such as reproduction activity rate during the breeding season, sexual maturation at an early age, relatively large eggs, male guarding eggs and short life cycle of the species (Ekmekçi and Kırankaya 2006). Ekmekçi and Kırankaya (2006) reported that *P. parva* can lay eggs in branches, leaves, plastic waste from the habitats. Therefore, when the consider the problem of the Ulugöl with aquatic plants, it is observed that this contributes to increase in the number of *P. parva* compared to other fish species in the habitat.

The reduction of biodiversity or the disappearance of certain species makes biological resources unusable and useless. On the other hand, when it comes to genetics, biodiversity becomes even more important. Biotechnological developments that will benefit human beings and ecosystems in the future depend on the wealth of gene pools of biological resources (Polat et al. 2011). Considering studies related to Turkish ichthyofauna, information for these destructive effects on the aquatic ecosystems of invasive fish species which increases the distribution area in Turkish inland waters is quite limited (Özuluğ et al. 2013). In order to avoid irreparable losses in fish biodiversity of Turkey, the distribution areas of these invasive species should be identified. Necessary management actions should be given to the fisheries studies about identifying possible mechanisms of invasive fish action on native fish species in the habitats such as disease, hybridization, food and habitat competition. Because of that the necessary steps against the occurrence of the invasive species and the species should be monitored in the habitats.

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