



SAKARYA ÜNİVERSİTESİ

FEN BİLİMLERİ ENSTİTÜSÜ DERGİSİ

Sakarya University Journal of Science
SAUJS

ISSN 1301-4048 e-ISSN 2147-835X Period Bimonthly Founded 1997 Publisher Sakarya University
<http://www.saujs.sakarya.edu.tr/>

Title: Two New Records for the Fish Fauna of Simenlik-Akgöl Lagoon in Yeşilırmak River Basin (Samsun-Turkey)

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Received: 2022-07-05 00:00:00

Accepted: 2022-09-20 00:00:00

Article Type: Research Article

Volume: 26

Issue: 6

Month: December

Year: 2022

Pages: 1104-1110

How to cite

Melek ÖZPİÇAK, Semra SAYGIN, Savaş YILMAZ, Nazmi POLAT; (2022), Two New Records for the Fish Fauna of Simenlik-Akgöl Lagoon in Yeşilırmak River Basin (Samsun-Turkey). Sakarya University Journal of Science, 26(6), 1104-1110, DOI: 10.16984/saufenbilder.1141017

Access link

<https://dergipark.org.tr/en/pub/saufenbilder/issue/74051/1141017>

New submission to SAUJS

<http://dergipark.gov.tr/journal/1115/submission/start>

Two New Records for the Fish Fauna of Simenlik-Akgöl Lagoon in Yeşilirmak River Basin (Samsun-Turkey)

Melek ÖZPİÇAK*¹ , Semra SAYGIN¹ , Savaş YILMAZ¹ , Nazmi POLAT¹ 

Abstract

In this study, two new freshwater fish species, *Gambusia holbrooki* Girard, 1859 and *Petroleuciscus borysthenicus* (Kessler, 1859) were reported from Simenlik-Akgöl Lagoon in Yeşilirmak Basin (Samsun). Turkey has a rich biodiversity in terms of freshwater fish. Because of climate change, periodic ichthyofauna monitoring and updating of fish fauna are critical. *Gambusia holbrooki*, Eastern mosquitofish, is an invasive fish species and has a widespread range because of biological struggle against mosquitoes in many water sources. However, simultaneously feeding with fish eggs presents a significant threat to biodiversity. And also, *Petroleuciscus borysthenicus*, Dnieper chub, is a small bodied-fish from the genus *Petroleuciscus* with a wide range. Dnieper chub and Eastern mosquitofish were assessed as Least Concern (LC) species according to the IUCN criteria. The minimum and maximum total lengths of *P. borysthenicus* and *G. holbrooki* are 4.5 cm-5.7 cm and 2.5 cm-5.3 cm, respectively. The results of this study reveal that the existence of new fish species has been recorded for the fish fauna of Simenlik-Akgöl Lagoon, and the distribution area of both these fish species have reached a different location in Yeşilirmak Basin.

Keywords: New record, Yeşilirmak River Basin, *Gambusia holbrooki*, *Petroleuciscus borysthenicus*

1. INTRODUCTION

Historical natural processes have produced biodiversity [1]. This means that the identification of biological units, such as species, that are the product of evolutionary processes is the first step in any logical approach to protecting biodiversity [2]. Turkey has a rich biodiversity and endemism in terms

of freshwater fish, because of having both European- and Asian origin species [3]. The species whose range crosses Turkey throughout different geological epochs settle in these locations and establish local colonies there [4]. And also, Black Sea rivers could have acted as glacier refuges during the creation of freshwater ichthyofauna [5, 6]. As a result, many researchers were interested in the detailed

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examination of Turkey's ichthyofauna and the finding of faunal components [7-16].

Palearctic leuciscid genus *Petroleuciscus* was first described by [17]. This genus is phenotypically and genetically distinct from sister group *Squalius* [6, 18]. In this genus, *Petroleuciscus borysthenicus* is distributed in Eurasia: Eastern, northern, and western, Black Sea and Azov Sea basins, from eastward in Europe to northwestern Turkey [19]. Due to its extensive distribution and high abundance, this fish was given the IUCN designation of Least Concern (LC) species [20].

The mosquitofish, *Gambusia holbrooki* Girard 1859, one of the worst invasive fish in the world, small fishes of the family Poeciliidae only native to freshwater basins of the east coast of the U.S.A. and Mexico but has been introduced into more than 50 countries [21] in order to control mosquito populations and hence malaria [22]. They were introduced into Turkey for the biological control of malaria between the years 1920-1929 [23]. *G. holbrooki* exhibit strong sexual dimorphism, with females being noticeably bigger than males and males having an anal fin transformed into a gonopodium [24]. The conservation status of *G. holbrooki* was classified as Least Concern (LC) according to the IUCN Red List Criteria [25].

The aim of this study is to record the presence of *Petroleuciscus borysthenicus* and *Gambusia holbrooki* of the families Leuciscidae and Poeciliidae which were not recorded in previous studies of Simenlik-Akgöl Lagoon located within the borders of Yeşilirmak River Basin.

2. MATERIALS AND METHODS

Samples were collected from Simenlik-Akgöl Lagoon following coordinates, 41°16' 41.952"

N - 36°56'29.868" E using SAMUS 725 MP electroshocker (Figure 1).

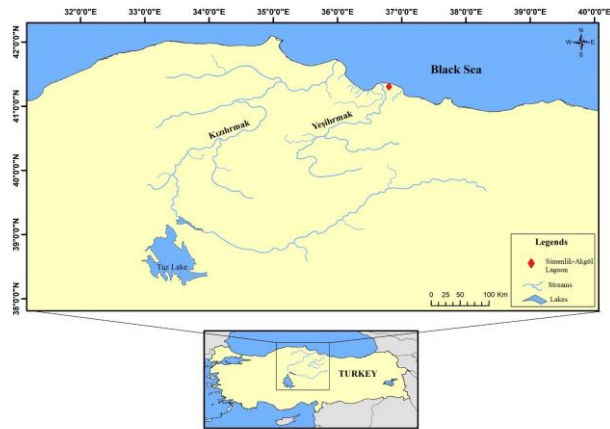


Figure 1 The map of Simenlik-Akgöl Lagoon

Petroleuciscus borysthenicus and *Gambusia holbrooki* samples were immediately fixed in 4% formaldehyde in the field and stored permanently in 70% ethanol. Identification of the specimens was based on the morphological characters following [10, 13, 20].

Samples were measured for total length (TL), fork length (FL) and standard length (SL) (0.01 cm.). Individual weights (W) were taken using a digital balance with a precision of 0.01 g. Meristical counts such as Dorsal fin rays (D), Anal fin rays (A), Pectoral fin rays (P), and Ventral fin rays (V) were performed for each sample. Linealateral scales were counted on the left side of the fish samples. Sex was determined by macroscopic examination of the gonads.

3. RESULTS AND DISCUSSION

A total of 20 *Petroleuciscus borysthenicus* (12 female, 8 male) individuals and 31 *Gambusia holbrooki* (15 female, 16 male) individuals were sampled from Simenlik-Akgöl Lagoon. The minimum and maximum total lengths and weights of *P. borysthenicus* and *G. holbrooki* individuals are 4.5-5.7 cm and 2.5-5.3 cm, and 0.90-1.98 g and 0.15-1.95 g respectively. And

also, morphological data were offered in Table 1. Meristic characters of the *P. borysthenicus* samples were counted as D: III-IV/8-10; A: III-IV/9-10, V: I-II/8-9; P: I/9-11 and also, D: I-II/5-6; A: II-III 7-8, V: I-II/4-5; P: I/7 for *G. holbrooki*. Scales on lineae lateral are counted as 33-40 and 29-32 for *P. borysthenicus* and *G. holbrooki*, respectively.

Table 1 Descriptive statistics of morfometric measurements for *P. borysthenicus* and *G. holbrooki*

Variables	<i>P. borysthenicus</i>	<i>G. holbrooki</i>
	Min-Max (Mean±SD)	Min-Max (Mean±SD)
Total Length (cm)	4.50-5.70 (5.07±0.4)	2.50-5.30 (4.19±0.9)
Fork Length (cm)	3.90-5.30 (4.64±0.3)	-
Standard Length (cm)	3.60-4.80 (4.16±0.3)	1.90-4.40 (3.34±0.7)
Weight (g)	0.90-1.98 (1.31±0.3)	0.15-1.84 (0.95±0.5)

SD: Standard deviation, Min: Minimum, Max: Maximum.

In the province of Samsun, Simenlik-Akgöl Lagoon Lake is located 25 kilometers from the center of Terme. The boundaries of Yeşilirmak Delta include this region. When the literature is examined, it has been found that there are different studies carried out with the aim of determining the fish fauna of the Yeşilirmak Delta [26-31]. There are some studies about fish fauna of Simenlik-Akgöl Lagoon in literature. *Mugil cephalus*, *Mugil saliens*, *Esox lucius*, *Carassius gibelio*, *Tinca tinca* and *Abramis brama* were recorded from Simenlik by [32]. In addition, *Syngnathus abaster*, *Platichthys flesus*, *Atherina boyeri*, *Gasterosteus aculeatus*, *Neogobius melanostomus* and *Proterorhinus marmoratus* were added to fish fauna of Simenlik-Akgöl Lagoon Lake [26, 33]. However, a recent study [33] recorded an endemic fish species, *Anatolichthys marassentensis* from Simenlik-Akgöl Lagoon.

It is essential to regularly update the fish fauna and monitor the ichthyofauna due to climate change. *Petroleuciscus borysthenicus* was first declared to belong to the genus *Squalius* [8]. It has been accepted later as valid species belonging to the new genus *Petroleuciscus* by many scientists and authorities [17, 20, 34]. *P. borysthenicus* was detected in the Karaboğaz Lagoon [26, 35] and [36] in Miliç River in Samsun Province. *P. borysthenicus* is a small bodied-fish a wide range. This small-bodied fish tolerates a variety of habitats, including marshes, lakes, and montane streams, and favors shallow places with sluggish currents [37- 39].

Also, *G. holbrooki* reported in in this study clearly corroborate with several data obtained by [40] from the Kızılırmak River, Taflan, and Yurtluk Streams and [36] from Miliç River. *G. holbrooki* is among the most invasive fish worldwide, with well documented ecological impacts on ecosystem functioning [41]. The detection of this species in a new location in the Yeşilirmak Basin will contribute to the determination of any potential effects on the local fish fauna. There is no record of *P. borysthenicus* and *G. holbrooki* from Simenlik-Akgöl Lagoon.

4. CONCLUSION

In this study, we report two new records of *P. borysthenicus* and *G. holbrooki* from Simenlik-Akgöl Lagoon. The results of this study reveal that the existence of these fish species has been recorded for the fish fauna of Simenlik-Akgöl Lagoon. In particular, the fact that one of the caught species is an invasive species is important for carrying out more comprehensive studies in this area.

It is important to look into the effects of invasive fish species that have colonized the inland waters of Turkey, either naturally or as a result of human activity, and have established

long-term populations there. Particular attention should be paid to endemic species that live in these habitats. It is essential for scientists, decision-makers, resource managers, and the general public to comprehend the variety of the freshwater ichthyofauna of any nation in order to more accurately assess how human activities affect the freshwater fishes there.

Funding

The author (s) has no received any financial support for the research, authorship or publication of this study.

Authors' Contribution

The authors contributed equally to the study.

The Declaration of Conflict of Interest/ Common Interest

No conflict of interest or common interest has been declared by the authors.

The Declaration of Ethics Committee Approval

This study does not require ethics committee permission or any special permission.

The Declaration of Research and Publication Ethics

The authors of the paper declare that they comply with the scientific, ethical and quotation rules of SAUJS in all processes of the paper and that they do not make any falsification on the data collected. In addition, they declare that Sakarya University Journal of Science and its editorial board have no responsibility for any ethical violations that may be encountered, and that this study has not been evaluated in any academic publication environment other than Sakarya University Journal of Science.

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