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Menba Kastamonu Üniversitesi Su Ürünleri Fakültesi Dergisi 2022; 8(1): 31-38 Araştırma Makalesi/Research Article

First Record of *Atherina boyeri* Risso, 1810 in Atikhisar Reservoir (Çanakkale, Turkey)

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Abstract

This paper reported the first occurrence of the big-scale sand smelt *Atherina boyeri* (Risso, 1810) in the Atikhisar Reservoir, Çanakkale, Turkey. A total of 130 individuals of *A. boyeri* were caught using a beach seine with 10 mm mesh size, 1.5 long and 1 m high in June 2021. The total length and weight of specimens ranged between 3.2-9.1 cm and 0.17-4.38 g, respectively. This study provides valuable information about the spatial distribution of *A. boyeri* and the biodiversity of the reservoir. Further investigations should be carried out to determine bio-ecological features of *A. boyeri* population to understand its effect on the reservoir.

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INTRODUCTION

Atherina boyeri (Risso, 1810) is extensively distributed throughout the Mediterranean and the Black Sea and in the eastern Atlantic Ocean (Antonucci et al., 2012). Although it is a euryhaline species that spend a significant part of its life cycle in brackish coastal environments (Bamber & Henderson, 1988), it can be found in freshwater habitats. *A. boyeri* has plenty and accomplished populations in inland waters in Anatolia even though it is a marine species (Gençoğlu & Ekmekçi, 2016). It is listed as Least Concern in the IUCN Red List of Threatened Species (Freyhof & Kottelat, 2008). They commonly prefer slow-flowing or still waters, and they regularly form schools near the coasts (Freyhof & Kottelat, 2008). They primarily feed on fish larvae, small mollusks, worms, and crustaceans in lakes and estuaries (Froese & Pauly, 2022). *A. boyeri* can reproduce in various habitats (Antonucci et al., 2012) and resides in coastal lagoons during the larval and juvenile phases while the adults move to the sea before the cold season (Mistri & Colombo, 1988). There are no major threats known to this species yet (Freyhof & Kottelat, 2008).

It is known as translocated/invasive species for the inland waters of Turkey (Ağdamar et al., 2021). Recently, the introduction of *A. boyeri* into natural and artificial lakes in Turkey has been reported by several authors (Kırankaya et al., 2014; Saç et al., 2015; Apaydın Yağcı et al., 2015; Gençoğlu & Ekmekçi, 2016; Ünlü et al, 2017; Partal et al., 2019; Ağdamar et al., 2021). Although Akbulut et al. (2008) documented the presence of *A. boyeri* in Sarıçay Creek, there is no confirmed record for the presence of *A. boyeri* in Atikhisar Reservoir. Therefore, the present study aimed to document a new distribution area and the first report of *A. boyeri* in Atikhisar Reservoir in Çanakkale, Turkey.

MATERIALS AND METHODS

Atikhisar Reservoir (Figure 1) has been constructed on Sarıçay Stream for supplying water to the people inhabiting Çanakkale for drinking purposes (Kale, 2019). It is the only water source bringing water for drinking purposes to communities living in the city (Kale & Acarlı, 2019a; Kale et al., 2020). The reservoir also provides water for both domestic use and agricultural activities to the neighboring locations (Kale & Acarlı 2019a; Kale & Acarlı 2019b).

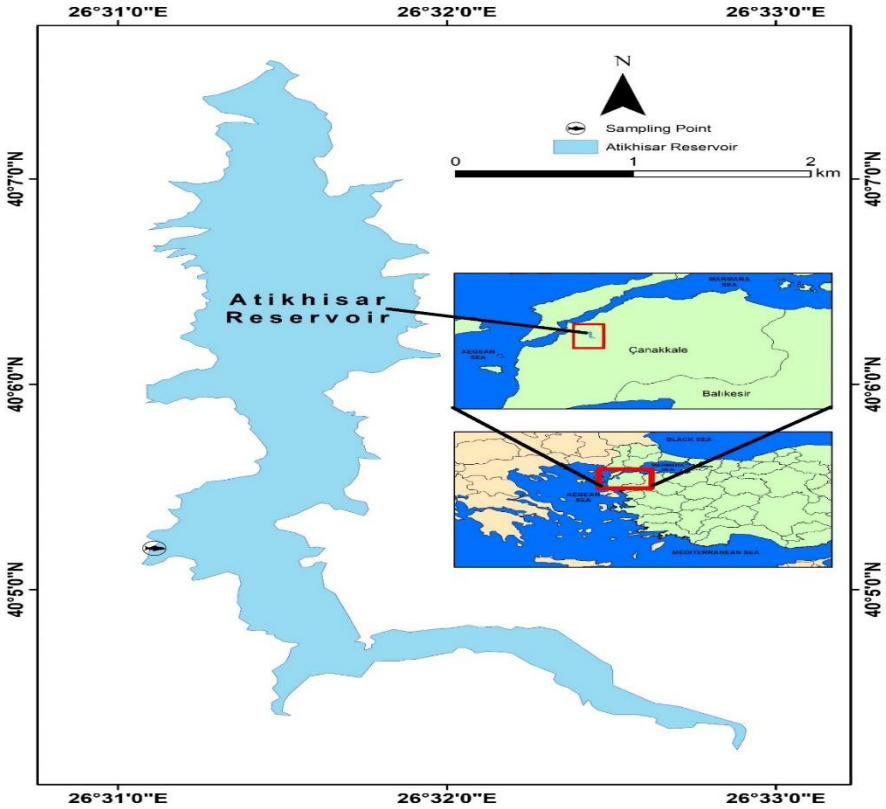

Figure 1. Sampling location of *Atherina boyeri* in Atikhisar Reservoir (Çanakkale, Turkey)

Sampling was conducted during the daytime on June 2021 in Atikhisar Reservoir. The big-scale sand smelt individuals were collected using a beach seine with 10 mm mesh size, 1.5 m long and 1 m high. The sediment was a muddy substrate in the sampling location. Specimens were fixed in formalin. Total length (TL) and weight (W) of *A. boyeri* individuals were recorded in the Fisheries Histology and Biochemistry Research Laboratory of the Faculty of Marine Sciences and Technology, Çanakkale Onsekiz Mart University in Çanakkale, Turkey. The image of the captured specimen of *A. boyeri* was provided in Figure 2.

Figure 2. The image of *A. boyeri* from the Atikhisar Reservoir (Çanakkale, Turkey)

RESULTS AND DISCUSSION

A total of 130 individuals were observed during the sampling surveys. The total length and weight of specimens ranged between 3.2-9.1 cm and 0.17-4.38 g, respectively. The descriptive statistics of the dataset was given in Table 1. The mean total length and mean weight of the collected specimens were 7.57 (±0.57) cm and 2.65 (±0.51) g, respectively.

Table 1. Descriptive statistics of the dataset

Parameters	N	Mean	SE	Median	SD	Kurtosis	Skewness	Range	Min	Max
TL (cm)	130	7.57	0.05	7.60	0.57	26.24	-3.26	5.90	3.20	9.10
W(g)	130	2.65	0.04	2.60	0.51	5.61	0.08	4.21	0.17	4.38

Note: *N* is the sample size; *SE* is the standard error; *SD* is the standard deviation, *Min* is the minimum value; *Max* is the maximum value of the dataset.

This study describes the first presence of *A. boyeri* in the Atikhisar Reservoir. Akbulut et al. (2008) observed it in Sarıçay Creek. Partal et al. (2019) also documented the introduction of *A. boyeri* into Bayramiç Reservoir in Çanakkale. Ağdamar et al. (2021) reported the presence of *A. boyeri* in Tepeköy Stream, Gökçeada Island, Çanakkale. Several authors have also reported the occurrence of *A. boyeri* in freshwater ecosystems (Balık et al., 2005; Onaran et al., 2006; Özuluğ, 2008; Birecikligil & Çiçek 2011; Yerli et al., 2013; Saç et al., 2015; Bostanci & Yedier, 2018; Yedier et al., 2019; İlhan et al., 2020; Kelleci et al., 2021). A comparison of the length and weight values of available literature in some freshwater ecosystems in Turkey was tabulated in Table 2.

Table 2. Comparison of length and weight values of *A. boyeri* reported in freshwater ecosystems in Turkey

Location	N	Length			Weight (g)		Reference
		Length Type	*Min*	*Max*	*Min*	*Max*	
Aslantaş Reservoir (Osmaniye)	409	TL (mm)	23.87	115.35	0.11	9.64	Gençoğlu et al. (2020)
Bayramiç Reservoir (Çanakkale)	98	TL (cm)	2.4	8.2	0.06	4.31	Partal et al. (2019)
Büyükçekmece Reservoir (İstanbul)	22	TL (cm)	3.1	6.1	0.295	2.36	Saç et al. (2016)
Demirköprü Dam Lake (Manisa)	41	TL (cm)	3.9	13.6	0.4	16.5	İnnal & Engin (2020)
Devegeçidi Dam Lake (Diyarbakır)	15	TL (mm)	40.3	55.1	0.70	8.00	Ünlü et al. (2017)
Hirfanlı Reservoir (Kırşehir)	323	TL (mm)	40.98	110.25	*N/A*	*N/A*	Kırankaya et al. (2014)
Hirfanlı Reservoir (Kırşehir)	674	TL (mm)	5.76	115.65	0.01	10.48	Gençoğlu & Ekmekçi (2016)
Hirfanlı Reservoir (Kırşehir)	369	TL (mm)	24.35	107.77	*N/A*	*N/A*	Gençoğlu et al. (2020)
Hirfanlı Reservoir (Kırşehir)	1449	TL (mm)	29.0	95.0	0.14	6.42	Benzer & Benzer (2017)
Hirfanlı Reservoir (Kırşehir)	35	TL (cm)	6.5	8.6	1.53	4.13	Benzer (2019)
Hirfanlı Reservoir (Kırşehir)	369	TL (mm)	38.64	113.20	0.34	10.94	Gençoğlu et al. (2020)
Homa Lagoon (İzmir)	103	TL (cm)	3.4	10.6	0.29	8.40	Acarlı et al. (2014)
Karacaören-1 Dam Lake (Burdur)	513	TL (mm)	4.5	8.5	0.63	4.10	Becer & Kılıç (2018)
Köyceğiz Lagoon (Muğla)	355	TL (mm)	27.93	97.03	0.12	6.60	Gençoğlu et al. (2020)
Lake Bafa (Muğla)	16	SL (cm)	4.5	7.4	*N/A*	*N/A*	Güçlü et al. (2013)
Lake Bafa (Muğla)	2204	TL (cm)	5.0	10.7	1.00	10.59	Ofluoğlu et al. (2021)
Lake Eğirdir (Isparta)	1433	TL (cm)	83.5±0.99(mean±SE)			3.96±0.12 (mean±SE)	Küçük et al. (2012)
Lake Eğirdir (Isparta)	182	TL (mm)	58.98	95.00	1.35	5.39	Bostancı et al. (2014)
Lake Eğirdir (Isparta)	12041	FL (cm)	1.6	9.8	0.15	9.42	Apaydin Yagci et al. (2015)
Lake Eğirdir (Isparta)	612	FL (mm)	2.7	10.6	0.12	9.90	Apaydın Yağcı et al. (2016)
Lake Eğirdir (Isparta)	612	FL (cm)	2.5	9.9	0.12	9.90	Apaydın Yağcı et al. (2021)
Lake Eğirdir (Isparta)	464	TL (mm)	34.43	95.45	0.39	6.67	Gençoğlu et al. (2020)
Lake Eğirdir (Isparta)	114	TL (cm)	3.9	6.6	0.27	1.45	İnnal & Engin (2020)
Lake Gölmarmara (Manisa)	20	TL (cm)	3.8	4.7	0.36	0.64	İnnal & Engin (2020)
Lake İznik (Bursa)	922	TL (mm)	8.0	115.0	0.001	11.00	Özeren (2009)
Lake İznik (Bursa)	237	FL (cm)	2.0	10.6	0.06	10.50	Çetinkaya et al. (2011)
Lake İznik (Bursa)	36	TL (cm)	6.2	10.4	1.70	7.20	Benzer & Benzer (2020a)
Lake İznik (Bursa)	3053	TL (cm)	2.6	11.2	0.11	11.02	Cilbiz et al. (2020)
Lake İznik (Bursa)	290	TL (mm)	27.21	115.65	0.08	9.79	Gençoğlu et al. (2020)
Lake Küçükçekmece (İstanbul)	50	SL (cm)	8.30	10.40	*N/A*	*N/A*	Altun (1999)
Lake Küçükçekmece (İstanbul)	15	TL (cm)	3.9	11.1	*N/A*	*N/A*	Tarkan et al. (2006)
Küçükçekmece Lagoon (İstanbul)	15	SL (mm)	3.5	9.8	*N/A*	*N/A*	Gaygusuz et al. (2006)
Marmara Lake (Manisa)	101	TL (cm)	3.7	8.7	0.40	5.40	İlhan & Sarı (2015)
Ömerli Reservoir (İstanbul)	240	SL (mm)	6.6	10.8	*N/A*	*N/A*	Gaygusuz et al. (2006)
Ömerli Reservoir (İstanbul)	442	TL (cm)	7.7	12.9	*N/A*	*N/A*	Tarkan et al. (2006)

Seyhan Reservoir (Adana)	15	TL (mm)	72.1	100.1	2.10	5.90	Çevik et al. (2018)
Süreyyabey Dam Lake (Yozgat)	46	TL (cm)	5.80	7.80	0.12	3.57	Benzer (2018)
Süreyyabey Dam Lake (Yozgat)	394	TL (mm)	32.0	90.0	0.225	4.062	Benzer & Benzer (2019a)
Tepeköy Stream (Çanakkale)	2	SL (mm)	41	53	*N/A*	*N/A*	Ağdamar et al. (2021)
Yamula Dam Lake (Kayseri)	30	TL (cm)	6.40	10.20	1.50	7.31	Benzer & Benzer (2019b)
Yamula Dam Lake (Kayseri)	1110	FL (cm)	3.5	8.3	0.38	4.82	Benzer & Benzer (2020b)
Atikhisar Reservoir (Çanakkale)	130	TL (cm)	3.20	9.10	0.17	4.38	Present study

Although Partal et al. (2019) claimed that migratory waterfowl could play a role in the spreading of *A. boyeri* among close watersheds, it is well known that the big-scale sand smelt has been illegally introduced to many freshwater ecosystems by small-scale fishermen engaged in sport fishing and amateur fisheries. Due to its extensive assortment preferences of food and habitat, *A. boyeri* adapts very well to its environment, grows rapidly, and forms large populations (Becer & Bilgin, 2018). The introduction of invasive species in a freshwater ecosystem caused to decrease in the number of fish species that have commercial value since they intensely consumed eggs and larvae of these species (Altındağ & Ahıska, 2006). Atalay et al. (2017) noted that *A. boyeri* was considered a threat to inland fisheries and a commercially valuable species in Turkey. On the other hand, the negative impacts of the big-scale sand smelt on the fisheries and ecosystem were a contentious issue (Tarkan et al., 2012). Therefore, comprehensive studies should be performed to better understand the competition among other species in the freshwater ecosystems.

Many researchers have carried out samplings and surveys in the Atikhisar Reservoir to determine the faunal composition of the reservoir. Chub (*Squalis cephalus*) (Akbulut et al., 2008; Selvi et al., 2015), common carp (*Cyprinus carpio*) (Akbulut et al., 2008), European eel (*Anguilla anguilla*) (Kale, 2019), northern pike (*Esox lucius*) (Selvi & Kaya, 2013), spined loach (*Cobitis taenia*) and black goby (*Gobius niger*) (Akbulut et al., 2008) species have been reported. On the other hand, the zebra mussel (*Dreissena polymorpha*) (Kaya et al., 2013), margined ramshorn (*Planorbis planorbis*), keeled ramshorn (*Planorbis carinatus*) freshwater snail (*Melanopsis* sp.), European valve snail (*Valvata piscinalis*), ubiquitous peaclam (*Pisidium casertanum*) (Akbulut et al., 2009), Turkish crayfish (*Pontastacus leptodactylus*) (Kale et al., 2020; Kale et al., 2021a), and *Mauremys rivulata* (Kale et al., 2021b) species have also been reported. However, no researcher has documented the occurrence of *A. boyeri* in the Atikhisar Reservoir. The present study reported a new distribution area and the first occurrence of *A. boyeri* in the Atikhisar Reservoir. Therefore, this study provides valuable information about the spatial distribution of *A. boyeri* and the biodiversity of the reservoir.

Successful and effective management of reservoir fisheries is essential for protecting the natural ecosystem and ensuring the sustainability of fish stock (Kale & Acarlı, 2018). Therefore, fisheries managers and policymakers should consider the presence of *A. boyeri* in the Atikhisar Reservoir and make appropriate policies to ensure the sustainability of fisheries resources in the reservoir.

CONCLUSION

This paper documents the first observation of *A. boyeri* in the Atikhisar Reservoir (Çanakkale, Turkey) and provides a significant contribution to the literature since the Atikhisar Reservoir is a new distribution area for *A. boyeri*. Therefore, the present study provides significant knowledge on the spatial distribution of *A. boyeri* and the biodiversity of the reservoir. Further investigations should be carried out to determine the population dynamics if *A. boyeri* stocks have been established population in the reservoir.

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COMPLIANCE WITH ETHICAL STANDARDS

a) Authors' Contributions

SK: Designed the study, carried out field study and laboratory experiments, data analysis, prepared figures and tables, wrote the first draft of the manuscript

SB: Designed the study, carried out field study and laboratory experiments

DA: Designed the study, carried out field study and laboratory experiments

All authors have approved the final version of the manuscript.

b) Conflict of Interest

The authors declare that there is no conflict of interest.

c) Statement on the Welfare of Animals

For this type of study, formal consent is not required.

d) Statement of Human Rights

This study does not involve human participants

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