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Some morphometric characteristics of *Alburnus caeruleus* (Heckel, 1843) in Adıyaman region, Türkiye

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A B S T R A C T

In this study, the distribution and some diagnostic features of *Alburnus caeruleus* in Adıyaman region were determined. The research was carried out in 18 stations which contains two natural lakes (Azaplı and Gölbaşı Lakes), two reservoirs (Atatürk and Çat Reservoir) and 10 stream systems. *Alburnus caeruleus* individuals were detected from Kahta Stream, Sofraz Stream, Ziyaret Stream, and Çakal Stream. The average length of *A. caeruleus* individuals caught in the research area is 73.70-81.91 mm, and their average weight is 3.70-5.56 g. It was determined that the colours and patterns of *A. caeruleus* individuals differed according to stream habitats, the number of line lateral scales was 51-55, and the number of pharynx teeth was 2.5-5.2. *A. caeruleus* has a limited distribution in the streams in the Adıyaman region, from minimal populations and needs to be protected. Additionally, *A. caeruleus* has the potential to be an ornamental fish in aquariums.

INTRODUCTION

Species belonging to the genus *Alburnus* are mostly primarily distributed in Türkiye, Syria, the Caucasus, Europe and Iran (Kottelat and Freyhof, 2007; Seçer et al., 2020). Recent studies have recorded 29 species of the *Alburnus* genus in Türkiye, 18 of which are endemic (Çiçek et al., 2018; Freyhof and Turan, 2019; Bayçelebi, 2020; Seçer et al., 2020). Additionally, Türkiye is the speciation center for this genus (Özuluğ and Freyhof, 2007). The *Alburnus* genus has a bright-looking and light-coloured body, greenish-brown back, silver-white sides and abdomen. They live in flocks in lakes and fast-flowing areas of rivers close to the pelagic zone (Geldiay and Balık, 2009). *Albburnus caeruleus* is endemic in the Tigris-Euphrates River Basin and distributed in Türkiye, Syria, Iran and Iraq (Coad, 2010, 2020; Zareian et al., 2015; Kaya et al., 2016; Birecikligil et al., 2017; Esmaeili et al., 2018; Saç, 2020).

In the Merzimen Stream, a branch of the Euphrates River close to Adıyaman region, Turan et al. (2014) described a new species *Alburnoides recepi*. However, Birecikligil et al. (2017) examined the morphometric and molecular characteristics of fish samples from the same locality and found that they were synonymous with *A. caeruleus*. Dorafshan et al. (2014) state a high polymorphism level between *Alburnus mossulensis* and *A. caeruleus*. Saç (2020) states that *A. caeruleus* is highly sensitive to many important threats, such as invasive species and pollution. It is essential to update information on the geographical distribution of freshwater fish. This study aimed to reveal the distribution of *A. caeruleus* in the rivers in Adıyaman region and some of its diagnostic features, thus forming a step towards future studies.

MATERIALS AND METHODS

Adıyaman is located in the middle Euphrates Basin. The most important river of the basin is the Euphrates River and the others are; Göksu Stream, Sofraz Stream, Aksu Stream, Karasu, Çakal Creek, Ziyaret Stream, Eğri Stream, Kalburcu Stream and Kahta Streams. There are Gölbaşı and Azaplı lakes and Atatürk Reservoir in Adıyaman region. Kahta Stream, which takes its source from the southeastern Taurus Mountains, constitutes one of the most important tributaries of the Euphrates River.

Table 1. Sampling localities and their coordinates

Location	Longitude (E)	Latitude (N)
Gölbaşı Lake	37°47′38″E	37°38′55″N
Göksu, Tut area	37°56′55″E	37°45′54″N
Çat Reservoir	38°14′05″E	38°02′44″N
Kömür Stream	38°27′39″E	37°50′41″N
Kahta Stream, Bulam village	38°15′27″E	37°55′12″N
Ziyaret Stream, Zey village	38°16′29″E	37°48′13″N
Eğri Stream	38°11′36″E	37°46′40″N
Azaplı Lake	37°33′18″E	37°44′39″N
Atatürk Reservoir, Çamgazi region	37°41′08″E	38°17′39″N
Atatürk Reservoir Samsat region	37°33′51″E	38°29′14″N
Aksu Stream	37°50′23″E	37°44′54″N
Çakal Stream	38°09′51″E	37°43′21″N
Ziyaret Stream	38°20′10″E	37°46′02″N
Sofraz Stream, Üçgöz region	37°57′09″E	37°37′20″N
Kalburcu Stream	38°30′15″E	37°45′44″N
Göksu Stream	37°46′26″E	37°51′54″N
Kahta Stream, Cendere region	38°36′36″E	37°56′06″N
Kahta Stream, Teğmenli village	38°36′36″E	37°56′06″N
● Kahta Stream	38°15′27″E	37°55′12″N
● Ziyaret Stream	38°16′29″E	37°48′13″N
●Çakal Creek	38°09′51″E	37°43′21″N
● Sofraz Stream	37°57′09″E	37°37′20″N

Note: (●Locality where *A. caeruleus* is found)

This study was carried out in the in the streams, lakes and reservoirs in Adıyaman region between April 2012 and December 2013. A total of 18 localities were sampled and the presence of *A. caeruleus* individuals was detected in 4 localities. The geographical locations of the research area are given in Table 1.

Fish samples were caught in streams by using electroshock devices. The GPS coordinates of the sampling stations were determined. The caught fish samples were brought to the Hydrobiology Research Laboratory in 5-L plastic containers in a 4% formaldehyde solution. Then, the fish's length measurements (mm) were made with a digital calliper with a precision of 0.01 mm, and the weight measurements were made with a digital scale with a precision of 0.01 g. The localities where *A. caeruleus* individuals were caught are shown in (Figure 1).

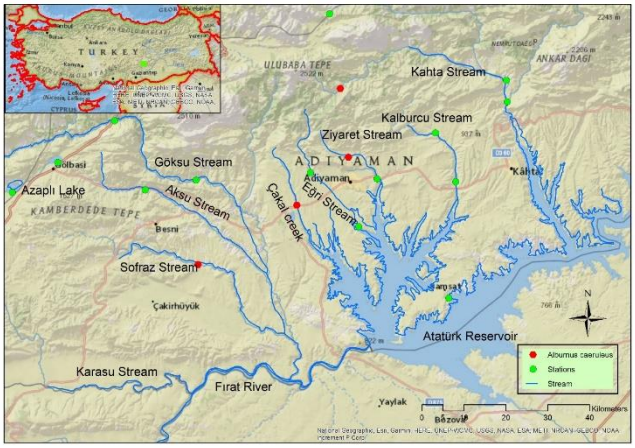

Figure 1. Sampling localities in Adıyaman region

RESULTS AND DISCUSSION

According to the results obtained from field studies, *A. caeruleus* individuals have a very limited distribution in Adıyaman region, with their presence identified in Kahta Stream, Ziyaret Stream, Çakal Stream, and Sofraz Stream (Table 1).

The body of *A. caeruleus* is slightly flattened from the sides and is covered with scales. The dorsal fin begins slightly behind the base of the ventral fins. The mouth is small and terminal. The lips are underdeveloped, and whiskers are absent. The lower jaw is longer than the upper jaw and is directed upwards. The caudal fin is forked, and the free ends of the lobes are pointed. *A. caeruleus* can be easily distinguished from other *Alburnus* species by its laterally flattened body structure and black spots on its body (Figure 2a). However, these black spots are not always present and vary according to habitats and seasons (Figures 3a, 4a, 5a). *A. caeruleus* individuals in Adıyaman region generally live in the flowing, clean streams with rocky and gravel bottoms (Figures 2b, 3b, 4b, 5b).

Table 2. Length, weight and some meristic character counts of *A. caeruleus* individuals detected in Adıyaman region

Characteristics	**Kahta Stream**			**Sofraz Stream**			**Ziyaret Stream**			**Çakal Stream**		
	n	*x*	*sd*	*n*	*x*	*sd*	*n*	*x*	*sd*	*n*	*x*	*sd*
Total weight (g)	3	4.90	0.42	4	4.50	0.56	5	5.56	0.73	2	3.70	0.42
Total length (mm)	3	73.70	4.14	4	75.45	5.06	5	81.91	1.64	2	75.57	1.55
Fork length (mm)	3	66.50	3.80	4	61.95	2.65	5	73.73	4.23	2	65.79	0.87
Standard length (mm)	3	58.86	4.34	4	54.78	1.59	5	65.70	1.08	2	59.93	0.42

Meristic characters		**Kahta Stream**	**Sofraz Stream**	**Ziyaret Stream**	**Çakal Stream**
Dorsal	Spine	3	3	3	3
	Soft ray	8	8	8	8
Anal	Spine	3	3	3	3
	Soft ray	16	17	16	17
Ventral	Spine	1	1	1	1
	Soft ray	8	8	8	8
Pectoral	Spine	1	1	1	1
	Soft ray	14	14	12	12
Pharynx teeth		2.5-5.2	2.5-5.2	2.5-5.2	2.5-5.2

Note: *n*: Number of fish, *x*: mean, *sd*: standard deviation.

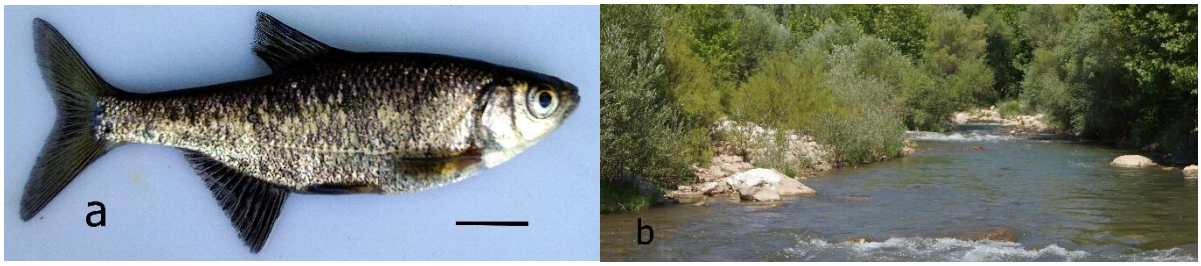

Figure 2. a) The specimen of *A. caeruleus* (total length: 76.63 mm, total weight: 5.29 g, scale: 10 mm). from b) Kahta stream

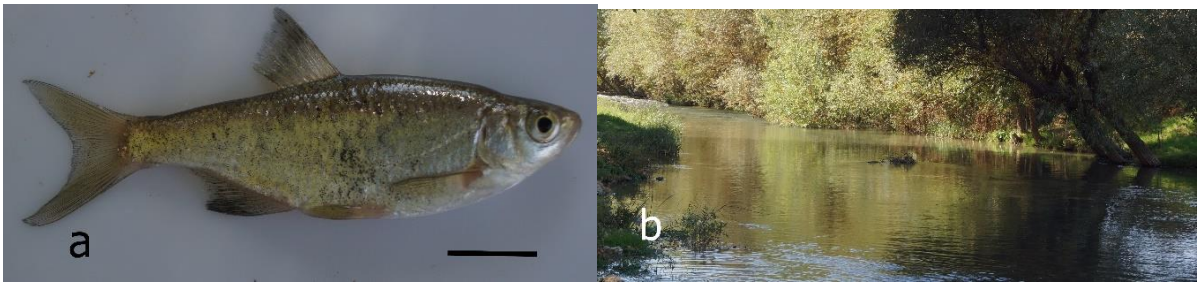

Figure 3. a) The specimen of *A. caeruleus* (total length: 65.13 mm, total weight: 3.5 g, scale: 10 mm) from b) Sofraz stream

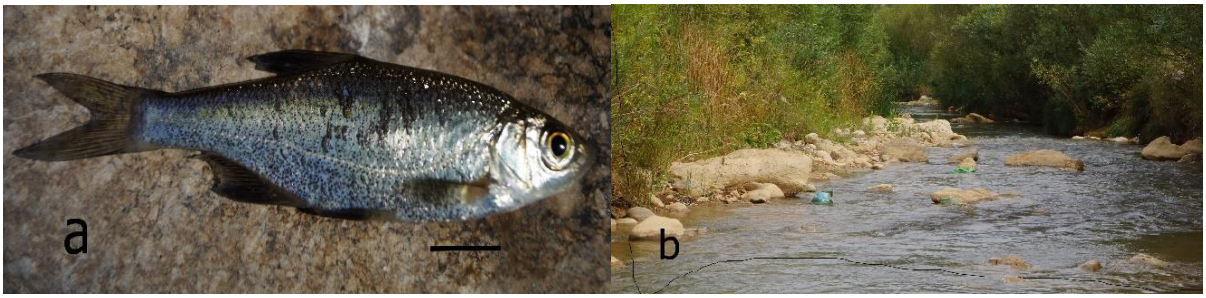

Figure 4. a) The specimen of *A. caeruleus* (total length: 83.26 mm, total weight: 6.4 g, scale: 10 mm) from b) Ziyaret stream

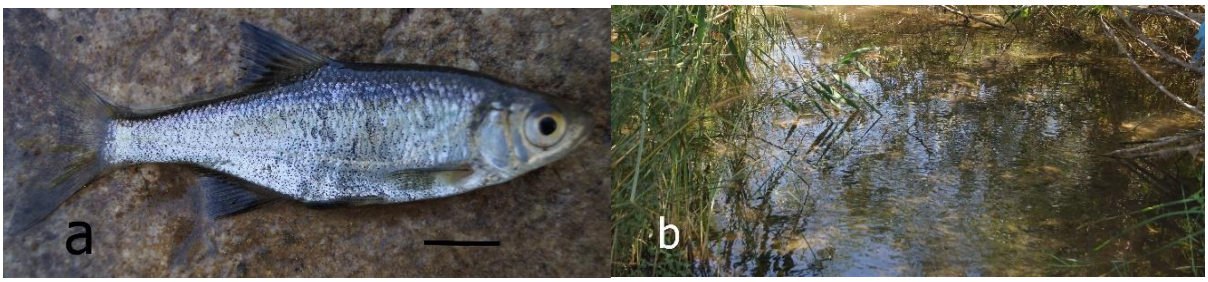

Figure 5. a) The specimen of *A. caeruleus* (total length :74.47 mm, total weight: 4.0 g, scale: 10 mm) from b) Çakal stream

The free edge of the dorsal fin of *A. caeruleus* is straight, and the number of rays is D: II-III 8-9. The number of lateral line scales varies between 51- 55. The base of the anal fin is long, and its free edge is slightly convex. Pharynx teeth are in two rows and are 2.5-5.2 in diameter (Table 2). Length (mm) and weight (g) of *A. caeruleus* individuals identified from the research area in Table 2. Accordingly, the average size of the individuals (n:14) caught from Kahta, Sofraz, Ziyaret and Çakal streams is between 73.70-81.91 mm, and their weight is between 3.70-5.56 g (Table 2).

Sungur (2009) describes some diagnostic features of *A. caeruleus*: lateral line scales number 58-69 (59) states that the number of pharyngeal teeth is 2.5-5.2 and their average length is 5.8 cm. Kaya et al. (2016) state that *A. caeruleus* is distributed in the tributaries of the Tigris River; its standard length is between 62-83 mm, and the number of lateral line scales is 53-55, similar to our research findings. Negative factors affecting *A. caeruleus* populations in streams in Adıyaman region are ponds for irrigation purposes, sand-gravel pits, etc. factors such as. Additionally, *A. caeruleus* is in the LC category according to IUCN status (Çiçek et al., 2023). Although the *A. caeruleus* in question has no economic value in terms of fisheries, it can be used as an ornamental fish in the aquarium (Sungur, 2009).

CONCLUSION

A. caeruleus exhibited a limited distribution within the streams of Adıyaman region. The individuals displayed varied colours and patterns across different stream habitats. Several negative factors impact *A. caeruleus* in these streams, including irrigation ponds, sand-gravel pits, and other similar disturbances. Additionally, *A. caeruleus* has the potential to be an ornamental fish in aquariums.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest

The author declares that there is no conflict of interest.

Ethical Approval

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

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Data Availability

The data supporting the findings of this study are available from the corresponding author upon request.

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