Journal of Limnology and Freshwater Fisheries Research

http://www.limnofish.org

Distribution and Some Diagnostic Properties of *Capoeta damascina* (Valenciennes, 1842) in Streams of the Ceyhan and Seyhan River Basins, Türkiye

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ABSTRACT

This study determined the distribution and some diagnostic characteristics of *Capoeta damascina*, which belongs to the Cyprinidae family, in the Ceyhan and Seyhan River basins. *C. damascina* individuals were detected in 21 of 25 Ceyhan River Basin stations and 12 out of 15 in the Seyhan River basin stations. *C. damascina* show a wide distribution in the Ceyhan and Seyhan River basins. It has been determined that *C. damascina* lives at altitudes between 125 m (Hemite Stream) and 1620 m (Söğütlü Stream) in the Ceyhan River basins, and in streams at altitudes ranging from 165 m (Çakıt stream) to 1758 m (Sarız Stream) in the Seyhan River basins. The average total length of *C. damascina* individuals (n: 218) caught in the Ceyhan River Basin is 14.72 cm, and their average weight is 40.12 g. In the Seyhan River basin, the average total length of *C. damascina* individuals (n: 74) was found to be 17.31 cm, and their average weight was 72.24 g. The mean number of line lateral scales was 71, the number of gill rakers was 23, and the number of pharyngeal teeth was 4:3:2-2:3:4.

Keywords: *Capoeta damascina*, distribution, diagnostic, Ceyhan River, Seyhan River

ARTICLE INFO

RESEARCH ARTICLE

Received : 08.11.2022
Revised : 06.01.2023
Accepted : 28.02.2023
Published : 28.04.2023

DOI:10.17216/LimnoFish.1200932

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Ceyhan ve Seyhan Nehir Havzalarındaki Akarsularda *Capoeta damascina* (Valenciennes, 1842)'nın Dağılımı ve Bazı Diagnostik Özellikleri, Türkiye

Öz: Bu çalışmada, Cyprinidae familyasına ait *Capoeta damascina*'nın Ceyhan ve Seyhan nehir havzalarındaki dağılımı ve bazı diagnostik özellikleri belirlenmiştir. Ceyhan Nehir havzasında 25 istasyondan 21'inde, Seyhan Nehir havzasında ise 15 istasyondan 12'sinde *C. damascina*'nın varlığı tespit edilmiştir. *C. damascina*, Ceyhan ve Seyhan Nehir havzalarında çok geniş bir dağılım göstermektedir. Ceyhan Nehir havzasında 125 m (Hemite Çayı) ve 1620 m (Söğütlü Çayı) arasındaki rakımlarda, Seyhan Nehir havzasında ise 165 m (Çakıt Suyu) ile 1758 m (Sarız Suyu) arasında değişen rakımlardaki habitatlarda yaşadığı belirlenmiştir. Ceyhan Nehir havzasında yakalanan *C. damascina* bireylerinin (n: 218) ortalama total boyları 14,72 cm, ortalama ağırlıkları ise 40,12 g'dır. Seyhan Nehir havzasında bulunan *C. damascina* bireylerinin (n: 74) ise ortalama total boyları 17,31 cm, ortalama ağırlıkları ise 72,24 g olarak tespit edilmiştir. Ortalama line lateral pul sayısı 71, solungaç diken sayısı 23 olup farinks diş sayısı ise 4:3:2-2:3:4 şeklindedir.

Anahtar kelimeler: *Capoeta damascina*, dağılım, diagnostik, Ceyhan Nehri, Seyhan Nehri

How to Cite
Kara C, Alp A, Bozali N. 2023. Distribution and Some Diagnostic Properties of *Capoeta damascina* (Valenciennes, 1842) in Streams of the Ceyhan and Seyhan River Basins, Türkiye 9(1): 11-16. doi: 10.17216/LimnoFish.1200932

Introduction

The genus *Capoeta* has a wide geographical distribution in northern India and China, Afghanistan, Turkestan, the Aral Sea, the Middle East, and Anatolia (Türkmen et al. 2002; Alp et al. 2005; Kaya et al. 2019). This genus comprises 36 nominal species, with 18 species reported from Turkey (Çiçek et al. 2022). There are many studies on the *Capoeta* species (Alp et al. 2005; Alwan 2010; Alwan et al. 2016a; Alwan et al. 2016b; Bektaş et al. 2017; Turan et al. 2022). Turan et al. (2022), revaluated the species belonging to the genus

Capoeta in Anatolia based on genetic data. The *Capoeta damascina* species group occurs in the entire Levant, Mesopotamia, the Orontes, Iran, and the southern and eastern parts of Turkey (Zareian and Esmaili 2017). It is also stated that *C. damascina* is in the Mesopotamian group (Bektaş et al. 2019). *C. damascina* is commonly found in the Orontes, Ceyhan, and Seyhan river basins (Geldiay and Balık 2009; Kaya et al. 2019; Bayçelebi 2020). *C. damascina* individuals in the Ceyhan and Seyhan River basins were reported as *Capoeta capoeta angorae* in studies conducted by Alp et al. (2005). Later, taxonomic and molecular studies by Alp et al. (2020), Alwan (2010), Alwan et al. (2016b) and Turan et al. (2022) demonstrated that the species *C. angorae* found in the Ceyhan and Seyhan River basins is strictly synonymous with *C. damascina*.

C. damascina is widely found in the Ceyhan and Seyhan river basins and has economic importance. In the Ceyhan and Seyhan basins, Geldiay and Balık (2009); Bayçelebi (2020), Kaya (2019) and Turan et al. (2022) have records of *C. damascina* from various localities. These studies were generally reported a few locations from the basins. Today, there are many reservoirs and hydroelectric power plants (HPP) in the Ceyhan and Seyhan River system. For example, there are 9 reservoirs and 50 small hydroelectric power plants (HPP) in the Ceyhan River system (Alp et al. 2020). Most of these hydroelectric power plants (HPP) do not have fish passes (Alp et al. 2020). It is inevitable that these adverse conditions will cause habitat loss in the reproductive migration (Alp et al. 2020) *C. damascina* populations. There is no study in the literature that determined the extensive distribution areas of *C. damascina* in the Ceyhan and Seyhan basins. In this study, it is aimed to set a step for future studies by revealing the regional distribution and some diagnostic features of *C. damascina* in the Ceyhan and Seyhan basins.

Materials and Methods

This study was carried out in streams of the Ceyhan and Seyhan River basins between April 2014 and May 2016, the locations of the streams and reservoir are shown in Figure 1.

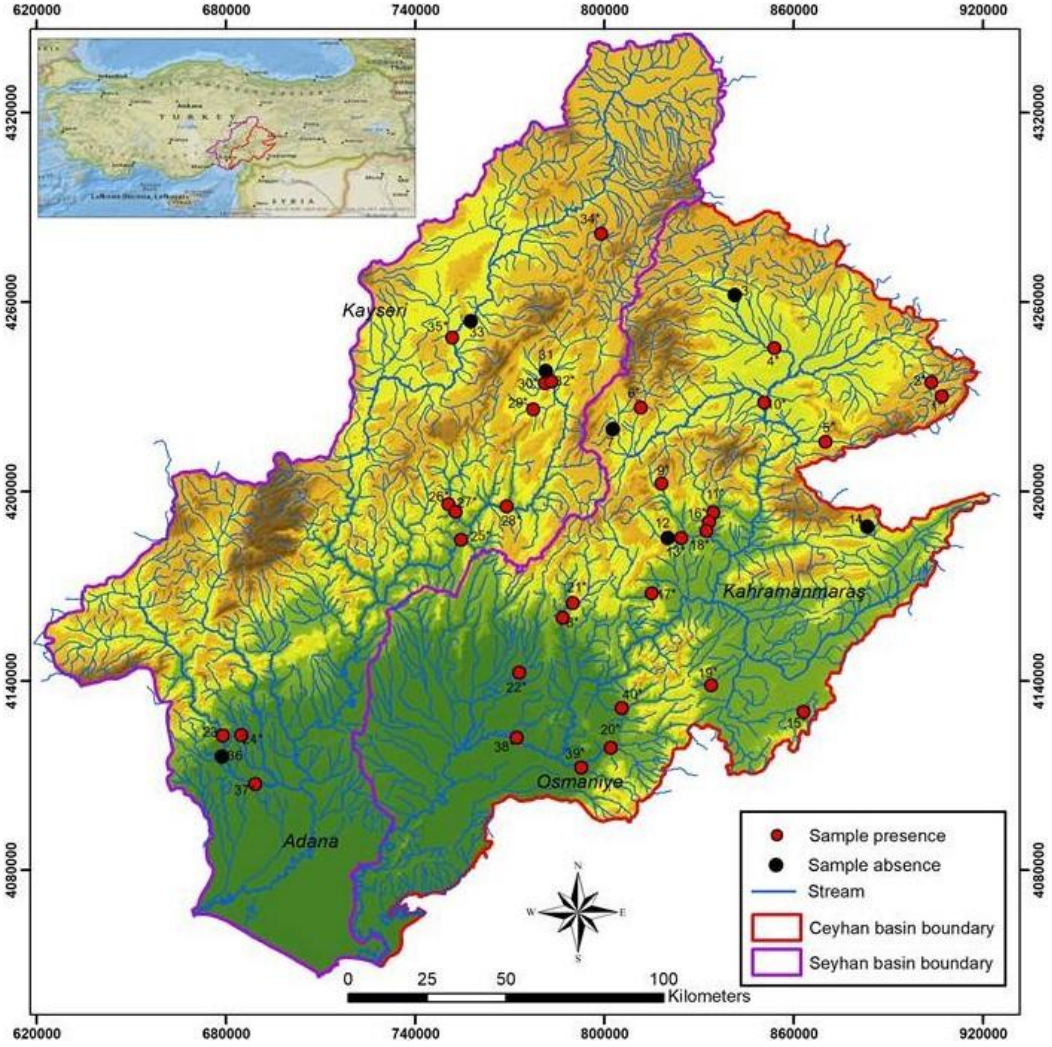

Figure 1. Distribution of *C. damascina* in streams in the Ceyhan and Seyhan basins

The Ceyhan River is one of the important rivers of Türkiye, and it arises from the mountains at an altitude of approximately 2200 m in the Göksun, Elbistan, and Afşin districts of Kahramanmaraş and is fed by springs and streams. The Ceyhan River forms a wide delta in Çukurova and empties into the Iskenderun Bay. The most important streams of the Ceyhan River are Söğütlü, Nergele, Hurman, Kömür, Törbüzek, Fırnız, Aksu, Savrun, Yarpuz, Akçasu and Hemite.

The Seyhan Basin is located in the south of Türkiye and the eastern Mediterranean district. This basin is to be nourished by two main streams called Zamantı and Göksu. North of Gövdeli Mountain (2719 m), where the west part of the East Taurus Mountains is to be named Uzunyayla (Sunkar 2008). This basin has been surrounded by mountainous areas with over 2000 m average altitude from the north, south, and west. Streams in the upper basin of the Zamantı Stream have a meander structure. Especially, stream where Uzunyayla district of Zamantı stream is covered with vascular plant flora. Besides, an important branch of the Zamantı Stream is Karagöz. In addition, Zamantı Stream joins Göksu near Feke. Göksu is one of the most heavily flowing branches of the Seyhan River. It takes its source from Tahtalı Mountains around Tufanbeyli. It merges with Sarız Stream, passes through narrow and deep valleys around Feke and merges with Kapuzbaşı waterfalls to mix with the Seyhan River. In addition to the Seyhan River, it is also fed by streams such as Çakıt, Üçürge, Feke, Himmetli, İncedere and Kalasuyu.

Fish samples were caught by using an electroshocker, separating and tension nets in rivers, and nets with 18x18 mm, 22x22 mm, and 32x32 mm mesh size in lakes and reservoirs. The GPS coordinates of the sampling stations were recorded (Table 1).

Table 1. Sampling stations and their GPS coordinates

Stations	Streams and reservoirs	Altitude	Longitude	Latitude
1*	*Söğütlü Stream	1620	37.63361	38.11694
2*	*Söğütlü Stream	1474	37.60028	38.15028
3	Hurman Stream 1	1258	36.90028	38.43361
4*	*Hurman Stream 2	1145	37.04575	38.28699
5*	*Nergele Stream	1213	37.21694	38.00028
6*	*Kömür Stream,	1417	36.55028	38.13361
7	Terbüzek Stream	1390	36.45028	38.06694
8*	*Keşiş Stream	401	36.24499	37.54226
9*	*Tekir Stream	1125	36.61726	37.91461
10*	*Ceyhan River	1233	37.00028	38.13361
11*	*Tekir Stream	750	36.80028	37.80028
12	Fırnız Stream	920	36.63251	37.75838
13*	*Fırnız Stream	690	36.68361	37.75028
14	Aksu Stream	1125	37.35028	37.76694
15*	*Aksu Stream	464	36.90028	37.16694
16*	*Zeytin Stream	698	36.78361	37.80028
17*	*Körsulu Stream	560	36.56736	37.60261
18*	*Menzelet Reservoir	588	36.77332	37.77489
19*	*İmalı Deresi	649	36.76694	37.33361
20*	*Akçasu Stream	264	36.40028	37.16694
21*	*Karaçay Stream	127	36.28361	37.58361
22*	*Savrun Stream	295	36.88361	37.58361
23	*Çakıt Stream	165	35.01694	37.23361
24*	*Üçürge Stream	195	35.08361	37.23361
25*	*Feke Stream 1	518	35.90028	37.76694
26*	*Feke Stream 2	719	35.83361	37.86694
27*	*Feke Stream 3	593	35.86694	37.85028
28*	*Himmetli Creek	729	36.05731	37.86524

Table 1. Continue

29*	*Güzelim Stream	1376	36.16694	38.13361
30*	*İncesu Stream	1367	36.21694	38.20028
31	Kalasuyu Stream	1350	36.21694	38.23361
32*	*Göksu Stream	1355	36.23361	38.21694
33	Zamantı Stream 1	1768	36.66694	38.63361
34*	*Sarız Stream	1758	36.43361	38.63361
35*	*Zamantı Stream 2	1350	35.88111	38.35249
36	Karaisalı Stream	148	35.00028	37.18361
37*	*Çakıt Stream	83	35.13361	37.08361
38*	*Hemite Stream	125	36.06694	37.18361
39*	*Yarpuz Stream	126	36.30028	37.11694
40*	*Sabun Creek	223	36.45028	37.26694

(*Stations where *C. damascina* is distributed)

The sampled fish were brought to the Hydrobiology Research Laboratory in 5-liter plastic containers in a 4 % formaldehyde solution. Then, the height measurements of the fish 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 stations where fish sampling is done and the localities where *C. damascina* individuals are caught are shown on the map in Figure 1.

The body of *C. damascina* is spherical, spindle-shaped, and covered with scales. The scales are not large. The head is broad, the nose is blunt, and the mouth is ventral. They have short double whiskers. The lobes of the caudal fin are pointed and the fork is deep. The back of the body is gray-brown, and the abdomen and flanks are yellowish white (Figure 2). It is therefore referred to as "Yellow Fish" in the area and is significant for both reactionary and commercial fishing in streams that are connected to the river system. The *C. damascina* species spawns in the spring, when the males' heads are covered in tiny white reproductive tubercules (Alp et al. 2020).

Figure 2. *C. damascina* specimen from the Fırnız stream

Results and Discussion

C. damascina individuals were found in 12 out of 15 different stations in the Seyhan River basin and 21 out of 25 stations in the Ceyhan River basin. Individuals of *C. damascina* have been found in the Ceyhan River basin, Hurman, Nergele, Kömür, Söğütlü, Fırnız, Körsulu, Tekir, Zeytin, Aksu, Keşiş, İmalı, Karasu, Sabun, Savrun, Yarpuz, Hamus, Hemite and Menzelet Reservoir (Figure 1, Table 1). In the Seyhan River basin, *C. damascina* was found from Çakıt, Üçürge, Feke, İncesu, Sarız, Güzelim, and Zamantı Stream (Figure 1; Table 1). *C. damascina* individuals were not observed in the 3rd, 7th, 14th, 31st, and 33rd stations.

The average total length of *C. damascina* individuals (n: 218) founded in the Ceyhan River basin was 14.72 cm, and their average weight was 40.12 g. The smallest identified individual was 8.27 cm and 6.4 g; the largest individual had a total length of 23.4 cm and 139.14 g. The average total length of *C. damascina* individuals (n: 74) caught in the sampling localities in the Seyhan River basin was 17.31 cm, and their average weight was 72.24 g. The smallest individual

was 9.68 cm and 10.7 g, and the largest individual was 27.67 cm and 225.8 g. Average length and weight distributions of *C. damascina* populations founded in the rivers belonging to the Ceyhan and Seyhan River basins are given in Table 2.

Table 2. The total lengths (cm) and total weights (g) of *C. damascina* from the stations of Seyhan and Ceyhan River basins (n: Number of fish, TL: Total Length (cm), W: Weight (g), SD: Standard Deviation)

Seyhan River Basin							
Stations	**n**	**Mean TL (cm)**	**Min.-Max.**	**SD**	**Mean W(g)**	**Min.-Max.**	**SD**
Çakıt Stream	11	14.13	9.68-16.85	2.46	37.30	10.7-58.4	16.21
Zamantı Stream	14	21.24	16.36-27.08	3.45	119.67	49.92-207.9	56.72
İncesu Stream	6	12.37	10.83-13.33	0.93	22.28	18.9-28.6	4.18
Sarız Stream	8	19.52	16.38-21.46	1.64	89.82	57.7-113.5	19.89
Güzelim Stream	4	18.58	14.08-27.67	6.26	91.62	34.5-225.8	91.09
Feke Stream	11	20.06	14.08-27.63	4.05	130.73	34.5-225.8	59.70
Himmetli Stream	14	16.33	12.25-21.70	3.22	54.75	21.9-123.0	33.63
Göksu Stream	6	12.37	10.83-13.33	0.93	22.28	18.9-28.6	4.18
Ceyhan River Basin							
Hurman Stream	17	12.73	10.00-15.90	1.30	26.94	13.80-43.60	8.31
Nergele Stream	13	12.01	10.30-13.10	0.77	18.30	11.20-24.60	3.61
Kömür Stream	13	16.10	12.60-19.00	2.09	49.20	27.87-82.47	17.06
Söğütlü Stream	8	11.84	10.33-14.08	1.06	31.19	24.62-47.59	6.94
Fırnız Stream	18	18.49	12.82-22.50	2.86	64.65	25.68-101.95	22.68
Körsulu Stream	15	16.60	14.55-18.89	11.18	52.24	32.97-68.06	9.40
Tekir Stream	44	15.25	10.00-23.4	3.36	47.36	12.07-139.14	30.73
Zeytin Stream	14	14.86	8.27-21.07	3.92	37.05	20.05-70.25	19.36
Aksu Stream	16	14.61	9.5-20.80	2.85	36.00	10.80-90.80	20.93
Keşiş Stream	3	14.63	14.10-15.10	0.50	49.04	40.76-57.85	8.55
İmalı Stream	4	16.51	13.78-21.69	3.57	86.25	56.00-126.00	31.41
Menzelet Dam	14	19.76	12.00-29.22	5.35	11.82	10.04-13.90	1.05
Karaçay Stream	5	12.31	10.59-14.84	1.95	26.62	16.22-42.16	11.68
Sabun Stream	4	12.61	11.22-13.72	1.03	30.88	21.62-37.41	6.67
Savrun Stream	6	13.48	10.43-19.12	3.20	46.52	19.83-110.90	33.81
Yarpuz Stream	5	12.68	10.45-14.49	1.47	33.99	12.87-46.71	12.91
Hamus Stream	10	11.58	8.60-14.50	1.69	18.38	6.40-31.50	7.39
Hemite Stream	9	13.47	12.90-15.10	0.73	34.11	28.00-46.40	6.23

The meristic features of *C. damascina* in the Ceyhan and Seyhan basins are given in Table 3. Accordingly, the number of scales on the lateral line of *C. damascina* varied between 65 and 78. The pharyngeal teeth are in a 4:3:2-2:3:4 order (Table 3). The number of gill rakers is between 22-24. Kaya et al. (2019) state that the number of scales on the line lateral of *C. damascina* varies between 66 and 76, and the number of gill rakers is between 20 and 25, which is similar to our research findings in terms of meristic properties.

Table 3. Meristic characteristics of *C. damascina* samples in Ceyhan and Seyhan River basins (n: number of fish, X: mean value; Min: minimum, Max: maximum; SD: standard deviation)

		n	**X**	**Min.**	**Max.**	**SD**
Dorsal fin	Spine	35	2	2	3	0.29
	Soft ray	35	9	7	10	0.56
Anal fin	Spine	30	2	1	2	0.25
	Soft ray	30	6	5	8	0.73
Pectoral fin	Spine	28	1	1	2	0.48
	Soft ray	28	13	11	16	1.19
Ventral fin	Spine	28	1	1	1	
	Soft ray	28	8	7	9	0.58
Line lateral scale		55	71	65	78	3.91
Line lateral dorsal		14	13	12	15	1.03
Line lateral ventral		14	11	8	13	1.49
Gill rakers		14	23	22	24	0.73

According to literature, one of the most common fish species in the Ceyhan River basin is *C. damascina* (Alp et al. 2020). There are currently 50 small hydroelectric power plants (HPP) in the Ceyhan River basin, in addition to large reservoirs like Berke Reservoir, Aslantaş Reservoir, Sır Reservoir, Kılavuzlu Reservoir, Menzelet Reservoir, Kartalkaya Reservoir, and Adatepe Reservoir (Alp et al. 2020). Large reservoirs like Yedigöze, Çatalan and Seyhan Reservoir, as well as smaller hydroelectric power plants, can be found in the Seyhan River basin. According to Alp et al. (2020), *C. damascina* populations migrated toward the upper basins of the streams during the spawning season.

The spawning habitats and migration of *C. damascina* will inevitably be impacted as a result of this situation. Domestic, recreation, and trout farming activities also contribute to the pollution of the Aksu, Fırnız, Törbüzek, Söğütlü and Hurman streams. Additionally, there are quarries for sand and gravel, irrigation ponds, etc. in the field of study. Additionally, there are a number of activities that harm fish populations, such as the fact that *C. damascina* populations will inevitably be negatively impacted by these unfavourable conditions.

Acknowledgements

This research was supported by the Kahramanmaraş Sütçü Imam University Scientific Research Projects (BAP) Coordination Unit, Project No. 2014/1-16 M, and was carried out with the legal consent of the Ministry of Food, Agriculture, and Livestock, General Directorate of Fisheries and Aquaculture (permission date 03.04.2014; permission number: 01334). We thank the pertinent institutions on behalf of the authors.

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