



Population Density of *Potamon potamios* (Olivier 1804) in Gölbaşı (Fish) Lake (Gölbaşı Village/Kırıkhan/Hatay)

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Abstract

To determine the population density of the *Potamon potamios* (Olivier, 1804) species in Gölbaşı (Fish) Lake (Gölbaşı Village - Kırıkhan - Hatay), samples were collected in July 2020 and 2021. Once a week during the period of 3 weeks, a total of 6 times. Wire cages with one-sided doors that could open inwards were used to capture the fish samples. Fish remains as bait was placed in the cages. To avoid recounting the same individuals, individuals were marked after each count with a water-resistant pen that can be seen in purple light. Collected samples were examined live at the sampling point. During the examination of the samples, male and female individuals were counted and recorded. Enumerated individuals were released back into their habitats after marking. At the end of the census, it was observed that there was a decrease in the population in 2021 with the effect of low rainfall and drought. While the total number of samples detected in 2020 was 196, 84 individuals were detected in 2021. It is thought that the reason for the sudden decrease in the number of individuals is the decrease in the groundwater level due to low precipitation and the withdrawal in the lake level.

Keywords: Potamonidae, *P.potamios*, Gölbaşı, Kırıkhan, Hata

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Gölbaşı (Balık) Gölü (Gölbaşı Köyü / Kırıkhan / Hatay) *Potamon potamios* (Olivier 1804) popülasyon yoğunluğu

Özet

Potamon potamios (Olivier, 1804) türünün Gölbaşı (Balık) Gölü'ndeki (Gölbaşı Köyü - Kırıkhan - Hatay) popülasyon yoğunluğunun belirlenmesi amacıyla Temmuz 2020 ve 2021'de belirlenen örnekleme noktalarından örnekler toplanmıştır. Örnekleme 3 hafta boyunca haftada bir olmak üzere toplam 6 kez yapılmıştır. Numuneleri yakalamak için tek taraflı kapıları içeriye doğru açılabilen tel kafesler kullanılmıştır. Kafeslerin içine yem olarak balık kalıntıları konmuştur. Aynı bireylerin tekrar sayılmasını engellemek için, her sayımdan sonra bireyler suya dayanıklı ve mor ışıkta görülebilen kalemle işaretlenmiştir. Örneklerin incelenmesi sırasında, dişi ve erkek bireylerin sayımları yapılmış ve kaydedilmiştir. Sayılan bireyler, işaretlemenin ardından habitatlarına geri bırakılmıştır. Nüfus sayımı sonunda düşük yağış ve kuraklığın da etkisiyle 2021 yılında nüfusta azalma olduğu gözlemlendi. 2020 yılında tespit edilen toplam örnek sayısı 196 iken, 2021 yılında 84 örnek tespit edilmiştir. Birey sayısındaki ani düşüşün nedeninin, yağışların az olması nedeniyle yeraltı su seviyesinin düşmesi ve göl seviyesinin çekilmesi olduğu düşünülmektedir.

Anahtar kelimeler: Potamonidae, *P.potamios*, Gölbaşı, Kırıkhan, Hatay

1. Introduction

Crabs can easily live in environments such as sea, brackish water, and freshwater [1]. It has been reported that only 9 species of crabs belonging to the genus *Potamon*, which are represented by approximately 4500 species in the world, are in the inland waters of our country [2].

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For the first time in our country, a taxonomic study was conducted on freshwater crabs by Geldiay and Kocataş in 1977 [3].

In the study conducted by Brandis et al. in 2000, the distribution areas of the genus *Potamon* were reported as the southern coasts of Turkey and Cyprus and the Greek Islands [4].

Females of this species generally prefer rocky and shallow areas during the breeding season. They spend time hiding in these areas during the day. At night, they come ashore from the water to hunt. Male individuals, on the other hand, spend most of their time in the water and come ashore in a very small part of the night [1].

Gölbaşı (Balık) Lake is located 4 km from the Syrian border. Gölbaşı Lake, at the foot of the Kurt Mountains, northeast of the Amik Lake, is 29 km from Reyhanlı and 11 km from Kırıkhan.

Gölbaşı Lake, the only natural lake of Hatay, is located within the borders of Kırıkhan, between Gölbaşı Village and Kamberlikaya Village. There is a natural island in Gölbaşı Lake. The lake, which was registered as a "Wetland of National Importance" on 19.04.2017 by the Turkish General Directorate of Nature Conservation and National Parks of the Ministry of Agriculture and Forestry, was opened to tourism after the environmental arrangements [5]. The basin of the lake, fed by spring waters, is approximately 792 hectares. It is planned to increase this area to 1000 hectares with the work to be done. The lake is mostly fed by groundwater. However, it affects precipitation, albeit in small amounts.

Catfish and eel fishing are also done in Gölbaşı Lake. It is home to 193 different bird species. Many species of waterfowl incubate here and hatch their young. A total of 73 bird species from water and shore birds that can survive on wetlands currently use the area. Bird species such as the Flamingo, which has an important place in Anatolian culture and is also locally called the Alli Crane, the Izmir Kingfisher, the Pied Kingfisher, and the Boz alamecek and Little Sparrow, whose normal distribution is in the Southeast Anatolian provinces, can be found around Gölbaşı Lake [6]. The topographic structure of Gölbaşı Lake, which has an important place in terms of biodiversity, is also important. Thanks to its suitable topographic structure, it is a stopover and accommodation point for migrating birds and other creatures. For this reason, it is useful to emphasize the topographic structure (Figure.1).

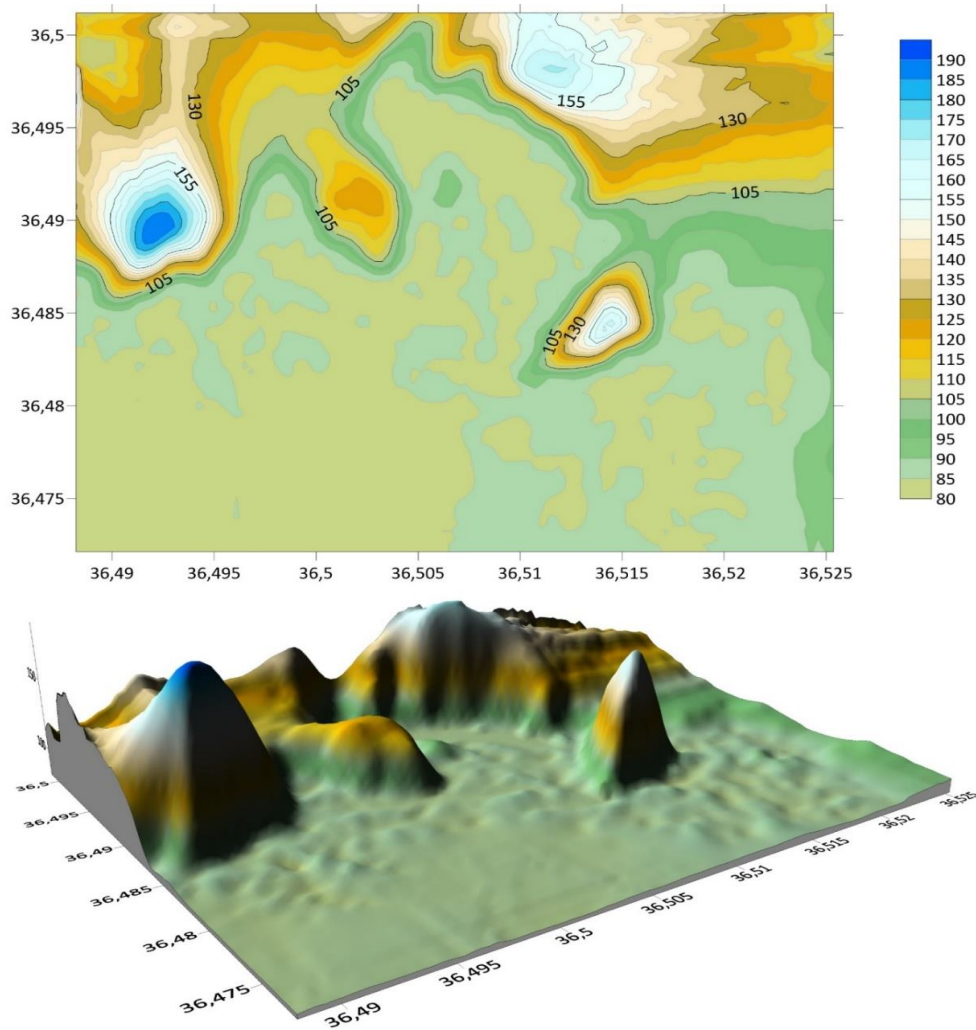


Figure 1. 2 and 3-dimensional topographic views of Gölbaşı Lake, above sea level

The Precambrian strata, the oldest unit around Lake Amik, are seen in the northwest of Amik Lake. The Precambrian formations extend in the northeast-southwest direction between Hassa and Kırıkhan on the eastern foothills of the Amanos Mountains [7].

Cretaceous strata belonging to Mesozoic in the vicinity of Amik Lake are encountered in the Amanos Mountains in the north of Kırıkhan, in the east of Gölbaşı Lake, and around Kızılkaya. The Cretaceous layers consist of limestone and are partly conglomerate. The Mesozoic Jurassic layers are located to the east of Gölbaşı Village and consist of limestone layers [7].

Basalt lavas are located in the east of Gölbaşı on the Syrian border. Mediterranean soils are generally poor in humus and rich in iron sesquioxide. This compound gives the soil its red color [4]. These soils are found on limestones on the Kuseyr Plateau, around Reyhanlı and east of Gölbaşı Lake [8].

The main plants found around the lake; are common reed (*Phragmites communis*), false spear (*Erianthus strictus*), arrowroot (*Imperata cylindrical*), sedge (*Typha*) species, and reed (*Pragmites*) (Table 1) [9]. The existing fauna and flora of Gölbaşı Lake give an idea about the fauna and flora of old Amik Lake (Figure 2).

Table 1. Hydrophyte plant species that grow near Gölbaşı Lake and form communities (from Güzelmansur, A., & Yücel, M. 2013)

Turkish name	Latin name
Common reed	<i>Phragmites communis</i>
Oklu grass	<i>Imperata cylindrical</i>
Reeds	<i>Typha sp.</i>
Lying spear	<i>Erianthus strictus</i>
Lotus	<i>Nuphar lutea, Nymphaea alba</i>



Figure 2. Gölbaşı Lake, northeast of Amik Lake

Amik Lake and Gölbaşı Lake are located on one of the most important migration routes for birds migrating from Asia and Europe to Africa. Since it is on the migration route, it is a wetland that is a resting, sheltering, and feeding area for birds.

However, with the drying of Amik Lake, which is on the migration route of birds migrating from Europe to Africa, an important bird area disappeared and all the density was concentrated in Gölbaşı Lake. Due to adequate protection and limited wetlands, the snakehead (*Anhinga rufa*) bird, which is one of the rare birds of Africa and Asia, living only in Lake Amik in our country, and the rare species of black cormorant have also completely disappeared. This situation negatively affected other living species as well [8].

Potamon potamios is a semi-terrestrial crab species that live around the eastern Mediterranean, including many Mediterranean islands, and to the south and west of the Sinai Peninsula [10, 11].

Some examples of recent studies on *Potamon potamios*; are Özbek, M. Ustaoglu, M. R. (2006); (Cumberlidge, N. 2008-2009); Cumberlidge, N., & Ng, P. K. L. (2009); Cumberlidge, N., et al. (2009); Harlıoğlu M.M., Farhadi A., Harlıoğlu A.G. (2018); Öntürk, T., (2018-a, b, c); Öntürk, T., (2019) İpek, M. and Özbek, M. (2022) [10, 11, 2, 12, 13, 14, 1, 15, 16, 17, 18].

2. Material and Method

Our study area is Gölbaşı Lake in the Kırıkhan district of Hatay province (Figure 3). Sampling processes were carried out from the points determined on the lake (Figure 4), 6 times in total during the period of 3 weeks in July 2020 and July 2021. Wire cages were used for the capture of *Potamon potamios* specimens. Fish pieces were placed in the cages as bait. The captured samples were counted by making male and female distinctions. Afterward, all samples were released back into their living environments. To prevent recurrence in weekly counts, captured individuals were marked with a water-resistant pen that was detectable with ultraviolet light. Samples were collected and counted before sunrise in the morning. Coordinates of the sampling locations Table 2 are given in Table 2.

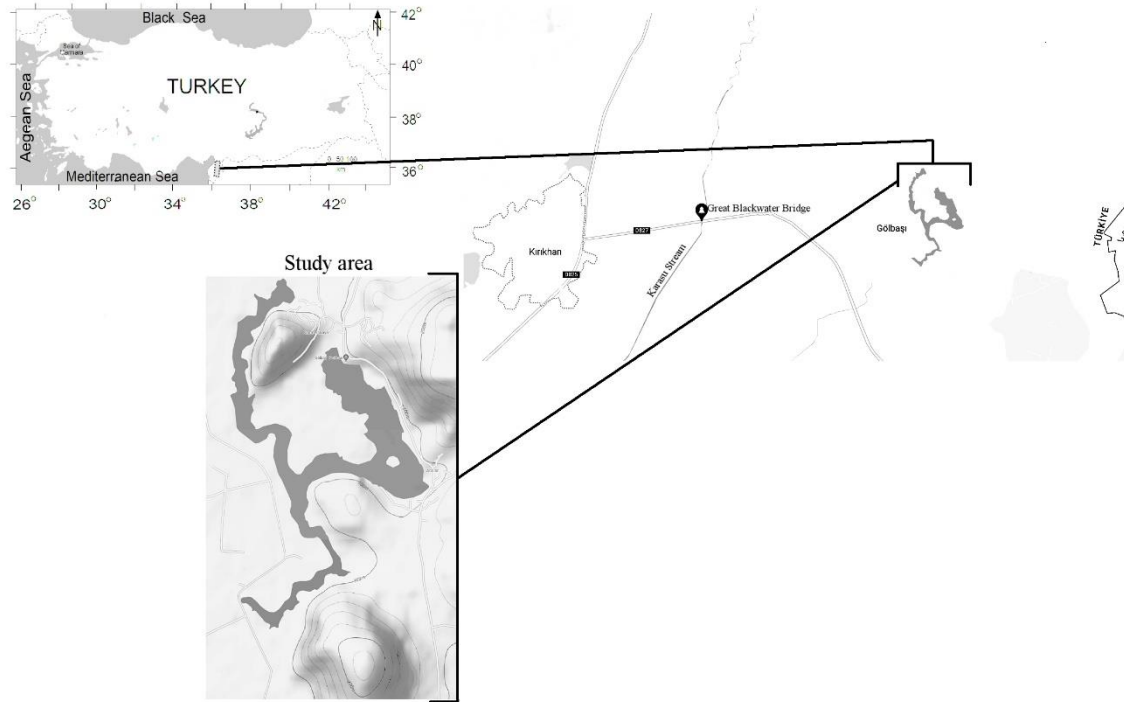


Figure 3. Study area

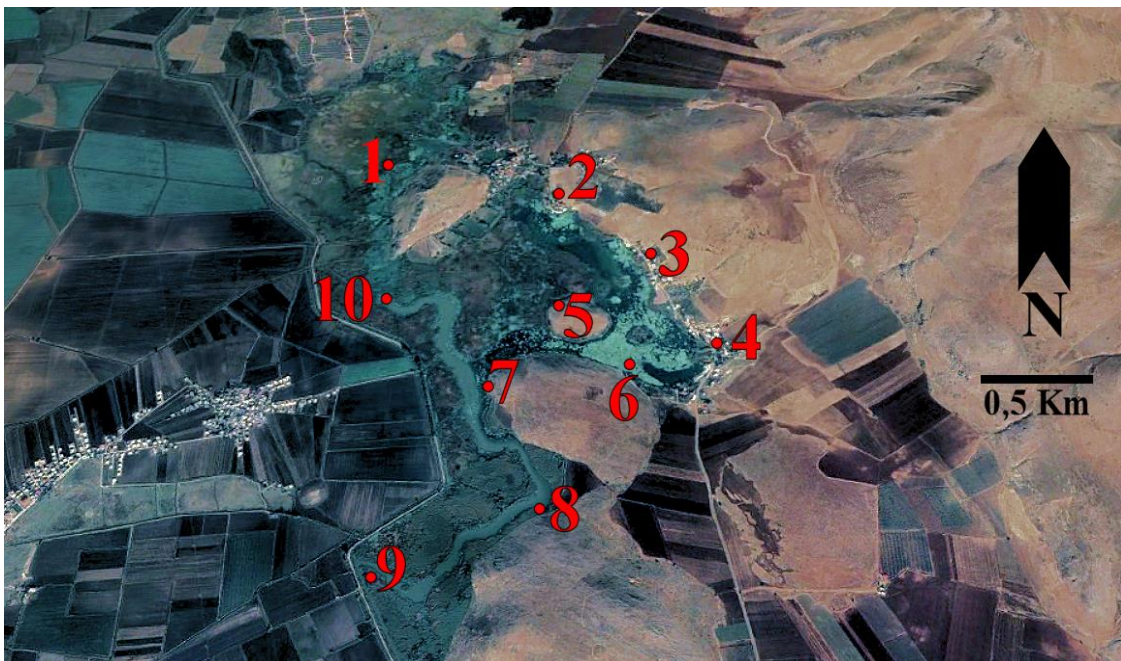


Figure 4. Sampling stations

Table 2. Coordinates of stations

Station number	Coordinates
1. Station	36°30'56.19"N 36°28'51.97"E
2. Station	36°30'45.29"N 36°29'25.88"E
3. Station	36°30'32.96"N 36°29'42.40"E
4. Station	36°30'14.92"N 36°29'53.78"E
5. Station	36°30'26.18"N 36°29'27.00"E
6. Station	36°30'12.82"N 36°29'38.77"E
7. Station	36°30'9.19"N 36°29'11.42"E
8. Station	36°29'49.29"N 36°29'22.15"E
9. Station	36°30'30.78"N 36°29'32.52"E
10. Station	36°30'27.33"N 36°28'53.00"E

3. Results

As a result of the sampling studies, a total of 196 individuals were counted in 2020. Of these, 117 were identified as male and 79 as female. In 2021, a total of 84 individuals were counted. 61 of them were male and 23 of them were female Table 3. The distribution of male and female individuals according to the stations are shown in Figure 5 and Figure 6.

The annual comparative distribution of male and female individuals by stations is shown in Figure 7.

The highest number of individuals was determined at station 5 in both 2020 and 2021. The least number of individuals was detected at station 10 in 2020, and station 9 in 2021.

In 2021, the water level decreased by about 70 cm compared to 2020.

Table 3. Distribution of male and female individuals by years.

St. no	2020			2021		
	Total individual	Female individual	Male individual	Total individual	Female individual	Male individual
1. St.	19	7	12	7	2	5
2. St.	21	9	12	9	2	7
3. St.	19	8	11	8	1	7
4. St.	23	9	14	12	4	8
5. St.	28	16	12	19	9	10
6. St.	21	7	14	7	1	6
7. St.	23	7	16	7	1	6
8. St.	14	5	9	6	1	5
9. St.	15	5	10	4	1	3
10. St.	13	5	8	5	1	4
Total	196	79	117	84	23	61

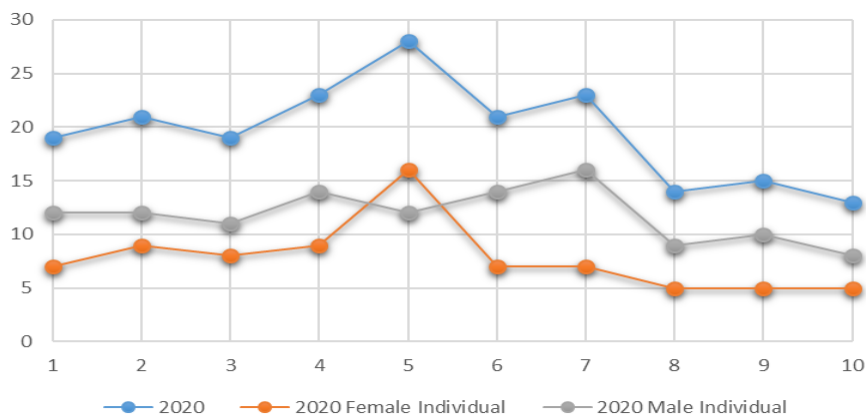


Figure 5. Distribution of 2020 female and male individuals by stations

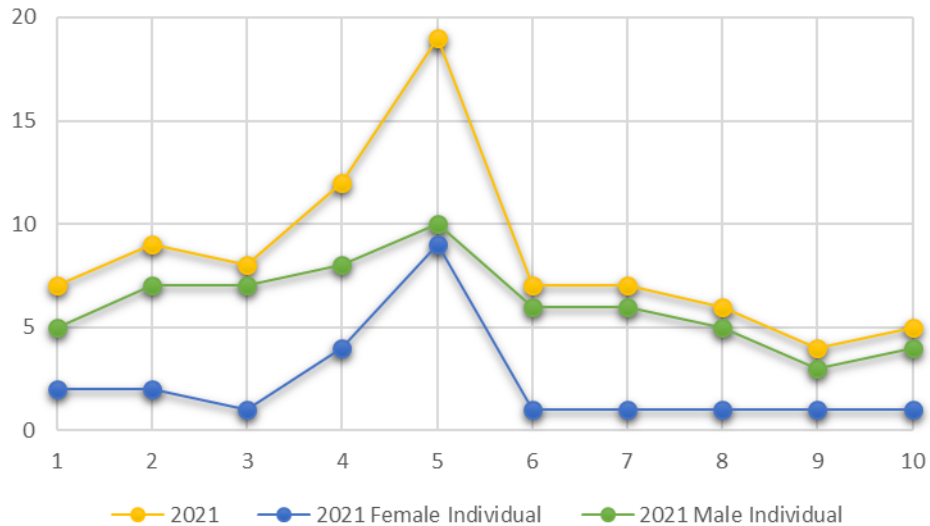


Figure 6. Distribution of 2021 female and male individuals by stations

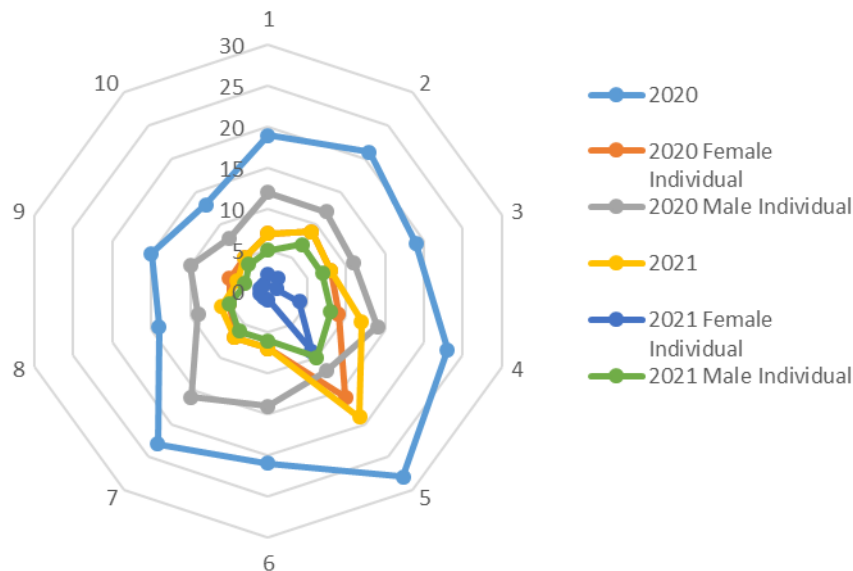


Figure 7. Comparison of the yearly distribution of male and female individuals by stations

4. Conclusion and Discussion

The reason why the highest number of individuals is seen at station 5 in both years is thought to be related to the fact that it is far from the coast and is the region with the least human transportation.

However, the fact that it is a suitable environment in terms of shelter and nutrition brings station 5 to the fore. When we look at the general structure of the station, it is seen that fish prefer these regions to spawn. Due to this situation, it is possible to feed *Potamon potamios* species with fish eggs.

In 2021, a significant decrease in lake level was observed due to the decrease in precipitation and the accompanying drought. With this decline, the living environment in the lake was also affected. The living conditions of both the *Potamon potamios* species and other living things have become difficult. As the water needs of the agricultural areas increased with the drought, the water was drawn from the lake by pumps above normal. However, the increase in the evaporation rate with the increasing effect of temperature caused a significant decrease in the water level. In addition, the impact of the wild irrigation systems and numerous boreholes in the surrounding area is also great.

According to Kumerloev (1988), the area is the spawning ground of about 48 bird species. In the study; swamp bunting (*Emberiza schoeniclus*), willow sparrow (*Passer hispaniolensis*), common primrose (*Remiz pendulinus*), great reed spruce (*Acrocephalus arundinaceus*), common reed viper (*Acrocephalus scirpaceus*), great egret (*Egretta albarus* (Botarus), balaban The existence of cranes (*Grus grus*), lapwing (*Vanellus vanellus chettusia*), reed nightingale (*Cettia cetti*), henna partridge (*Alectoris chukar*), collared bustard (*Houbara bustard*), green bee-eater (*Merops superciliosus*) around Lake Amik is described [19].

One of the aquatic creatures in the food chain of these bird species that make nests and lay eggs in the lake surroundings and among the plants in the lake is the crustacean species. Therefore, it is thought to have an effect on the *P. potamios* population.

In addition, it is thought that the feeding habits of *Pelophylax bedriagae*, *Bufo variabilis*, *Ophisops elegans*, *Apathya cappadocica*, *Natrix natrix*, and *Natrix tessellata* species distributed in the region are also effective on the population [20].

While Hassa and Kırıkhan sections are irrigated by the waters of the Karasu River, irrigation around Gölbaşı Lake is done with water drawn from boreholes and canals. However, this also increases irrigation costs. However, high water demand and consumption caused the groundwater level to decrease.

For this reason, the lake floor and its surroundings have a structure suitable for water loss from the base. It is thought that there is water loss from the lake floor due to the deep wells drilled in the surrounding area.

The water losses experienced adversely affect biological diversity. If this situation is not prevented, some species will go extinct.

Primary freshwater crabs (Pseudothelphusidae, Potamidae, Potamonautidae, Gecarcinucidae, and Trichodactylidae) are a group of purely freshwater families [21, 22]. In the first global conservation assessment of primary freshwater crabs, Cumberlidge et al. (2009) found that a significant portion (one in six) of the world's 1300 species is threatened with extinction, and a larger portion (about half) does not even have sufficient data to be evaluated in the first place; They identified the various threats facing this group of animals and called for strategies to be developed to protect the world's threatened freshwater crabs [23].

As a result, failure to develop the necessary protection methods and to combat drought effectively will cause a significant decrease in the *Potamon potamios* specimens and even the extinction of the species. In addition, preventing wild irrigation and the unconscious use of groundwater will protect both the lake and the biodiversity in the lake..

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