

## An overview of the status of the inland fishery of Basrah province, Iraq during 2023

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### Abstract

The fishing activities in the inland waters in Basrah province, Iraq were evaluated. Information on landings was collected from six inland landing sites from January to December 2023. Inland fishing resulted in a total catch of 2,060 tons of fish and consisted of fifteen fish species. The most commonly caught fish were Common carp (31.36%), Tilapias (13.59%) and Mulletts (11.26%). Non-native species like Common carp and Tilapias contributed 44.95% of the total inland catch. In contrast, native highly valued species like Binni, Yellowfin barbell, Himri barbell, and Shabout formed only 18.10% of the total catch. So, from a fisheries management perspective, it is crucial to boost the populations of native species, ensure the right amount of water is obtained from the upper Tigris and Euphrates Rivers, and implement national fishing regulations to deter illegal fishing methods.

**Keywords:** Inland and marine fisheries; Native and non-native species; Basrah; Iraq

### 1. Introduction

The Basrah province is bounded by the Tigris and Euphrates Rivers, the water masses of the marshlands from the north, and the Arabian Gulf from the south. There are two main water bodies that run through Basrah to the Arabian Gulf, which are the Shatt Al-Arab River and the Shatt Al-Basrah Canal. The Shatt Al-Arab River receives freshwater from the Tigris and Euphrates Rivers, as well as from the Karkheh and the Karun Rivers from Iran [1]. Therefore, two strictly different groups of fish are caught in the province: marine fish species from the northwest region of the Arabian Gulf and freshwater fish from the main rivers and the marshlands (inland fishery). The inland waters support a wide variety of fish species, with 98 different species identified and a majority of these species (57) belong to the Cyprinid [2].

The Basrah province was exposed to a decline in the quality and quantity of water due to the construction of hydropower projects in the headwaters of the Tigris and Euphrates Rivers and their tributaries, the diversion of the Karun and Karkha Rivers into Iranian territory, the invasion of exotic fish species, and seawater intrusion upstream, reaching up to 100 km into the Shatt Al-Arab River during dry years. These factors led to the deterioration of the aquatic systems of the province [3-6].

Some studies have been published on the inland fishery of Basrah, which focused on species composition, fishing efforts, total and species landings, and their trends. These studies include Sharma [7], Mohamed *et al.* [8], Nasir and Khalid [9], Abood and Mohamed [10] and Mohamed and Abood [11].

The inland natural ecosystem of Basrah province is negatively affected by several factors such as climate change (e.g. changes in temperature, precipitation, and penetrating sea waters) and anthropogenic factors (e.g., impoundment of dams and agriculture practices). So, the main objectives are to evaluate the current status of inland fishery in terms of

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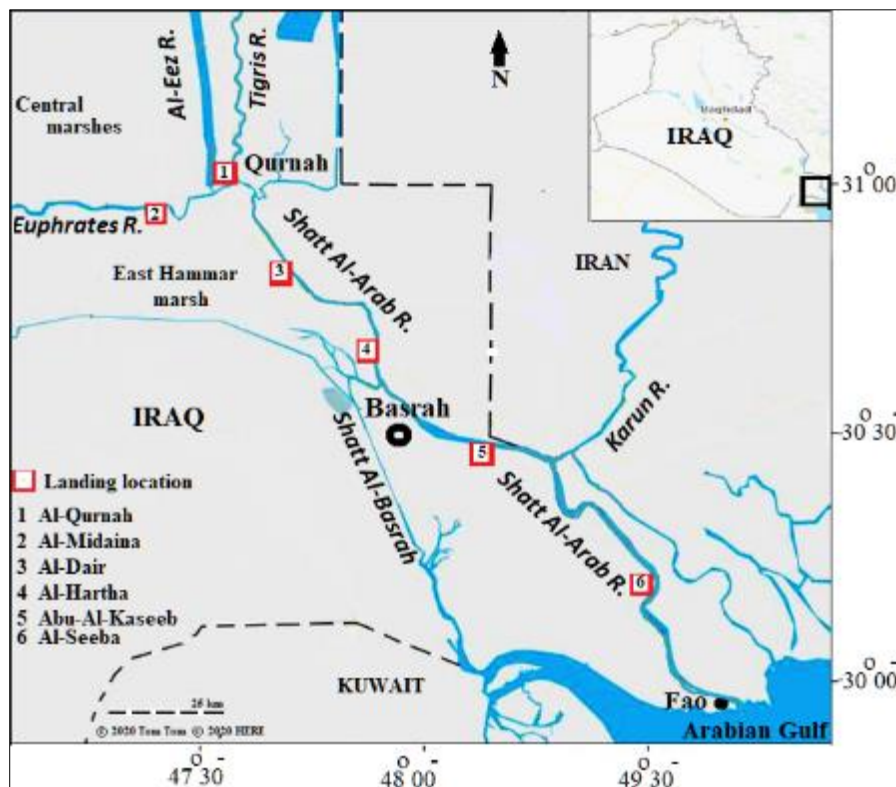
total and species catches, the trends of landings, and fishing efforts from January to December 2023 to assist the plane and management of the sector

## 2. Material and methods

### 2.1. Study area

The Basrah province is situated in southern Iraq between latitudes 29°50' and 31°20' in the North and longitudes 47°40' and 48°30' in the East. A diverse range of water resources, including rivers, channels, marshes and marine waters characterizes the province. The Tigris and Euphrates rivers and marshlands such as Al-Hammar and Al-Hawizah surround the province in the north and marine waters of the Arabian Gulf in the south. The Shatt Al-Arab River flows through the Basrah governorate to the Gulf, along with the Shatt Al-Basrah Canal leading to the Gulf through Khor Al-Zubair and Khor Abdullah (Fig. 1).

The landing sites in the Basrah province, specifically Al-Qurna, Al-Midaina, Al-Dair, Al-Hartha, Abu-Al-Kaseeb, and Al-Seeba for the freshwater fishery were monitored (Fig. 1). These sites were chosen due to their proximity to water bodies in the province and their suitability for fishing and landing activities. The research will encompass the period from January to December 2023.



**Figure 1** Location of the landing sites of data collection in the Basrah province

### 2.2. Data analysis

The official primary data consists of the monthly catch of each species, the number of fishermen, and the specifications of fishing gear. This information is gathered by the competent staff of the Directorate of Basrah Agriculture of the Iraqi Ministry of Agriculture from the landing sites. The primary data is then computerized, analyzed using descriptive statistics, and presented in numerical and graphical formats for each species.

The relative abundance (%R) of each species was calculated according to the formula of Krebs [12]:

$$\%R = C_i / TC * 100$$

where  $C_i$  is the landing of  $i^{\text{th}}$  species and TC is the total landings.

The monthly variations between monthly landings were tested using one-way analysis of variance (ANOVA), and the least significant differences were used to analyze the difference between months using the SPSS software (version 16, 2007) statistical package.

The Microsoft Excel 2010 program was used to determine the trend line (technical analysis) indicating the general direction and patterns of fish species' landings and to perform all computations and analyses.

### 3. Results

#### 3.1. Catches species

Table 1 lists the fish species and their scientific, common, and local names caught by inland fishery during 2023. The inland catches comprised from 15 species belonging to four families, namely Cyprinidae represented by eight species, Mugilidae and Cichlidae by three species each and Sparidae by one species. Other species that are not commercially desirable are often sold as mixed fish.

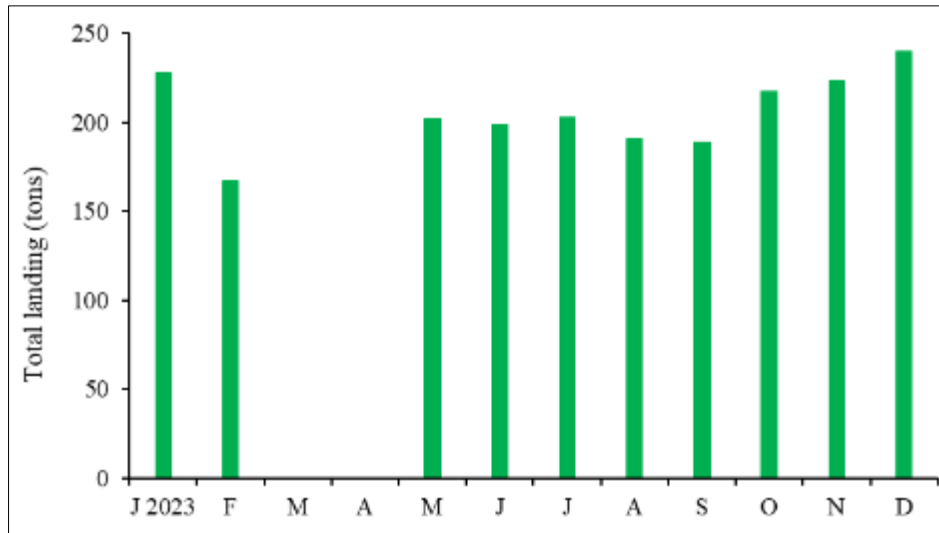
**Table 1** Fish species in the Basrah inland fishery during 2023

Family	Scientific name	English name	Local name
Cyprinidae	<i>Cyprinus carpio</i>	Common carp	Samti
	<i>Leuciscus vorax</i>	Tigris asp	Shalig
	<i>Carasobarbus luteus</i>	Himri barbel	Hemri
	<i>Mesopotamichthys sharpeyi</i>	Binni	Bunni
	<i>Luciobarbus xanthopterus</i>	Yellowfin barbell	Gattan
	<i>Arabibarbus grypus</i>	Shabout	Shaboot
	<i>Carassius auratus</i>	Crucian carp	Kaezmeh
	<i>Alburnus mossulensis</i>	Mosul bleak	Samnan
Mugilidae	<i>Planiliza abu</i>	Abu mullet	Khishni
	<i>Planiliza subviridis</i>	Greenback mullet	Beyah
	<i>Planiliza klunzingeri</i>	Klunzinger's mullet	
Sparidae	<i>Acanthopagrus arabicus</i>	Arabian yellowfin seabream	Shanak
Cichlidae	<i>Oreochromis niloticus</i>	Nile tilapia	Bultee (Tilapia)
	<i>Oreochromis aureus</i>	Blue tilapia	
	<i>Coptodon zillii</i>	Redbelly tilapia	

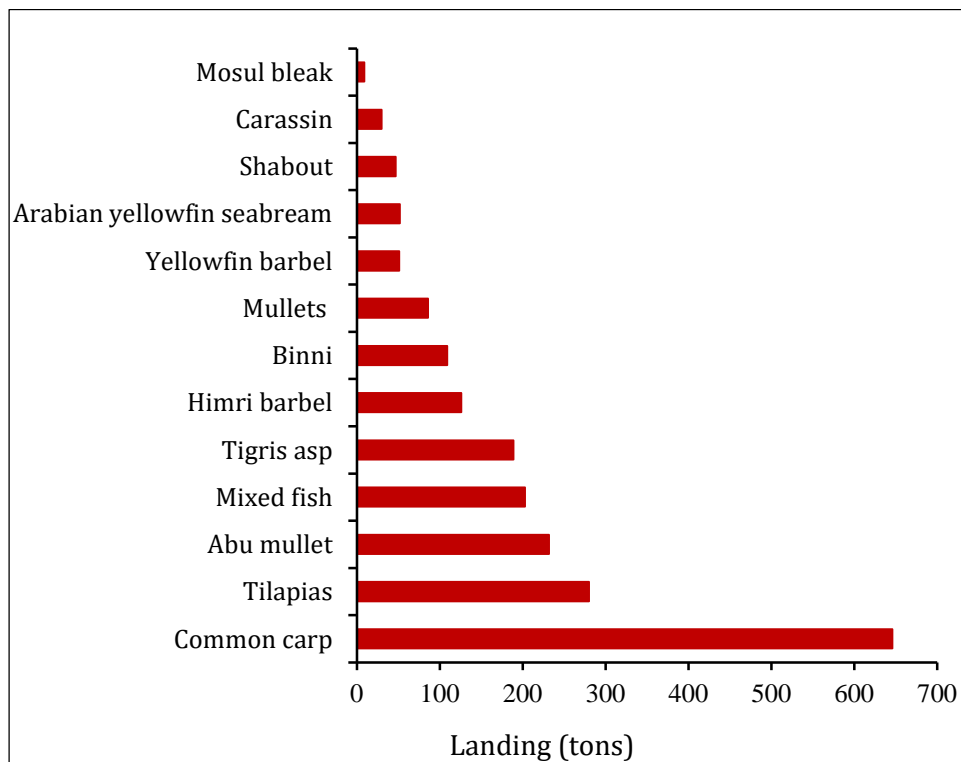
#### 3.2. Total landings

The monthly total landings of inland fishery in 2023 are depicted in Figure 2. The lowest landing was 166 tons, observed in February, while the highest was 240 tons in December, with an overall landing of 2,060 tons.

The total landing of each species caught by inland fishery during 2023 is shown in Figure 3. A total of 2,311 tons from different species were landed, and the three most commonly landed species were Common carp with about 646 tons, Tilapias at 280 tons and Mulletts at 232 tons. The other caught species ranged from 9 tons for Mosul bleak to 189 tons for Tigris asp, while mixed fish landing was 203 tons. The most commonly caught fish species were the exotic species such as Common carp and Tilapias making up 44.95% of the total inland catch. In contrast, native species like Binni, Yellowfin barbell, Himri barbell, and Shabout, which are highly valued, accounted for only 18.10% of the total catch.



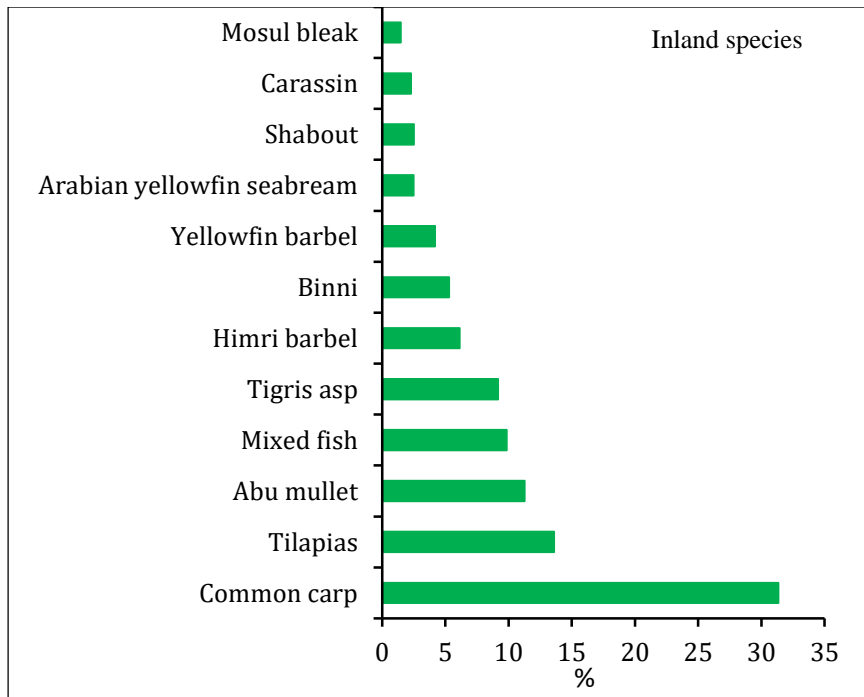
**Figure 2** The monthly landings of the inland fishery during 2023



**Figure 3** The total landing fish species in inland fisheries during 2023.

### 3.3. Relative abundances of species

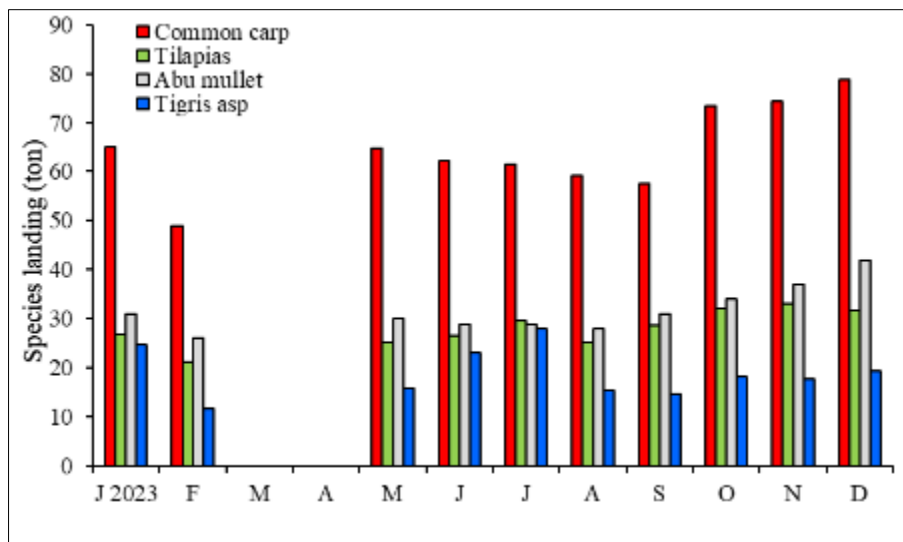
The relative abundances of different species caught by inland fishery are illustrated in Figure 4. Common carp was the most prevalent species in inland fishery constituting 31.36% of the total catch, followed by Tilapias (13.59%) and Abu mullet (11.26%). Other species ranged from 0.44% for Mosul bleak to 9.17% for Tigris asp. Mixed fish contributed to 9.85% of the total inland catch.



**Figure 4** The relative abundance of fish species in the inland fishery during 2023

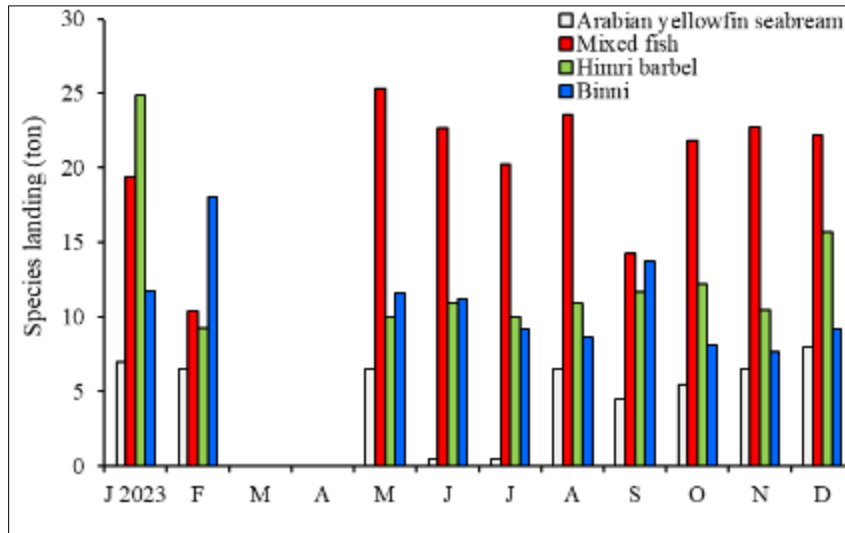
### 3.4. Species landings

Figure 5 illustrates the monthly fluctuations in the landings of Common carp, Abu mullet, Tilapias and Tigris asp in the inland fishery during 2023. Common carp was the main species that landed during the study period when the landing extended from 49 tons in February to 79 tons in December. The second most landed species was the Abu mullet, their landings ranged from 26 tons in February to 42 tons in December. The landing of Tilapias fluctuated from 21 tons in February to 33 tons in November, and Tigris asp varied from 12 tons in February to 28 tons in July.



**Figure 5** The monthly fluctuations in the landings of Common carp, Abu mullet, Tilapias and Tigris asp in the inland fishery during 2023

The monthly changes in the landings of Himri barbel, Binni, Arabian yellowfin seabream, and mixed fish in the inland fishery in 2023 are depicted in Figure 6. The Himri barbel's landing varied from 9 tons in February to 25 tons in January, while the Binni's landing ranged from 8 tons in October to 18 tons in February. The landing of Arabian



**Figure 6** The monthly variations in the landings of Himri barbel, Binni, Arabian yellowfin seabream, and mixed fish in the inland fishery during 2023

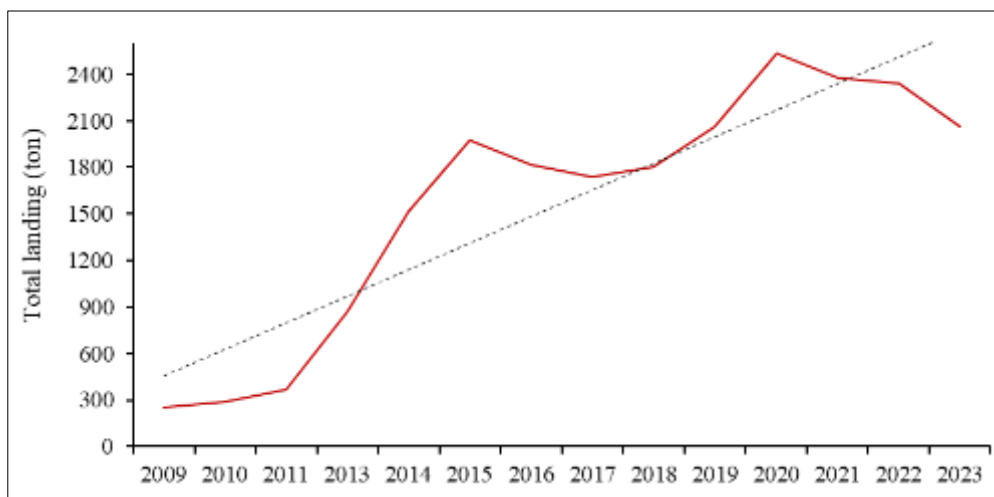
yellowfin seabream changed from one ton in June to 8 tons in December, and the mixed fish landing varied from 10 tons in February to 25 tons in May.

### 3.5. Fishing efforts

2140 non-motorized boats were working in inland fisheries ranging from 3.5 to 5.0 m in length, each employing one to three fishermen, and 1160 motorized boats powered by outboards of 2 to 55 hp ranging from 5.5 to 10.5 m in size, using two to three fishermen to operate each. Several fishing gears were identified in the inland fishery during the study period included gill nets (drift and fixed), seine nets, cast nets, electrical fishing and hand lines.

## 4. Discussion

The aquatic habitats in the province of Basrah support numerous freshwater, diadromous, and marine fish species, making fishing one of the dominant economic activities. Currently, the total catch of inland fisheries is estimated at 2,339 tons in 2023, primarily consisting of native, introduced, and invasive fish species. This catch has consistently increased over the years (Fig. 7), the total fish landing was approximately 256.0 tons in 2009 and it reached its highest point at 2,538 tons in 2020 [11].

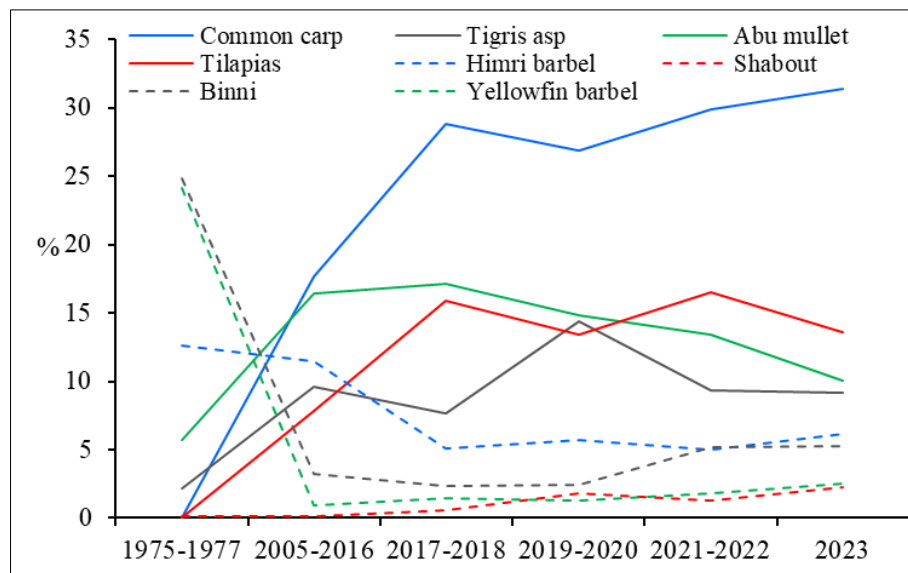


**Figure 7** The trend of the total landings of Basrah inland fishery (2009-2023)

The overall increase in inland fish landing may be attributed to several factors, including the expansion of fishing activities, the stocking of Common carp and the prevalence of invasive Tilapia species in the water ecosystem in southern Iraq. 2140 non-motorized and 1160 motorized boats were working in the inland fishery. In contrast, about 1283 boats operated in this fishery from 2005 to 2016, most less than 10 m long and had small outboard motors with 1490 registered fishers [9]. Since Common carp were introduced into the aquaculture industry more than 60 years ago [13], the species has been established very well in different inland systems of Iraq. In recent years, the stocking of this species in the region has increased due to artificial propagation at a shrimp hatchery in the Basra marshes annually by the Ministry of Agriculture. Moreover, the Tilapia species first invaded the middle water systems of Iraq in 2007 [14] and there was a rapid expansion in the aquatic environments in the south of Iraq [15], suggesting the ability of Tilapias to colonize highly stressful environments.

The predominant fish species caught in 2023 were exotic, such as Common carp and Tilapias, which formed 44.95% of the total inland catch. In contrast, native freshwater fish symbolic of the Mesopotamian aquatic environment, such as Binni, Yellowfin barbel, Himri barbel, and Shabout, were highly valued but only accounted for 18.10% of the total catch. These species have experienced a notable decrease in landings and are considered threatened by the International Union for the Conservation of Nature. They are also listed in the Red List [16-18].

To compare the changes in the proportions of the main species of the Basrah inland fishery from 1975 to 2023, a literature review was conducted using the works of Sharma [7], Mohamed *et al.* [8], Nasir and Khalid [9], Abood and Mohamed [10] and Mohamed and Abood [11], and was illustrated in Figure 8. During this period, several species experienced a significant increase in their percentages. Notably, the Common carp rose from 0.0% in 1975-1977 to 31.36% in 2023, while the invasive tilapia increased from 0.0% to 13.59% during the same period. Additionally, the percentage of Tigris asp, a predatory fish, rose from 2.2% in 1975-1977 to 9.17% in 2023. Shabout was prohibited from fishing in the marshes for breeding and to promote fish growth during the 1970s [7]. Their landings increased slightly from 0.2% during 1975-1977 to 2.28% in 2023. Meanwhile, other native species of high economic value showed a significant decrease in their catches from 1975 to 2023 (Fig. 8). For instance, the Yellowfin barbel decreased from 24.1% in 1975-1977 to 2.48% in 2023, Binni decreased from 24.8% in 1975-1977 to 5.29% in 2023, and Himri barbell decreased from 12.6% in 1975-1977 to 6.12% in 2023.



**Figure 8** The landing proportions of Common carp, Tilapias, Abu mullet, Binni, Yellowfin barbel, Himri barbel, and Shabout in the inland fishery (1975-2023)

The decline in the catches of native species of high economic value and their contributions over the last few decades could be attributed to deterioration in the aquatic environment in south Iraq. The quality and quantity of water in Iraq have significantly decreased due to the construction of multiple hydropower dam projects in the headwaters of the Tigris and Euphrates Rivers and their tributaries [19, 20]. This has disrupted the natural flood pulse during spring which is the main breeding season for native high-value fish in the southern regions. These fish depend on water level and temperature to stimulate spawning and migration, and to support the survival and growth of juvenile fish [21, 22]. Numerous studies have discussed how changes in the annual flood patterns in floodplain areas due to the construction

of dams upstream can impact the composition of fish populations, fish reproduction, and the overall growth and survival of juvenile fish [23, 24, 25, 26]. According to Scudder and Connelly [27], the construction of major dam projects on rivers has had a detrimental impact on fisheries by altering the natural flood patterns that many fish species and fisheries rely on, especially in downstream areas.

On the other hand, several studies have indicated that Common carp and Tilapias are considered problematic in several countries due to their perceived impacts on water quality, aquatic plants, and the population sizes of native freshwater fish through competition and lowering habitat quality [28-35].

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## 5. Conclusion

The study showed that the inland fish catch has increased in recent years. This increase has been linked to the prevalence of non-native species like Common carp and Tilapias in the inland fishery. Conversely, economically valuable species such as Binni, Yellowfin barbel and Himri barbel have contributed less than their historical levels. Therefore, the following management actions should be required to maintain sustainable stocks in the aquatic ecosystems in Basrah involve regional cooperation between Iraq, Turkey and Iran to secure the appropriate quantities of water from the upper Tigris and Euphrates Rivers and their tributaries for Iraq, strengthening the stocks of economically valuable native fish by artificially propagating them and then releasing juvenile species into natural water bodies, and restrict the reproduction of carps and confining them to fish farms.

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## Compliance with ethical standards

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### *Disclosure of conflict of interest*

There is no conflict of interest to be declared.

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