Research Article

Status of Fishing and Commercial Marketing of Hilsa Shad, *Tenualosa ilisha* (Hamilton-Buchanon, 1822), in Basrah Governorate, Southern Iraq

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Abstract | Due to a lack of information on the state of Hilsa shad (*Tenualosa ilisha*) fishing and commercial marketing in Basrah province, south of Iraq, this study was conducted to offer an update on the species' status. The current study seeks to analyze the capture and marketing of currently available commercial species. In 2021, the average number of fishermen per unit of effort was 2025, with 871 small fiberglass boats and 166 large iron boats. The entire catch of hilsa shad during 11 years, from 2014 to 2024, was 9095 tons, whereas the total catch of all fish, including shad, was 38187 tons. The average catch over the last 11 years (2014-2024) is 826.82 tons/year. The percentage was 5.59% in 2017 and reached a peak of 37.74% in 2023, with hilsa shad accounting for 23.82% of total captures. The current study indicates that natural conditions, variables, freshwater discharge from the Shatt Al-Arab River, and fisheries management north of the Arabian Gulf all have a significant impact on the status of hilsa shad.

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Introduction

Hilsa shad (*Tenualosa ilisha*) is a fish species affiliated with Dorosomatidae, one of the most important families in the Middle East, South Asia, Pakistan, and India (Khan *et al*., 2025). The first identification of the present species was made by Russel (1803); he called it Palash. Then, the species was renamed by Hamilton in 1822 as *Clupanodon ilisha* (Al-Dubakel, 2011). Hilsa shad, an anadromous species locally called "Sboor" in Iraq Sboor is a favorite and desired species in the south of Iraq; the species possesses high food value and commercial importance (Borah *et al*., 2023). The species is widely distributed in the_Shatt Al-Arab River and enters the Tigris at Al-Auzir city, south of Missan province. The fish are widely dispersed in freshwater, estuaries, and the Arabian Gulf; it is a migratory species to rivers to complete its reproductive cycle (Singh *et al*., 2021; Mohamed and Abood, 2024).

Hilsa shad is an economically important fish for

diet, particularly in Basrah province in southern Iraq, India, and Bangladesh. In Basrah, the species plays an important role in most local markets and traditional cuisine. The fish is marketed at high prices because of its oil content and unusual flavor (Nowsad and Hoque, 2021).

The current fish species reside in schools in coastal waters and travel more than 190 kilometers to the Shatt Al-Arab River. The fish swims quickly through the water column, covering 71 kilometers in a single day in its preferred open water. This fish is a filter feeder that feeds on plankton, as well as grubbing on muddy substrates (Siddique *et al*., 2022). In general, the species spends most of its life in saltwater (sea), migrates to the river to spawn in freshwater since its eggs cannot tolerate increased salinity concentrations, and then returns to marine environments (Houde *et al*., 2022). Hilsa shad loves shallow water that blends salt and freshwater (estuaries) with high nutrients, feeding on plankton (phytoplankton and zooplankton) as well as tiny crustaceans and detritus (Shohan *et al*., 2024). The fish possesses excellent reproductive potential with a rapid rate of growth to sustain the population, despite being subjected to high fishing pressure as one of the most targeted species (Hossain *et al*., 2019). Between February and September, anadromous fish enter rivers and estuaries from the sea to spawn, a process known as reproductive migration, because sufficient habitat is available for reproduction (Nasir, 2016; Ahmed, 2021). This fish has major economic importance because of its high trading value, especially for large sizes, and its wonderful taste and fatty meat improve its commercial value; hence, this species has become critical to local inhabitants (Rahman and Islam, 2020; Narzary *et al*., 2021). This major commercial fish is also a part of a larger regional commerce between the coastline countries. The populations of this species encountered challenges represented by increased fishing pressure, environmental deterioration, overfishing, habitat loss, and pollution, which reduced the huge number of individuals of the species (Hossain *et al*., 2019; Aldoghachi and Altamimi, 2021). Furthermore, the construction of dams on the rivers and the decline of discharges that change the estuaries' nature due to anthropogenic activities hurt the reproduction of these species (Shaha *et al*., 2022). Hilsa shad has an important role in being caught in the north of the Arabian Gulf and the Shatt Al-Arab River, and their occurrence makes it substantial in the local fisheries and contributes to improving the livelihoods of many fishermen and their families (Islam *et al*., 2020). However, the capture number of hilsa shad fluctuated during different years in the Iraqi marine water and the Shatt Al-Arab River due to the region's fluctuating natural conditions during the last decade (Abdullah, 2024). Because of the importance of the current fish species, they are exposed to high rates of exploitation and overfishing in the north of the Arabian Gulf region, which would be harmful to the interests of the citizens of the coastal countries (Mozumder *et al*., 2018). Cooperation among coastline countries in developing sustainable fishing practices and adopting regulations agreed upon by regional coastal governments plays an important role in the long-term viability of present species fisheries. Regional governments and environmental groups should implement various steps to maintain supplies of this species, such as setting restrictions on fishing gear and prohibiting fishing during the breeding season (Hossain *et al*., 2019; Islam *et al*., 2024).

Several research studies on fish capture and selling in Basrah province have been conducted, including Al-Dubakel (2011), Mohamed and Qasim (2014), Younis *et al*. (2018), and Abdullah (2024).

The research study aims to evaluate the capture and selling of hilsa shad Tenualosa ilisha, in Basrah Governorate, southern Iraq, between 2014 and 2024.

Materials and Methods

Description of study area

The current investigation was conducted in Al-Fao, approximately 102 kilometers south of Basrah City (Figure 1). The samples were obtained from three sites in Iraqi marine waters located in the northwest Arabian Gulf, which encompass the Shatt Al-Arab estuary, Khor Abdullah, and Khor Al-Aumia, as well as the regional Iraqi waters confined between the coordinates N 29°58' 44˝, E 48° 55' 20.90˝. (Albadran *et al*., 2016).

Iraqi maritime waters have specific habitat traits shaped by their modest depth (20-50 m), turbid seas in a vast territory, and arid climate. The water is continuously diluted with fresh water from the Shatt Al-Arab River (Albadran, 2021).

Data collection

The initial data was gathered from the Basrah Agriculture Directorate, which depended on the Al-Nasr Cooperative Society for fishing and marketing fish in the city of Al-Fao (Adullah, 2024). Some information was obtained from a previous study by Mohamed and Abood (2024). During the study period, monthly excursions to the primary landing site were made to gather some data, as well as monthly field interviews with fishermen about fishing amount and targeted species, which were recorded in special tables.

Statistical Analysis

SPSS version 20 (Statistical Package for Social Science) was used to assess catch quantities in Iraqi marine waters, while Microsoft Excel version 2016 was used to estimate a straight-line equation for caught trends and generate diagrams.

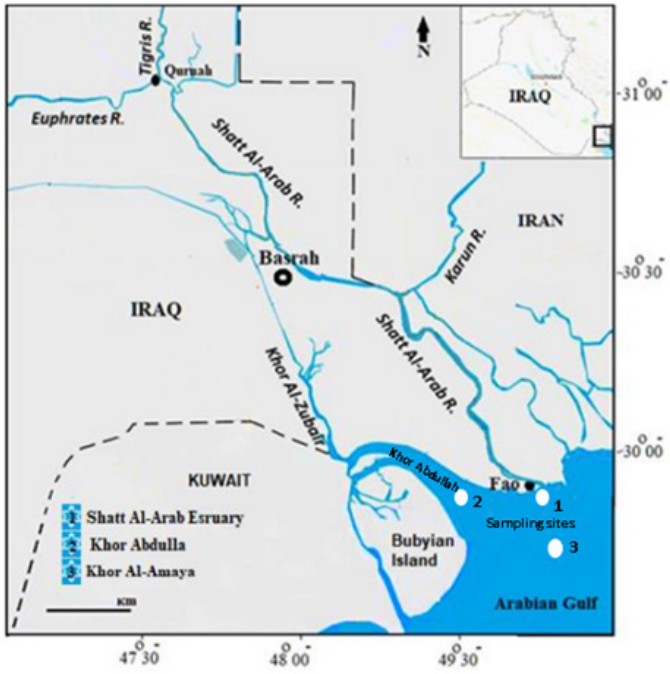

Figure 1: *Map of Iraqi marine waters illustrated landing sites.*

Results

Catch per unit effort

There are no statistics on catch per unit effort every year, but in 2021, there were roughly 2025 fishermen who worked in the fishing sector as part of the catch per unit of effort (CPUE) in fishing, which is classified into two categories of boats: Small fiberglass boats are 14 meters long, with 871 boats per boat and 2–3 fishermen. The big ships, known as dhows, were over 22 meters long and built of iron, with approximately 166 boats, each carrying 8 to 12 fishermen. The main tools used to catch hilsa shad are draft gillnets, which are locally known as "Sayssi" and have different mesh sizes; the local measurement in the arm equals 50 cm; if the number of mesh sizes in the arm is ten, it is called "Al-Ashery"; if the number of mesh sizes is eight, it is called "Al-Thmani"; and if the number of mesh sizes is six, it is called "Al-Sodaisei." In addition to shrimp, the fish taken on the expedition were of various sorts. The large ships' fishing trips last nearly 5 to 10 days, and they bring fuel, food, ice, and drinking water, whereas small boats market their catch daily at the landing site. The trip's revenues vary according to the season, catch quantity, and fishing trip expenses.

Catches of Hilsa Shad

Hilsa shad landings from 2014 to 2024 showed a small increase in the annual trend, ranging from 209 tons in 2017 to 1380 tons in 2023. The average catch over the last 11 years is 826.82 tons each year, with minor variance from year to year (Figure 2). The entire capture of hilsa shad for 11 years, from 2014 to 2024, was 9095 tons, whereas the total catch of all fish, including hilsa shad, was 38187 tons, ranging from 2627 to 4315 tons in 2014. From 2014 to 2024, the trend line increased steadily, and b = 76.31 shows a clear increasing trend with a big value at the y-axis intersection (Figure 2).

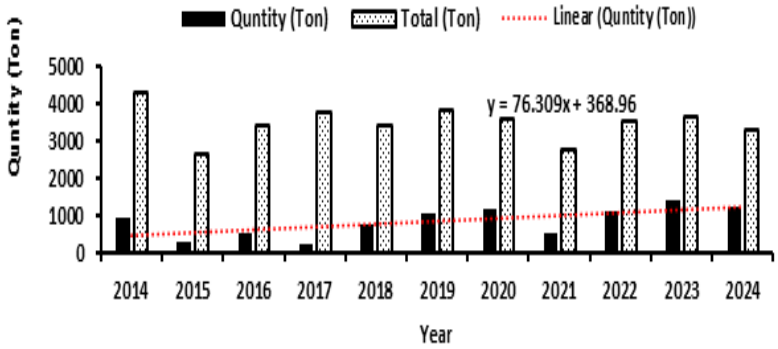

Figure 2: *The yearly catch of Hilsa shad from 2014 to 2024 in the Basrah province*

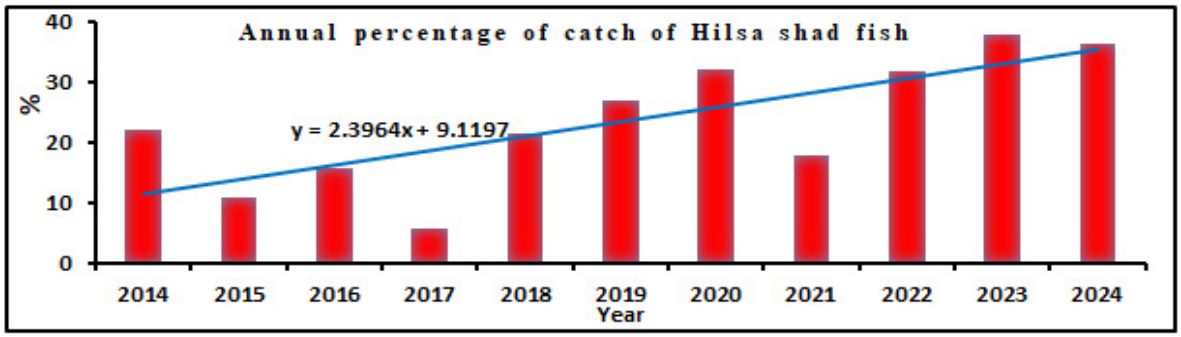

Figure 3: *Annual fluctuations and trends in the percentage catch of Hilsa shad from 2014 to 2024 in Basrah province.*

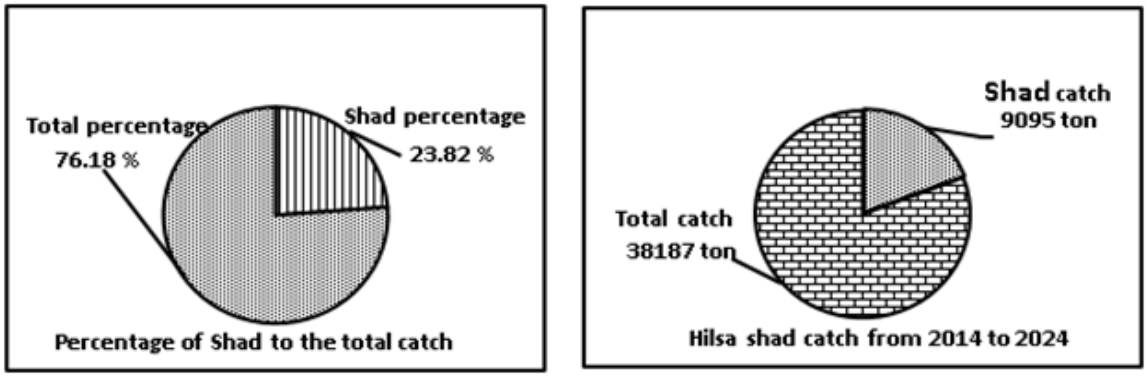

Figure 4: *Hilsa shad catch and percentage to the total catch from 2014 to 2024.*

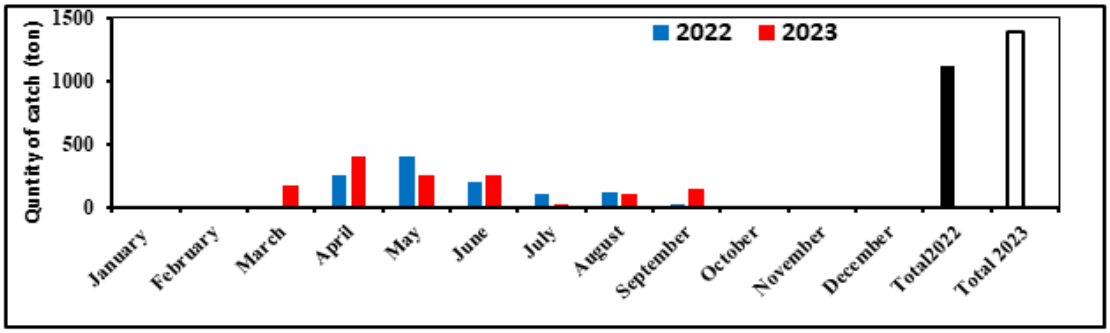

Figure 5: *Monthly fluctuation in the quantity of Hilsa shad catch in the years 2022 and 2023, marketed from Basra province.*

The annual percentage of shad in the overall catch decreased from 2014 to 2017 but then grew until 2024 (Figure 3). The minimum yearly percentage for total caught was 5.59% in 2017, with a high of 37.74% in 2023. Between 2014 and 2024, shad accounted for 23.82% of total catches. The trend line showed a steady increase toward 2023 (b = 2.40) (Figure 3 and Figure 4).

The monthly catch of hilsa shad fluctuated dramatically between 2022 and 2023. The lowest catch in 2022 (1 ton) was in February, while the greatest was 400 tons in May. The quantity of hilsa shad marketed in 2023 ranged from 5 tons in January and February to 400 tons in April. The total quantity was higher in 2023 than in 2022, with a range of 1116 to 1390 tons (Figure 5).

The monthly capture of five selected fish species and shrimp in Iraqi maritime waters in 2022 and 2023 in comparison to hilsa shad (Figure 6). *Pampus argenteus* catches ranged from one ton in February to 75 tons in May 2022, while in 2023 it fluctuated between two tons in December and 150 tons in both July and August. The capture of mullets (*Planiliza klunzingeri*, *P. subviridis*) fluctuated from 20 tons in May 2022 to 250 tons in August, while in 2023, the catch ranged from 150 tons in November to 275 tons in September and October.

Marketing of Hilsa shad

During fishing trips, fishermen bring a lot of ice to

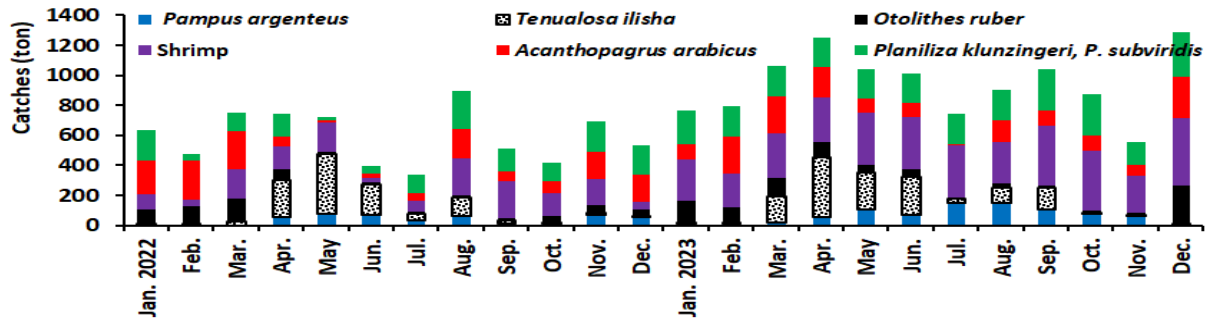

Figure 6: *The monthly quantities of fishing of five selected species and shrimp compared to Hilsa shad during 2022 and 2023.*

preserve the shad and other commercial fish species. They also bring a sufficient amount of fuel for both the fishing and the return trip to the landing site in Al-Fao city, which is known locally as "Al-Alwa." This is the first step in the marketing process for Hilsa shad fish. Al-Basrah City and other Iraqi regions buy the shad and other species for transportation and other Iraqi provinces. The Shad is classified into three sizes (big, medium, and small). Weight is not employed in the marketing process in Basrah province; the large and medium sizes are sold by the number, while the small size is offered by the kilogram or basket at a set price. In the 2024 season, the large size sells for around 35 to 50 US dollars per pair, while the medium size costs nearly 17 dollars.

Discussion

Although fish farming and related aspects such as proximate composition, length-weight relationship, fish growth, feed utilization efficiency, and metal analysis are important in fish aquaculture farming, (Javed *et al.*, 1992; Naeem *et al.*, 2010a, b; Ismat *et al.*, 2013; Naeem *et al.*, 2016). However, fisheries continue to be particularly important, as farmed fish frequently underperform their wild counterparts due to factors such as feed quality and environmental stress (Ashraf et al., 2011; Ismat *et al.*, 2013). The hilsa shad is a key target migratory species in the North Arabian Gulf and Shatt Al-Arab River fisheries. However, fishing activities (number of fishermen and registered fishing boats) have changed significantly recently compared to previous surveys, when Al-Khayat (1978) reported 345 fishing vessels in Al-Fao between 1965 and 1974. In the same trend, Salman (1983) claimed that the number of fishermen climbed to almost 1000, occupying 73 large boats and 283 small vessels, the majority of which were from Al-Fao City. According to Al-Dubakel (2011), there were 965 ships registered in the Al-Fao and Al-Sindbad associations, and the fishing sector employed 9,650 to 11,580 fishermen. Furthermore, 600 small boats were carrying 2 to 3 fishermen. According to Mohamed and Abood (2020), 320 registered fishing boats operated in Iraqi marine seas between 2017 and 2019, with 246 built of iron, 67 of fiberglass, and 7 made of wood. In the current study, the number of boats (166 dhows) decreased sharply, whereas the number of small boats increased from 600 in Al-Dubakel (2011) to 871 in the current study. This was accompanied by a decrease in the number of workers in the fishing sector; the current study recorded 2025 workers in 2021 in the fishing sector, compared to 6950 to 11850 workers recorded in Al-Dubakel (2011). The decline in the number of boats and people working as fishermen is due to the significant lack of income from fishing due to the scarcity of commercial fish stocks and the lack of government support (Teh *et al.*, 2020; Warren and Steenbergen, 2021). The increase in the number of small boats is due to the migration of marsh fishermen to the Shatt al-Arab and marine waters due to the drought of marshes, which is due to the low discharge of the Tigris and Euphrates rivers and the increase in population (Olson and Speidel, 2024).

The catches of hilsa shad fluctuated and differed from one year to another; the landing percentage during the period 1965 to 1973 was 90.2% of the total caught (Al-Kayat 1978), then the percentage declined to 52.90% for the period 1991 to 1994, according to Ali *et al.* (1998). In the period 1995 to 1999, the hilsa shad percentages started to decline to 41.80% and 30.70%. Al-Dubakel (2011) confirmed this when he discussed the commercial catch and marketing of *Tenualosa ilisha* in the Basrah province, south of Iraq. The study mentioned that the mean of landings from 1990 to 2006 was 6000 tons per year, and the maximum catch was approximately 12000 tons of shad in 2002, of the

total catch, which was about 23000 tons of fish in different species. The percentage of shad in the period from 1965 to 1974 was 56.90%, while the percentage was from 1990 to 2002 and between 2003 and 2007 (38.90% and 5.10%), respectively. Mohamed and Qasim, (2014) reported that catch quantities of shad from 2007 to 2011 were 1323, 628, 716, 592, and 375 tons, respectively, but the total percentages were 16.90% of the total catch (18.2, 24.3, 14.6, 19.5, and 10.0%, respectively), and the caught quantity from 1965 to 2002 was 582 to 22901, respectively. According to Mohamed (2018), shad was one of the three most abundant species from 2008 to 2016, accounting for 14.20% of the total catch in Iraqi marine fisheries. Mohmed and Abood, (2020) stated that the whole catch of shad from 2017 to 2019 was 3452 kg, accounting for 9.09% of the total catch, but Mohamed and Abood (2023, 2024) reported that hilsa shad accounted for 5.80% in 2020 and 6.75% in 2022. The catch of hilsa shad in the current study ranged from 209 tons in 2017 to 1380 tons in 2023, with a mean of 826.82 tons each year, while the shad ratio ranged from 5.59% in 2017 to 37.74% in 2023, with a mean ratio of 23.82% of the overall catch from 2014 to 2024. When comparing catch quantities and ratios, it was discovered that shad accounted for much higher landing quantities and ratios from 1965 to 1974; for example, Al-Dubakel (2011) stated that shad contributed 56.90% of the total catch from 1965 to 1974, 38.90% of the total catch from 1995 to 2002, and 5.1% from 2003 to 2007. Shad landings have decreased as a result of lower discharge rates in the Tigris and Euphrates Rivers, as well as the Shatt Al-Arab River, increased shad overfishing, a lack of local protection, and an absence of regional cooperation in marine resource management (Mohamed, 2018; Mohamed and Abood, 2024). Because Iraqi maritime waters overlap with Iran and Kuwait, growing exploitation rates due to increased fishing pressure have an impact on the abundance of this species, including hilsa shad, particularly in the absence of regional cooperation between these countries (Ben-Hasan *et al.*, 2018). Shad was the primary target species and a significant contributor to Iraq's maritime fishery in the past and now. Shad fishing thrived twice in 1971; a decline in fishing quantities preceded it, and in 2002, this was due to the cessation of hunting during military operations in the Iran-Iraq War from 1980 to 1988, which allowed the shad fish to rebuild their stocks (Mohamed and Qasim, 2014; Ben-Hasan and Daliri, 2023). Hilsa shad is widely dispersed in the northern Arabian Gulf habitats and participates in three coastal fisheries (Iraq, Iran, and Kuwait); therefore, increased exploitation of this species may have an impact on the species population by lowering the reproductive cycle in these nations (Mohamed and Abood 2023). According to Al qattan and Gray (2021), fishery landings in Kuwait declined from 6900 tons in 1995 to 3100 tons in 2013. Decreased constituted 55% of the total catch, with hilsa shad and silver pomfret (*Pampus argenteus*) accounting for the majority of the reduction. The annual and monthly fluctuations in shad catch quantities can be attributed to many biological and natural factors, including habitat factors, feeding and wintering migrations, and spawning migrations, including biotic and abiotic factors. The above agents together impact the abundance, availability, and distribution of shad in many areas and seasons (Hossain *et al.*, 2019; Poulet *et al.*, 2023). Shad is a migratory fish that moves to reproduce and feed. This transition from marine to freshwater during the breeding season leads to higher catch rates (Hossain *et al.*, 2019). Environmental factors, particularly water temperature, light time, and intensity, influence the pattern of migratory and feeding habits. These fluctuations cause significant variability in the monthly capture of shad (Shohan *et al.*, 2024). Ultimately, understanding the dynamics of these fish is crucial for effective fisheries management and the conservation of commercial species. Commercial competition between fish species reduces the demand for the consumption of hilsa shad (Alam *et al.*, 2025). Hilsa shad, particularly in the presence of other attractive economic species such as silver pomfret (*Pampus argenteus*), Arabian yellowfin seabream (*Acanthopagrus arabicus*), Tigertooth croaker (*Otolithes ruber*), Mullets (*Planiliza subviridis*, *Planiliza klunzingeri*), and shrimp. Shad is a wonderful oily fish, particularly the larger varieties. Its price has risen recently due to a high demand for its consumption, as well as the species' rarity as a result of increased fishing pressure and exploitation (Al-Dubakel, 2011; Ben-Hasan and Daliri, 2023). After the decrease in discharges from the Tigris and Euphrates rivers as a result of dams constructed on their sources, as well as a decline in water levels in the marshes (Mohamed and Abood, 2024). Many marsh fishermen moved to sea fisheries as an alternative to the marsh fishery, increasing fishing pressure and limiting shad fish entry for spawning and reproduction. Furthermore, as the population has grown, so has the number of fishermen and the pace of exploitation of these species

(Greco and Pollath, 2024).

The marketing of Hilsa shad in the Basrah province is crucial due to its nutritional value, understanding of market dynamics, available opportunities, transportation and preservation challenges, and cultural preferences (Abdullah, 2024). The fishermen keep their current catch on ice till they return from their fishing trip. It is then transported to the landing location in Al-Fao City for sale and distribution to commercial markets. Hilsa shad has a distinct flavor and is highly valued for its cultural significance among the people (Majumdar, 2019). The size of the fish affects the price of shad. For example, in 2024, the price of a pair of shad in the large sizes ranged from 27 to 47 USA dollars at the start of the season, while the price of a pair in the middle size varied from 14 to 17 dollars. The small size was sold in kilograms (based on a personal visit to the landing site in Al-Fao city in 2024). Internet marketing: High-commercial-value fish, such as shad fish, are currently marketed online to various Iraqi provinces by reserving demand, placing the fish in an icebox, and shipping it from the landing site in Al-Fao to the clients (Funge-Smith and Bennett, 2019).

Conclusions and Recommendations

The Hilsa shad's status and catch quantities fluctuate annually and monthly, depending on varying natural conditions factors (abiotic and biotic), the amount of freshwater discharged from the Shatt al-Arab, and proper fisheries management in the northern Arabian Gulf, particularly the use of legal net mesh sizes and the prohibition of fishing during the spawning season. These measures are regulated through regional collaboration among the riparian governments (Iraq, Iran, and Kuwait), as well as other logistical operations such as sale, storage, and transit until the fish reaches the consumer.

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Novelty Statement

The paper reviewed fishing quantities, percentages, and marketing of Hilsa shad (*Tenualosa ilisha*) from 2014 to 2024 and researched the fluctuation in capture quantities from one year to another with a continuous decrease in the general trend of catch quantities and an increase in prices..

Authors' Contribution

Abdul Hussein J. Abdullah: Wrote the text of the manuscript and analyzed the data.
Mohammed A. Jasim Aldoghachi: Designed the experiment, conducted data analysis as well as format the manuscript and the figures
Audai M. Qasim: Collected and examined the raw data of the manuscript.

Generative AI or AI assisted technology statement
The authors declare that no generative AI or AI-assisted technology was used in the writing or editing of this manuscript.

Conflict of interest
The authors declare that there is no conflict of interest among the authors of the manuscript.

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