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A New Record of the North African Catfish *Clarias gariepinus* (Burchell, 1822) in Al-Dalmaj Wetland Southern Iraq, Including Local Ecological Analyses

Ibrahim M. Al-Sudani¹, Mudhafar A. Salim², Salwan Ali Abed^{3*}, Asmaa M. Neamah⁴, Safaa A. Kadhum⁵, Mohammed Turki Jabbar⁶

¹Al-Karkh University of Science- Environmental and Energy College, Iraq.

^{2,6} Iraqi Organization for the Conservation of Nature (IOC/N), Iraq.

^{3,4,5} College of Science, University of Al-Qadisiyah, Diwaniyah, Iraq

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*Correspondence author email:

Salwan.abed@qu.edu.iq

ABSTRACT

This paper reports the first official record of the invasive North African Catfish, (Burchell, 1822), in the Al-Dalmaj Wetland, a Key Biodiversity Area (KBA) located in southern Iraq. Specimen of this alien have been collected during routine biodiversity monitoring from different locations in Al-Dalmaj wetlands. Morphometric and meristic characters confirmed the species identity, notably its long dorsal fin, lack of an adipose fin, and the four pairs of barbels. Given its generalist diet, flexible respiration system, and high tolerance for extreme environmental conditions, the establishment of *C. gariepinus* poses a severe threat to the native ichthyofauna of this key wetland, being holding the highest population of the vulnerable native Bunni (*Mesopotamichthys sharpeyi*). We discussed the ecological atmosphere for this species in Al-Dalmaj wetlands along with the potential introduction pathways, primarily escape from aquaculture and dispersal via the Main Outfall Drain (MOD), and highlighted the urgent need for adopting effective management strategies regarding this potential aquatic invasive species.

1. Introduction

1.1 The Al-Dalmaj Wetland Ecosystem

Al-Dalmaj Wetland, situated across the administrative boundaries of the Al-Qadisiyah and Wasit governorates in southern Iraq (Central Coordinates: 32.214810°, 45.455837°), represents a crucial freshwater body within the lower Mesopotamian river basin. Exceeding an estimated area of 500km², this semi-isolated lake and marsh matrix has been designated globally as a Key Biodiversity Area (KBA) (Salim, et al., 2021). Structurally, the ecosystem comprises a vast, shallow permanent open-water zone

with depths ranging from 0.5 to 2.5 meters, flanked by temporary seasonal pools and dense littoral stands of emergent plants, predominantly *Phragmites australis* and *Typha domingensis* (Abed, 2014).

Historically engineered to serve as an agricultural drainage reservoir supplied primarily by the Main Outfall Drain (MOD), or "Third River," Al-Dalmaj has evolved into a fully functional, self-sustaining wetland that performs critical regional ecological services (Salim, et al., 2021). It acts as a massive hydrological stabilizer, microclimate regulator, and a premier sanctuary for migratory avifauna travelling along the West Asian–East African Flyway. Over 117 bird species, including globally vulnerable and endangered species such as the marbled duck (*Marmaronetta angustirostris*) and the Basra reed warbler (*Arocephalus griseldis*), heavily depend on the site for wintering and breeding (Abed, et al., 2014; Mohammad, 2017). Concurrently, the complex sub-habitats of the wetland support a diverse array of native Mesopotamian ichthyofauna, which forms the core socioeconomic backbone for traditional artisanal fishing communities in the region (Scott, 1995; Al-Hemidawi, et al., 2020; Salim, et al., 2021).

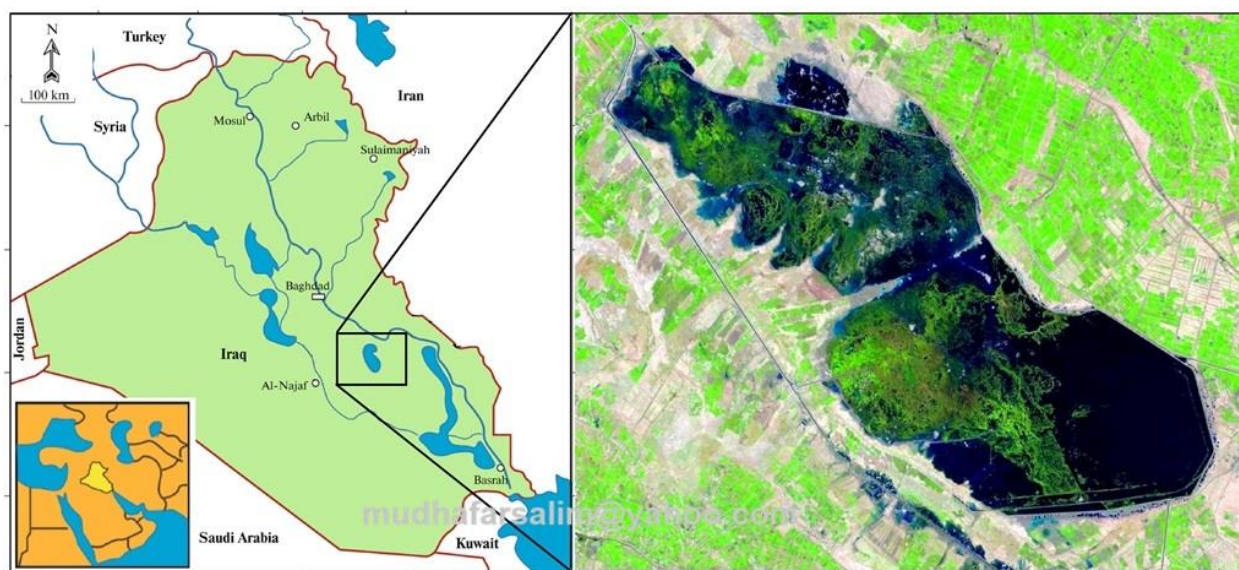


Figure 1: A map showing the location of Dalmaj wetlands in Iraq.

1.2 Biology and Ecological Profile of the North African Catfish

The North African Catfish, *Clarias gariepinus* (Burchell, 1822), is a large, benthopelagic siluriform fish naturally distributed throughout the major river systems of Africa, the Levant, and parts of Asia Minor, characterized by an elongated, eel-like body, a heavily depressed bony head, and four pairs of highly sensitive oral barbels (Hadi, et al., 2024; Ghazwan, 2025). It seems that the remarkable evolutionary success and invasive potential of *C. gariepinus* stem directly from its distinct physiology and behavior (Willoughby and Tweddle, 1978).

Key features among these adaptations is a specialized, vascularized accessory breathing structure which enables the species to breathe atmospheric oxygen (Ghazwan, 2025). Consequently, *C. gariepinus* can endure prolonged periods of absolute hypoxia, burrow into damp mud matrices to survive seasonal droughts, and actively migrate short distances over wet terrestrial terrain to colonize adjacent water bodies, furthermore, the species exhibits remarkably high fecundity, with mature females capable of broadcasting

up to hundreds of thousands of eggs per single spawning cycle under optimal temperature conditions (Willoughby and Tweddle, 1978; Hadi, et al., 2024).

1.3 Mechanisms and Threats of Aquatic Bioinvasions

Biological invasions within freshwater ecosystems are increasingly recognized as primary drivers of global biodiversity decline, resulting in irreversible alterations to native communities. Freshwater bodies, particularly those heavily managed or fragmented by human interventions, are highly susceptible to alien species establishment due to continuous ecological disturbances and artificial hydro-connectivity (Mutlak, and Al-Faisal, 2009; Bernery, et al., 2022). Long-term ecological surveys indicate that the Al-Dalmaj protected area is facing progressive pressure from alien bioinvasions, with over 10 non-native fish species—such as *Coptodon zillii* - already altering local trophic networks (Salim, et al., 2021).

The introduction of an aggressive, top-tier generalist predator like *C. gariepinus* creates a critical hazard. The historical isolation of the Tigris-Euphrates basin permitted the evolution of specialized cyprinid assemblages that lack evolutionary behavioral defenses against large, air-breathing siluriform predators. While initial records documented the presence of *C. gariepinus* in the main stem of the Tigris River in Baghdad and Wasit provinces, its expansion into the land-locked, protected marshes of Al-Dalmaj signifies a major ecological breach (Ghazwan, 2025; Al-Hemidawi, et al., 2020).

By aggressively competing for spawning grounds and directly preying upon vulnerable endemic species - including the economically vital Bunni (*Mesopotamichthys sharpeyi*), Shabboot (*Arabibarbus grypus*), and Himri (*Carasobarbus luteus*)—the establishment of *C. gariepinus* threatens to induce a catastrophic trophic cascade, jeopardizing both the biodiversity structure and the local fisheries economy, especially for this species' wide range of toleration (Salim, et al., 2021; Hadi, et al., 2025; and Dakhil, et al., 2026).

2. Materials and Methods

2.1 Study Area and Sampling Scheme

Field sampling was conducted at four distinct littoral stations within the western and south-western margins of the Al-Dalmaj Wetland, Iraq. The sampling and other data collecting field work trips have been conducted on 2025 between the months March and November 2025. The sampling areas consist of shallow water depths ranging from 0.8 to 1.5 meters and dense stands of emergent *Phragmites australis* macrophytes (Abed, et al., 2014). To ensure representative coverage of nocturnal fish activity, sampling operations were carried out between sunset and early morning. Specimen collection was executed utilizing a combination of multi-mesh monofilament gillnets (of different sizes) and collecting samples from the local fishermen. Table 1 below shows the central coordinates of the sampling sites.

Table 1. *List of the sampling sites in Al-Dalmaj Wetland, Iraq.*

Sampling Station		Coordinates (DD.)	
		N	E
	ST-1	32.378418°	45.233146°
	ST-2	32.154019°	45.486749°
	ST-3	32.186943°	45.362401°
	ST-4	32.124449°	45.602630°

The map in Figure 2 below shows the distribution of the sampling sites in Al-Dalmaj wetlands,

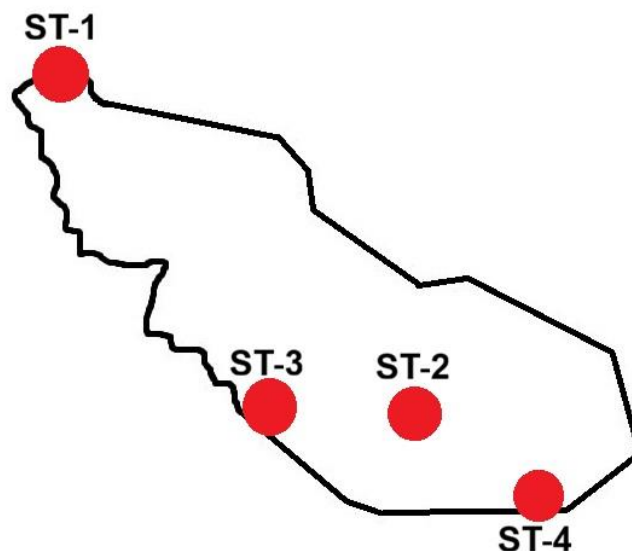


Figure 2: A map showing the four sampling locations in Al-Dalmaj wetlands.

2.2 Laboratory Processing and Morphometric Analysis

The collected specimens were placed in insulated cooler boxes on ice and transferred to the laboratory of Al-Qadissiya University for detailed ichthyological examination. Taxonomic identification was performed using definitive regional and international keys for the family Clariidae, focusing strictly on differentiating *C. gariepinus* from native siluriforms and other potential alien clariids based on its elongated dorsal fin configuration, lack of an adipose fin, and specific barbel arrangements (Hadi, et al., 2024; Ghazwan, 2025).

More than 13 morphometric measurements were recorded to the nearest 0.1 mm using standard metric ruler. Key linear measurements included Total Length (TL), Standard Length (SL), Head Length (HL), Head Width (HW), pre-orbital/post-orbital lengths, and the lengths of the four pairs of sensory barbels (nasal, maxillary, inner mandibular, and outer mandibular) have been recorded for each specimen (Hadi, et al., 2024; Ghazwan, 2025). Meristic counts were completed under a stereomicroscope and included the counting of dorsal fin soft rays, anal fin soft rays, pectoral fin rays and spines, and pelvic fin rays. All data were systematically compiled for comparative statistical reporting.

3. Results

3.1 Morphological Confirmation

The analyzed specimens displayed the classic diagnostic features of as detailed in regional keys (Hadi, et al., 2024; Ghazwan, 2025). The collected specimens possessed slender bodies with dark mottled gray-olive dorsal coloration and a pale belly. They presented a notably long dorsal fin extending nearly to the rounded caudal fin without an intervening adipose fin, alongside four pairs of well-developed, elongated oral barbells. All specimens have been weighed by a standard electric scale. The photos below (Fig. 3) shows some of the collected specimens from Al-Dalmaj wetlands.



Figure 3: Measuring some samples collected from Al-Dalmaj wetlands.

3.2 Morphometric Data

To robustly validate the identity of the captured species, comprehensive statistical breakdowns of the linear measurements and countable anatomical structures were conducted. Table 2 provides the raw parameters alongside baseline ranges found within the collected sample size (N = 6).

Table 2. *Morphometric measurements and meristic counts (in CM) of collected from Al-Dalmaj Wetland, Iraq.*

Samples Measurements	1	2	3	4	5	6	Mean
Total Weight (g)	273	560	122	131	84	54	120.00
Total Length	33	40	25	26	22	20	27.83
Body Depth	3.5	5	2.8	3.5	2.9	2.3	3.33
Head Length (HL)	7.5	8.5	6	5	4.3	4	5.88
Head Width	3.5	4.5	2.4	2.2	2.1	1.5	2.70
Nasal Barbel length	4	4.5	4	3	2	3	3.42
Maxillary Barbel length	5.9	8.5	6	5.5	4.5	4	5.73
Inner Mandibular barbel	5.5	5.5	4	3.3	2.3	2.9	3.92
Outer Mandibular barbel	6	7	4.7	4	4	3.9	4.93
Dorsal Fin Rays (mm)	63	105	58	79	77	69	75.17
Anal Fin Rays	42	66	49	47	51	51	51.00
Pectoral Fin Rays	8	10	7	8	8	8	8.17
Pelvic Fin Rays	5	8	5	5	5	5	5.50

3.3 Habitat Observations

At the time of capture, the collection site exhibited high ambient water temperatures and moderate turbidity were different among the sampling locations. The presence of the specimens alongside relatively larger ones strongly suggests that the species might actively breeding and establishing a self-sustaining population within the wetland, rather than existing as isolated transient individuals. It seems that most (if not all) of the different types of wetlands in Al-Dalmaj area (open lake, marsh, large canal, and smaller waterways) provide suitable habitats for this alien species (Salim, et al., 2021). Some of 106 species of fish (including freshwater and marine entrant species) has been recorded in southern marshlands of Iraq (Al-Daham, 1982; Coad, 1996; Coad, 2010) update in 2009 by (Abd et al., 2009; Salim, et al., 2021) but they didn't listed the North African Catfish, *C. gariepinus* never.

This alien fish species has not been recorded previously in Al-Dalmaj wetlands among the alien species found in this area and published on 2021, so, it's occurrence in this wetland might not exceed five years (Moammed, 2014; Salim, et al., 2021).

4. Discussion

The species seems to be recently recorded from the Iraqi freshwaters within central Iraq parts (Hadi, et al., 2024; Ghazwan, 2025). The documentation of the North African catfish, , within the Al-Dalmaj Wetland represents the first record of this fish species in this area, representing a critical geographic expansion of this highly invasive species in Iraq's inland waters. This finding confirms that the species is no longer confined to isolated stretches of the main stems of the Tigris and Euphrates rivers (Ghazwan, 2025). The presence of the samples of different age categories collected from Al-Dalmaj area strongly signals that *C. gariepinus* is not merely transient in Al-Dalmaj, but has established a self-sustaining, actively breeding population.

4.1 Invasion Corridors and Colonization Dynamics

The primary hydrological vector facilitating this ecological breach is the Main Outfall Drain (MOD), colloquially known as the "Third River". The MOD serves as a massive agricultural wastewater drainage that represents the main feeder of Al-Dalmaj wetlands (Abed, 2014). Because the MOD bypasses traditional river management controls and experiences severe nutrient loading, it functions as an ideal, unchecked biological highway for opportunistic, stress-tolerant alien species such as *Oreochromis aureus* and *Tilapia/ Coptodon zilli* (Mutlak, F. M. and Al-Faisal A. J., 2009).

Historically, accidental escapes from unauthorized or poorly secured warm-water aquaculture facilities in neighboring provinces in the upper Euphrates & Tigris rivers waters in Turkey and Syria - particularly during seasonal flooding events - introduced *C. gariepinus* into the Tigris basin (Abdullah, et. al., 2020; Hadi, et al., 2024; Ghazwan, 2025). Once inside the river system, the species exploited its high physiological plasticity. The unique accessory breathing apparatus allows *C. gariepinus* to withstand the highly saline, hypoxic, and heavily polluted conditions characteristic of the MOD - environments that act as lethal chemical barriers to many native cyprinids (Dakhil, 2026); consequently, the MOD has transformed from a drainage canal into a direct vector for biological homogenization, feeding invasive predators directly into the core of southern Iraq's key biodiversity areas. Recorded of this alien, air-

breathing siluriform predator fish species indicated the deterioration of water quality (Coad, 2010; Al-Sudani, 2011).

4.2 Trophic Impacts and Threats to Endemic Ichthyofauna

The establishment of an apex, nocturnal generalist predator within Al-Dalmaj presents an immediate threat to the trophic structure of the wetland. The historic evolutionary isolation of the Mesopotamian basin meant that native fish species evolved in an ecosystem devoid of aggressive, air-breathing siluriform predators (Abdullah, et. al., 2020; Ghazwan, 2025). As a result, endemic cyprinids exhibit a distinct lack of behavioral predator-avoidance strategies against species that hunt using quite unique techniques.

C. gariepinus is a notorious opportunistic omnivore whose diet shifts toward heavy piscivory as individuals grow larger. In Al-Dalmaj, it enters direct resource competition and predatory conflict with culturally and economically vital native fish. Species such as the Bunni (*Mesopotamichthys sharpeyi*), Himri (*Carasobarbus luteus*), and Shabboot (*Arabibarbus grypus*) are already suffering from severe environmental stresses, including river fragmentation, damming, and overfishing (Coad, 1996; Bernery, et al., 2022). The introduction of *C. gariepinus* adds a compounding pressure that could trigger a severe trophic. By aggressively consuming juvenile native fish and outcompeting adults for food and littoral spawning grounds among the *Phragmites* reed beds, this invasive catfish risks driving fragile local populations toward localized extinction (Willoughby, and Tweddle, 1978; Abdullah, et. al., 2020; Bernery, et. al., 2022)

4.3 Management and Conservation Challenges

Managing the spread of *C. gariepinus* in a vast wetland like Al-Dalmaj presents immense logistical and ecological challenges. The very traits that make this species a successful invader—such as its capacity to burrow into damp mud during dry spells and its extreme tolerance to varying water quality parameters - render conventional eradication methods completely ineffective (Willoughby, and Tweddle, 1978; Bernery, et. al., 2022). Chemical control or intensive electrofishing cannot be applied at a landscape scale without causing catastrophic collateral damage to the remaining native biota and the globally threatened avifauna that rely on the wetland's food web (Salim, et al., 2021).

Furthermore, Al-Dalmaj is a designated Key Biodiversity Area, meaning conservation interventions must be carefully balanced with the socio-economic needs of local fishermen communities who depend on artisanal fishing, and if *C. gariepinus* replaces native commercial cyprinids, it will fundamentally disrupt the local fishing economy, as the marketplace value. Therefore, management must pivot toward containment and population suppression, this can be achieved by engineering physical or acoustic exclusion screens at the inflow regulators connecting the MOD to Al-Dalmaj (feeding canal), alongside creating economic incentive programs that pay local fishermen to selectively target and harvest (IOCN, internal communications 2025).

5. Conclusion and Recommendations

The formal, first recording of in the Al-Dalmaj Wetland is a clear indicator of rapid biological homogenization in Iraq's freshwater systems (IOCN, internal communications 2025). Immediate intervention actions are required to prevent an ecological disaster represented by spreading this alien species to be an invasive in Al-Dalmaj PA:

- **Install physical and acoustic screening systems:** Place selective mesh screens and acoustic barriers at all major inlets connecting the Main Outfall Drain (MOD) to the wetland to block further colonization routes.
- **Launch community-based economic incentives:** Compensate local fishermen (buying the captured cat fish) specifically for targeting, catching, and aware them that the permanently removing *Clarias gariepinus* from the ecosystem would help protect commercial cyprinid and Bunni fish stocks.
- **Establish a long-term bio-monitoring network:** Implement systematic, multi-station gillnetting and electrofishing surveys to map the exact population density, age structure, and migration patterns within the marshes.
- **Activate a strict local aquaculture regulation:** Enforce stringent containment policies and mandatory safety barriers for all commercial fish farms in neighboring provinces to prevent further accidental flood-related escapes.
- **Conduct comprehensive biological study** (stomach content analyses, eggs and spawning time): Perform routine dietary examinations on captured specimens to precisely quantify the predation rate on endemic cyprinids like the Bunni and Himri.
- **Conduct comprehensive education awareness:** By attending continuous visits targeting the fishermen and other local communities highlighting the seriousness of spreading of this alien fish species and discuss the doable manners to reduce and eradicate their population.

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7. References

- [1] Abdullah, A.J., Abdullah, S.A., and Yaseen, A.T. (2020) A Composition and Abundance of Alien Fish Species in-Inland Waters, Southern Iraq. Iraqi Journal of Science, 2021, Vol. 62, No. 2, pp: 373-386. DOI: 10.24996/ijs.2021.62.2.3.
- [2] Abed A. S. 2014. Bio-Ecological study of Marbled Teal *Marmaronetta angustirostris* in Hor Al-Dalmaj - Iraq. Ph.D. dissertation, University of Baghdad, Iraq.
- [3] Abed A. S; Salim M. A & Hussain L.I (2017). Distribution of the Marbled Teal *Marmaronetta angustirostris* over different habitats in Al-Delmej Wetlands, Iraq, Advance Research Journal of Multidisciplinary Discoveries. 11.0,C-3(2017): 10-13.ISSN-2456-1045. .
- [4] Abed Salwan Ali, Maysoon Al-Taae and Salim M.A , (2014). The Status and Conservation of the Vulnerable Marbled Teal, *Marmaronetta angustirostris* Menetris1832 (Aves- Anseriformes) in Al-Dalmaj Wetland, Iraq. Bull. Iraq Nat. Hist. Mus. 13(2): 113-120.
- [5] Al-Hemidawi, F.N.M., Mohammed, A.H., and Al-Saad, H.T.. (2020). Water Quality of Al-Dalmaj Marsh, Iraq, Mesopot. J. Mar. Sci., 2020, 35(1): 13 – 24.

- [6] Al-Daham, N. K. 1982. The ichthyofauna of Iraq and the Arab Gulf: A check-list. Publications of the Basrah Natural History Museum, 4:1-102.
- [7] Bernery, C., Bellard C., Courchamp, F., Brosse, S., Gozlan, R., Jari, I., Teletchea, F., Leroy, B. (2022). Freshwater Fish Invasions: A Comprehensive Review. The Annual Review of Ecology, Evolution, and Systematics is online at [ecolsys](https://ecolsys.org/) . Annu. Rev. Ecol. Evol. Syst. 2022. 53:427–56
- [8] Coad, B. W. (1996). Exotic fish species in the Tigris-Euphrates basin. Zoology in the Middle East, 13:71-83.
- [9] Coad, B.W. (2010). Freshwater Fishes of Iraq. Pensoft Series Faunistica #93. Sofia-Moscow: Pensoft Publishers.
- [10] Dakhil, Z. F., Mohammed, E. H. M., Al-Safi, M. H.d (2026). Effect of Sewage Water on African Catfish (*Clarias gariepinus*) in the Tigris River, Baghdad, Iraq. South Asian Res J Bio Appl Biosci, 8(2), 147-157.
- [11] Ghazwan, M. I. (2025). A new record of North African catfish (Burchell, 1822) (Siluriformes: Clariidae) in Baghdad from Tigris River. GSC Biological and Pharmaceutical Sciences, 32(2), 43–49.
- [12] Hadi, H. D., Yousif, N. H., and Mohammed, S. H.. (2025). Histological Study of the Stomach of the North African Catfish *Clarias gariepinus* (Burchell, 1822) (Siluriformes, Clariidae) from the Tigris River, Iraq. Basrah Journal of Agricultural Sciences, 38((Special Issue), 360-376.
- [13] Hadi, Hind D., Baraaj, Abed H., Ali ,Atheer H. and Sajet, Maab R. (2024).Bull. First record of the North African Catfish *Clarias gariepinus* (burchell, 1822) (siluriformes, clariidae) in Tigris river, iraq. 18(2):477-485.
- [14] IOCN (Iraq Organization for Conservation of Nature) – NGO. Internal communications regarding the management of Al-Dalmaj Protected Area - 2025.
- [15] Mohammad, K. M., (2014). The current status of the vertebrate diversity in al-Dalmaj marsh, al-Diwaniya province. Bull. Iraq Nat.Hist. Mus. 13 (1): 5-14.
- [16] Mutlak, F. M. and Al-Faisal A. J. (2009). A new record of two exotic cichlids fish *Oreochromis aureus* (Steindacher, 1864) and *Tilapia zilli* (Gervais, 1848) from south of the main outfall drain in Basrah city. Mesopotamian Journal of Marine Science, 2009,24(2): 160 – 170. (In Arabic).
- [17] Rashid, R.A. (2016). Parasites of some fishes of the Tigris River in the Al-Shawaka area in Baghdad Governorate, Iraq. College of Education for Pure Sciences Ibn Al-Haytham, University of Baghdad: 106 pages
- [18] Salim, M.A., Al-Sudani, E.M., Haloob, A., and Abed, S.A. (2021). Invasive Alien Species in Al-Dalmaj Protected Area, Iraq: Conservation and Wildlife Management Approach. First International Virtual Conference on Environment & Natural Resources. IOP Conf. Series: Earth and Environmental Science 790 (2021) 012088.
- [19] Salwan Ali Abed, Maysoon M. Altaey, & Mudhafar A. Salim (2014); Status and conservation of ducks in Dalmaj wetlands, southren Iraq Int. J. of Adv. Res. 2 (8). (ISSN 2320-5407). www.journalijar.com.
- [20] Scott, D.A. 1995. Directory of Wetlands in the Middle East; IUCN-The World Conservation Union and International Waterfowl and Wetlands Research Bureau: Gland, Switzerland and Slimbridge, UK, 1995.
- [21] Willoughby, N. G. AND Tweddle D. (1978). The ecology of the catfish *Clarias gariepinus* and *Clarias ngamensis* in the Shire Valley, Malawi. Reprinted from J. Zoo!., Lond. (1978) 186.