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Study of the Human Activities Impacts on the Biodiversity (plant samples) in Al-Hammar Marsh Water in Al-Fhood city / Thi-Qar governorate

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ABSTRACT

Background: The southern marshes of Iraq are a variety of aquatic environments; these include deep and shallow perennial, seasonal, fresh, and salt marshes, most of which are open water and dense aquatic vegetation. **Methodology**: The study was conducted on the Hammer Marsh in the Al-Fhood sub-district in Dhi-Qar governorate. It is a group of marshes located south of Al-Shatrah, one of the permanent marshes; the length is about 50 km, and the study includes 9 stations. Results: The study showed the dominance of (*Phragmites australis*) and (*Typha domingensis*) plants in wetlands, it was found in all study stations. The clear waters in the deeper areas of the marsh have provided support for the submerged and diverse aquatic plant groups, including (*Ceratophyllum demersum*) that appeared in four stations (F1, F2, F3, F5b) other scattered plant groups, and several existing swamp weeds appeared, including the (*Myriphyllum vulgar*) and (*Potamogeton pectiatus*). As for the phosphate values, they were higher than the permissible limits in most of the stations recorded (0.752mg/L) in station F5b, and the nitrate values were recorded at high values in marsh water, higher than the internationally permissible limits (1) that it recorded (1.1 mg/L) in station F2. The growth of aquatic plants appears dense in the Hammer marsh in Al-fhood, such as (*Phragmites australis*), (*Typha domingensis*), (*Ceratophyllum demersum*), (*Myriophyllum*), and (*Potamogeton pectiatus*), where it grew in the stations (F1, F2, F3, F5b). The phytonutrients provide phosphate and Nitrogen, and the ones coming from human waste, mainly in the areas surrounding the marsh, stimulate the growth of aquatic plants, which later decompose to produce unacceptable odors and add BOD to the water. **Conclusion:** There is a difference in the ability of aquatic plants and weeds to absorb nutrients in the marsh water.

Key words: marsh plants, heavy metals, marsh, biological pollutants.
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INTRODUCTION

The marshes comprise an integrated ecosystem that dates back more than 5,000 years and are one of the largest wetlands in the Middle East. The region has been subjected to drying operations since the early 1980s, which have constituted the most significant environmental disaster, altering the natural features and life, and resulting in damage to existing biodiversity and a significant deterioration of the ecosystem (2). The marshes are shallow water bodies that have formed over a long period and are home to a variety of aquatic plants and animals. The marshes also serve as an essential food source for fish, birds, and other animals, as well as aquatic plants that inhabit them. The marshes are a natural phenomenon in which aquatic and terrestrial life is diverse. They are a reservoir of fresh water and a unique natural environment. These areas are also a cultural heritage and a source of biological diversity (3) .

The marshlands are an aquatic ecosystem whose natural resources, population patterns, and lifestyles are closely tied to water, whether it is permanent or temporary. Life systems have evolved in areas unfamiliar to the inhabitants of other regions. The inhabitants of the marshlands are characterized by a specific economic, social, and cultural pattern, and distinct life characteristics characterize their plants and animals. Its lands have a unique geographical character. Despite the stability of the inhabitants of this region, some of them do not permanently settle in one place. The marshlands are a significant source of milk, fish, and bird production, and serve as a major stopover for migratory birds (4).

Biodiversity refers to the diversity of living organisms and their environments. It is a term that connotes the study of living organisms, their protection, development, and environmental maintenance. Such maintenance is considered one of the most significant challenges facing humanity, and all this interest and scientific research falls within the field of environmental maintenance. (5) This biodiversity includes qualitative diversity and ecosystem diversity. Qualitative diversity in marshes refers to the diversity of biological species within a specific environment or among a group of living organisms. In contrast, ecosystem diversity encompasses natural formations such as deserts, lakes, coral reefs, and all the living organisms that inhabit them. Today, human activity has a major impact on the loss of biodiversity, as its impact is not hidden through the use of chemical pollutants and overhunting of animals, which requires protecting the ecosystem and enhancing that protection, whether by planting forests and preventing random waste of biodiversity (5). Biodiversity is one of the important biological factors in determining water quality and maintaining the ecological balance (6).

Al-Saad *et al.* (7) concluded that the marshes are rich in nutrients, especially nitrate and phosphate, which enhance their suitability for the growth and billings of aquatic plants and phytoplankton. Additionally, the seasonal variation of all parameters was monitored during this study, and the results revealed fluctuations in some of them across different seasons and locations within the marshes. The results obtained during this survey established important background information and a baseline for further restoration work, indicating reasonable signs of successful restoration.

Al-Gburi *et al*. (8) concluded that the decrease in Tigris and Euphrates discharges during the past decades was due to drought conditions and upstream damming, as well as the increasing stress of wastewater effluents from agricultural, residential, and industrial (mainly oil extraction) activities led to the degradation of the downstream Al-Hammar Marsh water quality in terms of physical, chemical, and biological properties. As such, properties were found to consistently exceed both the historical and WHO objectives. The concentration of heavy metals in water showed a distinct decreasing trend at the Marsh outlet station compared to other stations .

Al-Musawi *et al*. (9) demonstrated concerns about the water quality index of the Al Hammar marsh. The water quality of Station M1, also known as Al-Hamedy, located in the middle of the marsh and affiliated with the Al-Basra governorate, was evaluated from 2011 to 2015, using 12 selected parameters. The parameters include pH, Phosphate (PO_4), Nitrate (NO_3), Magnesium (Mg), Calcium (Ca), Total hardness (TH), Sodium (Na), Sulphate (SO_4), Chloride (Cl), Total dissolved solids (TDS), Alkalinity (Alk.), and Electrical conductivity (EC). The Arithmetic Weighted Index was employed to ascertain the water quality index (WQI) in the Al-Hammar marsh. Their results revealed that the marsh quality fell below the class of poor water quality, and the marsh water was brackish due to the high concentration of total dissolved solids flowing in from the estuaries of the feeding channels coming from the river Euphrates, as well as from the tidal phenomenon via the river Shatt Al-Arab.

Jaffer *et al.,* (6) studied the impact of some environmental parameters on phytoplankton diversity in the eastern Al-Hammer marsh. 223 species of phytoplankton were identified, and they are as follows: 88 species of Bacillariophyta, which were at 44%, 70 species of Chlorophyta, which were at 29 %, and 39 species of Cyanophyta, which were at 16 %. Twelve species of Euglenozoa were at 4%, four species of Miozoa were at 3%, and the Phylum Charophyta and Ochrophyta had only eight and two species, respectively, both of which were at 2%. The common phytoplankton recorded at the studied sites includes *Nitzschia palea*, *Scenedesmus quadricauda*, *Oscillatoria princeps*, and *Peridinium bipes*. These species showed a significant positive correlation with Electrical Conductivity (EC), Silicate/Silicic species (Sio3), and Water temperature (WT). Phytoplankton, including *Gomphosphaeria semen-*

Vitis, *Dicloster acuatus*, *Tetrastrum heteracanthum*, and *Dictyocha fibula*, recorded a significant positive correlation with NO_3, PO_4, DO, and PH. Water temperatures ranged between 14.2°C and 33.9 °C in Al-Mansoury and Al-Sada, respectively .

Al-Taee, *et al*. (10) studied the assessment of water quality for Al-Salibat marsh \Southern Iraq. This study refers to an increase in some of the measured variables' values, as indicated by the current study (total dissolved solids (TDS), turbidity (TUR), EC, Biochemical oxygene demand over 5 days (BOD5), NO_3, NO_2, PO_4, Pb, Cd) compared to the recommended Iraqi and international standards of the water quality parameter. This is caused by untreated home sewage that drains into the marsh immediately. The study demonstrates that the use of the Canadian Council of Ministers of the Environment (CCME) guidelines is a valuable tool for assessing water quality, providing precise data interpretation to support community efforts in improving water quality. The results of the CCME showed that the water is unsuitable for drinking and aquatic life, but suitable for other purposes.

METHODOLOGY

Study area:

The study was conducted on Al-Hammar Marsh, located in the Al-Fuhoud district in Dhi Qar Governorate, which is a group of marshes located southeast of Al-Shatrah in Dhi Qar Governorate. It is one of the permanent marshes and its length is about 50 km. A symbol was given to each site included in the sampling, and its geographical coordinates were determined as shown in Table (1) and Figure (1). A map of the locations of the sampling sites included in the study, the study included the year 2021 for irrigation.

Figure (1): Sampling sites

Sample collection and chemical analysis:

1- Heavy metals: Plant samples were collected from some areas of Al-Hammar Marsh in Dhi Qar Governorate in August 2021. The samples were taken using clean plastic bags, and the heavy elements in the samples were estimated using a flame atomic absorption spectrometry device (11).

2- Nitrate oxides: The measurement of NO_3 was done with a spectrophotometer at wavelengths 275nm and 220nm (12), and the nitrate concentrations were calculated as in the following equation:

Weight NO_3= (absorbance at 220nm-absorbance at 275nm) Mwt/Aeqwt-N

A = volume of hydrochloric acid in milliliters, N = molarity of hydrochloric acid, Eqwt and Mwt = equivalent weight and molecular weight of nitrate.

3- Phosphate: The concentrations of phosphate were measured according to the American Public Health Association (APHA) (1998). Its quantity is calculated as in the following equation:

PO_4 mg/L= (absorbance at 700 nm) $MwtPO_4$/A-$EqwtPO_4$

Table (1): Names, coordinates, and symbols of the study sites

(Stations)	Symbol	Lat.	Long.
Al-Fhood	F1	30.980413	46.732278
Al-Hammar inlet	F2	30.964674	46.722838
Al-Hammar marsh	F3	30.966039	46.717265
Wastewater/ Al-Fhood	F4	30.981351	46.732642
Al-Hammar with the Euphrates River	F5a	30.980288	46.772405
Sewerage	F5b	30.975914	47.023972
Al-Hammar inlet	F6	30.975348	47.024292
Abu-Sobat Marsh	F7	30.969958	47.038475
Martyr's monument	F8	30.978907	47.041887

RESULTS

Table (2) shows a general description of the vegetation cover in the marshes. Reeds (*Phragmites australis*) and papyrus (*Typha domingensis*) are the dominant species among the floating plant groups in the wetlands, where they are found at all study stations. Reeds were the dominant plant in the permanently flooded areas, and the incoming river waters provided the marsh with nutrients that enabled the reeds to grow very tall, reaching 8 m. At the same time, papyrus is more common in areas that experience seasonal flooding. Reeds and papyrus are considered effective treatments for water pollution because they can purify water and provide an environment free from pollutants (3). The clear water in the deeper areas of the marsh provided support for the diverse submerged aquatic plant groups, including *Ceratophyllum demersum* (4), which was observed in four stations (F1, F2, F3, F5b). Other scattered plant groups and some herbs appeared. Floating marshes included *Myriophyllum vulgaris* and *Potamogeton pectiatus*. Several endangered plant groups were absent, including *Cyperus rotundus* and *Aeluropus lagopoides*, which were previously present in the marsh but were not reported after it was drained.

TABLE (2): TYPES OF AQUATIC PLANTS PRESENT IN THE STUDY SITES

Sites	F1	F2	F3	F4	F5a	F5b	F6	F7	F8
Phragmites australis	+	+	+	+	+	+	+	+	+
Typha domingensis	+	+	+	+	+	+	+	+	+
Ceratophyllum demersum	+	+	+	_	_	+	_	_	_
Myirophyllums vulgar	+	+	_	_	_	_	_	_	_
Potamogeton pectiatus	_	+	_	_	_	_	_	_	_

Table (3): Measurement values of Nutrients in Marsh water

Station	NO_3 (mg/L)	PO_4
F1	11.9	0.373
F2	27.6	1.1
F3	15.7	0.56
F4	7.3	0.055
F5a	5.5	0.067
F5b	18.5	0.752
F6	23.9	0.148
F7	4.3	0.026
F8	5.2	0.043
WHO standard 2011	50	0.1

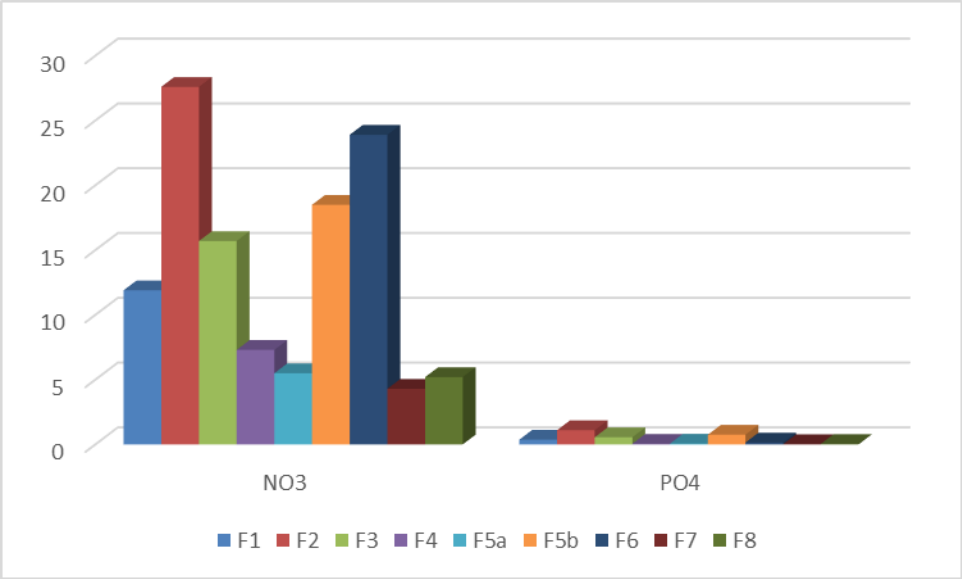

Figure (2): represents the chemical measurements of water

DISSCUSION

Water samples were collected during August using one-liter plastic bottles for chemical tests (NO_3, PO_4) and measured using the Ultra spectrophotometer method. Nitrate oxide values in Al-Hammar Marsh water are a result of chemical fertilizers that are used to increase the fertility of the agricultural soil on both sides of the marsh. As well as from the city's sewage water that is dumped into it, and organic materials in the water, such as plants that grow in it at high density, which are decomposed first into ammonia, then into nitrite, and finally into nitrate. Nitrate values were recorded as high at all sites in the Marsh water, exceeding the international permissible limit (1).

As for the phosphate values, they exceeded the permissible limits in most stations. Although plants can store phosphate in large quantities more than they need, the phosphate ratios were high, indicating inefficiency in

removing them. The sources of phosphate in the marsh water are due to the use of phosphate fertilizers in abundance to increase soil fertility, in addition to industrial water, such as oil facilities, sewage water, and chemical detergents that are dumped in the marsh, causing nutrient enrichment, leading to a decrease in oxygen in the water (13). The growth of aquatic plants appears densely in the Al Hammar Marsh in the Al Fuhud area, such as (reeds, papyrus, *Ceratophyllum demersum*, rubia, and swamp grass), where it increased in stations (F1, F2, F3. F5b), as the plant nutrients provide phosphorus and nitrogen, coming mainly from human waste in the areas surrounding the marsh, which stimulates the growth of aquatic plants that conflict with water uses and which later decompose to produce unacceptable odors and add (BOD) to the water.

CONCLUSION

1- The change in the quality and quantity of water has an impact on the extent of biodiversity, especially on the diversity of plants, which leads to a variation in the numbers and types of plants prevailing in the marshes.

2- The dominance of reed and papyrus plants was observed in the marsh areas, which proves that they are resistant to physical and chemical changes in water quality.

3- The impact of wastewater discharge, and the increase in the use of plant fertilizers. In addition to other human activities, this will lead to an increase in the levels of plant nutrients (phosphorus and nitrogen) discharged from the areas surrounding the marsh, which stimulates the growth of aquatic plants that conflict with water uses, and which later decompose to produce unacceptable odors and increase the value of BOD to the water.

4- There is a difference in the ability of aquatic plants and weeds to absorb nutrients in the marsh water.

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دراسة تأثير مياه الصرف الصحي ومياه المصب العام على التنوع الحيوي (النباتات نموذجا) في هور الحمار في ناحية الفهود / محافظة ذي قار

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الخلاصة

خلفية البحث:تعد اهوار العراق الجنوبية مجموعة منوعة من البيئات المائية والتي تشمل المستنقعات الدائمية والموسمية العميقة والضحلة ، العذبة والمالحة ومعظمها ذات مياه مفتوحة ونباتات مائية كثيفة . **الهدف من الدراسة:** اجريت الدراسة على هور الحمار الكائن في ناحية الفهود في محافظة ذي قار وهي مجموعة من الاهوار التي تقع جنوب شرق الشطرة في محافظة ذي قار وهي من الاهوار الدائمية وطولها حوالي (50) كم. **المواد وطرق العمل:** وتم اخذ العينات من تسع محطات حيث اظهرت الدراسة سيادة نبات القصب (Phragmites australis) والبردي (Typha domegensis) في الاراضي الرطبة حيث تواجدت في جميع محطات الدراسة ، ولقد وفرت المياه الصافية في المناطق الاعمق في الهور الدعم لمعيشة المجاميع النباتية المائية المغمورة والمتنوعة من ضمنها نبات الشمبلان (Ceratophyllum Demersum) الذي ظهر في اربع محطات هي (F1,F2,F3,F5b) وظهرت مجاميع نباتية اخرى متفرقة وعدد من اعشاب المستنقعات العائمة من ضمنها نبات الروبيا (Myriophyllum vulgars) وعشبة المستنقعات .(Potamogeton pectiatus) كما تم قياس العناصر الثقيلة في النباتات حيث سجل تركيز الرصاص والكادميوم والكروم في نبات القصب والبردي والشمبلان كانت اعلى من الحدود المسموح بها في جميع المحطات اما الزنك والنحاس فقد سجلا اقل من الحدود المسموح ، اما قيم الفوسفات كانت اعلى من الحدود المسموح بها في اغلب المحطات حيث سجلت اعلى نسبة (0.752) في محطة F5b وقد سجلت قيم النترات قيما منخفضة في مياه الهور اقل من الحد المسموح عالميا (WHO,2011) حيث سجلت (27.6) في محطة F2 . **الاستنتاج:** يظهر نمو النباتات المائية بصوره كثيفة في هور الحمار ناحية الفهود مثل (القصب ،البردي ،الشمبلان ،الروبيا، وعشبه المستنقعات) حيث ازدادت في محطه (F1,F2,F3.F5b) بسبب توفر المغذيات النباتية الفسفور والنتروجين والقادمة من المطروحات البشرية بصورة رئيسية في المناطق المحيطة بالهور والتي تحفز نمو النباتات المائية والتي تتعارض مع استعمالات المياة والتي تتحلل فيما بعد لتنتج روائح غير مقبولة وتضيف (BOD) الى مياه.

الكلمات المفتاحية: نباتات الاهوار، العناصر الثقيلة ، الاهوار، تلوث بايولوجي .