MARSH BULLETIN
EISSN 2957-9848

Monthly Fluctuation in Individual Numbers of Caspian Turtle *Mauremys caspica caspica* and Euphrates Soft Shell Turtle *Rafetus euphraticus* at West Hammer Marsh, Southern Iraq

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Abstract.

Monthly occurrence of Caspian turtle *Mauremys caspica caspica* and Euphrates soft shell turtle *Rafetus euphraticus* in the West Hammer marsh was monitored from October 2021 to September 2022.Three Stations were chosen in the marsh: eastern Al Manar, northern Al Fhood, and western Al Tar. Salinity has a negative effect on the number of both species, as shown at the Al-Manar station. Low water temperatures had a significant effect on the number of *R. euphraticus* individuals in the marsh. The highest and lowest total numbers of *M. capsica* were recorded in Al Fhood 47 and Al Tar 21, respectively. For *R. euphraticus*, the highest and lowest numbers were 24 and six in Al Fhood and Al Tar, respectively. The highest and lowest monthly numbers recorded for *M. capsica* were 13 and three in October and May. The highest monthly numbers of *R. euphraticus* were recorded in June was 7, and the lowest in December, January, February, and April was 2. The western station Al Fhood represent the best habitat for both *M. caspica capsica* and *R.euphraticus* in West Hammar marsh on the contrary

Keywords. Caspian Turtle, Iraqi Marshlands, Euphrates soft shell, Turtles of Mesopotamia marshes.

Introduction

The Iraqi southern marshlands look like an oasis in the massive desert of Levant and Southwestern Asia. It is characterized by vast areas with diverse marsh ecosystems and possesses rich biodiversity and high productivity (Richardson and Hussain, 2006). The southern marshes were drained (1990-2003) by the Saddam regime to approximately seven percent of their original size, and after 2003, the marshes were haphazardly inundated with more than half reclaimed (IMRP, 2006).

The West Hammer marsh represents the west flank of the southern marsh and receives water from the Euphrates River in the shape of several tributaries. Before 1990 drainage, it was part of vast Al Hammer marsh, after inundation in 2003, West Hammer marsh was separated from the eastern part by motor road passing through marsh and series of small isles of thick canopy of common reeds. The estimated area of the marsh was 148,393 sq. hectors (MO irrigation). Recently, the southern marshes have faced several ecological problems, mainly decreasing the freshwater impulse from Euphrates and its tributaries due to building dams in the upper reaches of Turkey, in addition to the effect of global warming. The aim of the present study was to monitor the monthly fluctuations in the individual numbers

of *M. capsica* and *R. euphraticus in the* West Hammar marsh.

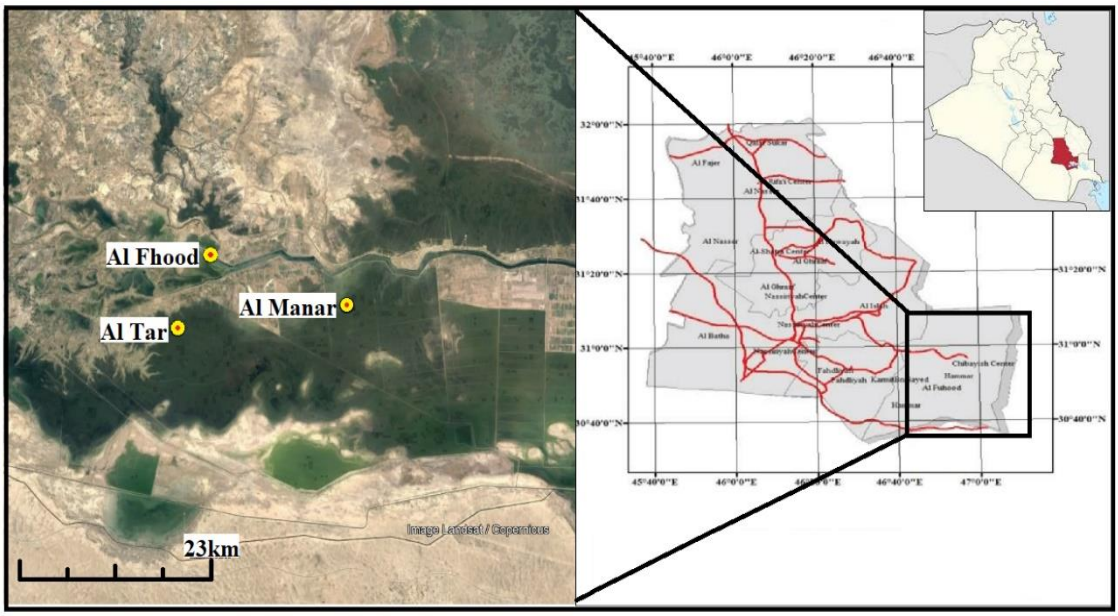
Previous Iraqi studies on the biology and ecology of *M. caspica* and *R. euphraticus are* limited, especially in southern Iraq. Few published articles have been traced (Fazaa *et al*., 2015) studied the reproduction and individual numbers of *R. euphraticus* in the central marshes of Iraq from October 2013 to June 2014. In Basrah Province, including the East Hammer marsh (Yousif, 2016), *R. euphraticus* and *M. caspica capsica* were recorded from four stations between January and December 2009. He was concerned with the sopite - temporal distribution. A check list prepared by Afrasiab *et al.* (2018) on reptiles of Basrah province contain 49 species including freshwater and marine turtles published.

The seasonal abundance of *M. capsica* and *R. euphraticus in the* East Hammar marsh has been studied (Majeed *et al*.,2023), demonstrating the effect of a sharp increase in salinity on perish and a decline in the number of individuals of both species.

Details of both turtle species have been reported in Iran (Ghaffari *et al*., 2008) and (Ghaffari *et al*., 2013); however, in Turkey (Fritz and Freytag, 1993), the distribution of *M. caspica caspica* in Antolla was described. Nest description of *R. euphraticu*s by Biricik, and Turga (2011) in the upper Tigris River/Southeast Turkey. A comprehensive survey of *R. euphraticus* from the Tigris and Euphrates Rivers and their tributaries was published by Taskavak *et al*. (2016).

Materials and Methods

The southern Iraqi marshes are covered by a large canopy of emergent aquatic plants, mainly *Phargmites australesis*, *Typha demoningesis*, and *Schinoplactus littoralis*, and thick submerged plants, such as *Certophyllum demersum*. Three field stations were selected from the West Hammar marsh. The western station was the Al Tar (GPS, N:30°52'37.24", E:46°40'17.94") represent an openness marsh type with water depth between 0.65 -2.0 meters. The northern was Al Fhood (GPS, N:30°57'19.77", E:46°42'34.65") also an openness marsh type with water depth between 0.60 -2.5m. The eastern station was Al Manar (GPS, N:30°54'13.65", E:46°53'24.90") represent mixed of an openness and channel marsh types with water depth between 0.40 -2.0 m. Co-ordination of the three stations was measured using the Garmin GPS-126. Air temperature, water temperature, pH, and salinity (g/l) were measured at each marsh station. *M.caspica capsica* and *R.euphraticus* were identified after (Yousif, 2016).



Map 1. Al Tar (western station), Al Fhood (northern station), and Al Manar (eastern station) at the West Hammer marsh in Thi Qar Province, southern Iraq.

Monitoring

Mauremys caspica capsica and *Raftus euphraticus* were monitored by three methods:

- Individuals trapped in fixed fishing nets (100 m length , 2 m depth with mish 3*3 cm) were set for 2 h. at each station.
- Specimens were collected after electro fishing for 15 min. at each station.
- Direct field counts of individuals on banks at each station.

The number of individuals of each species was counted monthly at each station to calculate the seasonal fluctuations.

Results and **Discussion**

Water Parameters

Water temperature was measured monthly at the three stations (Fig. 1), the lowest temperatures recorded were 17 and 18 °C in December 2021 and January 2022, respectively; the highest temperatures of 33 °C and 36 °C were recorded in July and August 2022, respectively. No significant differences existed between the designated stations. Spatial difference did exist between the stations could be due the time lag in measuring temp., water depth and amount of emerge plants canopy, plants shade play a role in decreasing the water temperature. The lowest salinities recorded at Al Tar, Al Fhood, and Al Manar were 4.51‰, 1.12‰, and 1.34‰ in October and February, respectively. The highest salinity values were recorded again at Al Tar station 8.23 ‰ in August, Al Tar 3.9‰ in September, and Al Fhood station 3.93 ‰ in June (Fig 2). An increase in salinity could be related to a decrease in freshwater discharge from the Euphrates River and an increase in air temperature due to global warming (Hussein and Attee, 2000; Petihakis *et al*. 1999). The increase in salinity at the Al Tar station could be related to stagnation, as a slow current led to an increase in evaporation. fig (3) exhibited monthly pH values in the three station and ranged between 6.5 -8.5, the lower pH values was due to decomposition of aquatic plants and other biota due to use local poisons in fishing while increase in pH mainly due to increase in salinity, nevertheless these values are in accordance with previously recorded pH values to Iraqi inland waters (Al-Saad *et al*., 2010; Hassan, 2008).

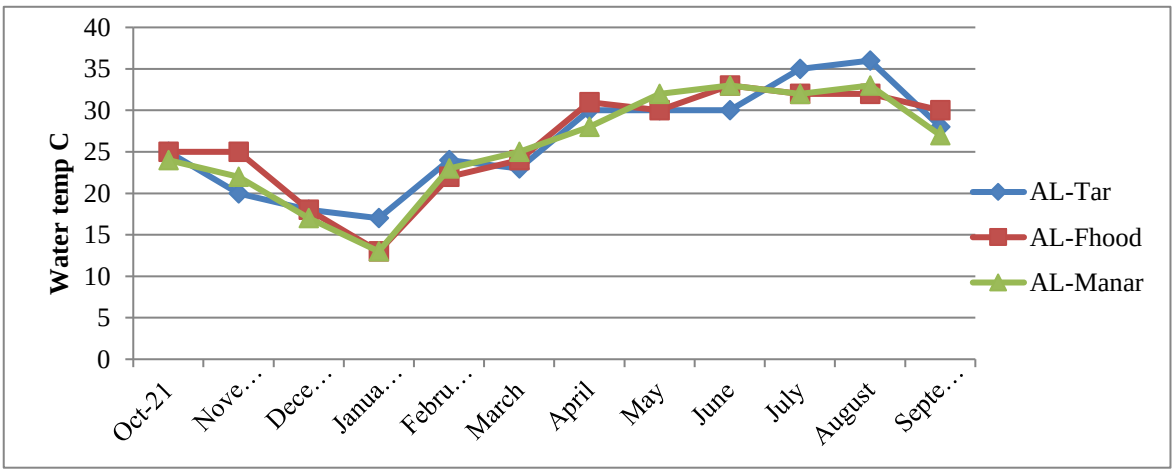


Figure 1. Monthly changes in water temperature C° at Al Tar, Al Fhood, and Al Manar stations during the period from October 2021 to September 2022 in the West Hammer marsh.

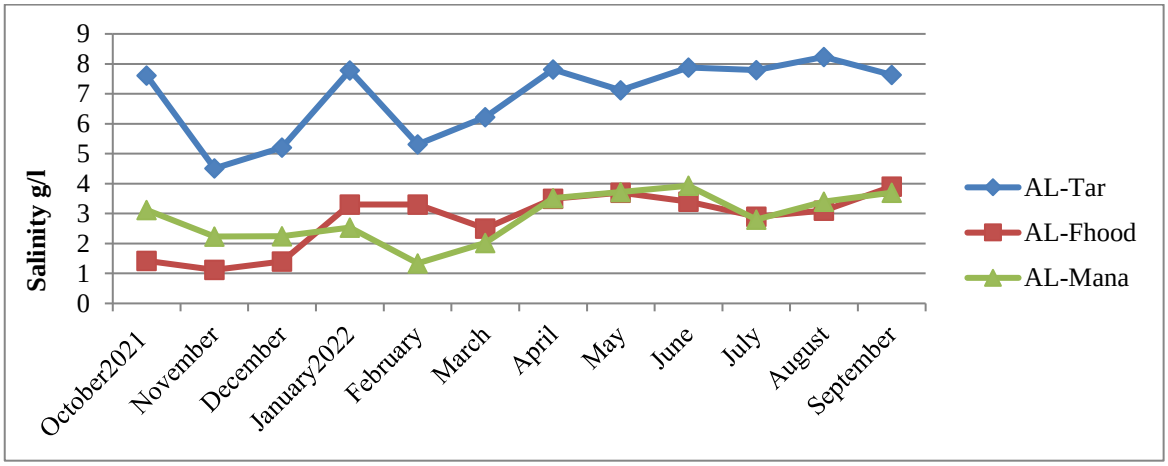


Figure 2. Monthly changes in salinity g/l at Al Tar, Al Fhood, and Al Manar stations during the period from October 2021 to September 2022 in the West Hammer marsh.

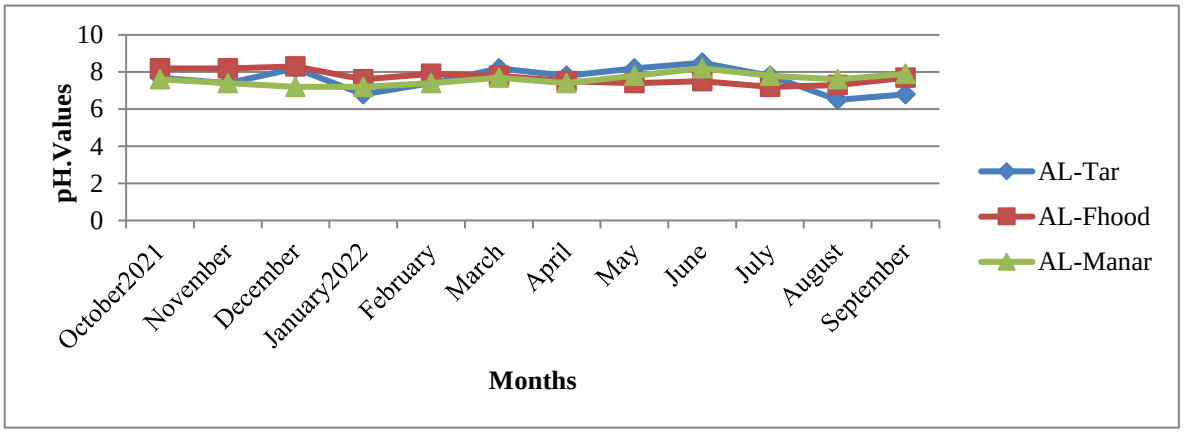


Figure 3. Monthly changes in pH values at Al Tar, Al Fhood, and Al Manar stations from October 2021 to September 2022 in the West Hammer marsh.

Monthly Numbers Fluctuation

The monthly obtained *M. caspica capsica* is shown in Table (1), with the lowest number of individuals being three in May 2022. The highest number (13) is recorded in October 2021 and September 2022. No seasonal trend was observed for the number of individuals.

Table 1. Monthly catch by fixed gill nets and electro-fishing methods of *M. caspica capsica* from Al Manar, Al Fhood, and Al Tar stations at West Hammar marsh from October 2021 to September 2022.

Months	Al Manar	Al Fhood	Al Tar	Total
October 2021	6	3	4	13
November	-	4	1	5
December	2	3	5	10
January 2022	3	6	-	9
February	4	7	1	12
March	2	3	-	5
April	1	5	1	7
May	3	-	-	3
June	4	4	3	11
July	3	4	2	9
August	1	3	1	5
September	4	5	3	13
Total	33	47	21	102

Monthly records of *R. euphraticus obtained by fixing* fishing nets and electro-fishing are shown in Table (2). The lowest number of individuals was two, obtained in December 2021, January, and February 2022. The highest numbers were recorded in May, June, and July 2022. The peak was seven in June 2022.

Table 2. Monthly catch by fixed gill nets and electro-fishing methods of *R. euphraticus* from Al Manar, Al Fhood, and Al Tar stations in West Hammar marsh from October 2021 to September 2022.

Months	Al Manar	Al Fhood	Al Tar	Total
October2021	1	2	-	3
November	3	1	-	4
December	1	-	1	2
January 2022	2	-	-	2
February	-	2	-	2
March	2	3	-	5
April	1	1	-	2
May	2	3	1	6
June	3	3	1	7
July	-	4	2	6
August	1	2	-	3
September	-	3	1	4
Total	16	24	6	46

The highest and lowest total numbers of *M. capsica* were recorded in Al Fhood and Al Tar (47 and 21, respectively). For *R. euphraticus*, the highest and lowest numbers were 24 and six

in Al Fhood and Al Tar, respectively. The highest and lowest monthly numbers of *M. capsica were* 13 and three in October and May, respectively. While the highest monthly numbers of *R.euphraticus* recorded seven in June and lowest two in December ,January ,February and April, (tables 1 and 2).

Direct Field Counts

The combined field count of *M. capsica* individuals on the banks of the three stations was 27, mostly at Al Fhood, then Al Manar, and third Al-Tar station, especially during late spring and early summer months.

The direct count of *R. euphraticus* individuals on the banks of three stations in the marsh was 18 individuals, mostly in Al Fhood and Al Tar. The lowest number was recorded at Al-Manar station, with no records for several months.

In general, Al Fhood station had the highest number of direct observations.

Monthly fluctuation of water temperature and salinity g/l with the total number of *M. capsica* and *R. euphraticus in the* West Hammer marsh, as shown in fig 4 and 5.

Three peaks for an increase in the number of M. capsica individuals in the West Hammer marsh conceding partly with an increase in water temperature, the first peak in the September - October period, the second in February, and the third in June, and the lowest number was recorded in May (fig 4).

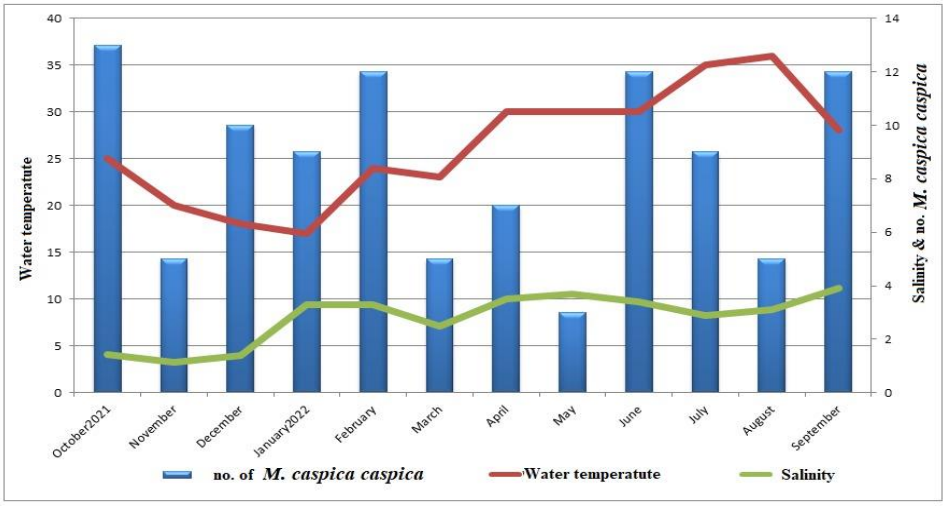


Figure 4. combined the results of monthly changes in water temperature ^{0}C, salinity (g/l), and number of *M. caspica caspica* in the west Hammer marsh

One major peak was observed for an increase in the number of *R. euphraticus* individuals in the West Hammer marsh from May to July, which is consistent with the increase in water temperature and salinity. Lower numbers were recorded in December, January, February, April (Fig 5

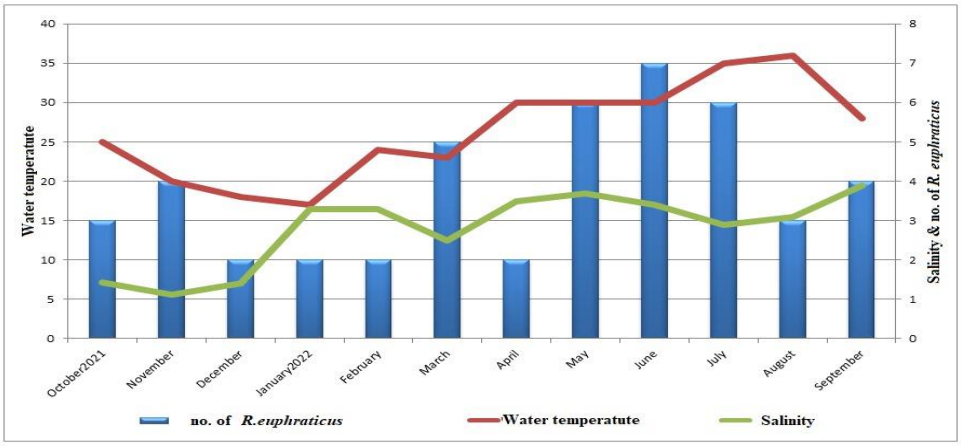


Figure 5. combined the results of monthly changes in water temperature (°C), salinity (g/l), and number of *R. euphraticus in the* west Hammer marsh.

The correlations between water parameters and individuals numbers of *M. caspica capsica* and *R.euphraticus* in Al tar , Al Fhood and Al Manar stations were demonstrated in figures 6,7, and 8. Air, water temperature, and salinity were positively correlated with the number of both species at the three stations. The pH showed a positive correlation only at the eastern station, Al Manar. Water depth and transparency were negatively correlated with the numbers of both species.

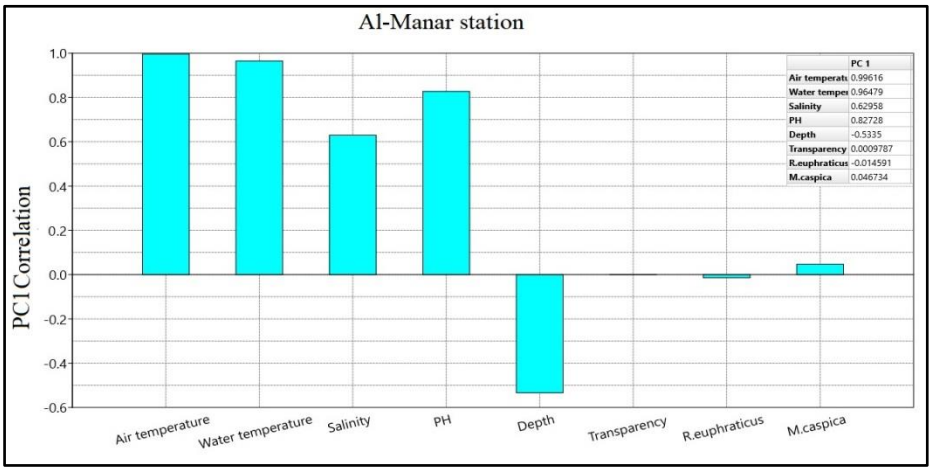


Figure 6. The correlation between water parameters (air temperature, water temperature, salinity, pH, depth, and transparency) and the numbers of *R. euphraticus and M. capsica* at the Al-Manar station in the West Hammer marsh.

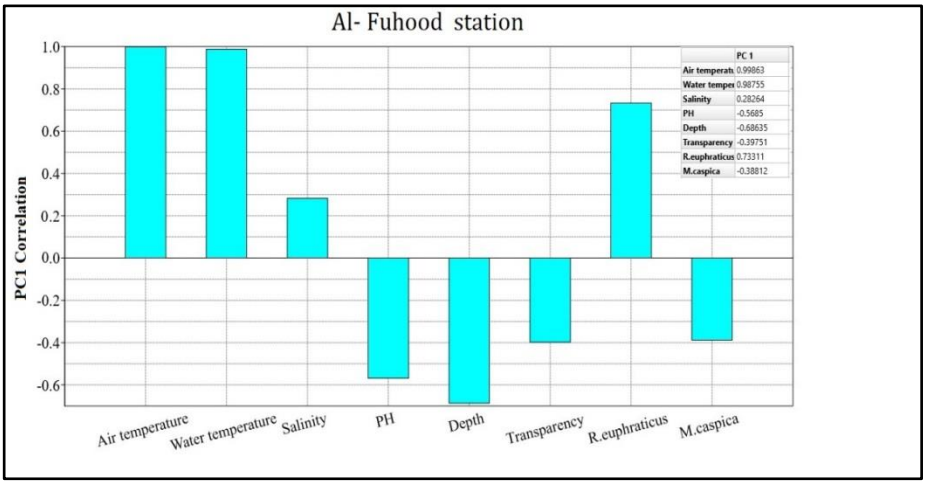


Figure 7. The correlation between water parameters (air temperature, water temperature, salinity, pH, depth, and transparency) and the numbers of *R. euphraticus and M. caspica* at the Al Fhood station in the West Hammer marsh.

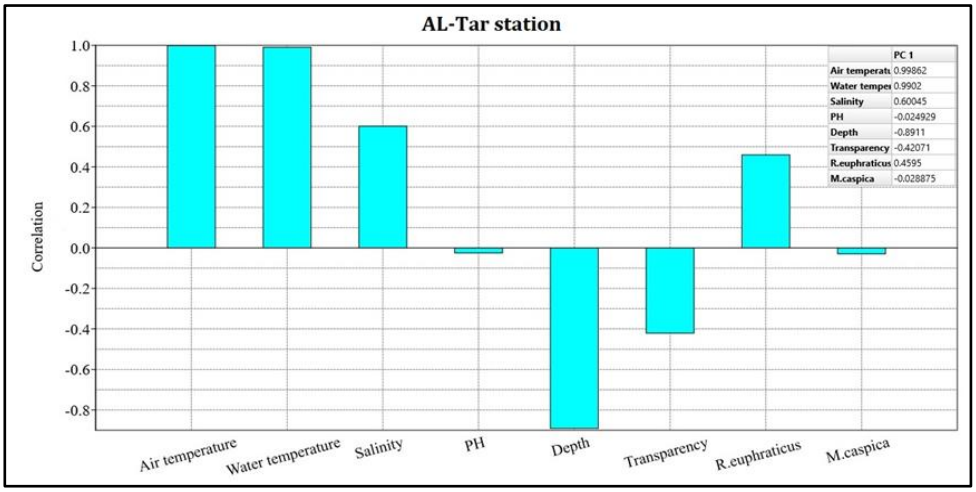


Figure 8. The correlation between water parameters (air temperature, water temperature, salinity, pH, depth, and transparency) and the numbers of *R. euphraticus and M. caspica* at the Al Tar station in the West Hammer marsh.

Both M. *capsica* and *R. euphraticus* face brutal treatment by fishermen and sport anglers in the West Hammer marsh. *R. euphraticus* individuals were slaughtered to extract fats used as local knee medicine. Fishermen tend to kill *R. euphraticus* entangles in floating gill nets as retaliation for predating fish catches. while releasing *M. caspica* back to the water. Field observations at the west parameter of the West Hammer marsh. Hundreds of shells of died *M.caspica capsica* due to reduction of water level and increase in water salinity were noticed at periphery of the western station. These brutal actions could have affected the number of both species in the marsh.

Large sizes of *R. euphraticus were observed* on muddy banks in a few months, epically at Al Fhood station, while juveniles and medium ones were obtained by fixed fishing nets and electro-fishing.

R. euphraticus individuals feeding on fish trapped in fixed gill netting,feeding on common carp (*Cyprinus carpio*),Benni (*Mesopotamichthys sharpeyi*), and Kattan (*Luciobarbus xanthopterus*) also noticed feeding on carcasses of dead water buffalo.

In general, the northern station Al Fhood represents the best habitat for both *M. caspica* and *R. euphraticus in the* West Hammar marsh, as expressed in higher numbers, which could be closer to the Euphrates tributaries. In contrast, Al Tar, the western station, had the worst results. Field measurements indicated that both species of turtles can tolerate water temperature range of 17-33°C, salinity 1.12 – 8.23 ‰ and pH 6.5- 8.5 prevailed in West Hammer marsh. Increase in salinity have negative effect on numbers of both species as showed in Al-Manar station, the same was noticed in East Hammer marsh in 2018 (Majeed *et al*.,2023). Decreased water temperature exhibited significant effect on number of individuals of *R.euphraticus* in the marsh.

It seems that the depth of the water column and transparency have no significant effect on increasing the number of individuals of either species, as exhibited in all stations of the open marsh habitat (figures 6,7, and 8).

The results obtained that the West Hammer marsh habitat was more favourable to two species of aquatic turtles *M. caspica capsica* and *R. euphraticus* than that of East Hammer marsh.

Conclusion

The research showed that the presence and spread of aquatic turtles in the study area is controlled by factors such as temperature fluctuations and salinity differences, through which the presence of these species can be predicted when the influencing environmental factors are known.

Acknowledgement

Thanks, and appreciation to the Environment Department, which provided all the facilities and support to conduct the research.

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التذبذب الشهري في أعداد أفراد السلحفاة القزوينية *Mauremys caspica caspica* والسلحفاة الفراتية ناعمة الصدفة *Rafetus euphraticus* في هور الحمار الغربي ، جنوب العراق

عادل فاضل عباس هشام عبد الستار الجابري نجاح عبود حسين
قسم البيئة كلية العلوم جامعة البصرة

المستخلص:

تم دراسة تواجد السلحفاة القزوينية *Mauremys caspica capsica* والسلحفاة الفراتية *Rafetus euphraticus* شهريا في هور الحّمار الغربي وللفترة من تشرين الأول 2021 الى أيلول 2022. اختيرت ثلاث محطات في منطقة الدراسة هي شرق المنار وشمال الفهود وغرب الطار. أظهرت الدراسة التأثير السلبي لملوحة المياه على كلا النوعين كما ظهر في محطة المنار. بينت الدراسة التأثير السلبي لانخفاض درجة حرارة الماء على عدد افراد السلحفاة الفراتية في منطقة الدراسة. سجل اعلى عدد افراد للسلحفاة القزوينية في الفهود وكان 47 فرد وادناها 21 فرد في الطار، في حين سجل اعلى عدد افراد للسلحفاة الفراتية في الفهود وكان 24 فرد وادناها ستة افراد في الطار. اعلى تسجيل شهري لاعداد افراد السلحفاة القزوينية كان 13 فرد في تسرين الأول وادناه ثلاث افراد في أيار، في حين سجل اعلى عدد افراد شهري للسلحفاة الفراتية في حزيران وكانت سبعة افراد وادناه فردين في كانون الأول، كانون الثاني، شباط، ونيسان. بينت الدراسة ان محطة الفهود هي أفضل بيئة لكل من *M. caspica capsica* و *R.euphraticus*، وعلى العكس من ذلك كانت محطة الطار الغربية هي الاقل .

الكلمات المفتاحية: السلحفاة القزوينية، السلحفاة الفراتية، سلاحف اهوار السهل الرسوبي