The effect of some environmental factors on the density and distribution of freshwater Gastropoda *Melanopsis nodosa* and *M. costata* (Ferussac 1823) in the Banks of Shatt Al–Arab, Basrah, Iraq

Nada M. Al–Baghdadi iD

Department of Marine Biology, Marine Sciences Centre, University of Basrah, Iraq
Email: nada.abdaltef@uobasrah.edu.iq

Received 25/09/2023 Accepted 23/05/2024 Published 25/06/2024

Abstract

The current research aimed to study the effect of monthly changes on the density and distribution of the two most common snails, *Melanopsis nodosa* and *Melanopsis costata*, in five stations in the middle part of the Shatt al-Arab River. It provides us with knowledge of the intertidal area on banks of the Shatt Al-Arab coast that the environment is suitable for the life of these species of snails in the lowest tidal region; these species were found in high densities during months of Spring and Autumn seasons compared with Summer and Winter at all stations, which indicates the effect of the moderation of temperature on the density and distribution of these species. The statistical analysis showed an inverse correlation between the density of snails, salinity, and current waters of the Shatt al-Arab River and a positive correlation between the density with water temperature and pH. However, the excessive rise in water temperatures of the Shatt al-Arab, which was associated with the rise in the concentration of salinity during most of the Summer months as a result of the decrease in water releases, which was originally caused by climate changes and problems with the upstream countries neighboring Iraq, which caused sharp decreases in the densities of individuals of these species.

Key words: Shatt Al-Arab River, *Melanopsis nodosa*, *Melanopsis costata*, environmental factors.

Introduction

Macroinvertebrates are currently used in bio monitoring programs worldwide and are widely considered important for water quality assessment (Mamert *et al*., 2016).

P-ISSN: 1812-237X, E-ISSN: 2788-5720, https://ijaqua.uobasrah.edu.iq/index.pip/iaqua

The diversity of invertebrates and the variability in their tolerance to pollution and environmental degradation makes them a good bioindicator for pollution (Tachet *et al.*, 2010; Abdul-Latif, 2020). Gastropoda, including freshwater snail species, is an important ecological component in aquatic habitats (Costil *et al.*, 2001). Usually, they play a dominant role in the ecology of freshwaters by providing food for many animals and grazing on vast amounts of algae and detritus (Ignacio Agudo-Padrón, 2011; Abdul-Latif, 2020). They inhabit a variety of habitats like rocky bottoms, soft substrates of ponds, and aquatic plants (Johnson, 2009)

The study of the biological and environmental aspects is one of the important strategies for knowing the composition of the fish and invertebrate communities (Al-Rudaini, 2010), which has an important role in understanding the reality of populations in the water surface for their development and addressing the causes that lead to the deterioration or lack of productivity (Hussain *et al,*. 2008), that the characteristics of the abiotic environment have an important role in the distribution of aquatic organisms (Weiner, 2000), as the dynamics of assemblages are influenced by abiotic and biotic factors, such as the interaction between species, which includes (competition and predation).

A study was conducted to clarify some obscurity about Melanopsidae was performed on specimens collected from different sites of the South of Iraq. Three different morphs were recognized, two are widespread: *Melanopsis costata*and *Melanopsis nodosa*, the other *Melanopsis subtingitana* has a narrow distributions (Naser. 2006).

The snails in the Shatt al-Arab have been studied by many researchers, such as Khalaf, (2016), Al-Khafaji *et al.* (2018), and Abdul-Latif (2020). There are many previous studies concerned with studying the density, distribution, population dynamics, and productivity of the snails and their relationship with environmental factors and their use as environmental indicators for organic pollution and heavy metals in southern Iraq (Khalaf 2011; Nashaat *et al.*, 2016; Al-Khafaji *et al.*, 2021). Moreover, A study was conducted during 2011-2012 to evaluate the preference of some freshwater snails, including

M. nodosa, over specific species of macrophytes and other aquatic plants in the lower
reaches of the Al-Hammar marsh (Qazar, 2016). According to the Constancy Index (S), *M. nodosa* was considered a Constance species in Al- Gharaf's river (Mirza and Nashaat, 2019).

The current study aims to find out the effect of monthly variation in environmental factors caused by climatic changes and their severity on the individuals of these two species during the four seasons.

Materials and Methods

Study site: Five stations were chosen, representing the middle part of the Shatt al-Arab River in 2021 (Table 1): Garmat Ali, Al-Sandbad Isle, Al-Salhiya Isle, M'hala, and Abu Flous (Fig. 1).

Table 1: Coordinates of the in the Banks of Shatt Al–Arab River

Station	Longitude	Latitude
Garmat Ali	30°34'11.58"	47°45'08.74"
Al-Sandbad Isle	30°34'31.96"	47°46'34.58"
Al-Salhiya Isle	30°30'39.10"	47°51'25.10"
M'hala	30°28'10.15"	47°54'46.76"
Abu Flous	30°27'21.62"	48°01'28.17

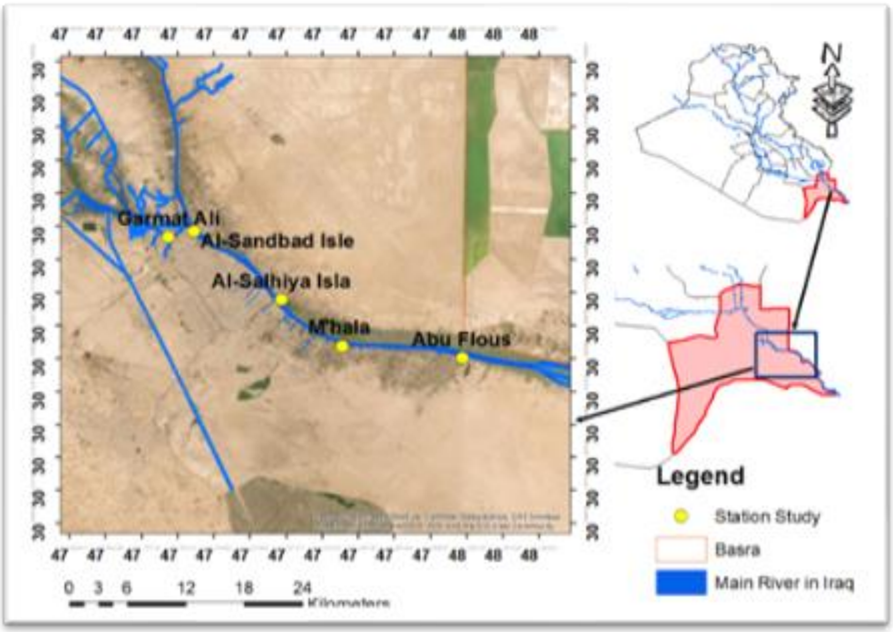


Figure 1: Map showing the study stations of Shatt Al-Arab River

Sampling

Samples were collected monthly, and the average number of individuals was extracted for each of the four months to obtain seasonal values for the year 2021 for the five stations. A Quadrate with an area of 0.0625 m2, equivalent to 1 out of 16 parts per square meter, was used. The specimens were placed in plastic containers with a quantity of water from the same site. Some of the environmental factors were measured in the field.

Environmental measurements

Water samples were collected from the study stations, one sample per month, from 20 cm below the surface water using plastic containers, and at the rate of three replications for each station.

Environmental factors were measured, and monthly rates were obtained, like water temperatures using a graduated thermometer (0-100°C) and pH using Elmetron pH meter mod. CP-411, salinity using WTW electrical conductivity meter mod. LF91. Salinity was expressed in units (part per thousand) ‰, and current speed was calculated using the (CM2) Current Meter Model, and it was measured in m/s (APHA, 2005).

The relationship between: (individuals and environmental factors) was mainly analyzed using ordination techniques. Associations between environmental variables and this species' distribution were quantified using Canonical Correspondence Analysis, CCA, CANOCO, version 4.5 (Braak and Smilauer (2002). CCA is a nonlinear ordination technique primarily designed to analyze the relationships between multivariate ecological data sets directly. Monte Carlo permutation techniques (499 permutations) were used to test the significance of the different environmental factors on the species composition. Analysis of variance (ANOVA) was used to assess ecological differences ($p \leq 0.05$) among river sites. All statistical computations were made using SPSS software (version 19) statistical package.

Results and Discussion

Monthly changes in some of the essential environmental factors: 1-Water temperature varied during the study period, with the highest temperature was (33.5 ° C) recorded during August 2021 in Garmat-Ali St. and the lowest was 13.3 ° C recorded during January 2021 in Al-Salhiya St. (Figure 2); it is generally noted that the increase in water temperature in the ecosystem is closely related with the ambient temperature (Ishaq and Khan, 2013). This result has been agreed with what was reported by Al- Baghdadi *et al*. (2020).

These changes in temperature (Table 2) during the months of the year were reflected in the behavior of the organism studied, as the density of the organisms increased in the months of Spring and Autumn seasons with the moderation of temperatures because it had a direct impact on the effectiveness of aquatic organisms and the growth rate of phytoplankton. The lowest density of snails was recorded during the month's Summer season at all the stations, and this is a result of the direct effect of heightened temperature on the activity of aquatic organisms; on the other hand, the low and slow growth of phytoplankton and the provision of nutrients to those organisms plays a vital role in the behavior, abundance, and distribution of aquatic organisms on the other hand (Al- Baghdadi *et al*., 2020).

Table 2: Monthly variations in water temperature at stations in the Banks of the Shatt Al–Arab River

Months	Temp. ˚C				
	St 1	St 2	St 3	St 4	St 5
January 2021	14.0	16.6	13.3	17.2	15
February	18.8	15.2	19.6	18.4	20.6
March	22.7	23.5	21.3	22.8	20.9
April	25.2	27.3	26.4	26.9	27.5
May	26.5	27.3	28.2	26.7	27.6
June	29.4	28.2	27.9	28.5	28.1
July	31.7	30.7	30.0	31.0	30.6
August	33.5	32.4	31.6	30.7	31.4
September	31.5	30.3	29.9	.31.8	31.0
October	29.8	30.1	28.9	28.7	27.9
November	28.5	27.9	28.5	27.6	27.8
December	22.3	22.4	21.5	21.0	20.8

2-Salinity water values varied from 1.1‰ record in March 2022 at Garmat-Ali St. to 4.8 ppt. was recorded in September 2022 at M'hala St. (Table 3). The highest salinity value in the water of the Shatt al-Arab River was recorded in the fourth station. In contrast, the lowest value was recorded in the first St. The continuous increase of salinity by adding salt ions to the river water from irrigation of agricultural lands and sewage water on both sides of the river (Al-Mahmoud, 2015). The decrease in water salinity coincided with the highest values of snail density at Garmat-Ali St.

The high values of salinity coincided with the low density of the snail, especially at M'hala and Abu Flous St. This indicates the negative effect of high salinity on snail density. This result is consistent with that of Khalaf (2011), which indicated that some species of snails were lost due to high salinity. Watson and Omerod (2004) suggest that months of less rainfall are accompanied by a decrease in the abundance of large benthic aquatic organisms in the intertidal zone.

Table 3: Monthly variations in salinity values at the study stations in the Banks of Shatt Al–Arab River

Months	Salinity values mg/l				
	St 1	St 2	St 3	St 4	St 5
January 2021	1.8	1.6	1.3	1.2	1.5
February	1.2	1.5	1.6	1.4	2.6
March	1.1	2.5	2.7	2.2	2.9
April	1.2	2.3	2.4	2.2	2.5
May	1.5	2.1	2.2	2.9	2.6
June	2.4	2.9	2.9	2.5	2.1
July	1.7	3.7	3.0	3.6	3.8
August	2.5	2.4	3.0	4.5	3.9
September	3.5	3.0	2.9	4.8	4.2
October	2.8	3.1	2.7	2.5	2.9
November	1.9	2.4	2.5	2.5	2.7
December	1.8	2.3	2.5	2.7	2.8

3. PH values of the water at the five study stations ranged from 7.0, recorded in July 2022 at Abu Flous station, to higher values of 8.3, recorded in May 2022 at Al-Sandbad St. (Table 4). The pH showed a lightly alkaline trend. Generally, the pH of water would have been influenced by the catchment area's geological features and the water's buffering capacity (Shyamala *et al*., 2008). The lowest values of pH indirectly affect aquatic snails (Evans and Ryan, 2010), and it was recorded in Summer and Autumn due to the increase in the production of carbon dioxide resulting from the decomposition of organic matter, which works to reduce the pH.

4. Current Speed values of the water of the five study stations ranged from 0.12 m/sin July 2022 at Sindebad St. and the highest value (0.96 m/s). Recorded in February at Garmat Ali St. (Table 5).

Several factors affect the speed of the current, including wind movement, sudden changes in atmospheric pressure, temperature distribution, and precipitation (Woodworth *et al*., 2019).

The highest values of current velocity were recorded during the winter due to rainfall and low temperatures. In contrast, the lowest values were recorded during the summer months because of the low water drainage from the Iranian side (Abdu-Latif, 2020).

Table 4: Monthly variations of pH values at the study stations in the Banks of Shatt Al–Arab River

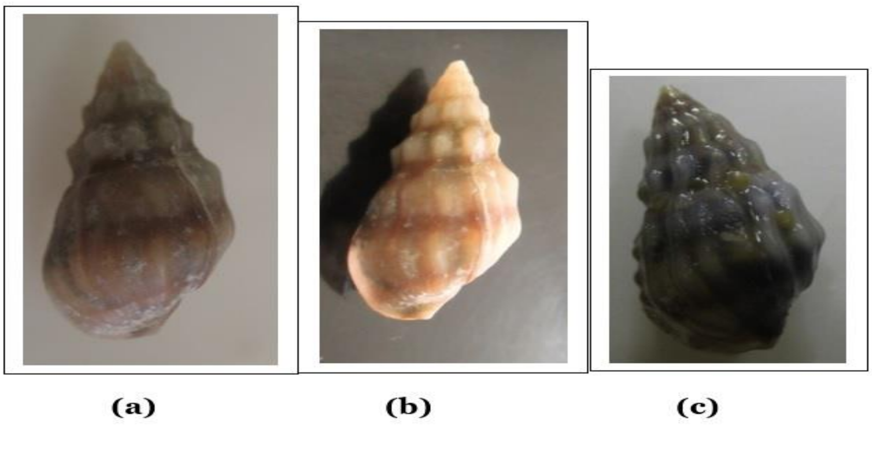
Months	pH values				
	St 1	St 2	St 3	St 4	St 5
January 2021	7.8	7.6	7.3	7.2	7.3
February	7.7	7.4	7.6	7.5	7.2
March	8.1	8.0	7.7	7.2	7.3
April	8.0	7.9	7.4	7.4	7.5
May	8.1	7.9	7.6	7.5	7.6
June	8.1	8.3	7.9	7.5	7.5
July	7.9	7.8	7.7	7.6	7.0
August	8.1	8.2	8.0	7.5	7.7
September	7.5	7.8	7.7	7.6	7.4
October	7.8	8.1	7.7	7.5	7.5
November	7.9	7.9	7.5	7.5	7.8
December	7.8	7.6	7.5	7.6	7.4

Table 5: Monthly variations of current speed values at the study stations in the Banks of Shatt Al–Arab River

Months	Current speed values m/s				
	St 1	St 2	St 3	St 4	St 5
January 2021	0.77	0.76	0.84	0.76	0.65
February	0.96	0.85	0.76	0.7	0.76
March	0.86	0.88	0.77	0.69	0.72
April	0.85	0.77	0.85	0.64	0.75
May	0.81	0.79	0.76	0.75	0.76
June	0.87	0.83	0.79	0.75	0.68
July	0.69	0.75	0.69	0.77	0.70
August	0.81	0.82	0.67	0.70	0.69
September	0.75	0.74	0.67	0.76	0.74
October	0.66	0.68	0.73	0.75	0.72
November	0.68	0.69	0.69	0.59	0.62
December	0.61	0.58	0.65	0.67	0.68

Monthly changes in density of *M. nodosa* and *M. costata* in the Banks of Shatt Al–Arab River

Changes in the population density of *M. nodosa* were studied in the five stations at a rate of three replicates and expressed as average density (individual/m2); in five stations, the highest density was recorded (96 ind./m2) during April 2022 at Garmat Ali St. and the lowest density (24 ind./ m2) was reported during August 2022 at M'hala and Abu Flous St. (Table 6). The highest density of *M. costata* in five stations was recorded (80 ind/m2) during April 2022 at Abu Flous St., and the lowest density was (24 ind/m2) during December 2022 at Garmat Ali, Al-Sandbad, and Al-Salhiya St. (Table **7).** As a result, aquatic vegetation and substratum directly or indirectly affect the snails' densities (Saha *et al*., 2017). The highest total density of the two species of snails was recorded in the spring and autumn seasons at Garmat Ali and Al-Sandbad St., indicating the suitability environment of these two stations more than other stations for the life of these two species. These two stations are characterized by lower salinity than the other stations, which means that these two species prefer low salinity conditions. This was confirmed by many studies on these two species and other species of freshwater snails (Camara *et al*., 2012; Al-Waaly *et al*., 2014; Al-Khafaji *et al*., 2021; Qazar, 2016). Who indicated that rainfall and low salinity, in addition to the abundance of plants and aquatic algae, played an essential role in increasing the density of the snails.



(a) **(b)** **(c)**

Plate 1: specimen in the photo (a) *M. nodosa* collected from Garmat Ali St., and specimen in the photo (b) from Al-Salhiya St.; specimen in the photo (c) of *M. costata* specimens collected from Abu Flous St.

Statistical analyses from the multiple statistical analysis of *M. nodosa* and the environmental factors noted that the two environmental factors, water temperature and pH, have a positive correlation with this species' density. In comparison, the other factors, salinity and water currents, were inverse correlated with the density (Fig. 2). The result agreed with Abdul-Latif (2020), who found it in *Melanoides tuberculata*. This study found an inverse correlation of *M. tuberculate* with the current speed and a positive relationship with water temperature and pH at Al-Salhiya St. It also agreed with the conclusion of Khalaf (2016), who found a positive correlation between *M. tuberculation,* the density of snails, and pH in Shatt Al-Arab and some of the southern marshes.

Table 6: Density (ind./m^2) of *Melanopsis nodosa* at the study stations

Stations	St 1		St 2	St 3	St 4	St 5
Months		Density (ind./m^2)				
January 2021	80		64	64	40	40
February	80		80	64	64	40
March	80		80	64	80	80
April	96		80	80	80	64
May	64		64	80	64	64
June	80		64	80	64	64
July	80		80	64	64	80
August	80		64	64	24	24
September	80		64	64	80	64
October	80		80	56	80	56
November	80		64	48	64	40
December	80		64	64	40	40

Table 7: Density (ind./m2) of *Melanopsis costata* at the study stations

Stations	St 1	St 2	St 3	St 4	St 5
Months	Density (ind./m^2)				
January 2021	40	56	64	40	40
February	56	40	40	65	56
March	56	40	64	40	40
April	40	64	40	40	80
May	64	40	64	56	64
June	40	40	40	56	56
July	40	56	64	64	40
August	40	64	64	48	64
September	40	40	40	40	64
October	40	40	56	64	56
November	40	64	48	64	40
December	24	24	24	40	40

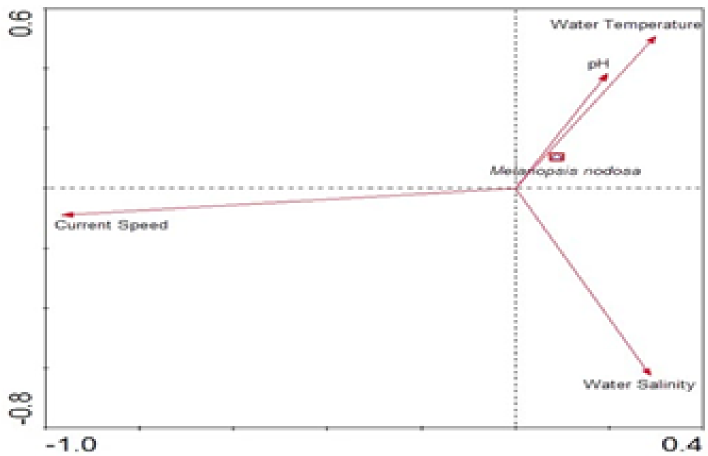


Figure 2: CCA analysis of the relationship between environmental factors and the density of the snail *Melanopsis nodosa* in the Banks of Shatt Al–Arab River

Conclusions

1-The snail is a common species in the tidal region of the Shatt al-Arab River, as it was present at all the stations throughout the year.

2-The snail *Melanopsis nodosa* can be found in large numbers in the intertidal zone with low salinity and slow speed of water currents.

3-A correlation was found between the snail densities and some environmental factors.

The individuals of this species are considered to have a wide tolerance to salinity and temperature despite the decreases in the abundance of its individuals, which was recorded in previous studies on the same species. Changes in salinity and temperature may make stresses of relatively low effect, particularly when compared to other threats these animals face (e.g., loss of critical habitat due to pollution, eutrophication and coastal development, boat traffic, oil and gas exploration, and biotoxins associated with red tide events).

Acknowledgments

The author would like to thank everyone who helped and supported this work in the Crustacean Laboratory, Department of Marine Biology, and the administration at the Marine Sciences Centre, University of Basra, who facilitated the collection of samples.

References

Abdul-Latif, N.M. (2020). The Relationship of Organic Pollution Indices with the Biology of three benthic Macroinvertebrates in the intertidal zone of Shatt Al-Arab River. Ph. D. Thesis, Coll. Agric., Univ. Basrah, 199 p. (In Arabic). URL.

Al- Baghdadi, N.M.; Sultan, E.N. and Abdullah, A.M. (2020). The Effect of some environmental factors on the density and distribution of isopod *Sphaeroma annandalei annandalei* along the intertidal zone of the Shatt AL-Arab river. Iraq. Plant Arch., 20(1): 84-92. https://faculty.uobasrah.edu.iq › 1642328068.

Al-Khafaji, K.K.; Hreeb, K.K.; Akash, A.N. and Al-Shara, A.S. (2018). The abundance and Distribution of Invertebrates and Relation to Macrophyte Communities in Intertidal Zone of Shatt Al-Arab River, Basrah, Iraq. Oceanogr. Fish Open Acc. J., 6(2): 555-682. URL.

Al-Khafaji, K.K.; Karim, R.M. and Al –Baghdadi, N.M. (2021). Study of Aquatic Gastropods (Mollusca) in Shatt Al-Arab River, Iraq. Egyptian J of Aquatic Biology and Fisheries, 25(3): 137-146. https://ejabf.journals.ekb.eg/article_172861.html

Al-Mahmoud, H.K. (2015). Hydrological changes in the lower part of Mesopotamia. Iraqi J. Aquacult., 12(1): 47-70. https://www.iasj.net ›iasj›search-IASJ-IraqiAca. Sci. J.

Al-Rudaini, A.M.J. (2010). Environment, nature and structure of the fish community in Al-Radwaniyah Lake, west of Baghdad. Iraqi J. Agric., 15(1): 96-106. (In Arabic).

Al-Waaly, A.B.M.; Mohammad, M.K. and Al-Miali, H.M. (2014). Freshwater snails Diversity in the Middle and South Regions of Iraq. Adv. Biores., 5(3): 166-171. URL.

APHA (American Public Health Association) (2005). Standard Methods for the Examination of Water and Wastewater. 21st Edition, American Public Health Association/American Water Works Association/Water Environment Federation, Washington DC., 1193 pp.

Braak, C.J.F.t and Smilauer, P. (2002). CANOCO Reference Manual and CanoDraw for Windows User's Guide: Software for Canonical Community Ordination (version 4.5). Biometris, Wageningen and Ceské Budějovice, 500 p. https://library.wur.nl/WebQuery-/wurpubs/fulltext/405659

Camara, I.A.; Bony, Y.K.; Diomandé, D.; Edia, O.E.; Konan, F.K.; Kouassi, C.N.; Gourène, G. and Pointie, J.P. (2012). Freshwater snail distribution related to environmental factors in Banco National Park, an urban reserve in the Ivory Coast (West Africa). Afr. Zool., 47(1): 160-168. DOI: 10.3377/004-.047.0106

Costil, K.; Dussart. G.B.J. and Daguzan, J. (2001). Biodiversity of aquatic gastropods in the Mont St-Michel basin (France) in relation to salinity and drying of habitats. Biodiv. Cons., 10: 1-18. https://link.springer.com/article/10.1023/A:1016670708-413#article-info.

Evans, R.R. and Ryan, S.J. (2010) Distribution and environment influences on freshwater gastropods from lotic systems and springu in pennsylvani USA, with conservation recommendations. Ames Malac. Bull. 28: 135-150. https://www.fwgna.org ›downloads › Evans&Ra.

Hussain A. I.; Anwar, F.; Sherazi, S.T.H. and Przybylski R. .(2008). Chemical composition, antioxidant and antimicrobial activities of basil (*Ocimum basilicum*) essential oils depends on seasonal variations. Food Chem., 108(3): 986-995. URL.

Khalaf, R.Z. (2011). An environmental study of gastropods from the tidal zone in Shatt al-Arab - Iraq. M. Sc. Thesis, Coll. Sci., Univ. Basrah, 94 pp. (in Arabic)

Khalaf, R.Z. (2016). "Synecology of Macrobenthic Invertebrates communities of three different aquatic habitat of Southern Iraq". Ph. D. Thesis Coll. Sci., Univ. Basrah, 252 pp. (in Arabic)

Ignacio Agudo-Padrón, A. (2011). Current knowledge on population studies on five continental molluscs (Mollusca, Gastropoda et Bivalvia) of Santa Catarina State (SC, Central Southern Brazil region). Biodivers. J., 2(1): 9-12.

Ishaq, F. and Khan, A. (2013). Diversity Pattern of Macrozoobenthos and their Relation with Qualitative Characteristics of River Yamuna in Doon Valley Uttarakh and American-Eurasian. J. Toxicol. Sci., 5(1): 20-29.

Johnson, P.D. (2009). Sustaining America's Aquatic Biodiversity-Freshwater Snail Biodivers. Conserv. Fish. Wild., 420-530. URL.

Mamert, O.F.; Hubert, Z.T.S; Ernest, K.; Lié, N.T.N. and Siméon, T. (2016). Influence of municipal and industrial pollution on the diversity and the structure of benthic macro-invertebrates community of an urban river in Douala, Cameroon. J. Bio. Env. Sci., 8(6): 120-133.

Mirza, N.N.A. and Nashaat, M.R. (2019). Abundance, Diversity and Distribution of Mollusca in the Gharaf River, Southern Iraq. Iraqi J. Sci., 60(3): 469-485. DOI: 10.24996/ijs.2019.60.3.7

Naser, M. D. (2006). Some notes on Melanopsidae (Gastropoda) of Mesopotamia. Iraqi J. Aquacult., 3(2): 85–90. DOI: 10.58629/-ijaq.v3i2.306.

Nashaat, M.R.; Al-Azzawi, M.N. and Ahmed, D.S. (2016). Oncentrations of Copper and Zinc in Benthic Invertebrates Collectedfrom the Tigris River at Baghdad City. J. Int. Environ. Appl. Sci., 11(1): 8-17. URL.

Qazar, I.A.A. (2016). The relationship between aquatic macrophytes and some Gastropoda (snails) in the lower reaches of Hammar marsh. Mesopt. Environ. J., 2(4): 23-32. URL.

Saha, B.K.; Jahan, M.S. and Hossain, M.A. (2017). Ecology and abundance of *Bellamyabengalensis*(Lamarck, 1822) (Gastropoda:Viviparidae) in pond habitats of Rajshahi. Bangladesh J. Sci. Ind. Res., 52(2): 107-114. DOI: 10.3329/-bjsir.v52i2.32920

Shyamala, R.; Shanthi, M. and Lalitha, P. (2008). Physicochemical Analysis of Borewell Water Samples of Telungupalayam Area in Coimbatore District, Tamilnadu, India. J. Chem., 5(4): 924-929. URL.

Tachet, H.; Richoux, P.; Bournaud M. and Usseglio-Polatera P. (2010). Invertébrésd'eaudouce. Systématique, Biologieécologie. Paris, CNRS éditions, 592 p. URL.

Watson, A.M. and Ormerod, S.J. (2004). The distribution of three uncommon freshwater gastropods inthe drainage ditches of British grazing marshes. Biol. Cons., 118: 455–466. DOI: 10.1016/j.biocon.2003.09.021.

Weiner, E.R. (2000). Application of environmental chemistry. Boca Raton. London. Lewis published, http://faculty.ksu.edu.sa/ Almutaz/ Documents/ ChE, 438 pp.

Woodworth, P. L.; Melet, A.; Marcos, M.; Ray, R.D.; Guy Wöppelmann, G.; Sasaki, Y.N.; Cirano, M.; Hibbert, A.; Huthnance, J.M.; Monserrat, S. and Mark A. Merrifield, M. A. (2019). Forcing Factors Affecting Sea Level Changes at the Coast. Surveys in Geophysics, 40: 1351–1397. URL.

تأثير بعض العوامل البيئية على كثافة وتوزيع قواقع المياه العذبة *Melanopsis nodosa* و (Ferussac 1823) *M. costata* في ضفاف شط العرب، البصرة، العراق

ندى مفيد البغدادي iD
قسم الاحياء البحرية، مركز علوم البحار، جامعة البصرة
Email: nada.abdaltef@uobasrah.edu.iq

تاريخ الاستلام: 2023/09/25 تاريخ القبول: 2024/05/23 تاريخ النشر: 2024/09/25

المستخلص

يهدف البحث الى دراسة تأثير العوامل البيئية على تواجد ووفرة القواقع الاكثر شيوعا *Melanopsis nodosa* و *Melanopsis costata* في خمس محطات في الجزء الاوسط من نهر شط العرب. كما يزودنا بمعرفة البيئة المناسبة لحياة هذه الانواع من القواقع في منطقة المد والجزر المنخفضة في ضفاف ساحل شط العرب، ، تم العثور على هذه الانواع بكثافات عالية خلال فصلي الربيع والخريف مقارنة مع فصل الصيف والشتاء في جميع المحطات مما يدل على تأثير اعتدال درجة الحرارة على كثافة وتوزيع هذين النوعين. أظهرت نتائج التحليل الإحصائي وجود علاقة عكسية بين كثافة القواقع والملوحة وسرعة تيار مياه نهر شط العرب، وارتباط موجب بين كثافة الأنواع مع درجة حرارة الماء ودرجة الحموضة. إلا أن الارتفاع المفرط في درجات حرارة مياه شط العرب، (والذي ارتبط بارتفاع تركيز الملوحة خلال معظم أشهر الصيف نتيجة انخفاض الإطلاقات المائية، والذي كان سببه في الأصل التغيرات المناخية ومشاكل مع دول المنبع المجاورة للعراق) سبب انخفاضا حادا في كثافات أفراد هذه الانواع.

الكلمات المفتاحية: نهر شط العرب، *Melanopsis nodosa*، *Melanopsis costata*، العوامل البيئية.

P-ISSN: 1812-237X, E-ISSN: 2788-5720, https://ijaqua.uobasrah.edu.iq/index.pip/iaqua