

Original Article

Distribution and density of Brachyuran crabs in Shatt Al-Basra Canal, Basrah, Iraq

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Abstract: Crab samples were collected monthly from September 2023 to June 2024 in the Shatt Al-Basra Canal, Basrah, Iraq. During sampling, the air temperature ranged from 8 to 38°C, biological oxygen demand (BOD) from 3.5 to 7.3 mg/L, and total organic carbon (TOC) from 0.25 to 0.54. Based on the results, the highest density recorded for *Nasima dotilliformis* in December was 6 ind/m², for *Leptochryseus kuwaitensis* in February, and for *Ilyoplax stevens* in December and January, reaching 4 ind/m². *Nasima dotilloformis* was found throughout the whole study period in all months, but the two other species were absent in some months, with *L. kuwaitensis* having a lower density. Temperature had the most significant impact on the presence and density of the crab community and was a fundamental factor in the dryness of the riverbank soil. The results also showed a significant inverse correlation between temperature and BOD and an insignificant direct correlation between temperature and TOC.

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Introduction

Crabs have a well-developed carapace, usually wider than the length and depth of the crabs' body, with the abdomen folded underneath as a segmented flap and the first pair of clawed pereopods (Thomson, 1951). The predatory and mutualistic relationships between crabs and other marine animals, reproductive biology, population dynamics, and their importance are fascinating to marine ecologists. Various aspects of crab behavior, such as burrowing, sound production, and foraging, are of interest to animal behaviorists. The physiological adaptations of their osmotic balance, respiration and ventilation, hormonal control of molting, autotomy, and regeneration of lost limbs, and highly organized nervous systems are exciting for physiologists (McLay, 1988). Many benthic crabs pass through a planktonic molting stage, which is determined by the number of molts, the duration of molting, and the increase in body size at molting. They then metamorphose into megalopa, during which the transition from plankton to benthic life occurs (Anger, 2006).

Recently, great attention has been paid to studying

the brachyuran fauna of Iraq and their identification and distribution (Naser, 2009; Naser et al., 2013; Yasser and Naser, 2019), and many studies conducted along the coastal region of the Persian Gulf (Basson and Jones 1986a; Al-Khayat and Jones, 1996; Apel, 1996; Al-Ghais and Cooper, 1996; Hornby, 1997). Brachyuran crab species are common inhabitants of rocky shores (NG et al., 2008). Yasser and Nasser (2021) listed 30 species on the Iraqi marine coasts that belong to the Brachyuran crab, most of which belong to the family Pilumnidae, in four genera and five species, followed by Leucosiidae, Camptandriidae, Macrophthalmidae, Sesamidae, Epialtidae, and Varunidae, respectively. This study aimed to investigate the distribution and density of Brachyuran crabs in Shatt Al-Basra Canal, Basrah, Iraq.

Materials and Methods

Samples were collected monthly from September 2023 to June 2024 from the banks of the Shatt Al-Basra Canal, beyond the canal's regulator (30°24'7"N, 47°46'49"E) (Fig. 1). The samples were collected using a plastic quadrat with a 1 m length, which was

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Figure 1. The location of sampling station.

thrown 16 times to cover the entire study stations. Each square containing the crab nest holes was dug to a depth of 15 cm to collect the specimens. After being identified, the crabs were returned to their habitats, and some samples were fixed and preserved in 10% buffered formalin. Soil sampling was also done to estimate total organic carbon and texture and to correlate crab densities with soil structure. In addition, air temperature, biological oxygen demand (BOD), and total organic carbon (TOC) of the studied stations in the Shatt Al-Basra Canal were measured during sampling.

Results

Study area: The Shatt Al-Basra River is a sewage channel for all regions of Basra Governorate. The sampling area was characterized by high levels of pollution, which led to a lack of biodiversity in the area, except for a few individuals of polychaetes and mud skippers. However, due to the availability of organic materials, many insects are found, followed by local and migratory birds (Fig. 2).

The highest temperature during the sampling period was 38°C in June 2024, while the lowest temperature was 8°C in January. The highest BOD



Figure 2. The location of sampling stations.

value was recorded in December 2023 and March 2024, when it reached 7.3, while the lowest value was recorded in October, when it reached 3.5. The highest TOC value was recorded in May, when it reached 54%, while the lowest was in February, when it reached 25% (Table 1).

Three Brachyuran crabs were collected during the study period from Shatt Al-Basra Canal, viz. *Nasima dotilliformis*, *Leptochryseus kuwaitensis*, and *Ilyoplax stevensi* (Figs. 3-5). The density of *N. dotilliformis* ranged between 2 and 6, *L. kuwaitensis* 0-4, and *I. stevensi* 0-4 ind/m² in the sampling stations (Table 2, Fig. 6). The highest presence ratio was for *N. dotilliformis* in June, where it reached 100%, while the lowest presence ratio was for *L. kuwaitensis* in January, where it reached 10%. However, the ratio was 0% for *L. kuwaitensis* in other months (Fig. 7).

Figure 8 shows the negative relationship between the monthly total density of all crab species and the air temperature during the study period. In addition, Figure 7 shows the relationship between the BOD and the total monthly density of all crabs, which was significantly positive. The relationship between organic carbon and crab density was insignificant (Fig. 9).

Discussions

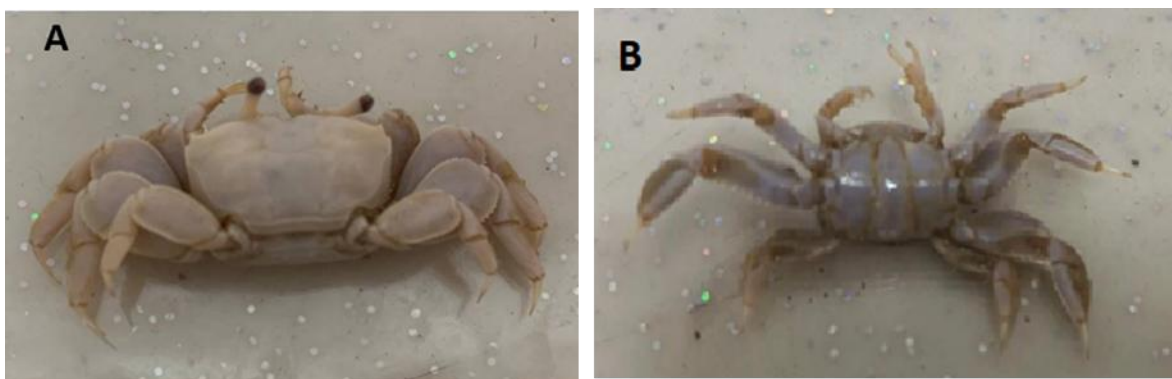
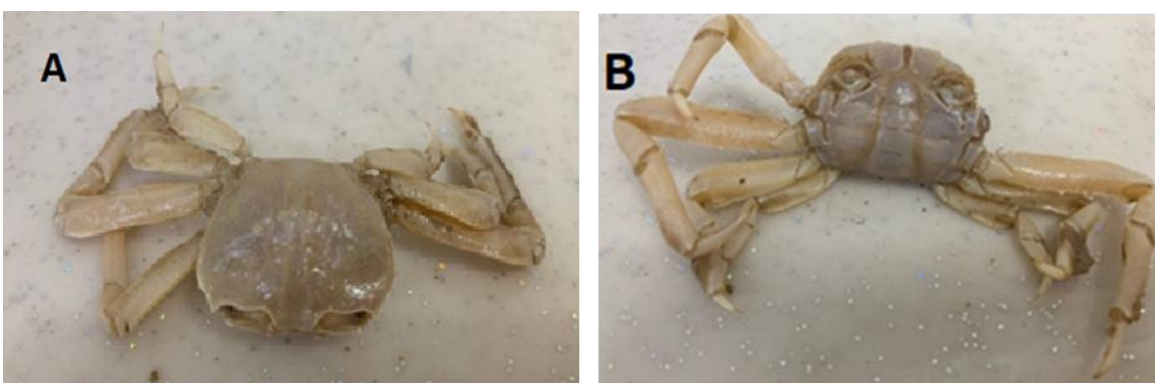
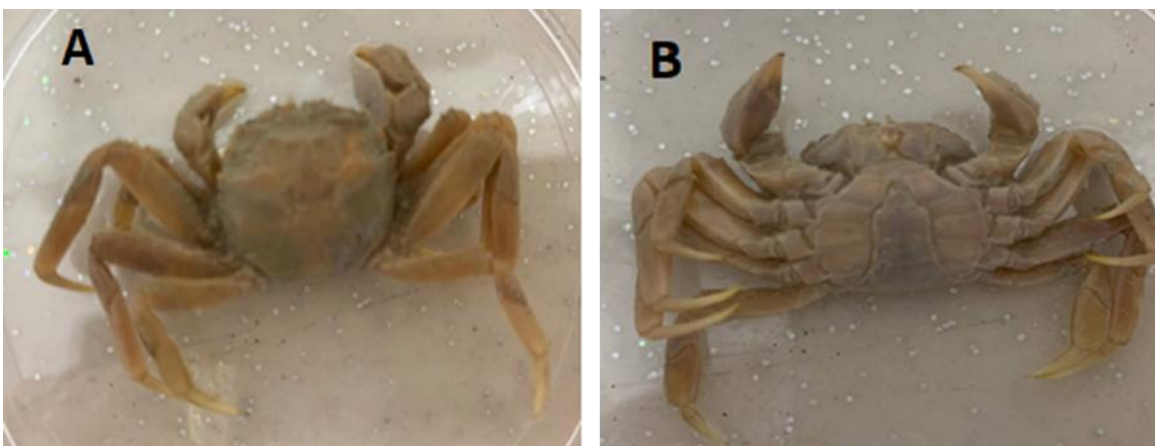
High temperatures in the summer characterize the climate of Iraq, which is temperate during the winter.

Table 1. Values of temperature, BOD, and TOC during the study period.

Months	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.
Air temp.	30	28	24	11	8	13	21	33	34	38
BOD	3.6	3.5	4.6	7.3	7	6.4	7.3	6	3.9	3.6
TOC	0.33	0.29	0.33	0.45	0.34	0.25	0.49	0.31	0.54	0.53

Table 2. Values of temperature, BOD, and TOC during the study period.

Species	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.
<i>Nasima dotilliformis</i>	4	3	4	6	5	3	5	5	2	3
<i>Leptochryseus kuwaitensis</i>	0	0	0	2	1	4	2	0	1	0
<i>Ilyoplax stevensi</i>	3	2	2	4	4	2	3	2	0	0

Figure 3. *Nasima dotilliformis*. (A) dorsal, and (B) ventral view.Figure 4. *Leptochryseus kuwaitensis*. (A) dorsal, and (B) ventral view.Figure 5. *Ilyoplax stevensi*. (A) dorsal, and (B) ventral view.

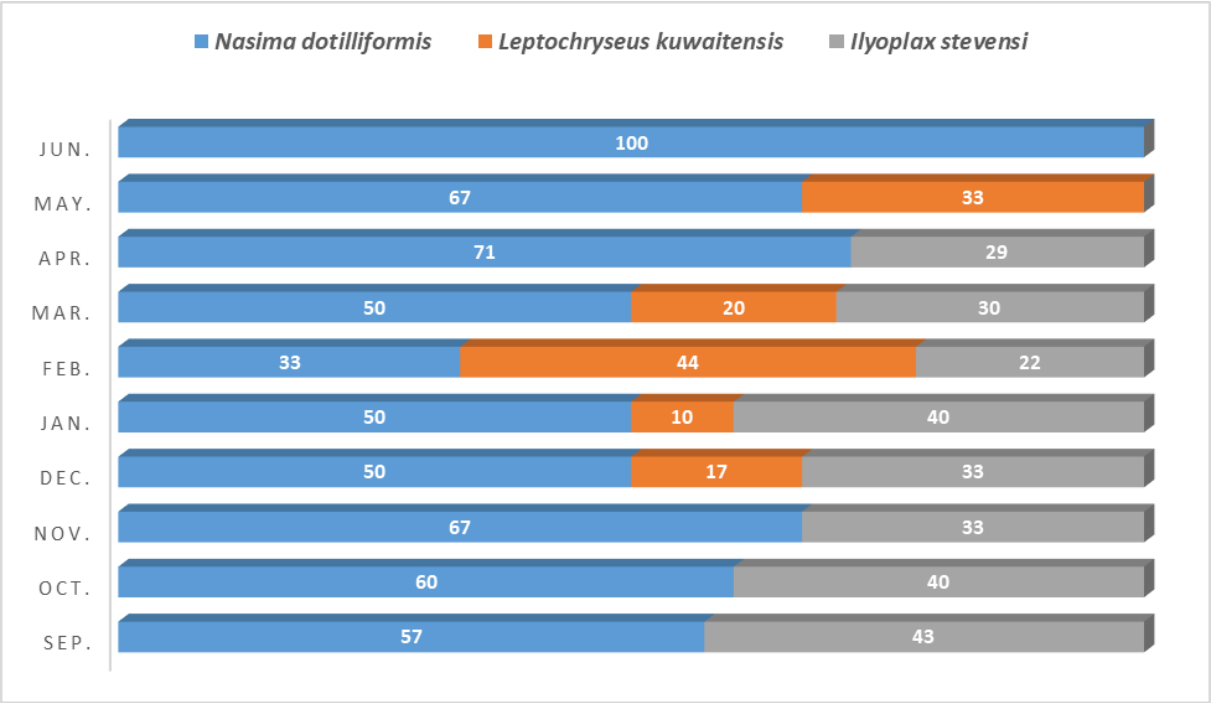


Figure 6. The ratio (%) of three species of crabs during the study months.

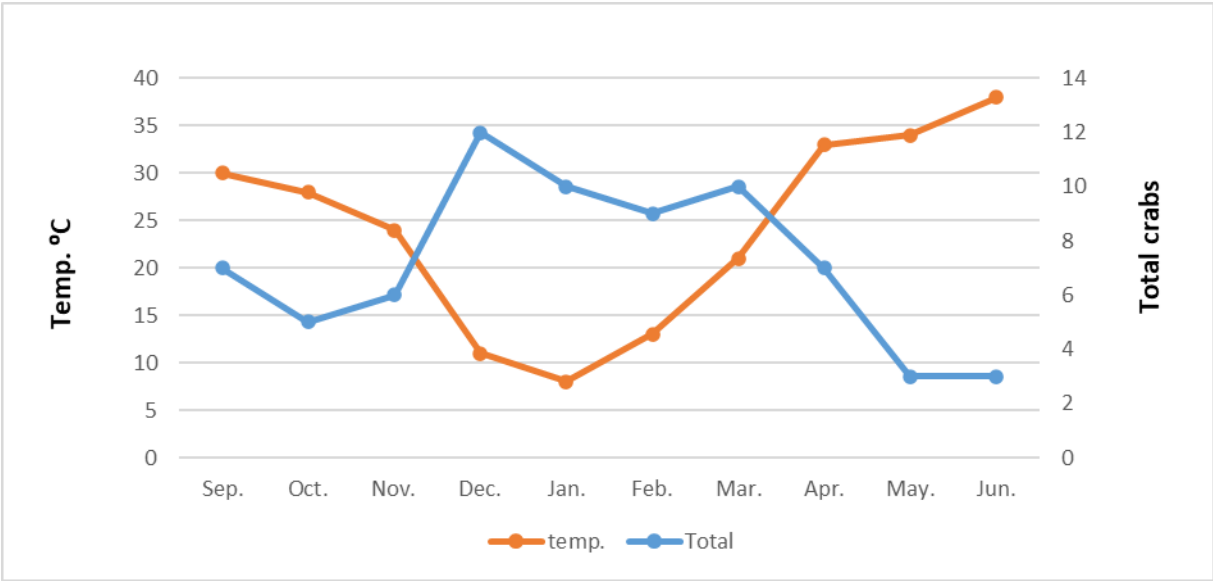


Figure 7. The relationship between temperature and total densities of crabs.

There is also a tremendous thermal fluctuation between night and day. The Shatt Al-Basrah is an artificial channel for collecting sewage water from all areas of the Basrah Governorate. Also, most of its banks are a dumping ground for waste from nearby residential areas, construction crushers, and animal slaughterhouses, making it a harsh area for many organisms. Therefore, it is characterized by very poor

biodiversity.

The current study finds *L. kuwaitensis*, *I. stevensi*, and *N. dotilliformis* in the Shatt Al-Basrah. Azra et al. (2019) reported that Brachyura species are sensitive to temperature changes. Our results also revealed a significant inverse correlation between temperature and crabs’ density for all collected species. Our results agreed with the findings of Azra et al. (2020), who

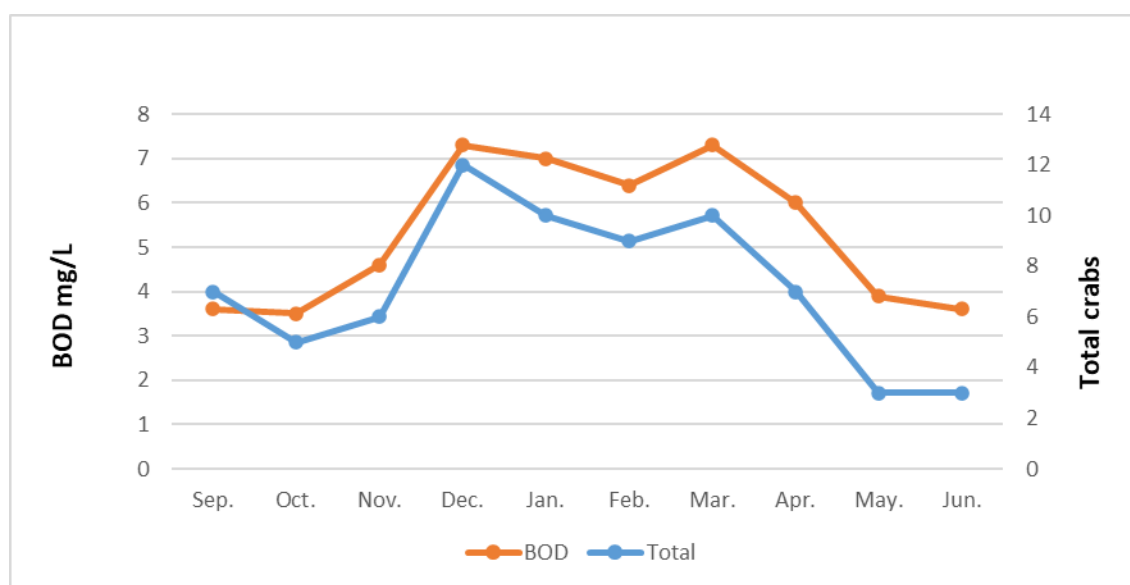


Figure 8. The relationship between biological oxygen demands (BOD) and total densities of crabs.

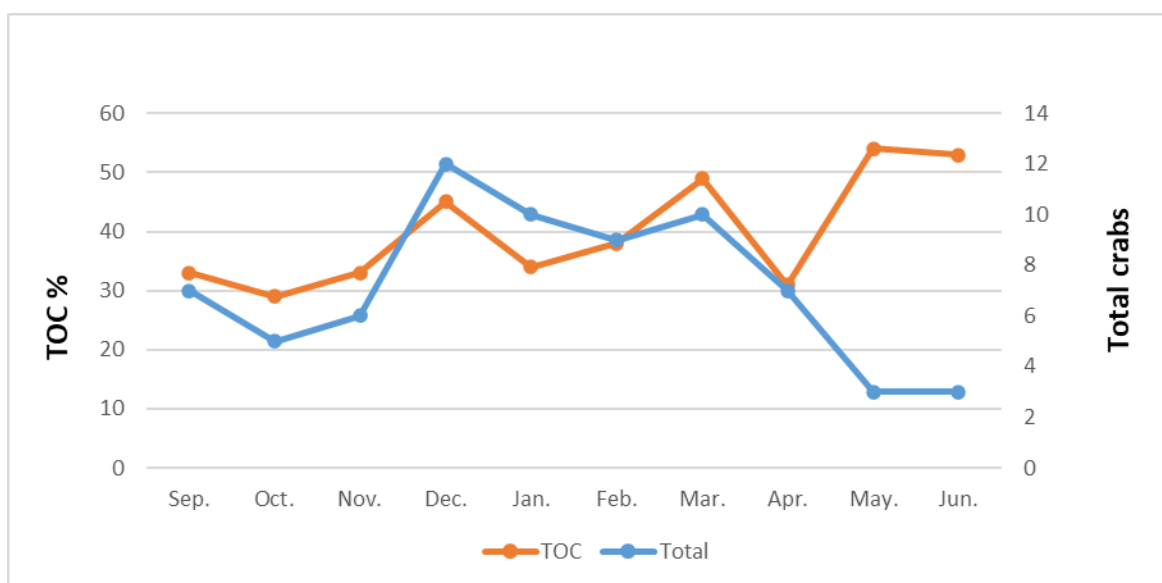


Figure 9. The relationship between total organic carbon (TOC) and total densities of crabs.

found that crabs differ in their tolerance to temperature and their response to temperature changes. Watsan et al. (2018) found that the *Ocypode cordimanus* has a high-temperature tolerance by descending into burrows to depths up to 40 cm.

Some studies have reported a positive correlation between BOD and temperature; however, our work found the opposite, an inverse correlation. The reason could be the dryness of the tidal zone, where the decomposition process occurs within a record time of the water receding, which negatively affects the decomposition of organic matter (observations by the

authors).

Therefore, due to the moderate temperatures during the winter months and the high humidity, BOD rates increased during these months, leading to a positive correlation between the density of all crab species and BOD. The results of this study were consistent with the findings of Chumsri et al. (2023), who found that human disturbances affect the behavior of fiddler crab, *Austruca annulipes*, which increases anti-predatory behaviors more than mating behaviors. Despite the inverse correlation between crab density and BOD, the results did not show any correlation between crab

density and TOC, consistent with the findings of Lam-Gordillo et al. (2022), who found that depth, salinity, temperature, and sand content were the most influential factors on crab density. The environment of the Shatt Al-Basra Canal suffers from many pollutants, as it is a sewage channel and dumping ground for its riverbanks, justifying a lack of biodiversity and the low density of existing organisms.

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