

Effect of the burrowing crab on the microfauna community at the coastal of khor Al-Zubair NW Arabian Gulf

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Abstract:

The main objective of study area to evaluate the effect of Burrowing crabs on the microfauna in three habitats (intertidal flat, super tidal flat and salt marsh) in the beach of Khor AL- Zubair, NW Arabian Gulf. Many organisms such as Ostracods, Nematodes, Turbellorians, Foraminifera and Copepods are community distributing in the study area. The results showed that the densities of all studied organisms varied significantly among habitats. Highest values were observed in an intertidal flat while lower in salt marsh. The Microfauna in the intertidal flat and supratidal flat habitats were more affected than salt marsh habitat and they were controlled by burrowing crabs. Ostracods, Turbellarians, Foraminifera, and copepods densities were significantly lower in disturbed than control in both habitats. Nematodes which did not effected by burrowing crabs behavior and digging process, there was no significant difference between the disturbed and controing. In general the study found that burrowing crabs play an important role to control Microfauna community structure in Khor AL- Zubair estuarine, the crabs disturbance effect the surface assemble and the reaction of microfauna was differ depend on the intensity and changing their distribution.

Introduction:

Microfauna are importance components of coastal and estuarine ecosystem, As grazers of to influence primary production, nutrient cycling and other benthic metabolic processes (Aarinio, 2000). Intertidal flat zone environment is a rich source of food for secondary consumer species, which are attracted to estuaries by the large productive populations of primary consumers (Navas *et al.* 2002).

Crabs are considered to be an important on the structure and function of many estuarine ecosystems throughout the world (Heck *et al.* 1995).

Burrowing and foraging activities of crabs promote bioturbation of estuarine intertidal flats. They remove large amount of sediment and changing the substrate characteristics, increasing water and organic matter contents as well as their penetration in the sediment layers (Botto and Iribane, 2000. Meziane *et al.* 2002).

The microfauna community structure is effected by the sediment characteristics and presence of the burrowing crabs in the intertidal habitat. The crabs excavate and maintain semipermanent open burrows and remove large amounts of sediment during feeding and burrow maintenance forming a surface mound around burrows (Iribane *et al.* 1997). In spite of this behavior, abundance and widely distribution, no information is available about the effect of this crab on the structure of the microfauna community in the carried out to evaluate the effects of this burrowing crab on microfauna at three different habitats in an beach embayment of khor AL-Zubair.

The main locality of the present is the khor AL-Zubair lagoon in the north west Arabian Gulf (Fig. 1).

Methods:

Three habitats present in the beach of khor AL-Zubair have been chosen. Six sites selected randomly (three near the mounds of the burrow (Disturbed) and others three about 30 cm from crab burrow (control)).

Sediment samples were collected (to evaluate the microfauna) from each site by corer tube in an area 6.25 cm² and depth 2 cm, fixed in 4% formalin with Bengal stain, the PH and Eh were measured locally at the same time. Surface sediment samples were collected from each site to determine the organic materials.

The microfauna separation was done in the marine science centre laboratories, Basrah University, 2007, samples washed in flowing water and sieved by (500, 250, 125, 63, and 43 μ m) then classified using stereoscopic microscope.

Granulometry data were obtained through sieving and pipette analysis and dried samples were than combusted at 550 C° for 60 min in order to determine organic matter content through weight loss (Suguio, 1973) statistical analysis were based in two way ANOVA to test the differences in microfaunal data and a biotic parameters between habitats and situation (control and disturbed). All data were tested for normality (Kolmogorov – Smirnov test) and homogeneity of variances prior to their use in statistical test (Underwood, 1997).

Biological data were transformed to log (X + 1) to assure variance homogeneity normal distribution. In cases in which the ANOVA result was significant (P < 0.05), Tuckey's multiple comparison test was applied to determine specific differences (Underwood, 1997).

Results:

The granulometric composition of surface sediments ranged from very fine sand and moderately sorted in the intertidal flat to poorly sorted finest sand in supratidal flat and salt marsh. The investigated of fine fractions and organic matter significantly increase from intertidal flat to supratidal flat habitats, while redox potential (Eh) and (PH) decreased (Table 1).

Differences observed among situations were no significant (P > 0.05) at all habitats. Also, habitat by situations were no significant (P > 0.05).

The results found significant differences ($P < 0.01$) in the density of microfauna groups in all habitats. There was significant differences ($P < 0.01$) also in the density of Copepods, Ostracods, Foraminifera and Turbellarians.

The density near the hole edge was less than the control (30 cm from the hole or Burrow)(fig 2-5) .

For all habitats (Fig 6) we did not find any differences in the nematode density.

The density was high for all microfauna in intertidal flat and supra tidal flat habitats unlike the salt marsh.

Discussion

In this study I examine the generality of this observation and began to test the relationship between the burrowing crabs and the microfauna in the beach of khor Al-Zubair on the NW Arabian Gulf. Burrow of crabs can serve a number of functions for protection from the environment for defence from predators as place to store food and reproduction (Jan and Zeil, 2003)

They microfauna commun structure was negatively effected by crabs resulting in lower densities of the Ostracods, Foraminifera, Copepods and Turbellarians in sediment edge mounds at the all intertidal flat and supratidal flat.

However, nematodes were not affected in either habitat also, non microfauna group were effected in salt march habitat. The burrowing crab is a deposit feeder but there are no evidences that this crab selectively preys upon microfaunal organisms (Botto and Iribane 1999).

Marine benthic infauna affects the distribution and transport of sediment particles and power water solute through feeding, burrowing, but bulding and irrigation (Angela et al, 2000).

The effects of crab on microfauna community structure are mainly related to an intense sediment disturbance because of the burrowing activities. This quit plausible that crab disturbance caused by continuous sediment deposition around the burrow mainly affect the surface populations (Botto an Iribane 2000).

The Copepods, Ostracods can also disply movements through water column (Keyser 1988), thus the lower densities around burrows may be due to active migration of the microfauna in response to bioturbation in superficial sediment layer.

The biogenic effect on sediments are spatially and temporally variable, shifting with changes in the rates and location of the activities on the responsible organism (Gremar and Amouroux, 1988). Nematodes were not affected by burrowing crab in neither habitat, which suggested that these organisms could well adapted to caused – crab disturbance. Nematode abundance varied predictably along a disturbance gradient revealed by historic and measured water sediment quality parameters.

These results showed that the burrowing crab could play an important role in determining meiofauna community structure in beach habitats of khore Al- Zubair.

However, crab disturbance seemed to effect mainly surface populations, especially intertidal mudflat and supratidal flat.

Furthermore, the lack of effect observed in salt marsh was probably related to a less intense disturbance, suggesting that microfauna response to crab disturbance was variable among habitats, depending on the

intensity and frequency of the disturbance, (Leonardo and Carlos, 2005).

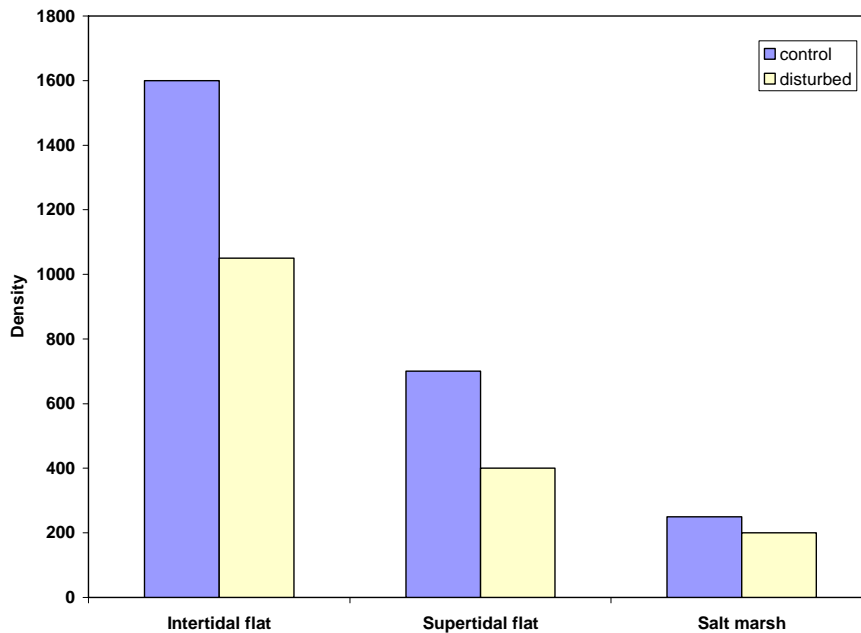
References

- Aarinio, L. (2000). Experimental evidence of predation by juvenile flounder, *platichthys flesus*, on a shallow water meiobenthic community. J. Exp. Mar. Bio. Ecol. 246, PP. 125-138.
- Angela B. Moline S. A. Netzer (2000). Fiddler crab Rhythm and Blues: Daily and tidal rhythms of *Uca Leptodactyla* in salt water aquarium. NCUR Uni. Of Montana April, PP.26-29.
- Brian, R. silliman, Craig A. Layman, and Andrew H. Altiern. (2003) symbiosis between an Alpheid shrimp and xanthoid crab in salt marshes of Mid – Atlantic states, U.S. A., J. of crustacean. Biology, 23 (4): PP.879-879.
- Botto, F. and Iribarne, O. (1999) Effect of the burrowing crab *chasmagna thus granulate* (Dana) on the benthic community of SW Atlantic Coastal lagoon. J. Exp. Mar. Biol. 241, PP.263-284.
- Botto, F. and Iribarne, O. (2000). Contrasting effects of two burrowing crabs (*Chasmagnathus granulate* and *Uca uruguayensis*) on sediment composition and transport in estuarine environments. Estuar. Coast. Shelf Sci., 51, PP.141- 151.
- Heck, K. L., Able, W., Roman, C. T., and Fahy, M. P. (1995). Composition, abundance, biomass, and production of macrofauna in New – England estuary: comparison among eelgrass and other nursery habitats – Estuaries, 18 (2), PP 279 – 389.
- Gremare, A. and Amouroux, J.M. (1988). Etude experimentale des taux de digestion et de metabolisme de *Eupolyornia nebulosa*: Influence de l'etat de maturation sexuelle. Oceanol. Acta 11:299-305.
- Iribarne, O. Bortolus, A. and Botto, F. (1997). Between – habitat differences in burrow characteristics and trophic in the southwestern Atlantic burrowing crab *chasmagnathus grannulata*. Mar. Exol. Prog. Ser. 155, PP. 137-145.
- Jan M. Hemmi and J. Zeil (2003). Burrow surveillance in fiddler crab. I Description of behaviors. J. of Exp. Bi. 206. PP. 3935 -3950.
- Keyser, D. (1988). Ostracoda. In: Higgins, R. P. and Thiel, H (Eds.) Introduction to the study of meiofauna. Washington : Smithsonian Institution press. PP. 370 – 376.
- Meziane. T. M. C. Sanabe and M. Tauchiya (2002). The ecology and physiology of decapods of mangrove swamp. Symp- Zool. Soc. Lond., 59. PP. 315 -341.
- Navas, F, Portig, A. A. Malvarz, Jackson, D.W. T., G. C. Cooper, J, A. G. Montgomery, W. I and Roberts D., (2002) Monitoring of the new towards intertidal flats, construction phase. A report to the River Agency. Department of Agriculture and Regional Development for Northern Ireland. University of Ulster and the Queen's Univ. of Belfast.
- Suguio, K. Edgard Blucher (1973). Introducao sedimentologia. EDUSP, Univ. Sao Paulo. Brazil,
- Underwood, A.J. (1997). Experiments in ecology their logical design and interpretation using analysis of variance. Cambridge University press Cambridge.

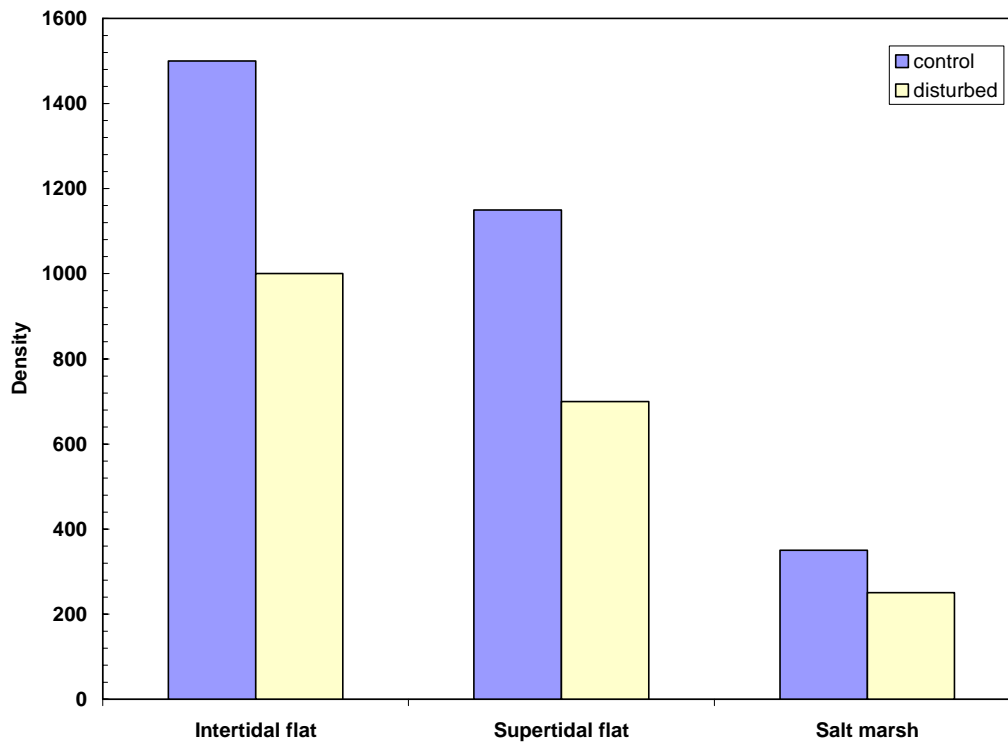


Parameter	Intertidal Flat		Supratidal Flat		Salt Marsh	
	Control	Disturbed	Control	Disturbed	Control	Disturbed
Mean grain size (Ø)	3.02(0.02)	3.06(0.01)	3.79(0.12)	3.86(0.18)	3.62(0.53)	3.40(0.41)
Sorting (Ø)	0.7(0.05)	0.78(0.05)	1.32(0.09)	1.36(0.11)	1.41(0.12)	1.66(0.22)
Fines(%)	8.4(0.79)	6.2(0.96)	18.6(3.02)	18.1(3.97)	23.8(7.5)	22.4(7.23)
Organic matter(%)	0.35(0.06)	.037(0.08)	0.51(.013)	0.6(0.12)	0.81(.044)	0.97(0.41)
Eh(mV)	-104(45)	-193(87)	-203(45)	-218(53)	-257(60)	-243(37)
PH	7.2(.012)	7.1(.18)	6.93(0.37)	6.9(0.52)	6.18(0.2)	6.40(0.31)

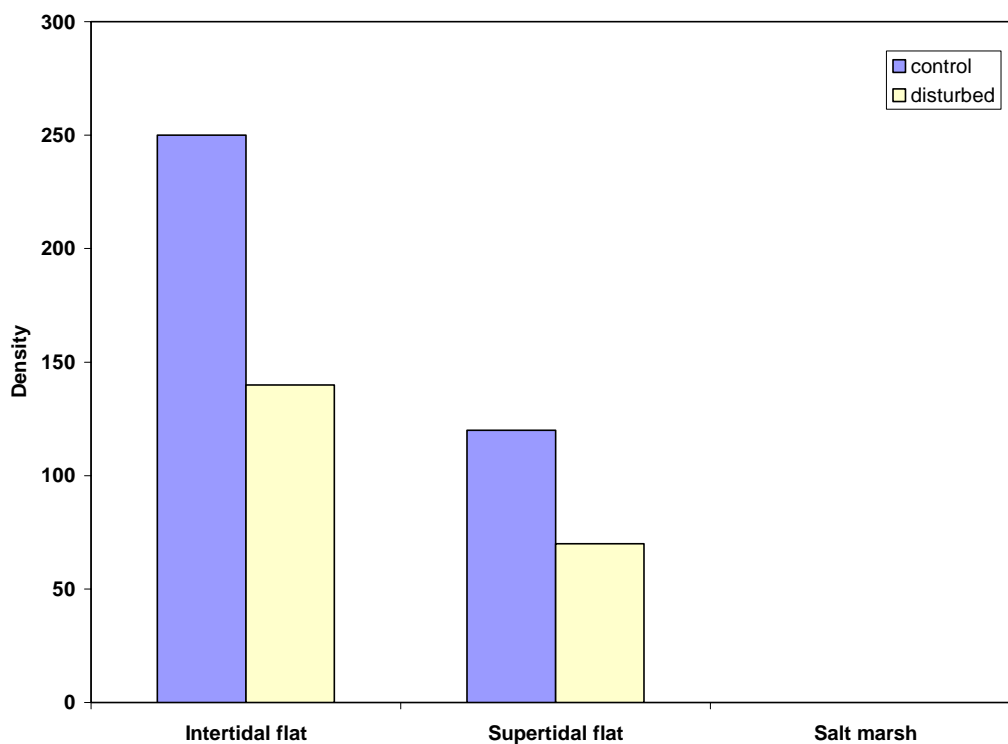
Table (1): Mean values and standard deviation (in parenthesis) of the a biotic parameters measured in control and disturbed conditions at each habitat.



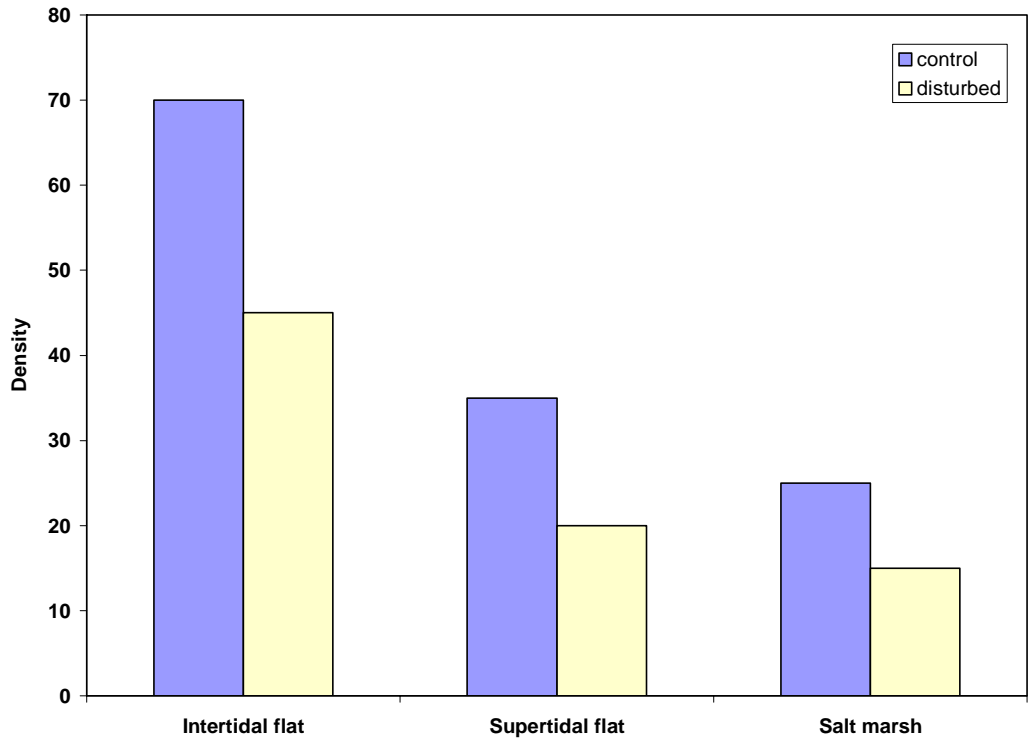
Fig(2):Mean density (ind.m2) Ostracada in both habitats and situations. Open bars: control ;closed bars: disturbed.



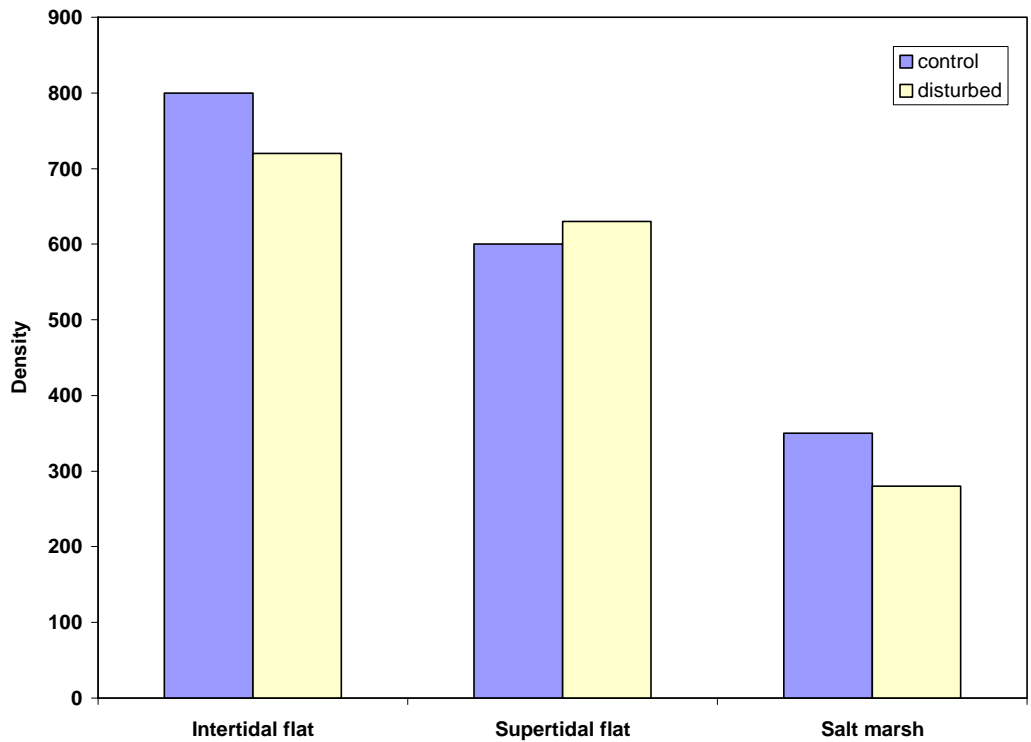
Fig(3):Mean density (ind.m²) of Foraminifera in both habitats and situations. Open bars: control ;closed bars: disturbed.



Fig(4):Mean density (ind.m²) of copepods in both habitats and situations. Open bars: control ;closed bars: disturbed



Fig(5):Mean density (ind.m²) of Turbellarians in both habitats and situations. Open bars: control ;closed bars: disturbed



Fig(6):Mean density (ind.m²) of Nematods in both habitats and situations. Open bars: control ;closed bars: disturbed