

Comparison of the population structure of the crab *Uca sindensis* from two intertidal flat habitats North West Arabian Gulf

Hamza A.Kadhim

Department of Geology ;College of Science ;University of Basrah
Basrah-IRAQ

ISSN –1817 –2695

((Received 19/11/2007 , Accepted 2/3/2008))

Abstract

The structure of two population of *Uca sindensis* crab in two habitats at the north west Arabian Gulf were compared. The size of individuals; distribution sex ratio and recruitment were evaluated. The physical properties of sediments (texture and organic matter contents) were also examined. The population structure of the crabs was investigated during one year in two habitats. Crabs were caught manually from 15 – min during low tide. The carapace width of each crab was measured with caliper and the sex and ovigerous state were recorded. The median size of crabs differed in each sample population. It was smaller at Shatt Al- Arab estuary where as larger at Khor Abdallah. The intertidal zone of Shatt Al Arab estuary and Khor Abdallah showed high productivity. Marked differences were found regarding individual size, either their onset of sexual maturity or their asymptotic size, suggesting that food availability may be favoring growth in the studied population

Key words: Crabs ;Uca; Intertidal ; sindensis; Population

Introduction

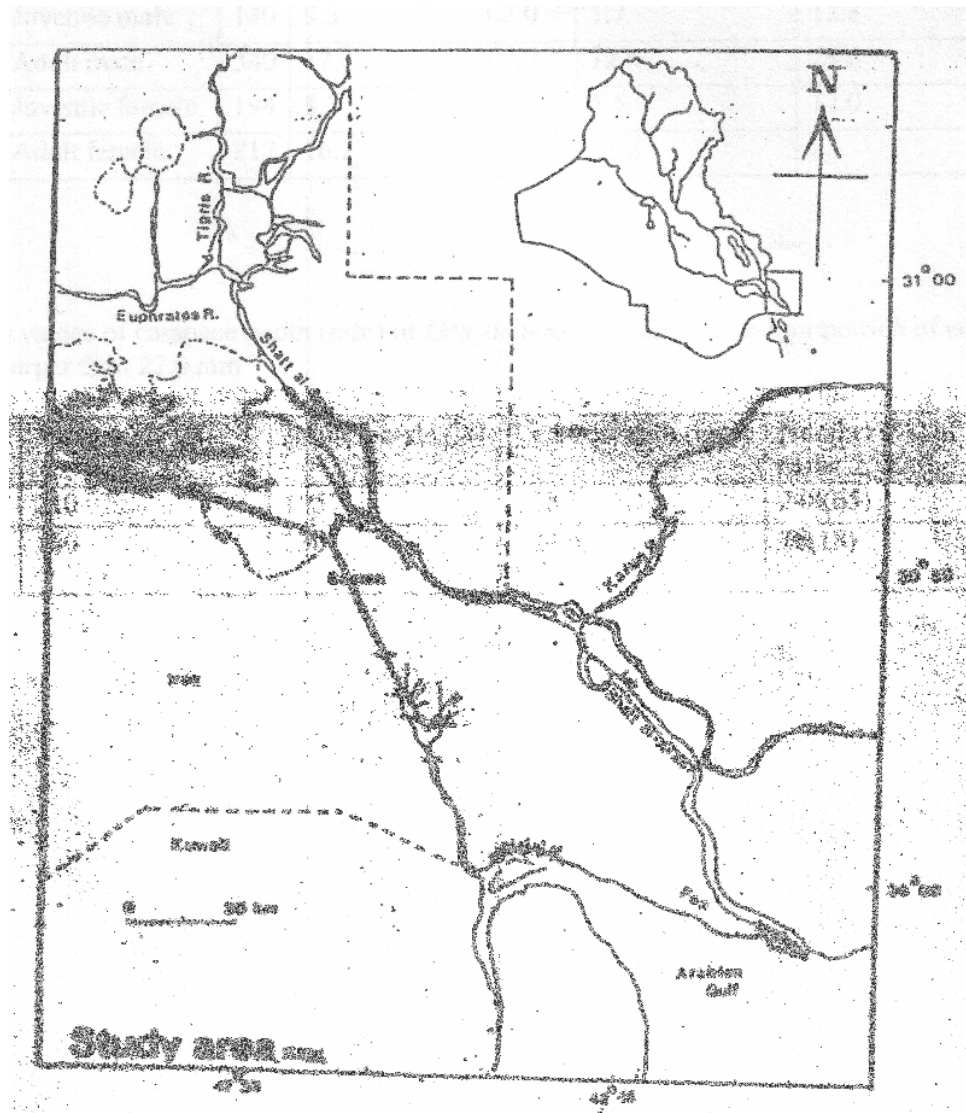
The *Uca sindensis* crabs are small, semi – terrestrial that are active during low tide on the intertidal mud flats of tropical and subtropical estuaries[1]. Most species are diurnal and work to tight schedule of a few hours a day with most of their time spent feeding while the remaining time is divided between burrow maintenance, social interaction, grooming and predator avoidance [1]. Crab are abundant in mangrove forests, but it is very difficult to quantify their population density accurately [2] Crabs are important because they control the remineralisation rate of detritus [3].

Uca sindensis, Show sit – fidelity living in the burrows that they creat and activity maintain by digging the substrate. The crabs live in high density colonies and occupy small, overlapping home ranges that centred around the important

resource of their burrow [4].

Intertidal flat and mangroves showed that high primary production and many authors have addressed the influence of crab activities on the ecosystem [5- 6-7].The crabs live in maxid – sex colonies on intertidal mud flat [8] Here my research topic deals with the study of the observation and begin to test population structure also takenplace in other intertidal crabs.Basides the size which may be an indicator of habitat productivity, juvenile recruitment and sex – ratio also examined in order to compare key processes ruling population dynamics

The main locality of the present study is Khor Abdallah and Shatt Al-Arab estuary in the north west of Arabian Gulf [Fig. 1].



Fig(1): In Iraqi Map illustrated the study area

Methods

The study carried out during the period January-December 2006. Two samples of sediment (about 10 cm deep and 300g weight) were randomly obtained over each sampling area. The sediment texture was measured according to [9] and the organic matter content was quantified by ash-free dry weigh (AFDW). Seasonal samples of sediment were taken to compare the sediment characteristics, and comparisons were carried out by running one – way analyses of variance, followed by Tukey procedure [10]. *Uca* crabs were sampled at low tide, by using ACPUE method. In the laboratory, the individuals were sorted and the

sex was determined by checking the presence of gonopods and enlarged chelipeds in males, and the four pleopod pairs and symmetric chelipeds in females. Carapace width (CW) was recorded with caliper. The size at the onset of sexual maturity was estimated using the allometric technique. The size – frequency distributions for the whole sample at each site departed significantly from normality. Therefore, the male and females adult in median size were compared among their two populations using the nonparametric kruskal - wallis test. Seasonal juvenile recruitment for each population were assessed by comparing the monthly estimates

Comparison of the population structure of the crab *Uca sindensis*...

of the juvenile proportion [11]. Departures from the 1:1 sex ratio were tested using chi-square test. The ovigerous proportion as their relative frequency within mature females were calculated

each month. Paired Z- test were used to compare overall juvenile, male, and ovigerous females proportions between sampling sites. The statistic significance level of 5% was used in all analyses.

Results

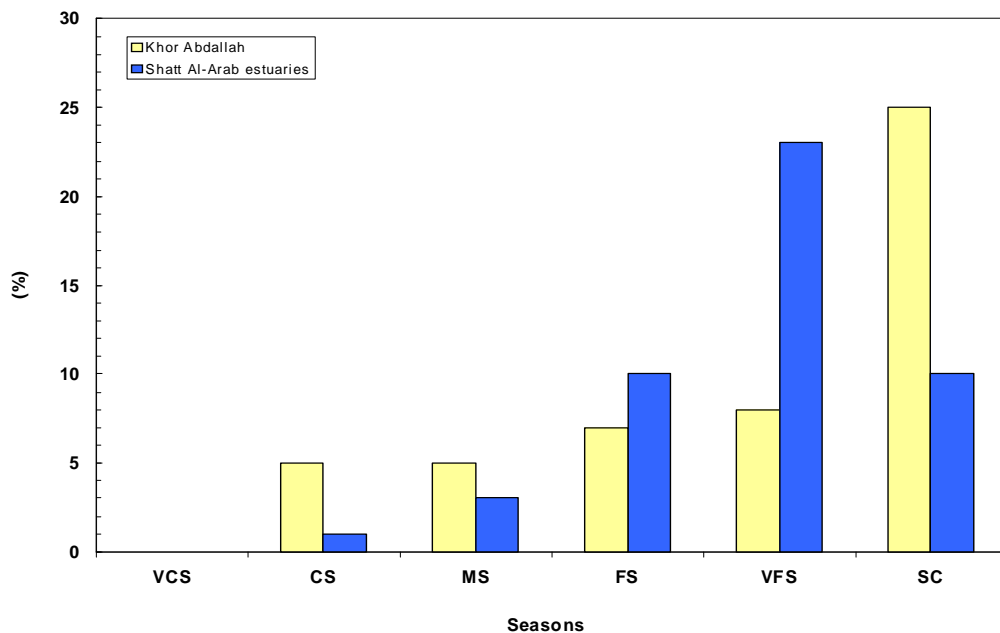
SYSTEMATIC

PHYLUM: ARTHROPODA
CLASS : CRUSTACEA
SUBCLASS : CRIPEDIA
ORDER :DECAPODA
SUBORDER : NATANTIA
FAMILY : OCYPODIDAE
GENUS : *Uca*
SPECIES: *Uca sindensis* (Alcock)

The granulometric composition of sediments from Khor Abdallah showed great proportion silt/clay while very fine clay/sand prevailed in Shatt Al- Arab estuary (Fig 2). The organic matter contents of sediments was greater in Khor Abdallah and lower in Shatt Al- Arab estuary in the four seasons(Fig 3). Size characteristics of crabs measured at each sampling site are shown in(Table1). Maximum crab size was lower in Shatt Al-Arab estuary (CW=24.6 mm) than at Khor Abdallah (Table 2)The median size of adult males differed among habitats (P < 0.05). It was smaller in Shatt Al – Arab estuary and largest in Khor

Abdallah .

The median size of adult females was greater in khor Abdallah and smaller in Shatt Al- Arab eustry. Juvenile recruitment was continuous in the two sites with lower proportions of recruits recorded during summer when reproductive activity was highest (Fig 4). The overall juvenile percentage in Khor Abdallah was significantly lower than Shatt Al- Arab estuary. In all population the sex ratio was male – biased(X^2 test , P < 0.05). The male proportion at Shatt Al Arab estuary was significantly higher than Khor Abdallah. (Z- test, P < 0.05) (Fig 5).



Fig(2):Comparison of the granulometric composition of sediments in each studied site.

VCS=very coarse sand;CS=coarse sand; MS=medium sand;FS=fine sand;VFS=very fine sand and SC=silt clay

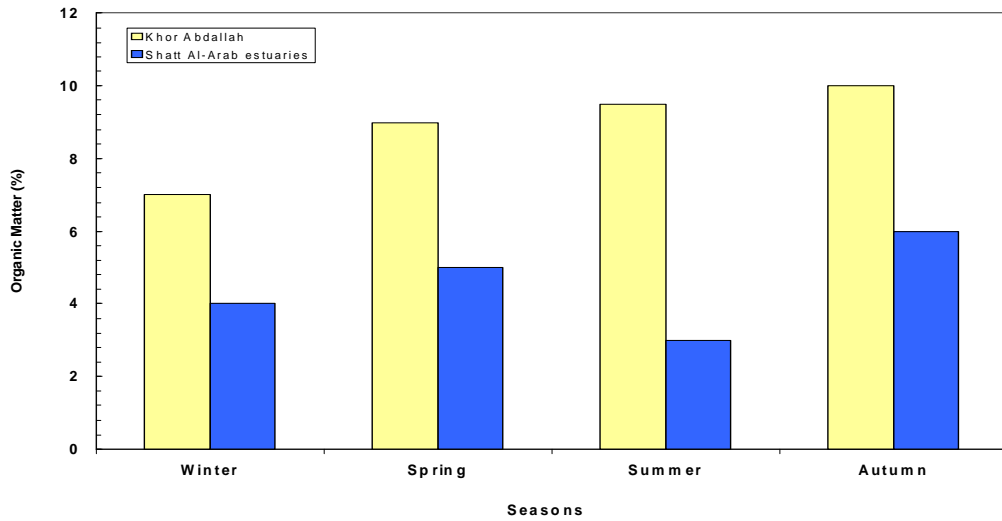
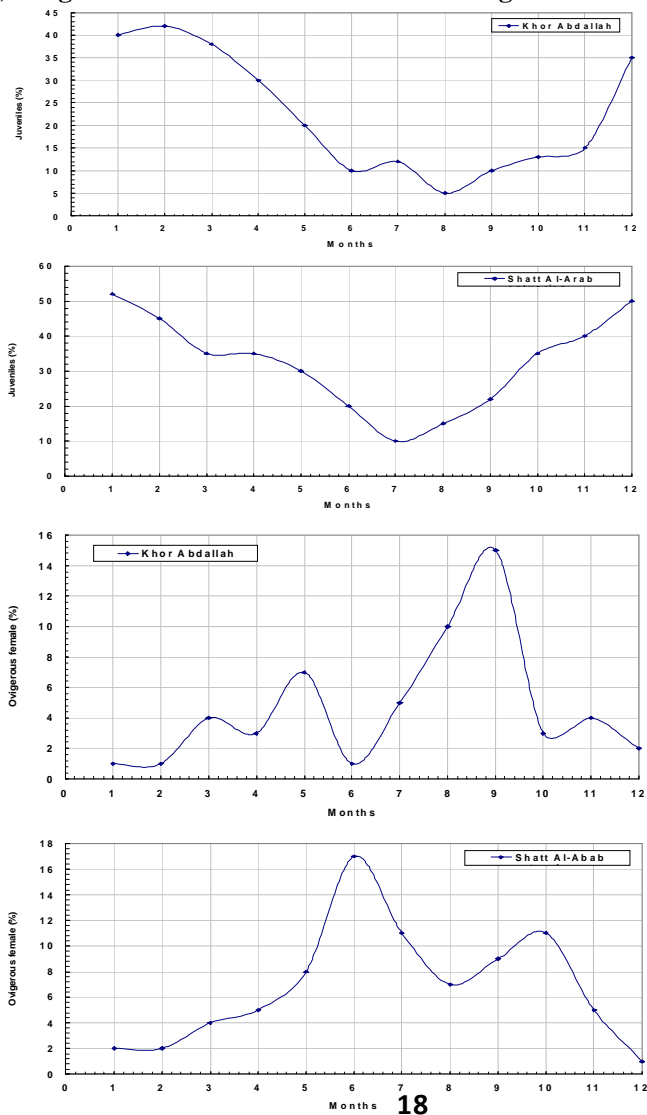
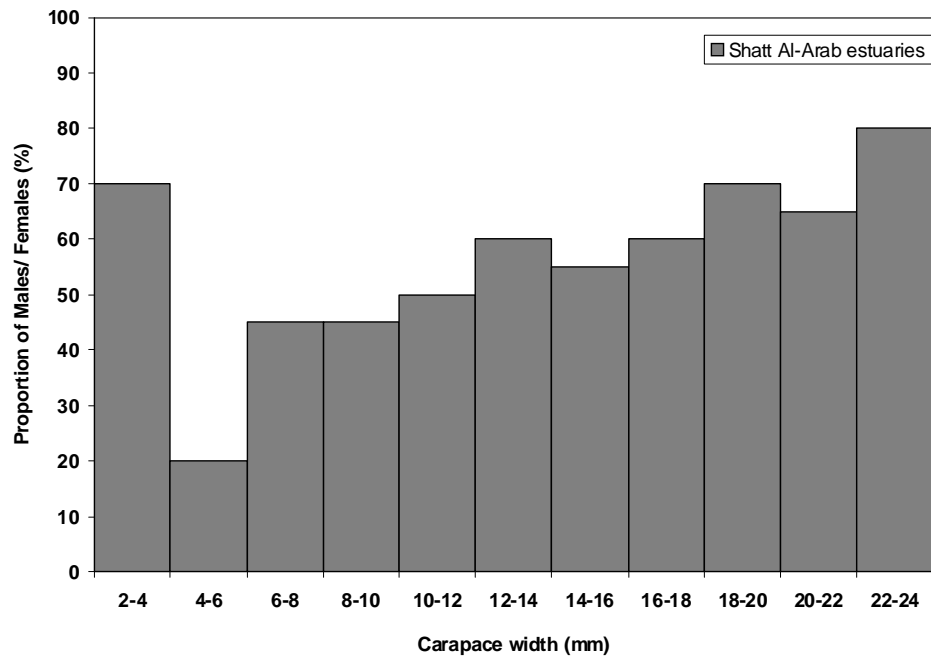
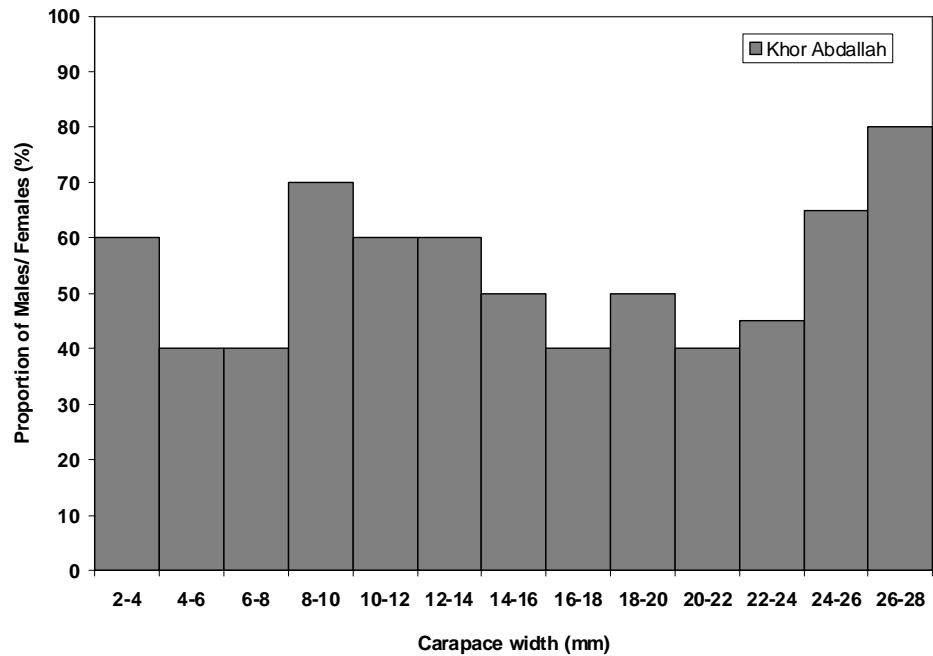


Fig (3): Organic matter contents recorded during each season in each studied site.



Fig(4):Recruitment of juvenile individuals and ovigerous-ratio in the crab at each



Fig(5): Sex –ratio in each size class of the crabs .Dark and white columns represent the male and

female proportions respectively. Asterisks indicate significant departures = from 1:1 ratio

Table (1) : Description statistics of crab size (Carapace width in mm) according to sex and development of phase in *Uca pugnax*

site	Demographic categories	n	Carapace width mean (mm)	±SD	Carapace width minimum (mm)	Carapace width maximum (mm)
Khor Abdallah	Juvenile male	215	10.2	2.0	6.3	12.0
	Adult male	380	23.0	3.1	11.6	28
	Juvenile female	205	10.8	2.4	5.2	14.7
	Adult female	270	20.1	2.7	13.2	25.4
Shatt Al-Arab estuary	Juvenile male	140	9.5	2.0	1.7	12.8
	Adult male	340	17.0	3.0	12.5	24.6
	Juvenile female	194	8.7	2.1	5.5	12.0
	Adult female	212	16.2	2.5	11.2	23

Table (2): Maximum values of carapace width (mm) of *Uca pugnax* at each site and proportion of adult crabs equal to or larger than 22.0 mm

Site	Adult male (n)	Adult female (n)	Largest crab (mm)	Number (%) of crabs ≥ 22.0
Khor Abdallah	210	195	28	248(65)
Shatt Al-Arab estuary	180	230	24.6	76(18)

Discussion

Intertidal flat are generated in geographical areas where wave active is moderate and river input is small. They are the manifestation of progradation of sediments driven from a marine sediment source and can occur in lateral accreting tidal – dominated estuaries or wave – dominated inner parts of estuaries [12]. The consumption of locally produced organic matter in a given mangrove is directly influenced by sediment

texture and local hydrology. Muddy substrates (silt / clay predominant) retain more chemical elements than larger grains [13].

The sediments of Khor Abdallah promote a better organic accumulation than Shatt AL-Arab estuary. The highest organic matter content registered in khor Abdallah may indicate the presence of fuel derived hydrocarbons and /or organic material still to be decomposed, since the

interstitial community is known to have been affected [13].

In Shatt AL-Arab estuary organic matter content was lowest in spite of its high productivity. This is probably due to the fact that large grain fractions prevail at that site and that direct tide action may easily flush litter and other organic material seawards.

Identifying the source of organic material is often difficult, since this not a direct result of beach productivity but depends also on the production interstitial community, geomorphology, tide action, and litter exportation that influence organic content retention [14- 12- 15].

[5] suggested that crabs would not rely solely on intertidal flat leave for feeding, since their chemical composition would not supply the metabolic requirements of these consumers. In fact their diet is complemented by bacteria and other microbes they remove from the mud surface larger. In Khor Abdallah, the impacted infauna may not represent an adequate food source for the crab population. The interstitial community from Shatt AL-Arab estuary may be more abundant than at Khor Abdallah, so the source seems to be greater in those areas. The crabs *Uca sindensis* reach a markedly smaller size at Shatt AL-Arab estuary compared to Khor Abdallah. [16] associated the suppression and retardation of growth of the semiterrestrial crab *Aratus pisonii* with habitat productivity. Indicative data on productivity,

contamination, and food availability seem to explain size differences among the populations compared. Furthermore, exposure to tide action seems to be important, since it may prevent retention of litter, as suggested at Shatt AL-Arab estuary. Otherwise, hydrological features, sedimentology and infauna composition at Khor Abdallah may favour area for growth and reproduction to *Uca sindensis*. Proper testing on the effect of environmental constraints on key biological processes of macrofauna would, however, require intensive field sampling on several discrete intertidal flat areas, in order to allow site replication from impoverished to enriched environments. Similar patterns of the two populations suggest that larval release and development taken place under similar conditions.

The sexual proportion of *Uca sindensis* favourable to males for all sampled populations was also observed in other crab populations, suggesting that sex ratio depends on both ecological and behavioural features but perhaps not much on environmental conditions, [17-18].

Growth and the ontogenetic timing of sexual maturity seem to be highly variable in *Uca sindensis*. Such variation seems to be largely dependent on characteristics are thought to be uncoupled to other processes shaping population structure, such as sex ratio and juvenile recruitment.

References:

- 1 -H. E. Caravello and G. N. Cameron. *Oecologia*, 72:123, (1987).
- 2 -D. J. Macintosh. *Symp. Zool. Soc. Lond.* ,59: 315, (1988).
- 3 -A. I. Robertson. *Austral Ecology*, 16: 433, (1991).
- 4 -C. E. de Rivera and Vehrencamp. *Behav-Ecol.* 12: 189, (2001).
- 5 -A. I. Robertson and P. A. Daniel. *Oecologia*, 78: 191: (1989).
- 6 -R. R.S. Twilley, S. C.S. Nedaker, A. Yanez-Arancibia and E. Medina. *Biodiversity and ecosystem function: ecosystem analyzes*, pp. 387. Cambridge Univ. Press. U. K, (1995).
- 7 -S. Y. Lee. *Est. Coast. Shelf Mar. Sci.*, 49: 703, (1999).
- 8- P. R. Y. Backwell, John, H. C., Steven, R. T., Michael, D. J. and Neville, I. *Proc. R. Soc. Lond. B.* 267: 719, (2000).
- 9.J. H. Zare. Prentice Hall, New Jersey. *Scient. ed.*J.M.Gilli(1996).
10. F. , G. C. Navas, D. W. T. Malvarez, Jackson, J. A. G. cooper and A. A. Portig. *J. Coastal Research*, 36: 531, (2002).
11. D., J. C. ReitermajerViana, A. F. de S. Queiroz, R. M. Barbosa, S. A. Rocha and J. B. Souza. *Proceedings of the IV symposio do Escosistemas Sp. Brazil*, 1, 195, (1998).
12. R. F. Leeand D.S. Page. *Mar. pollut. Bull.* 34 (11), 928, (1997).
13. O. D., C. C. Moura, Lamparelli, F. O. Rodrigues and R. C. Vincent. *Proceeding of the IV symposio de Escosistemas Sp. Brazil*, 1, 130, (1998).
- 15 R. S. Brian, Craig, A. L. and Andrew, H. A., *J. crustacean Biology*, 23 (4), 876, (2003).
14. J. E., M. M. P. CondeTognella, E. T. Paes, M. L. G. Soares, I.A. Louro and Y. Schaeffer – Novelli. *Intercincia* 25 (3), 151, (2000).

15. E. D., M. A. Spivak., Gavio and C. E. Navaro. Australia (2003).
Mar. Sci., 48 (3), 679, (1991).
16. M. Breitfuss Ph. D thesie. Griffith University,

المخلص

درست مجتمعات السرطان *Uca sindensis* في بيئتين شمال غرب الخليج العربي ,درست مجتمعات السرطان خلال الفتره من شهر كانون الثاني ولغايه كانون الاول من العام 2006 تم جمع العينات خلال فترة الجزر,وجدت الدراسه ان هناك لختلاف في تركيب المجتمعين وكانت منطقة ما بين المد والجزر لمصب شط العرب وخور عبدالله من اكثر المناطق انتاجيه .