Journal of Environmental Sciences, 2010; Vol. 39, No. 3 : 289-308

STUDIES ON THE FIDDLER CRABS (*Ocypodidae, Uca*) IN THE INTERTIDAL ZONE OF KUWAIT BAY

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ABSTRACT

This work deals with monitoring fiddler crabs in the intertidal zone along the Kuwait Bay muddy shores. However, fifty samples of fiddler crabs are collected during the hot Summer season of the year 2009 and examined for parasitic infection and to evaluate the factors controlling the biodiversity in the study area. The results indicate the abundance of the fiddler crabs allover the intertidal mud flat of the Bay and the total absence of either external and/or internal parasites in their tissues and organs.

The monitoring process revealed that, the fiddler crabs form mixed colonies with mudskippers and each crab digs its deep burrow where it hides from disturbances and during the high tide. Under certain conditions, the single crabs build polygonal territories of a size of about one meter, surrounded by dams, defended against rivals, and large enough to provide food.

The color of the fiddler crabs is dark brown or mud-colored and their eyes are on vertical stalks which can be lowered to lie flat along the front edge of their shells. They habitually wave one large claw in the air; and their other front claw is much smaller and more inconspicuous. Only the males have this large claw, which is almost as big as their whole body. Females have two small claws which are much more useful for feeding. To make up for only having one feeding claw, the males have to shovel their food in twice as fast as the females.

A forestation of intertidal zones with mangrove plantations is viable options to improve coastal environment and enrich marine biodiversity. These factors also protect the coastline from strong currents and support the accumulation of sediments and organic matter in the intertidal zones. These changes would improve the quality of mudflats and promote the survival and growth of marine fauna.

Key words: *Fiddler Crabs, Ocypodidae, Intertidal Zone, Parasites, Kuwait Bay*

INTRODUCTION

Kuwait is situated at the extreme Northwestern end of the Arabian Gulf between latitudes 28°30' and 30°05' North and longitudes 46°33' and 48°36' East. The State of Kuwait comprises the mainland and nine offshore islands, including the inhabited island of Failaka, the large low-lying muddy island of Bubiyan near the mouth of the Shatt Al-Arab, and seven small coral islands mostly in the South.

The climate is characterized by very hot,

dry summers and cool rainy winters. Dust and sand storms are common throughout the year.

The average annual rainfall in Kuwait City is about 111 mm, but other parts of the country receives as little as 23 mm or as much as 206 mm. Most of the rainfall occurs as light winter showers brought about by Westerly depressions. Summer temperatures are extremely high, often exceeding 45°C during July and August. In winter, temperatures often more than 20°C during the day, but then fall rapidly at night when frosts are not uncommon, especially in land. The humidity is generally high and often exceeds 90%.

The only natural wetlands in Kuwait are marine and coastal. The only significant freshwater wetland is a complex of shallow pools and marshes fed by sewage and other waste water in an area of Sabkha near the town of Al-Jahra at the West end of Kuwait Bay.

In recent years, increased developmental activities and misuse of native vegetation have largely degraded the coastal environment and marine ecosystems. Harsh weather conditions have also accelerated the disappearance of vegetation cover in both coastal and inland areas. Hence, the State of Kuwait has initiated greenery program to both beautify and enrich the living environment. The 290 km long coastline, of which approximately 57% is the intertidal zone, offers a good potential for greenery development (Abou El-Nil et al., 2001). Forestation of intertidal zones with mangrove plants is considered a viable option to improve coastal environment and enrich marine biodiversity. Mangrove plantations also protect the coastline from strong currents and support the accumulation of sediments and organic matter in the intertidal zones. These changes would improve the quality of mudflats and promote the survival and growth of marine fauna (Sbandar et al., 2001, Al Nafisi et al., 2009).

Rosenberg (2001) reported that fiddler crabs (Ocypodidae, *Uca*) are a well-known group of small, intertidal brachyuran crabs, characterized by strong sexual dimorphism and male asymmetry. The major claw is used for only two functions: display and combat; the minor claw is used for feeding. The waving display of male fiddler crabs serves a function in both male-male aggression and male-female species recognition and mate choice.

Fiddler crabs have been the subject of wide variety of studies, including sexual selection (Christy, 1983, 1987; Backwell et al., 1999), reproductive isolation (Salmon et al., 1978, 1979; Salmon and Kettler, 1987), visual and acoustic display (Salmon, 1965, Salmon and Atsaides, 1968, Hyatt, 1977, Hagen, 1983, 1984), combat(Crane, 1967, Hyatt and Salmon, 1978, 1979, Jennions and Backwell, 1996), foraging (Miller, 1961, Weissburg, 1992, 1993; Wolfrath, 1992), asymmetry (Huxley and Callow, 1933, Yamaguchi, 1973, Takeda and Murai, 1993), allometry (Veitch, 1978; Hagen, 1987), regeneration (Weis, 1977, Trinkaus-Randall, 1982, Hopkins et al., 1999), claw mechanics (Levinton and Judge, 1993, Levinton et al., 1995), morphometrics (Rosenberg, 1997), circadian rhythms (Palmer, 1988, 1989, 1991), color change histology(Coohill et al., 1970; Fingerman and

Fingerman, 1977; Hanumante and Fingerman, 1981), osmoregulation, heat tolerance (Vernberg and Vern-berg, 1968; Vernberg and O'Hara, 1972), visual neurology (Land and Layne, 1995a, b_ Zeil and Al-Mutairi, 1996, Zeil and Zanker, 1997, Layne, 1998), toxicity, environmental monitoring, and pollution (Devi, 1987, Weis and Kim, 1988, Ismail et al., 1991). Most studies have concentrated on just one or two species. This is due, in large part, to the lack of a good phylogeny with which to ground comparative studies in a phylogenetic framework (Harvey and Pagel, 1991).

Abdul-Salam et al. (1997) examined the prosobranch snail *Clypeomorus bifasciata* in Kuwait Bay for digenean infections over a one year period during 1994/1995.They examined a total of 1500 snails and 567 (37.8%) were found to harbor nine digenean species. The crab *Xantho exaratus* collected from snail sampling sites was heavily parasitized by microphallid metacercariae of the genera *Longiductotrema* and *Microphallus*. This was the first report on microphallid metacercariae in crabs in the Arabian Gulf region.

Clayton (1988) stated that the ocypodid crab *Cleistostoma kuwaitensis* inhabits the upper shores of the mudflats of Kuwait, where it constructs a semi-permanent mud hood over the entrance to its burrow. He collected data, between September and November 1986, on the distribution and orientation of the hoods and their openings to investigate the crab's social spacing system. Irrespective of density, the distribution of burrow hoods is non-random, tending towards a regular dispersion. A contributory factor for this dispersion pattern is that the surface hoods tend to increase the distance between adjacent burrows. The hood openings are randomly distributed with respect to compass direction but avoid directly facing those of nearest neighbours. In the absence of burrow plugging and eviction as used by other ocypodid crabs, construction of elongated hoods appears to be a good alternative for ensuring social spacing.

How et al. (2008) stated that fiddler crabs communicate by a sequence of waves and gestures; males have an oversized claw used in clashes of ritualized combat of courtship over a female and signal their intentions between conspecifics. The movement of the smaller claw from ground to mouth during feeding underlines the crabs' common name; it seems that animal plays the larger claw somewhat like a fiddle. The crab's smaller claw picks up a chunk of sediment from the ground and brings it to the mouth, where its contents are sifted through (making the crab a detritivore). After anything edible is salvaged (algae, microbes, fungus), the sediment is replaced in the form of a little ball.

Lailvaux et al. (2008) stated that fiddler crabs such as *Uca lactea mjoebergi* have been shown to bluff in regards to their fighting ability. Upon regrowing a lost claw, a crab will occasionally regrow a weaker claw that nevertheless intimidates crabs with smaller but stronger claws.

Lim (2006) compared the dimensions of crab burrows in two sympatric populations of fiddler crabs, *Uca vocans* and *U. annulipes*, to determine interspecies variation. Comparisons between the two species showed that the

descent slopes of the burrows were similar, indicating that there is no evidence to suggest that burrows of fiddler crabs in sandy habitats have steeper descent slopes than those in muddy habitats.

Hemmi and Zeil (2003) reported previously that fiddler crabs, *Uca vomeris* (McNeill), defend their burrows against intruders in a burrow-centered frame of reference. The crabs respond whenever an intruder approaches to within a certain distance of the burrow entrance, and this distance is independent of the approach direction. The crabs combine information from the path integration system on the location of their invisible burrow and visual information on the retinal position of an intruder to make this all centric judgment.

Mullica and Krisanadej (2004) studied the distribution, morphology, population density, and adult sex ratio of nine sub-species fiddler crabs in Southern Thailand. In four species, more than 50% of the males were right-handed. More than 50% of the males in eight out of the nine species had brachychelous claws. Only *U. tetragonon* males had brachychelous and leptochelous claws in equal proportions

Satoshi and Minoru (2003) examined the preference of the fiddler crab Uca panamensis for feeding substratum-sand or rock-and its manner of feeding. The crab made its burrow in the sand among rocks but preferred to feed on rocks. The feeding time decreased as the distance between the burrow and the rock increased to be a result of exclusive interaction among the crabs because they defended their feeding area on the rocks against others. The morphological alteration of the minor chelipeds, the application of water from the branchial chambers, and direct swallowing permit the fiddler crab to feed on fine materials attached to rocks.

Burford et al. (2001) stated that at each low tide, male and female *Uca tangeri* remove mudballs from inside their burrows and place them on the surface. Some females placed their mudballs in an arrangement similar to that of males. They investigated several factors that may have been responsible for this change in female mudballing behavior, and found that no significant effect of the lunar cycle, female size and reproductive state, or burrow features. The authors (ibid) discussed the avoidance of sexual coercion or parasite modification of host behavior as possible factors. They concluded that intersexual differences in mudballing behavior are more complex than previously thought.

Chen Lin et al. (2002) gave an integrative description of the correlation of physiological parameters of osmoregulation and the habitats of the four common Uca species in Taiwan. The results suggest that *U. formosensis* and *U. lactea* can sustain a wider range of salinity change through both modifications in gill morphology and Na+, K+-ATPase activity. *Uca arcuata* can regulate in a hypo-osmotic condition and *U. vocans* tends to be a weak osmoregulator

The fiddler crabs in Kuwait :

The fiddler crabs in Kuwait are dark brown or mud-colored and can be recognized as belonging to the same group as the ghost crab because they all have eyes on vertical stalks

which can be lowered to lie flat along the front edge of their shells. The fiddler crabs, so called because they habitually have one large claw in the air rather like a demented violinist. The crab's other front claw is much smaller and more inconspicuous. Only the males have this large claw, while as females have two small claws which are much more useful for feeding. Clayton and Wells (1994) stated that the males have to shovel their food in twice as fast as the females, because they only having one feeding claw.

The large claw may be either on the right or the left, but individual colonies usually have a preponderance of one or the other. The big claw is used to advertise a male's breeding condition and to threaten other males. They are territorial in defense of their burrows, and during the breeding season a male will keep the same burrow for a new several days. But at other times they are nomads who wander around and either build a new burrow every time the tide comes in, or else simply sun down into so. If a wandering male approaches a breeding male they will engage in ritual combat, waving their claw at each other from a safe distance, and making noises by rubbing bits of their body together, or drumming their legs on the ground or against their hard shell. No damage is ever done in such stylized conflicts. But you will often see these large claws lying around on the mud. This is usually the result of a dispute over a burrow, when one fiddler crab has evicted another from its burrow by hauling it out bodily.

Clayton and Wells (1994) also, reported that there are two different species of fiddler crabs in Kuwait and they each have a distinctive way of waving their claws to tell each other apart. They are found at the top of the muddy shore and the best places to see them are along the North shore of Kuwait Bay beyond Jahra.

The Coast Characteristics

Coastal habitats in Kuwait range from exposed beaches to rocky highlands. Sand, silt and clay exist on both intertidal and sub-tidal littoral zones. Artificial structures (platform, jetties, etc.) and offshore islands play a considerable role in the variability of resources existing in Kuwait. Jones (1985) reported that the interaction of the physical factors produces a severe regime for the marine biota on the coastal and marine habitats in the Arabian Gulf, especially intertidally, so that diversity is lower within the inner part of the area than in the gulf of Oman and the Indian Ocean in general.

Although biological and ecological data on the marine biota of the region is limited, with some coastal areas receiving more attention than others at least four critical marine habitats, coral reefs, intertidal marshes, mangrove and sea grass beds, and kept forest, have been recognized in the region (Price et. al., 1993).

Based on the sediment nature and morphology, the coastal zone of Kuwait was classified into two main provinces: Northern muddy (material finer than 62.5 microns) province and Southern rocky/sandy (coarser than 62.5 microns) province. These provinces were subdivided into several zones (Abou-Seida and Al-Sarawi, 1990).

One of the features of the Kuwaiti marine environment is Kuwait bay which is an elliptically shaped bay that protrudes from the Arabian Gulf in Westward direction at its Northwestern corner. It is of a moderate size (850 km_) with an average water depth of 5 m and a maximum depth of 20 m at the entrance (Al-Ghadban, 2004). The Northern shoreline is a pristine shore and in contrast, the Southern part the bay hosts urban activities, major ports such as Shuwaikh and Doha Ports and three major power and desalination plants (Doha East, Doha West and Subiya). Al-Yamani et al. (2004) stated that Kuwait Bay presents a unique ecosystem and a significant nursery ground for many fishes and shrimp species.

Based on the data given by Dames and Moore (1983) and Samhan et al. (1986), the water quality in Kuwait Bay and Khor Al-Subiya is acceptable. Dissolved oxygen levels are above minimum accepted limits, biological oxygen demand is low, trace metal concentrations are also low, and pH values are within acceptable limits. Moreover, strong tidal currents provide good flushing of the water of the bay and about 30% of the water of the bay is exchanged in a normal tide cycle (Al-Ghadban and Al-Ajmi, 1993). Other physical and chemical parameters such as alkalinity, phosphorous level, salinity, and oil and grease are within acceptable and normal values for this region of the world.

The situation is somewhat different along the coastal zone. This area is exposed and stressed as a result of the extensive man-made activities, such as dredging, indiscriminate solid and liquid waste disposal and over fishing. In their extensive study for the coastal area of Kuwait, Al-Bakri et al. (1985) have concluded that the alteration of the coastal zone has resulted in more impact to the ecosystem compared to the harsh environmental condition. Al-Ghadban et al. (1992) stated that the environmental condition of the coastal area became more critical as a result of the war-related activities.

Sulaibikhat embayment is located in the Southern part of Kuwait Bay. It is a shallow water body with a maximum 4 meter water depth and a muddy bottom. It hosts urban activities and several discharge point sources such as sanitary, wastewater and emergency outlets. Previous studies on sediments quality of Sulaibikhat embayment reported higher concentrations of total petroleum hydrocarbons, polycyclic aromatic hydrocarbon and aliphatic hydrocarbons Such contaminants were attributed to the effect of Shuwaikh and Doha ports and the discharge points in the bay (Khan et aI., 1999).

Higher values of total organic carbon content (more than 3%) were reported in the area (Al-Ghadban et al., 1994). The Sula'ibikhat embayment is the most vulnerable area with an increase concentration of pollution load, and therefore, recommended a rehabilitation plan for the area (El-Sammak et al., 2005).

Parasitic infection in fiddler crabs

Parasites of fiddler crabs were studied by some authors (Ahmed, and Khan, 1976, Wong et al., 1989 and Anderson, 2000). Nickol et al. (2002) studied cystacanths of *Hexaglandula corynosoma* which were discovered in the fiddler crabs *Uca spinicarpa* and *Uca rapax*

collected in Mississippi and Florida. This is the first record of H. corynosoma from the United States and the first record of an intermediate host for any species of the genus. This is the first report of an intermediate host for A. frassoni.

Roccatagliata and Jordá (2002) discussed the infestation of the fiddler crab *Uca uruguayensis* by *Leidya distorta* (Isopoda, Bopyridae) from the Río de La Plata estuary, Argentina.

Cremonte et al. (2007) studied the larval Spirurida (Nematoda) parasitizing two crab species (*Uca uruguayensis* and *Chasmagnathus granulatus*) from the Southwest Atlantic coast of Argentina. They reported that the presence of these larval nematodes in both crab species may be influenced by the similarity in the crabs' habitat and feeding behavior. Both species of burrowing crabs inhabit the upper intertidal zones and feed on sediments, and consequently, they have similar chances of coming into contact with eggs and infective larval nematodes deposited in the feces of birds and fish definitive hosts.

Smith et al. (2007) stated that fiddler crabs (*Uca* spp.) are common inhabitants of temperate and tropical coastal communities throughout the world. As second intermediate hosts for trematodes, they investigated patterns of host distribution and parasitism for three species of sympatric fiddler crabs. They reported that fiddler crab distribution varied among species, with *Uca speciosa* dominating the low and mid intertidal regions of mangrove banks. The authors (ibid) suggested that differences in parasitism are driven by host selection.

MATERIALS AND METHODS

The studied fiddler crabs in the present study are monitored along the Kuwait Bay shores (Fig. 1) during the hot Summer season, near delivery hospital, Shuwaikh area, Kuwait Governorate. They are particularly abundant in the muddy shore. However, a number of fifty mudskipper samples are collected randomly to be examined for external and internal parasites.

The procedure followed for monitoring the mud skippers is described by Clayton and Wells (1994), that comprises using a sheet of plywood or a big stone to help to distribute our weights more evenly across the mud, as a surface crust of dried mud may seem quite hard, but if it cracks one, and one will sink right down into the soft ooze below. But if one chooses the right type of shore he should be able to observe the mudskippers from the safety of dry land. Fifty samples of fiddler are collected and examined dissected in the laboratory for external parasites and detecting of internal parasites.

The fiddler crabs have been monitored in the study area close to their colonies. Any foot motion or disturbance were gave rise escaping the crabs, therefore they will move quickly into their burrows until the environment seems to be quite (Fig. 2). Different behaviors are also observed of the crabs, among them the differences between the males and the females in the colony.

Fig. 1 : Kuwait Bay shoreline and mudflat, State of Kuwait.

RESULTS AND DISCUSSION

Rosenberg (2001) stated that the fiddler carbs (*Ocypodidae Uca*) are well known group of small, intertidal brachyuran crabs, characterized by strong sexual dimorphism and male asymmetry.

Crabs of the genus Uca are found in intertidal sheltered zones of tropical and subtropical regions, burrowing in the sediment and feeding on sedimentary organic matter.Their digging activity causes bioturbation that effects the nutrient cycling and promotes transfer of energy and nutrients to nearby estuaries (Colby and Fonseca, 1984, Genoni, 1991, Castiglioni and Negreiros-Fransozo, 2006).

Fiddler crabs are important dietary items for a large number of fishes, birds and mammals, being responsible for a significant part of the macrobenthic production in the intertidal zone (Koch et al. 2005, Masunari, 2006). Uca males have one cheliped much larger than the other, in females both chelipeds are small (Fig. 3).

The major cheliped plays an important role in agonistic behavior and in courtship (Crane 1975). It develops until the animal becomes sexually mature (Masunari and Ayoub, 2003). There is a close relationships between the size and form to feeding, and habitat occupation, among other ecological features, influencing the fitness of an organism, being the result of evolutionary processes (Peres Neto, 1995).

Fig. 2 : The fiddler crab, respond to us by retreating quickly into his burrow.

A) **B)**

Fig. 3 : A) The Male crab and **B)** The Female crab.

Because the size of the food of fiddler crabs is so small, they must eat a large amount of it, which can become quite time consuming. This makes eating the largest activity in the day. The rest of the day, fiddler crabs spend hiding from potential predator. Whenever the fiddler crabs see any kind of movement that may be a potential predator, they will quickly run into their burrow for safety. They may remain in their burrows from 20 seconds to1 minute until some crabs come out of their burrows to see if the dangerous predator has gone (Figs. 4 and 5).

Fig. 4 : The crabs burrows.

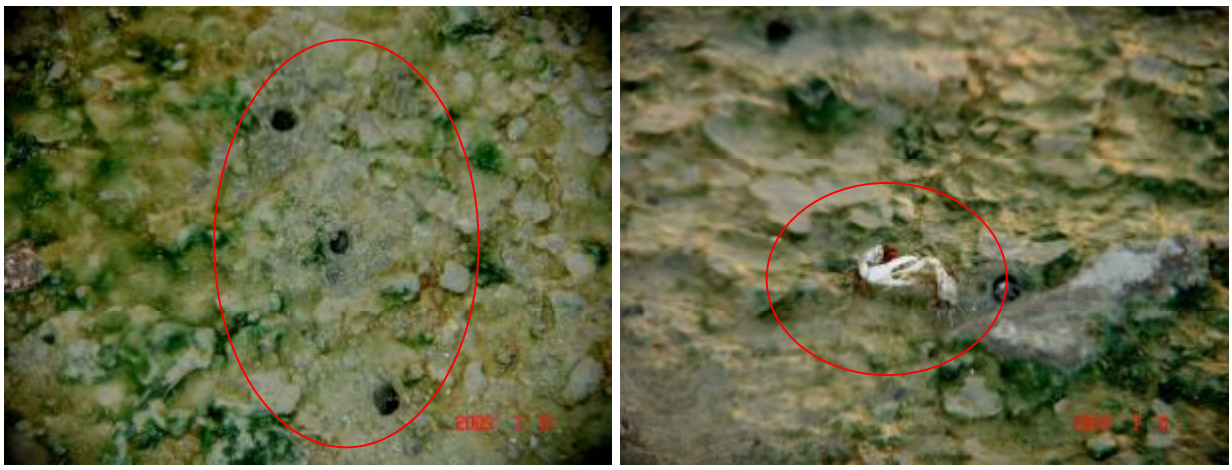

Fig. 5 : The fiddler crabs are recognized by the male distinctively asymmetric claws.

Fiddler crabs are considered as food for many animals including sea gulls and refuge birds. Territorial, decorating, and scavenger are some other behaviors noted among fiddler crabs. After the crab has eaten the food, it will spit out sand granules that were mixed with the food.

The sand, the crab will make little balls and combine them together making big sand balls. This appears to be a territorial behavior because the crab does this action near his burrow. The fiddler crab will then decorate its burrow by strategically moving the sand balls around into mounds. Fiddler crabs are also scavengers, as they drag things like seaweed and sticks into their burrows. The crabs seem to have their own area in which they build their burrows, decorate, and eat; if another crab comes into that area the crab which "owns" that spot will push him out of the area.

Al-Nafisi et al. (2009) reported that important outside factors occurred in Kuwait Bay and impacting Sulaibikhat embayment need to be considered when assessing the water quality. These factors are the discharge of approximately 30, 000 cubic meters of untreated sewage water and the shut down of the sea water injection plant North of Kuwait Bay (used to inject treated sea water in oil wells to maximize oil production) that lead to release of highly toxic and biocidal bacteria. Such factors combined with the heat and humidity and low evaporation rate may have lead to the recent fish kill accident that happened in August 2001. Al-Nafisi et al. (2009) also, concluded that at the long run an increased population and diversity of fauna followed by richness of animal species will lead to a better environment and good rehabilitation of this stressed area.

Jennions et al. (2003) stated that the fiddler crabs, *Uca lactea perplexa,* respond to potential predators by retreating into their burrows. This is noticed clearly in the present study. Time inside the burrow during unprovoked retreats during normal activity provides a 'null model' to test whether sex, tidal cycle and body size affect hiding time from potential predators. Jennions et al. said that using experimentally created predator-like stimuli made the males hid for significantly longer than females, and larger crabs of both sexes also hid for longer. This differs from burrow use during unprovoked retreats, suggesting hiding time varies depending on the potential risk of predation on re-emergence. If risk prior to hiding predicts risk on emergence, the closer the proximity of a predator-like stimulus when first encountered the longer crabs should hide. This result accommodates with the result of the present study. The results of Jennions et al., (2003) suggest prey can use stimuli prior to hiding to predict predation risk on re-emergence, but studies on predators are required to test this claim. This result agrees with the result of the present study. No external, and internal parasites were detected in the 50 randomly chosen fiddler crabs, this result needs more studies.

CONCLUSIONS

The present work deals with monitoring fiddler crabs in the intertidal zone along the Kuwait Bay muddy shores. However, fifty samples of fiddler crabs are collected during the hot Summer season of the year 2009 and

examined for external and internal parasites and to evaluate the factors controlling the biodiversity in the area. The results indicate the abundance of the fiddler crabs allover the intertidal mud flat of the Bay and the total absence of either external and/or internal parasites in their tissues and organs.

The monitoring process revealed that, the fiddler crabs form mixed colonies with mudskippers and each crab digs his own deep burrow where it hides from disturbances and during the high tide. Under certain conditions, the single crabs build polygonal territories of a size of about one meter, surrounded by dams, defended against rivals, and large enough to provide food.

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A forestation of intertidal zones with mangrove plantations is viable options to improve coastal environment and enrich marine biodiversity. These factors also protect the coastline from strong currents and support the accumulation of sediments and organic matter in the intertidal zones. These changes would improve the quality of mudflats and promote the survival and growth of marine fauna. However, important results concerning the factors controlling the biodiversity are arrived and recommendations for preserving the intertidal zone fauna are given.

RECOMMENDATION

Further environmental studies on the Bay are recommended to evaluate the probable reasons of absence of either external and/or internal parasites in the fiddler crabs.

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Received on 10 / 1 / 2010

الملخص العربى

دراسات على القباقب العابثة، عازفة الكمان (أكيبوديدى، يوكا) فى المنطقة المدية من جون الكويت

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باحث بيئى ، الكويت[1]

يتضمن هذا البحث مراقبة القباقب العابثة (عازفة الكمان) فى المنطقة المدية من الشواطىء الطينية فى جون الكويت، وقد تم تجميع عدد ٥٠ عينة من هذه القباقب خلال فترة الصيف الحار من عام ٢٠٠٩، وتم فحصها للإصابة بالديدان الطفيلية، وكذلك لتقييم العوامل المنظمة للتنوع الحيوى بهذه المنطقة.

وأشارت نتائج البحث إلى كثرة أعداد القباقب العابثة وانتشارها فى المنطقة المدية الطينية فى جون الكويت، مع ملاحظة الغياب التام للطفيليات سواء الخارجية أو الداخلية فى أنسجة وأعضاء القباقب المدروسة، وأظهرت نتائج البحث أن هذه القباقب العابثة تقوم ببناء مستعمرات مشتركة مع حيوان نطاط الطين (نطاط الوحل) وأن كل قبقب يقوم بحفر حجره الذى يلجأ إليه من الضوضاء وللاختباء عند إرتفاع المد.

وتحت ظروف معينة يقوم كل قبقب ببناء منطقة مضلعة تبلغ مساحتها متر واحد، وتكون محاطة بأسوار للحماية من القباقب المجاورة المنافسة له، بالإضافة إلى أنها تكون كافية لتوفير الغذاء له، ويتراوح لون القباقب العابثة بين اللون البنى الغامق وبين لون الطين، وتكون الأعين موجودة على سيقان باستطاعتها أن تنزل طولها ليصبح بمحاذاة الحافة الجانبية للدرقة التى تحيط بها، ومن المألوف والمعتاد أن تلوح القبقاب العابثة بمخلب كبير واحد فى الهواء، فى حين أن المخلب الآخر يكون صغيراً، وهذا المخلب الكبير موجود فقط فى الذكور وهو يقارب فى حجمه حجم الجسم كله، والإناث لها مخلبين صغيرين يساعداها فى التغذية كثيراً، ونتيجة لوجود مخلب واحد فى الذكور لتناول الغذاء، فالذكور تضطر لجرف غذائها بضعف سرعة الإناث.

إن تحريج المناطق المدية بنبات المانجروف هو إحدى الخيارات القابلة للتنفيذ والتى تفيد وتحسن البيئة الشاطئية وتزيد غنى التنوع الحيوى البحرى، وهذه العوامل كذلك تحمى الشاطىء من التيارات القوية وتدعم تجمع الترسبات والمواد العضوية فى المناطق المدية، إن هذه التغيرات تحسن جودة الترسبات الطينية وبالتالى نمو الحيوانات البحرية، وعلى العموم، فإن هناك نتائج مهمة تم إستخلاصها من البحث الحالى تتعلق بالعوامل المنظمة للتنوع الإحيائى، وهناك كذلك توصيات للمحافظة على الحيوانات فى المنطقة المدية.

JOESE 5

STUDIES ON THE FIDDLER CRABS (*Ocypodidae, Uca*) IN THE INTERTIDAL ZONE OF KUWAIT BAY

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Reprint

from

Journal of Environmental Sciences, 2010; Vol. 39, No. 3

http://www.mans.edu.eg/facscim/english/MJI **ISSN 1110-192X**