



The Abundance and Composition of Crabs (Decapoda) in Uta Ewa Brackish Water, Akwa Ibom State, South-South, Nigeria

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ABSTRACT: Study on the abundance and composition of crabs in Uta Ewa brackish water was carried out between January and May 2012 at two sampling stations. The physicochemical parameters of the water were measured *in situ* using standard methods according to APHA (1998). Crabs species were collected at two sampling stations using square lift net trap, while at low tide, crab species were collected by hand-picking at random and preserved in a chest box for identification. Air and Water temperature ranges from 27.9-31.6 °C and 28.2-28.9 °C respectively, while Dissolved Oxygen and Salinity were between 3.28-4.09 mg/L and 7.5-12.9 ppt respectively. The results of the physicochemical parameters were within limits of the National Environmental Standards and Regulations Enforcement Agencies for aquatic life. A total of 107 crabs were collected from the two sampling stations. *Goniopsis pelii* was the most abundant in Station 1 accounting for 57.9%, followed by *Callinectes amnicola* 26.3%, while in Station 2, *Callinectes amnicola* was the most abundant accounting for 46.6% of the percentage abundance. Station 2 had the highest Shannon diversity index of 1.22, while Station 1 had 1.15. The abundance and composition of crab species in the study areas is an indication that the area is an important ecological zone for benthos macroinvertebrates conservation. © JASEM

<http://dx.doi.org/10.4314/jasem.v20i4.3>

Keywords: Uta Ewa, Brackish Water, Physicochemical Parameters, Abundance, Composition, Crab species,

Crabs are highly important group and are one of the most common marine decapods, with approximately 5000 species described worldwide (Braga *et al.*, 2005).

Although there are some freshwater and brackish water forms occupying the littoral, supra littoral and even up shore zones, they are also dominant in many estuarine habitats where salinity and temperatures can fluctuate dramatically daily (Ng *et al.*, 2008). The majority of crab species occur in tropical and subtropical regions as compared to temperate and cold regions (Fransozo and Negreiros-Fransozo, 1996; Boschi, 2000).

In the benthic communities, the crabs contribute immensely to the biodiversity and ecosystem function, while they are also source of human food (Hendrickx, 1995). Crabs are important within estuarine food webs, providing food for fish (Thomas *et al.*, 1990; Heck and Coen, 1995). According to Heck and Coen, (1995), the estuarine and mangroves are major nursery grounds for a variety of juvenile fish and many of these fish are dependent on crab larvae for food. Also, it is reported that crabs together with other macro-benthic invertebrates, constitute the link between the unavailable nutrients in detritus and useful protein materials in fish and shellfish (Adebisi, 1989; Ajao and Fagade, 1990; Idowu and Ugwumba, 2005). The abundance and composition of living organism in any aquatic habitat is very important in the measure of the productivity and quality of the aquatic environment. In brackish and mangrove environment in tropics and sub-tropics; *Geryonmaritae*, *Ocypode africana*, *Goniopsis pelii*, *Sesarma reticulatum*, *Uca tangerii*, *Callinectes amnicola*, *C. pallidus*, *C. marginatus*, *Cardiosoma*

armatum and *Gecarcinus weileri* are the common crab species that are found (Fransozo and Negreiros-Fransozo, 1996).

The crab species, *Callinectes amnicola*, *Ocypode africana*, *Sesarma reticulatum* along with *Goniopsis pelii* and *Uca tangerii* are reported to be the most abundant crab species in the water bodies of the brackish and mangrove environment in Nigeria as reported by Chindah *et al.*, (2000) in New Calabar River, Cross River State; Lawal-Are and Kusemiju, (2000) in Badagry Lagoon, Lagos State, and Onadeko *et al.*, (2015) in Lagos Lagoon, Lagos State. The dearth of baseline information on the abundance and composition of crabs species in Uta Ewa brackish water, Akwa Ibom State, Nigeria, form the objective for this study.

MATERIALS AND METHODS

Study Area: Uta Ewa estuary is located at latitude 40°32' to 40°52'N and longitude 70°25' to 70°45'E (Fig. 1). The estuary lies on the western bank of Enong creek about 12km from the mouth of Imo River, where drainage has broken the coastal area into a jigsaw of irregular shaped tidal flat. Characteristically, the area is typical of an estuarine tidal water zone with fresh water input from Imo River and with extensive mangrove swamps and intertidal mud flats. The estuary is bounded by thick mangrove dominated by *Rhizophora* species and interspersed by *Nypa* palm. The main occupation of the people occupying the areas is fishing; other activities such as trading on fish; both fresh and smoked, fire wood cutting and water transportation system are also carried out.

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Two sampling stations with unique ecologically setting and human activities were established along the length of the estuarine. The sampling stations were about two kilometres apart from each other.

Station 1 is located upstream of the Uta Ewa estuary with human settlement and local market on the left flank of the shoreline. Vegetation is sparse with mainly mangrove *Rhizophora* sp. and *Nypa* palm. The station is very shallow and the bottom when expose at low tide is made of fine sand. Human

activities included; logging of the mangrove, sand dredging, washing of boats, canons and fishing nets, and swimming.

Station 2 is situated downstream of the estuary with no human settlement. On the shorelines are thick vegetation of mangrove *Rhizophora* sp. and *Nypa* palm. The station is slightly deep and at low tide, the greater part of the bottom mud flat is exposed. Human activities in this station are minimal, with only fishing activity

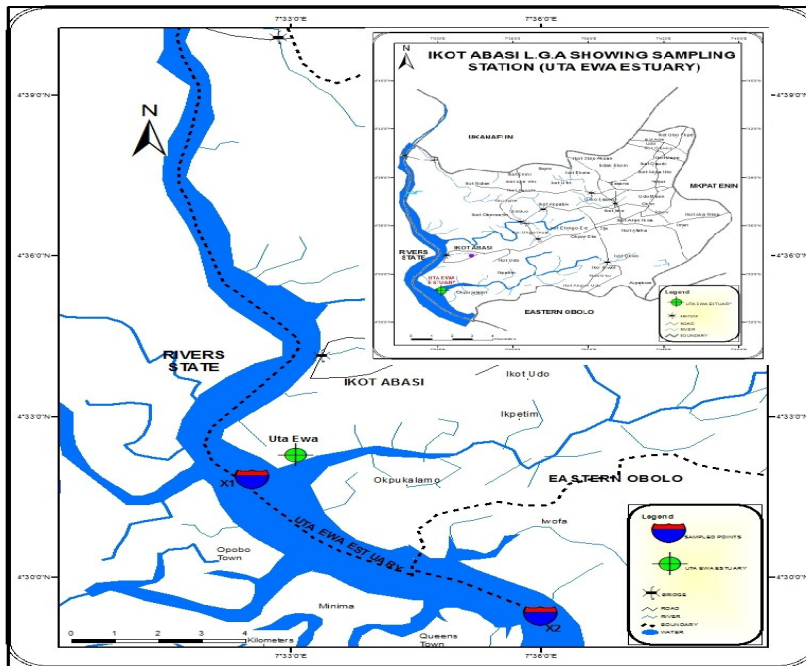


Fig 1. Map of study area showing Uta Ewa Beach and the sampling stations

Physico-chemical parameters: The following physical and chemical parameters were determined: air temperature, water temperature, pH, Dissolved Oxygen (DO), depth, transparency, salinity. Apart from air and water temperature, transparency, salinity and depth were done in situ, Dissolved Oxygen was determined in the laboratory. Surface water samples were collected in 2L Glass bottles containers after they were rinsed with distilled water from each sampling stations.

Determination of Temperature: Temperature was taken using a centigrade mercury-in-glass thermometer. Air temperature was measured by holding the thermometer in the air for 3 minutes. Water temperature was measured by inserting the thermometer to a depth of 10cm into the water for 3 minutes. Reading was taken three times and mean

value recorded. The results were expressed as degree Celsius (°C).

Determination of Dissolved Oxygen (DO): Water samples from each station was collected into 250mL stoppered samplings bottles without air bubbles and fix immediately with Manganous sulphate solution and Potassium iodide, sodium hydroxide and sodium azide solution. In the laboratory, the DO concentration of the water sample was determined using the azide modification of the iodometric method as reported by (APHA, AWWA, WEF, 1998). The result was expressed as mg/L.

Determination of Salinity: An Extech meter Model ExStik EC400 was used to measure salinity. The meter was calibrated with 3.3mol solution of potassium chloride. The glass electrode of the meter was inserted into the water sample after being rinsed

with distilled water and measurement was taken after the reading had stabilized. The result for salinity was expressed as part per thousand (‰).

Determination of pH: The pH was measured using electronic pH meter (Oakton waterproof Instruments pHtestr 10). The pH meter was standardized using prepared buffer solution according to the manufacturer's instruction. Water sample was put into a beaker after it was rinsed with distilled water. The glass electrode of the meter was inserted into the water sample and measurement was taken after the reading had stabilized.

Determination of Water Depth: An improvised long pole was dipped into the river; the pole was marked and later measured out with a measuring tape. The results was expressed as meter.

Determination of transparency: Transparency was measured using a Secchi disc measuring about 20cm in diameter. The Secchi disc was lowered into the water and the suspended rope that was marked was later measured out. The result was expressed as meter.

Collection of Crab Species: Crab species were collected between January and May 2012 at two (2) sampling points. Crabs species were collected using

square lift net trap, while at low tide, crab species were collected by hand-picking at random. The crabs collected were preserved in a chest box in the field and later transferred to the Department of Zoology Laboratory, University of Uyo, for sorting and identification according to Lawal-Are (2009).

Identification of Crab Species: The collected crabs were identified to species level using identification keys provided by Schneider (1990); Dahdouh-Guebas *et al.* (1999); Martin and Davis (2001).

Data Analysis: Microsoft Excel (2007) was used for Data analysis for the percentage composition and abundance of the crabs, mean and standard deviation of the physicochemical parameters of the study stations, while version 3 of PAST Software Design was used to determine the Shannon Diversity index of the Crabs community composition.

RESULTS AND DISCUSSION

The results of the physicochemical parameters measured in Uta Ewa brackish water is presented in Table 1

Table 1: Showing the physicochemical parameters measured in Station 1 and 2 in Uta Ewa blackish water

Parameter	Station 1		Station 2	
	Range	Mean±SD	Range	Mean±SD
Air Temperature (°C)	27.9-31.6	29.86±1.55	28.6-30.3	29.56±0.69
Water Temperature (°C)	28.2-28.9	28.4±0.29	28.1-28.9	28.36±0.36
Dissolved Oxygen (mg/L)	3.28-4.09	3.71±0.40	3.55-3.79	3.68±0.10
Salinity (ppt)	7.5-12.9	10.14±2.53	0-4.3	2.98±2.05
pH	7.3-7.7	7.44±0.19	6.40-7.0	6.74±0.24
Depth (m)	2.5-11	5.48±3.30	1.50-4.0	3.24±1.12
Transparency (m)	0.45-0.83	0.66±0.19	1.10-1.65	1.50±0.23

The lowest mean air temperature (29.56±0.69) was reported in Station 2 while the highest mean value was reported in Station 1 (29.86±1.55). The lowest mean water temperature; 28.36±0.36, was reported in Station 2, while the highest mean value was reported in Station 1. The lowest mean dissolved oxygen; 3.71±0.40, was recorded in Station 1 while the highest mean value (3.68±0.10) was recorded in Station 2. The lowest mean salinity (2.98±2.05) was recorded in Station 2 while the highest mean value; 10.14±2.53, was recorded in Station 1. Higher pH were recorded in Stations 1 while the lowest was in Station 2. Station 2 recorded the lowest mean water depth while the highest mean value was in Station 1. Transparency recorded the lowest mean value in Station 2 while the highest was recorded in Stations 1.

The physicochemical parameters of any water body are vital ecological factors, as it directly affects

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oxygen consumption, metabolism, growth, moulting, hormones and survival of crustaceans (Chen *et al.*, 1995; Medesani *et al.*, 2001; Onadeko *et al.*, 2015). The results for physicochemical parameter in Uta Ewa Brackish water were within limit as recommended by National Environmental Standards and Regulations Enforcement Agencies (NESREA) for aquatic life. Although salinity was low in Station 2, this could be attributed to the intrusion of freshwater into the brackish water during low tide. Similar results were also reported by Vanessa *et al.*, (2014) of fluctuation in salinity during high and low tides in Wouri Estuary, Douala, Cameroon.

Crabs Composition and Abundance: The Composition of crab species encountered in Uta Ewa brackish water is showed in Table 2, while Plate 1-3 are pictures of the crabs species encountered during the study period

Table 2: The composition of crab species encountered in Uta Ewa brackish water

S/N	Family	Crab species	Common names
1	Grapsidae	<i>Goniopsis pelii</i>	Purple mangrove crab
2	Gecarcinidae	<i>Cardisoma armatum</i>	Land crab
3	Ocypodidae	<i>Ocypode africana</i>	Ghost crab
4	Portunidae	<i>Callinectes amnicola</i>	Swimming crab
5	Xanthidae	<i>Panopeus africanus</i>	



Plate 1: *Callinectes amnicola* (Swimming crab)



Plate 2: *Panopeus africanus*



Plate 3: *Cardisoma armatum* (Land crab)

A total of 107 crabs belonging to five families were recorded. *Goniopsis pelii* was the most abundant in Station 1 accounting for 57.9% of the percentage abundance, followed by *Callinectes amnicola* 26.3%, while in Station 2, *Callinectes amnicola* was the most abundant accounting for 46.6% of the percentage abundance. Station 2 had the highest Shannon diversity index of 1.22, while Station 1 had 1.15 (Table 3).

Table 3: The Relative abundance and Shannon diversity index of the crab species in Stations 1 and 2

S/N	Crab species	Station 1	Relative abundant (%)	Station 2	Relative abundant (%)	Total
1	<i>Goniopsis pelii</i>	11	57.9	30	34.1	41
2	<i>Cardisoma armatum</i>	-	-	3	3.4	3
3	<i>Ocypode africana</i>	2	10.5	10	11.4	12
4	<i>Callinectes amnicola</i>	5	26.3	41	46.6	46
5	<i>Panopeus africanus</i>	1	5.3	4	4.5	5
	Total	19		88		107
	Shannon Diversity index (H')	1.15		1.22		

The Purple mangrove Crab; *Goniopsis pelii*, was the most abundant crab species encountered in Station 1, although the station is characterised with few mangrove *Rhizophora* species and nypa palms, the fine sandy bottom and highly perturbed activities by

humans may have resulted in lower abundant and composition of crabs in the station as compared with Station 2 with muddy bottom. The Swimming crab; *Callinectes amnicola*, accounted for the highest abundant, while the Land crab; *Cardisoma armatum*

accounted for the least abundance of the five families. This result disagreed with results of Cannicci *et al.* (1995) in Kenyan coast and Onadeko *et al.* (2015) in Lagos Lagoon coast, who reported that the Land crab was the most abundant in mangrove swampy areas. The Land crab; *Cardiosoma armatum* was not encountered in Station 1 and this could be explained by the fact that the species thrive well in amphibious areas as also reported by Onadeko *et al.*, (2015) a characteristic feature of Station 2 in the study area. The *C. armatum* were very sensitive to any slightest disturbance thus burrowing very fast. *Callinectes amnicola* is the most important and valuable edible crab at the coastal region (Chinadah *et al.*, 2000; Lawal-Are and Kusemiju, 2000). The Mangrove crab, *Goniopsis pelii* was restricted to its swampy, marshy environment covered with mangrove nypha palms. *Ocypode africana* (Ghost crab) occurred on the sand column in the superlittoral zone nearer to the brackish water, emerging from their burrows when the tide is low and they are also noted to have affinity for foraging to survive (Strachan *et al.*, 1999).

Conclusion: The composition and abundance of crabs species in the study areas is an indication that the area is an important ecological zone for macro-invertebrates conservation, so as to sustain its biodiversity which play a vital role in aquatic ecological services. *Callinectes amnicola* was the most abundant and are economically important species locally; hence the need to integrate a sustainable management practices as they are hunted on a daily basis.

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