of Jimson weed during gestation. *Veterinary & Human Toxicology* 23:413-415.

Mackereth, F.J.H. (1963) *Some methods of water analysis for Limnologists* Fresh water Biological Association Publication No. 21 70pp.

Manandhar, N.P. (1995) Inventory of some herbal drugs of Myagi district Nepal. *Economic Botany* 494:371 – 379.

Okwuosa, V.N. and Omoregie, E. (1995). Acute toxicity of alkybenzene sulphonate (ABS) detergent to the toothed carp, *Aphyosemion gairdneri* (L) *Aquaculture Research* 26; 755-758.

Omoregie, E., Ofojekwu, P.C. Anosike J.C. and Adeleye, A.O. (1998). Acute toxicity of malachite green to the Nile tilapia, Oreochromis, niloticus *(L).* Journal of Aquaculture in the Tropics *(13) 4. 233 – 237.*

Shah, N.C. (1982). Herbal folk medicines in northern India. *India Journal of Ethopharmacology* 63:293 – 301.

UNEP (United Nations Environmental Programme) (1989). *Estimation of the acute lethal toxicity of pollutants to marine fish and invertebrates.* Reference methods for marine Pollution Studies No. 43, 27pp.

Wise, M.L., Statiable, C.L. and Grizzle, J.M. (1987). Acute toxicity of Nitrofurazone to channel catfish, *Ictalurus punctatus and goldfish. Carassius auratus. Bulletin of Environmental Contamination and Toxicology* 38, 42 – 46.

Zagari, A. (1992) *Medical Plants* 5th Ed., Tehran University Publication, Tehran, Iran. 889pp.

ASPECTS OF THE BIOLOGY OF THE LAGOON CRAB, *CALLINECTES AMNICOLA* (DEROCHEBURNE) IN BADAGRY, LAGOS AND LEKKI LAGOONS, NIGERIA.

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ABSTRACT

A preliminary report of the size, composition, growth pattern and food habits of the blue crab, *Callinectes amnicola* (De Rocheburne) in the Badagry, Lagos and Lekki Lagoons is presented. The collection of crabs from the three lagoons covered the period May 1999 to October 2000. The carapace length of the crabs for Badagry lagoon ranged from 2.2cm to 16.4cm with weight of 4.4g to 252.6g. The crabs showed a unimodal size distribution. For the Lagos Lagoon, crabs sizes ranged from 3.5cm to 16.8cm and weighted 3.2g to 277.1g. The sizes of crabs in the Lekki Lagoon ranged from 3.5cm to 16.1cm and weighted 3.5g to 262.7g. Crabs from the three lagoons exhibited negative allometric growth. The food items of the crabs were similar in the three lagoons and comprised mainly of mollusc shells, fish parts, shrimps and crab appendages and occasionally of higher plant materials.

INTRODUCTION

The blue crab, *C ammicola* is a very popular food item in the diet of the coastal communities in West Africa. It is caught in the creeks, lagoons and the adjacent inshore marine waters. Previous reports on its occurrence in the Lagos Lagoon where it supports a major fishery were made by Fagade (1969) and Solarin (1998). The fishery was carried out mostly by women during the rainy season (June to November). Aspects of the biology of the blue crab in the Badagry lagoon was studied by Lawal-Are (1998).

Williams (1974) reported the occurrence of the crab along the coast of Senegal to Cameroon while Kwei (1978) studied the size composition, growth pattern and maturity in Mukwe and Sakumo Lagoons in Ghana. This is a preliminary report on aspects of the biology of *C. amnicola* in the Badagry, Lagos and Lekki Lagoons. three major lagoons in South – Western Nigeria.

MATERIALS AND METHODS

The Badagry, Lagos and Lekki Lagoons (Fig. 1) are part of a continuous system of creeks and lagoons lying along the coast of Nigeria from the border with the Republic of

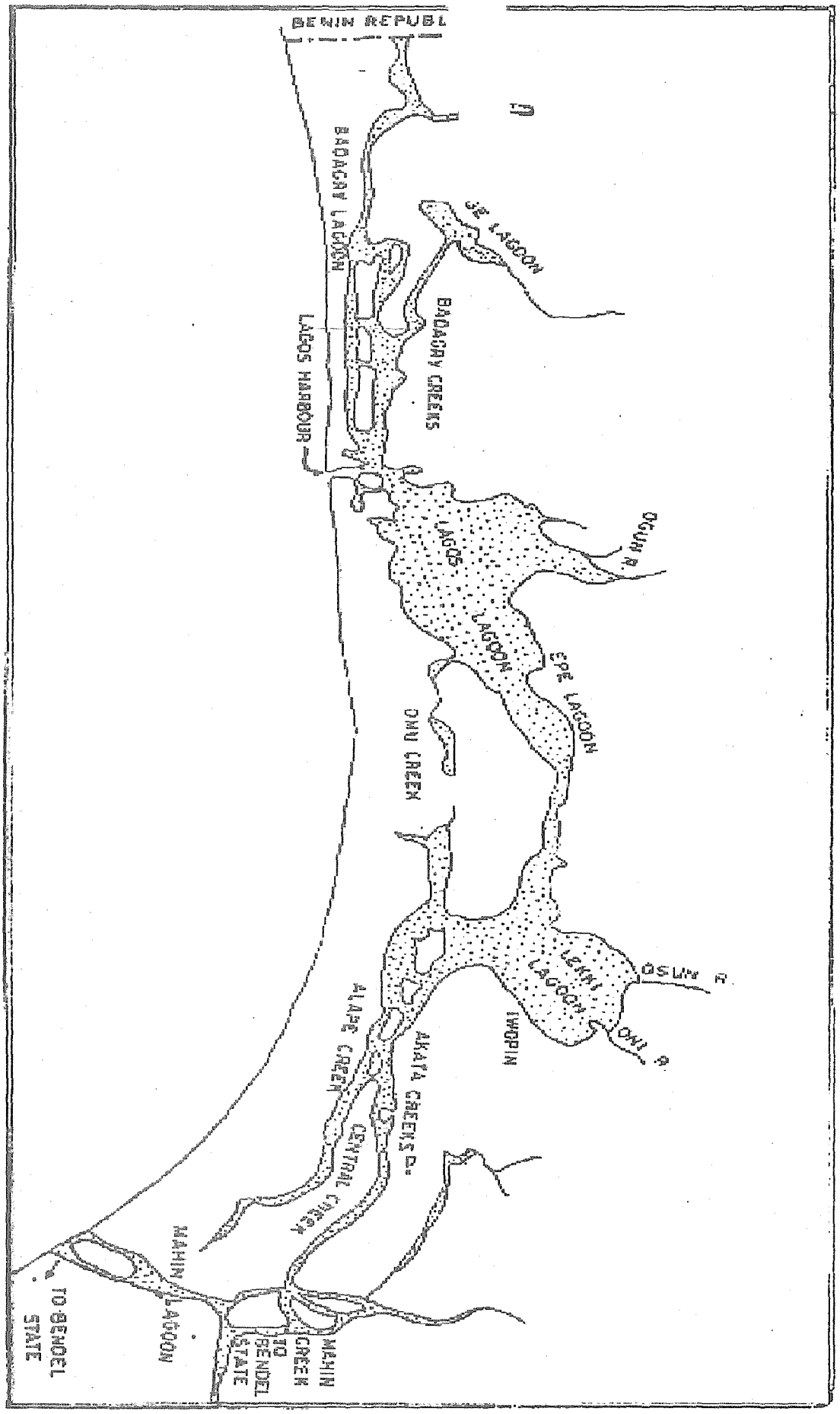

Fig. 1: Lagoons and Creeks of South-Western Nigeria
Source: Kusemiju (1988)

Benin to Niger Delta. The fishery and major ecological factors operating in the three lagoons have been documented by the FAO (1969), Fagade and Olaniyan (1974), Ezenwa (1981), Ezenwa and Kusemiju (1985), Kusemiju (1981), Solarin (1985), Solarin and Kusemiju (1991), Solarin (1998).

The specimens of *C. amnicola* were collected bi-weekly at Badagry jetty, Bariga jetty (in Lagos) and Epe jetty for Lekki Lagoon from crabbers who were mostly women. The randomly selected crabs were immediately preserved in an ice-chest with ice-blocks and later transferred into a deep freezer in the laboratory prior to analysis.

The physico-chemical parameters: temperature, dissolved oxygen, salinity, pH and transparency were measured in situ in the lagoon between May 1999 and October 2000.

In the laboratory, the sexes of the crabs were determined using the method described by Kwei (1978). The carapace length, carapace width and weight of the crab were taken as described in Lawal-Are and Kusemiju (2000). For the food analysis, the cardiac stomach of each specimen was dissected out and the contents examined under a binocular microscope. The food analysis was by the numerical and occurrence methods (Kwei, 1978; Hyslop, 1980).

RESULTS AND DISCUSSION PHYSICO-CHEMICAL PARAMETERS

Some preliminary results of the physico-chemical parameters obtained in the Badagry, Lagos and Lekki Lagoons are shown in Table 1. Salinity in Badagry Lagoon ranged from 0.7 to 7.5% while the pH ranged from 6.7 to 7.8. Transparency was 0.07 to 0.51m. The physico-chemical parameters were similar to those reported by Ezenwa (1981).

In the Lagos Lagoon, the water temperature ranged from 25.5 to 32.3°C, salinity was 1.0 to 24.4‰ while dissolved oxygen ranged from 4.0 to 11.2mg/1, pH 6.5 to 8.0 and transparency 0.06 to 0.36m. The physico-chemical parameters were similar to those reported for the Lagos Lagoon by Fadade and Olaniyan (1974) and Solarin (1998).

For Lekki Lagoon, surface water temperature ranged from 26.5 – 31.2°C, dissolved oxygen, 5.2 to 11.8mg/1, salinity 0.0 to 3.1‰, pH 6.5 to 7.6 and transparency 0.10 to 0.47m. The results were similar to those reported by Kusemiju (1981) except in the salinity regime of the water. The maximum salinity reported by Kusemiju (1981) was 0.3‰ while the maximum obtained in this study was 3.1‰. It would appear that Lekki lagoon is beginning to experience a low brackish water regime instead of being completely fresh water.

Table 1: Physico-chemical parameters in Badagry, Lagos and Lekki Lagoon (May 1999 to October 2000)

Badagry Lagoon	**Range**
Air Temperature (°C)	25.4 – 31.2
Surface Water Temp. (°C)	26.8 – 31.8
Bottom Water Temp. (°C)	26.4 – 30.8
Dissolved Oxygen (mg/1)	4.9 – 11.2
Salinity (‰)	0.7 – 7.5
PH	6.7 – 7.8
Transparency (m)	0.07 – 0.51
Lagos Lagoon	
Air Temperature (°C)	23.8 – 30.4
Surface Water Temp. (°C)	25.5 – 32.3
Bottom Water Temp. (°C)	25.0 – 31.3
Dissolved Oxygen (mg/1)	4.0 – 11.2
Salinity (‰)	1.0 – 24.5
PH	6.5 – 8.0
Transparency (m)	0.06 – 0.36
Lekki Lagoon	
Air Temperature (°C)	25.0 – 30.0
Surface Water Temp. (°C)	26.5 – 31.2

Bottom Water Temp. (°C)	26.0 – 30.5
Dissolved Oxygen (mg/l)	5.2 – 11.8
Salinity (‰)	0.0 – 3.1
PH	6.5 – 7.6
Transparency (m)	0.10 – 0.47

SIZE COMPOSITION

Badagry Lagoon

A total of 1910 *C. amnicola* were examined in the lagoon. The sizes ranged from 2.2 to 16.4cm total length while the weights ranged from 4.4 to 252.6g. The length – frequency showed a unimodal size distribution of which most of the crabs were in the medium – sized group (5.5 – 6.4cm total length). Young crabs entered the fishery in August. There was recruitment to the stock with individuals in the size range of 1.5 to 3.4cm being caught from August to October. Crabs occurred in the lagoon throughout the year although the population was greatly reduced in the months of October and November.

Lagos Lagoon

The 1127 crabs examined in the Lagos lagoon ranged in size from 3.5 to 16.8cm total length and weights 3.2 to 277.1g. Crabs were obtained throughout the year but with heavier population abundance during the period of May to October.

Lekki Lagoon

621 specimens were collected from Lekki Lagoon during the period. The sizes ranged from 3.5 to 16.1cm total length and weights 3.4 to 262.7g. There was less population of *C. amnicola* in Lekki lagoon compared with the other two lagoons. The crabs were mostly caught during the months of May to November.

The size occurrence and size distribution obtained in the three lagoons were similar to those reported for *Callinectes sapidus* by Jefferies (1966) and for *Calinects latimanus* by Kwei (1978).

GROWTH PATTERN

Growth pattern for the crabs was based on the length-weight relationship. The calculated log of the carapace length/weight relationship of *C. amnicola* showed a linear relationship between the length and weight crabs. The length/weight relationship values for male, female and combined sexes are given below:

For Male:

Log Wt = 0.1275 + 2.7190 Log carapace length
(n = 280, r = 0.9230)

For Female:

Log Wt = 0.0536 + 2.3315 Log carapace length
(n = 295, r = 0.9500)

For Combined Sex:

Log Wt = 0.1015 + 2.4601 Log carapace length
(n = 575, r = 0.9410).

The values of b (regression coefficient) obtained for the makes, females and combined sexes were less than 3 which indicated that the crabs exhibited a negative allometric growth. The correlation coefficient ® was 0.9410 showing a very high positive correlation between carapace length and total weight in this species.

FOOD HABITS

The preliminary results of the food habits in *C. amnicola* from the three lagoons are shown in Tables 2, 3 and 4. The percentage of empty stomachs was highest in Lagos lagoon (24.8%) and lowest in Badagry lagoon (12.3%). The crabs fed on four major food items made up of fishes, molluscs, crustaceans and higher plant materials.

Table 2: Summary of stomach contents of *Callinectes amnicola* from Badagry Lagoon

Number examined	=	1910
Number of empty stomachs	=	234
% Empty stomachs	=	12.3%

Food Items	Number of Occurrence	% Occurrence
PISCES		
Fish bones	1059	63.2
Fish scales	564	33.7
Fish eyes	84 5.0	
MOLLUSCA		
Bivalve shells	1038	61.9
Gastropod shells	722	43.1

CRUSTACEA		
Crab appendages	362	21.6
Shrimp appendages	97	5.8
Macrobrachium appendages	151	9.0
ANNELIDS	13	0.8
INSECTS	6	0.4
HIGHER PLANTS MATERIALS	292	17.4
UNIDENTIFIED MASS	334	19.9
SAND GRAINS	435	26.0
MUD	15	0.9

Table 3: Summary of stomach contents of *Callinectes amnicola* from Lagos Lagoon

Number examined = 1127
Number of empty stomachs = 280
% Empty stomachs = 24.8%

Food Items	Number of Occurrence	% Occurrence
PISCES		
Fish bones	400	47.2
Fish scales	125	14.8
Fish eyes	32	3.8
MOLLUSCA		
Bivalve shells	355	41.9
Gastropod shells	308	36.4
GRUSTACEA		
Crab appendages	123	14.5
Shrimp appendages	109	12.8
Macrobrachium appendages	57	6.7
ANNELIDS	14	1.7
INSECTS	4	0.5
HIGHER PLANTS MATERIALS	139	16.4
UNIDENTIFIED MASS	230	27.2
SAND GRAINS	133	15.7
MUD	19	2.2
NYLON	52	6.1

Table 4: Summary of stomach contents of *Callinectes amnicola* from Lekki Lagoon

Number examined = 6210
Number of empty stomachs = 108
% Empty stomachs = 17.4%

Food Item	Number of Occurrence	% Occurrence
PISCES		
Fish bones	215	12.1
Fish scales	62	12.1
Fish eyes	21	4.1
MOLLUSCA		
Bivalve shells	392	76.4
Gastropod shells	225	43.9

CRUSTACEA		
Crab appendages	118	23.0
Shrimp appendages	56	10.9
Macrobrachium appendages	26	5.1
ANNELIDS	3	0.6
INSECTS	3	0.6
HIGHER PLANTS MATERIALS	94	18.3
UNIDENTIFIED MASS	91	17.7
SAND GRAINS	138	26.9

In Badagry lagoon, fish parts were the most important food items constituting 63.2% by occurrence. Bivalve molluscs occurred in 61.9% and gastropods in 43.1% of the stomachs. Crustaceans made up mostly of crab appendages accounted for 21.6% of the food items.

The food items of *C. amnicola* were similar in the three lagoons except that molluscs occurred more in crabs from Lekki lagoon (76.4%).

The number and variety of food items found in individual stomach of *C. amnicola* showed that the crab was an opportunistic carnivore as the stomach contents showed the presence of mollusk shells, fish parts, shrimp and crab appendages. The carnivorous way of feeding was also seen to be associated with an herbivorous habit as the crab fed occasionally on higher plant materials.

REFERENCES

Ezenwa, B.I.O. (1981). A study of the reproductive biology of the catfish *Chrysichthys nigrodigitatus* (Lacepede) in Nigeria. Ph.D. Thesis, University of Lagos.

Ezenwa, B.I.O. and Kusemiju, K. (1985). Seasonal changes in the gonads of the catfish, *Chrysichthys nigodigitatus* (Lacepede) in Badagry Lagoon, Nigeria *Biologia africana.* 2:15-23.

Fagade, S.O. (1969). Studies on the biology of some fishes and the fisheries of the Lagos Lagoon, Ph.D. Thesis, University of Lagos, Nigeria.

Fagade, S.O. and Olaniyan, C.I.O. (1974). Seasonal distribution of the fish fauna of the Lagos Lagoon. *Bull. de l'FAN* 36(I): 244 – 252.

FAO (1969). Fisheries Survey in the Western and Mid-Western Region of Nigeria. UNDP/FAO. Rome SF: 74/NIR 6, 142pp.

Hyslop, E.J. (1980). Stomach contents analysis: a review of the methods and their application, *J. Fish. Bio,* 17:411 – 429.

Jefferies, P.H. (1966). Internal condition of a diminishing blue crab population (*Callinectes sapidus). Chesapeaker Science,* 1:164 – 170.

Kusemiju, K. (1981). The hydrobiology and fishes of the Lekki Lagoon, Nigeria. Nig. J. Nat. Sc. 3 (1 & 2) 135 – 146.

Kusemiju, K. (1988). Strategies for effective management of water hyacinth in the creeks and lagoons of South-Western Nigeria. Proceedings of an International Workshop, Federal Ministry of Science and Technology Publication, Lagos. 39 – 45.

Kwei, E.A. (1978). Size composition, growth and sexual maturity of *Callinectes latimanus* (Rath) in two Ghanaian Lagoons. *Zoological Journal of the Linnean Society:* 64(2): 151 – 175.

Lawal-Are, A.O. (1998). Size composition, growth pattern and food habits of the crab, *Callinectes amnicola* (De Rocheburne) in the Badagry Lagoon, Nigeria. M.Sc. Thesis, University of Lagos, Nigeria.

Lawal-Are, A.O. and Kusemiju, K. (2000). Size composition, growth pattern and feeding habits of the blue crab, *Callinectes amnicola* (De Rocheburne) in the Badagry Lagoon, Nigeria. *J. Scien. Res. Dev.* 4: 117 – 126.

Salarin, B.B. (1974). The swimming crabs f the genus *Callinectes* (Decapoda: Portunida) *U.S. Fish Bulletin.* 72: 685 – 798.