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Length-Weight Relationship and Condition Factor of some Important Fish Species from Sangana River, Niger Delta

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ABSTRACT
This study investigated the length-weigh and condition factor of five important fish species from Sangana River. The results obtained for the length-weight relationship indicate that all the fish species for dry and wet season exhibit negative allometric growth. The value "b" ranges from 0.781 (*Mugil cephalus* to 1.080 (*Caranx latus*) in dry season and in wet season, it ranges from 0.764 (*Caranx latus*) to 1.060 (*Polydactylus quadrifilis*). The mean condition factor for the five fish species across both season ranged from 0.45 – 0.83. The study results suggest that the status of the fish is influenced by anthropogenic activities in the area.
Keyword: Condition factor, Fish species Length-weigh relationship, Sangana river

INTRODUCTION

Fish is a major source of animal protein [1, 2]. According to Oladejo [3], Angaye et al. [4], about 20% of animal protein is supplied by fish. Fish farming is a major business in Nigeria as such is a source of livelihood to several families [5]. Fish are obtained from the natural stock (i.e. wild) or pond (which could be earthen or concrete). Based on nutrient, fish contain high quality proteins, fats, vitamins, calcium, iron and essential amino acids [6].

The aquatic ecosystem is frequently contaminated by anthropogenic activities and to lesser extent by natural effects. Aquatic ecosystem contamination in affect by pesticides which enter the water through runoff from agricultural field close the aquatic ecosystem [7-10], effluents from several types of industries [11] including pharmaceutical [12, 13], processing waste water from oil palm [14], cassava etc. furthermore municipal wastes are discharged into the surface water in most communities aligning surface water in Bayelsa state [15]. On aquatic ecosystem, the wastes could alter the physical, chemical and biological characteristics of the water. Alteration in water and sediment characteristics could affect the distribution, abundance and diversity of aquatic organisms such as fisheries.

Fish is an important organism that is used to assess toxicity in aquatic ecosystem [7-10]. Fisheries have the tendency to bioaccumulate and biomagnify contaminants from its environment. The productivity and well-being of fisheries including growth are assessed using different biometric indices. Among the various management tool is fisheries science, weigh-length relationship have been widely reported as an essential fishery management tool [16-20]. The length-weight relationship of a particular species allows the inter-conversion of these parameters [21]. According to Nehemia et al. [22], isometric or allometric growth pattern which can either be positive or negative are usually observed.

Another biometric indices used in assessing the status of a fish in its environment is the condition factor. According to Iyabo [23], condition factor is vital in the study of life cycle of fisheries. Ajani et al. [24] reported that condition factor is the degree of wellbeing or relative robustness of the fish and it is expressed by coefficient of condition (also known as factor or length weight factor). Lalrinsanga *et al*. [18] also stated that it's a good index for showing the relationship between the between biotic and abiotic factors in the physiological condition of the fishes. Mir et al. [25] reported that Fulton's condition factor (K) is widely used in fisheries and fish biology studies.

The study is aimed at determining the length-weight relationship and condition factors of five fish species from Sangana River.

MATERIALS AND METHODS

Study Area

The study area was carried out in the Sangana River in Akassa kingdom in Brass Local Government Area region of Nigeria. Akassa encompassed an area of 120km^2 and is situated on both sides of the Nun River. Like other major locations in Bayelsa state, fishing is a major occupation of indigenes of the area. The study area is endowed with dense mangrove vegetation throughout the course of the river. As such it is also subjected to regular tidal fluctuation through its course. Sangana community is an oil rich community and situated very close to the Atlantic Ocean. Based on climate, there two major seasons in the area including wet or rainy and dry seasons. The rainy season spans from April to November, while the dry season spans from November to March.

Fish Sampling

Fish sampling was carried out between October 2013 and September 2014 using gill nets, long lines, tray and stakes. Fishes were catch by fishermen and were isolated and conveyed in thermos Cool boxes to the laboratory. Fish specimen was identified using monographs, description, checklists and keys [26-34]. The length of the fish was measured using meter rule. Fish weight was obtained after drilling water from the buccal cavity and blot drying with a dry piece of clean hand towel, weighing was done in a table top weighing balance.

Length – Weight Relationship

The weight length relationship was determined based on the method previously described by Pauly [35]:

$W=aL^b$ (Eqn. 1)

Where

W=Weight of fish in (g)

L= Total Lenght of fish in (cm)

a= Constant (intercept)

b= The Length exponent (Slope)

The "a" and "b" values were obtained from a linear regression of the length and weight of fish. When b is equal to three (3), isometric pattern of growth occurs but when b is not equal to 3, allometric pattern of growth occurs, which may be positive if >3 or negative if <3 [21, 22]. The correlation (r) that is the degree of association between the length and weight was computed from the linear regression analysis.

Condition Factor

The condition factor (K) of the experimental fish was estimated from the relationship:

$K=100W/L^3$ (Eqn. 2)

Where;

K= Condition Factor

W= Weight of Fish (g)

L= Length of Fish (cm)

Analysis of Experimental Data

The following statistical tools were used to analyzed the data obtained; Regression and Correlation Analysis for linear regression of length and weight of fish Microsoft Excel (2010) for computation of means and standard error; statistical package for social sciences (SPSS) and FISAT [36] for description statistics, length-weight relationship and condition factor of fish.

RESULTS AND DISCUSSION

The result of the length-weight relationship of the various fish species from Sangana River in Bayelsa State for both dry and wet seasons are presented in Table 1. The length-weight regression equation correlation coefficient (r), coefficient of determination (r^2) and significance of correlation for the various fish species in dry and wet season are presented in Table 2. The findings of this study have some similarity with work of Seiyaboh et al. [16] in same species of fish in this study from Brass river. The values obtained for the length-weight relationship indicate that all the fish species for dry and wet season exhibit negative allometric (NA) growth. The value "b" ranges from 0.781 (*Mugil cephalus* to 1.080 (*Caranx latus*) in dry season and in wet season it ranges from 0.764 (*Caranx latus*) to 1.060 (*Polydactylus quadrifilis*). The results of this study are slightly lower than the ranged reported by Hart and Abowei [37], Fafioye and Oluajo [38]. The variation of fish size may either be

genetic or environmental pollution. Based on growth pattern, the findings of this study are comparable to work of previous authors. As such negative allometric have been reported in some fishes in Nigeria water ways [16, 17, 39, 40].

The correlation coefficient "r" ranged from 0.750 (*Mugil cephalus*) to 0.962 (*Caranx latrus*) in dry season and in wet season it ranges from 0.884 (*Mugil cephalus*) to 0.924 (*Caranx latrus*). The coefficient of determination "r^2" ranges from 0.563 (*Mugil cephalus*) to 0.926 (*Caranx latus*) in dry season and in wet season it ranges from 0.713 (*Mugil cephalus*) to 0.854 (*Caranx latus*). This finding is close to the work of Hart and Abowei [37], Seiyaboh et al. [16, 40].

The result from this study shows that in dry season, the growth rate is different from what is obtainable during the wet season. The length-weight relationship give information on the condition and growth pattern of fish.

Table 1: Length-Weight Relationship of Various Fish Species in Sangana River.

Species	Season	Tot.	Range	Min.	Max.	Mean±S.E	Range	Min.	Max.	Mean±S.E	`a	b	r	r^2	Growth Pattern
Micropogonias undulatus	Dry	100	23.00	11.00	34.00	17.72±0.48	30.00	14.00	44.00	25.04±0.70	0.296	0.881	0.828	0.685	NA
	Wet	100	21.00	9.00	30.00	17.36±0.49	32.00	13.00	45.00	27.40±0.89	0.165	1.022	0.889	0.791	NA
Mugil cephalus	Dry	100	10.50	10.00	20.50	15.24±0.27	18.00	12.00	30.00	20.96±0.40	0.396	0.781	0.750	0.563	NA
	Wet	100	15.50	10.00	25.50	15.70±0.38	21.00	15.00	36.00	23.52±0.67	0.181	0.991	0.844	0.713	NA
Lutjanus campechanus	Dry	100	10.30	10.00	20.30	15.74±0.34	20.00	10.00	30.00	19.34±0.52	0.016	1.058	0.785	0.783	NA
	Wet	100	11.20	10.00	21.20	17.13±0.65	20.00	20.00	40.00	29.54±1.29	0.281	0.963	0.901	0.811	NA
Caranx latus	Dry	100	18.00	10.00	28.00	17.08±0.41	23.00	11.00	34.00	19.12±0.52	0.052	1.080	0.962	0.925	NA
	Wet	100	15.00	10.00	25.00	16.07±0.44	17.00	18.00	35.00	26.08±0.58	0.496	0.764	0.924	0.854	NA
Polydactylus quadrifilis	Dry	100	21.00	11.00	32.00	16.81±0.50	32.00	12.00	44.00	24.20±0.76	0.179	0.980	0.877	0.769	NA
	Wet	100	22.00	10.00	32.00	18.50±0.50	32.00	13.00	45.00	29.60±0.87	0.123	1.060	0.895	0.800	NA

Table 2: Length – Weight Regression Equation, Correlation Coefficient (r), Coefficient of Determination (r^2) and Significance of Correlation for Various Fish Species in Sangana River

Fish Species	Season	Regression Equation	R	r^2	Significance of Correlation
Micropogonias undulates	Dry	LogW=0.296+0.881LogL	0.828	0.685	P<0.05; t=14.61, df=99
	Wet	LogW=0.165+1.022LogL	0.889	0.791	P<0.05; t=19.26, df=99
Mugil cephalus	Dry	LogW=0.396+0.781LogL	0.750	0.563	P<0.05; t=11.23, df=99
	Wet	LogW=0.181+0.991LogL	O.884	0.713	P<0.05; t=15.60, df=99
Lutjanus campechanus	Dry	LogW=0.016+1.058LogL	0.886	0.785	P<0.05; t=18.91, df=99
	Wet	LogW=0.281+0.963LogL	0.901	0.811	P<0.05; t=9.72, df=99
Caranx latus	Dry	LogW=0.052+1.080LogL	0.962	0.926	P<0.05; t=34.92, df=99
	Wet	LogW=0.496+0.764LogL	0.924	0.854	P<0.05; t=23.90, df=99
Polydactylus quadrifilis	Dry	LogW=0.179+0.980LogL	0.877	0.769	P<0.05; t=18.08, df=99
	Wet	LogW=0.123+1.060LogL	0.895	0.800	P<0.05; t=19.82, df=99

The condition factor of the various fish species for both dry and wet season is presented in Table 3. The mean condition factor for dry and wet season of some fishes from Sangana river was 0.63 and 0.58 respectively (*Polydactylus quadrifilis*), 0.55 and 0.68 respectively (*Micropogonias undulates*), 0.68 and 0.68 respectively (*Mugil cephalus*), 0.58 and 0.68 respectively (*Lutjanus campechanus*) and 0.45 and 0.83 respectively (*Caranx latus*). The condition factor value estimated in this study compared to previously work showed that it's lower than the value reported by Iyabo [23], Atama et al. [39], but close to the values reported by Seiyaboh et al. [16], Abowei [17]. The mean condition factor of fish species was low for both seasons. This could be due to poor condition attributed to human activities and environmental pollution such as indiscriminately felling of mangrove forest, dumping of sewage and domestic waste.

Table 3: Condition Factor of Various Fish Species in Sangana River

Fish Species	Season	Total No.	Range	Min.	Max.	Mean ± S.E
Micropogonias undulates	Dry	100	1.20	0.11	1.32	0.55±0.03
	Wet	100	1.89	0.17	2.06	0.68±0.05
Mugil cephalus	Dry	100	1.38	0.32	1.70	0.68±0.04
	Wet	100	1.51	0.19	1.70	0.68±0.04
Lutjanus campechanus	Dry	100	1.09	0.24	1.33	0.58±0.03
	Wet	100	1.60	0.40	2.00	0.68±0.08
Caranx latus	Dry	100	0.95	0.15	1.10	0.45±0.02
	Wet	100	1.78	0.22	2.00	0.83±0.05
Polydactylus quadrifilis	Dry	100	1.04	0.13	1.18	0.63±0.03
	Wet	100	1.16	0.14	1.30	0.58±0.03

CONCLUSION

The study assessed the condition factor and length-weight relationship of five species of fish from Sangana River. The result of the length-weight relationship of the fish species exhibited negative allometric growth pattern. The condition factor for the five fish species across both season ranged from 0.45 – 0.83. The low condition factor recorded in this study could be due to impacts of anthropogenic activities in the water ways.

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