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THE LENGTH - WEIGHT RELATIONSHIP OF FISHES OF KUNDUCHI CREEK, DAR ES SALAAM, TANZANIA

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ABSTRACT

The length - weight relationship of 27 species of marine teleosts collected from Kunduchi Creek, Dar es Salaam was investigated using the formula $W=aL^n$. The 'n' values were found to exhibit marked variation in different species ranging from 1.3932 to 4.8356 which indicates that not all fishes follow the cube law ($W=aL^3$) as suggested by Allen (1938).

INTRODUCTION

STUDIES on the length - weight relationship of several fishes have been described by many workers. Such studies, however, have covered only few fishes in Tanzanian waters, for example studies on *Siganus sutor* by Mziray (1983), *Leptoscarus vaigensis* by Rubindamayugi (1983) and on siganids and mackerel by Bwathondi *et al.* (1981). This work compares the 'n' values of different fishes caught at Kunduchi area.

MATERIAL AND METHODS

Study area

The Kunduchi Creek is about 20 km north of Dr es Salaam, situated at latitude 06° 40′ S and longitude 39° 15′ E. The banks of the creek are fringed with mangroves, *viz. Avicinea, Rhizophora, Brugueira, Ceriops* and the sub-litoral zone is covered by extensive growth of seagrasses *Thalassodendron* with isolated patches of *Syringodium, Holudule, Halophila* and *Thalassia* (Mc Cusker, 1971). The temperature at the Kunduchi Creek ranges from 26.0°C in August to 32.8°C in February and salinity from 31.8°/₀₀ in April to 36.5°/₀₀ in February (Bryceson, 1979). Two study sites were chosen, namely the creek itself and the open area in front of Kunduchi Marine Biological Station.

Samples

Samples were obtained every fortnight by beach seining. More than one thousand specimens collected from January to August 1983 were analysed. The total length and weight were measured to the nearest 0.1 cm and 0.1 gm respectively.

The length - weight relationship was calculated by using the equations $W = aL^n$ or $\log W = \log a + n \log L$ where W represents the weight of the fish in gm, L represents the length of the fish in cm, 'a' the intercept and 'n' the slope. This formula was preferred over the 'cube law' ($W=aL^3$) because it is only in some fishes that the slope is equal to 3 (Allen, 1938).

RESULTS

The length-weight relationship using data collected from twenty seven (27) different species of fishes has been expressed in Table 1. It is seen in this Table that the value of n ranges from 1.3932 to 4.8356 with a mean of 3.0685 whereas that of the intercept 'a' ranges from 0.0001 to 0.3805, with a mean of 0.0574. The 'n' values for 20 out of 27 species range from 2.5-4.5, 6 species below 2.5 and 1 species above 4.5.

TABLE 1. *Length - weight relationship of fishes of Kunduchi*

FAMILY	SPECIES	N	a	n	r	S.R.	FOOD ITEMS
Pomacentridae	*Abudefduf* sp.	35	0.3634	1.3932	0.5514	3.6829	copepods, larval stages of bivalves
Tetradontidae	*Arothron aerostaticus*	10	0.0499	0.9061	0.9972	0.0399	larval stages of bivalves & fishes
Tetradontidae	*Arothron hispidus*	13	0.0184	3.2002	0.9479	1.1046	small crabs, coralline algae
Tetradontidae	*Arothron immaculatus*	93	0.1137	2.3884	0.9629	6.9123	fish larvae, coralline algae
Carangidae	*Caranx sexfaciatus*	14	0.0121	3.0141	0.9804	0.3167	*Trichodesmium*, dinoflagellates, copepods
Callyodontidae	*Callyodon guttatus*	74	0.0023	3.9326	0.9602	3.3162	*Thalassia, Thalassodendron, Sargassum*
Chaetodontidae	*Chaetodon* sp.	9	0.1969	1.9056	0.7849	0.7276	copepods, mysids
Fistularidae	*Fistularia petimba*	11	0.00009	3.4193	0.9061	2.6289	mysids and small shrimps
Gerridae	*Gerres filamentosus*	7	0.0043	3.4994	0.9877	0.0324	dinoflagellates, copepods, mysids
Gobidae	*Gobius albomaculatus*	155	0.2433	1.6239	0.7927	13.9775	*Plurosigma, Trichodesmium, Rhizosolenia*
Leiognathidae	*Gaza minuta*	50	0.0154	2.8934	0.8908	0.8075	*Trichodesmium*, dinoflagellates, copepods
Hemiramphidae	*Hemiramphus* sp.	27	0.0001	3.8152	0.9482	0.4597	dinoflagellates, copepods
Scaridae	*Leptoscarus vaigeinsis*	77	0.0025	3.7128	0.9563	4.2723	*Thalassodendron, Syringodium, Halodule*
Lutjanidae	*Lutjanus fulviflamma*	199	0.0089	3.2460	0.9481	10.8146	crabs, squids, polychaetes, fish larvae
Plotosidae	*Plotosus anguillaris*	38	0.0018	3.4908	0.9787	0.6869	crabs, polychaetes, fish larvae
Plectorhynchidae	*Psedopristipoma plagiodesmus*	10	0.0030	3.8679	0.9876	0.0829	mysids, cyclopoids
Pomacentridae	*Pomacentrus opercularis*	9	0.0013	4.1105	0.9706	0.1291	copepods, mysids
Mullidae	*Parapeneus barbarinus*	9	0.0001	4.8356	0.9794	0.0440	copepods, *Portunus pleagicus*, fish larvae
Synodontidae	*Synodus indicus*	16	0.0133	2.7769	0.9419	0.4801	juvenile fishes, squids, crabs
Sillaginidae	*Sillago sihama*	19	0.0028	3.2879	0.9525	1.4054	copepods, mysids, brittle star
Sphyraenidae	*Sphyraena obtusata*	60	0.0070	2.8898	0.9488	0.5453	juvenile fishes, shrimps
Scorpaenidae	*Scorpaena mossambica*	8	0.0113	3.0429	0.9424	0.1024	juvenile shrimps, mysids
Scorpaenidae	*Scorpaena guamensis*	54	0.0047	3.6459	0.8393	2.5957	juvenile shrimps, mysids
Clupeidae	*Sardinella gibbosa*	33	0.3805	1.4453	0.7318	0.8566	phytoplankton, copepods, mysids
Siganidae	*Siganus canaliculatus*	60	0.0105	3.0457	0.8867	7.6154	*Hypnea* spp., *Gracilaria* spp., *Jania* spp.
Siganidae	*Siganus stellatus*	14	0.0784	2.1460	0.8217	0.7480	*Hypnea* spp., *Gracilaria* spp., *Jania* spp.
Theraponidae	*Therapon theraps*	52	0.0059	3.3212	0.9434	1.3671	small shrimps, mysids, copepods

N = number of individuals, a = intercept, n = slope, r = correlation coefficient, SR = some of residuals.

Discussion

Le Cren (1951) contends that the length-weight relationship of fishes, serves two purposes namely, to determine the mathematical relationship between two variables; length and weight and to measure the variations from expected weight for length of individuals or groups of fishes. Allen (1938) suggests that the value of 'a' in an ideal fish is 3, that is it should agree with the 'cube law'. But according to Hile (1936) and Martin (1940) the value of 'n' generally ranges between 2.5 and 4.5, on the other hand Carlender (1969) observed that the value of 'n' can range from below 2.5 to above 4.5. The value of 'n' obtained in this study ranges from 1.3932 for *Abudefduf* sp. to 4.8356 for *Parapeneus barbarinus*. Beverton and Holt (1975) suggest that the value of 'n' is almost always near to 3.

Several theories have been advanced by a number of workers as to what governs or influences the value of 'n'. Soni and Kathal (1979) argue that the value of 'n' is dependent and governed by the feeding behaviour of fish. However Bwathondi *et al.* (1981) did not find any relationship between the feeding behaviour of fish and the value of 'n'. In the present study, however, fishes of different feeding habits had different values of 'n'. Also the size or type of food consumed by the fish seems to have influence on the value of 'n'. For example, planktonivores, herbivores and predators have different ranges for the value of 'n'. Since the present study is mainly covering juvenile fishes, it is suggested that the value of 'n' may be influenced by the different developmental stages the fishes are in. Juveniles are undergoing progressive changes in shape and condition as they grow and consequently affecting the regression of the log of weight and log of length.

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