Full Length Research Paper

Allometry and condition factors of African pike "*Hepsetus odoe*" actinopterygii in a lake

ADEDOKUN, Mathew Adewale[1]*, FAWOLE, O. O.[2] and AYANDIRAN T. A.[2]

[1]Fisheries Technology Department, Oyo State College of Agriculture, P. M. B. 10 Igboora, Oyo State, Nigeria.
[2]Pure and Applied Biology Department, Ladoke Akintola University of Technology, P.M.B 4000 Ogbomoso, Oyo State, Nigeria.

The physiological growth of length and weight variables and the general welfare of *Hepsetus* odoe in Ogbomoso reservoir were investigated. The relationship regression coefficient indicated that the fish sampled showed algometric growth with regression factor of 0.88 in the natural population of fish. The mean K for 133 specimens was 1.5, while 1.5 and 1.6 were K based on sexes (male and female) respectively. Also, 1.789 ± 0.44 (F IV) and 1.880 ± 0.31(M IV) were the highest means K in female and male gonad development stages. The general well being of the sampled fish is affected by both gonads maturity and sexes (p>0.05) while habitat affinity, seasonal variations and size range do not (p<0.001).

Key words: Length-weight relationship, condition factors, resident water body, *Hepsetus odoe.*

INTRODUCTION

The geographical range of *Hepsetus odoe* covers the tropical region of West and Central Africa. It is found in most rivers in West Africa from the Senegal southwards to Botswana. The southern limit of its distribution is the Okavango Delta in Northern Botswana (Merron et al., 1990). Moriarty (1983) reported abundance of *H. odoe* in Kanji Lake, Nigeria. It is usually found near the banks of rivers in heavy vegetation, but also can be found in swampy environments, lagoons etc. In areas where one of its major predators is historically absent (tiger fish) *H. odoe* will venture into more open waters (Jackson, 1961).The colour of *H. odoe* varies and this is related to the wide range of distribution and developmental stages, that is, young to adults as observed by Jubb and Manning (1961). *H. odoe* is singled out of characins that venture into nest building and shows sexual dimorphism (Merron et al., 1990). Also*, H. odoe* is one of the economically important fishes of tropical African

freshwaters (Olaosebikan and Raji, 1998; Adedokun and Fawole, 2012).

The most striking feature of *H. odoe* is its dentition. Both upper and lower jaws are filled with sharp pointed teeth, but the lower jaw has two rows while the upper only has one. There are also two large canines in each jaw. Two pairs of dermal flaps can be found on the upper and lower jaws (Barnard, 1971; Adama and Abdul azeez, 2011). According to Merron et al. (1990), very little is known about the development of *H. odoe* and observed that the species undergoes direct development due to a very short larval period. Length- weight relationship is one of the parameters for growth (W= al^b), another growth parameter is condition factor (K). It expresses condition of fish in numerical forms, that is, the degree of well being or health or fatness of the fish) (K = W × 100/ L^3). The significance of these growth parameters will ensure a rational exploitation of the species in
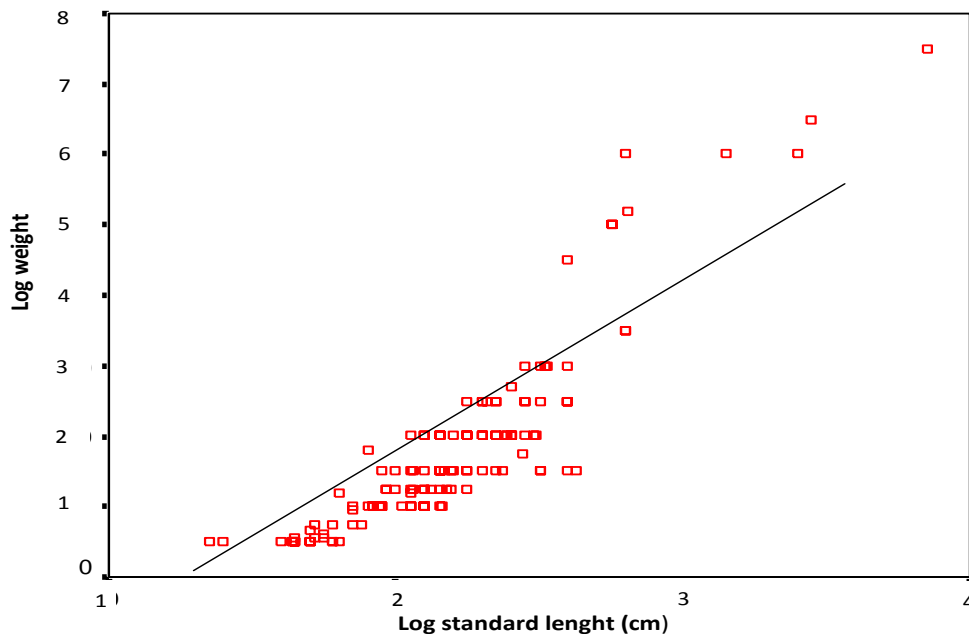
*Corresponding author. E-mail: matdokun@gmail.com.

Figure 1. Log standard length - log weight relationship.

Ogbomoso reservoir. This work aims at providing information on: (i) the physiological growth (Length-weight variables) of African pike in the resident water body, and (ii) the effects of habitat, seasons, sex and size on the general welfare of African pike in the natural population of fish.

Study area

The area of study is Ogbomoso reservoir which was impounded in 1964 (Ojo, 2002). The major tributaries are Idekun, Eeguno, Kemolowo, Omoogun and Yakun streams. The reservoir has a catchment area of about 321 km^2, extending over longitude 8° 05^{1}N to 8° 10^{1}N and latitude 4° 10^1 E to 4° 15^1 E in Oyo State, Nigeria. The minimum depth is 0.83 m while the maximum depth is 16.36 m. The temperature of the reservoir is 28 and 32°C during dry and wet seasons respectively. The pH range of the reservoir was 5.8 to 7.1 and turbidity of 18 to 45 cm.

MATERIALS AND METHODS

During the period of study, 133 samples were collected and sampling for *H. odoe* commenced in April 2009 and extended till March 2010. The only fishing method employed was gill netting. The studied morphometric includes total length, standard length and weight of the fish in millimeters and grams by using measuring board and manual scale. Regression was used to analyse the log form of dependent variables:

W = a + bL (log .form)

The fish body weight expressed as a percentage of fish total length

cube was used as condition factor (K).

RESULTS

Length-weight relationship

The standard length of the specimen examined ranged from 13.5 to 39.0 cm while the weights ranged from 50 to 750 g. The mean standard length was 2.2 cm and mean weight was 183 kg. The equation describing the relationship of the two biological variables of fish is given as $W = aL^b$ (Tesch, 1968); where W denotes weight (g), L = standard length in cm. A logarithm plot of weight against log length yields b as an exponent (with values between 2 and 4; often 3) and a (constant).

According to Tesch (1968), the value b=3 shows that the fish grows isometrically. Values obtained other than 3 indicate allometric growth (positive or negative). The equation above can be represented thus; log W = log a + blog L.

A regression line is drawn from the graph of logarithm weight against logarithm of length, where b is the regression co-efficient (slope of graph) and log a is the intercept of the regression line on the y- axis. The graph shows allometric growth for *H. odoe* in Ogbomoso reservoir and the value of b calculated from the graph is 4.11 with regression factor 0.88 (Figure 1).

Condition factor (K)

The condition factor (k) expresses the general well- being of fish in its habitat. The condition factor obtained in this

Table 1. Monthly mean condition factor for *H. odoe* in Ogbomoso reservoir.

Month	Number of fish	Mean K
Jan 2010	4	1.0250 ± 0.096
Feb 2010	5	1.6000 ± 0.837
Mar 2010	10	1.3000 ± 0.411
Apr 2009	11	1.3636 ± 0.425
May 2009	7	1.2571 ± 0.257
Jun 2009	9	1.2556 ± 0.188
Jul 2009	16	1.5125 ± 0.430
Aug 2009	12	1.4417 ± 0.309
Sep 2009	26	1.4846 ± 0.303
Oct 2009	14	1.6500 ± 0.293
Nov 2009	9	1.6000 ± 0.332
Dec 2009	10	1.6400 ± 0.263

Table 2. Condition factor in relation to gonad maturity in *H. odoe.*

Sex(gonad stages)	Number of fish	Mean K
F II	10	1.500 ± 0.123
F III	22	1.615 ± 0.298
F IV	28	1.789 ± 0.443
M II	3	1.480 ± 0.084
M III	11	1.437 ± 0.632
M IV	19	1.880 ± 0.312

study ranged from 0.8 to 2.7 with mean condition factor of 1.5. While male and female had condition factors 1.5 and 1.6 respectively.

Monthly condition factor

Table 1 shows monthly condition factor of *H. odoe* in Ogbomoso reservoir with mean condition factor greater than 1.

Condition factor in relation to the stage of gonad maturity

Table 2 shows average condition factor based on gonad development stages. As the gonad stages increased, there is development in size and weight of the gonads and the more significantly difference along the gonads development stages (p>0.05).

Condition factor in relation to habitat and season

Table 3 shows the impacts of habitats (inshore and offshore) and seasons (dry and wet) on the general welfare of *H. odoe* in Ogbomoso reservoir. The condition factor values of sampled fish from different micro habitats

were 1.6, 1.7 and 1.5 for grassy, middle and open water habitats. Also for dry and wet seasons *H. odoe* had 1.5 and 1.5 condition factor respectively. Therefore, there is no significant difference in both microhabitats and between seasons (p<0.001).

Condition factor in relation to sex and size

Table 4 shows that size has no negative effects but sex do on the physical health of the fish in the resident water body. The sizes of *H. odoe* caught during this period of study ranged from 13.5 to 18.0 cm S. L. as smaller fishes and 18.1 to 39.0 cm S. L. as larger fishes. As a result, fish sizes showed no significant difference (p<0.001). While there is significant difference between male and female sexes (p>0.05)

DISCUSSION

The length-weight relationship shows that *H. odoe* enjoyed positive allometric growth in Ogbomoso reservoir. This implies that, the fish was heavier than its length in the resident water body. This result is not in line with the findings of Fawole and Arawomo (1999) who reported negative allometric growth in *Tilapia galileaus* in Opa reservoir. Though, they are two different species with different foraging mode. The well being of *H. odoe* in the reservoir might be attributed to the suitable environment as indicated by the high condition factor (Table 1). The increase in weight of fish may be associated to the quality of the food which is the proximate factor determining growth rate which agrees with the works of Uwem et al. (2011).

The results indicate that, the condition factor of the fish is not affected by habitat and season variations (Table 3). This may not be unconnected with the availability of food and close proximity between prey and predator during falling water period. The significant difference between male and female and gonads maturation may be due to the differences in size and weight gain of male and female gonads; which is a reflection of early maturation of gonads in female than in its male counterpart. Meanwhile, the condition factor does not vary with the size of the fish (Table 4).

However, the productivity of the reservoir and high values of condition factors are reflection of the existing balance amongst the environmental elements, which is evidenced in the influx of nutrients from the adjoining upland and the symbiotic interplay of abiotic factors within the aquatic ecosystem.

Conclusion

The physical development and general welfare of *H.*

Table 3. Condition factor in relation to habitat and season.

Variables	Habitat		Season	
	Inshore	Offshore	Wet	Dry
Number of fish	74	59	81	52
Mean K	1.592±0.405	1.590±0.394	1.508±0.409	1.519±0.418

Table 4. Condition factor in relation to fish sex and size.

Variables	Sex		Size	
	Male	Female	Small (13.5-18.0 cm)	Large (18.1-39.0 cm)
Number of fish	46	63	24	109
Mean K	1.584±0.393	1.602±0.404	1.575±0.225	1.578±0.410

odoe in the resident water body are determined through studied growth parameters. The general well being of the sampled fish is not affected by habitats affinity, season variations and size range while gonad maturity and sexes indeed do.

RECOMMENDATION

Though, *H. odoe* specimens do not occur presently in large number in the commercial gillnets of 10.2 cm (4") mesh size; the ongoing commercial exploitation of this species probably with a lesser mesh size of 8.9 cm (3 ½") might enhance faster growth, improve socio-economic status of the local fishermen and help to sustain the much needed protein in man.

REFERENCES

Adedokun MA, Fawole OO (2012). Distributions and Habitations of African pike *Hesetus odoe* (Bloch, 1794), in Oba Reservoir, Ogbomoso, Nigeria (Actinopterygii: Hepsetidae). Munis Entomol. Zool. 7(2):708-713.

Adama SO, Abdul azeez A (2011). Composition of Fish Species and Fisheries activities of Tunga Kawo Dam, (Wushishi) Niger State. 26th Annual Conference and Fair of the Fisheries Society of Nigeria (FISON) at Federal University of Technology Minna, Niger State.

Barnard K (1971). A pictorial guide to South African fishes. Cape Town: Maskew miller Limited.

Fawole OO, Arawomo GA (1999). Fecundity of *Sarotherodon galilaeus* in the Opa reservoir Ile Ife, Nig. J. Sci. Res. 4(1):107-111.

Jackson PBN (1961). The impacts of predation especially by the tiger fish *(Hydrocynus sp)* on African freshwater fishes. Proc. Zool. Soc. London 136:603-622.

Jubb RA, Manning, S (1961). Freshwater fishes of the Zambezi River, lake Kariba, Pungive, Sabi Lundi and Limpopo. Cape Town Gothnic Printing Company 7:1-22.

Merron GS, Holden KK, Bruton MN (1990). The production biology and early development of the African pike, *Hepsetus odoe*, on the Okavango Delta, Botswana. Environ. Biol. Fish. 28:215-235.

Moriarty C (1983). The African pike *Hepsetus odoe*. Nig. Field. 47:212-222.

Ojo OO (2002). Artificial Lake fisheries Management in Oyo State; Pre-season Training of Officers handling the IFAD- Assisted Artisanal Fisheries. pp. 1-8.

Olaosebikan BD, Raji A (1998). The field guide to Nigerian freshwater fishes. FCFFT, P.M.B.1500, New- Bussa Niger State, Nigeria. Decency Enterprises and Stationeries Ltd.,

Tesch FW (1968). Methods for Assessment of fish production in freshwaters, (Ed. Ricker, E. W.) I. B. P. Handbook No. 3: I[ST]Edition;. *Blackwell, Scientific Publications Oxford and Edinburgh.* pp. 93-123.

Uwem GU, Ekanem AP, George E (2011). Food and Feeding habits of *Ophiocephalus obscura* (African snake head) in the Cross River Estuary, Cross River State, Nigeria.