Journal of Fisheries International 1 (2-4): 132- 135, 2006

Submission of Article for Publication-Implications of Carcass Quality and Condition Factor to the Processing of Some Selected Freshwater Fish Families

O.A. Oyelese
Department of Wildlife and Fisheries, Management University of Ibadan, Nigeria

Abstract: The implications of carcass quality and condition factor to the consumers, preservators and processors was studied using the following common representative members of five selected fresh water fish families. They are family. Clariidae-*Clarias gariepinus*, Mochkidae-*Synodontis clarias*, Cichlidae-*Tilapia nigrodigitatus,* Bagridae-*Chrysichthys nigrodigitatus*, Channidae-*Channa obscura*.Four fish replicates (2 females and 2 males) were used for each fish family. Each fish specimen were dissected after taking the standard /Total length and weight readings. The visceral organs were removed and the wet carcass weight were recorded. Samples of each family representative were taken and subjected to initial proximate analysis. The dry carcass weight of the fish specimen were also taken after oven drying at 105°C for 24 h in order to determine the moisture content. All length and weight reading were replicated four times in each case, the condition factor (k) and carcass quality factor (productive potential carcass quality factor (PPCQF) was also calculated. The condition factor (K) and carcass quality factor (PPCQF) of the fresh water fish families were significantly different ($p<0.05$) from each other with highest condition factor (K) of 2.32 and lowest carcass quality factor (PPCQF) of 1.2855 recorded in *Tilapia niloticus* while the lowest condition factor (k) 0.71 and highest carcass quality factor 2.1764 was recorded in *Clarias gariepinus*. Also in terms of carcass quality *Synodontis clarias* with PPCQF of 1.8381 is second, followed by *Chrysichthys nigrodigitatus,* 1.5133 and fourth *Channa obscura* with PPCQF of 1.4429 and also with lower values of 1.19, 0.87 and 0.80 condition factor recorded respectively. The carcass quality of a fish is not determined by the "state of well being '' or condition factor but it is a function of its protein and fat content as shown in this study with higher values of protein (62.00%) and fat (5.80%) recorded for *Clarias gariepinus* compared to lower crude protein (39.61%) value and fat(4.58%) recorded for *Tilapia niloticus*. However the latter is better adopted for culture in the wild with its high condition factor (2.32) value. While the culture of *Clarias gariepinus* with a low condition factor (0.71) is highly favoured under aquaculture practices. The culture of other fresh water fishes also with low condition factor like *Synodontis* (k = 1.19), *Chryschthys* (k = 0.87) and *Channa* (k = 0.80) should also be promoted under well monitored culture condition.

Key words: Five freshwater fish families, condition factor, carcass quality (PPCQF), proximate composition, processing

INTRODUCTION

This study is aimed at determining the (Fulton's) condition factor (k) which is a measure of the state of well being of the fish and the carcass quality which in this case is a measure of the nutritiveness (carcass protein and fat) and acceptability to consumers and processors for representatives of five selected fresh water fish families. These representatives are:-

- Family Clariidae-*Clarias gariepinus*
- Family Bagridae-*Chrysichthys nigrodigitatus*
- Family Channidae-*Channa obscura*
- Family Cichlidae-*Tilapia niloticus*
- Family Mochokidae-*Synodontis clarias*

As reported by [1,2].

The state of well being of fish intrinsically is determined by the condition and state of its internal organs in relation to its environment (wild or culture situation) if food is not a limiting factor. The proper functioning of this organs will determine the physical state of the fish and its condition factor or state of well being which is manifested externally as growth[3].

Growth is isometric when there is proportional relationship between the body weight and the body length and allometric if the reverse is the case[4]. It therefore implies that a fish with a very high condition factor is well adapted to its environment and may not necessary be a highly nutritive fish or highly priced fish with a higher market value. It may also imply that such a fish will readily adapt to any culture situation , even in the wild. A fish with a very low condition factor may have a

relatively low range of choice especially in feeding within its immediate environment. Such a fish may be highly recommended for culture purposes, if its requirements for growth, reproduction and survival are met.

Eating of fish is advisable for human being because it reduces the blood cholesterol level. The importance of protein has been emphasized over the years and has always been a priority in nutritional studies. This is because protein is the most important single nutrient required in the largest quantity for growth. Hence the need to increase the source of protein supply in the diet of Nigeria populace[5,6]. It is therefore the objective of this study to

- Compare the body weight, length and condition factor of representatives of the five selected fresh water fish families.
- Determine the productive potential carcass quality fact or (PPCQF) in term of nutritive value of the five selected fresh water fish families.
- Determine the implications of these carcass quality factors to the consumers and processor of the five selected fresh water fish families.

MATERIALS AND METHODS

Fifty Adult fresh fish of five fresh water fish families (10 in each case) were procured from Aleshinloye fish market in Ibadan and transported live to the Laboratory of the department of Wildlife and Fisheries Management.

Each fish specimen were dissected after taking the standard Total length and weight reading in 4 replicates. The visceral organs were removed and the wet carcass weight were recorded. Sample of each family representative were taken and subjected to initials proximate analysis for crude protein, fat (ether extract), moisture, ash, crude fibre and non free fat extracts (N.F.E) before the commencement of other experiment procedures.

The fish family representative under study are

- *Clarias gariepinus*-Family Claridae
- *Chrysichthys nigrodigitatus*-Family Bagridae
- *Channa obscura*-Family Channidae
- *Tilapia niloticus*-Family Cichlidae
- *Synodontis clarias*-Family Mochokidae

Measurement of biological relationship in the study

Length and weight mesurements: The total length (absolute length) and standard lengths of the specimens were measured using a measuring board graduated in centimeters (cm). The total length (TL) was measured from the anterior most extremity of the fish to the end of the tail fin. While the standard length (SL) was measured from the anterior most extremely (base of the lower jaw) of the fish to the hidden base of the tail fin in the fish peduncle.

Also a sensitive accoulab weighing scale was used to measure the body weight, wet carcass weight (after the removal of all visceral organs and dry carcass weight after oven drying at 105°C for 24 hours of the representatives of the five selected fresh water fish families. All length and weight reading were replicated four times using 2 males and 2 females in each case and the calculated mean readings are shown in Table 1-4 in the results.

Percentage (%) moisture content andpercentage (%) dry carcass weight deteermination used incalcuting carcass quality: The moisture content was determined by the difference in weight of wet carcass sample (after removal of the visceral organs)before drying in the oven and the final dry carcass weight was weighed after drying at a temperature of 105°C for 24 h.

$$\text{Moisture (\%)} = \frac{\text{Moisture Content (wet carcass weight-Dry Carcass weight)}}{\text{wet carcass weight}} \times \frac{100}{1}$$

The percentage dry carcass weight was calculated as follows

$$\text{Dry carcass weight (\%)} = \frac{\text{Dry carcass weight}}{\text{wet carcass weight}} \times \frac{100}{1}$$

Fulton's condition factor (k): The condition factor (k) is the state well being of the fish and it is used widely to express the relative robustness of the stability of an environment for a specie of fish. Condition factor may change with age, sexual differences, season or the physiological state of the fish, such as before spawning and after spawning.

$$\text{Fulton's condition factor (k)} \frac{100 \times \text{Total body weight (w)}}{L^3 \text{ (Toatal lenght)}^3}$$

$$K \frac{100w}{L^3}$$

W = Total body weight

L = Total length

Hence condition factor is also used in determining the timing and duration of gonad maturation in fish populations.

Determination of carcass quality factor productive potential carcass quality factor (PPCQF):

$$\text{Carcass quality factor (PPCQF)} = \frac{\text{Crude protein (\%)+Fat (\%)}}{100\%} \times \frac{\text{Dry carcass Weight}}{100\%}$$

The percentage crude protein and percentage fat (ether extract, used in the above calculations for each of the representatives of the five fish families were as determined from the initial proximate analysis as shown in (Table 1).

RESULTS

As shown in Table 1 *Clarias gariepinus* had the highest crude protein (CP) value of 62.00% second is *clarias* (Mochokidae) with 1.8581,third is *Chrysichthys nigrodigitatus* with C.P of 50.00% while the leas crude protein of 39.61% was recorded in *Tilapia niloticus.*

In this study *Synodontis clarias* had the highest fat content of 6.50%, second is *Chrysichthys nigrodigitatus* with 6.36%, third is *Clarias gariepinus* with a fat content of 5.80% and also the least fat content of 4.58% was recorded *in Tilapia niloticus.*

Coincidentally as shown in Table 2, *Tilapia niloticus* had the least body weight among the five fish families but the highest condition factor (k) of 2.32 followed by *Synodontis clarias* with 1.19 while the least condition factor of 0.71 was recorded in *Clarias gariepinus* as shown in Table 3.

The highest carcass quality factor (PPCQF) as shown in the Table 4 was recorded in *Clarias garipinus* (Claridae) with a value of 2.1764, second is *Synodontis* the least carias quality factor of 1.2855 was recorded in *Tilapia niloticus* (Cichlidae).

Table 1: Proximate composition of five selected fresh water fish families

	Claridae *Clarias gariepinus*	Channidae *Channa obscura*	Bagridae *Chryscithys nigrodigitatus*	Cichlidae *Tilapia niloticus*	Mochokidae *Synodontis clarias*
Moisture	17.48	20.76	20.52	17.58	18.13
Ash	10.10	10.77	12.93	14.34	12.65
Fat	5.80	4.43	6.36	4.58	6.50
Fibre	0.62	6.47	5.84	15.24	5.50
Protein	62.00	47.36	50.00	39.61	53.38
N.F.E	4.00	10.21	4.35	8.65	3.84

Table 2: Mean body weight total/standard length head and gut length of five selectad fish families

Specie	Body weight (cm)	Feed length (cm)	Total length (cm)	Standard length (cm)	Tail length (cm)	Gut length (cm)	Tail length total length (cm) (%)	Gut length total length (%)	Head length total length (%)
Claridae *Clarias gariepinus*	402.50	12.90	38.50	34.00	4.50	50.00	11.69	129.87	33.51
Bagridae *Chrsichths nigrodigitatusI*	293.68	9.75	32.38	26.13	6.25	64.50	19.30	199.20	30.11
Channidae *Channa obscura*	165.20	7.58	27.43	23.25	4.18	10.75	15.24	39.19	27.63
Cichlidae *Tilapia niloticus*	96.50	4.08	16.08	13.08	3.00	66.50	18.66	413.56	25.37
Mochokidae *Synodotis clarias*	149.93	6.43	23.25	19.13	4.12	30.00	17.72	129.03	27.66

Table 3: Mean carcass weigth total length and condition factor fish families

Specie	Body weight (cm)	total length (cm)	Wet carcass weight (cm)	Dry carcass weight (cm)	Dry carcass weight from wet weight	Moisture content (%)	Moisture content (%)	Contition factor $k = 100\ w/L^3$
Claridae *Clarias gariepinus*	402.50	38.50	350.00	112.35	32.10	237.35	67.81	0.71
Bagridae *Chrysichthys nigrodigitatus*	293.68	32.38	281.70	75.63	26.85	206.07	73.15	0.87
Channidae *Channa obscura*	165.20	27.43	161.53	45.00	27.86	116.53	72.14	0.80
Cichlidae *Tilapia niloticus*	96.50	16.08	89.38	26.00	29.09	63.38	70.91	2.32
Mochokidae *Synodontis clarias*	149.93	23.25	141.42	43.88	31.03	97.54	68.97	1.19

The condition factor (k) was significant ($p<0.05$)

N.B

$$\%\text{Drycarcassweight} = \frac{\text{Drycarcassweight}}{\text{Wetcarcassweight}} \times \frac{100}{1}$$

$$\text{Condition factor (k)} = \frac{100 \times \text{Body weight (w)}}{(\text{Length (L)})^3}$$

$$\%\text{Moisture content} = \frac{\text{Wetcarcasswt} - \text{Dry carcass}}{\text{Wetcarcassweight}} \times \frac{100}{1}$$

Table 4: Mean carcass qulity factor ((ppcqf- productive carcass potentail carcass quality factor) of 5 selected fresh water fish families

Specie	Body weight (cm)	Total length (cm)	Crude protein (%)	Fat other extract (%)	Dry carcass weight (%)	Carcass quality (PPCQF)
Claridae *Clarias gariepinus*	402.50	38.50	62.00	5.80	32.10	2.1764
Bagridae *Chrysichthys nigrodigitatus*	293.68	32.38	50.00	6.36	26.85	1.5133
Channidae *Channa abscura*	165.20	27.43	47.36	4.43	27.86	1.4429
Cichlidae *Tilapia niloticus*	96.50	16.08	39.61	4.58	29.09	1.2855
Mochokidae *Synodontis clarias*	149.93	23.25	53.38	6.50	31.03	1.8581

The carcass quality factor (PPCQF) was significantly different (p<O.O5 among the fish species.

N.B

$$*\text{Carcass quality factory (PPCQ)} = \frac{\%\text{ Crude protein}+\%\text{ Fat}}{100\%} \times \frac{\%\text{Drycarcassweight}}{100\%}$$

(Production potentialcarcassquality factory)

DISCUSSION

The state of well being or condition factor of a fish as shown in this study does not determine the carcass quality of the fish. For instance *Tilapia niloticus* in this study had the highest condition factor (k) of 2.32 but the lowest carcass quality factor (PPCQF) of 1.2855, whereas *Clarias gariepinus* with the least condition factor (k) of 0.71 had the highest carcass quality factor (PPCQF) of 2.1764 (as shown in Table 3 and 4).

This probably implies that the sum total of the crude protein and fat content of a fish determines its carcass quality, the consumer tastes and the high pricing by both the processor and the user (i.e., the consumer). Hence the reason why such fish species like *Clarias gariepinus* (PPCQF of 2,1764) (Claridae) *Synodontis clarias* (PPCQF of 1.8581 (Mochokidae) and *Chrysichthys nigrodigitatus* (with PPCQF of 1.5233 (Bagridae) attracts higher prices and are of high consumer preference in the open market (as shown in Table 4).

The high condition factor (k) of 2.32 for *Tilapia niloticus* suggests its adaptability to different culture conditions, hence its ready availability in all fresh water bodies and it is often termed pollution indicators. It breeds easily and naturally in open waters and needs little or no cultural practices for its culture and management.

Whereas *Clarias gariepinus* with the lowest condition factor (k) of 0.71 is better suited for well managed programmed and monitored aquacultural practices as opposed to its culture in the wild. Over the years this has yielded good dividends[3,7-10].

However it is advocated that other representatives of the other fish families with lower condition factors.

Channa obscura (0.80) *Chrysichthys nigrodigitatus* (0.87) and *Synodontis clarias* (1.19) should by further researched into and subjected to suitable aquacultural procedures for their breeding as it is the case with *Clarias gariepinus.*

CONCLUSION

The carcass quality (PPCQF) of a fish is determined by the protein/fat ratio in its tissues and it is not a function of its condition factor which is a measure of it state of well being or its adaptabilty to its environment as it is the case with *Tilapia niloticus Clarias gariepinus* with the highest carcass quality PPCQF (2.1764) and lowest condition factor (0.71) is the recommended consumer/processors choice. Hence while further promoting its culture under programmed, well managed aquacultural procedures the breeding and culture of other fresh water fishes should also be promoted.

REFERENCES

1. Fagade, S.O. and A.A. Adebisi, 1979. On the fecundity of *Chrysichthys nigrodigitatus* of Asejire Dam, Oyo State. Nig. J. Natural Sci., 2: 131.
2. Lewis, D.S.C., 1974. The effects of formation of Lake Kanji (Nigeria) upon the indigenous fish population. Hydrobiol., 45: 251-301.
3. Elliot, O.O., 1975. Biological observation of some species used for Aquaculture FAO/CIFA symposium on Aquaculture in Africa-Ghana. CIFA/75/8.E18.
4. Olatunde, A.A., 1983. Length-Weight relationship and the diets of *Clarias lazera* in Zaria. Nigeria Proceeding of 3rd Annual Conference of fisheries Society of Nigeria F/SON , pp: 88-192.
5. Bender, A.E., 1969. Problems of human protein nutrition. Royal Soc. Health J., 5: 221-226.
6. Huss, 1975. Quantity and Quality changes in fresh fish, FAO Fisheries Technological paper 348, F.A.O. Rome, Italy, pp: 195.
7. Carreon, J.A. R.F. Neutura and C.J. Almazan, 1973. Note on the induced breeding of *Clarias macrocephalus* (Gunther). Aquaculture, 2: 5-16.
8. Ezenwa, 1975. Fish Seed Production in Nigeria FAO Symposum on Aquaculture, pp: 441-449.
9. F.A.O., 1972. Induced breeding of *Clarias* species. F.A.O.Aquaculture Bull., 4: 11.
10. Hogendoorn, H., 1979. Controlled propagation of the African Catfish.*Clarias lazera* (C and V). Reproductive biology and field experiment Aquaculture,7: 323-333.