

Research Article

An Estimation of the Size Composition and Condition Factor of *Ophiocara Porocephala* from Amassoma Flood Plains, Niger Delta, Nigeria

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Abstract: An estimation of the size composition and condition factor of *Ophiocara porocephala* from Amassoma flood plains, Niger Delta, Nigeria was carried out for a period of six months (April-June 2010 and November, 2011-January, 2012) to assess aspects of the fishery status. The flood plain of Amassoma is one of the low lands in Niger Delta providing nursery and breeding grounds for variety of both finfish and shell fish species. Fish plays on important role in the development of a nation. Apart from being a cheap source of highly nutritive protein, it also contains other essential nutrients required by the body. Therefore the study of condition factor and size composition of *Ophiocara porocephala* from Amassoma flood plains will provide information on the amount of stock available for the fishery, evaluation of production, information for stock sizes, an important information for the evaluation of mortalities and status of the fish population, estimating the average weight at a given length group and an index of growth and feeding intensity. Length measurement values ranged from 8.2-15.3 cm; while width, weight and condition factor measurement values ranged from 1.2-2.5 cm, 3.98 g–40.35 g and 0.29-1.78. The highest length frequency (26) was estimated for values ranging from 11.5-12.5 with class mark 12.0 mm. The lowest length frequency (1) was estimated for length range 14.8-15.8 mm with class mark 15.3 mm. The highest width frequency (27) was estimated for values ranging 1.8-1.9 mm with class mark 1.85 mm. The lowest width frequency (2) was estimated for values ranging from 2.2-2.4 and 2.5 -2.6 mm with class marks 2.45 and 2.65 mm, respectively. The highest weight frequency (31) was estimated for values ranging from 10.0-14.9 g with class mark 12.45 g. The lowest weight frequency (2) was estimated for values ranging 6. 0-10.9 g with class mark 8.45 g. The highest condition factor frequency (49) was estimated for values ranging from 0.9-1.1 with class mark 1.0. The lowest condition factor frequency (4) was estimated for values ranging from 0.3-0.5 with class mark 0.4. From a sample size of 81 specimens, K value was 0.999 and the exponential equation was $W_t = 0.05998 (TL)^{2.719}$, indicating an isometric growth pattern. There was no temporal variation in the condition of the fish with condition index value 0.99- 1.00 and condition factor value of 0.999 is an indication of the fish species poor condition.

Keywords: Amassoma flood plains, condition factor, Niger delta, Nigeria, *ophiocara porocephala*, size composition

INTRODUCTION

Snakehead Gudgeon (*Ophiocara Porocephala*) (Plate 1) belongs to the family Gobiidae. Among the fishes, the families, Gobiidae is the most diverse and are often very abundant. About 90 species are present in Singapore; over 40 of these are found in mangroves. Gobies are often recognized by their cylindrical bodies, two dorsal fins, pectoral fins with broad base and rounded heads. Many species also have their pelvic fins united to form a disc. The Gobiids can be used as condiment for soup, fish feeds and bioindicators for pollution. The flood plain of Amassoma is one of the low lands in the Niger Delta providing nursery and breeding grounds for a variety of both finfish and shell fish species.



Plate 1: Snakehead gudgeon *Ophiocara porocephala* Size: up to 32 cm



Plate 2: Grey knight goby *Stigmatogobius sadanundio* Size: up to 8 cm

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Plate 3: Javanese fatnose goby *Pseudogobius javanicus* Size: up to 4.5 cm

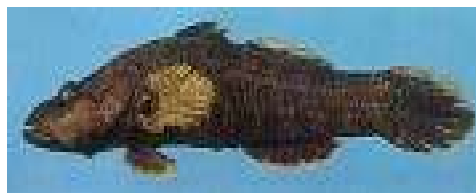


Plate 8: Mangrove flathead gudgeon *Butis butis* Size: up to 14 cm

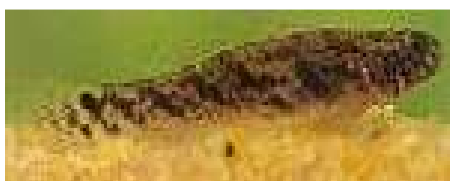


Plate 4: Common mullet goby *Hemigobius hoevenii* Size: up to 6 cm



Plate 5: Blue-eyed goby *Hemigobius melanurus* Size: up to 7 cm



Plate 6: Glass goby *Gobiopetrus birtwistlei* Size: up to over 2 cm

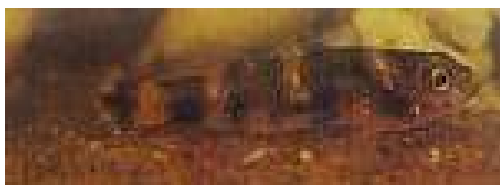


Plate 7: Bumblebee goby *Brachygobius kabillensis* Size: up to 2 cm

There are several other species of Gobiids (Plates 2-8): The Grey knight goby has a long first dorsal fin and black spots on the side of the body. The Javanese fat nose goby and the Common mullet goby appear to be the most abundant species in the mangrove. In leaf-filled pools, the Blue-eyed mullet goby may be seen hovering in mid water. It rushes for cover when approached. The tiny Glass goby with

its almost transparent body and large mouth occurs in tidal streams and pools. The conical snout and under slung lower jaw suggests the predatory nature of the Mangrove flathead gudgeon. It conceals itself by lying still against mangrove roots and other similarly-colored surfaces and ambushes unsuspecting prey that wander too close. The Snakehead gudgeon is a large predatory species that is common in mangroves.

Estimation of the general well being of fish (Abowei, 2006). It is based on the hypothesis that heavier individuals of a given length are in better condition than less weightier fish (Bagenal and Tesh, 1978). Condition factors have been used as an index of growth and feeding intensity. Abowei (2009a) posted that condition factors of different populations of same species is indicative of food supply and timing and duration of breeding. Pauly (1983) reported that the numerical magnitude of the condition factors can be influenced by factors such as:

- Sex
- Age
- Time of year
- Stage of maturity
- Stomach content of the organism

Comparisons therefore could be meaningful if these factors are roughly equivalent among the samples to be compared (Abowei, 2009b). The condition factor of a fish decrease will increase in length (Bakare, 1970; Fagade, 1979) and also influences the reproduction cycle in fish (Abowei, 2009c). The length weight relationship of a fish is an important fishery management tool. Its importance is pronounced in estimating the average weight at a given length group. (Beyer, 1987) and is assessing the relative well-being of a fish population (Bolger and Connolly, 1989). It is advantageous to use two measurable and convertible sizes of fish for estimating the condition factors.

Condition factor has been used to investigate seasonal and habitat differences in condition. In fish, the condition factor or condition (K) reflects the fish in relation to its welfare. From nutritional point of view, condition factor is the accumulation of fat and gonodial development (Lecren, 1951). From reproductive point of view, the highest (K) values are reached in some

species condition factor K also gives information when comparing two populations. When determining the period of the gonodial maturation and when following up the degree of feeding activity of a species to verify whether it is making good use of its feeding source (Bagenal and Tesch, 1978). Furthermore Gayanilo *et al.* (1988) confirmed that the lowest condition (K) values during the more developed gonodial stages might mean resource transfer to the gonads during the reproductive period. Abowei, (2010) through other authors showed that values of the condition factor vary according to season and are influenced by environmental conditions. The same may be occurring in the environment under the study since the floodplain is influenced by many biotic and abiotic factors which favour the equilibriums of all the species in the ecosystem. The values obtained from the study showed the species were in poor condition. Gayanilo and Pauly (1997) reported that certain factors often affect the well-being of a fish, these include: Data pulling, sorting into Classes, Sex Stage and Maturity and stage of the stomach.

Fulton's Condition Factor: The relative robustness or degree of fish is expressed by coefficient of condition (also known as condition factor or length-weight factor) variation in a fish coefficient of condition primarily reflect state of sexual maturity and degree of nourishment, values may also varies with fish age and in some species with sex. The coefficient of condition has usually been represented by the letter (k) when the fish is measured and weighed in the metric system.

Fulton's condition factor (K) has been widely used by the fisheries profession. Calendar (1955) identified K as a sensitive measure of change and differences in body form. Fulton's condition factor assumes isometric growth ($b = 3$, fish shape does not change with growth) and is calculated as the ratio between the observed weight and an expected weight dependent on the fish's length. The formula for calculating K is:

$$K = (W/L^3) \times 100,000$$

where,

W = Weight in grams

L = Length in millimeters

100,000 is a constant used for scaling purposes (i.e., the resulting value should be close to a single digit and rounded to one decimal). Similarly, an English formula is given as:

$$C = (W/L^3) \times 10,000$$

where,

W = Weight in pounds

L = Length in inches

10,000 = A scaling constant

A general convention of subscript abbreviations has been used to designate which length measurement has been used to calculate C or K (Holi and Suiji, 1996). The subscript convention for maximum total length is K_{TL} or C_{TL} , fork length is K_{FL} or F_L , standard length is K_{SL} or C_{SL} and no subscript implies that total length was the measurement.

A problem with the use of K is the assumption of isometric growth, which is rarely the case (Bolger and Connolly, 1989). The result is that K increases with fish length when $b > 3$ (i.e., fish become more rotund with increased length). Comparisons should be restricted to individuals of similar length. To use K correctly, the assumption of isometric growth must be tested within each length interval stratum for which comparisons will be made (Cassie, 1954). Additionally, comparing K values across species is practically impossible because different fish shapes result in different value ranges for each fish species (Enin, 1995).

Relative Condition Factor: Lecren (1951) introduced the idea of the K_n for measuring fish condition and suggested that K_n could be used to distinguish between and measure separately the influences on condition of length and other factors. Relative condition factor is calculated with the formula:

$$K_n = W/W'$$

where,

W = The weight of the individual fish

W' = The predicted length-specific mean weight for the population under study

(Nawa, 1985) thought K_n would have its greatest application in studies involving fish populations in lentic waters. They believed that annual determination of K_n for all sizes of a given species could indicate which length groups were crowded or most abundant. Additionally, (Bhukaswan, 1980) postulated that K_n could be useful in detecting pollution or any situation that resulted in prolonged physiological stress on a segment of a fish population. Enin (1995) identified a practical advantage of K_n in that the average fish of all lengths and species has a value of 1.0; thus, the influence of length is removed, as was indicated by Lecren (1951). A disadvantage of K_n is that comparisons between fish must be confined to those homogeneous for b in their length-weight relationship (Bolger and Connolly, 1989) because median slopes can vary from one geographical range to another (Enin *et al.*, 1995). The result is that different W' equations are needed for each region or perhaps every population, making comparisons across water bodies difficult.

Residual Analysis: Whitehead (1984) examined the condition of broad whitefish (*Coregonus nasus*) in the

Prudhoe Bay region of Alaska by indexing residual values relative to whole population least-squares regression loge (weight) against loge (length). The population least-squares regression was generated from broad whitefish collected during nine sampling years. A large negative mean residual value was considered indicative of fish in poor condition, whereas small mean residual values indicate fish in average condition. The authors believed that residual analysis is synonymous with the concepts of K_n and W_r , in that all three examine the deviation of predicted weight from some common weight-length relationship. The flood plain of Amassoma is one of the low lands in Niger Delta providing nursery and breeding grounds for variety of both finfish and shell fish species. Fish plays an important role in the development of a nation. Apart from being a cheap source of highly nutritive protein, it also contains other essential nutrients required by the body (Abowei, 2010). Therefore the study of condition factor and size composition of *Ophiocara porocephala* from Amassoma flood plains will provide information on the amount of stock available for the fishery (King, 1991) evaluation of production, (King, 1996) information for stock sizes (Krupka, 1974) an important information for the evaluation of mortalities and status of the fish population, estimating the average weight at a given length group (Beyer, 1987) and an index of growth and feeding intensity (Fagade, 1978). An estimation of the size composition and condition factor of *Ophiocara porocephala* from Amassoma flood plains, Niger Delta, Nigeria assess aspects of the fishery status will provide information on the amount of stock available for the fishery, evaluation of production, information for stock sizes, an important information for the evaluation of mortalities and status of the fish population, estimating the average weight at a given length group and an index of growth and feeding intensity.

MATERIALS AND METHODS

Study area: Niger Delta is one of the world's largest wetlands covering an area of approximately 70,000km³. The area is economically important and rich in biodiversity over 80% Federal Government revenue is located with the Niger Delta region. The red and white mangroves (*Rhizophora* and *Avicennia* spp). Mangrove swamps and flood plain border the river and it's numerous creeks and all there are well exposed at low tides. Amassoma is the head quarters of Ogboin clan as well as Ogboin in the North Rural Development Authority in Southern Ijaw Local Government Area of Bayelsa State (Nigeria) and the host community to the Nigeria University (NDU), Wilberforce Island, Bayelsa



Fig. 1: Geographical terrain map of Amassoma

State. Amassoma is located about 40km to the south of Yenegoa, the State capital with an altitude of 512m about sea level. It is bounded to the North by River Nun, West by Otuan and Wilberforce Island, East by Toru Ebeni and the South by Ogobiri. Amassoma has a diameter of about 6km East to West and approximately 2km North to South (Fig.1).

Fish sampling: Sampling was carried out forth nightly for a period of six months (April-June 2010 and November, 2011- January, 2012), using gillnets, long lines, traps and stakes. Catches were isolated and conveyed in thermos cool boxes to the laboratory on each sampling day. Fish specimens were identified using monographs, descriptions, checklist and keys (Reed *et al.*, 1967; Reed and Syndeham, 1978; Alfred-Ockya, 1983; Whitehead, 1984). Total length and weight of the fish specimens were measured to the nearest centimeter and gramme respectively, to obtain the required data. The weight of each fish was obtained after draining from the buccal cavity and blot drying samples. Total length and weight of fish specimens were measured to the nearest centimeter and grammes respectively, to obtain data on the length-weight relationship.

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

$$K = \frac{100}{L^3} W \quad (1)$$

where,

K = Condition factor

W = Weight of fish

L =Length of fish (cm)

The Total Length (TL) of the fish was measured from the tip of the anterior or part of the mouth to the caudal fin using meter rule calibrated in centimeter.

Fish were measured to the nearest centimeter. Fish weight was measured after blot drying with a piece of clean hand towel. Weight was done with a table top weighing balance, to the nearest gram. The length measurements were converted into length frequencies with constant class intervals of 2 cm. The mean lengths and weights of the classes were used for data analysis, the format accepted by FISAT (Gayanilo and Pauly, 1997). The relationship between the length (h) and weight (w) of fish was expressed by the equation (Pauly, 1983):

$$W = aL^b \quad (2)$$

where,

- W = Weight of fish in (g)
- L = Total length (TL) of fish in (cm)
- a = Constant (intercept)
- b = The length exponent (slope)

The “a” and “b” values are obtained from a linear regression of the length and weight of fish. The correlation (r²) that is the degree of association between the length and weight was computed from the linear regression analysis.

$$R = r^2 \quad (3)$$

RESULTS

Tables 1-4 express the Length, width and weight and condition factors frequency distribution of some specimens of *Ophiocara porocephala* from Amassoma Flood Plains. Length measurement values ranged from 8.2-15.3 cm; while width, weight and condition factor measurement values ranged from 1.2 cm-2.5cm, 3.98g-40.35 g and 0.29-1.78. The highest length frequency (26) was estimated for values ranging from 11.5-12.5 with class mark 12.0 mm. The lowest length frequency (1) was estimated for length range 14.8-15.8 mm with class mark 15.3 mm. The highest width frequency (27) was estimated for values ranging 1.8-1.9 mm with class mark 1.85 mm. The lowest width frequency (2) was estimated for values ranging from 2.2-2.4 and 2.5-2.6 mm with class marks 2.45 and 2.65 mm respectively. The highest weight frequency (31) was estimated for values ranging from 10.0-14.9 g with class mark 12.45 g. The lowest weight frequency (2) was estimated for values ranging 6. 0-10.9 g with class mark 8.45 g. The highest condition factor frequency (49) was estimated for values ranging from 0.9-1.1 with class mark 1.0. The lowest condition factor frequency (4) was estimated for values ranging from 0.3-0.5 with class mark 0.4. Table 5. Presents the condition factor and the exponential equation from the length weight relationship of *Ophiocara porocephala* from Amassoma Flood Plains. From a sample size of 81 specimens, K value was 0.999 and the exponential equation was

Table 1: Length frequency distribution of *Ophiocara porocephala* from Amassoma flood plains

Length class range (mm)	Length class mark (mm)	Frequency	Cumulative frequency
8.2-9.2	8.7	3	3
9.3-10.3	9.8	5	8
10.4-11.4	10.9	22	30
11.5-12.5	12.0	26	56
12.6-13.6	13.1	16	72
13.7-14.7	14.2	8	80
14.8-15.8	15.3	1	81

Table 2: Width frequency distribution of *Ophiocara porocephala* from Amassoma flood plains

Width class range (mm)	Width class mark (mm)	Frequency	Cumulative frequency
1.2-1.3	1.25	3	3
1.4-1.5	1.45	9	11
1.6-1.7	1.65	22	33
1.8-1.9	1.85	27	60
2.0-2.1	2.05	11	71
2.2-2.3	2.25	6	77
2.4-2.5	2.45	2	79
2.6-2.7	2.65	2	81

Table 3: Weight frequency distribution of *Ophiocara porocephala* from Amassoma flood plains

Weight class range (g)	Weight class mark (g)	Frequency	Cumulative frequency
1.0-5.9	3.45	4	4
6. 0-10.9	8.45	2	6
10.0-14.9	12.45	31	37
15.0-19.9	16.45	27	65
20.0-24.9	20.45	8	74
25.0-29.9	24.45	3	77
30.0-34.9	28.45	3	79
35.0-39.9	32.45	1	80
40.0-44.9	36.45	1	81

Table 4: Condition factor frequency distribution of *Ophiocara porocephala* from amassoma flood plains

Condition factor class range	Mid class	Frequency	Cumulative frequency
0.3-0.5	0.4	4	4
0.6-0.8	0.7	7	11
0.9-1.1	1.0	49	60
1.2-1.4	1.3	9	69
1.5-1.7	1.6	7	76
1.8-2.0	1.9	5	81

Table 5: Condition factor and exponential equation of *Ophiocara porocephala* from amassoma flood plains

N	K	Exponent equation
81	0.999	$W_t = 0.5998 (TL)^{2.719}$

$W_t = 0.5998 (TL)^{2.719}$, indicating an isometric growth pattern. There was no temporal variation in the condition of the fish with condition index value 0.99-1.00 and condition factor value of 0.999 is an indication of the fish species poor condition.

DISCUSSION

These results compared favorably with other reports from similar studies in similar water bodies. Condition factors of different species of cichlid fishes have been reported by Siddique (1977), Fagade (1978,

1979, 1983), Dadzie and Wangila (1980), Arawomo (1982) and Oni *et al.* (1983). Condition factors reported for some other species include: Alfred-Ockiya (1983, 2000) for *Chana chana* in fresh water swamps of Niger Delta and Hart (1997) for *Mugil cephalus* in Bonny estuary. From a sample size of 81 specimens, K value was 0.999 and the exponential equation was $W_t = 0.05998 (TL)^{2.719}$, indicating an isometric growth pattern. There was no temporal variation in the condition of the fish with condition index value 0.99-1.00 and condition factor value of 0.999 is an indication of the fish species poor condition.

The estimation of condition factor is the study of the general well being of fish. The condition factors have been used as an index of growth and feeding intensity. It was reported that the numerical magnitude of the condition factor can be influenced by factors such as sex, time of the year, stage of maturity and stomach content. The length-weight relationship of fish is an important fishery management tools. Its importance is pronounced in estimating the average weight at a given length group and assessing the relative well being of a fish population.

CONCLUSION

- *Ophiocara porocephala* from Amassoma flood plains exhibited an isometric growth pattern
- There was no temporal variation in the condition of the fish
- The condition factor value indicated that fish species was in poor condition
- Amassoma flood plains need regular and effective management strategy to manage the flood plains and *Ophiocara porocephala* fishery

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