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# Food, Feeding Habit and Condition Factor of *Schibe mystus* in Mid Cross River Flood System, Southeastern Nigeria

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A total of 100 stomachs of *Schilbe mystus* in the mid Cross River were analyzed. Seventy three (73%) of these stomachs had food items while 27 (27%) had empty stomachs. The result gave two divisions of the algae (Bacillariophyta (7.04%) and Chlorophyta (20.74%)) and three divisions of zooplanktons (Cladocera (0.74%), Rotifera (18.15%), Crustacean (24.44%) exploited by *S. mystus* in the mid Cross River. Other particles like sand grains and unidentified organism etc were also found in the stomach. The mean length of the fish sample was 15.0940±2.7647 cm while the mean weight was 23.410±9.8730 g. The difference in mean between the length and the weight was statistically significant ($p<0.05$). There was a positive correlation between the length and the weight of the studied samples ($r = 0.692$). Condition factor value for *S. mystus* was less than 1 indicating that the species is not in good condition. This finding has management implication for resource sustainability.

## Introduction

The global level of fish supply is becoming insufficient as a result of human pressure due to population increases [1]. Nigerian populace, which was estimated at about 162.5 million in 2011 with an annual population growth rate of 2.1% is expected to be 257.8 million by 2030 [2]. Hence food supply is expected to triple to cater for this increase, however the currently demand for fish in Nigeria is 3.21 million tons [1]. Therefore the present situation calls for serious and urgent action on how to ensure sustainable and sufficient production. The transition to scarcity of fish cannot be prevented by only intensive fishing but rather could be ameliorated by better management of fisheries resources and interventions to improve equity of resources apart from aquaculture practices. [1] reported that out of 200,000MT fish stock in all part of the world, more than a quarter is overexploited, depleted or recovering. In fisheries science, the condition factor is used in order to compare the "condition", "fatness" or wellbeing of fish and it is based on the hypothesis that heavier fish of a particular length are in a better physiological condition [3]. Condition factor is also a useful index for the monitoring of feeding intensity, age, and growth rates in fish [4]. It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live. Condition factors of different tropical fish species were investigated and reported by [5], and similar studies particular to catfishes including [6], [7], [8] and [9]. These reports focused on the determination of changes in condition factor with season, fish length, sex and/or reproductive status of fish in localities other than the freshwater reaches of Niger Delta floodplains. The study of the food and feeding habits of fresh water fish species is a subject of continuous research because it constitutes the basis for the development of a successful fisheries management programmed on fish capture and culture [10]. Nature offer a great diversity of organisms that are used as food by fish, and these differ in size and taxonomy group. The dietary analysis of organism in their natural habitat enhances the understanding of the growth, abundance, productivity and distribution of organisms. The diet of cultured species does not provide precise and reliable information on the food, feeding habits and condition factor of such species. Hence, most studies which are aimed at obtaining such information on food, feeding ecology and condition index of organisms are based on the analysis of gut content of organism caught from their natural habitats [11]. Condition factor has been used as an index of growth and feeding intensity [12]. Condition factor decrease with increase in length [12] and also influence the reproduction cycle in

fish [13]. Condition factor of fish is an important fishery management tool. Its importance is pronounced in estimating the relative well–being of a fish population in a particular river system. *S. mystus* belongs to family Schilbeidae and is a siluroid catfish of commercial importance. The schilbeid catfish are salient components of the ichthyofauna of many freshwater bodies [14] and like other catfishes are heavily exploited. There is paucity of information on this species in the mid Cross River basin. Despite the literature on this species, the bulk of studies conducted were in water bodies outside Nigeria. In Nigeria no such studies have been carried out in the Cross River basin therefore this study seeks to determine the food, feeding habits and condition factor of the *S. mystus*. Also to determine the length frequency distribution and the length-weight relationship of the species in the mid Cross River flood system with the view of obtaining information required for scientific management of this resource.

## Materials and Methods

### Study Area

The study area is the mid course of the Cross River basin located at Ndibe in Afikpo North local government Area of Ebonyi state. It is about 5km east eastwards away from Afikpo main town. The Cross River basin forms the border between Ebonyi state and Cross River state. The vegetation around the river is predominately grasses, tall and thin palm trees, and bamboo plants and elephant grasses unevenly distributed. Hence, the vegetation and the ecological built of the area attract some activities such as recreation (escortion, picnic), fishing, lumbering, farming activities as well as sand mining due to the presence of sand backs. There is a mini market by the river where some fishes are marketed immediately they are caught. However, in most cases, fishes are transported to other part of Ebonyi state and Cross River state. The major agricultural activities going on at the study area are farming and fishing. Crops cultivated within the area include cassava, maize melon, yam, groundnut etc during the wet season. They cultivate green vegetables of different kinds, tomatoes and pepper very close to the river during the dry season, and irrigate them from the river. There is also water fluctuation in the cross River basin with season which goes a long way to determine the agricultural activities of the occupants during each period. During the dry season (Nov- March), some areas of the river floor is seen and covered with sand hence fishing activities will be hampered and most fishermen would abandon their fishing activities and change over to sand mining. But during the raining season (April-September), water levels will increase and reverse the activities of the people. Fishing operations in the river is by use of hooks and line, nets etc.

### Sample Collection

A total of 100 fish specimen were collected from local fishermen at the beach site for a period of three months (August - October, 2014).The fish samples were caught by the local fishermen using locally available crafts and fishing gears which include canoes, cast nets, gill and lines. Samplings were done from 06:00 - 18:00 GMT at 3hr intervals. The experimental Africa Butter Catfish species caught were collected and transported in ice chests to Applied Biology Laboratory Ebonyi State University where they were preserved in 10%formalin, to avoid decay before examination. Identification of fish specimen was done using fish identification guide by [10] and [1]. The weight of each specimen was taken using a top loading Metler balance (model PN1200) to the nearest 0.1g after draining excess water with a pile of filter paper while standard length was measured in centimeter using a measuring board.

### Laboratory Analysis

Each fish was assigned a reference. The sexes of the fish were determined only after dissecting the fishes and nothing the presence of testes or ovaries. The intestines of individual fish were measured; the volume of the intestines was also noted. Thereafter, the intestines were cut open with a pair of scissors, and scrapped onto a grease-free glass slide and examined for stomach contents and were viewed microscopically.

### Statistical Analysis

The data obtained in the present study was presented using simple frequency distribution table and charts. The correlation between the length and weight was determined using (FAO-ICLARM Stock Assessment Tool) FiSAT II software. The condition factor was calculated using the mean weight and length and statistical difference was measured at 0.05 level of

significance.

The Length - weight relationship (LWR) was estimated by using the equation:

$$W = a L^b$$

Where W = Weight (g)

L = Standard length (cm)

a = Constant

b = Growth exponent.

The equation was linearised by a logarithmic transformation to give:

$$K = {}^{100W}/_{L^3}$$

Where K = Condition Factor

W = Total body weight (g)

L = Standard Length (cm)

## Results

A total of 100 stomachs of *S. mystus* from the mid Cross River were analyzed. Fishes with the length range of 14.1-16.0 cm has the highest frequency/occurrence (65.0%) while none of the fish sample falls under the length range of 12.0-14.0 cm and 16.1-18.0 cm (Fig. 1).Fishes with the weight range of 11.0-15.0 g has the highest frequency/occurrence (25.0%) while those with weight range of 5.0-10.0 g has the least frequency of occurrence (3.0%) (Fig. 2).

Table 1 shows the length-weight relationship and condition factor of *S. mystus*. The mean length of the fish sample studied in the present study was 15.0940±2.7647 cm while the mean weight was 23.410±9.8730 g. The difference in mean between the length and the weight was statistically significant ($p<0.05$). Also, there was a positive correlation between the length and the weight of the studied samples ($r = +0.692$). The calculated condition factor (0.681) shows that the conditions surrounding the fishes are below average and not favorable for the fish growth.

Table 2 shows the summary of the stomach contents of *S. mystus* 73(73%) of these stomachs had food items while 27 (27%) had empty stomachs. The table shows that there are two divisions of algae (Bacillariophyta (7.04%) and Chlorophyta (20.74%)) and three divisions of zooplanktons (Cladocera (0.74%), Rotifera (18.15%) and Crustacean (24.44%)) exploited by *S. mystus*. Other particles like sand grains, unidentified organism etc was also found in the stomach. Using the numerical method, the organisms were mostly from the division Crustaceans (24.44%) and Chlorophyta (20.74%).

***Table 1.*** *Length-Weight relationship and condition factor of S. mystus.*

| Variable | Mean±S.D | p-value | Correlation coefficient, r | Condition factor, k = 100W/L3 |
|---|---|---|---|---|
| Length (cm) | 15.0940±2.7647 | <0.05 | 0.692 | 0.681 |
| Weight (g) | 23.410±9.8730 | | | |

N/B:W=mean weight; L=mean length; k=condition factor; r = Pearson correlation coefficient; p = probability value; S.D= standard deviation

***Table 2.*** *Summary of the stomach contents of S. mystusin the mid Cross River.*

| Stomach Contents | Frequency of Occurrence | Frequency Percentage |
|---|---|---|
| **CRUSTACEAN** | | |
| Pseudosida bidentata | 2 | 3.03 |
| Graptoleberis testudinaria | 3 | 4.55 |
| Gamerus | 5 | 7.58 |
| Anisogamus | 9 | 13.64 |
| Streptocephalus | 11 | 16.67 |
| Diatomus | 8 | 12.12 |
| Cyclops | 7 | 10.61 |
| Diaphnia | 10 | 15.15 |
| Neuplius | 11 | 16.67 |

| Stomach Contents | Frequency of Occurrence | Frequency Percentage |
|---|---|---|
| Total | 66 | 24.44 |
| ROTIFERA | | |
| Brachionus caudatus | 8 | 16.33 |
| Dinophysis forfii | 4 | 8.16 |
| Oxyurella ciliate | 3 | 6.12 |
| Trichocerca diurella | 11 | 22.45 |
| Keretella | 10 | 20.41 |
| Philodina | 2 | 4.08 |
| Testudinella | 4 | 8.16 |
| Polyarthera | 5 | 10.20 |
| Total | 49 | 18.15 |
| CLADOCERA | | |
| Bosmina longirostris | 2 | 100 |
| Total | 2 | 0.74 |
| BACILLARIOPHYTA | | |
| Actinella comperei | 4 | 21.05 |
| Euryalona orientalis | 3 | 15.79 |
| Amphora ovalisr | 2 | 10.53 |
| Surirella brebissonii | 10 | 52.63 |
| Total | 19 | 7.04 |
| CHLOROPHYTA | | |
| Microspora | 4 | 7.14 |
| Selenastrum | 6 | 10.71 |
| Scenedesmus | 8 | 14.29 |
| Coelastrum | 7 | 12.50 |
| Ulothrix | 9 | 16.07 |
| Pediastrum | 6 | 10.71 |
| Closterium | 12 | 21.43 |
| Pediastrum | 4 | 7.14 |
| Total | 56 | 20.74 |
| Other particles | | |
| Aquatic insects parts | 11 | 14.10 |
| Parts of an insects | 14 | 17.95 |
| Unidentified food items | 18 | 23.08 |
| Mud/sand particle | 16 | 20.51 |
| Detritus | 19 | 24.36 |
| Total | 78 | 28.89 |
| Grand Total | 270 | |

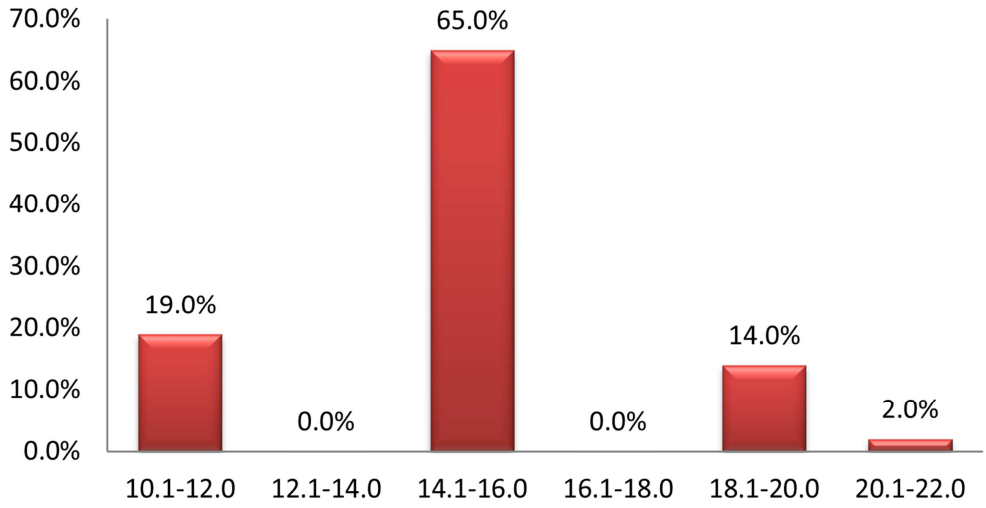


***Fig. 1.*** *Frequency distribution of the fish sample examined in relation to length.*

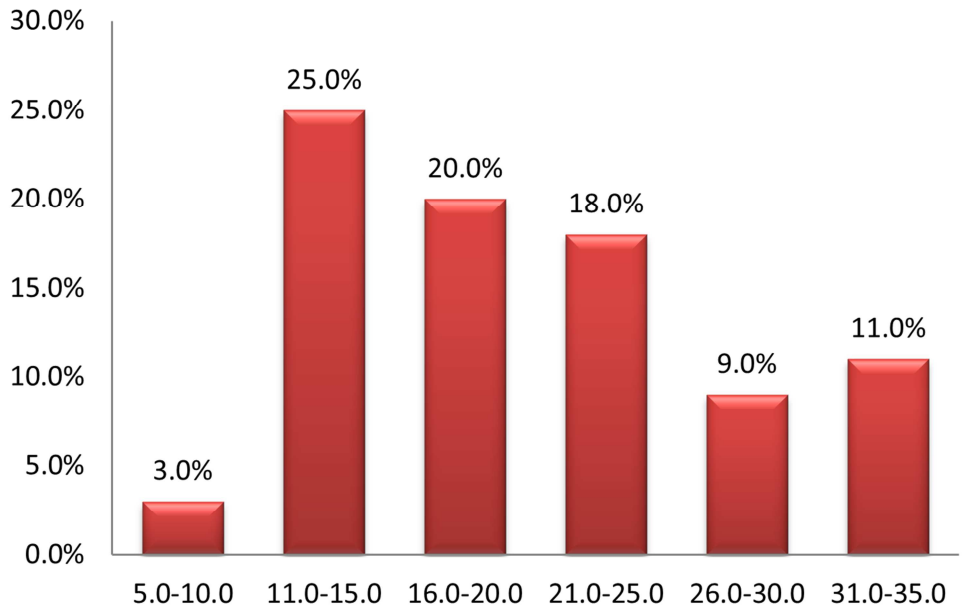


***Fig. 2.*** *Frequency distribution of the fish sample examined in relation to weight.*

## Discussion

A total of 100 stomachs of *S. mystus* from the mid Cross River flood systemwere analyzed. 73(73%) of these stomachs had food items while 27 (27%) had empty stomachs. Fishes with the length range of 14.1-16.0 cm has the highest frequency/occurrence (65.0%) while none of the fish sample falls under the length range of 12.0-14.0 cm and 16.1-18.0 cm. Similarly, fishes with the weight range of 11.0-15.0 g has the highest frequency/occurrence (25.0%) while those with weight range of 5.0-10.0 g has the least frequency of occurrence (3.0%).

The mean length of the fish sample studied in the present study was 15.0940±2.7647 cm while the mean weight was 23.410±9.8730 g. The difference in mean between the length and the weight was statistically significant ($p<0.05$). This however disagrees with the studies of [11] and [13].

Also, there was a positive correlation between the length and the weight of the studied samples ($r = +0.692$). This is in agreement with previous studies on different fish species from various water bodies [11], [12] and [13].

Finally, the mean condition factor, K (0.681) for *S. mystus* is less than 1 and this shows that the fish is below average condition within the river (Wade, 1992). The K value recorded in this study agrees with the values reported by [13]. The results of this study in agreement with [16] confirm that *S.mystus*is a planktivore because the diet consists mainly of phytoplankton and zooplankton. The most important food category in the diet of *S. mystus* of this study river is the division Crustaceans accounting for 24.44% of the total number of food items in the diets of the fish. Chlrorophyta, Rotifera, Bacillariophyta and Cladocera accounted for 20.74%, 18.15%, 7.04% and 0.74% respectively. This result is corroborated by the outcome of the frequency of occurrence method which revealed that the three most important food items in the diet of *S. mystus* (that is, *Anisogamus, Streptocephalus and Diatomus*) belong to the division Crustaceans. This agrees with the study by [13].

According to the ecomorphology hypothesis, diet should be predictable from the morphology of the fish, particularly from morphological traits related to feeding such as mouth size, jaw shape and dentition. Therefore, the domination of the food items of *S. mystus* of this study by zooplanktonic algae must have been due to its possession of a terminal month which is well adapted for sucking, sieving and picking zooplankton both within the water body and those attached to vegetation and other materials (submerge or floating). Copepod larvae (zooplankton) were also found in the stomach of *S. mystus* and this also agrees with earlier studies [16] and [17]. The mean condition factor, K (0.681) for *S. mystus* less than 1 indicating that the species is not in good condition which agrees with the findings of [9].

## Conclusion

The mean length of the fish sample was 15.0940±2.7647 cm while the mean weight was 23.410±9.8730 g. The difference in

mean between the length and the weight was statistically significant ($p<0.05$). There was a positive correlation between the length and the weight of the studied samples ($r = +0.692$). *S. mystus* is not in good condition. These findings have management implications for resource sustainability.

## Recommendation

The condition of the fish samples is not good which is an indication that the biotic and abiotic environmental conditions are unfavorable therefore further research is needed to assess the status of the aquatic ecosystem in which this fish live. Strategic management practices should be introduced for the mid Cross River flood system, Southeastern Nigeria.■

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