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Determination of morphometric and meristic characters of African snakehead, *Parachana obscura* (Gunthers, 1861) in river Rima, Sokoto, Nigeria

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Abstract
This study was carried out in Usmanu Danfodiyo University, Sokoto to determine the Morphometric characters of *P. arachanna obscura* from River Rima, Sokoto Northwest Nigeria. A total of 50 samples were collected from artisanal fishermen at their landing site biweekly for 3 months. The morphometric characters were measured and statistically analyzed based on sample groups using statistical tools such as; descriptive statistics, Regression, correlation and one way ANOVA. The standard length and body weight of *P. obscura* measured ranged from 16.3 cm to 42.5 cm and 27.9 cm to 1000.04 cm respectively. There was also no significant difference (P>0.05) in the meristic characters among the sample groups. The research however, concluded that all the parameters measured affirmed the body form of the species studied, which is fuss formic, sub-cylindrical in shape. The evaluated variations depict diversified phenotypes that need adequate knowledge for proper management of *P. obscura* populationin River Rima. Further researches were therefore recommended on the genetics and biology of this species.

Keywords: morphometric, meristic characters, African snakehead, river Rima

Introduction
There is an increasing demand for fish production through aquaculture in Nigeria. One of the species being screened for aquaculture is African snakehead, *Parachanna obscura*. Snakeheads are of high commercial value because of the good taste and high quality flesh. They are valued for their medicinal properties when eaten and the flesh is claimed to be good for cells rejuvenating, particularly during recuperation from serious illness and as a post-natal diet [1]. It is also recommended for post-operation patients. Snakeheads are considered to be more nutritive than Carp or Tilapias, in terms of a higher protein-to-fat ratio [2]. The name "snakehead fish" can anticipate feelings of snake than of a delicious fleshy fish dish common in some African countries. The Obscure Snakehead Fish, *Parachanna obscura* is a widely distributed freshwater fish endemic to Africa. Like the most cultured *C. gariepinus* which is one of the commercially important fish species that occur naturally in the Nigerian freshwater bodies [3]. African snakehead fish too is highly appreciated by the people of Africa where it is found because of its high nutritional value and economic potential. Its production in wild natural continental waters cannot meet local demands because of over exploitation [3]. It is a hardy species that can survive stressful conditions with rapid growth performance and upcoming aquaculture potential [4]. Poor harvesting methods using poisonous chemicals, fire and dynamite along with the improper netting of fish has affected the fish species and the human consumers. A better understanding of the life and growth parameters of the individual species is crucial for management of this freshwater fish.
Morphometric variations between stocks can provide a basis for stock structure, and may be applicable for studying short-term, environmentally induced variation for successful fisheries resources management [5]. It is widely used to identify differences between fish populations [6]. Grouping species according to traits, such as size, morphology, or behavior, is a means of simplifying specie-rich communities, and sometimes provides better predictive capabilities than analyses performed at higher levels of taxonomic resolution [7]. There is no available report on the morphometric and meristic characters of *P. obscura* from River Rima sokoto. Therefore, this research evaluated the morphometric and meristic characters of *P. obscura* from River Rima.

Morphometric is the empirical fusion of geometry with biology [8]. Patterns of morphometric variation in fishes indicate differences in growth and maturation rates because body form is a product of ontogeny. Therefore the result of this research will provide baseline information on the morphometric and meristic characters of *P. obscura* and will as well serve as baseline information for future research and researchers that wish to work on morphometric and meristic variations of *P. obscura*.

Materials and Methods

Study Area

This study was carried out in Usmanu Danfodiyo University Sokoto, a sub-Saharan ecological zone, located in the Savannah agroecological zone (Latitude 13 00' 27.0"N and Longitude 5 15'05.6"E) which is about 350 m above the sea level.. The rainfall establishes between mid-May to early June and reaches the peak in August. The climate is semi-arid and dry season starts in mid-October and ends in late April. The coolest months are November to January which is characterized by dry Harmattan wind. The area receives an average annual temperature of 30.26^0C with average ra(Google map, 2011)infall of 26.55 mm^2 and an average annual relative humidity of 48.54% [9].

Materials Used

The materials used during this experiment include; Measuring board, sensitive weighing scale (2Kg capacity, calibrated in grams), Dissecting kit and disposable gloves.

Sample Collection

A total of 50 samples of *Parachanna obscura* were collected from River Rima, Sokoto. The samples were collected between August and September, samples collected were taken to the research laboratory of Fisheries Department in Usmanu Danfodiyo University Sokoto, and the fish samples were weighed using sensitive weighing scale. Morphometric and meristic characters of each sample were collected using the measuring board and simple counts methods respectively.

Data collection

Data collected for the determination of Morphometric and meristic characters include:

Morphometric Characters

Body weight (BW), Total length (TL), Standard length (SL), Head length (HL), Snout length (SnL), Inter orbital distance (ID), Eyes diameter (ED), Caudal peduncle depth (CPD), Head width (HW), Pre dorsal distance (PDD), Pre anal distance (PAD), Dorsal fin length (DFL), Pectoral fin length (PFL),Distance between dorsal fin and caudal fin (DDCF), and Body depth at anus (BDA).

Meristic Characters

Pectoral fin count (PFC), Dorsal fin count (DFC), Anal fin count (AFC) and Pelvic fin count (PvFC).

Data Analysis

Data collected were analyzed using one-way analysis of variance (ANOVA). The results were expressed as Means ± SE. significant differences among means were determined using Duncan Multiple Range Test (DMRT) at p= 0.05 significant level. Relationship between length and weight were carried out using correlation and regression analysis.

Results and Discussion

Size Distribution of *P. obscura* from River Rima between August and October 2019

Size distribution of *P. obscura* from River Rima between aug ust and October 2019 was presented in Table 1. The Size distribution of the fish samples measured revealed that the highest body weight was recorded for the early September sample group; this is the period of bounties of food availability for such an insatiable carnivore like *P. obscura*. As reported by [10], Snakehead can easily consume a smaller fish of more than half its length. *P. obscura* is a voracious pelagic carnivore, a formidable predator, a typical piscivore, an insectivore and a consumer of crustaceans [11, 12, 13].

This research asserted that since the research area has the rainfall establishing between mid-May to early June and reaches the peak in August. The climate is semi-arid and dry season starts in mid-October and ends in late April. The coolest months are November to January which is characterized by dry Harmattan wind. The research was carried out during the raining season when all factors, such as, temperature, humidity, food availability and water level of the River Rima itself is high enough to support aquatic productivity.

Morphometric Characters (%SL) of P. obscura from River Rima between August and Octobert

The results

shows that the percentage of total length of *P. obscura* from R iver Rima for the month Mid-September was the highest compared to others as shown in Table 2. The head length percentage of the sample group of Late August was higher than the other sample groups. Also, for the eye diameter the difference in the head length percentage recorded for the late August, this was attributed to the different developmental stage of fish based on the assertion that, the head grows first, then followed by the rest of the body. [14] stated that, the diets of *P. obscura* depend on its developmental stages. Larvae feed on algae and protozoa. The report of [14], made this research to draw an assertion, observing that, the same sample population that had the lowest mean body weight also had the highest mean value of head length. Since the juvenile feed more on flesh than other food materials as reported by Imevbore and [15] that an analysis of stomach contents of juveniles and adults of P. obscura showed not only the presence of fry of different fish species but also insects, tadpoles, copepods and shrimps [16, 17]. showed that juveniles and adults of P. obscura are omnivore because they eat fish, detritus, insects, macrophytes materials, worm and plant detritus. They are insectivore piscivores-invertivores. Also, P. obscura has background enzyme allowing it to digest proteins, fats and carbohydrates contained in food [18, 19].

Table 1: Size Distribution of *P. obscura* from River Rima between August and october 2019

S/N	Morphometric Parameters	Late August	Mid-September	Late September	Mid October	Late October
1.	BW	51.90 ± 7.10	182.40 ± 44.93	171.10 ± 45.24	146.90 ± 16.38	175.09 ± 41.29
2.	TL	25.90 ± 1.41	27.20 ± 2.02	27.90 ± 2.27	26.40 ± 1.03	26.82 ± 1.87
3.	SL	21.20 ± 1.12	21.90 ± 1.90	22.50 ± 2.09	21.70 ± 0.96	21.72 ± 1.72
4.	HL	5.40 ± 0.31	5.50 ± 0.50	5.70 ± 0.56	5.20 ± 0.25	5.36 ± 0.47
5.	SnL	1.30 ± 0.15	2.20 ± 0.25	2.20 ± 0.25	1.90 ± 0.10	2.18 ± 0.23
6.	ED	1.00 ± 0.00	1.00 ± 0.00	1.00 ± 0.00	1.00 ± 0.00	1.00 ± 0.00
7.	ID	2.10 ± 0.10	1.90 ± 0.28	2.00 ± 0.30	2.00 ± 0.00	1.91 ± 0.25
8.	CPD	2.10 ± 0.10	1.80 ± 0.20	1.90 ± 0.23	2.00 ± 0.00	1.82 ± 0.18
9.	HW	2.70 ± 0.21	3.20 ± 0.25	3.30 ± 0.26	3.00 ± 0.15	3.09 ± 0.25
10.	PDD	7.70 ± 0.40	7.70 ± 0.58	7.90 ± 0.66	7.30 ± 0.30	7.55 ± 0.55
11.	PAD	11.20 ± 0.68	12.00 ± 0.91	12.30 ± 1.02	11.60 ± 0.52	11.82 ± 0.84
12.	DFL	13.30 ± 0.78	13.70 ± 1.09	14.00 ± 1.22	13.70 ± 0.68	13.55 ± 0.99
13.	PFL	3.40 ± 0.78	3.20 ± 0.29	3.40 ± 0.34	3.30 ± 0.15	3.18 ± 0.26
14.	DDC	1.10 ± 0.10	1.20 ± 0.13	1.30 ± 0.15	1.20 ± 0.13	1.27 ± 0.14
15.	PFC	15.50 ± 0.43	15.60 ± 0.22	15.70 ± 0.26	15.70 ± 0.30	15.73 ± 0.24
16.	DFC	40.70 ± 1.02	41.80 ± 0.25	41.90 ± 0.28	41.80 ± 0.13	41.82 ± 0.23
17.	AFC	29.30 ± 0.37	29.40 ± 0.163	29.40 ± 0.16	29.90 ± 0.31	29.23 ± 0.19
18.	PvFC	5.10 ± 0.18	5.70 ± 0.15	5.70 ± 0.15	5.60 ± 0.16	5.64 ± 0.15
19.	BDA	5.20 ± 0.36	5.60 ± 0.36	5.80 ± 0.61	5.50 ± 0.27	5.64 ± 0.51

Table 2: Morphometric Characters (%SL) of *P. obscura* from River Rima between August and October, 2019

S/N	Morphometric parameters	Late August	Mid-September	Late September	Mid October	Late October
1.	TL	0.0131_a	0.0028_a	0.0000_b	0.0000_b	0.0000_b
2.	HL	0.0144_a	0.0091_b	0.0050_b	0.0098_b	0.0098_b
3.	SnL	0.0079_a	0.0091_b	0.0050_b	0.0049_b	0.0048_b
4.	ID	0.0142_a	0.0085_b	0.0091_b	0.0104_a	0.0085_b
5.	ED	0.0206_a	0.0153_b	0.0159_b	0.0164_a	0.0152_b
6.	CPD	0.0557_a	0.0370_b	0.0383_b	0.0397_b	0.0362_b
7.	HW	0.0823_a	0.0562_b	0.0586_b	0.0618_a	0.0553_b
8.	PDD	0.0986_a	0.0652_b	0.0677_b	0.0731_a	0.0635_b
9.	PAD	0.0248_a	0.0154_b	0.0166_b	0.0175_a	0.0155_b
10.	DFL	0.0086_a	0.0059_b	0.0063_b	0.0059_b	0.0062_b
11.	PFL	0.0016_a	0.0016_a	0.0016_a	0.0015_a	0.0016_a
12.	DDCF	0.1940_b	0.2345_a	0.2273_a	0.2334_a	0.2382_a
13.	BDA	0.1539_b	0.1653_a	0.1599_a	0.1668_a	0.1667_a

Conclusion

In conclusion, the Morphometric characters of *P. obscura* measured exhibited morphological variations in head Morphometric parameters, general body Morphometrics and the meristic characters. Among the sample groups, the Morphometric characters measured showed diversified phenotypes.

Recommendations

P. obscura has been a potential aquaculture candidate in Nigeria, it has been revealed in recent researches on the investigation of additional freshwater fish species for the improvement of aquaculture in the country. The baseline knowledge of Morphometric and meristic characters will serve huge advancement in contributing to the understanding of the genetic morphology of *P. obsura* from River Rima. It is therefore recommended that more researches should be carried out in the area of other biological aspects of this fish species from this research area and this should be extended to other part of the country (Nigeria).

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