

Relative Abundance, Length-Weight Relationship and Condition Factor of *Bostrychus Africanus* And *Periophthalmus Barbarus* From Bomu and Kono Creeks, Rivers State

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Abstract

This study investigated selected aspects of the ecology of two gobiid fishes, *Bostrychus africanus* and *Periophthalmus barbarus*, inhabiting Bomu and Kono Creeks, Rivers State, Nigeria. Fish specimens were collected from the intertidal mudflats using basket traps between May 2023 and April 2024. The specimens were assessed for relative abundance, length–weight relationship (LWR), and condition factor (CF) following standard fisheries research procedures. Species identification was carried out using appropriate taxonomic identification keys, while the relevant ecological parameters were estimated using established methods. Descriptive statistics and analysis of variance (ANOVA), among other appropriate statistical techniques, were employed for data analysis. The results showed that *P. barbarus* was relatively more abundant, accounting for 51.99% of the total specimens collected, compared with 48.01% for *B. africanus*. However, the difference in relative abundance between the two species was not statistically significant. The logarithmic transformation of the length–weight data revealed negative allometric growth in both species, indicating that body weight increased at a proportionally lower rate than body length. At Bomu Creek, the log-transformed LWRs for *B. africanus* and *P. barbarus* were expressed as $\log W = 0.1263 \log L + 1.2351$ and $\log W = 0.1452 \log L + 1.2176$, respectively. At Kono Creek, the corresponding relationships were $\log W = 0.1067 \log L + 1.2384$ for *B. africanus* and $\log W = 0.1351 \log L + 1.2182$ for *P. barbarus*. The slope coefficients (*b*) obtained from these relationships were below the theoretical value of 3, confirming negative allometric growth in both species at the two study locations. The condition factor indicated generally favourable physiological condition in both species. *B. africanus* recorded mean CF values of 2.01 ± 1.62 and 2.58 ± 1.76 at Bomu and Kono, respectively, whereas *P. barbarus* recorded mean values of 1.43 ± 1.35 and 1.72 ± 1.83 , respectively. In general, individuals in the smaller size classes exhibited comparatively higher condition factors. No significant seasonal variation in CF was observed for either species at Bomu Creek. However, at Kono Creek, *B. africanus* exhibited a significantly higher CF during the wet season. Overall, *P. barbarus* was relatively more abundant than *B. africanus* at both study locations, although the difference in relative abundance was not statistically significant. Both species exhibited negative allometric growth, while their condition factors were generally higher at Kono Creek than at Bomu Creek, suggesting comparatively more favourable environmental conditions at Kono. The higher condition factors recorded at Kono may indicate greater habitat suitability and resource availability for the two gobiid species. Nevertheless, further studies incorporating environmental variables such as water quality, sediment characteristics, food availability, salinity, and other habitat attributes are required to establish the factors responsible for the apparent greater suitability of Kono Creek.

Keywords: *bostrychus*, *Periophthalmus*, *allometric growth*, *condition factor*, *relative abundance*, *Ogoniland*.

Introduction

Globally, fishes represent the most diverse group of vertebrates, with species occupying virtually every aquatic habitat, ranging from high-altitude mountain streams to deep ocean trenches (Mayer & Pšenička, 2024). Gobies, belonging to the families Eleotridae, Gobiinae, Periophthalmidae and Gobiidae, make up one of the largest fish families, with over 2,000 species in more than 200 genera. Most of them are relatively small, typically less than 10 cm in length, though some, large gobies such as *Gobiodes* or *Periophthalmus* can reach over 30 cm in length in exceptional cases (Patzner et al., 2011). Gobiids, such as *Bostrychus africanus* and *Periophthalmus barbarus*, are carnivores that feed on crustaceans, benthic invertebrates, small fishes and insects. Many species pass through a marine larval stage during which they feed on plankton (Ugbomeh et al., 2018). The ecological characteristics of fishes are determined by the interaction of abiotic factors, including temperature, salinity, dissolved oxygen, pH, conductivity, turbidity, water depth, substrate composition, and hydrological regimes, together with biotic factors such as food availability, competition, predation, parasitism, and habitat complexity (Mirzaei et al., 2015). Characteristics including relative abundance, length-weight relationship and condition factor are key in fish stock assessment (Mirzaei et al., 2015). Previous studies in southern Nigeria often reported a higher relative abundance of *B. africanus* over *P. barbarus* (Kingsley et al., 2019; Ezenwaka et al., 2024). Length-weight relationship in gobiids is strongly influenced by habitat characteristics, food availability, reproductive condition, seasonal changes, and environmental quality. Thus, some studies have reported negative allometric growth for *B. africanus* and *P. barbarus* (Ogolo et al., 2017; Stanislas et al., 2023) while others reported positive allometric growth (Abiaobo et al., 2021); Udoinyang et al., 2024), but Moslen and Daka (2017) reported varying growth coefficients ranging from both positive and negative allometry.

Ezenwaka et al. (2024) reported better condition of *B. africanus* (1.1 to 1.8) over *P. papilio* (0.7 to 1.1) from Ikpukulu-Ama Creek, Port Harcourt, while Akpan et al. (2025) found *P. barbarus* from Iko River Estuary in the Niger Delta Region of Nigeria to have condition factors ranging from 0.799 to 1.043. Udoinyang et al., 2024, also recorded condition factor values above unity for *P. barbarus* samples from a mangrove swamp in southern Nigeria. Thus, several factors including availability of food organisms, water quality, parasitism or disease determine the condition of fish in a specific environment.

This research was done to evaluate the relative abundance, length-weight relationship and condition factor of *B. africanus* and *P. barbarus* from Bomu and Kono Creeks due to sparsity of literature from both locations which are situate in the Ogoni region of Nigeria with its attendant environmental pollution issues.

Introduction

Fishes constitute the most diverse group of vertebrates and occupy virtually all aquatic environments, ranging from high-altitude mountain streams to the deepest oceanic habitats (Mayer & Pšenička, 2024). Among the diverse assemblages of fishes, gobiids are particularly notable for their ecological and morphological diversity. The group comprises several closely related taxa, including members of the families Eleotridae, Periophthalmidae and Gobiidae, and includes more than 2,000 species distributed across over 200 genera. Most gobies are relatively small, generally attaining less than 10 cm in total length, although some species, including representatives of *Gobiodes* and *Periophthalmus*, may exceed 30 cm under favourable conditions (Patzner et al., 2011). Gobiid fishes occupy a wide range of aquatic and

intertidal habitats and exhibit diverse feeding strategies. Species such as *Bostrychus africanus* and *Periophthalmus Papillio* are predominantly carnivorous, feeding on crustaceans, benthic invertebrates, small fishes and insects. In several gobiid species, the early life stages include a marine or estuarine larval phase during which plankton constitutes an important component of the diet (Ugbomeh et al., 2018). The distribution, abundance, growth and general condition of fishes are influenced by complex interactions between abiotic and biotic environmental factors. Important abiotic variables include temperature, salinity, dissolved oxygen, pH, conductivity, turbidity, water depth, substrate characteristics and hydrological conditions, whereas biotic influences include food availability, competition, predation, parasitism and habitat complexity (Mirzaei et al., 2015). Consequently, quantitative measures of fish populations and individual performance are important for evaluating the ecological status and productivity of aquatic ecosystems. In particular, relative abundance, length–weight relationship (LWR) and condition factor (CF) are widely used indicators in fish ecology and fisheries assessment. Relative abundance provides information on species representation within a fish assemblage, while the LWR describes the relationship between body length and weight and provides insights into growth patterns. Condition factor, on the other hand, is commonly used as an indicator of the physiological well-being, nutritional status and habitat suitability of fish populations (Mirzaei et al., 2015). Despite their ecological importance, gobiid populations may exhibit considerable spatial and temporal variation in abundance and biological characteristics. Previous investigations in southern Nigeria have reported differences in the relative abundance of *B. africanus* and *P. barbarus*. In several studies, *B. africanus* was reported to be more abundant than *P. barbarus* (Kingsley et al., 2019; Ezenwaka et al., 2024). Such differences may reflect variations in habitat characteristics, resource availability, environmental conditions and species-specific ecological preferences. Similarly, the length–weight relationship of gobiids may vary among locations and seasons in response to environmental quality, food availability, reproductive status, habitat characteristics and other ecological factors. Studies on *B. africanus* and *P. barbarus* have reported contrasting growth patterns, with some documenting negative allometric growth (Ogolo et al., 2017; Stanislas et al., 2023) and others reporting positive allometric growth (Abiaobo et al., 2021; Udoinyang et al., 2024). Moslen and Daka (2017) likewise reported variation in growth coefficients, with both positive and negative allometric patterns observed among gobiid populations. These inconsistencies highlight the influence of local environmental conditions on the growth characteristics of these fishes and underscore the importance of site-specific investigations. Condition factor also varies among gobiid populations and may provide useful information on habitat quality and the availability of resources within an ecosystem. Ezenwaka et al. (2024), for example, reported condition factor values ranging from 1.1 to 1.8 for *B. africanus* and 0.7 to 1.1 for *P. papilio* in Ikpukulu-Ama Creek, Port Harcourt, indicating comparatively better condition in *B. africanus*. Similarly, Akpan et al. (2025) recorded condition factor values ranging from 0.799 to 1.043 for *P. barbarus* inhabiting the Iko River Estuary in the Niger Delta region of Nigeria. Udoinyang et al. (2024) also recorded condition factor values greater than unity for *P. barbarus* from a mangrove swamp in southern Nigeria. Variations in condition factor among populations may be associated with differences in food availability, water quality, reproductive activity, parasitic infection, disease prevalence and other environmental conditions. Thus, assessment of condition factor can provide valuable evidence of the relative suitability of habitats for sustaining fish populations. The Ogoni region of the Niger Delta is characterized by extensive aquatic ecosystems that support diverse fish communities and provide important ecological and socioeconomic resources. However, these ecosystems have been subjected to considerable anthropogenic pressures, including petroleum-related pollution and other forms of environmental degradation, which may alter habitat quality and influence the distribution, growth and physiological condition of aquatic organisms. Despite the ecological importance

of Bomu and Kono Creeks, information on the population characteristics and biological condition of gobiid fishes inhabiting these systems remains limited. In particular, there is a paucity of published information on the relative abundance, length–weight relationships and condition factors of *B. africanus* and *P. barbarus* in these creeks.

Therefore, this study assessed the relative abundance, length–weight relationship and condition factor of *B. africanus* and *P. barbarus* in Bomu and Kono Creeks, Rivers State, Nigeria. The study provides baseline information on the population characteristics and biological condition of these ecologically important gobiids and contributes to a better understanding of their responses to the environmental conditions prevailing within the Ogoni region.

Materials And Methods

Study Location

Kono (latitude N 4° 35'45.78 and N 4° 36'23.52" and longitude E 7° 29'48.49" and E 7° 30'55.41") and Bomu (between latitude 4.6333° N and 7.3607° E) are fishing communities located respectively in Khana and Gokana Local Government Areas of Rivers State, both in Ogoniland (Fig. 1). The Kono creek, which is being invaded by *Nypa* palm, has a network of smaller creeks with the main creek being a bypass of the Imo River. Bomu, on the other hand, suffers environmental degradation due to the number of oil wells situated therein and it became the second community where oil was discovered with commercial value in 1958 (Mezie-Okoye, 2018).

Sample Collection and Handling

Mudskippers (*Periophthalmus barbarus*) and sleeper gobies (*Bostrychus africanus*) were obtained monthly from May 2023 to April 2024 at two major fish landing sites within the study area, namely Yón mu duu Landing Site at Kono and Bookoroma Fishing Market at Bomu. May to September 2023 was taken as the wet season while October 2023 to April 2024 was the dry season following the seasonal patterns during the period. Sampling was conducted in the early hours of each sampling day with the help of local artisanal fishermen, using traditional basket traps strategically set on the intertidal mudflats of both creeks during low tide.

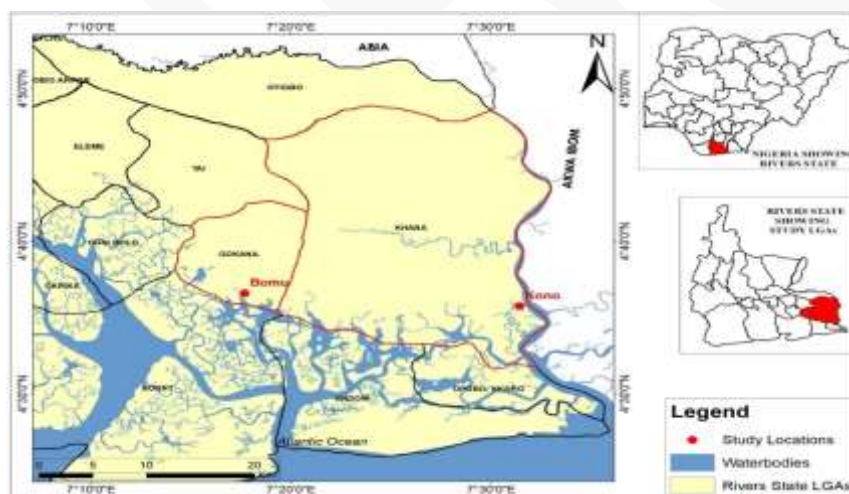


Fig. 1: Map of study area showing the sample locations

Samples were transported in a clean ice chest to the Entomology and Parasitology Laboratory, Department of Animal and Environmental Biology, Rivers State University, for morphometric measurements and examination. Fish identification was confirmed with keys from Idodo-Umeh (2003).

Morphometric measurements of the total length (TL) and wet body weight were taken respectively using a calibrated metre rule graduated in centimetres (cm) and a calibrated

electronic weighing balance (Camry, Model EK5350). All measurements and observations were carefully entered into standardized laboratory data sheets for statistical analysis.

Determination of Relative Abundance of Fish Samples

The relative abundance of the fish species was determined by dividing the number of each species by the total number of fish caught per month from each location, expressed as a percentage. Mathematically, it was calculated as follows:

Relative Abundance of Species 1 = (Number of Species 1 / Total Number of all Species) x 100 (eqn. 1)

Length-Weight Relationship

The values obtained for the total length and body weight of each fish sample was used to evaluate the length-weight relationship of each species per location. The relationship was determined according to Froese (2006) as follows:

$$W = aL^b \quad (\text{eqn. 2})$$

Where, W = weight of fish in grams, L = length of fish in cm, a = constant and b = an exponential expressing relationship between length-weight. The logarithmic form of the relationship was adopted and the results used to plot graphs of the length-weight relationship:

$$\text{Log } W = \text{Log } a + b \text{ Log } L$$

Where b represents the slope of the line, and Log a is a constant.

Condition Factor

The Fulton's coefficient of condition, K was calculated using the method:

$$K = W/L^3 \times 100 \quad (\text{eqn. 3})$$

Where W is body weight (W) in grams and L is the total body length (TL) in cm.

Statistical Analysis

Relative abundance was calculated using MS Excel. Descriptive statistics (mean, standard deviation, range etc) were used to analyse the values obtained for the fish morphometric characteristics. One-way analysis of variance was used to test for significant differences between locations and species. Graphs were used for data visualization.

Results

Relative Abundance of Gobies species in Bomu and Kono Creek

A total of 2,385 fish samples were caught from both study locations. *Periophthalmus barbarus* was the more abundant of the two species found in this study comprising 51.99% of the total catch (Table 1). A total of 1240 individuals of *P. barbarus* and 1145 individuals of *B. africanus* (48.01%) were captured.

Table 1: Relative Abundance (%) of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and Kono Creeks, Rivers State, Nigeria

Family/Species	Bomu	Kono	Total	% Relative Abundance
Butidae				
<i>Bostrychus africanus</i>	570 (47.1)	575 (48.94)	1145	48.01
Oxudercidae				

<i>Periophthalmus barbarus</i>	640 (52.9)	600 (51.06)	1240	51.99
Total	1210	1175	2385	
% Relative Abundance	50.73	49.27		

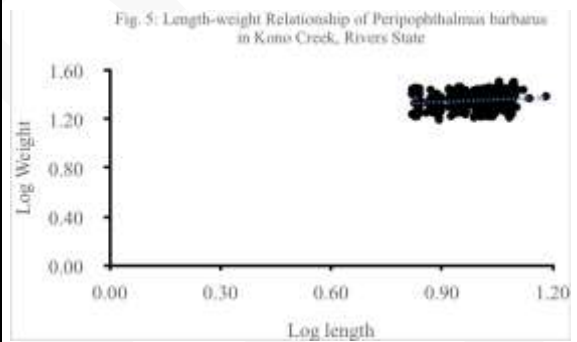
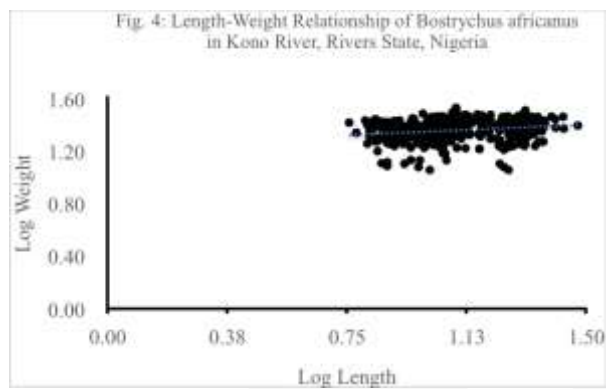
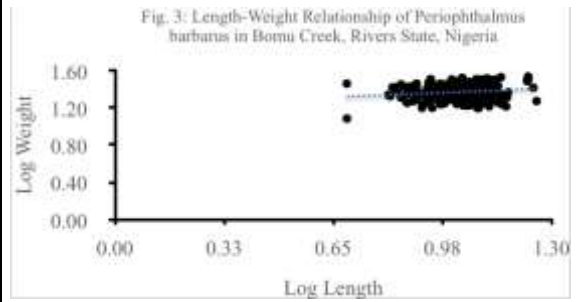
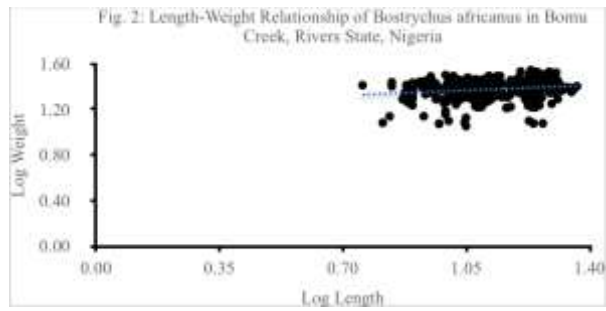
Length/Weight Relationship

The study found a non-linear association in the length-weight relationship of the species. The growth exponent (b) ranged from 0.126 - 0.107 for *Bostrychus africanus* and 0.135 and 0.145 for *P. barbarus* indicating negative allometric growth in both species (Table 2).

The equations of the relationship in both species were expressed as follows: In Bomu; *B. africanus*, $L = 0.1263 + 1.2351W$, $R^2 = 0.0333$; and *P. barbarus*, $L = 0.1452 + 1.2176W$, $R^2 = 0.0237$ (Fig. 2 and 3). In Kono, *B. africanus*, $L = 0.1067 + 1.2384W$, $R^2 = 0.0451$; *P. barbarus*, $L = 0.1351 + 1.2182W$, $R^2 = 0.0225$ (Fig. 4 and 5).

Table 2: Length-Weight Relationship of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and kono creeks, Rivers State

Species/Stations	a	b	R ²	Growth Pattern
<i>Bostrychus africanus</i>				
Bomu	1.235	0.126	0.003	Negative Allometry
Kono	1.238	0.107	0.045	Negative Allometry
<i>Periophthalmus barbarus</i>				
Bomu	1.218	0.145	0.024	Negative Allometry
Kono	1.218	0.135	0.0225	Negative Allometry



Condition Factor

The mean condition factor of *B. africanus* was 2.01 ± 1.62 and 2.58 ± 1.76 at Bomu and Kono, respectively while those of *P. barbarus* were 1.43 ± 1.35 and 1.72 ± 1.83 at Bomu and Kono, respectively (Table 3). In both species, significantly higher values were obtained in Kono.

Table 3: Mean condition Factor of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and Kono Creeks, Rivers State

Stations	K $\pm$ SD	Remark
<i>Bostrychus africanus</i>		
Bomu	2.01 ± 1.62^b	Good Condition
Kono	2.58 ± 1.76^a	Good Condition
<i>Periophthalmus barbarus</i>		
Bomu	1.43 ± 1.35^b	Good Condition
Kono	1.72 ± 1.83^a	Good Condition

Means with Different Alphabets Are Significantly Different at ANOVA ($p < 0.05$)

The mean monthly condition factors for both species at the study locations are presented in Tables 4 – 7. Lower size classes were generally in better condition than larger ones (Tables 8 & 9). Seasonal variations (Fig. 6 – 9) were generally not significant except in *B. africanus* of Kono which was significantly better in the wet season.

Table 4: Mean Monthly Condition Factor of *Bostrychus africanus* in Bomu Creek, Rivers State

Months	K $\pm$ SD	Remark
May	2.93 ± 1.20^b	Good Condition
June	3.03 ± 2.50^a	Good Condition
July	1.28 ± 1.23^f	Good Condition
August	1.28 ± 1.23^f	Good Condition
September	0.99 ± 0.87^g	Poor Condition
October	0.96 ± 0.87^h	Poor Condition
November	0.92 ± 0.89^i	Poor Condition
December	0.54 ± 0.40^l	Poor Condition
January	0.55 ± 0.13^k	Poor Condition
February	2.02 ± 1.09^c	Good Condition
March	1.86 ± 0.95^e	Good Condition
April	1.96 ± 0.89^d	Good Condition

Means with Different Alphabets are Significantly Different at *ANOVA* ($p < 0.05$)

Table 5: Mean Monthly Condition Factor of *Periophthalmus barbarus* in Bomu Creek, Rivers State, Nigeria

Months	K $\pm$ SD	Remark
May	3.32 $\pm$ 3.54 ^a	Good Condition
June	3.16 $\pm$ 2.37 ^a	Good Condition
July	1.38 $\pm$ 0.25 ^{ef}	Good Condition
August	1.34 $\pm$ 0.25 ^f	Good Condition
September	1.52 $\pm$ 0.26 ^{ef}	Good Condition
October	1.52 $\pm$ 0.67 ^{ef}	Good Condition
November	1.57 $\pm$ 0.22 ^e	Good Condition
December	2.31 $\pm$ 0.69 ^b	Good condition
January	2.04 $\pm$ 1.26 ^{bc}	Good Condition
February	1.88 $\pm$ 1.26 ^{cd}	Good Condition
March	2.19 $\pm$ 1.42 ^c	Good Condition
April	1.82 $\pm$ 2.00 ^d	Good Condition

Means with Different Alphabets Are Significantly Different at *ANOVA* ($p < 0.05$)

Table 6: Mean Monthly Condition Factor of *Bostrychus africanus* in Kono Creek, Rivers State

Months	K $\pm$ SD	Remark
May	3.73 $\pm$ 1.74 ^b	Good Condition
June	3.81 $\pm$ 2.72 ^a	Good Condition
July	3.17 $\pm$ 1.84 ^d	Good Condition
August	3.34 $\pm$ 2.16 ^c	Good Condition
September	0.72 $\pm$ 0.90 ⁱ	Poor Condition
October	0.91 $\pm$ 0.90 ^h	Poor Condition
November	0.69 $\pm$ 0.53 ^j	Poor Condition
December	0.56 $\pm$ 0.50 ^k	Poor Condition
January	0.26 $\pm$ 0.04 ^l	Poor Condition
February	1.28 $\pm$ 0.81 ^g	Good Condition
March	1.58 $\pm$ 0.87 ^e	Good Condition

April	1.57 ± 0.82^f	Good Condition
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Means with Different Alphabets Are Significantly Different at *ANOVA* ($p < 0.05$)

Table 7: Mean Monthly Condition Factor of *Periophthalmus barbarus* in Kono Creek, Rivers State

Months	K $\pm$ SD	Remarks
May	3.94 ± 2.75^b	Good Condition
June	3.80 ± 2.52^c	Good Condition
July	2.18 ± 1.05^h	Good Condition
August	1.96 ± 0.91^j	Good Condition
September	2.29 ± 0.85^g	Good Condition
October	1.79 ± 0.52^k	Good Condition
November	1.73 ± 0.46^l	Good Condition
December	2.01 ± 0.42^i	Good Condition
January	4.01 ± 2.83^a	Good Condition
February	2.30 ± 1.15^f	Good Condition
March	2.44 ± 1.20^d	Good Condition
April	2.33 ± 1.07^e	Good Condition

Means with Different Alphabets Are Significantly Different at *ANOVA* ($p < 0.05$)

Table 8: Mean Condition Factor of Various Size Classes of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu Creek, Rivers State

Size Classes	K $\pm$ SD	Remark
<i>Bostrychus africanus</i>		
5.70 – 10.05	3.92 ± 1.77^a	Good condition
10.05 – 14.40	1.48 ± 0.44^b	Good condition
14.40 – 18.75	0.51 ± 0.12^c	Bad condition
18.75 – 23.10	0.33 ± 0.08^d	Bad Condition
<i>Periophthalmus barbarus</i>		
4.90 - 8.18	6.43 ± 3.24^a	Good condition
8.18 – 11.45	2.13 ± 0.74^b	Good condition
11.45 – 14.73	0.64 ± 1.29^c	Poor condition

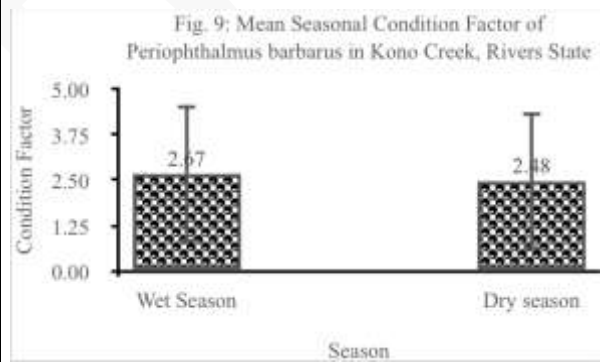
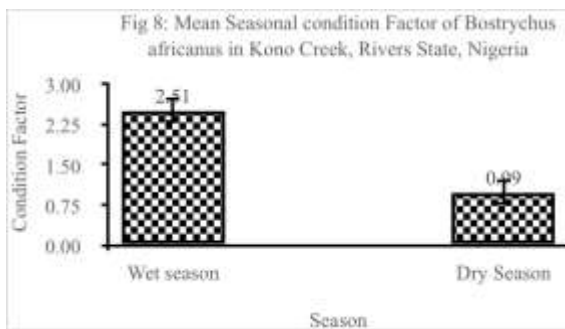
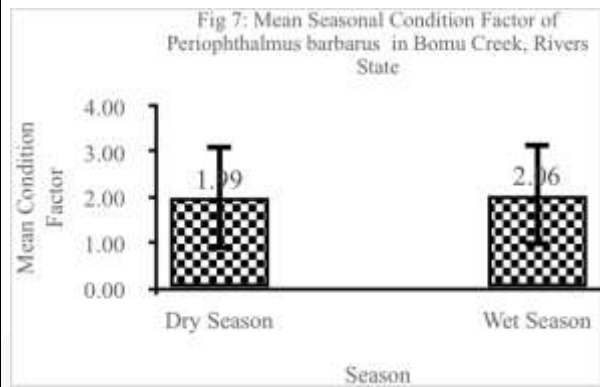
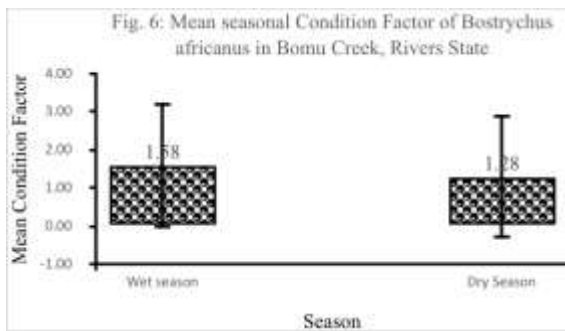
14.73 – 18.00	0.60 ± 0.13^d	Poor condition
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Means with Different Alphabets Are Significantly Different at *ANOVA* ($p < 0.05$)

Table 9: Mean Condition Factor of Various Size Classes of *Bostrychus africanus* and *Periophthalmus barbarus* in Kono Creek, Rivers State

Size Classes	K $\pm$ SD	Remark
<i>Bostrychus africanus</i>		
5.70 – 11.70	3.20 ± 1.95^a	Good Condition
11.70 – 17.70	0.96 ± 0.39^c	Poor Condition
17.70 – 23.70	0.29 ± 0.07^d	Poor Condition
23.70 – 29.70	2.51 ± 2.24^b	Good Condition
<i>Periophthalmus barbarus</i>		
6.60 – 8.75	5.73 ± 2.03^a	Good Condition
8.75 – 10.90	2.31 ± 0.59^b	Good Condition
10.90 – 13.05	1.50 ± 0.26^c	Good Condition
13.05 – 15.20	0.93 ± 0.25^d	Bad Condition

Means with Different Alphabets Are Significantly Different at *ANOVA* ($p < 0.05$)



Note that there is no seasonal difference

Discussion

Relative abundance of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and Kono Creeks

The present study recorded a slightly higher relative abundance of *Periophthalmus barbarus* (51.99%) than *Bostrychus africanus* (48.01%) from a total catch of 2,385 individuals across Bomu and Kono Creeks. Although *P. barbarus* was relatively more abundant, the difference between the two species was not statistically significant, indicating that both species contributed comparably to the gobiid assemblage within the study area. Information on the relative abundance of these two species in Nigerian coastal and estuarine ecosystems remains limited, making direct comparisons with previous studies difficult.

Tsoumou et al. (2024), in a study of the fish assemblage of the Lower Kouilou River, Republic of Congo, recorded four individuals of *B. africanus*, representing 0.50% relative abundance, whereas *P. barbarus* was represented by a single individual (0.15%). Although the relative abundance values reported by these authors were considerably lower than those observed in the present study, differences in sampling intensity, habitat characteristics, fishing methods, spatial coverage and community composition may account for the observed disparity. Similarly, Udoidiong and Ekwu (2011) reported the occurrence of *P. barbarus* and *B. africanus* along the eastern section of the Imo River Estuary, Nigeria. *P. barbarus* was present and regularly encountered at all three sampling locations, whereas *B. africanus* occurred at only one location. The wider occurrence of *P. barbarus* in that study is consistent with its comparatively higher relative abundance recorded in the present investigation.

Assou et al. (2018), in their assessment of fish diversity and community assemblage in Lake Togo, reported 40 fish species belonging to 10 orders, with Cichlidae being the most speciose family. Eleotridae and Gobiidae were represented by five and three species, respectively. However, *B. africanus* and *P. barbarus* were each represented by only one individual during the study period. The low abundance reported in that freshwater-associated system compared with the present study further demonstrates the spatial variability in the occurrence and abundance of gobiids across aquatic environments. The relatively high representation of these gobiids in Bomu and Kono Creeks may be associated with the availability of suitable intertidal mudflat habitats and food resources. Both species are adapted to shallow, estuarine and intertidal environments, although differences in habitat preference and tolerance to environmental stress may influence their local abundance. Anthropogenic activities may also modify gobiid populations through changes in habitat structure, water quality and food availability. Overexploitation is an additional factor that may affect the abundance of gobiids in southern Nigeria. Abiaobo and Udo (2017) reported that approximately 50% of the available *P. barbarus* stock was exploited annually, with a substantial proportion of the catch comprising individuals that had not completed approximately 55% of their growth. Such exploitation pressure could have implications for population recruitment and long-term stock sustainability. Given the limited published information on the abundance and population dynamics of these gobiids in southern Nigeria, the present findings provide useful baseline information for Bomu and Kono Creeks. Nevertheless, continued monitoring is necessary to determine whether the observed abundance pattern is persistent and to establish the relative contributions of environmental conditions, habitat characteristics, fishing pressure and seasonal recruitment to population abundance.

Length–weight relationship of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and Kono Creeks

The length–weight analysis indicated negative allometric growth in both *B. africanus* and *P. barbarus* at Bomu and Kono Creeks. The estimated slope (b) values were 0.126 and 0.107 for *B. africanus* at Bomu and Kono, respectively, and 0.145 and 0.135 for *P. barbarus* at the

corresponding locations. Because the relationships were expressed in logarithmic form, the slope represents the allometric growth coefficient. Values of b below the theoretical isometric value of 3 indicate negative allometric growth, whereby body weight increases at a proportionally slower rate than length.

The observed pattern is consistent with findings from some other Nigerian waters. Olopade et al. (2025), for example, reported negative allometric growth for *P. barbarus* from Old Bakana Creek, Rivers State, with a b value of 2.07. In contrast, Abiaobo et al. (2021) reported positive allometric growth for *P. barbarus* from Jaja Creek in the Niger Delta. Moslen and Daka (2017) also documented variation in growth coefficients among gobiid populations, with both positive and negative allometric growth patterns reported. These contrasting findings suggest that the growth characteristics of gobiids are not necessarily consistent across locations and may be strongly influenced by local environmental and biological conditions.

The length–weight relationship of fish may be affected by several intrinsic and extrinsic factors, including sex, age, reproductive condition, gonadal development, stomach fullness, physiological status, sample size, habitat characteristics, food availability, physicochemical conditions and seasonal fluctuations. Preservation and sampling procedures may also influence the estimated parameters (Abdullah & Zain, 2019). Consequently, differences in b values among studies may reflect genuine ecological differences as well as methodological variation. (The b values recorded in the present study are substantially lower than those commonly reported for fish populations and therefore warrant careful interpretation. In particular, the unusually low coefficients may be influenced by the size range of sampled individuals, sample composition or the manner in which the logarithmic data were generated. It is therefore important that the regression statistics, including sample size, coefficient of determination (R^2), correlation coefficient and significance level, are reported alongside the LWR equations. These parameters would provide a more complete assessment of the strength and reliability of the relationships.) this is for your personal benefit. See how you can explain this.

As this represents the first assessment of the LWR of these gobiids from Bomu and Kono Creeks, further studies covering multiple years and broader size ranges are recommended. Such investigations should also incorporate relevant environmental variables to determine the extent to which water quality, food availability, habitat characteristics and seasonal conditions influence growth patterns.

Condition factor of *Bostrychus africanus* and *Periophthalmus barbarus* in Bomu and Kono Creeks

Condition factor is widely used as an indirect indicator of the physiological well-being, nutritional status and general condition of fish. In the present study, *P. barbarus* recorded mean condition factor values of 1.43 ± 1.35 and 1.72 ± 1.83 at Bomu and Kono Creeks, respectively, while *B. africanus* recorded corresponding values of 2.01 ± 1.62 and 2.58 ± 1.76 . Thus, both species generally exhibited higher condition factors at Kono Creek, and the observed differences suggest that individuals inhabiting Kono may have experienced relatively more favourable conditions than those at Bomu.

The higher condition factors recorded at Kono may reflect differences in food availability, habitat characteristics, water quality or other ecological factors affecting energy acquisition and allocation. Environmental stress can increase energetic demands while simultaneously reducing food availability, potentially resulting in poorer body condition. Conversely, favourable environmental conditions and adequate food resources may promote somatic growth and improve condition (Abubakar et al., 2024; Ojo et al., 2025).

Seasonal variation in condition factor was generally not significant at either location. The exception was *B. africanus* at Kono Creek, where condition factor was significantly higher during the wet season. Seasonal differences in fish condition may be associated with changes

in food availability, hydrological conditions, reproductive activity and physicochemical characteristics of the aquatic environment. Similar seasonal fluctuations in condition factor have been documented for other fish species in Nigerian aquatic ecosystems (Seiyaboh et al., 2016; Seiyaboh, 2018). The condition factors recorded in the present study are generally higher than those reported for some populations of *P. barbarus* in other parts of southern Nigeria. Olopade et al. (2025), for example, recorded condition factors ranging from 0.64 ± 0.16 to 0.94 ± 0.11 for *P. barbarus* from Old Bakana Creek, whereas Abiaobo et al. (2021) reported a value of 1.06 for the species from Jaja Creek in the Niger Delta. Ezenwaka et al. (2024) reported condition factor ranges of 1.1–1.8 for *B. africanus* and 0.7–1.1 for *P. papilio* from Ikpukulu-Ama Creek, Port Harcourt. The comparatively higher values obtained in the present study, particularly for *B. africanus* at Kono Creek, indicate differences in the environmental conditions experienced by the respective populations. The apparent difference between the two study locations is particularly noteworthy given their contrasting anthropogenic pressures. Kono Creek is affected by *Nypa* palm invasion, whereas Bomu Creek is subject to substantial disturbance associated with artisanal petroleum-refining activities. Petroleum-related contamination can adversely affect water and sediment quality and may consequently influence food resources, physiological stress and the overall condition of aquatic organisms. However, the present study did not directly quantify the physicochemical or contaminant characteristics of the two creeks. Therefore, the higher condition factors recorded at Kono should be interpreted as an indication of comparatively better biological condition rather than definitive evidence that pollution differences alone caused the observed pattern.

Overall, the condition factor results suggest that both gobiid species were able to maintain relatively favourable body condition in the study area, although individuals from Kono Creek generally exhibited better condition. Further investigation integrating fish condition with water quality, sediment characteristics, food availability, contaminant concentrations and other ecological variables would be necessary to establish the mechanisms underlying the observed spatial differences.

Conclusion

This study provides baseline information on selected ecological characteristics of *Bostrychus africanus* and *Periophthalmus barbarus* inhabiting Bomu and Kono Creeks in the Ogoni region of Rivers State, Nigeria. *P. barbarus* was relatively more abundant than *B. africanus*, accounting for 51.99% and 48.01% of the total catch, respectively, although the difference in relative abundance was not statistically significant.

Both species exhibited negative allometric growth based on their log-transformed length–weight relationships, indicating that body weight increased at a proportionally lower rate than body length. The condition factor values generally indicated favourable body condition, with both species recording higher mean values at Kono Creek than at Bomu Creek. Seasonal variation was generally insignificant, except for *B. africanus* at Kono Creek, which exhibited significantly better condition during the wet season.

The higher condition factors recorded at Kono suggest that the creek may provide relatively more favourable conditions for these gobiid populations. However, this interpretation should be treated cautiously because habitat and water-quality variables were not simultaneously quantified in the present study. The apparent difference may reflect variation in food availability, habitat structure, water quality, anthropogenic disturbance or other ecological factors.

Recommendations

Given the limited information available on the fish communities of Bomu and Kono Creeks, further research should be undertaken to establish long-term patterns in gobiid abundance, growth and condition. Future studies should incorporate comprehensive fish stock assessments, broader temporal and spatial sampling, and measurements of physicochemical and ecological variables, including temperature, salinity, dissolved oxygen, pH, turbidity, substrate characteristics, food availability and relevant pollutants. Particular attention should be given to the potential effects of petroleum-refining activities in Bomu Creek and *Nypa* palm invasion in Kono Creek. Such integrated investigations would provide a stronger basis for determining the factors governing the distribution, growth and ecological health of *B. africanus* and *P. barbarus* and would support effective management and conservation of the aquatic resources of the Ogoni region.

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