AQUATIC RESEARCH
E-ISSN 2618-6365
Aquat Res 3(2), 72-** (2020) • https://doi.org/10.3153/AR20007
Research Article

Length-weight relationships and condition factors of Mochokidae (Pisces: Teleostei: Siluriformes) from Niger River, Northern Benin

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Cite this article as:

Arame, H., Adite, A., Adjibade, K.N., Sidi Imorou, R., Sonon, P.S. (2020). Length-weight relationships and condition factors of Mochokidae (Pisces: Teleostei: Silurifurmes) from Niger River, Northern Benin. *Aquatic Research*, 3(2), 72-84. https://doi.org/10.3153/AR20007

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Submitted: 24.12.2019
Revision requested: 17.01.2020
Last revision received: 18.02.2020
Accepted: 01.03.2020
Published online: 11.03.2020

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ABSTRACT

In the Niger River in Benin, the fishes of Mochokidae family are of high commercial and economic importance. The current study investigated size structures, length-weight relationships and condition factors of these catfishes in order to evaluate their plumpness. Mochokids were sampled monthly from February 2015 to July 2016 with traps, seine and gillnet. Overall, the fish species showed unimodal, bimodal and tri-modal standard-length distributions. Length-weight models displayed allometric coefficients (*b*) varying between 2.236 and 3.380, indicating positive and negative allometric growth with correlation coefficients (*r*) ranging between 0.87 and 0.99. Condition factors were moderate to low and varied from K= 0.409 for *Synodontis frontosus* to K= 7.276 for *Synodontis sorex* that showed a higher value K= 31.13 in aquatic vegetation. Major threats were the use of chemical fertilizers and pesticides for adjacent agriculture, the retrieval of water for agriculture and domestic uses, the invasion of floating plants, the introduction of exotic fish species and overfishing. These data constitute valuable fisheries documentation that will contribute to conservation, valorization and sustainable exploitation of Mochokid fishes in Niger River in Benin.

Keywords: Allometric growth, Conservation, *Synodontis schall*, Sustainable exploitation

Introduction

Length-weight relationship (LWR) and condition factor (K) have been widely used by aquatic biologists and fisheries managers to assess fisheries ecology, population dynamics and fish stocks in natural aquatic ecosystems and in semi-controlled aquatic mediums (Ricker, 1968). In addition, the « ecological health » and productivity level of aquatic ecosystems can be evaluated through length-weight models and condition factors (Deekae and Abowei, 2010) that are also powerful tools to assess growth patterns and the wellbeing of fishes (Muchlisin *et al*., 2010; Ndiaye *et al.,* 2015). In general, the growth of fishes could be negative allometric, positive allometric or isometric. Negative allometric growth with slopes $b<3$ implies that the fish becomes more slender as it increases in weight while positive allometric with slopes $b>3$ indicates that the fish become more rotund as length increases (Deekae and Abowei, 2010). In isometric growth ($b=3$), there is no change in body shape as the fish grows (Deekae and Abowei, 2010; Khristenko *et al.,* 2017).

The condition factors indicate the degree of plumpness of fish in their habitat and stand as a measure of various ecological and biological factors such as season, water quality parameters, food availabilities, stress, toxicity and gonadal development (Mac Gregoer, 1959). Condition factor is a useful index to assess the status of the fishes and can be used to monitor aquatic ecosystems (Oni *et al.,* 1983). In general, the fish shows a better condition or wellbeing when a higher value of the condition indices is recorded (Khallaf *et al.,* 2003).

In the Niger River in Northern Benin, recent fisheries surveys by Arame *et al.* (2019) revealed fourteen demersal Mochokid fish species that accounted for about 10.80% of the artisanal catches (Koba, 2005). In the fish community of Niger River, Mochokids are considered as one of the most abundant fish of high economic and commercial importance and thus, these fishes are intensively exploited by sedentary and migrant fishermen for sales and subsistence. However, in Benin, this regional running water is under strong anthropogenic pressures that caused severe threats to fish biodiversity. These degradation factors included the use of chemical fertilizers and pesticides in adjacent agricultures, the discharges of household wastes, the introduction of exotic species, the use of detrimental fishing gears and the lack of regulatory texts and management schemes. In the region, these ecosystem disturbances have caused habitat fragmentations and losses, spawning ground destructions, changes in fish community structure, and depletion of fish stocks (Hauber, 2011; Arame *et al.,* 2019).

Notwithstanding their high fisheries importance and the multiple habitat disturbances and threats to the fish fauna, nothing is known about the growth structure and the wellbeing of Mochokids in this regional riverine water. In particular, length-weight relationships and condition factors of this these fishes have not been investigated.

The current study was aimed at evaluating length-weight relationship (LWR) and condition factor (K*)* of dominant Mochokid fishes living in the Niger River in Northern Benin in order to provide a broader understanding of their plumpness and wellbeing.

Material and Methods

Study Area

The study region is the Benin part of the Niger River around Malanville municipality (North-Benin) that covered about 3.016 km². Malanville is located between 11°52'05″ North latitude and 3°22′59″ East longitude with a mean altitude reaching 200 m. The Niger River serves as a frontier between Benin and Niger Republic, a neighbor country. Malanville and surroundings exhibit a Sudano-Sahelian climate characterized by a dry season (November-April) and a rainy season (May-October). A dominant wind called Harmattan blows in all directions from November to January with temperatures ranging between 16 and 25°C (Adjovi, 2006). In Benin, the Niger River shows three tributaries, Mékrou, Sota and Alibori that caused severe inundations which at peak flood extended on about 275 km^2 (Adjovi, 2006), thus, creating a wetland that served as reproduction grounds for the fish community (Welcomme, 1985; Moritz *et al.,* 2006; Adite *et al.,* 2017). Malanville showed gneissic and gravelly soils whereas the Niger River valley and its tributaries exhibited sandy-clayish and ferruginous soils. Plant communities were dominated by grassy savanna. The river comprised floating and submerged plants that degraded the water quality. Artisanal fisheries involving many ethnic groups were highly developed on Niger River and constituted traditional activities that occurred on the river channel as well as on floodplains, pools and marshes (Hauber, 2011; Arame *et al.,* 2019; Adjibade *et al.,* 2019).

Mochokid Fish Collections

Sampling stations: For this study, four stations (Figure 1) were selected on the Niger River for the fish samplings (Arame *et al.,* 2019). Site 1 (Tounga village) is located at 11°52'216"N, 3°23'907"E. This site is highly degraded because of anthropogenic disturbances. Site 2 is located behind the "Dry Port" at 11°52'216"N, 3°23'907"E and is also degraded due to the construction of the dry port. Site 3 (Money village) is situated at 11°52'987"N, 3°20'819"E and is less degraded. Also less degraded, Site 4 (Gaya village) is situated at Niger Country side at 11°52'675"N, 3°25'329"E. Unlike Site 1 and Site 2 were artisanal fisheries were moderate, fishing activities were very developed at Site 3 and Site 4.

Fish sampling: Fish samplings were performed monthly from February 2015 to July 2016. On each sampling site, two habitats (aquatic vegetation and open water) were chosen. Traps, seines and experimental gillnets were used for the samplings that follow Adite *et al.* (2013).

In addition, fish were sampled from fishermen captures based on fish abundances. One third of each fishermen capture was sampled and uncommon species were systematically included in the sample (Okpeicha, 2011). All individuals were retained for the sample when the catch amount is less than 50 for a given species (Kakpo, 2011; Okpeicha, 2011). Mochokids were then identified *in situ* using identification references such as Van Thielen *et al.* (1987), Levêque and Paugy (2006). After identification, lengths (total length, standard length) of individual were measured to the nearest 0.1 cm using a measuring board and the weight (W) was measured to the nearest 0.01g using an electronic scale (CAMRY) (Arame *et al.,* 2019). As recommended by Murphy and Willis (1996), identified fishes were preserved in 10% formalin and transported to "Laboratoire d'Ecologie et de Management des Ecosystèmes Aquatiques (LEMEA)" of the Faculty of Sciences and Technics, University of Abomey-Calavi. In the laboratory, fish individuals were transferred into ethanol to facilitate biological observations.

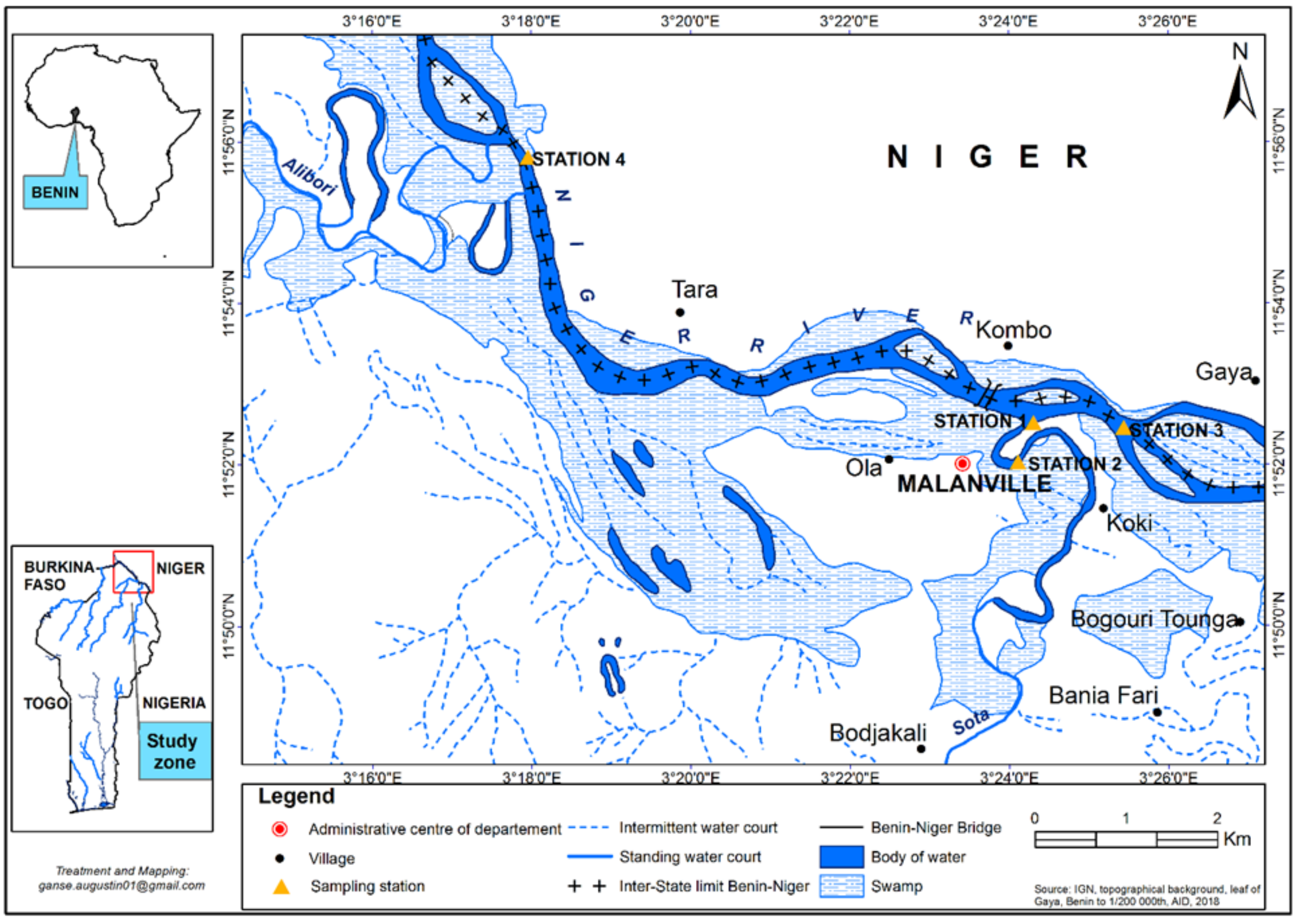


Figure 1. Study region (Malanville town and Niger River) and sampling stations**:** Station 1 = Tounga, Station 2 = Behind dry port, Station 3 = Gaya and Station 4 = Money

Data Analysis

Length-weight relationships of each Mochokid species were examined using the model below:

$W = a L^b$ (Le Cren, 1951) and its log-linear form is:

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

where L = Fish total length, W = weight, *a* = intercept, *b* = slope (Le Cren, 1951). The allometry coefficient (slope) "*b*" was compared with *b* =3 using t-test (Sokal and Rohlf, 1995), which was performed using SPSS Software version 21 (Morgan *et al.,* 2001). Length-weight relationships and size structure were established for species with sample size ≥ 20 individuals. Size structures were established through frequency histograms of standard-length intervals of each species. The wellbeing of each Mochokid was evaluated using Bagenal and Tesch, 1978 condition factor:

$$K = \frac{W}{L^b} \times 100$$

where, K is the condition factor, W is the total weight (g) and L the total length (cm).

Results and Discussion

Size Structures

A total of 4240 individuals of Mochokids were sampled in the Benin part of the Niger River including individuals from Gaya. Mochokid numerical abundances varied with species and ranged between 23 individuals for *Synodontis frontosus* and *Synodontis courteti* and 3159 individuals for the dominant species, *Synodontis schall*. With regards to sizes, standard length (SL) of Mochokid assemblages ranged between 4.5 cm (*Synodontis schall*) and 25 cm (*Synodontis membranaceus*) (Table 1). Species with large size individuals were *Synodontis membranaceus* exhibiting SL varying between 5.0-25.0 cm, *Synodontis courteti* (SL: 12.0-21.0 cm), *Synodontis budjetti* (SL: 10.9-21.0 cm), *Synodontis schall* (SL: 4.5-20 cm), *Synodontis sorex* (SL: 7.0-20.0 cm), *Synodontis clarias* (SL: 8.5-19.5 cm), *Synodontis violaceus* (SL: 8.0-17.5 cm) and *Synodontis melanopterus* (SL: 6.0-18.5 cm). Medium-sized species included *Synodontis macrophthalmus* (7.5-15.0 cm), *Synodontis ocellifer* (7.5-14.5 cm), *Synodontis filamentosus* (SL: 6.5-14.0 cm) and *Synodontis frontosus* (10.0-13.0 cm) and small Mochokids were *Synodontis nigrita* a (6.0-10.5 cm) and *Synodontis nigrita* b (7.0-9.5 cm) (Table 1).

Seven species, *Synodontis schall*, *Synodontis membranaceus*, *Synodontis nigrita* a, *Synodontis clarias*, *Synodontis sorex*, *Synodontis melanopterus* and *Synodontis filamentosus*, showed unimodal distributions. In contrast, species such as *Synodontis violaceus* showed bimodal size distributions (Figure 2(a-h)). Dominant species, *Synodontis schall*, *Synodontis clarias* and *Synodontis membranaceus* from the three major habitats (open water, aquatic vegetation, traditional fishpond "Whedo") showed significant variations ($P < 0.01$) of standard length across habitats. Indeed, calculated *F* values along with degrees of freedom and *p* values were $F_{2, 3156} = 19.64$ with $P = 0.001$ for *Synodontis schall*; $F_{2, 69} = 4.01$ with $P = 0.001$ for *Synodontis clarias* and $F_{2,709} = 4.64$ with $P = 0.001$ for *Synodontis membranaceus*.

Length-Weight Relationship (LWRs)

Allometric coefficients (*b*), intercept (*a*), correlation coefficients, growth trends and *p*-values of length-weight equations of the Mochokids inventoried are summarized in Table 1. Overall, allometric coefficients (*b*) were relatively high and ranged between 2.2588 and 3.0859 for *Synodontis sorex* and *Synodontis clarias*, respectively (Table 1 Figure 3: (a-h)). Seven species, *Synodontis schall*, *Synodontis membranaceus*, *Synodontis nigrita* a, *Synodontis sorex*, *Synodontis melanopterus*, *Synodontis violaceus* and *Synodontis filamentosus*, showed significant negative allometric growth ($b < 3$; $P < 0.05$). In contrast, one specie, *Synodontis clarias*, exhibited significant positive allometric growth ($b > 3$; $P < 0.05$) (Table 1).

Seasonally, allometric coefficients (*b*) varied between 2.4843 (*Synodontis schall*) and 3.0261 (*Synodontis clarias*) for the dry season, and between 2.4842 (*Synodontis schall*) and 3.3907 (*Synodontis clarias*) during the wet season. Inversely, the flood period showed a slope (*b*) ranging between 2.3234 for *Synodontis membranaceus* and 2.6205 for *Synodontis schall* (Table 2).

Spatially, *b* value ranged from 2.2439 (*Synodontis sorex*) to 3.1458 (*Synodontis clarias*) in the open water habitat, but this value was reduced in the aquatic vegetation habitat where it ranged between 2.5047 (*Synodontis membranaceus*) and 2.6191 (*Synodontis schall*). In the traditional fish pond (''Whedo'') *b* varied between 2.7995 (*Synodontis membranaceus*) and 2.911 (*Synodontis schall*) (Table 3). Overall, the distribution of *b* values of Mochokids in the Niger River followed a normal distribution (Ryan-Joiner normality test: $P > 0.05$) (Figure 4).

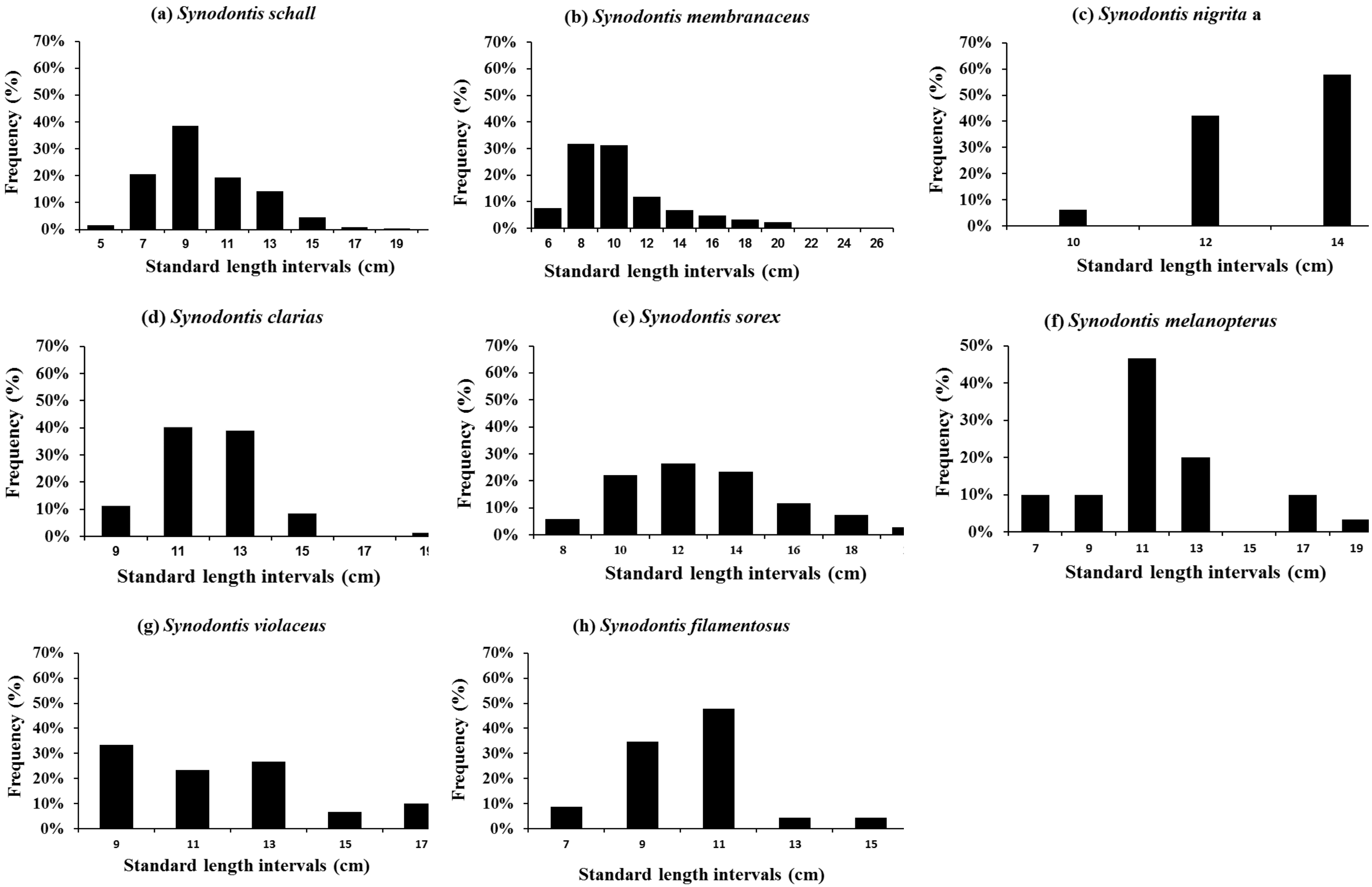
Table 1. Length-weight regression equations* of Mochokid fishes collected from February 2015 to July 2016 in Niger River in Northern Benin. N: Species abundance; a: Regression equation intercept; b: Regression equation slope, r^2: Coefficient of determination.

Species	N	**Standard Length (cm)**		**Weight (g)**		**Length-Weight Relationships**				
		Min	Max	Min	Max	a	b	r^2	Growth	*P*-value (t-test)
Synodontis schall	3159	4.5	20.0	34.0	237.5	0.027	2.6327	0.929	A-	*P* = 0.001
Synodontis membranaceus	712	5.0	25.0	4.5	451.3	0.024	2.6974	0.947	A-	*P* = 0.001
Synodontis nigrita a	95	4.5	10.5	3.2	44.3	0.020	2.9033	0.854	A-	*P* = 0.001
Synodontis clarias	72	8.5	19.5	15.3	178.3	0.008	3.0859	0.927	A+	*P* = 0.001
Synodontis sorex	68	7.0	10.0	7.5	176.5	0.062	2.2588	0.847	A-	*P* = 0.001
Synodontis melanopterus	30	6.0	18.5	6.5	108.0	0.0423	2.4805	0.961	A-	*P* = 0.001
Synodontis violaceus	30	8.0	17.5	11.1	22.5	0.016	2.8306	0.937	A-	*P* = 0.001
Synodontis filamentosus	23	6.5	14.0	5.2	48.4	0.014	2.7966	0.954	A-	*P* = 0.001
Synodontis ocellifer	15	7.5	14.5	11.2	83.7	-	-	-	-	-
Synodontis macrophthalmus	14	7.5	15.0	11.2	105.3	-	-	-	-	-
Synodontis budjetti	10	10.9	21.0	32.5	237.6	-	-	-	-	-
Synodontis nigrita b	6	7.0	9.5	10.0	27.0	-	-	-	-	-
Synodontis courteti	3	12.0	21.0	29.8	221.3	-	-	-	-	-
Synodontis frontosus	3	10.0	13.0	23.3	74.3	-	-	-	-	-

* Length-weight regression equations were performed only for species with sample size ≥ 20

A-: Negative allometric growth

A+: Positive allometric growth



* Size structure were performed only for species with sample size ≥ 20

Figure 2(**a-h**). Size structures of Mochokidae fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

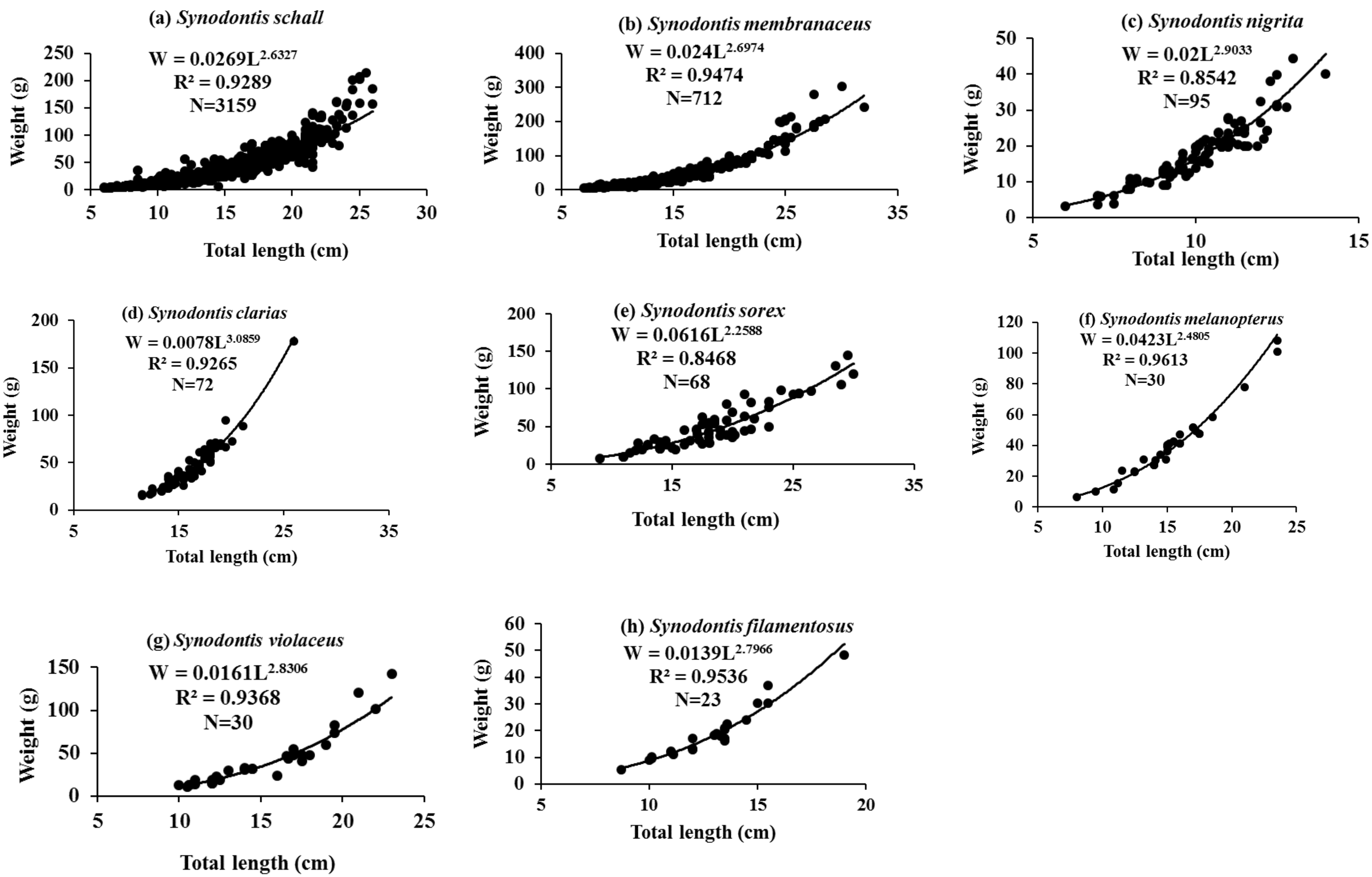


Figure 3(**a-h**). Curvilinear relationships between total length (L) and body weight (W) of Mochokidae fishes collected in Niger River in Northern Benin from February 2015 to July 2016

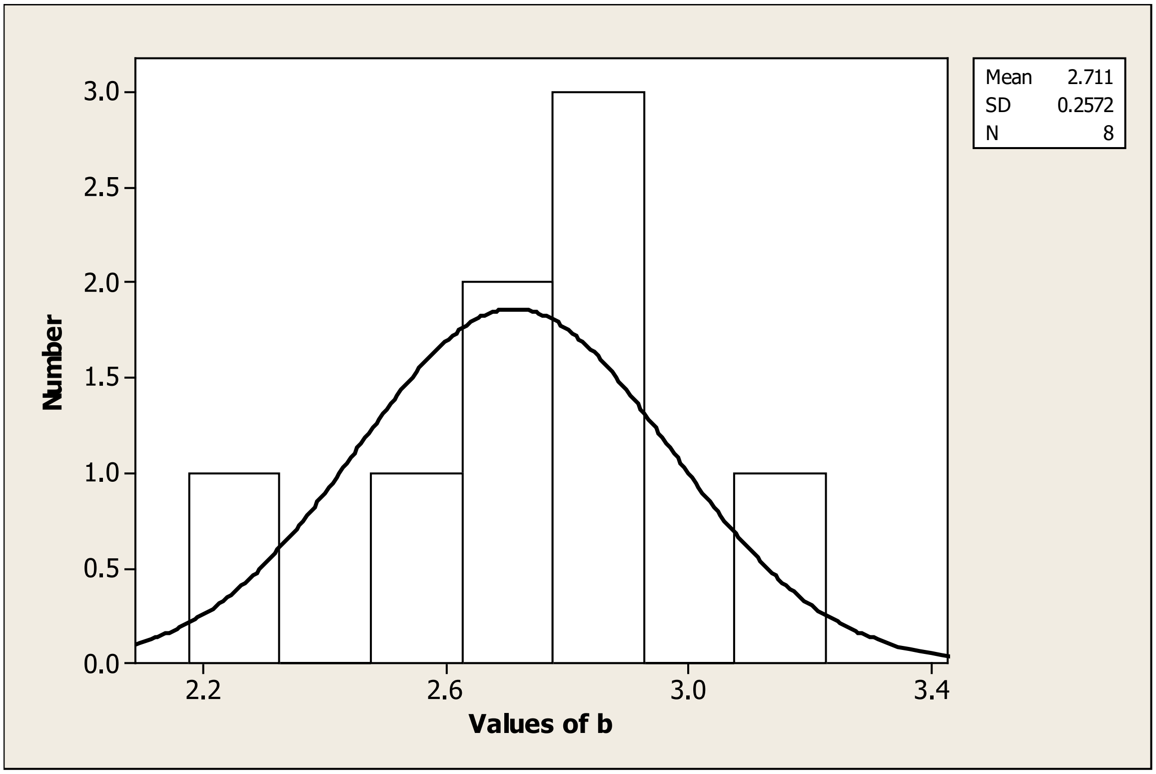


Figure 4. Distribution of slope (b) value of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

Condition Factors

In this study, the condition factors of Mochokidae fishes significantly ($P<0.05$) varied with species. *Synodontis sorex* exhibited the highest condition value (K = 7.276) whereas the lowest condition value (K = 0.790) was recorded for *Synodontis clarias* (Table 4). Except *Synodontis melanopterus,* all the species showed significant ($P<0.05$) seasonal variations of the condition factors (Table 5). Overall, during the dry season, *Synodontis sorex* showed the highest mean K = 8.25 ±3.36 whereas the lowest mean K= 0.94 ±0.12 was recorded in *Synodontis clarias*. In contrast, *Synodontis clarias* exhibited the highest K = 5.52 ±1.22 during the wet season with *Synodontis membranaceus* showing the lowest condition factor K= 1.98 ±0.26. In the flood season, K were relatively reduced and ranged between 3.05 ±0.61 for *Synodontis schall* and 5.94 ±0.97 for *Synodontis membranaceus.* Spatially, condition factors significantly ($P < 0.05$) varied with the different habitats and the highest value (K = 7.18 ±2.98) recorded in the open water for *Synodontis sorex*, whereas the lowest value (K = 0.67 ± 0.08) was recorded in the open water for *Synodontis clarias* (Table 6).

Overall, the results showed high length size variabilities within species assemblages and between populations (Figure 2, Table1). In this study, the maximum standard length (SL = 20 cm) recorded for the dominant species (*Synodontis schall*) is similar to that reported by Sidi Imorou *et al*. (2019) in Okpara Stream (SL = 20.3 cm) in Northern-Benin. However, the current findings for *Synodontis schall* were lower than the value reported by Konan *et al.* (2007) in the Coastal Rivers (SL = 22.5 cm) in South-Eastern of Ivory Coast and by Hazoume *et al.* (2017) in the Sô River (SL = 24.3 cm) in Southern Benin. In contrast, the maximum standard length for *Synodontis melanopterus* (SL = 18.5 cm) and *Synodontis macrophtalmus* (SL = 15.0 cm) were higher than the values reported by Sidi Imorou *et al.* (2019) in Okpara Stream (SL = 14.2 cm, SL = 12.4 cm, respectively).

However, the current records for *Synodontis nigrita* a (SL = 10.5 cm) and *Synodontis budjetti* (SL = 21.0 cm) were lower than the values reported by Sidi Imorou *et al.* (2019) in Okpara Stream, SL= 14.5 cm and SL = 23.0 cm, respectively. Likewise, the maximum SL of *Synodontis filamentosus* (SL = 14.0 cm), *Synodontis ocellifer* (SL = 14.5 cm) and *Synodontis sorex* (SL = 10 cm) recorded in the Niger River in Benin were lower than the values reported by Entsua-Mensah *et al.* (1995), SL = 19.0 cm, SL = 16.2 cm, SL = 21.6 cm, respectively in the Volta River in Ghana. These differences in Mochokid sizes were the results of different habitat conditions, mainly water quality, food availability, high fishing pressure, and levels of environmental degradations (king, 1991, 1996; Hart, 2007; Sidi Imorou *et al.,* 2019).

With regards to length-weight patterns, the current research indicated that allometric coefficients (*b*) varied between 2.2588 for *Synodontis sorex* and 3.0859 for *Synodontis clarias* along with significant ($P<0.05$) correlation coefficients (*r*) ranging between 0.84 and 0.92. These results agreed with those recorded ($2<b<4$) by Hazoume *et al.* (2017) and Sidi Imorou *et al.* (2019) respectively in the Sô river and in Okpara stream from Benin freshwater fishes. In general, the results revealed that most Mochokids (7/8) exhibited negative allometric growth with slopes (*b*) less than 3, indicating that the fish becomes less rotund as they increase in weight (Deekae and Abowei, 2010). These negative growth trends could be attributed to the multiple degradation factors such as the proliferation of invasive floating plants, dumping of domestic wastes, overfishing, introduction of invasive exotic fishes, uses of chemical fertilizers and pesticides in agriculture occurring in Niger River. Also, several other factors such as season, habitat, gonad maturity, sex and diet could have contributed to this negative growth patterns. For the dominant species, *Synodontis schall*, similar negative growth trends were reported by Laleye (2006) in the Oueme River and by Sidi Imorou *et al.,* (2019) in Okpara stream. Likewise, negative allometric growth were reported by Lawson (2013) in the Ugudu creek for *Synodontis ocellifer*, by Laleye (2006) in the Oueme River and by Hazoume (2017) in the Sô River for *Synodontis nigrita*. In contrast with our findings, *Synodontis schall* showed positive allometric growth in the Coastal Rivers of Ivory Coast (Konan, 2007) and both Mochokids, *Synodontis sorex* and *Synodontis ocellifer* exhibited an isometric growth in the Volta River in Ghana (Entsua-Mensah,1995).

Table 2. Length-weight regression equations by seasons of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

	DRY				WET				FLOOD			
Species	a	b	r	Growth	a	b	r	Growth	a	b	r	Growth
Synodontis schall	0.0399	2.4843	0.9405	A^{**}-	0.0399	2.4842	0.9405	A^{**}-	0.086	2.6205	0.9542	A^{**}-
Synodontis membranaceus	0.0162	2.8466	0.9380	A^{**}-	0.0197	2.7673	0.9803	A^{**}-	0.0588	2.3234	0.9441	A^{**}-
Synodontis nigrita a	0.0294	2.7245	0.9277	A^{**}-	-	-	-	-	0.0547	2.4922	0.8310	A^{**}-
Synodontis clarias	0.0093	3.0261	0.9599	A^{**}+	0.0032	3.3907	0.9747	A^{**}+	-	-	-	-
Synodontis sorex	0.0777	2.1924	0.8680	A^{**}-	-	-	-	-	-	-	-	-
Synodontis melanopterus	0.0474	2.4378	0.9715	A^{**}-	-	-	-	-	-	-	-	-

** P < 0.001
A-: Negative allometric growth
A+: Positive allometric growth

Table 3: Length-weight regression equations by habitat of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

	Open water				Aquatic vegetation				'Whedo"			
Species	a	b	r	Growth	a	b	r	Growth	a	b	r	Growth
Synodontis schall	0.0267	2.6324	0.9612	A^{**}-	0.0291	2.6191	0.9747	A^{**}-	0.0153	2.911	0.9851	A^{**}-
Synodontis membranaceus	0.0245	2.6887	0.9754	A^{**}-	0.0412	2.5047	0.8293	A^{**}-	0.0226	2.7995	0.9139	A^{**}-
Synodontis nigrita a	0.0190	2.9158	0.9281	A^{**}-	0.0464	2.5769	0.9051	A^{**}-	-	-	-	-
Synodontis clarias	0.0066	3.1458	0.9646	A^{**}+	-	-	-	-	-	-	-	-
Synodontis sorex	0.0673	2.2439	0.8708	A^{**}-	-	-	-	-	-	-	-	-
Synodontis melanopterus	0.0423	2.4805	0.9805	A^{**}-	-	-	-	-	-	-	-	-
Synodontis violaceus	0.0161	2.8306	0.9679	A^{**}-	-	-	-	-	-	-	-	-
Synodontis filamentosus	0.0139	2.7966	0.9765	A^{**}-	-	-	-	-	-	-	-	-

** P < 0.001
A-: Negative allometric growth
A+: Positive allometric growth

Table 4. Condition factors (K) of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

Species	Abundances	Condition factors (K)
Synodontis schall	3159	2.732
Synodontis membranaceus	712	2.438
Synodontis nigrita a	95	2.099
Synodontis clarias	72	0.790
Synodontis sorex	68	7.276
Synodontis melanopterus	30	4.267
Synodontis violaceus	30	1.633
Synodontis filamentosus	23	1.402

Table 5. Seasonal variations of condition factors (K±SD) of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016.

Species	Dry	Wet	Flood	*P*-value
	K±SD			
Synodontis schall	4.09 ±1.10[c]	4.00 ±0.37[b]	3.05 ±0.61[a]	*P* = 0.001
Synodontis membranaceus	1.65 ±0.30[a]	1.98 ±0.26[b]	5.94 ±0.97[c]	*P* = 0.001
Synodontis nigrita a	3.00 ±0.57[b]	-	5.54 ±0.88[c]	*P* = 0.001
Synodontis clarias	0.94 ±0.12[a]	5.52 ±1.22[b]	-	*P* = 0.001
Synodontis sorex	8.25 ±3.36[b]	-	-	*P* = 0.001
Synodontis melanopterus	4.77 ±0.51	-	-	*P* = 0.059

Table 6: Spatial variation of condition factors (K±SD) of Mochokid fishes collected in Niger River in Northern Benin from February 2015 to July 2016 in open water, aquatic vegetation and "Whedo".

Species	Open water	Aquatic vegetation	''Whedo"	*P*-value
	K±SD			
Synodontis schall	2.72 ±0.56[b]	2.96 ±0.56[c]	1.54 ±0.10[a]	*P* = 0.001
Synodontis membranaceus	2.48 ±0.44[a]	4.18 ±0.63[b]	2.27 ±0.17[a]	*P* = 0.001
Synodontis nigrita a	1.93 ±0.34[a]	4.7 ±0.71b	-	*P* = 0.001
Synodontis violaceus	1.48 ±0.26	-	-	*P* = 0.001
Synodontis filamentosus	1.40 ±0.15	-	-	*P* = 0.001
Synodontis sorex	7.18 ±2.98[a]	-	-	*P* = 0.001
Synodontis clarias	0.67 ±0.08[a]	-	-	*P* = 0.001

Nevertheless, in this survey, one (1) species, *Synodontis clarias,* showed positive allometric growth patterns along with slopes *b*>3, indicating that the fish became more rotund as total length increased (Deekae and Abowei, 2010). Probably, *Synodontis clarias*, showed high tolerance to habitat disturbances, and therefore, was indifferent to critical habitat conditions.

In the Niger River, condition factors (K) of Mochokids significantly (P<0.05) varied with species and ranged between 0.790 and 7.276. Species such as *Synodontis sorex*, *Synodontis melanopterus*, *Synodontis schall*, *Synodontis membranaceus* and *Synodontis nigrita* a showed high to moderate K between 2.1-7.3 probably because of their tolerance to ecosystem disturbances and changes in habitat conditions. Inversely, relatively reduced K varying between 0.790 and 1.633 were recorded for *Synodontis violaceus, Synodontis filamentosus* and *Synodontis clarias* that likely exhibited low tolerance to habitat degradation. In this survey, the condition factors recorded for the dominant species, *Synodontis schall*, were lower than those reported by Sidi Imorou *et al.* (2019) in the Okpara stream and by Akombo (2014) in the Benue River in Nigeria.

Seasonally, *Synodontis schall* showed a relatively good condition during dry, wet and flood periods, *Synodontis nigrita* a performed well during dry and flood periods and *Synodontis* *violaceus* displayed a good wellbeing during wet and flood seasons. *Synodontis sorex* performed well only during dry periods, *Synodontis clarias* showed a good condition only during the wet seasons and *Synodontis membranaceus* exhibited a high condition factor only during flooding. Differential tolerance to abiotic factors, stage of development, spawning cycle and habitat variability in relation with the species could act to affect the plumpness of each Mochokid in Niger River. For example, though *Synodontis sorex* performed well in open water habitat with mean K = 7.18 ±2.98, the highest value was recorded in aquatic vegetation where K peaked at 31.13 ±7.08. Finally, *Synodontis schall* and *Synodontis membranaceus*, two (2) indifferent Mochokids, performed well in both habitats.

Conclusion

The current fisheries research provides useful information for Mochokids management in the degrading Niger River. These catfishes showed a unimodal, bimodal and tri-modal size distributions in this riverine water. Among the eight dominant Mochokids discussed, seven (7) exhibited negative allometric growth while only one species, *Synodontis clarias,* showed positive allometric growth, indicating a weak wellbeing of the fishes. Condition factors were moderate and varied according to season and habitat types. These findings will serve both as reference data for follow-up and as documentation for a management scheme of Mochokidae fishes in Niger River.

Compliance with Ethical Standard

Conflict of interests: The authors declare that for this article they have no actual, potential or perceived conflict of interests.

Ethics committee approval: This study was conducted in accordance with ethics committee procedures of animal experiments.

Acknowledgments: We are grateful to the Laboratory of Ecology and Aquatics Ecosystems Management (LEMEA) of the Department of Zoology, Faculty of Sciences and Technics, University of Abomey-Calavi for its logistic assistance. Many thanks to Mama Razack, Boro Gado Ikililou, Akonou Germard, Aholou Didier, Kpade Bernard and the fishermen for their help in fish sampling. We also thank the numerous reviewers for their thorough peer-review of this manuscript.

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