E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2019; 7(3): 182-187

www.fisheriesjournal.com
Received: 16-03-2019
Accepted: 19-04-2019

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Fish assemblage of the Epitolu-Kime channel section of the Lower Taylor Creek, Niger Delta, Nigeria

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Abstract
The fish assemblage of the Epitolu – Kime Channel section of the Lower Taylor Creek was sampled for (7) months (February-August) 2016, using different gear types to provide necessary baseline information that will help in the sustainable use and management of the resources to enhance the socio-economic status of the riparian community. The specimens were sorted to the lowest taxonomic level and identified with identification manuals and morphometric parameters taken following standard procedures. A total of 357 specimens were sampled representing 33 fish species, 27 genera, 19 families and 9 orders. The Cichlidae was the dominant family (159 specimens) (44.5%) while *Oreochromis niloticus* was the most abundant species by number (22.1%). Gear types used showed cast net recorded the highest amount both in catch number (180) and species abundance (12). Intensive 12 months study is hereby recommended to be carried out to ascertain the true status of the fish species.

Keywords: cichlids; fishing gear; relative abundance; species composition

1. Introduction
Nigeria has a huge potential for fish production, with a coastline of 853 km, 200 nautical miles Exclusive Economic Zone (EEZ), so many dams, lakes and reservoir, and floodplains covering over 13 million hectares of water bodies [1]. It has been a common practice amongst the riparian communities over the years, to exploit fisheries resources from these waters, mostly from rivers and creeks [2].

Fish diversity and associated habitats management is a great challenge and the ability to evaluate the effects of habitats change and other impacts on the fish population required extensive surveying of the fish population before any and after any change occur [3]. The fresh water bodies of Nigeria, with over 270 fish species, are the richest in fish diversity in West Africa [4]. However, fishery resources are on the decline due to over-exploitation and inadequate management of her inland and coastal water bodies [5]. For sustainability of these resources, an adequate knowledge of species composition, diversity and relative abundance of her water bodies must be understood and aggressively pursued [2]. Several studies have been carried out in the lower Taylor Creek [6-9], a creek important in domestic water supply, sand mining and fisheries in the Gbarain Kingdom, Bayelsa State, Nigeria. But no study has been carried out the species composition or assemblage of the area. There is the dire need for a study of the species composition and abundance of the fish species, in a bid to recommend proper management of the fisheries resources in the Epitolu - Kime Channel section of the lower Taylor Creek, since the area under investigation is a major fishing ground which contribute economically, socially and culturally to the development of the fisheries in the region.

2. Materials and Methods
2.1 Study Area: The study was carried out in the Epitolu-Kime Channel Section of the Lower Taylor Creek, Yenagoa Local Government Area, Bayelsa State, Nigeria. The Creek lies between longitude $5^0\,01^1$ to $6^0 17^1$ E and latitude $5^0\,02^1$ to $6^0\,18^1$ E [8]. The entire stretch of the creek from Agbia to Polaku is about 16 km [9]. However, the experimental area which is between Epitolu (Agbia) – Kime Channel (Ogboloma) section of the creek is about 7 km. The Taylor Creek enjoys a humid tropical climate characterized by the hot wet conditions which are dry and wet seasons. Fishing in the area is dominated by artisanal fishers that use manually operated wooden (dug-out) canoes, using mostly traps, gill nets, cast nets and drift nets for fishing.

2.2 Fish sampling

Fresh samples were collected from the study area bi-weekly between the months of February and August, 2016. The fishing gear used were the traditional unbaited conical - valve basket traps (*Ingo* trap), gillnet (10-30 mm stretched mesh size), cast net (10-25 mm mesh size) and Malian (*Gura*) traps. The gear and methods used were in accordance with the recommendations of Gullard [10], that reliable sampling should involve a combination of two or more fishing gear.

The specimens were preserved in 10% formaldehyde solution and were later removed, rinsed in clean water and identified to the species level with the aid of identification keys by Powell [11] and Olaosebikan and Raji [12].

2.3 Statistical analysis

The relative abundance of the fish species was estimated using the formula:

$$RA = \frac{SA}{TS} \times 100\% \quad [13].$$

Where:

RA = Relative abundance of each species (%); SA = Species abundance; TA = Total abundance for all species

The monthly percentage occurrence of fish species was computed as follows:

$FO = n/N \times 100$ [14].

Where:

FO = Frequency of occurrence; n = number of individual fish species; N = total number of all the fish species.

3. Results and Discussion

Fish assemblage: The primary objective of a sampling survey of this nature was to attempt to find out what species exist in the creek and perhaps, elucidate the factors governing abundance. Although, according to Benech *et al.* [13], fish community studies are not generally equivalent to Ichthyocoenosis because the description of any fish community is a biased image arising from the sampling of a group of fishes in a particular environment at a given time. Meye and Ikomi [15] emphasized that gear selectivity and sampling strategies are usual sources of these biases. In spite of this obstacle, attempts will be made to compare data obtained in this work with that from related studies. A total of 33 species belonging to 9 orders, 27 genera and 19 families were recorded in the study area. The highest number of species (45.05%) was observed in the family Cichlidae, Characidae (19.06%) and Schilbeidae (10.04%) while the rest contributed slightly more or less than one percent each in catch number. Families Protopteridae and Gymnarchidae were the highest in catch weight with 38.6 and 28.2% respectively, while family Bagridae, Clupeidae, Eleotridae, Hepsetidae and Mochokidae contributed less than 1% each (Table 1). The fish assemblage of the Epitolu - Kime Channel section of the lower Taylor Creek compared favorably with fish composition previously mentioned on similar streams and creeks in Nigeria. In a similar study, Calabar River, Calabar, Nigeria, Andem *et al.* [16] reported 26 fish species belonging to 22 fish families. Adaba *et al.* [17] identified 61 species, belonging to 54 genera, 41 families and 15 orders from upper reaches of New Calabar River, Rivers State, Niger Delta, Nigeria. Falaye *et al.* [2] encountered 16 species and 8 families in Erelu Reservoir, Oyo, Nigeria. Francis *et al.* [18] identified 28 species, 21 genera, 15 families and 5 orders in Oguta Lake. Lawson *et al.* [19] reporting on the fish assemblage and diversity of Majidun Creek, Lagos, Nigeria recorded 18 families, 8 orders, 20 genera and 23 species of fin and shell fishes. Negi *et al.* [20] discovered 19 species belonging to 5 families, 2 orders and 6 genera in Tons River, Uttarakhand State, India. Imefon [14] sampled 19 fish species representing 13 fish families in Iba - Oku Stream, Ikpa River, Nigeria. Sixty two (62) fish species from 48 genera and 30 families were reported by Rodriguez – Romero *et al.* [21] in the coastal (mangrove) of Baja California Sur, Mexico. Onuoha *et al.* [22] recorded 4 orders, 7 families, 14 genera and 26 species in Ntak Inyang Stream, Calabar, Nigeria.

Table 1: Composition of fish families by number and weight in the Epitolu – Kime Channel Section of the Lower Taylor Creek

Families	No.	Percentage%	Weight (g)	Percentage %
Bagridae	4	1.1	84	0.3
Channidae	1	0.3	38	1.1
Characidae	70	19.6	694	3.1
Cichlidae	159	44.5	1630	6.1
Clariidae	1	0.3	2320	8.7
Claroteidae	2	0.6	157	0.6
Clupeidae	10	2.8	21	0.1
Cyprinidae	6	1.7	617	2.4
Distichodontidae	4	1.1	1042	3.1
Eleotridae	3	0.8	81	0.3
Gymnarchidae	4	1.1	5561	28.2
` Hepsetidae	1	0.3	65	0.2
Malapteruridae	5	1.4	295	1.1
Mochokidae	11	3.1	279	1.3
Nanidae	3	0.8	21	0.3
Palaemonidae	30	14.9	532	2
Polypteridae	4	1.1	317	1.7
Protopteridae	2	0.6	10128	38.6
Schilbeidae	37	10.4	481	1.6
Grand Total	357	100	26241	100

Table 2 shows the catch composition and relative abundance of the study area. The most dominant order was Perciformes and was represented by six families. The three most dominant species recorded in this study were *O. niloticus*, *M. felicinum*

and *S. mystus* having relative abundance of 22.1, 10.6 and 9.2% respectively, while the following species; *B. nurse*, *D. brevipinnis*, *D. rostratus*, *B. bajad*, *P. annecton*, *P. africanus*, *P. abbreviata*, *H. odoe*, *A. Occidentalis*, *H. longifilis*, *C. laticeps*, *S. membranecea*, *S. violacea* and *S. uranoscopus* contributed less than 1% in catch number. The number of fish species and families recorded in this study are higher than the reports of Allison and Okadi [23] in the lower Nun River, Onuoha *et al.* [22] in Iyang Stream, Imefon [14] in Iba-Oku Stream, Ayanwale *et al.* [24] in Tagwai Lake Mina, Negi *et al.* [20] in Tons River, India, and Falaye *et al.* [2] in Erelu Reservoir, all in Nigeria. However, the numbers from this study were lower than the records of Abowei *et al.* [25] on Sombreiro River, Meye and Ikomi [26] on River Orogodo, and Adaba *et al.* [17] on New Calabar River, Rivers State, Nigeria. This may be due to gear types/skills of operation, larger and deeper nature of the aforementioned water bodies.

The dominance of Cichlidae in terms of species abundance and diversity is in line with what is obtained in most of the works in many Nigerian creeks, lakes and rivers [2, 17, 18, 24, 27, 28, 29]. The dominance of the family Cichlidae could be attributed to the presence of phytoplankton and zooplankton which serves as food for them, their prolific breeding and their ability to adapt to lacustrine conditions in the creek. The same reason may also be responsible for the high number of *Oreochromis niloticus* which was the most dominant species in the study area. This is consistent with the works of Falaye *et al.* [2], Edward [28] and Offem *et al.* [30], who also reported the dominance of *O. niloticus* in their various works. Absence of effective predators such as *Heterotis niloticus* and *Citharinus cithanus* to check mate their prolific breeding may also contribute to the high number in the study area. No wonder, these fish species were not caught during the time of sampling.

Table 2: Catch composition and relative abundance of fish species in the Epitolu – Kime Channel

Order	Family	Species	N	N%	W(g)	W%
Characiformes	Characidae	*Brycynus baremose*	1	0.3	46	0.1
		B. macrolepidotus	9	2.5	131	0.4
		B. nurse	27	7.6	156	0.7
		Hydrocynus forskalii	10	2.8	361	1.2
	Distichodotindae	*Distichodus brevipinnis*	2	0.6	845	3.2
		D. rostratus	2	0.6	197	0.9
Clupeiformes	Clupeidae	*Pellonula leonensis*	10	2.1	21	0.1
Cypriniformes	Cyprinidae	*Labeo senegalensis*	6	1.7	617	2.4
		Bagrus bajad	3	0.3	85	0.7
Decapoda	Palaemonidae	*Macrobrachium felicinum*	38	10.6	284	1.1
		M. vollenhovenii	15	4.2	119	0.6
Lepidosireniformes	Protopteridae	*Protopterus annecton*	2	0.6	10128	38.6
Osteoglossiformes	Gymnarchidae	*Gymnarchus niloticus*	4	1.4	5561	28.2
Percimiformes	Channidae	*Parachana africanus*	1	0.3	38	0.1
	Cichildae	*Copton zilli*	18	5.8	183	0.6
		Hemichromis bimaculatus	26	7.3	159	0.8
		H. fasciatus	21	6	174	0.9
		Oreochromis niloticus	79	22.1	815	3.1
		Palaematolapia marie	15	4.2	259	0.5
	Eleotridae	*Bostricus africanus*	3	0.6	81	0.3
	Malapteruridae	*Malapterus electricus*	5	1.1	295	1.1
	Nanidae	*Polycentropsis abbreviata*	3	0.6	21	0.3
	Hepsetidae	*Hepsetus odoe*	1	0.3	65	0.2
Polypteriformes	Polypteridae	*Polypterus senegalus*	4	1.7	317	1.2
Siliruformes	Bagridae	*Auchenoglanis occidentalis*	1	0.3	84	0.3
	Clariidae	*Heterobranchus longifilis*	1	0.22	2320	8.7
	Claroteidae	*Clarotise laticeps*	2	0.6	157	0.6
	Mokochidae	*Syndontis courteti*	6	1.7	137	0.5
		S. membranecea	1	0.3	71	0.3
		S. violacea	4	0.9	73	0.3
	Schilbeidae	*Paraila pellucida*	2	0.6	8	0.1
		Schilbe mystus	33	9.2	435	1.6
		S. uranoscopus	2	0.6	38	0.1

3.2 Gear selectivity

The species composition harvested with the different gear types is shown in Table 3. The cast net recorded the highest number (180) of specimens with 17 species and distantly followed by Ingo trap, an unbaited conical - valve basket trap, (94 individuals) with 9 species. Malian trap and gill net recorded 49 and 34 individuals respectively with 12 species each. Cast net was selective in catching more of Cichlids and Characids throughout the study period, while the *ingo* trap was selective in catching *Macrobrachium* species. Malian trap and gill net were non-selective but had little catches of both Cichlids and Characids. Gear selectivity was observed in the fish catch from the study area. The variation in mesh sizes of the several fishing gear used may have highly influenced species composition and abundance in this study as opined by Meye and Ikomi [15]. Ufodike *et al.* [31] also supports this position, having reported earlier that gill net technology and catch period or techniques are essential in maximizing fish catches. Both cast net and gill nets constituted more than 50% of the catch in this study, which were dominated mainly by the Cichlids and Characids. The result agreed with those of Alfred – Ockiya [32] in Kolo Creek, Meye and Ikomi [15] in Urie Creek at Igbide, and Ago *et al.* [33] in Jebba Lake, all in Nigeria. Cast net, which is an active gear, showed high

selectivity and great efficiency in catching fish. The selectivity of cast net showed high catches of *Oreochromis niloticus, Palaematolapia marie, Schilbe mystus, Brycinus nurse, Hydrocynus forskalii, Copton zilli* and *Hemichromis fasciatus*. The selectivity may be connected with the morphometric projections on the body of most species such as Mochokids and the presence of scales on most other species such as Cichlids (*O. niloticus*). These projections make such fishes susceptible to gill net [15].

Table 3: Catch composition of gear types in the Epitolu – Kime Channel Section of the Lower Taylor Creek

Family	Species	Ingo Trap	Malian Trap	Cast Net	Gill net	Total
Characidae	*Brycinus baremose*	-	-	1	-	1
	B. macrolepidotus	-	2	1	6	9
	B. nurse	-	1	23	3	27
	Hydrocynus forskalii	-	-	10	-	10
Clupeidae	*Pellonula leonensis*	-	-	10	-	10
Cyprinidae	*Labeo senegalensis*	-	-	5	1	6
	Bagrus bajad	-	-	1	2	2
Distichodontidae	*Distichodus brevipinnis*	-	2	-	-	2
	D. rostratus	-	2	-	-	2
Palaemonidae	*Macrobrachium felicinum*	40	-	-	-	40
	M. vollenhovenii	15	-	-	-	15
Protopteridae	*Protopterus annecton*	-	2	-	-	2
Gymnarchidae	*Gymnarchus niloticus*	-	-	-	4	4
Channidae	*Parachana africanus*	1	2	-	-	3
Cichlidae	*Copton zilli*	-	-	18	-	18
	Hemichromis bimaculatus	16	3	7	-	26
	H. fasciatus	12	3	13	-	28

Table 3.1: Continued: Catch composition of gear types in the Epitolu – Kime Channel Section of the Lower Taylor Creek

Family	Species	Ingo Trap	Malian Trap	Cast Net	Gill net	Total
	Oreochromis niloticus	17	12	49	2	79
	Palaematolapia	-	-	15	-	15
Eleotridae	*Bostricus africanus*	3	-	-	-	3
Malapteruridae	*Malapterus electricus*	-	5	-	-	5
Nanidae	*Polycentropsis abbreviate*	-	3	-	-	3
Hepsetidae	*Hepsetus odoe*	-	-	-	1	1
Polypteridae	*Polypterus senegalus*	-	3	-	-	3
Bagridae	*Auchenoglanis occidentalis*	-	-	-	-	1
Clariidae	*Heterobranchus longifilis*	-	-	-	1	1
Claroteidae	*Clarotise laticeps*	-	-	2	-	2
Mochokidae	*Synodontis courteti*	-	-	5	1	6
	S. membranecea	-	-	-	1	1
	S. violacea	-	-	4	-	4
Schilbeidae	*Paraila pellucid*	-	-	2	-	2
	Schilbe mystus	5	-	21	7	33
	S. uranoscopus	1	-	-	1	2
Total		94	49	180	34	357
Grand total		26.3%	13.7%	50.4%	9.5%	

The heterogeneous mesh size of different panels in the cast net may also be connected with catch of fishes of different sizes. *Ingo* trap was selective in catching *Macro brachium* species (*M. felicinum* and *M. vollenhovenii*) and Cichlids (*H. bimaculatus* and *H. fasciatus*). This corresponds with the findings of Kingdom and Hart [6], who reported a likely predator - prey relationship between *Hemiochromis species* and *Macrobrachium* species in lower Taylor Creek. That *H. bimaculatus* and *H. fasciatus* are carnivorous species, and on trying to feed or prey on the *Macrobrachium* species, they got trapped in the *Ingo* trap. The catch of more of Cichlids (*Oreochromis niloticus*) in the unbaited Malian trap in this study was also put forward by Ipinjolu *et al.* [34], who reported that Malian trap catch fish indiscriminately but specializes in catching Cichlids and Clariids.

3.3 Monthly occurrence

The monthly occurrence of the fish species sampled in the study area is shown in Table 4. The results showed all round occurrences of the fish species; *H. bimaculatus, H. fasciatus, P. marie, O. niloticus and B. nurse*. However, *O. niloticus* was the most abundant fish fauna sampled. The present study which recorded highest catches (16.0%) in March and observed the least relative abundance in the month of April (9.60%) is similar with the report of Davies [35] in the lower reaches of Okpoka Creek, in Rivers State, Nigeria, who also recorded highest catch in the month of March (18.8%) during the dry season and least catch in the month of April (9.09%). In a similar study, Imefon [14] in Iba - Oku Stream, Ikpa River, Nigeria also recorded highest catch in the month of March (23.10%) during the dry season and highest in July (21.79%) during the wet season. The probable difference may be that the latter did not sample in the month of August. Some important freshwater species such as *Heterotis niloticus*, *Citharinus citharus* and *Momyrus* species were absent, and the decrease observed in some population of fish species may be caused by skills in gear operation, dredging activities, obnoxious and offensive (chemical) fishing practices during

sampling period, and use of unregulated mesh sizes which may have reduced their numbers significantly, hence making it very difficult for these fish species to be caught during sampling.

4. Conclusion

The results of the fish assemblage of the Epitolu – Kime Channel section of the Lower Taylor Creek have shown that it has a great potential for fisheries exploitation. The fish assemblage exercise of the study area comprised 357 individuals from 9 orders, 19 families, 27 genera and 33 species. The study area exhibited high species abundance and diversity dominated by Cichlidae, Characidae and Palaemonidae in the overall catch. Three species; *O. niloticus*, *M. felicinum* and *S. mystus* were the most abundant. The gear selectivity observed among the fish species showed that the use of multiple gears may probably be the best approach as fish composition in the nearest future. Some interventions that may be considered to improve the potential fish yield of the study area include regular monitoring for offensive fishing practices (chemical fishing), regulation of mesh sizes, management to prevent incessant dredging activities and sedimentation, and education of all the stakeholders to ensure sustainable management. Intensive 12 months study is also recommended in other to ascertain the true state of the fish species in the study area.

Table 4: Monthly occurrence of fish species in the Epitolu – Kime Channel Section of the Lower Taylor Creek

Species	Feb	March	April	May	June	July	August
Brycinus baremose	-	-	-	-	1	-	-
B. macrolepidotus	-	3	2	1	-	1	2
B. nurse	5	5	4	2	3	3	4
Hydrocynus forskalii	-	-	-	-	-	4	6
Pellonula leonensis	-	-	-	-	3	4	3
Labeo senegalensis	-	3	-	2	-	-	1
Bagrus bajad	-	1	-	-	-	1	1
Distichodus brevipinnis	-	-	-	-	-	1	1
D. rostratus	-	-	1	-	1	-	-
Macrobrachium felicinum	2	-	5	1	3	9	18
M. vollenhovenii	1	2	2	2	-	3	5
Protopterus annecton	-	-	-	2	-	-	-
Gymnarchus niloticus	-	-	-	-	-	1	3
Parachana africanus	-	-	-	-	-	-	1
Copton zilli	1	2	4	1	2	2	6
Hemichromis bimaculatus	4	7	3	4	2	4	1
Polypterus senegalus	1	1	-	2	-	-	-

Table 4.1: Continued: Monthly occurrence of fish species in the Epitolu – Kime Channel Section of the Lower Taylor Creek

Species	Feb	March	April	May	June	July	Aug
H. fasciatus	4	3	4	4	4	1	1
Oreochromis niloticus	24	15	11	10	5	4	9
Palaematolapia marie	3	8	2	-	-	1	1
Bostricus africanus	-	1	-	-	2	-	-
Malapterus electricus	-	2	1	-	-	1	1
Polycentropsis abbreviata	-	1	1	1	-	-	-
Hepsetus odoe	-	1	-	-	-	-	-
Auchenoglanis occidentalis	1	-	-	-	-	-	-
Heterobranchus longifilis	-	-	-	-	1	-	-
Clarotise laticeps	-	-	-	-	1	-	1
Syndontis courteti	-	-	-	4	2	-	-
S. membranecea	-	-	-	1	-	-	-
S. violacea	-	-	-	1	3	-	-
Paraila pellucid	-	-	-	-	-	-	2
Schilbe mystus	-	-	-	4	7	9	14
S. uranoscopus	-	-	-	-	2	-	-
Total	46	57	40	42	42	49	81
Grand Total	12.9%	16.0%	11.2%	11.08%	11.08%	13.7%	22.7%

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