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STATUS OF THE FIN FISH FAUNA OF THE UPPER SOMBREIRO RIVER, ABUA/ODUAL LOCAL GOVT. AREA, RIVERS STATE, NIGERIA

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ABSTRACT
A twenty two weeks prelimnary study was carried out to assess the Status of the Upper Reaches of the Sombreiro River, one of the most important rivers in River state. A field survey was carried out in three sampling points in the Abua/Odual Local Govt. Area where fish samples were collected from the fishers and the Composition and Abundance assessed over the period using standard methods. Generally, the fish composition comprised of thirty seven (37) species in twenty (20) families from forty two thousand one hundred and twenty seven (42,127) individuals. However, through there was a weekly variation in composition following the seasons of the study from the dry season (weeks 1 – 14, Jan. to April) to the wet season (weeks 15 – 22, May to June). Some species were in the catch mainly in the rainy season (H. fasciatus) while others in the dry season (G. decadactylus, I. africana, L. dentatus) and some available through the period (O. mossambicus, T. zilli, and other Cichlid. The weekly composition showed a seasonal variation with two peaks in the wet season but a higher peak in composition in the late wet season. The relative abundance showed that S. maderensis had the highest percentage (57.17%) abundance followed by T. zilli with 5.83% , L. grandisquamis and L. falcipinnis with 3.25% and 3.57% respectively. The least abundant in descending order were, H. niloticus, and T. senegalensis (0.07% each), P. senegalensis (0.03%) and E. senegalensis (0.01%). Also, the weekly abundance of fish species revealed a seasonal variation in the abundance. Week 16 with 8.92% had the highest relative abundance but there was another peak at week 2. Week 7 (0.17%) had the least. These findings of greater composition and abundance in the dry season than the wet season were consistent with other works in the Niger Delta Area (Chindah (1994), Chindah and Osuamkpe (1997), Allison et al (1997), Ogamba (1998), Sikoki et al (1999), Nweke (2000), Ezekiel et al.(2002), Davis (2009), Onwuteaka (2015), Ibim and Owhonda(2017), Ibim and Bongilli (In press) . They reported salinity in the river and the presence/absence of food organisms were the main reasons. However, fishing pressure may be a major issue affecting the high number of rare fish species as they are well appreciated and attract good prices in the local markets. Inter/intra specific competition is another factor. This study therefore serves as baseline for a greater Research Survey and Bio-Monitoring for further assessment of the Fish and Fisheries, including the Ecosystem for documentation and proper management/conservation of the fish and fisheriess in the Upper Reaches of the Sombreiro River in Rivers state.

INTRODUCTION
Fishes belong to the class Pisces and they are adapted to life in water. They can be grouped into cartilaginous and bony fishes (Ibim and Igbani, 2013). Also they can be classified into fin or non-fin fishes with gills as breathing organs, they can be fresh water organisms or brackish and marine water dwelling organisms. Examples include aquatic mollusks, Turtles, sharks, marine sponges among others (Ibim and Udeme-Naa, 2011).

Fish population in the Niger Delta Area has been reported to be on the decline by several fishers (Personal Communication) and Nigeria at large (Areola, 2003). This has been reported to be as a result of the exponential increase in human population in the Niger delta and Nigeria at large, leading to a rapid increase in the demand for fish and fisheries product as source of food/animal protein and for aesthetic value (Areola, 2003). Areola (2003), further reported that although the fishing industries have not been fully developed in Nigeria, the demand for fish in Nigeria has been estimated to be about 2.66 million tons annually and that there is also a general appreciation of the commonly exported fish species from Nigeria. Olaosebikan and Raji (1998), reported that the Nigerian inland waters have been primarily used for fishing. Due to over fishing and exploitation, several economically important species are declining thereby leading to threat towards mass extinction of species.

Secondly, indiscriminate dumping of human and Industrial waste as well as sand mining and sand-filling of breeding areas of the rivers, as a result of exponential increase in human population are also a major issue in the Niger Delta Basin. Finally and most importantly, environmental pollution and degradation of the water bodies in the the Niger Delta Area is a major concern. As a result of the exploration and exploitation of Crude oil as the economic mainstay of Nigeria, the Rivers in the Niger delta Area have been reported to be polluted intermittently, causing fish fauna death and species decline.

Researchers have also identified other challenges such as Climate change (Ibim, 2016), water management project (Ticherler, 2000) as causes of the fish fauna decline. The Sombreiro River is one of the tributaries of the River Niger in the Niger Delta Basin. It originates from swamps in the Oguta-Ebocha zone (NNPC/RPI, 1985) through the Northern parts of Ogba/Egbema/Ndoni Local Govt. Area of Rivers State (Abowei *et al;* 2008)and located east of the Orashi River (NNPC/RPI, 1985). As the River moves inland southwards, it gradually becomes Brackish. Ezekiel (1986), reported that the Sombreiro River is connected to other rivers via creeks in the coastal areas of the Niger Delta. This makes the mouth of the river brackish and tidal environment (Ezekiel et al., 2011).the River eventually empties into the Atlantic Ocean. The Sombriero River provides lot of breeding ground for aquatic life because it is highly rich in mangrove forest (Dokubo, 1999). This mangrove forest serves as home to aquatic and terrestrial wild life and also serve as share protection source.

The Upper reach of the River is known to be fresh(NNPC/RPI, 1985 and Onwuteaka, 2015). Seasonal changes on the River depends on rainfall, buffered by the holding capacity of marginal swamps. The river is a tropical water systems with conductivity values that classify the Upper Reach as clear and black water depending on the season (NNPC/RPI, 1985). The river serves as a source of water for drinking, swimming exercise and washing. It also serves as a source of fish food for the locals around it. As a result of all of these it has been inferred that the fish population of this River has been severely negatively affected.

However, with all the numerous deleterious activities taking place within and around the the Sombreiro River, there is no information on the Status of the fish stock of the Upper Reach of the Sombreiro River. This study is pertinent as it will provide the much needed information on the fish species composition and abundance level of the Upper Reaches of the Sombriero River, for the development of protection and conservation strategies and laws that could stem further decline of the fish population. Therefore, this study is designed to investigate and identify fish fauna, their composition, diversity and abundance in the reaches of the River. This work is therefore aimed at identifying and documenting the Status (Composition and Abundance) of the Fish Stock of the Upper Reach of the Sombriero River.

MATERIALS AND METHODS

The Study Area

The Sombriero River is one of the most important rivers in River state. It is one of the rivers that link the River Niger to the Atlantic Ocean.it traverses several Local Government Areas in River State. It originates from swamps in the Oguta-Ebocha zone (NNPC/RPI, 1985) through the Northern parts of Ogba/Egbema/Ndoni Local Govt. Area of Rivers State (Abowei *et al;* 2008)and located east of the Orashi River (NNPC/RPI, 1985). This study was carried out in the Upper Reach of the Sombriero River in Abua/Odual Local Government Area of Rivers State (Fig. 1). The sampling points as shown in fig. 1, in the study area were Otapha located at latitude 6^0.32E and longitude 4^0.50N, Ogonokom located in latitude 6^0.43E and longitude 4^0.47N, and the Hulk located in latitude 6^0.422E and longitude 4^0.471N all at the Upper Reach of the Sombriero River.

The Upper reach of the River is known to be fresh(NNPC/RPI, 1985 and Onwuteaka, 2015). Seasonal changes on the River depends on rainfall, buffered by the holding capacity of marginal swamps. The river is a tropical water systems with conductivity values that classify the Upper Reach as clear and black water depending on the season (NNPC/RPI, 1985). The seasons experienced are wet and dry. The wet or raining season occurs between April to November with annual rainfall at 2500 and 3000mm per year (Abowei, 2000). The dry season lasts from November to March with occasional rain fall (Iwena, 2000). The area is flooded in the wet season and the flood recedes in the dry season. At this time the velocity of the river increases. The Sombriero River appears turbid during the raining season and becomes clear during the dry season (Dokubo, 1999). The river also serves as a source of water for drinking, swimming and washing, in the Abua/Odual Local Govt. Area. The vegetation consists mainly of *Nymphae* species (like *Nymphea lotus)* and *Eicchornia crassipes,* alongside other freshwater forest plants (Abowei *et al*; 2008). The Sombeiro river has a rich mangrove forest and this mangrove forest serves as home to aquatic and terrestrial wild life. It also serves as share protection source and it provides a lot of breeding grounds for aquatic life because (Dokubo, 1999). The bottom sediment of the river consists of fine sand and gravel (Abowei *et al*;2008 and Onwuteaka, 2015).

Experimental Procedure

Experimental Design and Sample Station Location

The study was designed to last six months (from January to June, 2016), with three sampling stations (Station A, Station B, Station C) covering the Upper Reach of the Sombriero River, as shown in Fig 1. The stations were sampled for fish by fishermen once every week using nets of different mesh size, gillnets, hooks and lines and traps.

Fish Sample Collection and Treatment

Fish samples were collected from local fishermen as they landed their catch. They were then sorted and counted as required and later put into Plastic aquaria containing 4% formalin, solution and taken to the laboratory for identification to species.

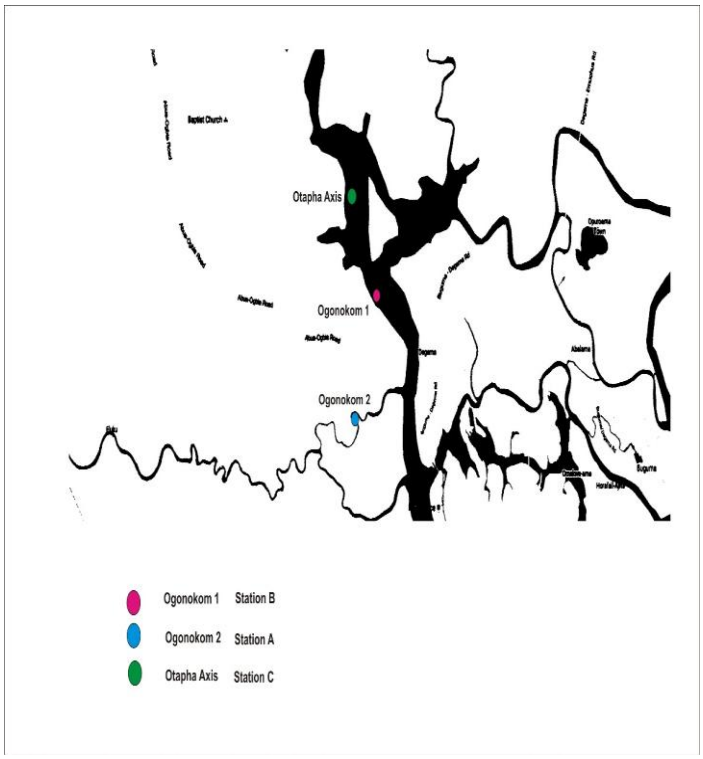

Fig. 1. Map of study Area

Data Collection

Physico-chemical parameter determination.

Temperature: Water temperature was measured using mercury bulb thermometer *insitu*. The thermometer was immersed in the water for about 2.5 minutes to ensure proper graduation, then the temperature reading was observed and recorded.

Hydrogen ion concentration (pH): The pH level of the water was determined using a pH meter (P. IIIATC pen type pH meter) standardized with 4.0 and 6.9 (pH) buffer solution (Salcon 1997).

Dissolved oxygen (DO): Dissolved oxygen content of collected water sample from the field was measured in the laboratory using a millwaki dissolved oxygen meter.

Conductivity/Salinity: This was measured using a water sampling kit to read off the conductivity/salinity of the water samples collected and recorded.

Fish Composition Determination

Fish composition was determined by estimating the total count of all landed fish. Later on the fish specimens were identified and sorted out into their different families and species and counts taken using identification keys such as; Wheeler (1994), Nigeria fresh water fish (Olasebikan and Raji, 2004), Taxonomy, Ecological notes, Diet and utilization (Idodo-umeh, 2003), Fish Base (Froese and Pauly, 2011) and Marine and Brackish water Ornamental and Food Fish Album (Ibim and Francis, 2012).

Fish species abundance determination.

Abundance was determined by the Relative abundance method which involve counting the total number of fish species caught per time.

Then the relative abundance score of the species was estimated following the criteria of Allison *et al*; (2003), and the Abundance score determined using the criteria; 1 – 50 = Rare (R), 51 – 100 = Few (F), 101 – 200 = Common (C), 201 – 400 = Abundance (A), and 400 = Dominant (D).

Data analysis

Statistical data analysis was carried out using the computer package SAS (1999). The ANOVA at probability of ($P< 0.05$) was used to compare the relative abundance and diversity of fish species within weeks of sampling.

RESULTS

Physicochemical parameters

Table 1: Mean Physicochemical Parameters of the Upper Reach of the Sombreiro River

Parameters	Range	Mean ± SE
Temperature °C	27-30	28.66 ± 0.2
pH	4.0-8	4.0 ± 0.2
Dissolved Oxygen (mg/L)	3.8-7	3.66 ± 0.2
Salinity	0.0-4.5	2.99 ± 0.2

The result of the mean physicochemical parameters of the period of the study (Table 1) revealed as follows;

Temprature: The temperature recorded during the period of this study ranged between 27 ^{0}C to 30^{0}C with a mean value of 28^{0}C. The highest temperature was recorded between week 8, 17 and 18. (30^{0}C± 1.0) in the months of March and June respectively.

Dissolved Oxygen: This ranged between 4 and 7mg/l with slight fluctuation throughout the period of sampling. The highest DO value was recorded in week 6, having between 6 and 7mg/l. The least value was from week 10 with a value of 4.2mg/l.

Hydrogen Ion Concentration (pH): The pH recorded in the period of this studies ranged from 4-8. The pH was highest in week 5 and the lowest in week 20.

Salinity: The salinity recorded during the study period ranged between 0.1 to 4.5ppt. Salinity decreased as the rains increased. The highest value was observed in week 8 and the lowest in week 21.

Fish Species Composition

The Fish Composition comprised of thirty seven (37) species in twenty (20) families from forty two thousand one hundred and twenty seven (42,127) individuals. There was a good mix of freshwater and brackish water species in the fish species composition of the Upper Reaches of the Sombreiro River, as shown in Table 3.

Table 3: Checklist Of fishes and Fish Composition of the Upper Reach of the Sombriero River, Abua/Odual

S/N	Species Names	Numbers of Species	Family	Order
1	*Arius gigas*	138	Aridae	Siluriformes
2	*Brycinus macrolepidotus*	396	Alestidae	Chariciformes
3	*Carangoides chrysophrys*	84	Carangidae	Perciormes
4	*Caranx hippos*	306	Carangidae	Perciormes
5	*Chromidotillapia guentheri*	719	Cichlidae	Perciormes
6	*Chrysichthys nigrodigitatus*	200	Claroteidae	Perciormes
7	*Eleotris Africana*	161	Eleotridae	Perciormes
8	*Eleotris senegalensis*	3	Eleotridae	Perciormes

9	*Elops lacerta*	268	Elopidae	Elopiformes
10	*Ethmolisa fimbrietta*	442	Clupeidae	Perciormes
11	*Goleoides decadactylus*	104	Sphyraenidae	Perciormes
12	*Hemichromis fasciatus*	837	Cichlidae	Perciormes
13	*Hepsetus odoe*	82	Hepsetidae	Perciormes
14	*Heterotis niloticus*	30	Osteoglosidae	Perciormes
15	*Illisha Africana*	952	Pristigasteridae	Perciormes
16	*Liza falcipinis*	1527	Mugilidae	Perciormes
17	*Liza grandisquemis*	1388	Mugilidae	Perciormes
18	*Lutjanus Campechanus*	215	Lutjanidae	Perciormes
19	*Lutjanus dentatus*	221	Lutjanidae	Perciormes
20	*Lutjanus goreensis*	262	Lutjanidae	Perciormes
21	*Monodactylus sebae*	892	Monodactylidae	Perciormes
22	*Mugil cephalus*	514	Mugilidae	Perciormes
23	*Oreochromis mossambicus*	780	Cichlidae	Perciormes
24	*Pamodasys commersonni*	158	Haemulidae	Perciormes
25	*Pamodasys jubileni*	149	Haemulidae	Perciormes
26	*Pamodasys peroteti*	197	Haemulidae	Perciormes
27	*Polydactylus quadrifilus*	130	Polynemidae	Perciormes
28	*Pseudotolithus elongatus*	428	Sciaenidae	Perciormes
29	*Pseudotolithus senegalensis*	13	Sciaenidae	Perciormes
30	*Sardinella maderensis*	24428	Clupeidae	Perciormes
31	*Sarotherodon gallileus*	967	Cichlidae	Perciormes
32	*Sarotherodon melanotheron*	1915	Cichlidae	Perciormes
33	*Sphyraena baracuda*	300	Sphyraenidae	Perciormes
34	*Syacium guinensis*	177	Paralicthyidae	Perciormes
35	*Tillapia zill*	2489	Cichlidae	Perciormes
36	*Trachinotus teraia*	227	Carangidae	Perciormes
37	*Tylosurus senegalensis*	28	Belonidae	Perciormes
	Total	42,127		

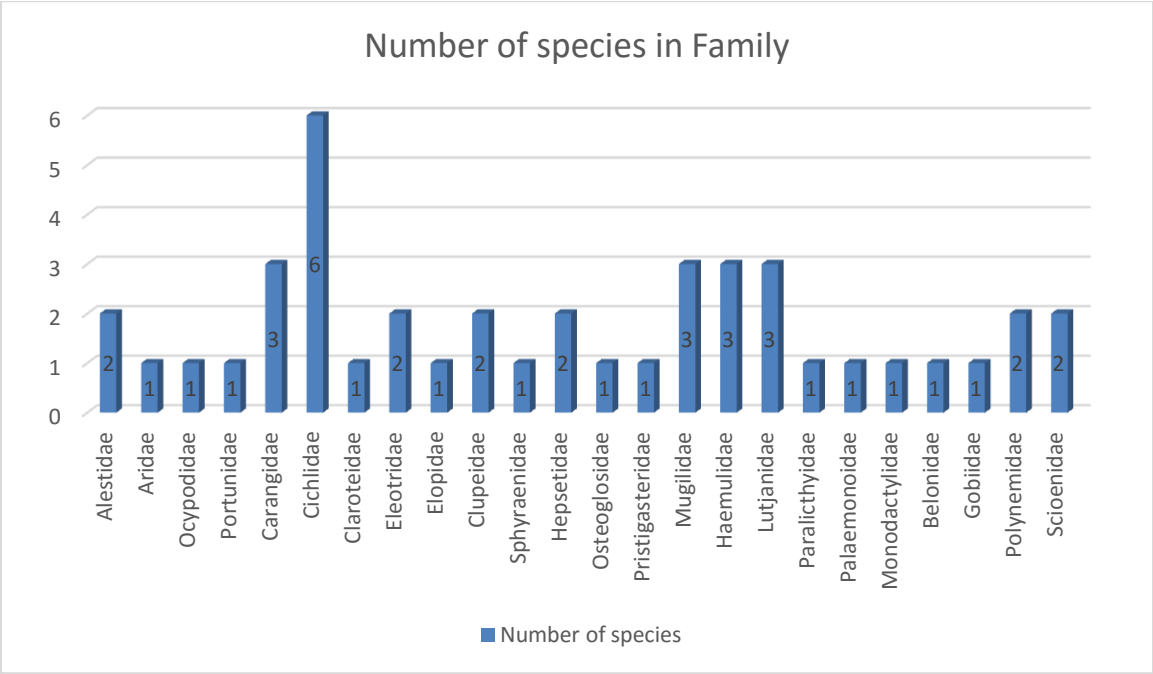

Fig. 2 Family Composition

The twenty fish families in the composition included the Aridae, Alestidae, Carangidae, Cichlidae, Claroteidae, Eleotridae, Elopidae, Clupeidae, sphyraenidae, hepsetidae, osteoglosidae, As shown in Fig. 2, out of the twenty (20) families caught from the Upper Reach of the Sombreiro river, the family Cichlidae had the most number of species, with five (5) different species. The families Carangidae and Mugilidae had three (3). Some other families had two (2) species for instance the Clupeidae and Eleotridae, whereas most of the families had a single (1) species for instance the Polynemidae and Clarotidae. The fish species in the composition (Table 3) revealed that the dominant species in the river was the Clupeid, *S. maderensis*, followed by the Cichlid, *T. zilli* and many other species that were abundant. However, there were four very low occurring species, with the lowest in the composition being the Eleotridae, *E. senegalensis.*
A look at the period (weeks) of the study revealed a notable variation in the fish composition (Table 4). The weekly composition (Table 4) revealed variation in the species composition following the seasons of the study from the dry season (weeks 1 – 14, Jan. to April) to the wet season (weeks 15 – 22, May to June). Some species were considerably low in the catch composition for some weeks when available (*A. gigas, B. macrolepidotus, C. chrysophyrs, etc*) while others have higher contributions to the composition when available (*S. maderensis, L. falcipinnis, L. grandisquamis,*). Some other species were rarely available in the catch all through the period (*H. odoe, E. senegalensis and T. senegalensis*).
Also some species were represented in the catch mainly in the rainy season (*H. fasciatus*) while others were more available in the dry season (*G. decadactylus, I. africana, L. dentatus*). Some though were available in fluctuating numbers all through the period without showing any trend (*O. mossambicus, T. zilli,* and other Cichlids)

Table 4: Weekly Fish Species Composition of the Upper Reach of the Sombriero River, Abua Odual LGA

S/N	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	TOTAL
1	*Arius gigas*	15	12	13	5	0	3	3	5	18	0	20	0	0	8	14	8	0	0	0	4	10	0	**138**
2	*Brycinus macrolepidotus*	31	0	0	0	35	48	1	20	28	28	0	23	33	41	22	0	24	17	10	10	12	13	**396**
3	*Carangoides chrysophrys*	16	0	0	0	0	0	0	4	0	10	10	0	0	25	0	0	12	0	0	5	2	0	**84**
4	*Caranx hippos*	0	0	0	0	30	15	0	13	8	20	60	40	0	85	20	0	0	15	0	0	0	0	**306**
5	*Chromidotillapia guentheri*	0	0	0	0	5	10	0	16	10	20	38	18	26	83	55	200	28	50	50	50	40	20	**719**
6	*Chrysichthys nigrodigitatus*	10	6	16	10	4	11	0	0	10	0	13	0	16	23	18	15	12	4	18	10	4	0	**200**
7	*Eleotris africana*	16	14	20	16	0	8	0	0	20	0	20	10	5	5	12	8	5	0	0	1	0	1	**161**
8	*Eleotris senegalensis*	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
9	*Elops lacerta*	4	11	19	16	10	5	0	0	0	10	0	0	16	0	0	13	30	20	30	32	32	20	**268**
10	*Ethmolisa fimbrietta*	45	85	68	35	10	10	0	0	0	0	43	50	0	15	30	8	0	0	15	10	18	0	**442**
11	*Goleoides decadactylus*	10	21	23	6	4	8	0	0	12	0	5	0	0	4	5	0	1	0	5	0	0	0	**104**
12	*Hemichromis fasciatus*	24	43	30	17	33	48	4	30	24	0	36	60	15	40	53	30	70	50	25	75	60	70	**837**
13	*Hepsetus odoe*	0	0	0	0	8	0	3	20	8	0	0	0	18	10	0	0	0	0	0	0	0	15	**82**
14	*Heterotis niloticus*	7	1	1	0	5	0	3	1	1	4	2	2	1	1	0	0	0	0	1	0	0	0	**30**
15	*Illisha africana*	145	220	170	101	20	0	0	0	0	20	70	0	51	40	25	40	0	0	0	50	0	0	**952**
16	*Liza falcipinis*	110	160	180	71	29	30	4	110	88	50	50	100	60	80	60	28	0	90	88	84	15	40	**1527**
17	*Liza grandisquemis*	130	110	130	51	12	0	8	105	93	40	80	80	60	50	40	90	0	109	55	40	20	85	**1388**
18	*Lutjanus Campechanus*	22	23	28	16	7	6	0	0	11	0	0	5	8	8	5	35	0	0	15	14	12	0	**215**
19	*Lutjanus dentatus*	34	28	37	20	5	6	0	0	15	0	0	0	10	10	13	0	8	0	20	10	5	0	**221**
20	*Lutjanus goreensis*	29	22	24	17	5	0	1	0	20	10	15	15	13	2	15	0	10	18	10	18	8	10	**262**
21	*Monodactylus sebae*	98	90	150	40	38	0	0	18	30	30	30	16	70	28	25	78	31	0	80	20	0	20	**892**
22	*Mugil cephalus*	0	0	0	0	20	0	10	80	50	50	0	0	80	30	20	59	20	0	55	40	0	0	**514**
23	*Oreochromis mossambicus*	60	45	23	15	11	8	0	15	45	35	36	38	15	60	64	30	40	70	50	20	65	35	**780**
24	*Pamodasys commersonni*	2	12	12	11	10	0	4	0	0	20	10	0	0	8	6	0	13	15	0	12	23	0	**158**
25	*Pamodasys*	0	0	0	0	8	0	1	0	0	10	20	0	15	0	0	10	0	0	15	60	10	0	**149**

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26	*Pamodasys peroteti*	58	0	0	0	0	0	2	8	0	13	26	20	0	10	0	0	20	8	0	12	20	0	**197**
27	*Polydactylus quadrifilus*	0	0	0	0	0	0	0	0	0	0	0	20	10	15	20	22	10	0	15	10	0	8	**130**
28	*Pseudotolithus elongatus*	61	45	65	35	13	20	0	10	0	15	48	0	20	0	15	20	0	18	0	33	10	0	**428**
29	*Pseudotolithus senegalensis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	5	0	0	0	0	0	**13**
30	*Sardinella maderensis*	400	550	450	550	1340	900	0	580	58	1300	500	1000	1800	2200	1200	2800	2400	1300	1700	1600	1100	700	**24428**
31	*Sarotherodon gallileus*	80	110	48	38	4	15	5	8	50	50	65	15	100	115	60	30	20	81	38	35	0	0	**967**
32	*Sarotherodon melanotheron*	75	110	90	65	48	58	8	70	180	121	186	80	130	50	129	90	50	135	30	70	20	120	**1915**
33	*Sphyraena baracuda*	38	36	47	41	8	0	4	14	0	0	0	0	0	28	0	20	0	10	8	10	20	16	**300**
34	*Syacium guinensis*	10	9	11	11	0	0	0	0	12	10	40	15	0	0	0	10	21	0	0	10	8	10	**177**
35	*Tillapia zill*	175	230	170	68	20	60	8	35	131	135	170	130	100	181	108	113	105	100	40	128	88	194	**2489**
36	*Trachinotus teraia*	42	45	47	3	0	0	3	0	10	8	10	8	20	8	5	5	0	0	0	5	2	6	**227**
37	*Tylosurus senegalensis*	12				0	0	0	8	0	0	0	0	0	0	0	5	2	0	1	0	0	0	**28**

Fish Species Abundance

The relative abundance (Fig. 3) showed that *S. maderensis* had the highest percentage (57.17%) abundance over all other species. All others were generally low in percent abundance. Among the other species however, *T. zilli* had the highest percent abundance with 5.83% , followed by; *L. grandisquamis and L. falcipinnis* with 3.25% and 3.57% respectively. The least abundant in descending order were, *H. niloticus,* and *T. senegalensis* (0.07% each), *P. senegalensis* (0.03%) and *E. senegalensis* (0.01%).

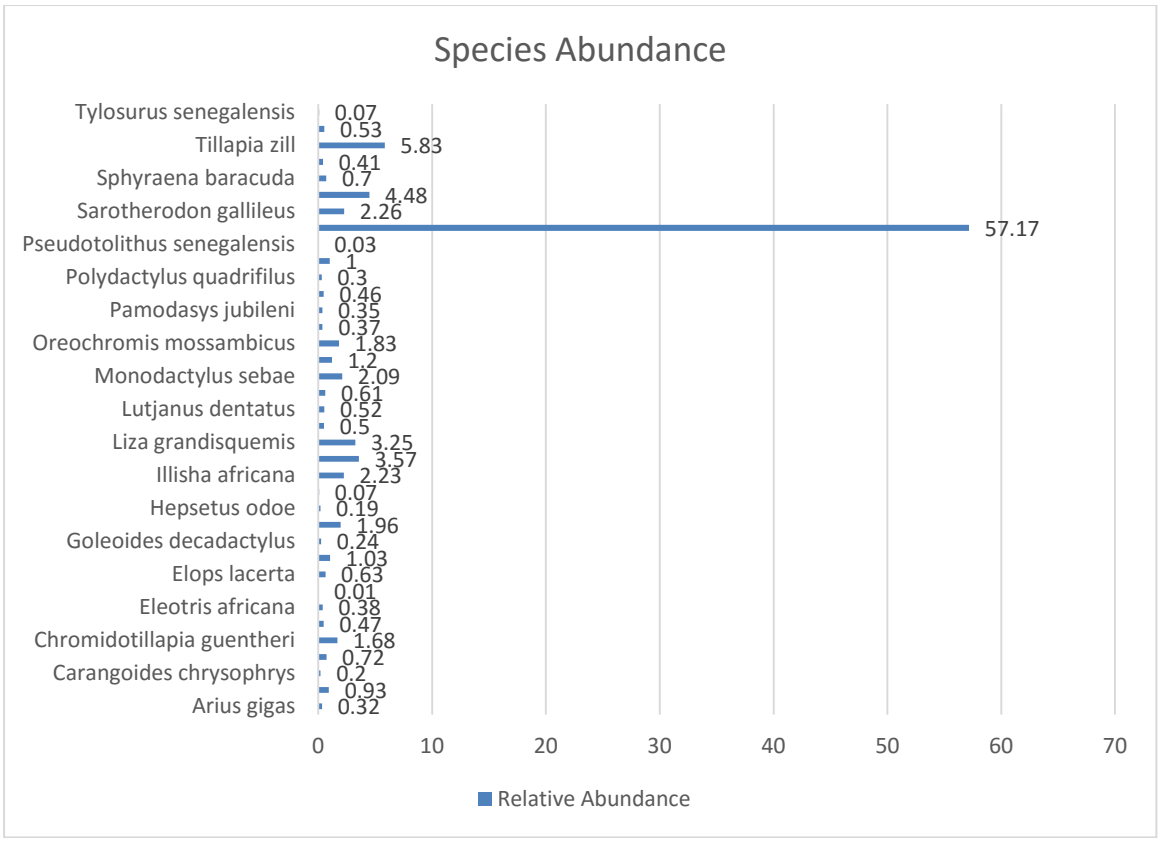

Fig. 3. Relative Abundance

However, species by species look at the weekly abundance (Table 5) revealed variation in the species abundance during the study period following the seasons of the study from the dry season (weeks 1 – 14- Jan. to April) to the wet season (weeks 15 – 22 May to June). It was observed that most of the true brackish water species were more available/abundant in the dry season period (*I. africana, Lutjanus species, Mugil species, M. sebae, G. decadactylus, Pomadasys species,* among others).

The main freshwater species were most abundant/available in the wet season (*B. macrolepidotus, C. guentheri, E. senegalensis, T. senegalensis*). However some species fluctuated in their availability/abundance (*A. gigas, C. hippos, C. nigrodigitatus, E. lacerta*, among others). Some species exhibited almost stable abundance all through the study period especially the Cichlids (*O. mossambicus*) though the two *Sarotherodon species* were more abundant in the dry season. Interestingly, *S. maderensis* a brackish species, were abundant all through the study period though more abundant from the beginning of the study to the 17th week(May). Some other species had extremely low abundance, for instance the *P. senegalensis* were unavailable in the catch untill the 15th and 17th week (May) at very low catches. Others were, *T. senegalensis, H. niloticus* and *E. senegalensis*. The *Eleotris senegalensis* was the least abundant, and was caught just once during the period of study.

Table 5: Weekly Relative Abundance of Fish Species

S/N	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	TOTAL
1	*Arius gigas*	0.85	0.59	0.69	0.40	0.00	0.24	4.17	0.43	1.93	0.00	1.25	0.00	0.00	0.25	0.68	0.21	0.00	0.00	0.00	0.16	0.62	0.00	0.33
2	*Brycinus macrolepidotus*	1.76	0.00	0.00	0.00	2.01	3.78	1.39	1.71	3.00	1.39	0.00	1.32	1.23	1.26	1.07	0.00	0.82	0.81	0.42	0.40	0.75	0.94	0.94
3	*Carangoides chrysophrys*	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.50	0.62	0.00	0.00	0.77	0.00	0.00	0.41	0.00	0.00	0.20	0.12	0.00	0.20
4	*Caranx hippos*	0.00	0.00	0.00	0.00	1.72	1.18	0.00	1.11	0.86	1.00	3.74	2.29	0.00	2.60	0.98	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.73
5	*Chromidotillapia guentheri*	0.00	0.00	0.00	0.00	0.29	0.79	0.00	1.36	1.07	1.00	2.37	1.03	0.97	2.54	2.69	5.31	0.95	2.37	2.11	2.02	2.49	1.45	1.71
6	*Chrysichthys nigrodigitatus*	0.57	0.29	0.85	0.79	0.23	0.87	0.00	0.00	1.07	0.00	0.81	0.00	0.59	0.70	0.88	0.40	0.41	0.19	0.76	0.40	0.25	0.00	0.47
7	*Eleotris africana*	0.91	0.69	1.07	1.27	0.00	0.63	0.00	0.00	2.15	0.00	1.25	0.57	0.19	0.15	0.59	0.21	0.17	0.00	0.00	0.04	0.00	0.07	0.38
8	*Eleotris senegalensis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
9	*Elops lacerta*	0.23	0.54	1.01	1.27	0.57	0.39	0.00	0.00	0.00	0.50	0.00	0.00	0.59	0.00	0.00	0.35	1.02	0.95	1.26	1.29	2.00	1.45	0.64
10	*Ethmolisa fimbrietta*	2.56	4.17	3.63	2.78	0.57	0.79	0.00	0.00	0.00	0.00	2.68	2.87	0.00	0.46	1.47	0.21	0.00	0.00	0.63	0.40	1.12	0.00	1.05
11	*Goleoides decadactylus*	0.57	1.03	1.23	0.48	0.23	0.63	0.00	0.00	1.29	0.00	0.31	0.00	0.00	0.12	0.24	0.00	0.03	0.00	0.21	0.00	0.00	0.00	0.25
12	*Hemichromis fasciatus*	1.36	2.11	1.60	1.35	1.89	3.78	5.56	2.56	2.58	0.00	2.25	3.44	0.56	1.23	2.59	0.80	2.38	2.37	1.05	3.03	3.74	5.06	1.99
13	*Hepsetus odoe*	0.00	0.00	0.00	0.00	0.46	0.00	4.17	1.71	0.86	0.00	0.00	0.00	0.67	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.08	0.19
14	*Heterotis niloticus*	0.40	0.05	0.05	0.00	0.29	0.00	4.17	0.09	0.11	0.20	0.12	0.11	0.04	0.03	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.07
15	*Illisha africana*	8.24	10.79	9.08	8.03	1.15	0.00	0.00	0.00	0.00	1.00	4.37	0.00	1.89	1.23	1.22	1.06	0.00	0.00	0.00	2.02	0.00	0.00	2.26
16	*Liza falcipinis*	6.25	7.85	9.62	5.64	1.66	2.36	5.56	9.38	9.44	2.49	3.12	5.73	2.23	2.45	2.93	0.74	0.00	4.27	3.71	3.39	0.94	2.89	3.62
17	*Liza grandisquemis*	7.39	5.40	6.94	4.05	0.69	0.00	11.11	8.95	9.98	1.99	4.99	4.58	2.23	1.53	1.95	2.39	0.00	5.17	2.32	1.61	1.25	6.15	3.29
18	*Lutjanus Campechanus*	1.25	1.13	1.50	1.27	0.40	0.47	0.00	0.00	1.18	0.00	0.00	0.29	0.30	0.25	0.24	0.93	0.00	0.00	0.63	0.56	0.75	0.00	0.51
19	*Lutjanus dentatus*	1.93	1.37	1.98	1.59	0.29	0.47	0.00	0.00	1.61	0.00	0.00	0.00	0.37	0.31	0.64	0.00	0.27	0.00	0.84	0.40	0.31	0.00	0.52
20	*Lutjanus goreensis*	1.65	1.08	1.28	1.35	0.29	0.00	1.39	0.00	2.15	0.50	0.94	0.86	0.48	0.06	0.73	0.00	0.34	0.85	0.42	0.73	0.50	0.72	0.62
21	*Monodactylus sebae*	5.57	4.42	8.01	3.18	2.18	0.00	0.00	1.53	3.22	1.49	1.87	0.92	2.60	0.86	1.22	2.07	1.06	0.00	3.37	0.81	0.00	1.45	2.12
22	*Mugil cephalus*	0.00	0.00	0.00	0.00	1.15	0.00	13.89	6.82	5.36	2.49	0.00	0.00	2.97	0.92	0.98	1.57	0.68	0.00	2.32	1.61	0.00	0.00	1.22
23	*Oreochromis mossambicus*	3.41	2.21	1.23	1.19	0.63	0.63	0.00	1.28	4.83	1.74	2.25	2.18	0.56	1.84	3.13	0.80	1.36	3.32	2.11	0.81	4.05	2.53	1.85
24	*Pamodasys commersonni*	0.11	0.59	0.64	0.87	0.57	0.00	5.56	0.00	0.00	1.00	0.62	0.00	0.00	0.25	0.29	0.00	0.44	0.71	0.00	0.48	1.43	0.00	0.38
25	*Pamodasys jubileni*	0.00	0.00	0.00	0.00	0.46	0.00	1.39	0.00	0.00	0.50	1.25	0.00	0.56	0.00	0.00	0.27	0.00	0.00	0.63	2.42	0.62	0.00	0.35
26	*Pamodasys*	3.30	0.00	0.00	0.00	0.00	0.00	2.78	0.68	0.00	0.65	1.62	1.15	0.00	0.31	0.00	0.00	0.68	0.38	0.00	0.48	1.25	0.00	0.47

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27	*Polydactylus quadrifilus*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	0.37	0.46	0.98	0.58	0.34	0.00	0.63	0.40	0.00	0.58	0.31
28	*Pseudotolithus elongatus*	3.47	2.21	3.47	2.78	0.75	1.58	0.00	0.85	0.00	0.75	2.99	0.00	0.74	0.00	0.73	0.53	0.00	0.85	0.00	1.33	0.62	0.00	1.02
29	*Pseudotolithus senegalensis*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.03
30	*Sardinella maderensis*	22.74	26.99	24.04	43.72	76.92	70.92	0.00	49.45	6.22	64.71	31.19	57.31	66.86	67.40	58.62	74.33	81.72	61.61	71.61	64.57	68.58	50.61	57.99
31	*Sarotherodon gallileus*	4.55	5.40	2.56	3.02	0.23	1.18	6.94	0.68	5.36	2.49	4.05	0.86	3.71	3.52	2.93	0.80	0.68	3.84	1.60	1.41	0.00	0.00	2.30
32	*Sarotherodon melanotheron*	4.26	5.40	4.81	5.17	2.76	4.57	11.11	5.97	19.31	6.02	11.60	4.58	4.83	1.53	6.30	2.39	1.70	6.40	1.26	2.82	1.25	8.68	4.55
33	*Sphyraena baracuda*	2.16	1.77	2.51	3.26	0.46	0.00	5.56	1.19	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.53	0.00	0.47	0.34	0.40	1.25	1.16	0.71
34	*Syacium guinensis*	0.57	0.44	0.59	0.87	0.00	0.00	0.00	0.00	1.29	0.50	2.50	0.86	0.00	0.00	0.00	0.27	0.72	0.00	0.00	0.40	0.50	0.72	0.42
35	*Tillapia zill*	9.95	11.29	9.08	5.41	1.15	4.73	11.11	2.98	14.06	6.72	10.61	7.45	3.71	5.55	5.28	3.00	3.58	4.74	1.68	5.17	5.49	14.03	5.91
36	*Trachinotus teraia*	2.39	2.21	2.51	0.24	0.00	0.00	4.17	0.00	1.07	0.40	0.62	0.46	0.74	0.25	0.24	0.13	0.00	0.00	0.00	0.20	0.12	0.43	0.54
37	*Tylosurus senegalensis*	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.07	0.00	0.04	0.00	0.00	0.00	0.07

However, a summary of the Total fish species Weekly Relatively Abundance (Fig. 3) showed a distinct trend of species variation from week1 in January to Week 22 in June. Week 16 with 8.92% had the highest relative abundance and the least relative abundance was recorded in week 7 with (0.17%). There was also an exhibition of two peaks at week 2 and 16. A drop was witnessed between week 4 and week 9 with the least relative abundance recorded in week 7. From Week 19 a gradual drop in abundance started again towards the end, week 22.

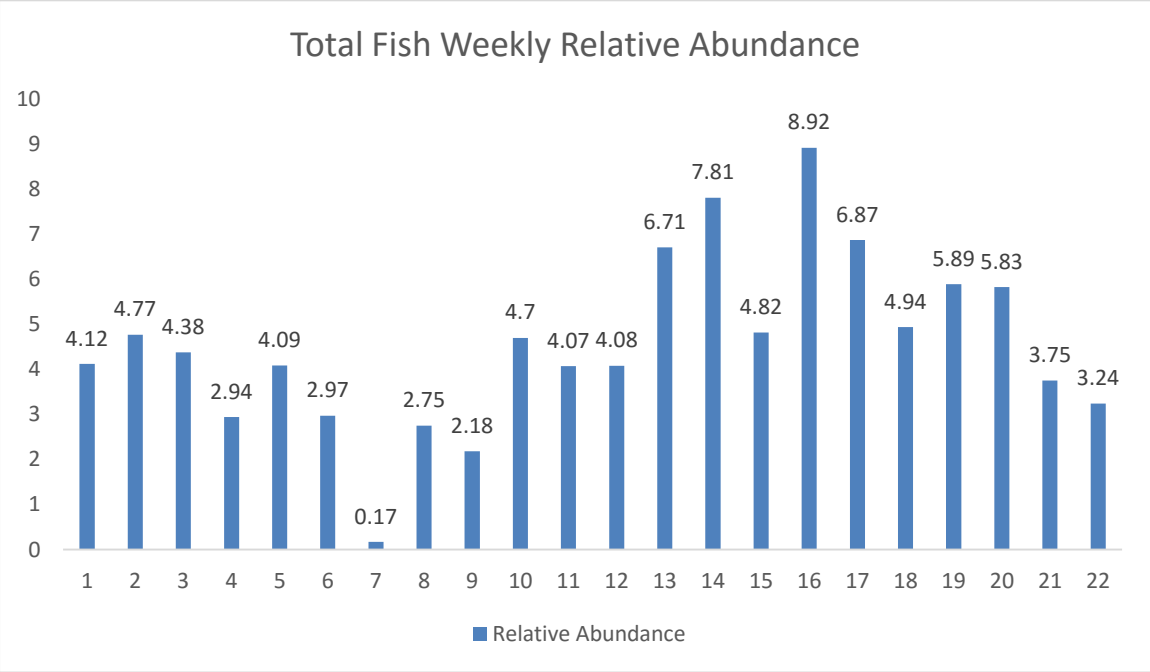

Fig. 4: Total fish Species Weekly Relatively Abundance.

The Total value of fish abundance score (Table 6) revealed that out of the thirty-seven (37) species recorded in the Upper Sombreiro, fourteen (14) were Dominant –D (*S. maderensis*), nine (9) were Abundant-A (*Elops lacerta*), eight (8) were Common -C(*G. decadactylus*), two (2) were Few- F(*H. odoe*) and four (4) were Rare -R (*E. senegalensis).*

The species Weekly values of Abundance Score (Table 6) however showed variation in the fish species status within the period of the study. It was observed that through the period of the study, only the *S. maderensis* were dominant (D), *T. zilli* were mainly common (C), five (5) other species were common to rare, among which are *Illisha africana, L. falcipinnis and L. grandisquamis*. Finally, most of the species (Twenty two-22) were rare (R) to unavailable all through the study, among which are *A. gigas, B. macrolepidotus*. One of such *Eleotris senegalensis,* was in fact reported only once in the entire period and was the most rare (R) among all the species.

Table 6: Weekly Abundance Score of Fish Species

S/N	Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	TOTAL
1	*Arius gigas*	R	R	R	R	0	R	R	R	R	0	R	0	0	R	R	R	0	0	0	R	R	0	**C**
2	*Brycinus macrolepidotus*	R	0	0	0	R	R	R	R	R	R	0	R	R	R	R	0	R	R	R	R	R	R	**A**
3	*Carangoides chrysophrys*	R	0	0	0	0	0	0	R	0	R	R	0	0	R	0	0	R	0	0	R	R	0	**F**
4	*Caranx hippos*	0	0	0	0	R	R	0	R	R	R	F	R	0	F	R	0	0	R	0	0	0	0	**A**
5	*Chromidotillapia guentheri*	0	0	0	0	R	R	0	R	R	R	R	R	R	F	F	C	R	R	R	R	R	R	**D**
6	*Chrysichthys nigrodigitatus*	R	R	R	R	R	R	0	0	R	0	R	0	R	R	R	R	R	R	R	R	R	0	**C**
7	*Eleotris Africana*	R	R	R	R	0	R	0	0	R	0	R	R	R	R	R	R	R	0	0	R	0	R	**C**
8	*Eleotris senegalensis*	0	0	0	0	0	0	0	R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**R**
9	*Elops lacerta*	R	R	R	R	R	R	0	0	0	R	0	0	R	0	0	R	R	R	R	R	R	R	**A**
10	*Ethmolisa fimbrietta*	R	F	F	R	R	R	0	0	0	0	R	R	0	R	R	8	0	0	R	R	R	0	**D**
11	*Goleoides decadactylus*	R	R	R	R	R	R	0	0	R	0	R	0	0	R	R	0	R	0	R	0	0	0	**C**
12	*Hemichromis fasciatus*	R	R	R	R	R	R	R	R	R	0	R	F	R	R	F	R	F	R	R	F	F	F	**D**
13	*Hepsetus odoe*	0	0	0	0	R	0	R	R	R	0	0	0	R	R	0	0	0	0	0	0	0	R	**F**
14	*Heterotis niloticus*	R	R	R	0	R	0	R	R	R	R	R	R	R	R	0	0	0	0	1	0	0	0	**R**
15	*Illisha Africana*	C	A	C	C	R	0	0	0	0	R	F	0	F	R	R	R	0	0	0	R	0	0	**D**
16	*Liza falcipinis*	C	C	C	F	R	R	R	C	F	R	R	F	F	F	F	R	0	F	F	F	R	R	**D**
17	*Liza grandisquemis*	C	C	C	F	R	0	R	C	F	R	F	F	F	R	R	F	0	C	F	R	R	F	**D**
18	*Lutjanus Campechanus*	R	R	R	R	R	R	0	0	R	0	0	R	R	R	R	R	0	0	R	R	R	0	**A**
19	*Lutjanus dentatus*	R	R	R	R	R	R	0	0	R	0	0	0	R	R	R	0	R	0	R	R	R	0	**A**
20	*Lutjanus goreensis*	R	R	R	R	R	0	R	0	R	R	R	R	R	R	R	0	R	R	R	R	R	R	**A**
21	*Monodactylus sebae*	F	F	C	R	R	0	0	R	R	R	R	R	F	R	R	F	R	0	F	R	0	R	**D**
22	*Mugil cephalus*	0	0	0	0	R	0	R	F	R	R	0	0	F	R	R	F	R	0	F	R	0	0	**D**
23	*Oreochromis mossambicus*	F	R	R	R	R	R	0	R	R	R	R	R	R	F	F	R	R	F	R	R	F	R	**D**
24	*Pamodasys commersonni*	R	R	R	R	R	0	R	0	0	R	R	0	0	R	R	0	R	R	0	R	R	0	**C**
25	*Pamodasys jubileni*	0	0	0	0	R	0	R	0	0	R	R	0	R	0	0	R	0	0	R	F	R	0	**C**
26	*Pamodasys peroteti*	F	0	0	0	0	0	R	R	0	R	R	R	0	R	0	0	R	R	0	R	R	0	**C**
27	*Polydactylus quadrifilus*	0	0	0	0	0	0	0	0	0	0	0	R	R	R	R	R	R	0	R	R	0	R	**C**
28	*Pseudotolithus elongates*	F	R	F	R	R	R	0	R	0	R	R	0	R	0	R	R	0	R	0	R	R	0	**D**
29	*Pseudotolithus senegalensis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R	0	R	0	0	0	0	0	**R**
30	*Sardinella maderensis*	A	D	D	D	D	D	0	D	F	D	D	D	D	D	D	D	D	D	D	D	D	D	**D**
31	*Sarotherodon gallileus*	F	C	R	R	R	R	R	R	R	R	F	R	F	C	F	R	R	F	R	R	0	0	**D**
32	*Sarotherodon melanotheron*	F	C	F	F	R	F	R	F	C	C	C	F	C	R	C	F	R	C	R	F	R	C	**D**
33	*Sphyraena barracuda*	R	R	R	R	R	0	R	R	0	0	0	0	0	R	0	R	0	R	R	R	R	R	**A**
34	*Syacium guinensis*	R	R	R	R	0	0	0	0	R	R	R	R	0	0	0	R	R	0	0	R	R	R	**C**
35	*Tillapia zill*	C	A	C	F	R	F	R	R	C	C	C	C	F	C	C	C	C	F	R	C	F	C	**D**
36	*Trachinotus teraia*	R	R	R	R	0	0	R	0	R	R	R	R	R	R	R	R	0	0	0	R	R	R	**A**
37	*Tylosurus senegalensis*	R	0	0	0	0	0	0	R	0	0	0	0	0	0	0	R	R	0	R	0	0	0	**R**

Data Analysis

The analysis of variance (ANOVA) at a probability, ($P<0.05$) comparing species abundance between weeks (Table 7) records that there was a significant different between weeks. The species abundance was not significantly different between weeks 1, 3, 5, 11, and 12. Week 2 does not differ significantly from weeks 10, 15 and 18. Also week 4 is not significantly different from weeks 6, 8 and 22. Week 7, is not significantly different from week 9. Lastly, week 13 does not differ significantly from week 17. The weeks whose value differ significantly ($P>0.05$) with others are weeks 16 and 21. These are highly significant from the other weeks. The highest species abundance occur in weeks 16 and 14 with the following abundance value (0.8924099516 ± 0.1^{aa}) and (0.7807709411 ± 0.1^{ac}) respectively, while the least species abundance occurred in weeks 7 and 9 with the following mean values, 0.0168511714 ± 0.1^{d} and 0.2181290519 ± 0.1^{d} respectively.

Table 7: The analysis of variance (ANOVA) at a probability, ($P<0.05$) comparing species abundance between weeks.

Weeks	Relative Abundance
1	**0.4116834788**±0.1[a]
2	**0.476981768**±0.1[e]
3	**0.4381304562**±0.1[a]
4	**0.2944274112**±0.1[c]
5	**0.4086409062**±0.1[a]
6	**0.2970018958**±0.1[c]
7	**0.0168511714**±0.1[d]
8	**0.2745336672**±0.1[c]
9	**0.2181290519**±0.1[d]
10	**0.4701944906**±0.1[e]
11	**0.4067685538**±0.1[a]
12	**0.4084068622**±0.1[a]
13	**0.6705361949**±0.1[ab]
14	**0.7807709411**±0.1[ac]
15	**0.482130737**±0.1[e]
16	**0.8924099516**±0.1[aa]
17	**0.6873873663**±0.1[ab]
18	**0.4938329394**±0.1[e]
19	**0.5890888665**±0.1[f]
20	**0.5830037213**±0.1[f]
21	**0.3754066515**±0.1[g]
22	**0.3236829171**±0.1[c]

DISCUSSION

The physico-chemical parameters recorded for the Upper Sombreiro River was consistent with the physical and chemical values for good water quality suitable for aquatic organisms in the Niger Delta (NEDECO, 1961). These values were also consistent with the fresh to mildly brackish water physico-chemistry reported in the mildly brackish to fresh water regime of the Upper Reaches of the New Calabar River (Ibim and Gogo,2013). Although the values varied through the period of the study, they were still within the acceptable range. The lower values were registered in the rainy season while the higher levels were in the dry season. This was also consistent with reports by Onwuteaka(2015) in the Upper Sombreiro also, Ibim and Owhonda(2017) in the Omuhechi stream of the New Calabar River, and Soyinka *et al.* (2009)in the Lagos Lagoon. Offem *et al*.(2011), reported that the wet and dry seasons give rise to changes in river physico-chemistry especially salinity and that, during the wet season (May-October) salinity falls to almost zero throughout the delta. Soyinka *et al* (2009) reported similar slight seasonal variation in salinity; reduced salinity during the rainy

season but increased salinity in the dry season. Ibim and Bongilli (In press) also recorded variation in salinity during the wet season in the Middle Reach of the Sombreiro River.

The present study, in which a total finfish composition of thirty seven (37) species in twenty (20) families was identified reveals a good composition of fish species for the Upper Reach of the Sombreiro River. There is paucity of information on the fin fish of this Upper Reach of the River. However the only known work on this Section by Onwuteaka (2015) contrarily reported forty nine (49) species in twenty nine (29) families. This difference in species composition could be related to his work period (March to December) as opposed to this study (January to June). This composition was however consistent with that of Ibim and Bongilli (In press) in the Middle Reach of the Sombreiro, the adjoining section of this River. Ibim and Bongilli (In Press) also recorded thirty one (31) species in twenty (20) families, though there were slight variations in species. Onwuteaka (2015) reported that fish species diversity is influenced by fine-scale environmental factors such as interconnectivity of rivers and streams. Thus, in similarity with this study in having high fish composition, some adjoining rivers like the Odhiokwu-Ekpeye local fishponds and floodplains around the Orashi River, recorded twenty five (25) species in twenty six (26) families (Ezekiel *et al.;* 2002). In the Upper freshwater section of the New Calabar River, with similar in physico-chemical characteristics recorded forty one (41) species in twenty five (25) families (Ibim and Gogo, 2013); the Omuihuechi stream, a small freshwater stream adjoining the New Calabar River recorded twenty (20) genera in ten (10) families (Ibim and Owhonda, 2017). Interestingly, in the Badagry lagoon also Soyinka *et al* (2009) reported s thirty seven (37) species in twenty one (21) families. Fagade and Olaniyan (1974), reported that species richness is higher in warm waters.

The River recorded a good composition of fish families, having 20 families. Onwuteaka (2015) recorded 29 families in the Upper Sombreiro which was similar to that recorded in this study. He reported that the River was rich in composition. This rich composition is also similar to the composition of the Middle reach of the Sombreiro where 20 families were recorded in the River. Among these families, though the Clupeids were found to be dominant the Cichlids were reported to have more species. These findings are common in the Niger Delta and consistent with the finding of Chindah (1994), Chindah and Osuamkpe (1997), Allison *et al* (1997), Ogamba (1998), Sikoki *et al* (1999), Davis (2009), Ibim *et al*., 2016; Ibim and Owhonda, 2017, amongst others. The variation in the weekly fish composition reported in this study revealed seasonal variation in fish species composition. This trend of seasonal variation is consistent with reports by several researchers. Ibim and Bongilli (in press) reported similar variation in species composition over time in the Middle Reach of the Sombreiro. This seasonality was also consistent with the findings of Chindah and Osuamkpe (1997), Allison *et al* (1997), Ogamba (1998), Sikoki *et al* (1999), Davis (2009), Ibim *et al*., 2016; Ibim and Owhonda, 2017, amongst others. They reported seasonal distribution of fish species in their various areas of research. Chindah and Osuamkpe (1997), and Davis (2009), reported that the presence/absence of food organisms (planktons) played a major role in the seasonal variation. Others reported rainfall (Fagade and Olaniyan,1974; Soyinka *et al* , 2009), and floods(Onwuteaka, 2015) as the main causes for the variation. Furthermore, Awitti (2011) reported that, the differences in physico-chemical parameters within the water body in the study area could be related to the rainfall pattern of the area, and these in turn would could have influenced the variation in diversity and composition.

In the Ologe lagoon in south west Nigeria, Soyinka and Kassem (2008) reported slight variation in species composition as a result of rainfall affecting salinity. Also Soyinka *et al* (2009) also recorded seasonal variation of fish species composition in the Lagos lagoon. This was attributed to the seasonal fluctuation in salinity. They reported reduced salinity during the rainy season but increased salinity in the dry season. Offem *et al*(2011) in their studies in

the seasonal differentiation in the species richness and diversity indices, revealed higher values of both for the dry season than the wet season.

The relative abundance in this River generally reveals a good number of species located here. The relative abundance pattern shown in this river is synonymous with most aquatic habitats in the Niger Delta Area especially in the brackish water sections where the Clupeid, *S. maderensis* is the most dominant followed by the the Mugilids and the Cichlids. This trend was consistent with the findings of Ibim and Bongilli (In press), in the Middle Reach of the Sombreiro; Chindah and Osuamkpe (1997), in the lower Bonny River; Davis (2009), in the Okpoka Creek; and Ibim *et al.*(2016), in the Upper and Lower New Calabar River. These three species are known to be plankton and epiphyton feeders. Their abundance could therefore be as a result of the high plankton abundance in the Niger Delta Rivers (Chindah and Osuamkpe, 1997; Davis, 2009). Additionally, the higher abundance of the *S.maderensis* in comparism with other species in this river could be related to the fact that there exist a lot of large species that attract good market prices in the market than the Sardines. Consequently, fishing pressure can be the reason for the low abundance of most of the river fishes. The lower percent abundance of the other species could however be related to several issues.

The variation in weekly abundance revealed seasonal species abundance. This is consistent with the findings of Fagade and Olaniyan (1974), Otobo (1995), Chindah and Osuamkpe (1997), Allison *et al* (1998), Sikoki *et al* (1999), Nweke (2000), Soyinka and Kassem(2008), Davies (2009), Onwuteaka (2015), Ibim and Owhonda 2017 and Ibim and Bongilli (In press). Onwuteaka (2015) reported that the Seasonal changes in the Upper Reach of the Sombreiro River depends on local rainfall. He further reported that during the wet season when the Niger River runs high, a larger part of the land between the Sombreiro River and the Orashi River becomes flooded thereby changing the characteristics of the River as it discharges its waters into it, giving it a mixed river classification. Ibim and Bongilli (In press) also recorded variation in salinity during the wet season in the Middle Reach of the Sombreiro River.

Unlike these works, the species seasonal variation had two peaks in the dry season. The first peak in the 2nd week was in the mid-dry season (Jan.) when more brackish water species were abundant. The second peak was in the 16th week (May) when the dry-season was coming to an end. The high abundance was as a result and there was a high presence of *S. maderensis*. The high abundance of the dominant (D) species the Mugilidae and the Clupidae, having higher numbers in the dry season (first six weeks) than the wet season were consistent with the findings of Fagade and Olaniyan (1974) and Osuamkpe (1994)Soyinka and Kassem(2008), and Davis (2009). Soyinka and Kassem (2008), reported that higher abundance in the dry season may have been as a result of a more stable environmental condition at the dry season).

The highly abundant species (*I. africana, Lutjanus species, Mugil species, M. sebae, G. decadactylus, Pomadasys species,* among others) during the early Dry season were the true brackish water species that required high salinities. The higher abundance in the dry season could also be associated with higher concentration of food organisms as there was no flood. Fagade and Olaniyan (1974) and Soyinka and Kassem (2008) reported that seasonal variation in fishes is attributed to the occurrence of high plankton population density in rivers during the dry season than the rainy season. Chindah and Osuamkpe (1997) and Davis (2009) reported the abundance of the *Sardinella* species in the Niger Delta Area as a result of high abundance of planktonic organism for food. In the Sombreiro, Ezekiel *et al* (2011) reported significant seasonal variation between the mean values of macrobenthic fauna of the wet and dry season. The dry season had higher values than the wet season. This will further sustain the fishes in the dry season.

The period of least abundance in the dry season, between week 4 and 9, with the least abundance in week 7 could be associated with the period of the arrival of the early rains. Though there is paucity of information to support the low abundance recorded here could be as a result of the dilution effect of the rains, leading to the migration of brackish water species. Soyinka *et al* (2009), reported that an increase in salinity was noticed again from around March to May, which coincides partly with both the dry and the wet season. Fishing pressure at this time could also not be ruled out as fishing is preferred in the dry season when there will be a concentration and ease to catch the large fish species (Personal Communication).

The gradual drop in abundance towards the end (22nd week) as the rains commenced fully (June- weeks 19- 22) was attributed to the reduction in salinity leading to the gradual migration of the brackish species. This was in agreement with the findings of Fagade and Olaniyan (1974), Osuamkpe (1994), Soyinka and Kassem(2008), Soyinka *et al* (2009), Davis (2009), Onwuteaka (2015), Ibim and Owhonda (2017) and, Ibim and Bongilli (In press). They reported reduced salinity during the rainy season but increased salinity in the dry season. In this study the main freshwater species (*B. macrolepidotus, C. guentheri, T. senegalensis*) were at this time most abundant/available as the salinities were much reduced as a result of the dilution effect of rains. Also Awitti (2011), reported that, rainfall affects water volume and depth which in turn affects the distribution of fish fauna and fish migration pattern. Furthermore, it was reported that, high water levels increase the size of the aquatic environment and enhances migratory and breeding movements of some fish species. Davis (2009) also reported that, in cases where fishes migrate, they tend to migrate seasonally, possibly to take advantage of their prey

It was recorded that some species that exhibited almost stable abundance all through the study period especially the Cichlids (*O. mossambicus*), though the two *Sarotherodon species* were more abundant in the dry season. This was consistent with the findings of Ibim and Owhonda (2017) in the Omuihechi Stream, a New Calabar River tributary and Ibim and Bongilli(In press) in the Middle Reach of the Sombreiro. Awiti (2011), reported that the Cichlids (Tilapias) family exhibit dominance that could be due to their ability to tolerate wide range of salinities and environments and ability to utilize a wide range of foods in the lower trophic level as herbivores, as well as their high fecundity and prolific nature. Also, the consistent dominance of the *S. maderensis*, a brackish species all through the study period could be attributed to the fact that there was high nutrient (Chindah and Osuamkpe, 1997 and Davies, 2009) in the Sombreiro. Ezekiel et al (2011). Abowei *et al.* (2008). Abowei (2000) reported the presence of a high number of phyto- and zooplanktons in the Lower Sombreiro River all through the seasons. Also, the presence of a large number of large commercially appreciated fish species could be an advantage to them, as fishing pressure becomes reduced. The other species that had extremely low abundance (*P. senegalensis, T. senegalensis, H. niloticus* and *E. senegalensis)* during the period of study could have been most likely affected by high fishing pressure as most of them are high value fish species. However there is no evidence to prove this statement.

Though the general abundance score recorded high dominance of species in the Upper Reach of the Sombreiro River, with only the lowest abundant four species as rare, the weekly abundance score revealed that only *S. maderensis* was dominant all through the study. All the other species with the exception of the Cichlids, Mugilids, *Illisha africana* and the *Monodactylus sebae* were rare throughout the study, alongside the four (4) fishes that were critically rare – *E. senegalensis, P. senegalensis, T. senegalensis and H. niloticus*.

The successful dominance of the Clupeidae may be associated with the fact that they are well adapted to the low salinities and have become permanent freshwater representatives of marine species (UNDP, Niger delta Biodiversity project, 2016). Secondly all of these

species are phytoplankton feeders and can survive well as the River provides enough food for them(Allison *et al*, 1997; Ogamba *et al.*, 1998; Sikoki *et al.*,1999 and Nweke, 2000). The fishes with lower abundance are mainly the carnivorous species. Abowei (2000), Abowei *et al.*,(2008) and Ezikiel *et al.,* (2011), reported that such fishes for instance *Sphyraena species, C. nigrodigitatus* were low in the rainy season as the zooplankton and small fishes reduced Also, fishing pressure may be a major issue affecting these fish species as they are well appreciated, attract good prices and are sought for in the market. Inter/intra specific competition is another factor that cannot be ruled out. In a situation as in the upper Sombreiro where a wide range of species are reported, competition for habitat and food species is pertinent. According to Maitland and Morgan (1997), that many fish species are declining in abundance as a result of overfishing, dam construction and loss of catchment, habitat degradation and destruction by human activities. These have often been the underlying factors responsible for the decline and extinction of some fish species rather than direct over exploitation.

CONCLUSION

The Status of the Upper Reaches of the Sombreiro River revealed that, the river supports a good composition of fish species and families from both the Fresh and Brackish aquatic environments, with the *S, maderensis, Mugil species* and *Cichlid species* as the dominant species. However weekly Composition showed a seasonal variation in the composition with higher composition in the wet season. The Abundance of fish fauna in the Upper reach of the Sombreiro River also showed a good abundance of species with the *S, maderensis, Mugil species* and *Cichlid species* as the dominant species. Also, the weekly abundance of fish species showed a variation in the abundance that revealed a significant seasonal variation in abundance. The abundance score showed that only the *S. maderensis* was dominant all through the period of the study, some others were abundant to few (Cichlids, Mugilids, *Illisha africana* and the *Monodactylus sebae*) while a majority of the fish species were rare. However, there were the four species (*E. senegalensis, P. senegalensis, T. senegalensis and H. niloticus*) that were extremely low in abundance. The seasonal patterns observed according to literature is related to fish adaptation to their natural environment. However, over fishing and some detrimental human activities are likely to be responsible for the rarity level seen in the river fishes. This study therefore serves as baseline for a greater Research Survey and Bio-Monitoring for further assessment of the Fish and Fisheries, including the Ecosystem by relevant bodies in the management and conservation fisheries space for greater knowledge on the Status of the species in the Upper Reaches of the Sombreiro River in Rivers state.

RECOMMENDATIONS

It is recommend that longer and elaborate research work should be carried out on the fish stock assessment of Upper Reaches of the Sombreiro River, in order to adequately understand the fin fish population status and their threats in order to properly manage the fishes and the fisheries sustainably. Also appropriate ecosystem management strategies and policies need to be considered to prevent all sorts of ecosystem degradation activities ongoing, to help sustain the fishes in the environment.

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