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Fish fauna of Akwa Ibom State inland waters

Abstract

Akwa Ibom State is one of the six states in the South-South geo-political zone of Nigeria; the region that lays the "golden egg" (The oil and gas). Unfortunately since this region started laying the so-called egg, neither the ground upon which the egg is laid nor other endowments of the region has rested. Oil spills, gas flaring and its accompanying climate change have impacted negatively on the environment and the other resources (fish inclusive) of the region. This paper therefore intends to review the ichthyofauna of the inland waters of Akwa Ibom State, with a view to assessing the status of the fisheries. Existing literatures on the ichthyofauna of some of these waters have been reviewed, while we also took a step further to survey two important landing sites (Oku Iboku landing and Ifiaoyong landing sites) in the State. In the two sites visited, *Chrysichthys* sp was the dominant species. On a general note, Akwa Ibom Inland fishery is very economically viable; providing good quality protein for the populace through fish supplies as well as providing source of livelihood to several others through the value chain of the fisheries. Beyond inspecting the fish faunal composition of the landing sites, we also interacted with the fishers' folk to understand the sources of conflicts. Violation of contractual agreement and non-adherence to time slot allotted to fishers; depending on fishing gear in use (low tide and high tide each has a different fishing gear) were pointed out as the sources of conflict. Looking at the fisheries on the periphery, they seem in-exhaustible, but deep down, the fisheries are gradually becoming overfished, proper management strategies should therefore be taken to avoid the "tragedy of the commons".

Keywords: Icthyofauna, fisheries, management, environmental

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Introduction

The inland freshwater in Nigeria constitutes about 12.4% of the total surface area.[1] According to Idoho Umeh[2] and Olaosibikan et al.,[1] Inland waters contain the richest collection of fish in West Africa. Nigeria Inland water bodies are primarily utilized for fishing by fishers of which the greatest part of it is artisanal in nature.[3] According to Aquaculture and Inland Fisheries Project Newsletter (2004), Nigeria inland fisheries produce about 200,000 tons from the 14 million hectares of inland waters, with the 14 million hectares of inland waters, Nigeria could be self-sufficient in fish production and in fact be a major exporter of fish if these inland fisheries are properly managed.[3]

Fish and its products constitute the cheapest sources of animal protein4 but according to Ndok[5] they constitute only 40% of the diet of an average Nigerian. Anko et al.,[6] noted that the Nigerian coastal zone has a great potential for fisheries and development, being endowed with a maritime area of 46, 300 km^2, an exclusive economic zone (EEZ) area of 210, 900 km^2 and inland waters of 12.5m ha. However, in spite of this huge endowment, the current yield mark of 400,000 metric tons is at a 50% deficit to meet the nation's fish need per annum of at least 1.5 million metric tons.[4] According to Akpan[7] the bulk of the production comes from the local fishers, whose production level is still at a deficit. Beyond, the inadequate fishing techniques adopted by the local fishers, inadequate management of the fishery resources and environmental degradation of the water bodies has put the fish resources on the decline.[8]

Improved management of these fisheries therefore becomes imperative. This starts with expanding the knowledge of the water bodies, information on the current status of the fisheries and the socio-economic characteristics in the fishing communities, so that people can effectively be integrated into co-management programme.[3]

Species composition is an indicator of the habitat of a particular fish species in a certain aquatic environment.4 It consists of the vertical composition or the horizontal composition.[9]

According to Usanga[10] to maintain a sustainable exploitation of these resources a comprehensive knowledge of the fish composition of the waters is of necessity. Akwa Ibom State, Nigeria is blessed with network of streams, rivers and seasonal flooded plains and tidal creeks, which play a major role in her development.[11] These inland waters provide easy means of transportation, occupational activities, and means of water disposal and source of food. Inland waters are important harbors for fishes of high economic values and some intrusive marine species that use them as spawning and nursery grounds.[11] These inland fisheries if sustainably managed will continue to provide good quality protein food for the teaming population of our people while at the same time still serving as a source of livelihood to several others. A lot has been done on rivers, estuaries, and streams in Akwa Ibom State.[10,11,12–18] This work therefore reviewed these literatures with a view to critically assessing the status of the inland waters in the state. Besides the literatures, we also went on a survey to two important landing sites in the state. These were Oku Iboku landing site, one of the reaches of the Cross River and Ifiaoyong (the landing site from Ikpa River). *Chrysichthys nigrodigitatus* were the dominant species landed in the two landing sites. Apart from itchthyofaunal survey, we also asked some questions bordering on their knowledge of spawning grounds, sources of conflict and general knowledge of fisheries management. These have been discussed in the later part of the review.

Some of the inland waters considered in this review were Qua Iboe River, Iba Oku Stream, NtakInyang, UtaEwa Creek and Obio Akpa Stream etc. The summary of the dominant species in the various inland waters reviewed are present on the Table 1 below:

These inland waters have been reviewed bellow:

Table 1 Some Inland Waters in Akwa Ibom State with their Dominant fish species

Inland water	Dominant species	Reference
Qua Iboe River	*Barbuscallipterus* (Cyprinidae) *Liza grandisquamis* (Mugilidae)	Ekpoet al.(2014)
Iba Oku Stream	*Malapteruruselectricus* (Malapteruridae) Cichlidae	Udo (2012) Udoidiong and King (2000)
NtakInyang Stream	*Brycinuslongipinnis* (Cheracidae)	Usanga (2015)
UtaEwa Creak	*Iliza Africana* (Clupeidae)	Akpan (2013)

Qua Iboe river

Qua Iboe River lies within the tropical region in the South Eastern Nigeria. It is located at latitude 40391 and 27061 N and longitude 70521 420181 E. It is a dominant hydrographic feature in Akwa Ibom State, Nigeria.[19] It drains its catchment area of about 7.092 km^2, and the river course covers a distance of C. 151 km from its source at Umunike in Imo State to where it discharges into the Atlantic Ocean at the Bight of Bonny close to Ibeno in Akwa Ibom State.[20,21] There are two predominant seasons (wet and dry seasons) in the zone. The dry season spans between November and April while the wet season spans between May and October. Rainfall is significantly lower at the head water but increases downstream.[20] According to Akpan[22] Rainfall is the most important hydro-meteorological variable that affects its physical hydrology. According to Ekpo et al.,[20] Fish fauna in Qua Iboe River are exposited under subsistence and artisanal fisheries, but however recorded 356 fishes comprising 20 species belonging to 12 families in Qua Iboe River (Table 2). The most abundant fish species was *Barbus Callipterus* (35.11%) followed by *Bienomyrus brachyistus* (12.64%) *Malapterurus electricus*(8.4%) while *Xenomystus nigri* and *Anqspidoglanis fasciatus* had 0.28% each.

The report of Ekpo et al.,[21] in Qua Iboe River estuary also recorded 187 fishes comprising 17 species belonging to 10 families; of these 187 fishes, Mugilidae recorded the highest percentage abundance (58.30%), followed by Trachinidae (12.58%), Sciaenidae (0.96) while Sphyraenidae and Serranidae recorded the lowest percentage abundance with 0.53% each. However, the species *Liza grandisquamis* recorded the highest abundance with 27.80% of the total specimens.

Finally, Ekpo et al.,[20] recorded 543 specimens of fish belonging to 21 families, 29 genera and 27 species in Qua Iboe River. The most abundant species was *Barbuscallipterus* (23.02%) followed by *Liza grandisquamis* (9.57) and *Barbusbrachyistus* (8.28%). The list abundant species were *Xenomystus nigri*, *Tilipia guineensis*, *Sarotherodon barracuda*, *Pomadasysperoteti, Epinephelus aeneus* and *Anaspidoglanis fasciatus* with 0.18% relative abundance each.[20]

Iba Oku stream

Iba Oku stream is a tributary of Ikpa River in Itu Local Government Area, Akwa Ibom State. It runs from Mfangfang pond, through ObotUyo into MfroIba.[11] It is a perennial tributary stream west of the lower reaches of the Cross River, Nigeria.[11] The bottom of the stream is predominantly sandy and muddy, which the edges are without mud. The topography of the catchments is sloppy, this makes the water current moderately fast and their riparian vegetation include Raphiahookeri and Raphiavinifera.[11]

According to Udo[11] report on the lcthyofaunal survey of Iba Oku Stream, a total of 312 fish samples (fin fish, crabs and shrimps) were collected. There were 9 orders, 13 families, 16 genera and 19 species. *M. electricus* which constituted 15.4% of the total catch was the most abundant species. This was followed by *Potamonates pacilli* (14.4%) and *Isichthys henryi* (11.9%) while *Heterobranchus* sp (0.3%) was the least abundant (Table 3).

Table 2 Families, species and Total number of specimens caught in Qua Iboe River, Nigeria

Family	Fish species	Number
Polypteridae	*Erpetoichthys calabaricus*	24
Notophteridae	*Xenomystusnigri*	1
Mormyridae	*Bienomyrus brachyistus*	45
	Isichthys henragii	3
Characidae	*Brycinus longipinnis*	20
Cyprnidae	*Barbuscallipterus*	125
Bagridae	*Anqspidoglanis fasciatus*	1
	A. akiri	7
	Chrysichthys aluuencis	7
Malapterinidae	*Malapterurus electricus*	30
Cyprinodontidae	*Epiplatysbi fasciatus*	9
	E. sexfasciatus	21
Cichlidae	*Thysochromisansorgi*	6
	Hemichromis fasciatus	12
	Chromidontilipia guntheri	18
	Tilapia mariae	12
	Pelvicachromis pulcher	4
Channidae	*Parachanna Africana*	6
Anabantidae	*Ctenepomane bulosum*	3
Nandidae	*Polycentopis abbreviata*	2
		356

Source: Ekpo, Udo and Odem (2014)

According to Udo (2012), based on index preponderance, the species may be graded as follows: *E. electricus* (1) *Erpetoicthys calabaricus* (2), *P. paccilli* (3), *Channaobscura* (4), *I. Henryi*(5), *Brycinus nurse* (6), *Epiplatys sexfaciatus* (7) and *Barbus callipterus* (8), while others had insignificant contribution. Condition factor also revealed that the fishes in Iba Oku stream were in good condition.[11]

The author however noted seasonal variation in the species and number of specimens sampled. For example, *M. electricus*, *I. henryi* and *B. brachyistius* showed greater abundance in dry season while *E. sexfasciatus* and *E. calabaricus* showed greater abundance in the wet season.

Udoidiong et al.,[18] also reported 18 fish species belonging to 17 genera representing 13 families in Iba Oku stream. This however differed from the report of Udo[11] in that Udo[11] recorded malapteruridae as the most abundant species while Udoidiong et al.,[18] recorded Cichldidae as the most dominant species.

Table 3 Taxonomy, size competition, relative abundance, index of preponderance and condition factor of fish in Ibaku stream, Ikpa River, Nigeria

Family/species	Standard length (cm)			Total weight (g)				
	N	%N	Min-max	Means	Min-max	Means	IP	I
Malapteruridae								
Malopterurus electricus	48	15.4	9.7.16.0	13.7	15.8.115.9	67.3	67.23(1)	2
Channidae								
Channaobsura	22	7.1	3.8.21.8	12.3	1.1.136	28.5	6.02 (4)	1
Channa Africana	5	1.6	7.7.13.5	11	4.7.36.8	18.2	0.20ns	1
Mormyridae								
Isichtyshenryi	37	11.9	4.7.17.2	8.5	0.4.14	6.3	3.75(5)	1
Brienomynus brochyistius	10	3.2	6.1.13.5	8.8	2.1.20.1	6.3	0.28 ns	0
Bagrudae								
Parauchenogionis ansorgei	10	3.2	1.6.11	7.8	3.8.27	7.5	0.33 ns	6
Cyprinodontidae								
Epiplatys sexfasciatus	22	7.1	2.1.6.4	4.6	0.6.7.1	3	0.61(7)	3
Characidae								
Brycinus longipinnis	8	2.6	6.8.8.1	7.5	9.3.13.5	11.7	0.32 ns	1
Brycinus nurse	7	2.2	16.19.2	17.4	82.8.224.5	124.9	2.60 (6)	3
Cichilidae								
Chromido tilapiagutheri	19	6.1	4.8.14.4	9.4	3.5.67.4	80.2	0.23 ns	3
Tilapia mariac	8	1	6.0.8.2	6.9	8.6.23.4	14.2	0.06 ns	4
Henucgrinus fasciatus	2	0.6	6.7.1	6.6	3.4.2	3.6	0.01 ns	1
Polypteridae								
Erpetoichthys calabaricus	22	7.1	21.1.35	27.8	19.5.80.2	41.7	8.80 (2)	0
Notopteridae								
Papyrocranus afer	2	0.6	10.5.14.4	12.6	10.8.20.2	14.1	0.02 ns	0
Clariidae								
Heterobranchus longifilis	1	0.3	19		91.9	91.9	0.04 ns	1
Penaeidae								
macrobrachium dux	14	4.5	3.7.8.6	5.4	1.3.13.5	3.5	0.31 n	1
Macrobrachium vollenhovenii	10	3.5	3.5.5.8	4.8	1.5.3.3.1.9	0.16ns	2.09	
Potamidae								
Potamonautes paecilli	45	14.4	1.5.4.1	3.1	0.7.23.5	9.7	8.51 (3)	1
Cyprinidae								
Barbus collipterus	25	4.6	2.3.5.8	4.9	0.4.9.5	3.4	0.52 (8)	1
Grand total	712				100			

Source: Udo (2012)

Ntak Inyang stream

NtakInyang Stream is one of the tributaries of Ikpa River. It is popularly known as EsukItam or Iyere in Itu Local Government Area of Akwa Ibom States, Nigeria.[10] Ikpa River is a small perennial tributaries Stream, located west of the lower Cross River in South-Eastern Nigeria.[23] It lies between latitude 50 21 and 570841 N and longitude 80 31 and 50 (ng. Geo view info. It has a main channel length of 53.3KM and an area of 576KM2, with a mean depth of 2.0m and a mean width of 12.5m.[23] The river has a considerably rich flora on its banks. These include *Elaeis guineensis*, *Raphiahookeri*, *Raphia vinnifera*, aquatic macrophytes such as Nymphaea, Vossia and *Crinium* sp.[24,25]

Usanga10 recorded a total of 456 fin fish specimens from Ntak Inyang stream belonging to 19 species, 12 families and 5 orders.

The most abundant fish species was *Brycinus longipinnis* (27.82%) followed by *Tilpiazilli* (21.05%), *Tilipiamariae* species were *Phagoloricatus Papyrocranus afer* and *Schilbe intermedius* each having relative abundance of 0.22% (Table 4).

Table 4 Species composition, monthly distribution and relative abundance of fishes of Ikpa River at NtakInyang

Order	Species	May	Jun	Jul	Aug	Sept	Oct	Total N	Ra (%)
Characiformes	*Characidae*								
	Brycinuslongipinnis	*43*	24	32	20	8	9	136	29.82
	B. nurse	*9*	6	5	5	4	5	34	7.46
	B. quinquestuamde	*3*	2	0	1	1	1	8	1.75
	Micralestes elongatus	*0*	2	3	1	2	2	10	2.19
	Citharinidae								
	Citharinuscitharus	0	0	2	0	3	4	9	1.97
	Distichodontidae								
	Phagoloricatus	1	0	0	0	0	0	1	0.22
	Phagoborusornatus	1	1	0	0	0	0	2	0.44
	Hepsetidae								
	Hepsetusodoe	1	2	1	0	2	3	9	1.97
Cypriniformes	*Cyprinidae*								
	Barbuscallipterus	0	1	2	0	1	0	4	
Osteoglossiformes	*Notopteriadae*								
	Papyrocramus afer	0	0	1	0	0	0	1	0.22
Perciformes	*Cichlidae*								
	C. guntheri	7	3	2	5	11	7	35	7.68
	H. fasciatus	4	6	3	4	8	5	30	6.58
	T. mariae	9	6	14	10	13	11	63	13.82
	T. zlli	10	15	25	20	15	96	96	21.05
	Eleotridae								
	Eleotris senegalensis	1	2	0	1	4	2	10	2.19
Siluriformes	Ariidae								
	Arius latiscultatus	0	0	0	0	2	1	3	0.66
	Bagridae								
	Chrysichthsaluuensis	1	1	0	0	0	2		0.44
	Mochokidae								
	Synodontisguttatus	1	0	0	1	0	0	2	0.44
	Schilbeidae								
	Schilbe intermedius	0	0	1	0	0	0	1	0.22
	Monthly composition by number	91	71	91	68	74	61	456	
	Number of species per month	13	13	12	10	13	12		

Source: Usanga (2015)

According to Usanga10 the Perciformes (51.31%) constituted the commonest order, whereas the Osteoglossiformes (0.22%) constituted the rarest order. The commonest families were Cichlidae (49.12%) and Characidae (41.23%). The author however noted a high species richness and diversity in the species of NtakInyang, based on Margalef's index (2.94) and Shanon Weiner's diversity index (2.112).

UtaEwa Creek

UtaEwa Creek is located around IkotAbasi Local Government Area, Akwa Ibom State, Nigeria. It lies between Latitude 40301 and 40451 N and longitude 7031 and 70451 E.26 The elevation of the area is generally less than 30 m above sea level.[14] The basic geological formation is made up of loose materials formed on the alluvial coastal plain.[27]

Ichthyofaural survey by Akpan[14] recorded a total of 668 specimens from 14 families consisting 28 species in the Uta Ewa Creek. According to Akpan[14] the commercial species of importance of Uta-ewa Creek include *Chrysichthys auratus*, *C. nigrodigitatus*, *Ilisaafricana*, *Ethamalosa finbriata*, *Pseudotolithus elongatus*, *P. typhi* and *Liza grandisquamus*. The fishery of the creek can therefore be said to be based on *I. africana* with relative abundance of 16.48%, *L. grandisquanis* (12.72%) and *Lutjamis gorensis* (6.14%). The author however attributed the high species richness to increased habitat availability and probably the presence of variety of dietary items and the presence of intrusive species from the Atlantic Ocean. (Table 5)[28]

Finally, Udoindiong[17] in his work restoration of stream ecosystem integrity in Akwa Ibom State worked on six first order streams. The streams were Nung Oku Stream, Mission stream, Udom stream, Akap streams, Afaha Obong stream and Abak stream. Of these six streams, fish collection was made in three of them.[17] Seventeen species from 10 families were collected from Udom stream, 19 species from 12 families were recorded from Nung Oku stream, while million stream, recorded 22 species belonging to 12 families. According to Udoidiong[17] 14, 15, 15 species were rare in Udom, Nung Oku and missions streams respectively. The author also noted the abundance of Shrimps *Desmocaristripiriosa* and *Macobrachium dux* which were exploited for subsistence in addition to freshwater crab, *sudanonautessp* that was recorded in Mission stream. Mission stream showed the highest species diversity and evenness but with the least dominance (11.72%) while Udom stream showed the highest dominance (35.58%) but with the least diversity index.[17] This report also showed that fish assemblages of Udom and Nung Oku Streams were highly similar with similarity index of 72.22%; 13 species occurring in both streams, while Nung Oku and Mission Stream showed the least similarity (43.9%) with 9 species occurring in both streams. Udom and Mission streams had a similarity index of 46.15% with 9 species in common.[17] The author however lamented on the removal of riparian vegetations from the streams resulting in increased temperature regimes in the streams which consequently leads to severe reductions in the number and types of fish and other aquatic animals.[29,30]

Table 5 Mean Length, mean weight and relative abundance of fish composition in UtaEwa, Nigeria

Family/Species	Total Catch	XTL(CM)	XBW	RA(%)	IP(%)
Carangidae					
Caranx hippos	29	85	24.4	4.34	0.07
Trachinotus goreenisis	26	9.91	16.6	3.89	0.04
Trachinotus teraia	38	8.04	6.65	5.69	0.02
Eleotridae					
Eleotris senegalensis	25	16.43	39.6	3.74	0.09
Electrisvittata	1	8.48	4.15	0.15	0.0003
Gobiidae					
Bathygobius soporato	11	26.1	32.3	1.65	3.00E-05
Lutjanidae					
Lutjanus gorensis	41	9.35	18.4	6.14	0.07
Haemulidae					
Posmadasysju belini	13	12	33.2	1.95	0.04
Cynoglossidae					
Cynoglossus senegalensis	15	27.65	108	2.25	0.15
Bothidae					
Citharichthysstampfii	15	12.9	8.05	2.25	0.01
Sciaenidae					
pseudotolithus	17	12.8	34.7	2.55	0.06
Senegalensis	35	21.89	91.6	5.24	0.31
Pseudotolithustypus	24	23.3	105	3.59	0.24
Arridae					
Arius gigas	18	21.87	67.7	2.7	0.12

Table Continued

Family/Species	Total Catch	XTL(CM)	XBW	RA(%)	IP(%)
Arius heudolitu	4	18.68	55	0.6	0.02
Bagridae					
Chrysichthysauratus	35	23.1	252	5.24	0.84
Chrysichthysnigrodigitatus	37	52.5	350	5.54	1.25
Bagrusdocmack	29	15.15	65.3	4.34	0.18
Trichiuridae					
Trichiuruslepturus	20	14.95	60.8	2.99	0.12
Malapteruidae					
Malapteruselectricus		13.7	53.5	2.99	0.1
Clupeidae					
Llishaafricana	70	25.85	30.1	16.48	0.2
Odoxothrissamento	3	1.8	14	0.45	0.0003
Ethmalosafimbriata	31	10.73	4.19	4.64	0.04
Pellonulaleonensis	4	5.25	1.9	0.6	0.0007
Mugilidae					
Liza grandisquamis	85	25.95	52.1	12.72	0.42
Mugilcephalus	22	17.91	66.3	3.29	0.13

Source: Akpan (2013)

Physical survey of two landing sites

Beyond the papers reviewed so far, we also took a walk to two important landing sites in Akwa Ibom State. These were Oku Iboku and Ifiaoyong landing sites.

Fish fauna

The ichthyofaunal survey at a glance revealed that *Chrysichthys* sp were the most dominant species landed at both sites.

Status of the fisheries

At the moment, the fisheries are still economically viable. Providing several good fish products to meet our nutritional needs, as well as provide a source of livelihood to several others through thevalue chain of the fisheries activities. However, a shocking revelation was made at Oku Iboku landing site; where fishers actually design drums to be catching *Chryisichlthys* sp in their spawning hide outs, what a reckless exploitation. If nothing is done and fast at that, then this economic viability of the fisheries will be a history. Also, during the survey a mere physical inspection was enough to tell a story about the state of pollution on Ifiaoyong. The mangrove trees have been so exploited that people no longer care about the fishery; the water has been so polluted with wood products among others.

Sources of conflict

During the survey, we also interacted with the fishers to find out the likely source of conflict in fisheries.

Two sources of conflict were identified

i. Violation of contractual agreement: here some supper-rich fish buyers do procure fishing gears as well as the boat to some fishers on the condition that the proceeds of the fishing would only be sold to them. Unfortunately, not all these fishers would keep to the agreement, as some secretly sell their proceeds to other fish buyers, this information however has a way of getting to these supper- rich buyers and conflict erupts.

ii. Non-adherence to time slot: For example in Oku, Iboku landing sites, two kinds of fishing gears were identified

a) Mfioro (2.5 yards with cork and lead suitable for low tide when the tide is ebbing and

b) Ewondo (8 yards and above during high tide when the tide is flooding).

According to the Chairman of the fishers' folk, 6 hours each is allotted for fishers using each of the gears. Conflicts therefore arise where fishers that are already offshore refuse to leave the shore during high tide to pave way for fishers using high tide gears. All effort to bring a lasting solution to this conflict according to the Chairman has failed, He therefore suggested for legal barking from the government.

Conclusion

Akwa Ibom Inland fisheries at a glance and from the literatures reviewed viable but deep down, the fisheries are gradually becoming overfished. Adequate management is therefore cooperative for the sustenance of the economic viability. Otherwise people that depend on these fisheries for good quality source of protein as well as source of livelihood will be ripe of these benefits in the nearest future.

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