

Assessments of fish catch composition of marine artisanal fishery in the Gulf of Guinea, Southwest Nigeria

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Abstract

Fish is a major source of protein in human diets. Fish demand has been on the increase due to increase in human population which has resulted to wide gap between fish demand and supply. This study was carried out to elucidate the major fish species that are economically important in the study area. Assessment of fish catch composition was done in the marine artisanal fish sector of Southwest Nigeria Gulf of Guinea. The study area was divided into three strata with one sampling station selected from each stratum. Four canoes were sampled per site per month. Fish catches were sorted into taxonomic categories, counted, measured and weighed. Sixty-nine fish species from forty-two families were identified constituting fifty-nine finfish and ten shellfish species. Clupeid family had the highest contribution both by weight (40.5%) and abundance (53.7%). Sardinella maderensis was the most abundant species by number (30.6%) and weight (27.9%). Parapenaeopsis atlanticus (51%) was the most abundant shellfish while P. validus (87%) was the highest by weight. Fish production was highest in Station 1 both by weight (37%) and abundance (41%). The status of finfish species showed that five species were very common; four were common, fourteen uncommon and thirty-six rare. Among the shellfish species, three species were very common, none was common, three were uncommon and three species rare. Effective management of these fish resources is necessary to ensure fish food security.

Key words: Artisanal fishery, Gulf of Guinea, species, abundance, Southwest, Nigeria.

Introduction

Fish is the principal source of animal protein for over one billion people (Williams, 1996); and provides many important nutritional and health benefits (FRDC, 2001). It is also a rich source of essential fatty acids, vitamins and minerals. The fats and fatty acids in fish, particularly the long chain n-3 fatty acids (n-3 and 6 PUFA), are highly beneficial and difficult to obtain from other food sources. Apart from being used as human food, fish is also increasingly demanded for use as animal feed. Nearly one-third of the world's wild-caught fish are reduced to fishmeal and fish oil, which are then used in feeds for livestock and in feeds for aquaculture industry (Delgado *et al*., 2003). Fish is the most internationally traded commodity (Gupta, 2006). Fish and fisheries support livelihoods by providing employment and incomes to million of people, both directly to those harvesting the fish, and indirectly

to those who supply materials, process and market the catch. About 40 per cent of global fish production was traded across the countries in 1998 as compared to 10 per cent of meat production (Gupta, 2006)

Nigeria coastline is about 850km (Dublin-Green & Tobor, 1992). In 1978, Nigeria established an Exclusive Economic Zone (EEZ) of 200 nautical miles from the coastline seaward which covers an area of 210,900 km^2 (Dublin-Green & Tobor, 1992). This encompasses the territorial waters which harbors the continental shelf of an area, 46,300 km^2. Areas within five nautical miles from the shore are non-trawling zone, which are exclusively meant for marine coastal artisanal fishing.

Artisanal fisheries is a traditional fisheries that is very prominent in the maritime states of Nigeria. Artisanal fisheries is the single most important component of domestic fish production, which contributes about 80% of the total fish output in Nigeria (Anene, *et al,* 2010, Faturoti, 2010, FDF, 1998). Besides, it provides livelihoods to one million fishermen and up to 5.8 million fisher folks in the secondary sector (Akinwumi *et. al,* 2011). It therefore remains an essential mechanism of fish production in Nigeria. Despite improved efforts to increase fish production, there is shortfall in production to meet the demand. The objective of this study is to investigate the marine coastal fish resources and assess the contribution of marine artisanal fishermen to fish production in part of Gulf of Guinea in Ogun State with the aim of managing them for sustainable production and resource utilization.

Materials and methods

The study was carried out in the marine coastal wetlands of Ogun State, Nigeria (Figure 1). The study area is situated in the rainforest belt of Nigeria with an annual rainfall of 125-150cm (Oluwalana, 1997). It is characterized by two distinct seasons; the rainy season last for eights months (March - October) while dry season last for four months (November to February). The relative humidity is high all the year round, usually above 80% during the wet season and ranges between 60% and 80% during the dry season (Oluwalana, 1997). The most humid months coincide with the rainy season spanning between April and October. The high humidity and the long wet season ensure adequate supply of water and continuous presence of moisture in the air. The vegetation of the area is mangrove forest characterized by coastal swamps especially in the rainy season. Stratified sampling technique was adopted in the selection of sampling sites. The study area of 15km stretch was divided into three strata along the coastline for easy assessment, each stratum stretching 5km. One sampling station was randomly selected from each stratum. Global positioning system (GARMIN GPS 12XL) was used to geo-reference the sampling stations within the study area. The selected landing stations were Station 1 (06.36911ºN, 004.35458ºE); Station 2 (06.35824ºN, 004.40029ºE) and Station 3 (06.34804ºN, 004.42901ºE).

Fish catch assessment

Fish catch from marine artisanal fishermen (1,728 canoes) was sampled between August, 2006 and July, 2008. The catches were removed from the gillnets and hooks (number 7), identified (FAO, 1990) and sorted into species. Fish species was weighed in batches by using hanging salter balance and counted. Fish species that were few in number were counted individually while those in large quantity were batched weighed according to FAO (1999). *Portunus validus* was the only specimen sexed into male and female

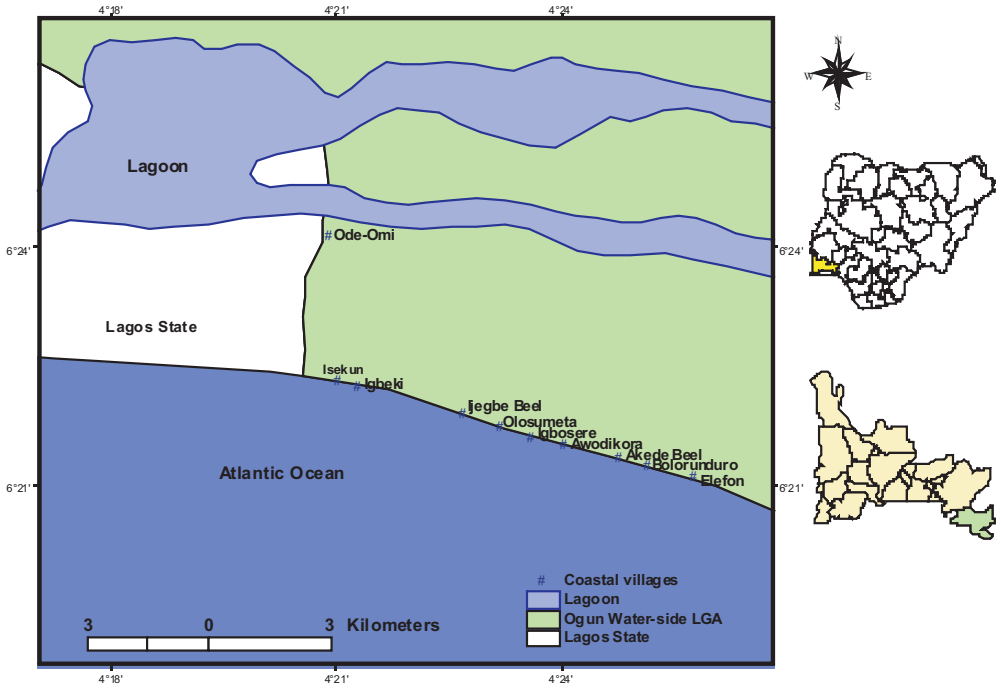

Figure 1: Map of the study area showing fish sampling stations

Table 1: Fish catch composition by abundance and weight (kg) of marine artisanal fishery in the Gulf of Guinea, Southwest Nigeria.

					Percentage Relative	
	Fish Families	Fish species	Abundance	Weight (kg)	Abundance	Weight
1	Albulidae	*Albula vulpes*	54	11.88	0.01	0.05
2	Ariidae	*Arius latiscutatus*	1363	842.56	0.35	3.32
3	Batrachoididae	*Halobatrachus didactylus*	2	2.66	0.00	0.01
4	Belonidae	*Strongylura senegalensis*	80	22.07	0.02	0.09
5	Carangidae	*Caranx senegallus*	1860	61.87	0.47	0.24
6		*Caranx hippos*	893	135.67	0.23	0.53
7		*Caranx crysos*	87	6.64	0.02	0.03
8		*Caranx latus*	36	3.58	0.01	0.01
9		*Chloroscombrus chrysurus*	32059	1632.82	8.14	6.43
10		*Hemicaranx bicolor*	2541	329.85	0.65	1.30
11		*Lichia amia*	4887	341.58	1.24	1.35
12		*Selene dorsalis*	16	1.89	0.00	0.01
13		*Trachinotus maxillosus*	6	0.34	0.00	0.001

because of its ease of sexing on the field. Percentage relative abundance was used to group the fish species into five status as abundant (above 5% relative abundance), common (between 1% – 4.9%), fairly common (between 0.1% – 1%), uncommon (between 0.01% – 0.1%), and rare (below 0.01%).

Results

Sixty-nine (69) fish species belonging to 42 families were assessed and duly reported. These constituted of 59 finfishes belonging to 35 families and 10 shellfishes belonging to 7 families (Table 1). Figure 2 shows the result of fish production by stations. Station 1 contributed the highest value in terms of abundance (37%) followed by Site 3 (35%) and then Station 2 (28%) to the total fish production. The highest total weight of fish catch was recorded in Station 1 (41%) followed by Stations 2 and 3 with 31% and 28% respectively. The families, Carangidae and Sciaenidae, were most represented with 9 and 6 fish species respectively. *Sardinella maderensis* (28.8%) has the highest contribution to the total fish catch by weight followed by *Pseudotolithus typus* (11.8%), *Pentanemus quinquarius* (10.7%), *Ilisha africana* (8.6%), *Chloroscombrus Chrysurus* (6.4%), *Cynoglossus browni* (4.9%), *Ethmalosa fimbrata* (4.5%), *Pteroscion peli* (3.5%), *Arius lasticulatus* (3.3%), *Trichiurus lepturus* (2.5%) and others contributed less than 2% each. Finfish species that made negligible contribution to total weight included *Aletura scripta, Ephippion guttifer, Tarpon atlanticus, Trachinotus maxillosus, Diodon hystrix* and *Synaptura cadenati*. They contributed less than 0.01% each. In abundance, *S. maderensis* (32%) has the highest contribution followed by *I. africana* (18.8%) and *P. quinquarius* (16.8%). However, *Tarpon atlanticus, Coryphaena equiselis, Alutera scripta, Halobatrachus didactylus*, *Synaptura cadenati, Diodon hystrix* and *Istiophorus albicans* contributed less than 0.002% each.

Clupeid family (*S. maderensis, I. africana and E. fimbrata*) dominated the total fish production by abundance with 56.1%, Carangids (10.8%), Polynemids (17.4%), and Sciaenids (9.7%). Others include Trichiuridae (2.6%), Haemulidae (1.1%) and others as 2.3%. While Figure 3 shows the percentage contribution of finfish families by weight to the total finfish production; Clupeids (41.8%) still dominated the catch followed by Sciaenids (18.0%), Polynemids (12.6%), Carangids (9.9%). Others include Cynoglossids (4.8%), Ariidae (3.3%), Trichiuridae (2.5%), Haemulidae (1.9%), Sphyraenidae (1.1%) and others (4.1%). Figure 2 shows the commonness and rarity of sampled finfish species. Five (5) finfish species were observed to be very common, four species were common, fourteen species were uncommon and thirty-six species were rare.

The result of shellfish production by weight and abundance is shown in Table1. *Portunus validus*, marine swimming crab, had the highest contribution (87.1%) followed by *Parapenaeopsis atlanticus* (10%) and *Penaeus notialis* (1.9%). Others contributed less than 1% each to the total weight of shellfishes. By abundance, the major shellfish caught were *P. atlanticus* (51.4%), *P. validus* (37.7%), *P. notialis* (9.6%). Other shellfishes contributed less than 1% each. Male *P. validus* were found to be less abundant than female in the samples; with a sex ratio of 1:3 respectively. The family Portunidae contributed about 88% of the total weight of the shellfishes. This was followed by Penaeidae (12%) and

Table 1: Fish catch composition by abundance and weight (kg) of marine artisanal fishery in the Gulf of Guinea, Southwest Nigeria.

					Percentage Relative	
	Fish Families	Fish species	Abundance	Weight (kg)	Abundance	Weight
14	Clupeidae	*Ethmalosa fimbrata*	20881	1138.2	5.30	4.48
15		*Ilisha Africana*	74047	2169.82	18.80	8.55
16		*Sardinella maderensis*	126160	7299.37	32.03	28.76
17	Coryphaenidae	*Coryphaena equiselis*	4	16	0.00	0.06
18	Cynoglossidae	*Cynoglossus browni*	1583	1229.77	0.40	4.85
19	Soleidae	*Synaptura cadenati*	2	0.08	0.001	0.0003
20	Dasyatidae	*Dasyatis margarita*	96	115.99	0.02	0.46
21	Diodontidae	*Diodon hystrix*	2	0.09	0.00	0.0004
22	Drepanidae	*Drepane Africana*	19	1.49	0.00	0.01
23	Elopidae	*Elops lacerta*	699	110.61	0.18	0.44
24	Exocoetidae	*Cypselurus milleri*	88	19.54	0.02	0.08
25	Gerreidae	*Eucinostomus melanopterus*	50	16.07	0.01	0.06
26	Haemulidae	*Brachydeuterus auritus*	3378	240.99	0.86	0.95
27		*Pomadasys jubelini*	198	52.19	0.05	0.21
28		*Pomadasys peroteti*	637	167.8	0.16	0.66
29		*Hemiramphus brasiliensis*	13	2.01	0.00	0.01
30	Istiophoridae	*Istiophorus albicans*	2	9	0.00	0.04
31	Lutjanidae	*Lutjanus goreensis*	152	110.42	0.04	0.44
32		*Lutjanus dentatus*	6	1.7	0.00	0.01
33	Lobotidae	*Lobotes surinamensis*	37	15.68	0.01	0.06
34	Lophidae	*Lophius kempi*	8	2.74	0.00	0.01
35	Megalopidae	*Tarpon atlanticus*	5	0.5	0.00	0.002
36	Monacanthidae	*Alutera scripta*	3	0.97	0.00	0.004
37	Monodactylidae	*Psettias sebae*	6	5	0.00	0.02
38	Mugilidae	*Liza gandisquamis*	97	15.29	0.02	0.06
39		*Mugil cephalus*	3371	159.61	0.86	0.63
40	Muraenesocidae	*Cynoponticus ferox*	46	29.4	0.01	0.12
41	Ophichthidae	*Echiophis creutzbergi*	8	4	0.00	0.02
42		*Ophisurus serpens*	6	3.95	0.00	0.02
43	Polynemidae	*Galeoides decadactylus*	2156	278.05	0.55	1.10
44		*Pentanemus quinquarius*	66243	2712.71	16.82	10.69
45		*Polydactylus quadrifilis*	134	196.11	0.03	0.77
46	Rhinobantidae	*Rhinobatos rhinobatos*	6	40	0.00	0.16
47	Scaenidae	*Pseudotolithus elongatus*	3911	389.29	0.99	1.53
48		*Pseudotolithus epipercus*	3868	272.91	0.98	1.08
49		*Pseudotolithus moori*	62	9.96	0.02	0.04
50		*Pseudotolithus typus*	11431	3005.24	2.90	11.84
51		*Pseudotolithus senegalensis*	64	18.36	0.02	0.07
52		*Pteroscion peli*	18744	880.38	4.76	3.47
53	Scombridae	*Scomberomorus tritor*	727	221.13	0.18	0.87

Table 1: Fish catch composition by abundance and weight (kg) of marine artisanal fishery in the Gulf of Guinea, Southwest Nigeria.

					Percentage Relative	
	Fish Families	Fish species	Abundance	Weight (kg)	Abundance	Weight
54		*Euthynnus alletteratus*	42	16.28	0.01	0.06
55	Sphyraenidae	*Sphyraena afra*	478	268.36	0.12	1.06
56	Tetraodontidae	*Ephippion guttifer*	12	0.86	0.00	0.003
57		*Lagocephalus laevigatus*	84	21.1	0.02	0.08
58	Trichiuridae	*Trichiurus lepturus*	10402	634.21	2.64	2.50
59	Carcharhinidae	*Rhizoprionodon acutus*	25	83.8	0.01	0.33
		Sub-total	393877	25380.44	100.00	100
60	Portunidae *	*Portunus validus*	6698	714.41	37.67	87.13
61		*Callinectes pallidus*	108	4.79	0.61	0.58
62	Calappidae *	*Calappa rubroguttata*	3	0.24	0.02	0.03
63	Coenabilidae *	*Goehobita clypeotus*	1	0.71	0.01	0.09
64	Penaeidae *	*Parapenaeopsis atlantica*	9133	81.94	51.37	9.99
65		*Penaeus* (*Farfantepenaeus*) *notialis*)	1701	15.91	9.57	1.94
66		*Penaeus kerathurus*	4	0.36	0.02	0.04
67	Palinuridae *	*Panulirus regius*	6	0.32	0.03	0.04
68	Mantis shrimp *	*Squilla aculeate*	110	0.95	0.62	0.12
69	Sepiidae *	*Sepiella ornate*	16	0.35	0.09	0.04
		Sub-total	17780	819.972	100	100
		GRAND TOTAL	411657	26200.41		

* Shellfish families

others (0.3%). However, Penaeidae recorded the highest value of 61% in terms of abundance while other families of shellfish species contributed 0.8% (Figure 6). Three shellfish species were observed to be very common (*P. atlanticus, P.validus* and *P. notialis*), no species was found to be common, three species uncommon while four species were rare as shown in Figure 3.

Discussion

In this study, 69 fish species belonging to 42 families were encountered. These constitute 59 finfishes belonging to 35 families and 10 shellfishes belonging to 7 families in the artisanal marine fisheries in the Gulf of Guinea in Ogun State. Odulate, *et al.* (2006) earlier reported 34 finfish species and 4 shell fishes belonging to twenty 25 families while Amadi (1991) had earlier reported 30 families of finfishes comprising 120 species in the marine environment of Nigeria. The variation observed in species composition from earlier works is likely to be due to differences in time, gear and space. However, DIVERSITAS (2001) noted that inventory of species, their characteristics, uses and biologies is crucial to protect such resource.

Forty-six percent of the finfishes identified were classified in the National Species Classification (NCS) as important commercial marine fishes in Nigeria (FDF, 2007). This study revealed that *S. maderensis*, a clupeid, dominated the catch contrary to *E. fimbrata* reported by Dublin-Green and Tobor (1992). The dominance of clupeids observed in the study was corroborated by Dublin-Green and Tobor (1992) that they are the major coastal

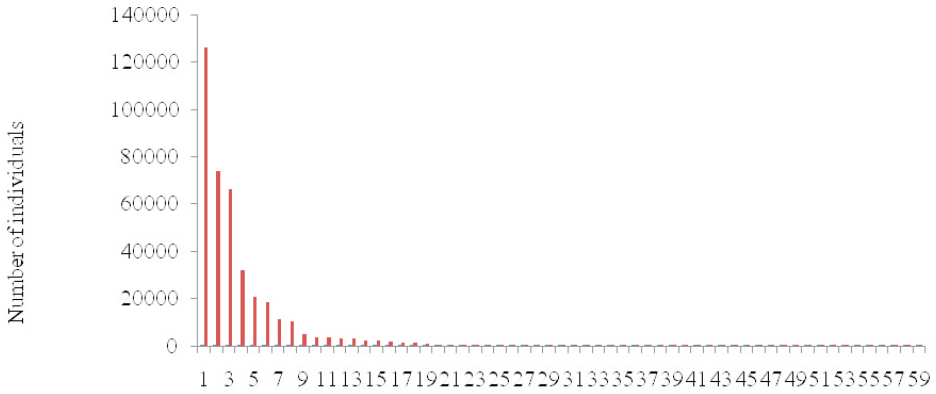

Figure 2: A rank-abundance curveof finfish species of marine artisanal fishery inthe Gulf of Guinea, Southwest Nigeria.

(1) *S. maderensis,*(2) *I. Africana,* (3*) P. quinquarius,* (4) *C. chrysurus,* (5) *E. fimbrata,* (6) *P. peli,* (7) *P. typus* (8) *T. lepturus,* (9) *L. amia,* (10) *P. elongatus* (11) *P. epipercus,* (12) *B. auritus,* (13) *M. cephalus,* (14) *H. bicolor,* (15) *G. decadactylus*, (16) *C. senegallus,* (17) *C. browni,* (18) *A. latiscutatus*,(19) *C. hippos,* (20) *S. tritor,* (21) *E. lacerta,* (22) *P. peroteti,* (23) *S. afra*, (24) *P. jubelini,* (25) *L. goreensis,* (26) *P, quadrifilis,* (27) *L. gandisquamis,* (28) *D. margarita,*(29) *C. milleri,* (30) *C. crysos,* (31) *L. laevigatus,* (32) *S. senegalensis*, (33) *P. senegalensis,* (34) *P. moori,* (35) *A. vulpes,* (36) *E. melanopterus,* (37) *C. ferox,* (38) *E. alletteratus,* (39) *L. surinamensis,* (40) *C. latus,* (41) *R. acutus*, (42) *D. Africana,* (43) *S. dorsalis,* (44) *H. brasiliensis*,(45) *E. guttifer,* (46) *L. kempi,* (47) *E. creutzbergi,* (48) *T. maxillosus,* (49) *L. dentatus,* (50) *P. sebae,* (51) *O. serpens,* (52) *R. rhinobatos*, (53) *T. atlanticus,* (54) *C. equiselis,* (55) *A. scripta,* (56) *H. didactylus*, (57) *S. cadenati,* (80) *D. hystrix*, (59) *I. albicans.*

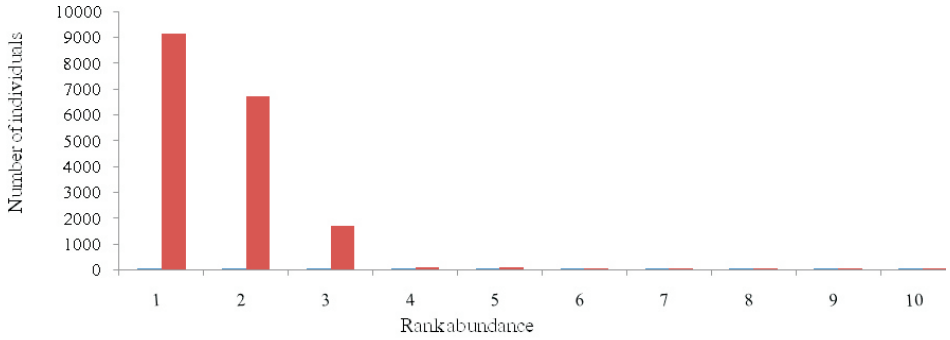

Figure 3: A rank-abundance curve of shellfish species of marine artisanal fishery in the Gulf of Guinea, Southwest Nigeria.

Very common = (1) *P. atlanticus,* (2) *P.* validus, (3) P. notialis; Uncommon = (4) Mantis shrimp, (5) C. pallidus; (6) S. ornata, rare = (7) P. regius, (8) *P. kerathurus* , (9) *C. rubroguttata,*; (10) *G. clypeotus*

pelagic resources, most valuable and abundant in the marine artisanal fisheries in Nigeria. *S. maderensis* dominated the fish catch in Stations 1 and 2 but the situation was different in Station 3; it was *P. quinquarius*. This might be due to the differences in time of fishing, fishing depth, type of crafts and mesh sizes of gillnets employed. This was corroborated by Kilgour and Barton (1999) who reported that fish communities show non-random patterns in fish composition over time and space. Earlier studies carried out by Ajayi and Talabi (1984); Akinyemi *et al.* (1986) and FDF (2007) reported the predominance of Sciaenidae, Polynemidae, Carangidae, Ariidae and Clupeidae families in artisanal landings. Ellenbroek (1987) opined that the dominant species in a community largely determine the structure and the functioning of that community. The highest fish production both in abundance and weight observed in sampling Station 1 could be attributed to the fact that it has highest concentration of fishermen using outboard engines in their fishing activities. So, they could probably travel far within the 5 nautical miles (non-trawling zone) exclusively reserved for artisanal fishermen. Two fish species of the poisonous family Tetraodontidae, *Lagocephalus leavigatus* and *Ephippion guttifer*, were reported in this study and were found in Station 1. Amadi (1991) documented that Nigerian marine fishes are edible with the exceptions of members of the family Tetraodontidae.

P. atlanticus was found to be most abundant among the shellfish resources. *P. notialis* was, however, reported by Dublin-green and Tobor (1992) as an important species among the shrimps and of high concentration off Lagos. *P. notialis* is Nigeria's foreign exchange earner in the fisheries industry (Nwosu, 2009). *Panulirus regius* was the only lobster recorded in the study. It was reported by Dubling-green and Tobor (1992) to be the only lobster species common in Nigeria marine waters and has no commercial value despite its delicacy. The species that characterize the marine ecosystem in study area differ in relative abundance with few species quite common. The strong disparity in abundance among the species, high number of individuals in few species and low number of individuals in many species is a typical characteristic of tropical fisheries with rare species at the tail of the plots.

Conclusion

Artisanal fishery is playing significant role in fish food production and a major driver in accomplishing the food security of millennium goal of 2020. There is therefore urgent need for management of fish food supplied by this sector especially those few fish species categorized as very common and common. Further research into the population dynamics of these fish resources should be carried out to understand the appropriate management measures that should be applied for sustainable production.

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