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Gillnet fisheries around Polaku and Koroama communities in the lower Taylor creek, Bayelsa state, Nigeria

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Abstract
The study examined Gillnet Fisheries around Polaku and Koroama Communities in the Lower Taylor Creek, Bayelsa State, Nigeria. The instrument of the study was a structured questionnaire. A total of 100 gillnet fishers were randomly selected from the study area. Fishes caught were identified to species level using a field identification guide. Data collected were analyzed using simple percentages, frequency count and Mean (X). The results show a dominance of males (95.0%) over females (5.0%) in gillnet fisheries in the study area. Majority (43.0%) of fishers fell within the agile and economically active age brackets of 30-39 years. More than half (62.0%) of the fishers are married, 25.0% are single, 6.0% are divorced and 7.0% are widowed. The majority of fishers (44.0%) had primary education, while none had tertiary education. Eighty percent of fishers are from Polaku and 20.0% from Koroama. Thirty-nine percent of fishers use bottom gillnets, 35.0% drift gillnets and 26.0% surface gillnets in the study area. The mesh size of nets ranged from 2" to 5". Species from the family Alestidae was the most abundant (15.7%) and the family Notopteridae was the least abundant (0.8%). Between 10 to 20 hours are spent by the fishers in fishing and the daily catch quantity ranges between 20 to 40 kg. Generated weekly income ranged below N35, 000 to N63, 000. The challenges encountered by the fishers include lack of storage facilities and destruction of fishing gears by maritime vessels operating in the area. It was thus recommended that government should provide storage facilities and regulate maritime vessel operation in the area.

Keywords: Gillnet fisheries, Lower Taylor Creek, Bayelsa State

Introduction
A gillnet is a large net wall that hangs vertically in the water with a floats line at the top of the net and weights line mounted at the bottom of the net [7]. The net is made of transparent monofilament line, so that fish and other animals are unable to see it [12]. Fishers usually vary the mesh size or the size of the net holes depending on the size of the species they want to capture. Small mesh sizes are used when targeting small species and large mesh sizes when targeting large species. The mesh sizes are designed in such a way that they are large enough for the head of the fish to pass through it, but not its body. As a result, when fish swim into the net they are entangled by the gills [12]. Gillnets are used for fishing in both the open ocean and coastal waters and can be set at different depths. Gillnets are of three types namely surface, mid and bottom gillnets [12]. Gillnets are commonly used by the artisanal fishers in the brackish, fresh and coastal waters of Nigeria to catch a variety of fish species [9, 19]. They require little investment in labour and equipment, and are effective in catching widely scattered fish populations [2]. In the Niger Delta region, several studies have revealed that gillnet is one common fishing gear been operated by the artisanal fisheries sector [17, 19]. About 85% of fishers use gill nets in Nigeria fresh water fisheries [2],
Gill net is one of the common fishing gears used for the exploitation of fish resources in the Lower Taylor Creek Area, Niger Delta, Nigeria [19]. Gill nets are important in the domestic fish production in the study area. Despite the importance of gillnet to artisanal fishers and the inhabitants of the area, information on gillnet fishery is scanty in the Lower Taylor Creek. The lack of basic information on gillnet fishery in the Lower Taylor Creek is assumed to be one of the major constraints in the planning and development of its fisheries. This study is expected to bridge this gap by providing useful information on the gillnet fishery around Polaku and Koroama communities in the Lower Taylor Creek.

The main aim of this study is to investigate the Gillnet Fishery around Polaku and Koroama communities in the Lower Taylor Creek, Niger Delta, Nigeria. Against this background, the specific objectives of this study are to determine the demographic characteristics., the different types of gillnet used by artisanal fishers, the fish families caught by gillnets, the daily catch and income generated and the challenges encountered by the fishers operating in the study area.

Materials and Methods

The study was carried out in Polaku and Koroama in the Lower Taylor Creek area, in Yenagoa Local Government Area of Bayelsa State, Niger Delta, Nigeria [13]. Noted that the Lower Taylor Creek is situated between latitude 5^0 01'N and 5^0 02' N and longitude 6^0 17'E and 6^0 18'E (Figure 1). Several creeks and flood channels transverse the freshwater swamp forest, which link the Nun River and Taylor Creek at various points and forming an extensive water body during the high flood. This network of creeks within the swamps and their associated floodplain lakes and fishing ponds constitute the main fishing area in the study area. Okoso Creek, is the most prominent creek connected to the Taylor Creek, which consequently empties into the Nun River at its confluence at Polaku community. The Taylor Creek is subjected to mild tidal influence in the dry season and flows swiftly in one direction during the flood season but flows gently in the low water period [15]. The Creek serves the residents in different forms ranging from domestic to commercial cassava tuber fermentation, washing of clothes, fetching of water for drinking, fishing, bathing, waste disposal and sand mining. The Lower Taylor Creek runs through vegetation that has palm trees, silk cotton and mahogany trees, which stand in the flood-free farmlands close to the Creek. The Creek is economically important and rich in biodiversity [16]. Presently, oil exploration and exploitation activities and other rural developmental programmes including road construction, sand mining, and land reclamation works are going on in the area [15].

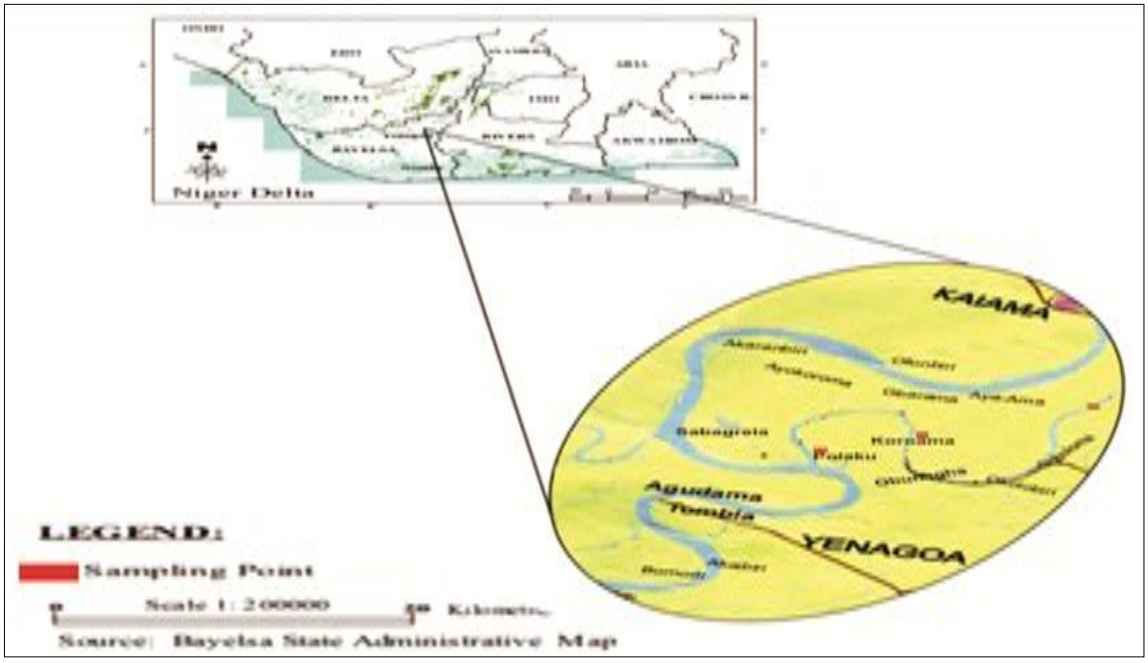


Fig 1: Map of Niger delta showing Bayelsa and lower Taylor creek, the study area

Sampling Procedure and Data Collection

The sampling sites Polaku and Koroama were selected because regular fishing activities is taking place in there. A survey was conducted to physically identify fishers using gillnet in the study area. Sampling was carried out twice monthly between July and September 2017. The instrument of study was a structured questionnaire which was developed. Data for the study was collected from all gillnet fishers (Polaku; 80 fishers and Koroama; 20 fishers) operating in the study area at the time of the study using the total sampling technique. The questionnaires, which consisted of two parts, was designed such that part one was to collect information on a number of gillnet fishers in the study locations; the type and size of gillnet used by the fishers, as well as reasons for using preferred gillnet size; the fishers demographic characteristics; gillnet catch composition, economic analysis from gillnet fishery including the daily quantity of catch (which was determined using a calibrated spring balance), and the weekly income generated by the fishers. While part two was structured to collect information on the challenges encountered by the fishers in their fishing and the fisher's suggestions on how to remedy the challenges they face in their fishery. The design for part two of the questionnaire was based on a four-point summative ratings of Strongly Agree (SA) - 4 points, agree (A) – 3 points, disagree (D) – 2 points and Strongly Disagree (SD) – 1 point. Together the 4-point rating adds up to 10 points (i.e. 4+3+2+1) and gives a criterion mean of 10/4 or 2.5.

Fish Identification

Fishes were identified with fishers using a field guide [21].

Data Analysis

Data collected were collated and analyzed using simple percentages, frequency count and Mean ($\bar{X}$).

Results

Demographic Data of Respondents

Data on the demographic characteristics of the respondents are presented in Table 1.

Table 1: Demographic characteristics of gillnet fisher in the Lower Taylor Creek

Parameter	Polaku	Koroama	Total	Percentage (%)
Gender				
Male	77	18	95	95.0
Female	3	2	5	5.0
Total	80	20	100	100.0
Age				
20-30	8	4	12	12.0
30-39	30	13	43	43.0
40-49	18	7	25	25.0
50-59	9	6	15	15.0
Above 60	4	1	5	5.0
Total	69	31	100	100.0
Marital Status				
Married	47	15	62	62.0
Single	21	4	25	25.0
Divorced	6	0	6	6.0
Widowed	6	1	7	7.0
Total	80	20	100	100.0
Educational Level				
No formal education	26	7	33	33.0
Primary education	39	5	44	44.0
Secondary education	15	8	23	23.0
Tertiary education	0	0	0	0.0
Total	80	20	100	100.0

***Source*:** Field Survey, 2017.

Males fishers (95.0%) dominated the gillnet fishery in the study area with female's fishers accounting for only 5.0% of the fishers. The majorityy of the fishers (43.0%) fell within the agile and economically active age brackets of 30-39 years, while those who were above 60 years of age accounted for 10.0%. Data on the marital status of the fishers showed that more than half (62.0%) of the fishers were married, 25.0% were single, 6.0% were divorced while 7.0% are widowed. On the educational levels of the respondents, the majority of them (44.0%) had primary education, 33.0% had no formal education, 23.0% had secondary education, while none of the fishers had tertiary education (0.0%).

Number of Fishers Using Gillnet in the Lower Taylor Creek: Eighty (80) gillnet fishers were observed in the Polaku community, while twenty (20) gillnet fishers were observed in the Koroama community (Table 2).

Table 2: Number of Fishers Using Gillnet in the Study Area

Location	No. of Gillnet Fishers	Percentage (%)	Total
Polaku	80	80.0	80
Koroama	20	20.0	20
Total	100	100.0	100.0

***Source*:** Field Survey 2017

Types of Gillnets Used by the Fishers in the Lower Taylor Creek

Thirty-nine percent (39.0%) of the fishers used more of bottom gillnets, 35.0% used drift gillnets, while 26.0% used surface gillnets (Table 3).

Table 3: Types of gillnets used by fishers in the Lower Taylor Creek

Type of Gillnet	Polaku	Koroama	Total	Percentage (%)
Surface Gillnet	21	5	26	26.0
Drift Gillnet	29	6	35	35.0
Bottom Gillnet	30	9	39	39.0
Total	80	20	100	100.0

***Source*:** Field Survey 2017

Table 4 showed the mesh size of gillnets (calibrated in inches) used by the fishers in the Creek. The majority (42.0%) of gillnet fishers in the Study Area reported using gillnet with a mesh size of three centimeters, followed by four centimeters (31.0%), two centimeters (19.0%), while only 8.0% used five centimeters mesh sizes.

Table 4: Mesh size of gillnet used by the fishers

Mesh size (cm)	Polaku	Koroama	Total	Percentage (%)
2	16	3	19	19.0
3	33	9	42	42.0
4	23	8	31	31.0
5	8	0	8	8.0
Total	80	20	100	100.0

***Source*:** Field survey, 2017.

Table 5 represents fishers' reasons for using gillnet types in the Lowe Taylor Creek Area. The reasons include: catches more fishes (40.0%), catches both large and small size of fishes (26.0%), catches smaller sizes of fishes (15.0%), catches larger sizes of fishes (13.0%) and funds can only afford to construct the gillnet been used (6.0%).

Table 5: Fishers' reasons for using Gillnet types in the Lower Taylor Creek

Parameters	Location			
	Polaku	Koroama	Total	Percentage (%)
Catches more fish	32	8	40	40.0
Catches both large and small sizes of fish	21	5	26	26.0
Catches smaller sizes of fish	12	3	15	15.0
Catches larger sizes	10	3	13	13.0
Funds can only afford the construction of the gillnet been used	5	1	6	6.0
Total	80	20	100	100

***Source*:** Field Survey, 2017.

Fish Families Caught by Gillnet in the Lower Taylor Creek

The number of the different fish families caught from the gillnet fisheries in the lower Taylor Creek is presented in Table 6. The family Alestidae - 349(15.7%) was observed to be the most abundant followed by Mochokidae - 300(13.5%), Cichlidae - 245(11.2%), Cyprinidae – 193(8.9%), Mormyridae - 147(8.5%), Claridae - 170(7.7%), Bagridae - 169(7.6%). Claroteidae, Citharrindae and Schilbeidae were observed to have equal abundance levels - 100 (4.5%) respectively followed by the family Hepsetidae - 92(4.1%), Distichodontidae - 56(2.6%), Malapteruridae-41(1.9%), Gymnarchidae - 36(1.6%), Polypteridae - 31(1.4%), Osteoglossidae - 21(1.0%), and finally Notopteridae - 15 (0.8%).

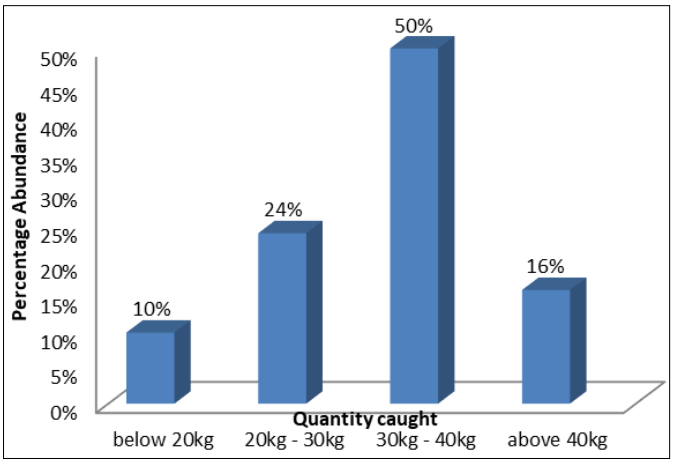
Table 6: Catch Abundance in Fish Family caught in the Gillnet Fisheries in the Lower Taylor Creek

Family	Number caught From Sampling cites	Total number	Abundance (%) of fish caught	
	Polaku	Koroama		
Alestidae	277	72	349	15.7
Bagridae	293	75	168	7.6
Claroteidae	80	20	100	4.5
Cichlidae	186	59	245	11.2
Citharrindae	80	20	100	4.5
Claridae	140	30	170	7.7
Cyprinidae	147	46	193	8.9
Distichodontidae	37	19	56	2.6
Gymnarchidae	22	14	36	1.6
Hepsetidae	74	18	92	4.1
Malapteruridae	34	7	41	1.9
Mochokidae	240	60	300	13.5
Mormyridae	160	27	187	8.5
Osteoglossidae	16	5	21	1.0
Notopteridae	12	3	15	0.8
Polypteridae	23	8	31	1.4
Schilbeidae	80	20	100	44.5
Total	1741	464	2205	100

***Source*:** Field survey, 2017.

Economic Analysis of Gillnet Catch in the Lower Taylor Creek

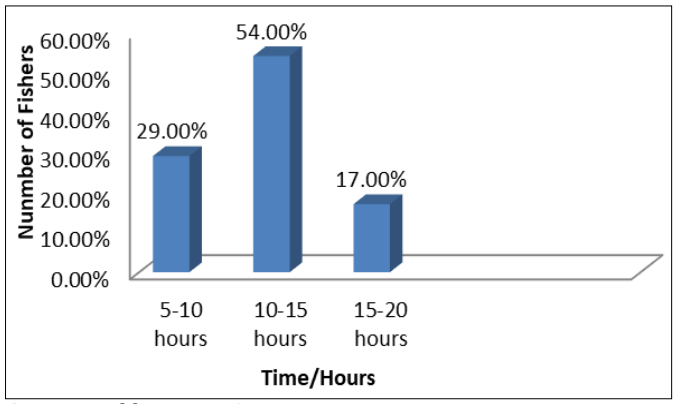
Fig 2 shows the daily catch (expressed in kilograms) from the gillnet fishers in the study area. The majority of the fishers (50.0%) caught between 30-40kg of fish daily, 24.0% caught not less than 20 – 30kg, 16.0% reportedly caught quantities above 40kg, while only 10.0% of the fishers caught below 20kg.



***Source*:** Field survey, 2017

Fig 2: Daily Catch of the Gillnet Fishers

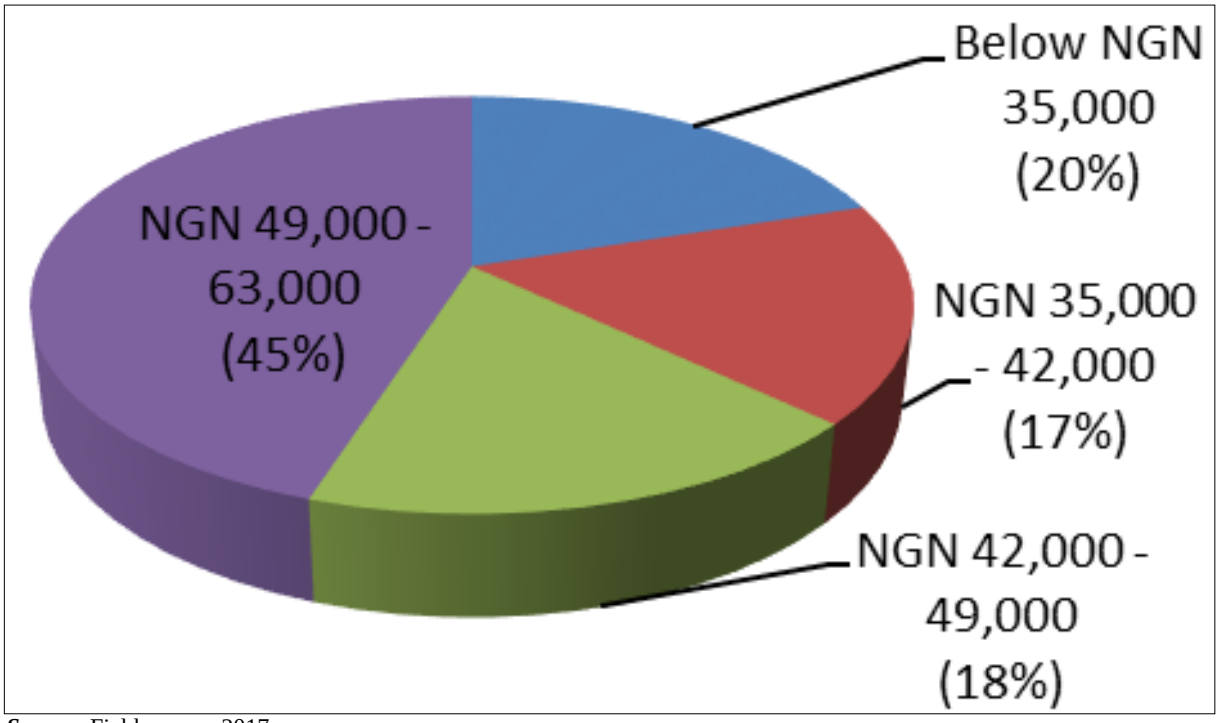
Fig 3 present the hours spent by the gillnet fishers to arrive at their daily catches. More than half of the fishers (54.0%) reported spending between 10 - 15 hours in fishing daily, 29.0% reported spending between 5 - 10 hours, 17.0% reported spending between 15 - 20 hours, while none of the fishers reported spend between 20 - 24 hours in fishing. Figure 4 shows the daily Income Generated by Gillnet Fishers in the study location.



***Source*:** Field survey, 2017

Fig 3: Hours Spent by Gillnet Fishers in Arriving at their Daily Catch Quotas

Fig 4 presents the weekly income generated by the fishers from gillnet fisheries in the Lower Taylor Creek. The majority (45.0%) of the fishers generated weekly incomes between NGN49,000 - 63, 000.00 from their catches, 20.0% of fishers reported generated weekly incomes below NGN35, 000.00, eighteen percent (18.0%) of the fishers reported generating weekly incomes between NGN 42,000 - 49, 000.00, while only 17.0% reported generating weekly incomes between NGN 35,000 - 42, 000.00.



***Source*:** Field survey, 2017.

Fig 4: Weekly income Generated from Gillnet Fisheries in the Study Location

Table 7 presents the challenges encountered by the fishers involved in the gillnet fishery in the Lower Taylor Creek. The challenges include: lack of funds to purchase fishing inputs, Lack of storage facilities, no access to credit facilities, lack of good markets, lack of processing facilities, destruction of fishing gears by maritime vessels and finally, Epileptic power supply.

Table 7: Challenges encountered by fishers involved in Gillnet Fishery in the Lower Taylor Creek

S/N	Challenges	N	$\bar{X}$	Criterion mean	Remarks
1.	Lack of storage facilities	100	3.8	2.5	Accepted
2.	Lack of funds to purchase fishing inputs	100	3.9	2.5	Accepted
3.	No access to credit facilities	100	3.8	2.5	Accepted
4.	Destruction of fishing gear by maritime vessels	100	3.2	2.5	Accepted
5.	Lack of good markets	100	3.7	2.5	Accepted
6.	Epileptic power supply	100	3.1	2.5	Accepted
7.	Lack of processing facilities	100	33	2.5	Accepted
	Total	51.4	37.5		
	Average	.3.4		2.5	

***Source*:** Field Survey, 2017

Table 8 represents the suggested solutions to mitigate the challenges encountered by gillnet fishers in the Lower Taylor Creek. The suggested solutions include: the provision of loans to fishers, provision of fishing inputs at subsidized rates, provision of storage facilities by the government, provision of processing facilities, provision of good markets to fishers for the sale of their catch, maritime vessels should drive carefully on the creek, and provision of constant power supply by the PHCN.

Table 8: Suggested solutions to challenges of Gillnet Fishery in the lower Taylor Creek

S/N	Parameters	N	$\bar{X}$	Criterion $\bar{X}$	Remarks
1	Government should provide storage facilities	100	3.6	2.5	Accepted
2.	Fishing inputs should be provided to gillnet fishers by the state and federal ministries of agriculture at subsidized rates	100	3.9	2.5	Accepted
3.	Loans should be made available to fishers cooperatives at affordable interest rates by financial institutions	100	3.2	2.5	Accepted
4.	fisher's cooperatives should be organized and empowered to regulate Maritime vessels operations in fishing locations along the creek	100	3.2	2.5	Accepted
5.	Government should provide good markets to enhance the fish sale	100	3.1	2.5	Accepted
6.	the Power Holding Company of Nigeria (PHCN) should endeavor to provide constant power supply in the region to enhance effective fish processing and storage operations	100	3.8	2.5	Accepted
7.	there should be Involvement of FISON representatives in the fisheries activities in the lower Taylor Creek for routine training of fishers on current fishing gears, gear development, and processing and storage techniques	100	3.4	2.5	Accepted
	Total		24.2	17.5	
	Average		3.5	2.5	

***Source*:** Field Survey, 2017

Discussion

The findings pertaining to the number of gillnet fishers in the lower Taylor Creek shows that fishers in the Polaku area of the lower Taylor Creek are more involved in gillnet fishery when compared to the Koroama area of the Creek. The finding is in agreement with [7] fisheries survey conducted in the Upper Nun River [7]. Which had earlier noted that gillnet and cast nets constitute some of the most important fishing gears used by artisanal fishers in the Upper Nun River. Both the Taylor Creek and Upper Nun river are connected and as such, it is not surprising that there exist similarities in fishing gear adopted by fishers in the different regions (that is Taylor Creek and River Nun) and the high proportion of fishers involved in gillnet fisheries. The different types of gillnet used by the fishers in gillnet fisheries in the Lower Taylor Creek, variations in fisher's preference of the various gillnet mesh sizes, which are dependent on the various reasons observed in this study are in conformity with the reports of [17] who reported that most artisanal fishers used a particular type of fishing gear because that gear gives them more catch than other fishing gear [22]. also reported that the choice of using a particular fishing gear is dependent on the fisher. Moreover, the findings also concur with the observations of [13] who noted that Gillnet, cast net, Hook and line, and Malian trap constitute the major fishing gears used by fishers, with the gillnet, cast net and Malian trap being locally produced by most fishers, and that the variations in the selection of fishing gears depends to a large extent on the size and type of fish fishers expect to catch. The demographic characteristics of the respondents corresponded with reports of [3, 8, 6] that the use of fishing gears in fisheries is practiced by fishers of both sexes but with a preponderance of males mostly between the economically active age of 30 to 39 years. Although, the results from most of these earlier studies showed the dominance of the artisanal fisheries sector by men that fishing activities are majorly carried out by males [23], they have emphasized that the contribution of the women folk in fishing activities cannot be underrated. According to [37], women mostly use traps and nets to catch fish in most fishing communities in Nigeria, and are also actively involved in fish processing and marketing. The dominance of male fishers in the gillnet fishery in the lower Taylor Creek could be attributed to the influence of gender disparity on occupation, especially fishing and fish farming in the study area because of the intensity of labour involved in active fishing gear operations when compared with passive fishing gear operations. Moreover, the findings are in line with the reports of [22, 8, 6], who also reported that fishing activities are mostly carried out by people within the age range of 30 to 40 years. This distribution might probably be due to the fact that younger people are more enthusiastic in trying new practices in fisheries and fishing operations, mentally alert and have greater flexibility in accepting new ideas in fishing gear development techniques and also do their own business without any problem that affect old age. The observed high number of married fishers in the Lower Taylor Creek is similar to the observations of [8, 20] who reported that the artisanal sector is made up of majorly by married people

(fishers). The possible reason for this could be attributed to the fact that married people have more pressing demands and problems to solve than the unmarried (singles) and those that are divorced. The observed high number of fishers having primary and secondary education is in line with [1]. This relative high literate level of fisher folks could give such households the capacity to successfully implement income diversification strategies to cope with income fluctuations, income failure and poverty. The observed fish families from the Gillnet Catch in the Lower Taylor Creek concur with the work of [7, 13, 10]. The similarities of the findings of this study to [8], could be attributed to the fact that the Upper Nun River and Taylor Creek are connected to each other, moreover, the River Ore reported by [10] in South West Nigeria and that of the Kontagora reservoir reported by [13] in Niger State are both connected to the river Niger to which the Taylor Creek flows into through the river Orashi in Yenagoa, Bayelsa state. It is therefore not surprising that the fish families from this study tend to be similar with those identified in these earlier studies. The implication of these findings for gillnet fisheries in the Lower Taylor Creek, Niger Delta Bayelsa State, is that fishers involved in gillnet fishery have at their reach a wide variety of edible fish species which are of high economic values, such as species of the family Gymnarchidae, Mochokidae, Mormyridae and Claridae and can help in improving the income earned by fishers from gillnet fisheries in the study locations. Economic analysis of the gillnet fisheries in the lower Taylor creek is in agreement with [4]. This in no doubt accounts for the high income generated from gillnet fisheries in the study area, an observation which is in congruence with report of [5]. The challenges reported by the gillnet fishers in the Lower Taylor Creek compares favorably to those identified by [11], including the destruction of fishing gears by maritime vessels, Lack of storage facilities and lack of funds to purchase fishing inputs. Similarly, the observed challenges are in line with finding of [4], whose work identified the lack of good markets, lack of funds to purchase fishing inputs, lack of access to credit facilities, Lack of storage facilities and, destruction of fishing gears by maritime vessels as major constraints to gillnet fisheries in the coastal areas of Ondo state. The suggested solutions to mitigate the challenges encountered in gillnet fisheries as reported by the respondents are in agreement with those recommended by [4] that government should intensify the right support in terms of aids and infrastructures and give localized informal training to fisher folks on the ways of improving fishing methods for sustainable management of the fishery. Moreover, the suggestions also concur with [13] that cooperative society should be formed by fishermen in fishing regions, as this play a significant role in conservation and management decisions for fishery resources.

Conclusion

It is evident from this study that, there are three main types of gillnets in use at the Lower Taylor Creek. They include: surface, mid and bottom gillnets. The most common gillnet used is the bottom gillnet. Majority of the gillnet fishers were within the agile economically active age range of 30-39 years. Lack of funds was observed to be a main issue militating against the output of fishers in the Lower Taylor Creek.

Recommendations

The following recommendations were made for the improvement and promotion of fishing activities and standard of living of fishers in the Lower Taylor Creek.

1. The government should provide storage facilities.
2. The government and non-governmental organizations should provide fishing inputs at subsidized rates to fishers.
3. Loans should be provided to fishers either in cash or in kind, because this will enable fishers to obtain more and new fishing gear and as well increase their catch and income generation.
4. Fisheries communities should ensure the enactment of legislatures that ensure maritime vessels drive carefully on the Creeks in other not to damage their fishing gear which is their source livelihood.
5. Government and communities' development boards should provide good market structures for fisher to enable them sell their catch easily and on time to avoid spoilage.
6. Government should provide constant power supply so that it will help the fishers to preserve their catch that is left over.
7. fishers should form cooperatives that will work with other stake holders to develop and provide effective processing facilities to enable them process the products in order to add value to them.

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