

### Original Research Article

## Perceived Effects of Sand Dredging on Livelihood Diversification of Artisanal Fisher Folks in Lagos State, Nigeria

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### Abstract

The study examined perceived effects of sand dredging activities on livelihood diversification of artisanal fisher folks in Lagos State, Nigeria. Multi-stage sampling procedure was used to select respondents for the study. Purposively, Eti-Osa, Ibeju-Lekki, Epe and Ikorodu local Government Areas (LGAs) were selected for intensive dredging activities. Registered artisanal fishermen in these LGAs were 310, 350, 380 and 320, respectively. Twenty percent of the population in each LGAs were selected using simple random sampling technique to arrive at 272 respondents interviewed for the study. An interview schedule guide was used to elicit information on respondents' socio-economic characteristics, knowledge, livelihood diversification and perception of the sand dredging effect on fishing activities. Data were analyzed using descriptive statistics, Pearson Product Moment Correlation and independent sample t-test. The mean age of fisher folks was  $37 \pm 8$  years, 92.1% of them were males, 81.4% were married and had households' size ranging from 1 to 16 persons. Over 50% of the respondents had no formal education. Monthly income of fisher folks in the study area ranged from ₦5,000 to ₦60,000 with a mean income of ₦22,892  $\pm$  13,564 and majority (92.9%) were members of a social group. Respondents diversified most into off-farm activities such as commercial bike riding, security and technician services. Slightly above half (55.7%) perceived sand dredging as having a negative effect on fishing activities. Results on inferential statistic revealed that a significant relationship existed between knowledge of sand dredging effect on fishing activities ( $r = 0.35$ ), monthly income ( $r = -0.181$ ) and social group ( $\chi^2 = 2.886$ ) and perceived effects of sand dredging on fishing activities. Deliberate policy drive to mitigate sand dredging practices is required to forestall the negative effect on livelihood diversification of the artisanal fisher folks. Consequently, the artisanal fishery contribution to total Gross Domestic Product (GDP), employment generation and total domestic fish production will be enhanced.

**Keywords:** Sand dredging; livelihood; diversification; poverty.

### INTRODUCTION

Agriculture and sand dredging are considered veritable activities playing a critical role in the rural livelihood improvement and alleviating rural poverty. While agriculture is the key strategy for rural poverty reduction in most rural communities and the coastal region of Nigeria, access to agricultural land remains a major challenge to the majority of the rural poor. The "World Bank (2001) estimated that over 40 percent of the world's population as poor and that about 75 percent of rural residents in developing countries experience absolute poverty. These people are regarded as the landless, powerless, marginalized, vulnerable and disadvantaged. Since the poor rural dwellers have limited access to the socio-economic benefits that are easily accessed by urban dwellers they usually seek livelihood opportunities in the primary and informal sectors of the economy especially in subsistence agriculture, small scale mining and quarrying" (Birabwa, 2006).

Diversification is widespread and has been occasionally shown, when households can seize opportunities, to offer them a pathway out of poverty. But this is not always the case. In rural (farming) households, those who begin poor in land and financial assets face more difficulties to overcome barriers of entry and investment to engage in non-farm activities, and remain caught in a 'poverty trap' (Barrett, 2005). This situation echoes that of fisher folks documented by IMM (2003) in the Bay of Bengal: not all members of fishing households benefited equally from diversification opportunities, in particular when a household engaged in activities associated with catching fish, such as processing and trading. Further, while better-off families benefited from diversification, disproportionate disadvantages were felt by poorer households who lacked skills, knowledge, finance, organizational ability, confidence and social linkages to effectively respond to arising diversification opportunities (IMM, 2003).

Ellis (2000) recognized the positive role of income diversification in agricultural households and its support in policy making. In fishing communities, however, evidence of diversification and plural income streams remains patchy. Fishing communities are often perceived as highly specialized and dependent on a single source of food and income: water (either fresh or marine). In fact, sole reliance on marine resources is not a characteristic of coastal economies now or in the past. Instead, there is overwhelming archaeological evidence dating back to the late stone age (Neolithic) of the contrary. Back then, coastal communities exploited marine foods in conjunction with wild and domestic plants and animals on a seasonal basis, giving rise to diverse economies, supporting complex societies (Binliff, 1977; Clark, 1983; Deith, 1988).

Despite the lack of alternative livelihood opportunities often highlighted in the fisheries management literature, the fisheries social science literature has long recognized fisher folk's continual processes of diversification, captured in the concepts of 'pluri-activity' and 'occupational mobility' (Acheson, 1981; Allison and Ellis, 2001). To reinforce that these processes have not more recently halted and are still relevant to small-scale fishers today and in the future. Ogunbiyi (2012) asserted that Lagos water bodies are under intense pressure due to various kinds of human activities. The most noticeable one is the indiscriminate extraction of construction grade sand by dredging operators. The sector is faced with the daily dredging activities, which could cause a major change for fish habitation and decline in the fishing business for those who rely on it for aliving.

This is evidenced in the report submission of Fasakin (2008) who opined that, despite the enormous resource capacity to produce 2.4 million metric/tonnes annually, as of 2007, Nigeria is still the largest importer of frozen fish to meet the demand of her citizenry. It further revealed that Nigeria imports about 560,000/tonnes of fish estimated at about \$400 million annually while the domestic fish production stands at about 400,000/tonnes *per annum*. In Nigeria, most of the fishing grounds have been rendered unproductive by dredging of some water bodies and dumping of toxic industrial effluent (Olowosegun et al., 2005). Whitehead (2007) stated that sand dredging is rapidly becoming an ecological problem as the demand for sand increases in industries and for construction. Also, "it is evident that there is growing threat to the environment especially the water bodies because the fisheries resources that the people depended upon are fast depleting" (Aghoghovwia, 2008).

Although dredging provides major economic and social benefits like increase in cash flow, employment opportunity and livelihood diversification but also gives rise to concerns about its effects on the seabed, marine wildlife, archaeological deposits and other

marine users, such as commercial fisheries (Tillin et al., 2011). Sand dredging is equally a direct cause of erosion, which has destroyed lives and property of citizens and still threatens lives and property of others. It also impacts negatively on aquatic life, as sea animals that depend on sandy beaches for their nesting are sent into near extinction, destroys fishery, causing economic problems for people who rely on fishing for their livelihood. Also, it puts fisher folks out of business, thereby worsening poverty and encouraging criminal activities as these people become desperate for survival.

Diverging interpretations of the relationship between diversification and fisheries management can also been seen in the fisheries development literature, where Allison and Ellis (2001) and Jul-Larsen et al. (2003), for example, argue that diversification (occupational and geographical) can reduce pressure on resources in times of scarcity or diminishing economic return by providing alternative options while fish stocks and/or markets recover, while Pauly (2006) argues that diversification helps keep people fishing despite resource scarcity by cross-subsidizing economically unviable fishing, thereby further accelerating fish stock decline. If the primary objective of diversification programmes in fishing communities (to increase incomes and standards of living in vulnerable fishing communities) is often achieved, examples of positive impacts on the fishery through reduced fishing pressure are however less common (World Bank 2004). Although these studies have investigated diversification in fishing communities, nonetheless, the perceived effect of sand dredging activities on livelihood diversification of artisanal fisher folks in Nigeria remains inadequately covered. It is on this premise that the research seeks to provide answers to the following research questions:

1. What are the socio-economic characteristics of the respondents?
2. What is the respondents' level of knowledge on the effects of sand dredging on fishing activities?
3. What is the extent of fisher folks' diversification into other livelihood activities?
4. What are the constraints sand dredging posed to fishing activities?
5. What are the perceived effects of sand dredging on fishing activities?

## MATERIALS AND METHODS

### Study Area

The study was carried out in Lagos state, Nigeria. The state is located approximately at latitude 6°24' and 6°31' North of the equator and longitude 3°16' and 3°27' East of the Greenwich Meridian. The State is bounded on the East and North by Ogun State, in the West by

Republic of Benin and in the South by Atlantic Ocean. It covers an area of 3,677 km<sup>2</sup> with a total population of 9,113,605; it has the highest population density of 2,451 persons per square kilometer in Nigeria (NPC, 2006).

**Population of the study:** the population of the study consists of all fisher folks in the study area.

**Sampling procedure and sample size:** Multi-stage sampling procedure was used to select respondents for the study. Purposively, Eti-Osa, Ibeju-Lekki, Epe and Ikorodu local Government Areas (LGAs) were selected for intensive dredging activities. Registered artisanal fishermen in these LGAs were 310, 350, 380 and 320, respectively. Twenty percent of the population in each LGA was selected using simple random sampling technique to arrive at 272 respondents interviewed for the study.

**Data Collection:** An interview schedule was used to obtain primary data from the respondents.

### Measurement of Variables

#### a) Independents variable

- i) Socio-economics variables: Age and income were measured at interval level while, sex, religion, marital status, social organisation, education and family size were measured at nominal level.
- ii) Respondents' knowledge of perceived effect of sand dredging on fishing activities: Responses were scored Yes = 1 and No = 0. The highest and lowest score were 24 and 0, respectively. The mean score was computed and used to categorize knowledge of fisher folks on the perceived effect of sand dredging into high or low knowledge.
- iii) Constraints to fishing activities: Nine (9) possible constraints items to fishing activities were listed and respondents were asked to indicate by ticking the level of severity. Scores were assigned as: severe constraint = (2), not severe constraint = (1). The mean scores were computed and used to rank the constraints from the most severe to the least severe constraint.
- iv) Extent of diversification into other livelihood activities: Responses were solicited from a list of livelihood activities. These activities were categorized into on-farm activities, off-farm activities and non-farm activities. On-farm activities include: arable crop farming, vegetable farming, cash crop farming, snailary, and animal husbandry. Off-farm activities include: farm product processing, produce storage, and produce marketing, and Non-farm activities include: carpentry, commercial bike riding, and bricklaying, civil service, welding and teaching. The mean score computed was used to ascertain the extent of diversification into high and low.

## RESULTS AND DISCUSSION

### Respondents' Socio-economic characteristics distribution

The age distribution (Table 1) ranged between 18 to 59 years with the mean age at  $37 \pm 8$ . Over one-third (40.7%) of the respondents were within the ages of 34 and 41 years, whereas only 5.7% were above 50 years of age; as shown in Table 1, this suggests that the fisher-folks in the study area were very young and within their active years. Corroborating this finding, Siyanbola and Fregene (2012) in a similar study found that majority of the fisher folks were youths less than 50 years of age. The results in Table 1 further reveal that the majority (92.1%) were males whereas females were only 7.9%. This implies that fishing activities were predominantly a male occupation as supported by Adeleke (2013). He asserted that the socio-economic characteristics of the artisanal fisher folks in the coastal region of Ondo state, Nigeria was predominately male-dominated.

On marital status, the majority (81.6%) of the fisher folks were married, 14.7% were single, and only 2.9 were widowed. This implies that most of people engaged in fishing were married. This is in consonance with Adeyemi et al. (2009) who posited that "marriage institution is still cherished and an indication of economic responsibilities of the respondents in caring for their dependents". Table 1 shows that a household with 4 to 6 persons constituted the highest percentage (45.0%) with household size mean of  $6 \pm 3$ . This is suggestive of fairly large households with the potential source of family labour as it is being practiced in most agricultural enterprises. This is in consonance with the findings of Adegbite and Oluwalana (2004) and Adegbite et al. (2008) showing that the larger the household size, the more prospects for labour efficiency.

Over 50% of the respondents had no formal education and 42.9% had only primary education. This implies that there is a high level of illiteracy among respondents. This could be due to the fact that most fisher-folks use their children as a source of labour at the expense of formal education. This corroborates with the findings of Anyanwu et al. (2009) who in their study on economic analysis of artisanal fishing at river Niger found that only 2% of fisher folks have tertiary education. The monthly income of fisher folks in the study area ranged between ₦5,000 to ₦60,000 with a mean income of ₦ 22,892. From the results, over 50% of the respondents earn between ₦5000 to ₦18,000 monthly. Only 2.1% of the respondents earn between ₦47,000 to ₦60,000 monthly. This suggests that a larger percentage of fisher folk are not making sufficient income from fishing enterprise due to several constraints facing the fishing industry such as dredging. This observation is in agreement with Anyanwu

**Table 1.** Socio-economic characteristics distribution of respondents

Variable		Frequency	Percentage (%)	Mean
Age (years)	18–25	18	6.4	378
	26–33	56	20.7	
	34–41	110	40.7	
	42–49	72	26.4	
	50–59	16	5.7	
Sex	Male	251	92.1	
	Female	21	7.9	
Marital status	Single	40	14.7	
	Married	222	81.6	
	Widowed	8	2.9	
	Separated	2	0.7	
Household size	1–3	35	12.9	6 ± 3
	4–6	122	45.0	
	7–9	82	30.0	
	10 and above	33	12.2	
Education	No formal education	153	56.4	
	Primary education	117	42.9	
	Secondary education	02	0.7	
	Tertiary education	0	0	
Religion	Christianity	128	47.0	
	Islam	142	52.3	
	Traditionalist	02	0.8	
Monthly income (Naira)	5000–18000	138	50.7	₦22,892 ± 13,564
	19,000–32000	46	17.1	
	33,000–46,000	82	30.0	
	47,000–60,000	6	2.1	
Social group	Yes	253	92.9	
	No	19	7.1	
Membership status	Executive member	56	20.6	
	Ordinary member	115	42.2	
	Adhoc-member	82	30.1	
	Non-member	19	7.1	

et al. (2009) who reported that a gross profit of about ₦20,000 per month by an average fisherman along River Niger in Onitsha, Nigeria.

Furthermore, Table 1 reveals that majority (92.9%) of the respondents were members of one social group or the other common social groups include: some of the social group fisher folks belong to include *Oloruntobi* fishing association, *Jejelaye* fishermen group, Jerusalem fishing group, *Aanuoluwa po* fishing association and *Mijepo* fishermen group. This suggests an active participation of fisher folks in social activities.

### Respondents' knowledge on perceived effect of sand dredging on fishing activities

The results in Table 2 indicate that the respondents perceived sand dredging effect on fishing activities to

include reduced quantity of fish capture, increased fish mortality, frequent escape of fishes during fishing activities, increased time spent on fishing activities, and contamination of water bodies. It implies that the people were knowledgeable about the consequences of the sand dredging effect, but they are constrained to diversify into sand dredging to argument their meager income and alleviate poverty. Barrett (2005) affirmed that poor rural (farming) households face more difficulties overcoming barriers of entry and investment in non-farm activities and thus remain caught in a 'poverty trap'. Ogunbiyi (2012) also observed that illegal sand mining constitutes serious environmental threats and consequences to society of which residents and government authorities are knowledgeable about.

**Table 2.** Respondents' knowledge on perceived effect of sand dredging on fishing activities

S/n	Knowledge Items	Correct (%)	Incorrect (%)	Mean	Rank
1	Increase in the mortality rate of fishes	99.3	0.7	0.99	2 <sup>nd</sup>
2	Loss of river banks due to erosion	62.9	37.1	0.63	18 <sup>th</sup>
3	Contamination of water bodies	99.3	0.7	0.99	2 <sup>nd</sup>
4	Reduced quantity of fishes capture	100		1.00	1 <sup>st</sup>
5	Relocation of fisher folks to other geographical areas	97.1	2.9	0.97	8 <sup>th</sup>
6	Increment of time spent on fishing activities	99.3	0.7	0.99	2 <sup>nd</sup>
7	Frequent flooding of the environment	57.1	42.9	0.57	21 <sup>st</sup>
8	Frequent canoe accident during fishing activities	73.6	26.4	0.74	16 <sup>th</sup>
9	Reduction in income generation	97.9	2.1	0.98	6 <sup>th</sup>
10	Sea animals going into near extinction	78.6	21.4	0.79	15 <sup>th</sup>
11	Frequent capture of immature fishes	25.0	75.0	0.25	23 <sup>rd</sup>
12	Market price fluctuation of fishes	95.7	4.3	0.96	10 <sup>th</sup>
13	High cost of fishing inputs	50.7	49.3	0.51	19 <sup>th</sup>
14	Reduction in tourist activities	17.9	82.1	0.18	24 <sup>th</sup>
15	High occurrence of storm during fishing activities	65.7	34.3	0.66	17 <sup>th</sup>
16	High occurrence of fish migration during fishing activities	97.9	2.1	0.98	6 <sup>th</sup>
17	Loss of nursery ground for migratory fishes	50.7	49.3	0.51	21 <sup>st</sup>
18	Frequent escape of fishes during fishing activities	99.3	0.7	0.99	2 <sup>nd</sup>
19	Increase in the number of labour force during fishing activities	87.9	12.1	0.88	12 <sup>th</sup>
20	Frequent change in pattern of fishing activities	91.4	8.6	0.91	11 <sup>th</sup>
21	Lack of ability to sell fishes at the river bank	59.3	40.7	0.41	22 <sup>nd</sup>
22	Increase in depth of water bodies	97.1	2.9	0.97	8 <sup>th</sup>
23	Increased livelihood diversification of fisher folks	87.9	12.1	0.88	12 <sup>th</sup>
24	Reduction in the quality of water bodies	85.0	15.0	0.85	14 <sup>th</sup>

Grand mean: 0.77

**Table 3.** Constraints to fishing due to sand dredging activities

s/n	Constraints	Severe	Not severe	Mean	SD	Rank
1	Contamination of water due to sand dredging affects fishing activities	94.3	5.7	0.94	0.23	4 <sup>th</sup>
2	Increase in depth of water affects fishing activities	97.1	2.9	0.97	0.16	1 <sup>st</sup>
3	Sand dredging leads to increased labour during fishing activities	67.1	32.9	0.67	0.47	9 <sup>th</sup>
4	We have to move far into the sea before we can have access to catching fish	96.4	3.6	0.96	0.18	2 <sup>nd</sup>
5	Sand dredging activities causes frequent accidents during fishing	73.6	26.4	0.74	0.44	6 <sup>th</sup>
6	Increase in the level of environmental hazard	68.6	31.4	0.69	0.46	8 <sup>th</sup>
7	Damaging of fishing traps in the water	82.1	17.9	0.82	0.38	5 <sup>th</sup>
8	Frequent flood occurrence	71.4	28.6	0.71	0.45	7 <sup>th</sup>
9	Reduction in the level of income	95.7	4.3	0.96	0.20	2 <sup>nd</sup>
10	Loss of fishing equipment and property	55.7	44.3	0.56	0.49	10 <sup>th</sup>

### Constraints to fishing due to sand dredging activities

The constraints to fishing due to sand dredging activities in order of severity in Table 3 shows that increase in depth of water as it affects fishing activities was ranked first ( $0.97 \pm 0.16$ ), while long distance covered on the sea before having access to fish catch ( $0.96 \pm 0.18$ ) and reduction in the level of income  $0.96 \pm 0.20$  were ranked second, respectively. This implies that dredging

activities make the sand bed deeper, which leads to increase depth of water bodies and its ultimate effect is reduction of income, as fewer fishes will be caught. This is consonance with Tamuno (2005) who posited that the depth of the dredged sections poses an additional risk to fisher folks and other river users.

### Livelihood diversification activities of fisher folks

Results in Table 4 show that all fisher folks diversify into at least one activity outside fishing. Majority



**Table 4.** Respondents' livelihood diversification activities

	Diversified livelihood activities	Freq.	Percent	Rank
<b>A</b>	<b>Farming/off farm agricultural activities</b>			
1	Arable crop	31	11.4	3 <sup>rd</sup>
2	Cash crop farming	12	4.3	4 <sup>th</sup>
3	Vegetable farming	35	12.9	2 <sup>nd</sup>
4	Farm product processing	10	3.6	5 <sup>th</sup>
5	Animal husbandry	66	24.3	1 <sup>st</sup>
6	Hunting	8	2.9	6 <sup>th</sup>
	<b>Total diversified on-farm activities</b>	<b>161</b>	<b>59.0</b>	<b>2<sup>nd</sup></b>
<b>B</b>	<b>Off –farm activities</b>			
1	Farm product processing	16	5.7	2 <sup>nd</sup>
2	Produce storage	12	4.3	3 <sup>rd</sup>
3	Marketing of farm products	64	23.6	1 <sup>st</sup>
	<b>Total diversified off-farm activities</b>	<b>91</b>	<b>33.5</b>	<b>3<sup>rd</sup></b>
<b>C</b>	<b>Non-Agricultural activities</b>			
1	Carpentry	19	7.1	4 <sup>th</sup>
2	Motorcycle driving	80	29.3	1 <sup>st</sup>
3	Taxi driving	4	1.4	7 <sup>th</sup>
4	Viewing centre	2	0.7	10 <sup>th</sup>
5	Security	45	16.4	2 <sup>nd</sup>
6	Technician	29	10.7	3 <sup>rd</sup>
7	Painting	4	1.4	7 <sup>th</sup>
8	Selling of plank	2	0.7	10 <sup>th</sup>
9	Schooling	4	1.4	7 <sup>th</sup>
10	Selling of sand	2	0.7	10 <sup>th</sup>
11	Brick laying	8	2.8	6 <sup>th</sup>
12	Fuel marketing	12	4.3	5 <sup>th</sup>
	<b>Total diversified non-farm activities</b>	<b>210</b>	<b>77.1</b>	<b>1<sup>st</sup></b>

(77.1%) diversifies into non-farm activities such as commercial motorbike riding, security and technician services. About 57.0% diversify into on-farm activities such as arable farming, animal husbandry and vegetable farming, whereas only 33.5% of respondents diversify into off-farm activities such as processing of agricultural produce, storage of agricultural produce and marketing of agricultural produce. This trend clearly shows the gradual shift from fishing to other income generating activities as a result of the decline in income from fishing activities caused by sand dredging. In support of this result, Olanipekun and Kuponiyi (2010) who studied the contribution of livelihood diversification to rural households' welfare posited that tendency for high diversification is essential to earn a better living.

#### **Respondent's perception of effect of sand dredging on fishing activities**

Table 5 shows the respondents' perception of sand dredging effect on fishing activities. Respondents perceived: frequent dredging of sand drives fishes far into the sea (4.93), dredging of sand would necessitate

for far travel distance before capture of fish (4.82), frequent dredging of sand should be discouraged (4.81), frequent dredging of sand is likely to reduce income of fisher folks (4.79), sand dredging activities might reduce the quantity of fish caught during fishing activities (4.66) as the major environmental effect of sand dredging on fishing activities.

Furthermore, Table 6 shows respondent's perception level of effects of dredging on fishing activities. Respondents with scores below the mean ( $98.91 \pm 5.01$ ) were categorized as having low perception of sand dredging effect, while those with scores above the mean ( $98.91 \pm 5.01$ ) were categorized as having high perception of sand dredging effect. Majority agreed to high effect of sand dredging on fishing enterprise and considered devastating to fisher folks' livelihood activity. This is consistent with Aigbedon (2005) who posited that sand dredging distorts livelihood activities and has adverse effects on physical environment.

#### **Hypotheses testing**

Table 7 indicates inferential statistical results of Chi square and Pearson Product Moment Correlation

**Table 5.** Respondents' perception on the effect of sand dredging on fishing activities

S/n	Perceived Effects	SA %	A %	U %	D %	SD %	Mean
1	Frequent dredging of sand drives fishes far into the sea	92.9	7.1	0	0	0	4.93
2	Frequent dredging of sand is likely to reduce income of fisher folks	79.3	20.7	0	0	0	4.79
3	Sand dredging activities might reduce the quantity of fish caught during fishing activities	67.1	32.1	0.7	0	0	4.66
4	Dredging of sand may lead to environmental hazards like flooding, erosion and pollution	59.3	40.7	0	0	0	4.59
5	Sand dredging activities can increase employment opportunity	1.4	14.3	53.6	12.1	18.6	3.32
6	Sand dredging activities could reduce the death of aquatic species	0.7	0	1.4	37.1	60.7	4.57
7	Sand dredging activities may enhance easy capture of fishes during fishing activities	4.3	0	2.9	37.1	55.7	4.40
8	Dredging of sand would allow for far travel distance before capture of fish	84.3	15.0	0	0	0.7	4.82
9	Sand dredging activities do allow for migration of household members to far away places from their family in order to secure other means of livelihood	58.6	35.0	3.6	1.4	1.4	4.48
10	Sand dredging activities is likely to disturb movement of canoes during fishing activities	25.0	50.7	20.0	3.6	0.7	3.96
11	Sand dredging activities could have a deleterious effect on fishing activities	78.6	20.0	0	0.7	0.7	4.47
12	Sand dredging activities may increase species of fish catch at any point in time	2.1	1.4	3.6	55.0	37.9	4.25
13	Sand in water bodies is a natural resources that is beneficial to fishery so it should be dredged regularly	16.4	19.3	0	26.4	37.9	3.50
14	Smoke released from machines used during sand dredging can pollute the air and water bodies	75.7	16.4	6.4	0	1.4	4.65
15	Frequent sand dredging could enhance the quantity of fish caught	1.4	0.7	18.6	31.4	47.9	4.23
16	Uncontrolled sand dredging could threaten fishing activities	77.1	18.6	1.4	0.7	2.1	4.68
17	Sand dredging activities usually improve the quality of water bodies	0	2.1	22.1	37.1	38.6	4.12
18	Frequent dredging of sand usually reduce the sale of fishes at the river bank	15.0	6.4	71.4	7.1	0	3.29
19	Dredging of sand usually encourage recreational activities on water bodies	9.3	5.0	67.9	10.7	7.1	3.01
20	Frequent dredging of sand should be discouraged	85.7	12.1	0.7	0.7	0.7	4.81
21	Indiscriminate dredging of sand could enhance clearing of water ways to ease fishing activities	0	0	40.7	29.3	30.0	3.89
22	Sand dredging activities could discourage youths who wish to engage in fishing activities	63.6	35.0	0.7	0	0.7	4.61
23	Uncontrolled sand dredging activities could support the quantity of fishes available for exportation	0.7	2.1	2.1	28.6	66.4	4.58

Grand mean: 4.29

SA – Strongly Agreed, A – Agreed, U – Undecided, SD – Strongly Disagreed, D – Disagreed

**Table 6.** Categorization of respondents based on perceived environmental effects of dredging on fishing activities

Level of Perceived effect	Frequency	%	Min	Max	SD	Mean score
Low effect (23–98.91)	120	44.3	80.0	109.00	5.01	98.91
High effect (98.92–115)	152	55.7				
Total	272	100				

**Table 7.** Chi square and Pearson Product Moment Correlation (PPMC) analysis of respondent's socio-economic characteristics

Variable	N	$\chi^2$ -value	Df	r-value	p-value
Sex	272	0.304	1		0.582
Education	272	1.598	2		0.450
Social group	272	2.886	1		0.049
Marital status	272	4.260	3		0.235
Income	272			-0.181	0.032
Age	272			0.095	0.264
Household size	272			0.117	0.167

Significant at  $P \leq 0.05$ **Table 8.** Pearson Product Moment Correlation (PPMC) – Perceived effects of sand dredging on fishing activities across selected LGAs

Variable	df	Mean	F-value	P-value
Perceived effect across LGAs	3	41.04	1.403	0.457

Significant at  $P \leq 0.05$ 

(PPMC) of respondents' socio-economic characteristics results revealed that respondents' social group ( $\chi^2 = 2.886$ ,  $P \leq 0.05$ ) and monthly income ( $r = -0.181$ ,  $P \leq 0.05$ ) were significantly related to perceived effect of dredging on fishing activities. However, fisher folks' marital status ( $\chi^2 = 4.260$ ,  $P > 0.05$ ), sex ( $\chi^2 = 0.304$ ,  $P > 0.05$ ), education ( $\chi^2 = 1.598$ ,  $P \leq 0.05$ ), household size ( $r = -0.117$ ,  $P > 0.05$ ), and age ( $r = 0.095$ ,  $P > 0.05$ ) were not significantly related to perceived effect of dredging on fishing activities. This implies that respondents' social group and income affects the way fisher folks feel about the effect of dredging on fishing activities. Social group could serve as a platform for sharing experiences, while fisher folks who make sufficient income from fishing are likely not to see dredging as a problem.

Table 8 shows inferential statistical of Pearson Product Moment Correlation (PPMC) result of perceived effects of sand dredging on fishing activities across selected LGAs. The results show that there is no significant difference ( $P > 0.05$ ,  $t = 1.403$ ) between the perceived effects of sand dredging on fishing activities in the selected areas. This can be adduced from the growing demand for sand used for various human activities. Therefore, it implies that the environmental effects of sand dredging on fishing activities are similar across the selected areas. Hence, sustainable environmental programmes on remediation activities to fisher folks should be similar across the region.

## CONCLUSION AND RECOMMENDATIONS

Artisanal fisher folks are knowledgeable about the negative effect of sand dredging on fishing activities. Notable effects identified were increase in water depth and hurdle of travelling far into the sea before catching fish and consequently low income from fish enterprise. Non-farm activities such as commercial motor riding, security job and technical services were the most diversified activities. However, enforcing

strict regulation of government policy against illegal dredging, extension education that focus more on aquaculture practices instead of diversifying to off-farm activities and non-fishing activities and periodic social and environmental impact assessment are measures to curtail the current devastating sand dredging effects.

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*Received: September 17, 2016*

*Accepted after revisions: August 17, 2017*

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