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# An Evaluation of Socioeconomic Status and Handling Practices Used by Small-Scale Fishermen Along Coastal Areas of Ondo State, Nigeria

Olusumbo Adeolu ADELAJA Roslina Binti KAMARUDDIN Lee Wen CHIAT
School of Economics and Agribusiness, College of Business, Universiti Utara Malaysia

**Abstract**
The purpose of this paper is to examine the socio-economic status and handling practices used by small-scale fishermen along coastal areas of Ondo State, Nigeria with respect to reduction of post-harvest fish losses. The study was carried out in twenty (20) fishing communities along the coastal areas of Ondo State, Nigeria. Primary data were used through administration of 21 questionnaires to active fishermen from each fishing communities as instrument for data collection. Most (44%) of the fishermen spent 12 hours for their fishing cycle. Result shows that fishermen do not have access to ice for preservation of fish and as a result of this they ensure to come back on time to maintain good quality fish prior to checking. Despite limiting the duration of fishing cycle, losses do occur due to handling practices used. Fish are placed on the floor of the boat after hauling of the nets at the fishing ground and covering materials are not made available for the fishermen. Significant association exist between demographic factors and duration of fishing cycle while there is no significant relationship between demographic factors and where fresh fish are placed. It is suggested that provision of infrastructural facilities such as good road network, storage facilities, covering materials and constant supply of electricity will reduce post-harvest fish losses. This will help fishermen to make more income as a result of good quality fish, improve their livelihood, rural development and ensure food security in the state and country at large.
**Keywords:** Handling practices, small-scale fishermen, rural development, post-harvest losses, food security

## 1. Introduction

The fisheries sector of Nigeria consists of capture and aquaculture fisheries. Capture fisheries is further sub-divided into industrial and artisanal which flourish well inside and outside to the open deep waters of 200nm EEZ across the 9 coastal states of the country's coastline (Ipinmoroti, 2012; Oladimeji et al., 2013; Okeowo et al., 2015). Report from Food and Agriculture Organization (FAO) (2010) stated that artisanal fisheries (668,754 tonnes) has the largest fish production level when compared to other sub-sectors (industrial sector 45,631 tonnes and aquaculture 253,893 tonnes) as at 2012. Despite the huge fish production level to the fisheries sector, the sub-sector is faced with serious of issues (post-harvest losses) hindering its development (Kumolu-Johnson & Ndimele, 2011; Emere & Dibal, 2013; Olusegun & Matthew, 2016). Artisanal fisheries simply mean small-scale fisheries which use outdated fishing equipment such as small boat, low cost expenses, low cost of operation and low application of innovation (Adedokun et al., 2006; Oladimeji et al., 2013). Marine small-scale operations (Artisanal) are categorized into two main sectors; brackish water fishing which is carried out within the creeks and estuaries where fresh water river and salt water ocean mixed together with high current; and coastal artisanal fisheries where fishermen do not go beyond depth less than 18 metres within the shore waters and less than 40 km distance from the coast (Jamiu, 2014). Small-scale fisheries use either active or passive nets and traps which is thrown from their wooden canoes with or without outboard engine of capacities between 15 and 40 horse power for their fishing activities (Bangura, 2012). According to Amos et al. (2007) fishermen spent longer time during fishing which is one of the factor that is responsible for fish losses. Fish spoilage is aggravated where provision of ice are not available for landed fish and time factor has been discovered to influence the spoilage rate of fresh fish. According to Diei-Ouadi and Mgawe (2011), fish spoilage will set in overtime whether ice or not. Similarly, period of time for set nets in the water also contribute to physical damage and stress of captured fish (LFI, 2009). This leads to body bruises, scale removal and so on which gives room for microbial attack to set in thereby leading to high level of spoilage (Diei-Ouadi & Mgawe, 2011). Due to high perishability of fish, suitable handling practices are required; spoilage rate are intensified where poor fish handling practices are carried out. Such practices include use of dirty fishing equipments, use of dirty boats, washing the fish in dirty water and placing of fish on surfaces that are dirty (Diei-Ouadi & Mgawe, 2011; Mungai, 2014). Findings from study carried out by Kyangwa and Odongkara (2005) discovered that fishermen do mishandle fish on board and during removal form fish nets. Likewise, Namisi (2005) indicated that fish caught are placed in open boat without the use of ice. The objectives of this study were to examine the demographic factors of the fishermen, post-harvest handling practices used on the fishing ground and landing site and determine the causes of post-harvest fish losses in the study area.

 

## 2. Materials and methods

This study was carried out along coastal areas of Ondo State, Nigeria. The coastal areas of Ondo State is around Ilaje Local Government Area (ILGA) with about 50 fishing settlements dispersed around the tributaries of the river that empty straight into the coast (Adebowale et al., 2008). The Local Government is located towards the extreme southern part of the state which covers about 1,318 $Km^2$ area and shares limits with the Ikales of Okitipupa and Ese-Odo LGAs in the north; the Ijebus of Ijebu- Waterside LGA of Ogun state in the west; the Apoi and Arogbo Ijaws in the north-east, as well as the Itsekiris of Delta state on the eastern flank, while the Atlantic Ocean formed the southern boundary (Figure 1). ILGA has the long fishing history dating back to precolonial days. The major people found along the coastline in the fishing communities are the fish producers. The people are native of Ilajes and their husband and male children are majorly the fishermen while their wives and female children are the processors (Adeparusi et al., 2003). About 80% of the Local Government is covered with swamp, water and flood plains while the coastline is characterized with vegetation of white mangrove *Aucennia africana* and *Paspalum vaginatom*. The flood plains are covered by *Eichornial crassipes* (water hyacinth) and *Typha, Avstralis* (Omotoso & Daramola, 2005). Transportation system are through speedboats, motorized canoes and paddled canoes. Fishing is the main occupation which is due to around 75% being riverine attached with open access to the sea. This area is considered as one of the most important fishing areas in the coast which have rich biodiversity that contains various grouping of fish, shellfish (shrimps, crabs, lobster, gastropods and cephalopoda), reptiles and other living organisms.

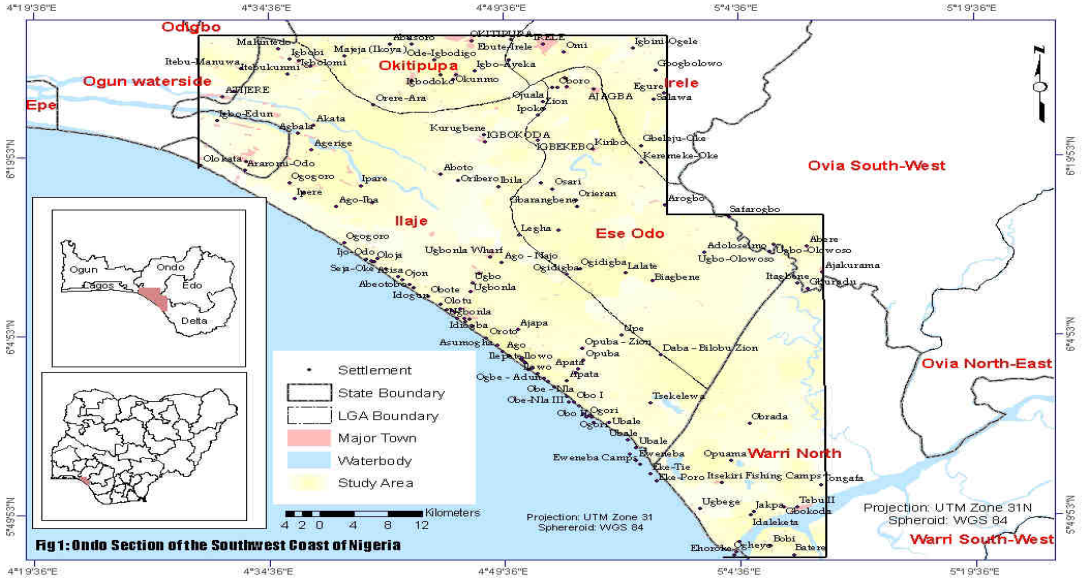


**Figure 1:** Map showing fishing communities along coastal areas of Ondo State
**Source:** http://pubs.sciepub.com/ajrd/2/1/1/index.html

### *2.1 Data collection and analysis*

Primary data were used for the collection of information through the use of structured interview guide. Multi-stage sampling technique was used in this study. Twenty one (21) active fishermen were simple randomly selected from twenty (20) viable fishing communities which were selected through purposive sampling technique. This gives a total of 420 respondents which were interviewed through face to face questionnaire administration but 400 was used for the analysis due to unanswered questions by some fishermen. This survey was carried out from March to June, 2017. Data were analysed using descriptive statistics (frequency, mean and standard deviation) and inferential statistics (SPSS 23). To determine the causes of post-harvest fish losses in the study area, a list of possible losses was compiled and investigated under 5-point Likert-type with five response options: strongly agree = 5, agree = 4, neutral = 3, strongly disagree = 2 and disagree = 1. The values were added and later divided by five to obtain a mean score of 3.0. This implies that any mean score that was equal to or higher 3.0 was perceived as a cause of post-harvest fish losses while mean score lower than 3.0 was perceived as not a cause of post-harvest fish losses. This is in accordance with Kessler (2006) as cited in Nenna and Ugwumba, 2014, p.263. The mean score is determined thus:

$Xs=\Sigma X/n$

Xs of each was computed by multiply the frequency of each response pattern with its appropriate nominal value and dividing the sum with the number of respondents to the items. This can be summarized with the equation below

$Xs = \Sigma fn/nr$

Where;
Xs = mean score
Σ = Summation
*f* = frequency
n = Likert nominal value
nr = Number of respondents

$$Xs = \frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$$

## 3. Results and discussion

### *3.1 Demographic characteristics of fishermen*

Table 1 presents the demographic results of the respondents in frequency and percentage. Almost 60% of the fishermen were between the age ranges of 31 to 40 years while 33% fall within 41 to 50 years of age. Result shows that all (100%) the fishermen were males in the study area. Majority (97.8%) of the fishermen were married while 1.3% were still single. All (100%) the fishermen in the study area were Yoruba tribe. The household size of majority (72%) of fishermen were within the ranges of 6 to 10 people per household. About 61% of the respondents had secondary education while 36% had only primary education. Nearly 30% of the fishermen had fishing experience between 16 to 20 years.

Table 1. Demographic factors of respondents (n = 400)

| Variables | Frequency | Percentage |
|---|---|---|
| **Age (years)** | | |
| 20 – 30 | 32 | 8.0 |
| 31 – 40 | 229 | 57.2 |
| 41 – 50 | 132 | 33.0 |
| Above 50 | 7 | 1.8 |
| Mean ± std | **38.60 ± 5.64** | |
| **Sex** | | |
| Male | 400 | 100.0 |
| **Religion** | | |
| Christianity | 400 | 100.0 |
| **Marital status** | | |
| Single | 5 | 1.3 |
| Married | 391 | 97.8 |
| Divorced | 1 | 0.3 |
| Widowed | 3 | 0.8 |
| **Tribe** | | |
| Hausa | 0 | 0.0 |
| Igbo | 0 | 0.0 |
| Yoruba | 400 | 100.0 |
| **Household size** | | |
| Less than 6 | 108 | 27.0 |
| 6 – 10 | 288 | 72.0 |
| Above 10 | 4 | 1.0 |
| Mean ± std | **6.45 ± 1.44** | |
| **Educational qualification** | | |
| No formal education | 13 | 3.3 |
| Primary education | 144 | 36.0 |
| Secondary education | 243 | 60.7 |
| **Fishing experience (Years)** | | |
| Less than 10 | 88 | 22.0 |
| 10 – 15 | 80 | 20.0 |
| 16 – 20 | 112 | 28.0 |
| 21 – 25 | 62 | 15.5 |
| Above 25 | 58 | 14.5 |
| Mean ± std | **17.61 ± 6.82** | |

**Source:** Field survey, 2017

### *3.2 Handling practices used by fishermen*

Various handling practices carried out by fishermen is presented in Table 2. It was discovered that most (44%) of the fishermen spent 12 hours for their fishing trip, about 34% spent 13 hours while a lesser percentage (3.3%)

 

spent 10 hours on fishing trip. The survey also revealed that all (100%) the fishermen make use of drift net to carry out their fishing activities with the use of planked boat majorly (89.2%) 9m in length which is powered by an outboard engine in the study area. Result shows that 99.5% of the fishermen placed the captured fish directly on the floor of the boat at the fishing ground together with the net. In other to prevent excessive sunlight on fresh fish, covering of fish with sack/nylon was another major form of handling method used by all (100%) the fishermen in the study area. All the fishermen stated that ice is not available for preservation due to lack of electricity. As a result of this, fish are offloaded immediately after landing in the study area. With respect to where fish are placed at the landing site, 77.7% of fishermen placed fish in the plastic basin, 18.8% placed inside woven basket while 3.5% placed fish on the ground. Majority (63%) of the fishermen sell through hand and basket to their buyers, 36.5% sells through kilogram, hand and basket while a lesser percentage (0.5%) sell through the use of basket only. Result shows that all the fishermen do have left overs of fish after selling at the landing site. It was discovered that they sell part at the landing site and take the other part home for their wives to process immediately against the next market day which is 3days interval.

Table 2. Handling practices used

| Variables | Frequency | Percentage |
|---|---|---|
| **Duration of fishing trip** | | |
| 10 hours | 13 | 3.3 |
| 11 hours | 55 | 13.7 |
| 12 hours | 176 | 44.0 |
| 13 hours | 136 | 34.0 |
| 14 hours | 20 | 5.0 |
| **Mean ± std** | **12.24 ± 0.87** | |
| **Fishing trips/week** | | |
| 4 times | **46** | 11.5 |
| **5 times** | **254** | 63.7 |
| **6 times** | **100** | 25.0 |
| **Mean ± std** | **5.14 ± 0.63** | |
| **Type of fishing gear used** | | |
| Drift net | 400 | 100.0 |
| **Types of fishing boat used** | | |
| Plank boat | 400 | 100.0 |
| **Size of boat used (meter)** | | |
| Less than 7 | 0 | 0.0 |
| 8 meter | 43 | 10.8 |
| 9 meters | 357 | 89.2 |
| **Where are the fresh fish placed after removal from the fishing ground** | | |
| Plastic basin | 2 | 0.5 |
| Placed on the floor of the boat with net | 398 | 99.5 |
| Woven basket | 0 | 0.0 |
| **Other form of handling method used to preserve fresh fish** | | |
| Covering of fish with sack/nylon | 400 | 100.0 |
| **Did you use ice to preserve fresh fish?** | | |
| Yes | 0 | 0.0 |
| No | 400 | 100.0 |
| **If no, state why** | | |
| No electricity | 378 | 94.5 |
| No ice | 22 | 5.5 |
| **Are fish landed and offloaded without delay** | | |
| Yes | 400 | 100.0 |
| No | 0 | 0.0 |
| **Where is fresh fish placed at the landing site** | | |
| On the ground | 14 | 3.5 |
| Plastic basin | 311 | 77.7 |
| Woven basket | 75 | 18.8 |
| **How do you sell your fresh fish at the landing site** | | |
| Basket | 2 | 0.5 |
| Hand and basket | 252 | 63.0 |
| Per kilogram, hand and basket | 146 | 36.5 |
| **At the landing site after sales, do you normally have leftovers of fresh fish** | | |
| Yes | 400 | 100.0 |
| No | 0 | 0.0 |
| **If yes, what do you do?** | | |
| Smoke | 351 | 87.7 |
| Smoke and sundry | 49 | 12.3 |

**Source:** Field survey, 2017

*3.3 Cleaning practices carried out by the fishermen at the landing site*

Table 3 shows the various cleaning practices carried out by the fishermen at the landing site. It was discovered that all (100%) the fishermen clean their boat, fish holding accessories, fishing gear with plain water and fish are

 

sorted at the landing site while majority (76.75%) of them wash their fish along the shoreline at the landing site. From the result and observation, it was discovered that fishermen do not degut their fish as a result of this expose the fresh fish to high rate of spoilage.

Table 3. Cleaning practices observed by the fishermen at the landing site

| **Variables** | **Yes** **Freq (%)** | **No** **Freq (%)** |
|---|---|---|
| Cleaning of boat after landing | 400 (100.0) | 0 (0.0) |
| Cleaning of fish hold and accessories | 400 (100.0) | 0 (0.0) |
| Cleaning of fishing gear | 400 (100.0) | 0 (0.0) |
| Washing of fish | 307 (76.75) | 93 (23.25) |
| Sorting of fish | 400 (100.0) | 0 (0.0) |
| Evisceration and removal of gills | 0 (0.0) | 400 (100.0) |
| Icing of fish | 0 (0.0) | 400 (100.0) |

**Source:** Field survey, 2017

*3.4 Causes of post-harvest fish losses in the study area*

This section presents the discoveries of the survey conducted with the fishermen in the study area. This exercise was facilitated by the need to understand the issues on post-harvest fish losses and to have in depth knowledge on the problem faced by fishermen for adequate policy intervention. Various items were compiled for adequate investigation from the fisher by rating accordingly using 5-point likert scales (disagree, agree, neutral, strongly disagree and disagree). Based on findings in Table 4, duration of fishing cycle to landing site leads to losses, delays in hauling nets result in poor-quality fish resulting to quality loss, use of chemicals in fishing affects the safety and quality of fish posing threat to consumers' health, exposing of fish to high temperature creates favourable conditions for fish spoilage leading to quality loss and affecting price, poor handling practices during unloading of fish causes quality losses, lack of covering facilities for fresh fish at the landing site to prevent excess sunlight, failure to use ice and containers result in poor quality fish, insect infestation and animal predation on fresh fish leads to losses, lack of storage facilities to ensure good quality of fish can lead to losses, lack of good means of transportation for effective movement of fresh fish, unexpected demand and supply situations can affect price and inadequate dissemination of market information can lead to selling of fish at a lower price resulting to market loss are all causes of post-harvest fish losses while discarding of by-catch at sea because fish is too small or not valuable enough to land for sale, fishing gear used by the fishermen causes quality loss, fish spoil easily if not preserved properly with ice during fishing and high post-harvest fish losses occur during rainy season were not causes of post-harvest fish losses.

Table 4. Causes of post-harvest fish losses

| Items | Disagree (1) | Strongly Disagree (2) | Neutral (3) | Agree (4) | Strongly Agree (5) | Weighted score | Weighted mean |
|---|---|---|---|---|---|---|---|
| | Freq (%) | Freq (%) | Freq (%) | Freq (%) | Freq (%) | | |
| Duration of fishing cycle to landing site leads to losses | | | | 157 (39.3) | 243 (60.8) | 1843 | 4.6** |
| Delays in hauling nets result in poor-quality fish resulting to quality loss | | | | 88 (22.0) | 312 (78.0) | 1912 | 4.8** |
| Use of chemicals in fishing affects the safety and quality of fish posing threat to consumers' health | | | | 175 (43.8) | 225 (56.3) | 1825 | 4.6** |
| Exposing of fish to high temperature creates favourable conditions for fish spoilage leading to quality loss and affecting price | | | | 182 (45.5) | 218 (54.5) | 1818 | 4.5** |
| Discarding of by catch at sea because fish is too small or not valuable enough to land for sale | 92 (23.0) | 269 (67.3) | 39 (9.8) | | | 747 | 1.9* |
| Fishing gear used by the fishermen causes quality loss | 139 (34.8) | 238 (59.5) | 16 (4.0) | 5 (1.3) | 2 (0.5) | 693 | 1.7* |
| Poor handling practices during unloading of fish causes quality losses | | | | 124 (31.0) | 276 (69.0) | 1876 | 4.7** |
| Lack of covering facilities for fresh fish at the landing site to prevent excess sunlight | | | | 194 (48.5) | 206 (51.5) | 1806 | 4.5** |
| Failure to use ice and containers result in poor quality fish | | | 1 (0.3) | 180 (45.0) | 219 (54.8) | 1818 | 4.5** |
| Insect infestation and animal predation on fresh fish leads to losses | | | | 170 (42.5) | 230 (57.5) | 1830 | 4.6** |
| Fish spoil easily if not preserved properly with ice during fishing | 188 (47.0) | 212 (53.0) | | | | 612 | 1.5* |
| Lack of storage facilities to ensure good quality of fish can lead to losses | | | | 151 (37.8) | 249 (62.2) | 1849 | 4.6** |
| Lack of good means of transportation for effective movement of fresh fish | | | | 131 (32.8) | 269 (67.2) | 1869 | 4.7** |
| Unexpected demand and supply situations can affect price | | | 4 (1.0) | 257 (64.3) | 139 (34.8) | 1735 | 4.3** |
| Inadequate dissemination of market information can lead to selling of fish at a lower price resulting to market loss | 26 (6.5) | 29 (7.3) | - | 75 (18.8) | 270 (67.5) | 1734 | 4.3** |
| High post-harvest fish losses occur during rainy season | 105 (26.3) | 295 (73.7) | | | | 695 | 1.7* |

Source: Field survey, 2017

## 4. Cross- tab relationship between demographic factors and handling practices

*4.1 Relationship between demographic factors of fishermen and duration of fishing cycle*

From Table 5, result shows that age, household size, educational status and fishing experience are significantly

related ($p < 0.05$) with duration of fishing cycle. This simply shows that alternative hypothesis is accepted while null hypothesis is rejected. Age cross-tabulation count indicates that out of 57.2% of fishermen between ages of 31 – 40 years, 53% used between 10 to 12 hours length for fishing cycle while 4.2% used between 13 to 15 hours. Household size cross-tabulation count shows that out of 72% of fishermen within the range of 6 – 10 people, 34% of them use between 10 to 12 hours during fishing cycle while 38% used 13 to 15 hours. Educational qualification cross-tabulation indicates that 21.8% of fishermen with secondary education spend 10 to 12 hours for fishing cycle while 39% spend 13 – 15 hours. Out of 26.5% of fishermen with fishing experience between 16 – 20 years, 19% of them use between 10 to 12 hours for fishing cycle while 6.5% spend 13 to 15 hours for fishing cycle.

Table 5. Relationship between demographic factors with duration of fishing cycle (hours)

| Variables | 10 – 12 | 13 - 15 | Total | $\chi 2$ | df | P-value |
|---|---|---|---|---|---|---|
| **Age** | | | | | | |
| 20 – 30 | 32 (8.0) | 0 (0.0) | 32 | | | |
| 31 – 40 | 212 (53.0) | 17 (4.2) | 229 | 333.846 | 3 | 0.000 |
| 41 – 50 | 0 (0.0) | 132 (33.0) | 132 | | | |
| Above 50 | 0 (0.0) | 7 (1.8) | 7 | | | |
| **Household size** | | | | | | |
| Less than 6 | 108 (27.0) | 0 (0.0) | 108 | | | |
| 6 – 10 | 136 (34.0) | 152 (38.0) | 288 | 98.286 | 2 | 0.000 |
| Above 10 | 0 (0.0) | 4 (1.0) | 4 | | | |
| **Educational qualification** | | | | | | |
| No formal education | 13 (3.2) | 0 (0.0) | 13 | | | |
| Primary education | 144 (36.0) | 0 (0.0) | 144 | 165.230 | 2 | 0.000 |
| Secondary education | 87 (21.8) | 156 (39.0) | 243 | | | |
| **Fishing experience (Years)** | | | | | | |
| Less than 10 | 88 (22.0) | 0 (0.0) | 88 | | | |
| 10 – 15 | 80 (20.0) | 0 (0.0) | 80 | | | |
| 16 – 20 | 76 (19.0) | 26 (6.5) | 102 | 318.569 | 4 | 0.000 |
| 21 – 25 | 0 (0.0) | 62 (15.5) | 62 | | | |
| Above 25 | 0 (0.0) | 68 (17.0) | 68 | | | |

**Source:** Field survey, 2017

*4.2 Relationship between demographic factors and where fresh fish are placed after hauling from the fishing ground.*

From Table 6, result shows that age, household size, educational status and fishing experience are not significantly related ($p > 0.05$) with where fresh fish are placed after hauling from the fishing ground. This simply shows that alternate hypothesis is rejected while null hypothesis is accepted. Age cross-tabulation count indicates that out of 57.4% of fishermen between ages of 31 – 40 years, 57.2% of them place their hauling net with fresh fish on the floor of the boat while 0.2% put the hauling net in a plastic basin bottom. Household size cross-tabulation count shows that out of 72% of fishermen within the range of 6 – 10 people, 71.8% of them place fresh fish on the floor of the boat immediately it is hauled while 0.2% make use of plastic basin. Educational qualification cross-tabulation indicates that out of 60.7% of fishermen that had secondary education, 60.5% place their fish on the floor of the boat while 0.2% make use of plastic basin. Out of 25.4% of fishermen with fishing experience between 16 – 20 years, 25.2% place their fish on the floor of the boat while 0.2% make use of plastic basin.

Table 6. Relationship between demographic factors with where fresh fish are placed after hauling from the fishing ground

| Variables | Plastic basin | Floor of the boat with the fishing net | Total | $\chi 2$ | df | P-value |
|---|---|---|---|---|---|---|
| **Age** | | | | | | |
| 20 – 30 | 1 (0.2) | 31 (7.8) | 32 | | | |
| 31 – 40 | 1 (0.2) | 228 (57.2) | 229 | 5.149 | 3 | 0.161 |
| 41 – 50 | 0 (0.0) | 132 (33.0) | 132 | | | |
| Above 50 | 0 (0.0) | 7 (1.8) | 7 | | | |
| **Household size** | | | | | | |
| Less than 6 | 1 (0.2) | 107 (26.8) | 108 | | | |
| 6 – 10 | 1 (0.2) | 287 (71.8) | 288 | 0.549 | 2 | 0.760 |
| Above 10 | 0 | 4 (1.0) | 4 | | | |
| **Educational qualification** | | | | | | |
| No formal education | 0 (0.0) | 13 (3.2) | 13 | | | |
| Primary education | 1 (0.2) | 143 (35.8) | 144 | 0.213 | 2 | 0.899 |
| Secondary education | 1 (0.2) | 242 (60.5) | 243 | | | |
| **Fishing experience (Years)** | | | | | | |
| Less than 10 | 1 (0.2) | 87 (21.8) | 88 | | | |
| 10 – 15 | 0 (0.0) | 80 (20.0) | 80 | 2.245 | 4 | 0.691 |
| 16 – 20 | 1 (0.2) | 101 (25.2) | 102 | | | |
| 21 – 25 | 0 (0.0) | 62 (15.5) | 62 | | | |
| Above 25 | 0 (0.0) | 68 (17.0) | 68 | | | |

**Source:** Field survey, 2017

## 5. Discussion

Respondents' age shows that fishermen are still in their productive, active and agile years for fishing activities. Almost 60% of the respondents fall within the age range of 31 to 40 years while around 33% was in the range of 41 to 50 years. This is in agreement with Adewumi et al. (2012) findings that majority of fishermen fell within the age range of 31 to 40 years and also supported by Mungai (2014). Fishing activities is dominated by married males, Yorubas, Christians in the study area. This result was in accordance with Akande and Diei-Ouadi (2010, Adewumi et al. (2012), and Tesfay and Teferi (2017) stated that fishing activities were majorly carried out by males while the processing of fish is done by the females. Almost 75% of the respondents have household size within the range of 6 to 10 people. Respondents stated that though they have secondary education but not all of them completed secondary education due to lack of good schools in the study areas. About 60% had secondary education while around 36% had primary education. Based on their level of education, it was assumed that this will inspire them to accept modern handling practices. Almost 30% of respondents had between 16 to 20 years of fishing experience. The mean duration of fishing trip in the study area is 12 hours. This is in agreement with Olusegun and Matthew (2016) that period of fishing with the available fishing gears should not surpass 12 hours prior to checking. This will make fish caught early to stay in excellent condition by the time it gets to the landing site. Literatures reported that if fish is not properly handled, there is possibility that deterioration will set in 12 hours after harvest (Kabahenda et al., 2009; Yohanna et al., 2013). Report from Mungai (2014) stated that fish from artisanal fishermen stayed at ambient temperature between 13 hours to 19 hours or more. It was observed that numerous factors such as fishing method, distance of the fishing ground to the landing site and weather determine fishing cycle. Longer fishing cycle leads to increased post-harvest fish losses due to spoilage (Amos et al., 2007). It was also stated that if good hygiene conditions are observed, freshness of fish will be maintained until it is off-loaded. All (100%) the fishermen make use of drift net to carry out their fishing activities with the use of planked boat majorly (89.2%) 9m in length which is powered by an outboard engine in the study area. According to OIA (2003), small boats are powered with outboard gasoline motors. Also, Nguvava (2013) findings revealed that 88.9% boats used in the study was powered by outboard gasoline engine. Suggestions from Masetta and Kasiga (2007) and Mungai (2014) stated that designs of boats and construction should be made with smooth surfaces with negligible projections, free of cracks, blunt inner corners to avoid concealing of dirt and micro-organisms and enable sufficient drainage. Findings revealed that majority of the fishermen placed the captured fish directly on the floor of the boat after hauling of net from the fishing ground. This findings is supported by Mungai (2014) stated that fishermen placed fish on the boat floor due to lack of adequate facilities and expose the fish to spoilage. In other to prevent excessive sunlight on fresh fish, covering of fish with sack/nylon was another major form of handling method used by all (100%) the fishermen in the study area. This

is in consistent with Tesfay and Teferi (2017) findings that fish are kept cool by covering them with sack. This is as a result of lack of ice in the study area and an alternative to ensure good quality of fish from the fishing ground to the landing site was improvised. From the observation, it is an offence which attract penalty fee if fish is not covered while coming from the fishing ground to the landing site. According to Diei-Ouadi and Mgawe (2011) and Nguvava (2013), it was observed that fish exposed to direct sun rays at the fishing grounds increased the spoilage rate by drying off surface of fish. The major reason why fish are being exposed to sunlight is due to lack of covering facilities. Similar outcomes were reported by Odongkara and Kyangwa (2005) cited in Mungai, 2014, p. 67, that fish transported from fishing ground to the landing site which were placed at the bottom of the boats were covered with leaves or plastic sheets. From the survey carried out by Mungai (2014), report shows that some of the fishermen did not cover their fish which resulted to high percentage of losses. Lack of ice also poses a serious threat to fishermen. Due to this, fish are offloaded timely in other to maintain the fish quality. Result shows that all the fishermen do have left overs of fish after selling at the landing site. In other to maintain the shelf life of the fish, the left overs are smoked and sundried which is sold on the next market day which is 3days interval. In the study area, fishermen do not remove gills or ice fish at the landing site. This is not in agreement with Mungai (2014) that fish should be degutted on board in other to reduce rate of spoilage. Correspondingly, Ponte (2005) stated that cleaning of fishing boats and other fishing accessories is not a daily routine by the fishermen and contaminated water is being used for this practice. Five (5) likert scale was used to rate the constraints faced by fishermen in the study area. This was used according to Nenna and Ugumba (2014) who carried out research on problems faced by farmers in Anambra State and used 5-point likert scale to identify level of severity of problem. Mean score of 3.0 was used as a baseline. This simply indicates that any mean value that is higher than 3.0 are causes of post-harvest fish losses which needs to be addressed while any mean value below 3.0 is counted as not a cause of post-harvest fish losses. Lack of infrastructural facilities, storage facilities, ice, delay in hauling of fishing nets, lack of electricity, lack of covering materials and insect infestation were seen as major constraints faced by fishermen. This is in line with Adewumi et al. (2012), Mungai (2014), and Tesfay and Teferi (2017) stated that rural communities are faced with lack of infrastructural facilities which is hindering rural development and livelihood of the small-scale fishermen.

## 6. Conclusion

Small-scale fisheries worldwide have been rated as being poor due to lack of infrastructural facilities, low income level and poor livelihood. Based on the findings in the study area, training on effective handling practices should be organized for the fishermen. This will help in proper handling of fish on the board and at the landing site and losses will be reduced in the study area. Also, fishing time should be reduced to the barest minimum of 12 hours prior to checking irrespective of the fishing gears used; proper handling of fish on board should be done by gutting, washing and storing in clean containers; Government is beseeched to pay more attention to the artisanal fishermen by providing adequate infrastructures that will help to maintain the quality of fish catch which will improve their income and livelihood.

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