**SOCIO-ECONOMIC ANALYSIS OF A SMALL SCALE FISHERY: A CASE STUDY OF *Pellonula leonensis* FISHERY IN OGUN COASTAL ESTUARY, SOUTH WEST NIGERIA**

**1.0 INTRODUCTION**

Inland fisheries are important source of revenue including foreign exchange for many countries through the sale of fish. It is also a source of food for poor people which play an important role in improving Africa’s food security (Bene and Heck, 2005). Inland fisheries in Nigeria is said to contribute about 200,000 metric tons to the total annual national fish production that stagnates at about 500,000 metric tonnes (Abiodun and Miller, 2007).

Freshwater fisheries provide benefits such as food to the people in developing countries. They provide a livelihood and income for millions of the world’s poorest people, and also contribute to the overall economic wellbeing of many developing countries by means of export commodity trade, tourism and recreation (World-Fish Centre, 2002). Nigeria is blessed with over 14 million hectares of reservoirs, lakes, ponds and major rivers capable of producing over 980,000 metric tonnes of fish annually (FDF, 2007). The annual fish consumption/demand in Nigeria has been estimated to be over 1.3 million metric tonnes and the total domestic production is just about 450,000 metric tonnes per annum (Tsadu *et al.,* 2006). Nigerians are high fish consumers with total consumption figures of about 1.5 million metric tonnes, out of which about 700,000 metric tonnes is imported (FAO, 2000). The domestic fish production from aquaculture, artisanal and industrial fisheries for 2014 is 1.123 metric tonnes (FDF, 2016), while the demand for fish keeps growing in Nigeria, the production of fish in the country is declining.

Artisanal fisheries sector made up the most important sector, which accounts for the major fish supply in the developing world. According to FAO (1991) assessment, out of 1.9 million people engaged in either full time, part time or seasonal fishing about 98% belongs to the artisanal sector. Artisanal fishery is however characterized with low technology, lack of modern equipments and low fund to expand, resulting in labour intensiveness of the sector, with little or no opportunities to expand. These problems however forced the fishermen to seek for additional income in non-fishing activities. Also, small-scale fisheries are often characterized by resource depletion, poor economic performance (manifest as poverty in fishing-dependent communities), food and/or nutritional insecurity, and social and cultural stress (Andrew *et al*., 2007; Bene *et al*., 2007).

Fishery business is very lucrative and plays a significant role in the economic condition of fishing communities. Fishery resources, if properly managed and adequately utilized create employment opportunities and provide a cheaper source of quality dietary protein thereby, improving the livelihood of the fishing communities and the populace of Nigeria at large. Adeyemo (2003) also reported that fish and fish based products provide cheap but high quality protein compared to bush meat, poultry, pork or beef. Apart from protein, fish also contains a wide variety of vitamins which include vitamins A, B (thiamine, riboflavin, nicotinic acid) C, D and E.

It is widely accepted view that the fish yields of most Nigerian inland waters are generally on the decline (Jamu and Ayinia, 2003). The decline of these fisheries has been attributed to a wide range of causes ranging from environmental degradation of the water bodies to inadequate management of the fisheries resources. For sustainable exploitation of these fisheries resources a crucial management tool is to have a comprehensive understanding of the fishery situation of the water bodies.

**1.1 Justification**

Fish compliments meat as the cost of the latter is beyond what most Nigerian can afford (Adedokun, *et al.*, 2006; Oladimeji *et al.*, 2013). In Nigeria, the artisanal fishery covers operation of small motorized or non-motorized canoes by fishermen in the coastal areas. This provides jobs for over 400,000 fishermen in the coastal areas and members of their families (Akegbejo-Samsons, 1997). Quite a sizeable proportion of the Nigerian population depends on fishing as a source of income. Apart from being an income earner to many Nigerians especially people in coastal, riverine and lake areas of the country, people earn their living from fish processing and marketing while others engaged in fisheries research (Soyinka and Kusemiju,2007; Bolarinwa, 2012). Thus, fish being the cheapest source of animal protein to human, there is need to protect and manage the fishery in the reservoirs for the community. In order for this to be done effectively, detail knowledge of the fishery of the coastal estuary is not only important but necessary. Also, knowledge of the status and trends of capture fisheries, including socio-economic aspects, is key to sound development of policy, better decision-making, and responsible fishery management. It is necessary at a national level for the maintenance of food security and for describing the social and economic benefits of fisheries.

**1.2 Problem statements**

Despite various efforts to increase fish production, not much has been done to increase the productivity, profitability, activities, and problems of *Pellonula leonensis* fishery in Ogun coastal water estuary. Increase in fish production will contribute to the well-being of the economy as a whole as this will improve the nutrition of the nation, as improvement in the nutrition of the nation will amount to national progress. Fresh fish provides an excellent source of protein for human diet. Again, with this research, artisanal fishermen might be able use the outcome of this study in the best way to enhance increase in productivity. It is against this background that this study attempts to provide answers to the following questions:

i. What are the socio-economic characteristics of fishermen engaging in *Pellonula leonensis* fishery in the study area?

ii. What is the cost structure and profitability of *P. leonensis* fishery in the study area?

iii. What are the factors that affect profitability and sustainability of *P. leonensis* fishery in the study area?

iv. What are the challenges faced by fishermen of this fishery in the study area?

v. What are the different types of fishing gears used at each location and their contribution to fishing activities in the study area?

vi. What is the profitability ratio of fisher folks in *P. leonensis* fishery?

**1.3 Objective of the study**

The main objective of the study is to examine the socio-economic analysis of fishermen in *Pellonula leonensis* fishery in the Ogun coastal estuary.

The specific objectives are to:

1. describe the socio-economic characteristics of fishermen capturing *P. leonensis* in the study area
2. analyze the cost structure and profitability of *P. leonensis* fishery in the study area
3. evaluate the factors that affect the profitability and sustainability of artisanal fisherfolks in the study area
4. identify the constraints facing *P. leonensis* fishery in the study area
5. determine the profitability ratio of fisher folks in *P. leonensis* fishery in the study area.

**1.4 Hypotheses of the Study**

The hypotheses were stated in a null form.

1. There is no significant relationship between the socio-economic characteristics of the respondents and *Pellonula leonensis* fishery in the study area.
2. There is no significant difference in the economic benefits accrued to fisherfolks involved in *P. leonensis* fishery in the study area.
3. There are no significant differences in the livelihood of the fishermen, profitability and sustainability of fisherfolks exploiting *P. leonensis* fishery in the study area.

**1.5 Limitation of the study**

This research Study is Ogun coastal estuary located in the Ogun waterside local government area of Ogun State, Nigeria.

**CHAPTER TWO**

**2.0 LITERATURE REVIEW**

**2.1 Small-scale fishery**

Inland fisheries provide food, employment opportunities, cash income, and contribute to poverty reduction in many developing countries (Sarch & Allison, 2001; Allison *et al*., 2002; Smith *et al*., 2005; Thorpe *et al*., 2005 Bene, 2009;). Many artisanal fisheries along shoreline areas in most places in the world are of the “S” type: Small-scale, Spatial-structured and catching Sedentary stocks (Orensanz *et al*., 2005). Although small-scale fisheries typically feature small catches per unit, cumulative catches exceed commercial and midsized fisheries in many areas (Coates, 2002). Poor households are highly dependent on fisheries as a protein source for family consumption and as a source of cash income, not only for fishers but also for farming fishers (Bene *et al*., 2009). Due to the ability of fishing to provide daily cash-income for households. Bene *et al*. (2009) refer to fish as “bank in the water” for people living in coastal areas. Overall, inland fisheries play an important role in the development of regional economies through employment opportunities (Neiland *et al*., 2000). It may be a native fisheries for sustenance or commercial fishing using indigenous or small scale fishing gear like nets, traps and also using motorized or non-motorized fishing boat during fishing activities (Mustapha, 2013). Artisanal fisheries use proportionally little amount of monetary capital for fishing activities by covering short distances close to the coastal shore of the water. The harvested fish are sold in their locality and consumed by fisher’s families (Mustapha, 2013).

Small-scale fisheries feature spatial and temporal disparities, scattered along the coastal area, with a variety of target species, fishing gears and modes of operation. In many cases, the fishers not only fish but also engage in other types of livelihood strategies. Inland fisheries are also varied in social and economic context (Allan *et al*., 2005). This condition confirms the heterogeneity and complexity of small-scale fisheries which have to be taken into account for appropriate fisheries management (Neiland *et al*., 2000; Tzanatos *et al*., 2005). Lack of data and information, together with complex socio-economic conditions result in the poor management, leading to marginalization of this sector. They are marginalized because of their socio-economic, geographic condition and politically get less attention from decision-makers (Pauly, 1997). Marginalization could be observed from lack of access to credit, poor roads, transportation and other types of infrastructure because they live in remote rural areas. In contrast to large-scale industrial fisheries, small-scale fishers engage in fishing with little capital and minimal access to technology (Sowman, 2006). This yields lower fishing capacity as they use smaller, non-motorized fishing vessels that are mostly operated by family labor through labor-intensive practices (Kuperan & Abdullah, 1994; Kent, 1997; FAO, 2005).

**2.2 Small scale fishery in Nigeria**

Nigeria is a typical coastal country with 800 Km of coastline and maritime area of 46,000 Km2 (0-20 m depth), an Exclusive Economic Zone (EEZ) area of 210,900 Km2 and a narrow Continental Shelf between 4.81 and 27.78 Km in the Gulf of Guinea (Udolisa *et al*., 1994). The fishery is exclusively artisanal with an annual potential yield of 55,000 metric tons of freshwater fishes (Ita, 1993). In Nigeria, a large population of artisanal fishermen who relies on the predominant use of small fishing gears is found around the coastal line. This group of fishermen commonly operates in inland rivers, lagoons and creeks; extending to about five nautical miles of the sea shore (Adesulu and Syndenham, 2002). A high percentage of landed fish in Nigeria is from artisanal catch. Tobor (1995) reported an access to over 180,000 metric tons of artisanal fishery resources in the area and an estimated annual yield potential of 1,830,990 metric tons of fish from which a harvest close to 350,000 metric tons are made annually. Faturoti (2010) reported that artisanal fisheries in Nigeria provided more than 82% of the domestic fish supply, giving livelihoods to one million fishermen and up to 5.8 million fisher folks in the secondary sector. The economic importance of these to the community include source of food, provision of employment, source of foreign exchange/income, tool to rural development and source of raw materials to manufacturers (Moses, 2006; Abulude *et al*., 2006). However, Tietze *et al*. (2005) noted that the use of poor quality fishing materials can limit fish catch levels and that efforts should generally focus on the quest for improved fishing techniques and gears to replace the low yielding traditional fishing methods. Akingba *et al*. (2017) opined that artisanal fishery in coastal areas has contributed immensely to the socio-economic conditions of the entire populace due to economic influx of people in search of fish and fish products from the adjoining communities.

**2.3 Contribution of fish production in Nigeria**

In Nigeria, only fish contributes on average, 20-25% per caput animal intake and could be as high as 80% in the coastal and riverside communities (FAO, 2000). Ajana, (2002) reported that the average annual demand for fish in Nigeria between 1995 and 2002 was estimated at 1.22 million metric tonnes by the year 2005. (FAO, 2000) estimated the projected population and fish demand/supply from 1997 to 2025, with domestic fish production by the year 2007 as 0.77 million tonnes. According to Fish Report 2006, Nigeria has become a major destination for imported seafood since the time the government of Nigeria made a tariff reduction on all fishery products in 2001 from 25% to 5%. Now, the aquaculture and fisheries industry is probably the fastest growing food producing sector and now accounts for 50% of the world’s fish that is used for food (FAO, 2016).

**2.4 Fish diversity in inland water of Nigeria**

Nigeria has large natural aquatic ecosystem that provide spawning and feeding habitats for a large number of freshwater and brackish water fish species (Meye and Ikomi, 2008; Emmanuel, 2009). These aquatic ecosystems with more than 270 fish species varieties are outstanding in terms of richness in West Africa (Meye and Ikomi, 2008). The diversity and conservation of fish in inland water has attracted the attention of many researchers over the years. Teugels and Powell (1993) reported about 243 species and 36 families mainly freshwater, in Niger basin, a region of high abundance in Nigeria. Ita (1993) revealed 268 diverse fish species in 34 well recognized Nigeria freshwater Lakes, rivers and reservoirs, with a surface of about 98,185, kilometer square are equivalent to 12% of the Nigeria entire area. Food accessibility, rate of breeding, spawning grounds, availability of water current, vegetation, water depth, migration of the fish as well as low predation have been previously suggested as major factors responsible for the distribution of fish families in the lake (Akintunde, 1976; Ita, 1978). However, Lawson and Olaitan (2010) pointed out that external drivers like habitat degradation could affect biomass of inland species. The human impacts, resulting from extraction of water for irrigation and industrialization could also cause burden of inorganic and organic pollutants in water (Lawson and Olaitan 2010).

**2.5 *Pellonula leonensis***

Kingdom: Animalia

Phylum: Chordata

Class: Actinopterygii

Order: Clupeiformes

Family: Clupeidae

Genus: *Pellonula*

Species: *leonensis* (Boulenger, 1916)

**2.5.1 Description**

*Pellonula leonensis* is characterised by having the first pre-pelvic scute being as large as the following ones lacking ascending arms, located behind the pectoral-fin bases; also characteristic are the inward-curving pre-maxillary teeth (Gourène and Teugels, 1991). It resembles *Pellonula vorax*, which has larger and straighter teeth, often pointing forward, and scutes before pectoral fin bases (Gourène and Teugels, 1991). Absence of large canine teeth in upper jaw distinguishes it from *Odaxothrissa* and also *Cynothrissa*; *Microthrissa* species are deep-bodied and have much more slender maxilla (Gourène and Teugels, 1991). Apparently able to enter brackish and seawater bodies, adults form schools, mainly nocturnal. They feed on terrestrial and aquatic insects, also on ostracods, entomostracans and fish larvae (Gourène and Teugels, 1991). Allison et al. (1997) also reported that fish catch varied with type of gear used, tidal condition and period of capture, diurnally and seasonally.

Pellonula is essentially a riverine fish (present in West African rivers from Senegal to Niger), which can inhabit both fast flowing and calm, muddy habitats (Lowe -McConnell, 1987). They inhabit areas closer to the shore (Turner, 1994). Availability of food, spawning rates, breeding grounds coupled with shelter, presence of current, vegetation, depth of water, breeding habits migration and low predation have been suggested as major limiting factors affecting the distribution and abundance of various fish families in Kainji Lake, Nigeria (Imevbore and Bakare, 1974; Lelek and El - Zarka, 1973; Willoughby, 1974; Akintunde, 1976; Olatunde, 1977; Ita, 1978). **2.5.2** *Pellonula leonensis* **fishery**

The Pellonuline clupeids fishes are important ichtyofaunal component of freshwater and brackish ecosystems. There are important ecologically and commercially and are widely exploited (Uneke *et al.*, 2010). *Pellonula leonensis* Boulenger, 1916 is the most widely distributed freshwater Clupeidae in West Africa. It is found in lagoons, lakes and lower, as well as upper, courses of rivers, from Senegal to the cross (Paugy *et al.*, 2003). According to Yao (2008), the total production of *P. leonensis* in man-made Lake Taabo was estimated at 320 tons per year. Studies on the diet (Kouamé, 2006), production (Yao, 2008) and reproduction (Koné *et al.*, 2011) of the Clupeidae *Pellonula leonensis* were done in Côte d’Ivoire. Otobo (1977) observed *Pellonula leonensis* as more abundant in the dry season in Kainji Lake while, Idodo - Umeh (2003) reported it as more abundant in rivers and lakes during the rainy season. Fishing for Clupeids, particularly Pellonula, the use of the atalla lift net has been reported in Jebba (Reed et al., 1967), Kainji Lake (Otobo, 1974; Otobo and Imevbore, 1977; Ita, 1993) and Anambra River (Ezenwaji, 2004), all in Nigeria. Also, Kingdom and Allison (2007), reported the emergence of Dala (a mosquito netting open water seine net) introduced by the migrant Malian fishers in the early eighties. It has been found to be very effective in harvesting clupeid stock in Kainji Lake (Ita, 1993; Yaro, 2003).

**2.6 Livelihood of small scale fisherfolks in Nigeria**

Livelihood comprises the capabilities, the assets (natural, physical, human, financial and social capital), the activities and the accesses to these (mediated by institutions and social relations) that together determine the living gained by the individual household (Chambers and Conway, 1992). A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in future, while not undermining the natural resource base (Chambers and Conway, 1992). About 12 million people (10% of total population) directly or indirectly depend on fisheries sector for their livelihood (DoF, 2005). According to Ovie and Raji (2006), fish is crucial to the Nigerian economy, contributing 5.4% of the gross domestic product (GDP). Fish are significant to the nation's economy in terms of food security, income, employment, poverty alleviation, foreign exchange earnings and provision of raw materials for animal feed industries. Fish is the commonest and cheapest source of protein for the teaming Nigeria's poor, estimated to be between 65-70% of the total population (Shetimma *et al*., 2014). Artisanal fishing is the term used to describe small scale, less technology, commercial or subsistence fishing practice. It is also described as capturing fish from the natural water using traditional fishing gears such as rod and tackles, arrows and harpoons, cast and drag nets, traps, barrier and traditional fishing canoes and boats (Wikipedia, 2012). Artisanal fishing usually occur around the world particularly in developing nations and are vital to livelihoods and food security of the local community. They supply income, employment and also supply the local people with protein at reasonable prices. Although Nigeria is blessed with many water bodies (dams, lakes, rivers and streams) where fish are sourced, yet the country fails to provide the required amount or quantity of fish required by the rapid growing population. According to Raufu *et al*. (2009), the current annual production of aquaculture is around 500,000 metric tonnes. This quantity is grossly inadequate for domestic consumption, thus Nigeria imports 700,000 metric tonnes of fish annually to cushion the supply- demand gap (Essien and Effiong, 2010).

**2.7 Fisheries survey**

Statistics of fishery are the main methods to quantify the accomplishment of a fishery within biological, environmental, social and economic structure in which it is conducted (FAO, 2002). The fishery survey can be performed to estimate the fish catch, fishing effort, economic expenses and revenues of fishing and the occurrence of these at a particular period of time. This provides statistical information on the status of fish catch, effort and socio economic characteristics (FAO, 1985). Fishery survey can be cost effective and the costs are made up of field operation and maintenance expenses connected to the operations (FAO, 2002). In various developing nations, these entire expenses may create a major limitations to the required effect of developing of fisheries statistic. According to du Feu (2003), another way in which cost of the fishery survey can be reduced is by enhancing effective sampling strategies.

**2.7.1 Survey standard and sampling survey**

Standardization method in data collection and production has contributed to the developments of science (Bonar and Hubert 2002). Survey standard is the process of arranging field operations, and producing reliable results. The importance of survey standard is the structure of the method used and effective framework of the sample based fisheries survey (FAO, 2002). The two important component of survey standard are stratification and classification. Stratification refers to the area to be covered during the research work, such as, landing site while classification is the method that will ascertain or discover the kind boat, gear, fish species and effort units used by the fishers (FAO, 2002). Sampling Survey gives detailed account of the selection procedure of a sample component from a target population. The three main components of sampling survey are frame survey, fisheries catch assessment survey and quality survey (FAO, 1985).

**2.7.2 Frame survey and catch assessment survey**

Frame survey is the sample-based or census-based methodology describing all fishing craft and gear which might be “potentially operating” within the evaluation context (FAO, 2002). Frame survey can be defined as the physical counts of gears obtainable in a fishing communities and a whole lake count of fishing canoes (du Feu, 2003). This author also stated that it involved annual record of all the fishing communities, fishers, fishing supporters and fishing equipment owned by the fishers. Before frame survey is taken into consideration, ones must decide a general structure of landing sites, and boat and gear to be included. After frame survey has been completed, the next obligation is to complete the list of landing site, boat and gear types which can later be used as the foundation to conduct future survey research (FAO, 2002).

Catch assessment survey (CAS) is the detailed inspection and recording of the fish species that are contained in a canoe, landed from a fishing trip (Moses *et al*., 2002). For the collection of current items, information of the input and output features of operating fisheries such as fishing effort, fish catch and catch assessment are designed and executed to allow data collection and sampling in both space and time (FAO, 1985).

**2.8 Methods of data collection in a fishery**

The basic information requirements for fisheries management are long time series of data set that precisely reflects the sociological, environmental and fisheries features and trends (du Feu, 2003). The selection of many methods for gathering fishery data will rely on the variables to be determined, as well as the source and availability of resources (FAO, 1999). According to Food and Agriculture Organization (FAO, 1999), there are five main methods of data collection and these are; Registration, Questionnaire, Interviews, Direct Observations and Reporting. The most prominent among these methods of data collection are questionnaire and interviews which are used for quantitative and qualitative research respectively.

Questionnaire is the most commonly used tool in educational research and this is obvious in published studies as reiterated by (Nworgu, 2006). According to Fife-Schaw (2001), questionnaire is perhaps the simplest common research instrument that is quite well understood and has the benefits of being simple, adaptable and required little expenses. Interview on the other hand, can be more time-demanding than questionnaire method, but could be more flexible and more suitable for complex questions (FAO, 1999). Interviews can be described as structured, semi-structured and unstructured (Fontana and Frey, 2005). The structured interviews can be accomplished by using survey methods. However, in unstructured interviews, jotting of notes while talking to the respondents is recommended (FAO, 1999). Opdenakker (2006) enumerated four type of interviews, thus: the face-to-face interview, telephone interview, MSN messenger and E-mail interview of which, the most common is face-to-face. Face-to-face interview, help greatly in producing quality data or information.

**2.9 The problem of data collection**

Undertaking qualitative interview can pose many challenges for researchers (Birch and Miller, 2000). Some of the problems identified include issue related to maintaining the boundaries between researchers and respondents (Dickson-Swift *et al*., 2006; Gale, 1992), developing friendly relationship (Liamputtong and Ezzy, 2005), managing feelings (Dunn, 1991) and biased ideas or reflexivity among the respondents (Ellingson, 1998). The problems of data collection can be lack of cooperation to sensitive questions, increase or reduction of actual data, traditional relations towards answering questions and non-response of the respondents (Adeyemi, 2010). The challenges of obtaining good quality data in a reservoir fishery has been reported by de Feu, (2003). These are;

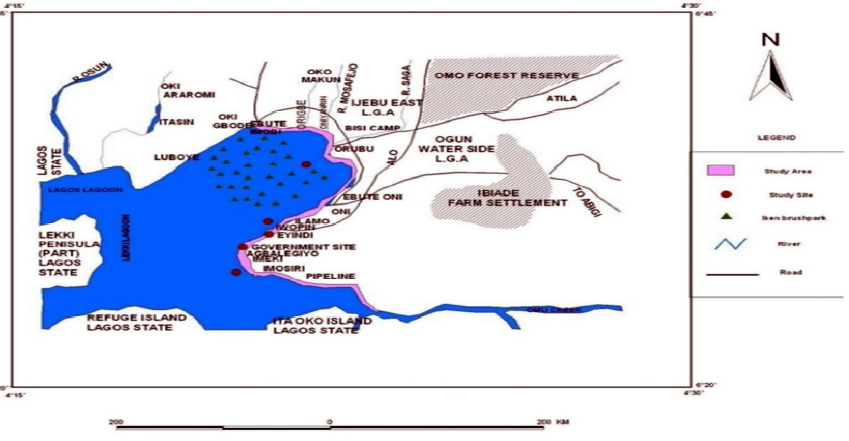
* High cost of fisheries survey and the effort required for collection of data.
* Problems of evaluating precise assessments of the status and trends of lake’s fisheries.
* Interrupted data collection due to the implementation of management measures such as ban of fishing gear types.
* Non-appreciation and uncooperative behavior of the fishers during data collection.

**CHAPTER THREE**

**3.0 MATERIALS AND METHOD**

**3.1 Study Area**

The study was carried-out in Ogun State coastal estuary, located between Ogun Waterside and Ijebu-East Local Government Areas of Ogun State, Nigeria. It is situated between 40°15’ E–40°30’ E and 60°20’ N 60°45’ N and bounded in the east by Lekki lagoon and south by Bight of Benin (Figure 1). The lack of direct access to the Atlantic Ocean coupled with the discharge of Rivers Osun, Mosafejo and Oni into the water makes it essentially freshwater (Abdul *et al.,* 2010). Fishing activities are carried out with canoes (motorised and non-motorised). The fishing gears include; gillnet, seine net, cast net, nonreturn valve traps, brush park fish aggregator and Bamboo traps.



**Figure 1: Map of Ogun State coastal estuary**

**Source: Abdul *et al*. (2010)**

**3.2 Sampling procedure**

Stratified sampling procedure was used to collect data for the study. The study area was divided based on their landing sites, and the landing sites which showed high activites in *P.leonensis* fishery was focused on and the rest of the landing sites were equally visited.

**3.3 Data Collection Instruments**

Data for this study were collected through the use of interview guide administered to 100 fish processors.

Data for this study was collected from both primary and secondary sources. The primary data was collected from respondents through the use of interview guide. The interview schedules was divided into four (5) sections: A, contains socio-economic characteristics of fishermen in the study area, B, contains fishing activities of the fisher men, C, contains fish marketing and processing techniques adopt by fishermen, D, contains the economic and profitability potential of *Pellonula leoensis* and E, contains the constraints faced by the fishermen in *P. leoensis* fishery.

**3.4 Data Analysis Techniques**

Various analytical tools was used to achieve the objectives of this study and these includes: simple descriptive statistics such as frequency, distribution tables, percentages, averages (mean), net fishing income (NFI), gross margin (GM) and profitability ratios.

1. Gross Margin (GM)

Gross margin is the difference between the gross fishing income and the total variable cost (Olukosi and Erhabor, 1989).

Therefore; GM = GFI – TVC

Where GM = Gross margin

GFI = Gross fishing income

TVC = Total variable cost

1. Net Fishing Income (NFI)

According to Olukosi and Erhabor (1989), net fishing income gives an overall level of profitability of an enterprise by putting both fixed and variable costs into consideration and subtracting the cost from the total revenue.

Therefore; NFI = TR – TC

Where TR = Total Revenue

TC = Total cost.

1. Profitability Ratios

Profitability ratio is a class of financial metrics that helps investors assess a business’s ability to generate earning compared with its expenses and other relevant costs incurred during a specific period. This will be calculated according to the method described by Okwu and Acheneje, (2011).

Some examples of profitability ratios are listed and explained below:

1. Benefit Cost Ratio BCR)

Benefit cost ratio or analysis is the term that either refers to helping to appraise, or assess the case for a project programme or policy proposal and an approach to making economy decision of any kind.

From the above definition, the process involves whether explicitly or implicitly weighing the total expected costs against the total expected benefits of one or more actions in order to choose the best or most profitable option.

Therefore; BCR = TR/TC

Where TR = Total Revenue

TC = Total cost

1. Expense structure ratio (ESR) = FC/VC

Where, FC = Fixed cost and VC = Variable cost

1. Rate of return (ROR) = NR/TC

Where, NR = Net Return

1. Gross Revenue Ratio (GRR) = TFE/GI

Where, TFE = Total farm expenses and

GI = Gross income.

**3.5.1 Measurement of variable**

The variables under investigation were measured as follows;

Independent variables

**3.5.2 Socio- economic Characteristics of the Respondents**

In order to determine the socio-economic characteristic of the fishermen questions were asked with respect to:

i. Actual age: was measured at interval level by obtaining the specific age of the respondents and categories in ranges as follows: less than 20 years, 21-30 years, 31-40 years, 41-50 years, and >50 years

ii. Sex: was assessed at nominal level as male = 1 and female = 2

iii. Marital status: was measured at nominal level and respondents were categorized into single = 1, married = 2, divorced = 3, and widow = 4.

iv. Educational level: measured at ordinal level by indication of level of education attained and the respondents were categorized into: No formal education = 1, Primary education= 2, Secondary education = 3, Tertiary education =4.

v. Religion: was measured at nominal level as Christian = 1, and Islam = 2

vi. Household size: this was measured at interval level by indication of the specific number of persons living and feeding under the same roof and categorized in ranges.

vii. Membership of cooperatives societies: measured at nominal level and respondents were asked to answer Yes = 2, No = 1.

Viii The constraints of fishermen exploiting P. leonensis fishery were rated as follows; Strongly Agree=5, Agree=4, Undecided=3, Disagree=2, Strongly Disagree=1 and reversed for negative statements during analysis.

**3.6 Reliability of the instrument**

The reliability test was done through the test-retest method in which the research instruments were administered to some selected respondents within the spate of two weeks in order to ascertain the consistency of results obtainable from several administered instruments (Olaoye, 2010). Each scale of the research instrument has reliability coefficients of at least 0.75 and hence are considered appropriate for the study.

**3.7 Analysis of Data**

The interview guide was checked for missing data and the data were coded and entered into the Statistical Package for Social Sciences (SPSS) for analysis. Descriptive (frequency, percentage, mean, mode and standard deviation) and inferential statistics were then used to analyze the data. The results were then presented in distribution tables, charts and graphs.

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