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SUSTAINABLE FISHERIES MANAGEMENT PROJECT (SFMP)

Baseline Study Of The Demersal Fisheries In The Western Region (Pra And Ankobra)

2015

THE UNIVERSITY OF RHODE ISLAND GRADUATE SCHOOL OF OCEANOGRAPHY | CRC COASTAL RESOURCES CENTER

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ACRONYMS

CCM	Centre for Coastal Management
CEWEFIA	Central and Western Region Fishmongers Improvement Association
CRC	Coastal Resource Center
CSLP	Coastal Sustainable Landscape Project
DAA	Development Action Association
DFAS	Department of Fisheries and Aquatic Science
DMFS	Department of Marine Fisheries Sciences
DQF	Daasgift Quality Foundation
FtF	Feed the Future
GIFA	Ghana Inshore Fishermen's Association
GIS	Geographic Information System
GNCFC	Ghana National Canoe Fishermen’s Council
HM	Hen Mpoano
ICFG	Integrated Coastal and Fisheries Governance
MESTI	Ministry of Environment Science and Technology
MOFAD	Ministry of Fisheries and Aquaculture Development
NDPC	National Development Planning Commission
NGOs	Non-Governmental Organizations
SFMP	Sustainable Fisheries Management Project
SMEs	Small and Medium Enterprises
SNV	Netherlands Development Organization
SSG	SSG Advisors
STWG	Scientific and Technical Working Group
UCC	University of Cape Coast
URI	University of Rhode Island
USAID	United States Agency for International Development
WARFP	West Africa Regional Fisheries Development Program

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SUMMARY

The purpose of the study is to establish a baseline fisheries assessment on key demersal species in the Western Region. In addition, a pilot project on cooperative research with fishermen and other stakeholders was initiated involving 12 fishermen. The research begun in March, 2015 with a scooping survey, followed up with consultations and interactions with the key stakeholders of the fisheries to identify landing sites and sampling opportunities. Four species were identified based on biological and economic importance within the demersal fish complex of the Western Region. (*Galeoides decadactylus, Brachydeuterus auritus, Pseudotolithus senegalensis and Pentanemus quinquarius*). Due to low occurrence in the landings of *Pentanemus quinquarius,* a new species *(Pagellus bellottii*) was added. Subsequently, monthly trips were conducted to collect a representative sample based on random sampling from various fishing gears at the landing sites between the Pra and Ankobra estuaries. Length, weight, sexual maturity, scale and otoliths were systematically measured and recorded. A total of 1,988 individuals were measured between April to September, 2015. This is a partial data of 2015 and does not constitute a large enough samples to analyze and draw conclusion on growth, mortality and spawning seasons.

The study also involved training fishermen and women processors on simple techniques on how to identify the species and collect basic biological information of these selected species. A total of 12 stakeholders participated with different level of commitments to the cooperative research initiative. A series of interactions and interviews with canoe fishermen and trawl operators to identify demersal gear inventory and characteristics. An additional seven months of sampling will continue following the same design and protocols before a stock assessments on these resources is done. Focus will also be on the social, economic significance and cultural related issues of the fisheries.

Overall demersal resources are primarily targeted by semi-industrial trawlers and few industrial vessels. Some catches occur at the mouth of the two estuaries using beach seines targeting mostly *Pseudotolithus senegalensis.* Sampling covered all gear and areas based on availability of fish during field trips.

INTRODUCTION

The sustainable fisheries management project (SFMP) seeks to contribute to the Government of Ghana's fisheries development objective and USAID's feed the Future Initiative goals of improved food security economic growth and poverty alleviation. It aims to end overfishing of key stocks important to local food security through a multi-pronged approach and hopes to achieve this working closely with the Ministry of Fisheries and Aquaculture and the Fisheries Commission of Ghana. This project builds on the accomplishments of the USAID/Ghana Integrated Coastal and Fisheries Governance (ICFG) initiative. In this follow-on, the project is focusing efforts on the small pelagic fisheries along the entire coastline as well as demersal fisheries and essential mangrove fish habitat in Western region of Ghana.

Ghana's fisheries sector contributes significantly towards the nation's economic development objectives relating to food security, employment, poverty reduction, and GDP and foreign exchange earnings. Fish has always had far-reaching implications for food security in Ghana (DOF, 2004). Fish supplies enhances food availability, ensuring good nutritional outcomes particularly of the poor and rural populations and the vast number of people engaged in fishing industry earns incomes that improves upon their access to food and livelihoods of fishing communities.

Ghana has the fifth largest Exclusive Economic Zone (EEZ) in West Africa (218,100km^2) and a continental shelf area of 24,300km^2; this varies in width from 20km of Cape Saint Paul

(in the East, Volta Region) to about 90 km between Cape Coast in the Central Region and Takoradi in the Western Region (Marine Fisheries Research Division). The Western region is charactized with more productive water bodies such as the Ankobra, Pra, Whin, Nyan etc. which has high influx of nutrients making the waters more productive. The Region is also noted for vigorous fisheries activities due to the expansion of the continental shelf and is concentrated with fishing fleets. The region is the most productive region among the four coastal regions in Ghana and it contributes about 36 percent of the total annual catch of the country (Fisheries Commission, Western Region).

The Ghanaian fishery is characterized by high percentage of pelagic species hence more attention has been dedicated to assessing these stocks relative to demersal fish species which contribute to about 20% of the country's fish landings (Ayivi, 2012). Even though demersal stocks contribute less in terms of landings, they are more valued economically and they play major role in terms of economic contributions to the fishery sector. These high valued demersal species exploited in Ghana appear to be unsatisfactorily assessed. Overall fishing pressure over the decades and the fluctuating catch rate of the fisheries resources could lead to possible overexploitation of these demersal resources- the need to regularly assess the stocks (Ayivi, 2012).

It is against this background that a research conducted by UCC in partnership with the SFMP, through cooperative research with fishermen and women processors is being undertaking. The research focuses on the Western region of Ghana and its demersal fishery, concentrating on *Brachydeuterus auritus, Pseudotolithus senegalensis, Galeoides decadactylus* and *Pagellus belottii* due to their high economic value and abundance. The research is to establish a baseline assessment of the demersal resources in relation to it socioeconomic importance. This research involves the compilation of secondary data such as the vessel registration data, landings and others from the MOFAD, FC, FPDF and special projects. The result this research will be presented to fisheries managers of the Fisheries Commission in other to guide them with management decisions related to fisheries.

METHODOLOGY

2.1- Surveys

The study involves monthly data collection which begun with a scooping survey on the 21st - 22nd March, 2015. The trip aimed at initiating a pilot project on cooperative research, which involves the participation of stakeholders in the research and data collections projects. This participatory approach included stakeholders of the fisheries from Anlo Beach, Ankobra and Sekondi, to learn and actively assist with this research. A follow up trip was made on 21st to 24th April, 2015 to identify various landing sites and select demersal species, important to the fisheries. A database with contact information of fishermen and fish processors involved in this research was developed.

Major landing sites as well as areas noted for intense beach seine activities within the Pra and Ankobra stretch were selected. These include Anlo Beach, Sekondi, Axim, Ankobra, Bobrama, Asanta, Essiama and Eikwe. Four demersal species of commercial importance (*Brachydeuterus auritus, Galeoides decadactylus, Pentanemus quinqarius* and *Pseudotolithus senegalensis*) were initially selected as key indicators of the demersal fish stocks in the region. The species selection was based on high occurrence in the region from the Fisheries Commission landings database. This was validated through a series of meetings with stakeholders in the Pra and Ankobra. However, after four months of biological data collection, it became clear that the *Pentanemus quinqarius* catches were very low, composed mainly with juveniles, were replaced with *Pagellus bellottii*.

Figure 1 Stakeholders and fisher folks meeting to identify the major demersal species and to use their knowledge to map fishing areas and spawning grounds.

2.2 Species Selected

Pseudotolithus senegalensis

Figure 2 Cassava Fish

Brachydeuterus auritus

Figure 3 Burrito

Galeoides decadactylus

Figure 4 Threadfin

Pagellus bellottii

Figure 5 Congo Dentex

2.3 Biological Data Collection

The study involves both field work and laboratory work. However, laboratory work, which comprises mainly aging of the species, has not yet started because of unavailability of aging equipment.

Field work on the other hand begun in May (19^{th} to 23^{rd}) where specimens were collected from the commercial landings of fishermen. Identification and sorting of species were done using identification manual. Parameters such as total length, fork length and standard length were measured to the nearest 1cm using fish measuring board. Body weight of specimens was taken using a spring balance and an electronic balance.

Thirty specimens of each species are randomly selected from samples for aging and reproductive analysis. Gonads of the thirty specimens were removed and their sex and reproductive maturity determined using a macroscopic staging system. Otoliths and scales were also removed from the specimens for growth analysis. Otoliths were washed in 10% alcohol and scales were also washed in ordinary water. Cleaned otoliths and are preserved for aging analysis.

Procedures for biological data collection were repeated in the successive months.

Figure 6 Data collection on fish species on field

2.4 Training of Fishermen and Fish Processors

The baseline study is a cooperative research which involves some stakeholders, specifically fishermen and fish processors of the fisheries in the Western Region. The purpose is to invite stakeholders to participate in fisheries research which often is the source of management decisions. The fishermen and fish processors trained were selected based on their interest in the subsequent months. Their training begun in June (16^{th}-19^{th}) and they are constantly involved in the data collection procedures. These fishermen and fish processors were taught the purpose of the research and they were trained on how to collect basic fisheries data (total length, fork length, standard length and body weight). They were also trained on sex determination, and macroscopic inspection of maturity of the species. The intention is to involve them throughout the data collection period and to have a hands-on knowledge on fisheries research procedures. A total of three fishermen and two women processors were retained in the study.

Figure 7 Fishermen being trained during sampling

3. RESULTS

A preliminary result of what has been done so far is presented in this section. Much could not be said about length-based data because data collected so far is not enough to give any substantive information about the stocks. Again, analyses of reproduction and age data are yet to be done.

The table below presents the total number of specimens sampled for each species in each month.

Table 1 Sampling Dates and Species

Sampling Dates	Species				
	Brachydeuterus auritus	*Galeoides decadactylus*	*Pentanemus quinqarius*	*Pseudotolithus senegalensis*	*Pagellus belottii*
Apr-15	84	24	65	52	
May-15	83	85	58	91	
Jun-15	61	109	19	75	
Jul-15	96	124	117	70	
Aug-15	114	110	103	86	
Sep-15	98	79	42	96	47
Total	**536**	**531**	**404**	**470**	**47**

3.1 Total Length-Standard Length Relationship

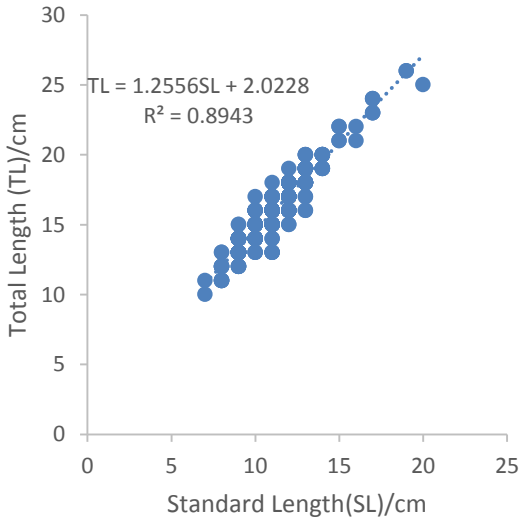

Figure 8 Total lenth-Standard length relationship for B. *auritus*

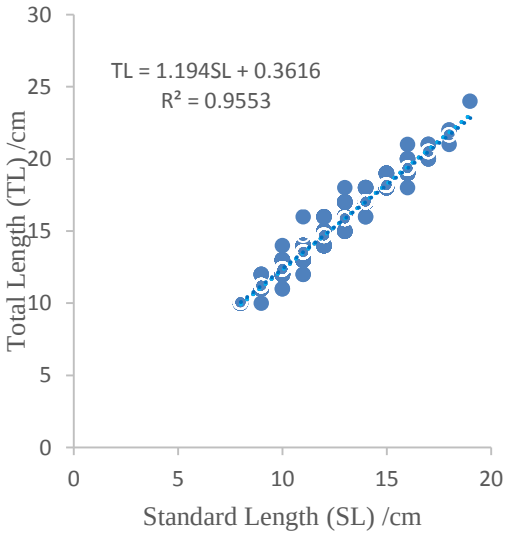

Figure 9 Total length-Standard length relationship for P. *quinquarius*

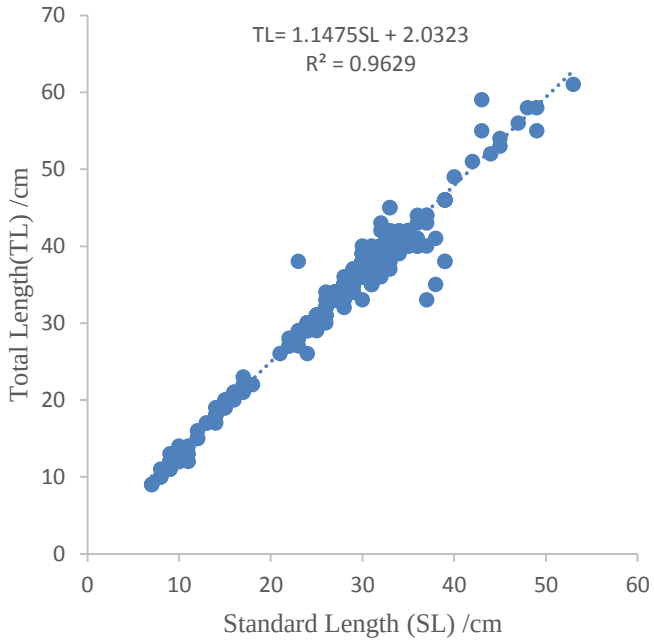

Figure 10 Total length-Standard length relationship for *Pseudotolithus senegalensis*

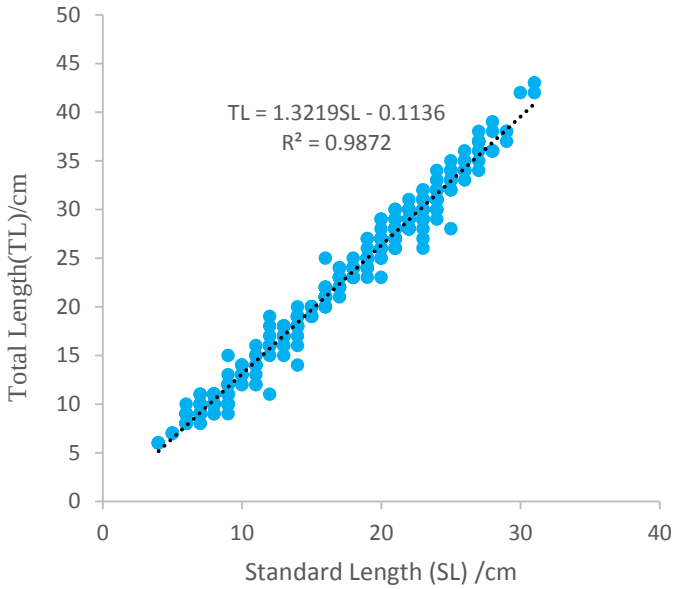

Figure 11 Total length-Standard length relationship for *Galeoidis decadactylus*

Generally all the length-length relationship was linear with strong positive correlations suggesting that the total length, fork length and standard length increase simultaneously.

The total length and standard length of all the species examined positively correlated with very high correlation coefficients. This implies total length increases with increasing standard length. The relationship between the total length and standard length of each species is presented on the respective graphs.

3.2 Fork Length-Standard Length Relationships

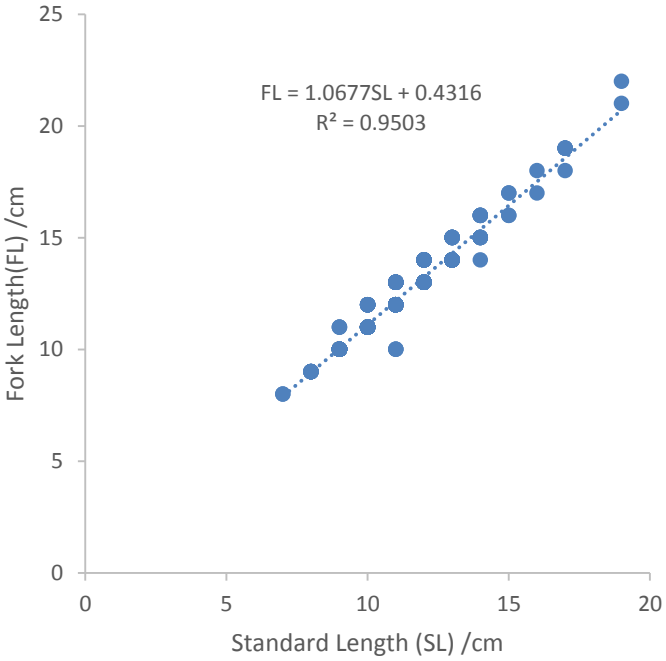

Figure 12 Fork length-Standard length relationship for *Pentanemus quinquarius*

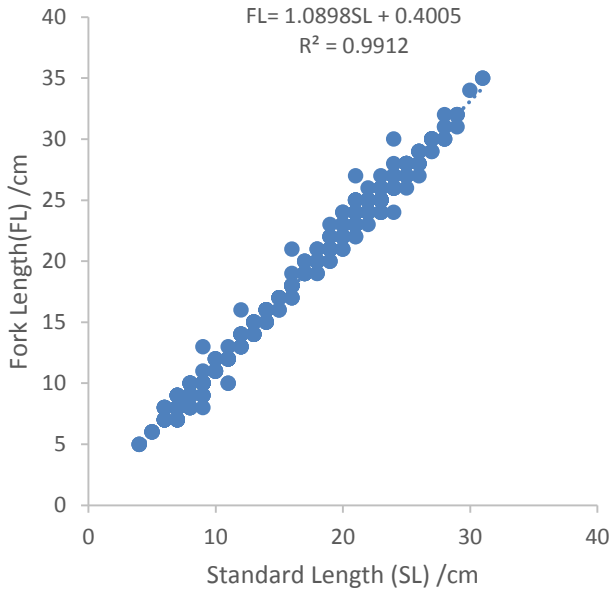

Figure 13 Fork length-Standard length relationship *galeoides decdactylus*

Fork length and standard length relationship also showed positive correlation with high correlation coefficient, 0.9 for *Pentanemus quinquarius* and 0.99 for *Galeoides decadactylus*.

3.3 Fork Length-Total Length Relationships

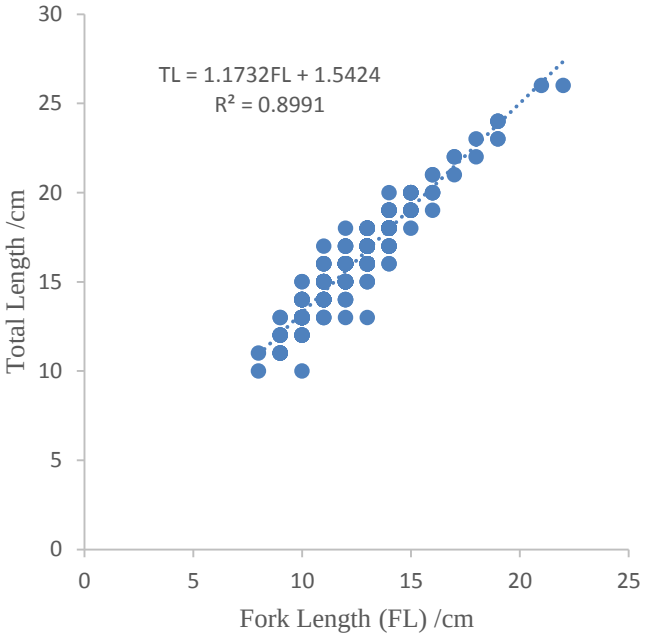

Figure 14 Fork length-Total length relationship for *Pentanemus quinquarius*

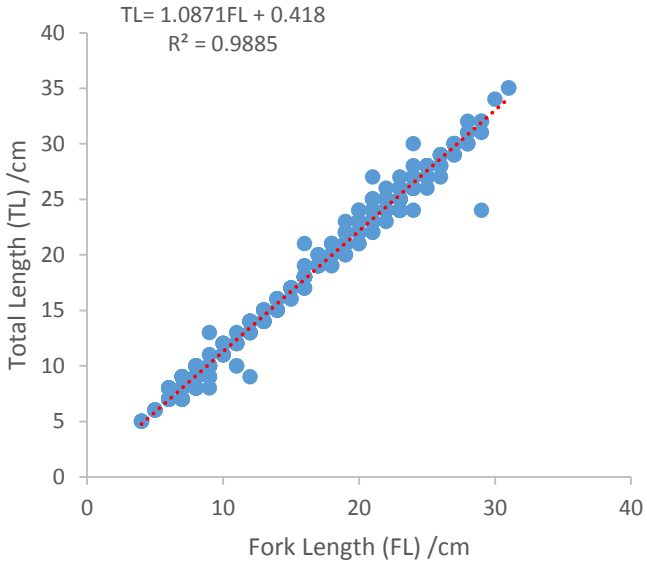

Figure 15 Fork length-Total length relationship for *Galeoides decdactylus*

Galeoides decadactylus and *Pentanemus quinquarius* were the only two species observed to have fork length. Again, the fork length-total length relationship was linear with very high correlation coefficients (0.8826 for *Galeoides decadactylus* and 0.998 for *Pentanemus quinquarius*).

3.4 Length-Weight Relationship

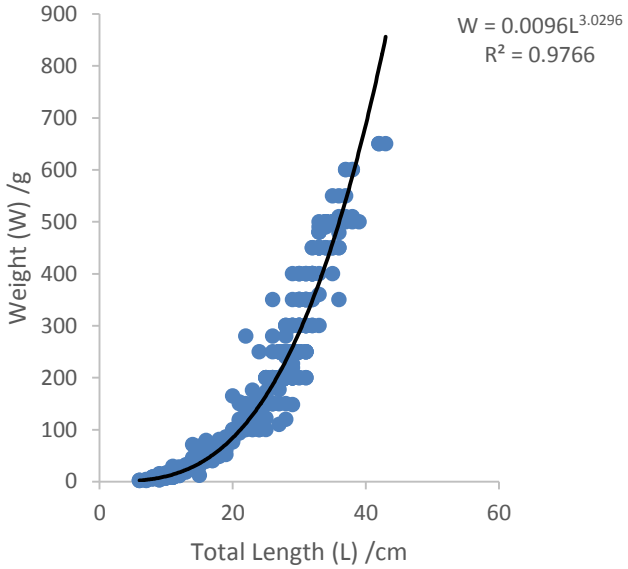

Figure 16 Length-Weight Relationship for *Galeoides Decadactylus*

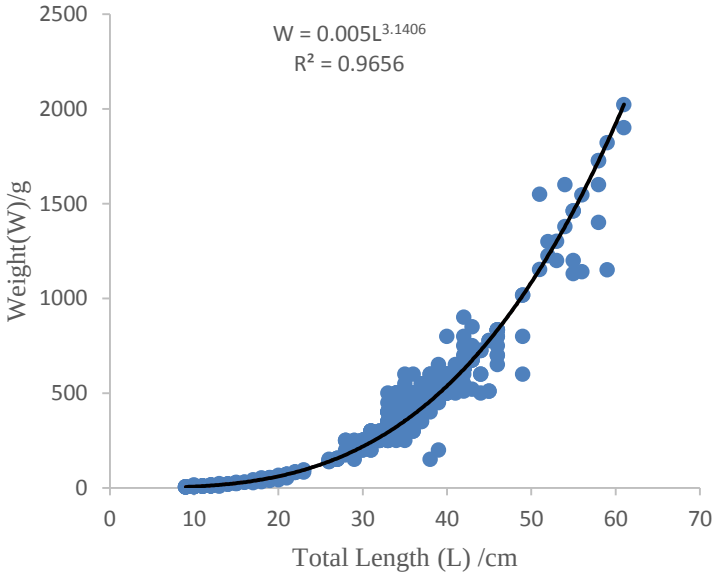

Figure 17 Length-Weight relationship for *Pseudotolithus senegalensis*

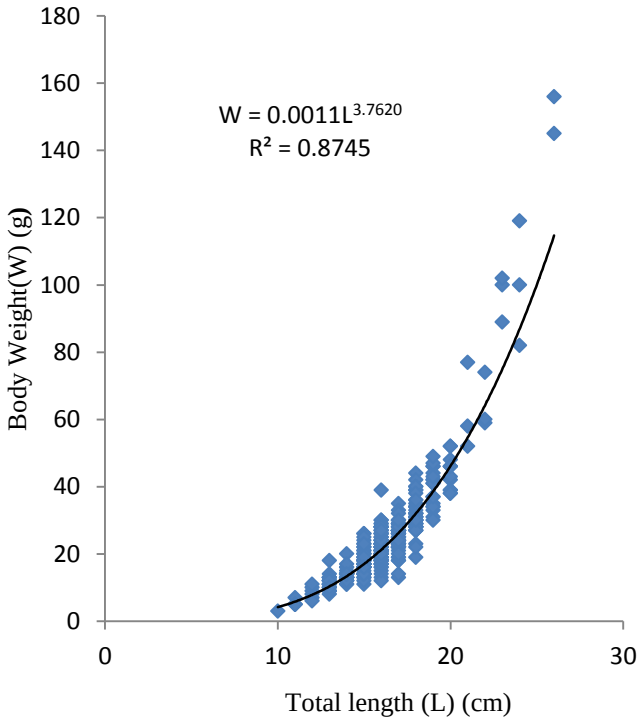

Figure 18 Length-Weight relationship for *Pentanemus quinquarius*

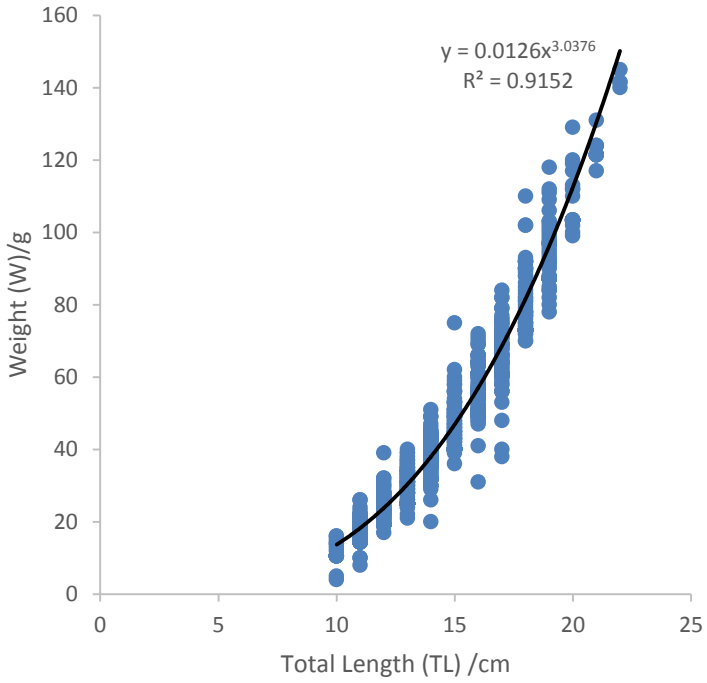

Figure 19 Length-Weight relationship for *Brachydeuterus auritus*

The body weight of all species analyzed positively correlated with length. The exponent values of the length- weight relationship did not deviate from the normal isometric value (3.0) except in the case of *Pentanemus quinquarius* which showed a b- value of 3.5. This implies all species show isometric growth. Thus the length and weight increase proportionally. However, *Pentanemus quinquarius* showed a positive allometric growth which suggests that the length and body weight of the species grow exponentially.

3.5 Frequency Distribution Graph for Species by Gear

Generally, samples from beach seine landings mainly consisted of smaller sizes of individuals which are typically caught by beach seine operations. The range of total length of the species varied by gear type as a reflection of selectivity. Total length ranged from 10 cm to 26 cm for *Pentanemus quinquarius* for beach seine fisheries. Those of *Brachydeuterus auritus* ranged from 10 cm to 26 cm (beach seine landings). Total length of *Galeoides decadactylus* from beach seine landings ranged from 6 cm to 37 cm and those from trawl fisheries ranged from 15 cm to 43 cm. For *Pseudotolithus senegalensis* a range 9 cm to 27 cm were observed for beach seine landings and 10 cm to 61 cm for trawl fisheries. The common size occurring in the sample for the species for the six month period range from 14-19 cm for *Pentanemus quinqarius,* 12 -18 cm for B. auritus, 26-30 cm for *Galeoides decadactylus* and 30-40 cm for *Pseudotolithus senegalensis*.

For each species, the smallest individual was observed in beach seine samples. Trawl fisheries on the other hand contained bigger specimens and often mixed with juveniles. Samples of *Pentanemus. quinquarius* consist mainly of smaller sizes with only a few individuals which appeared to be matured.

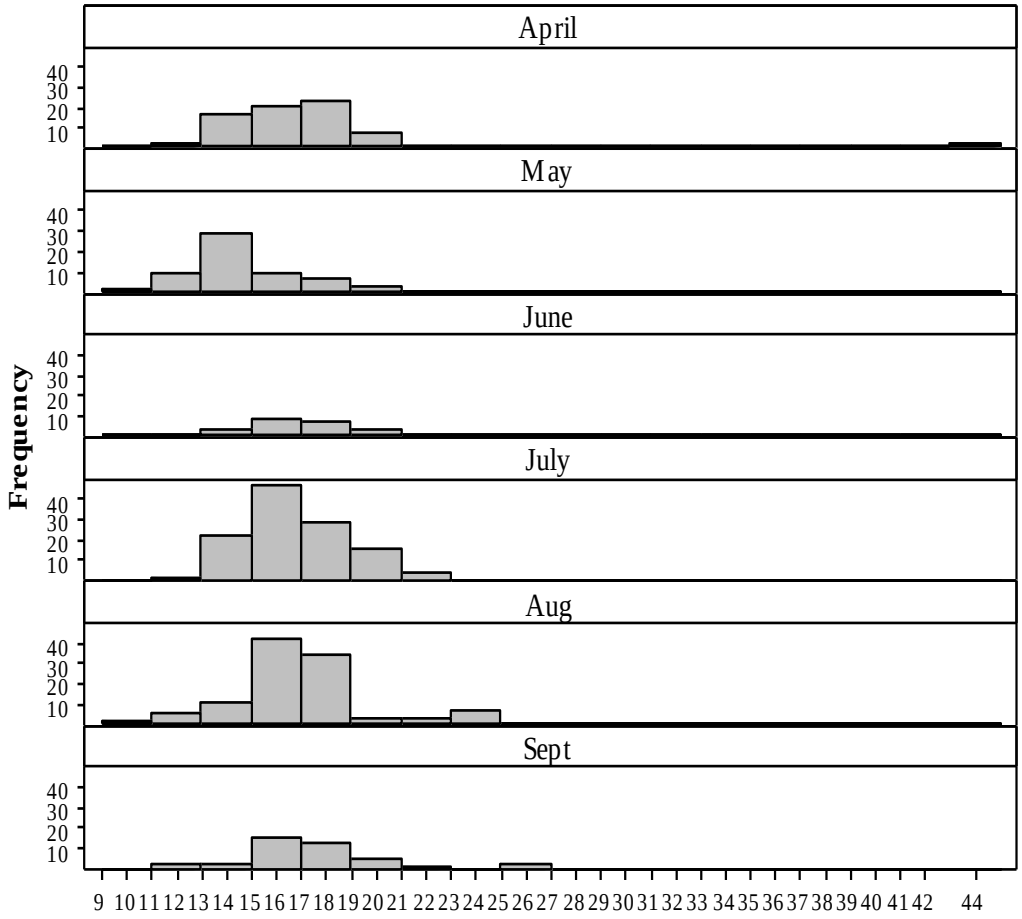

Figure 20 Length-frequency distribution of *P. quinquarius* (beach seine fishery)

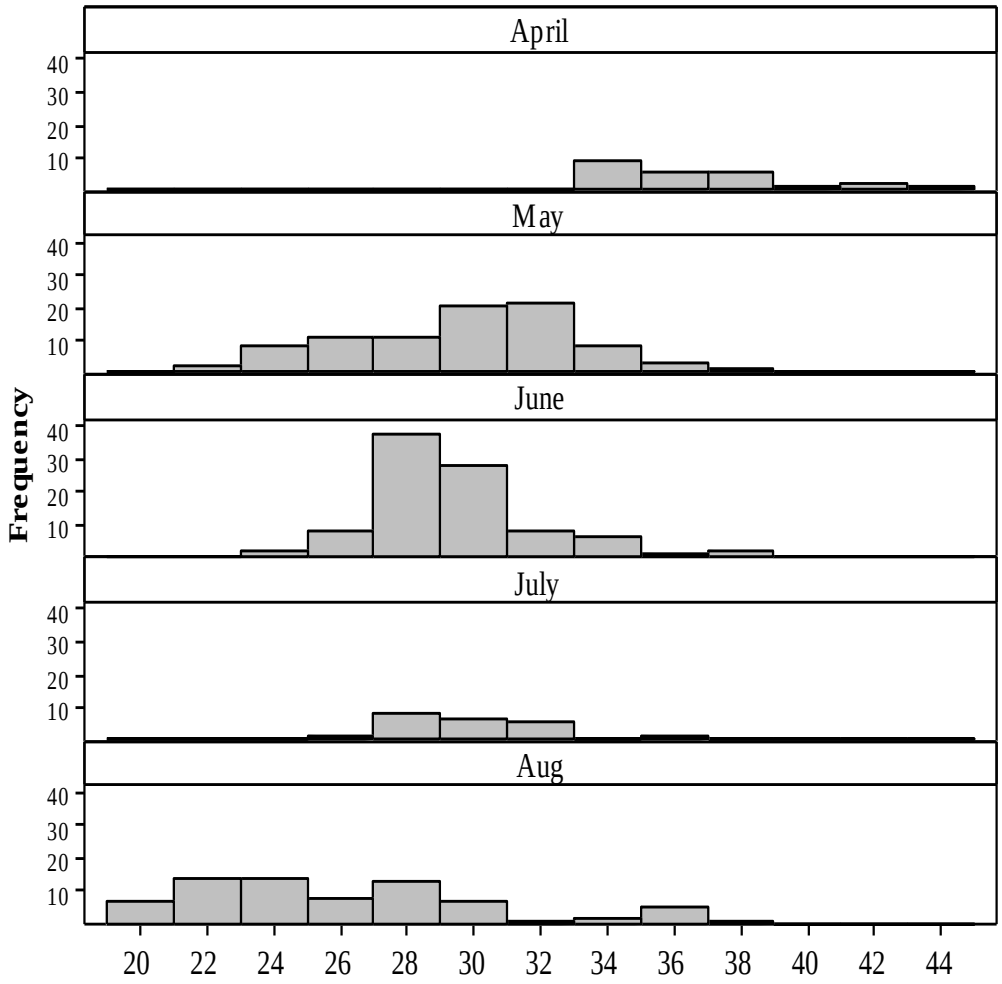

Figure 21 Length-frequency distribution of *Galeoides decdactylus* (Trawl net fishery)

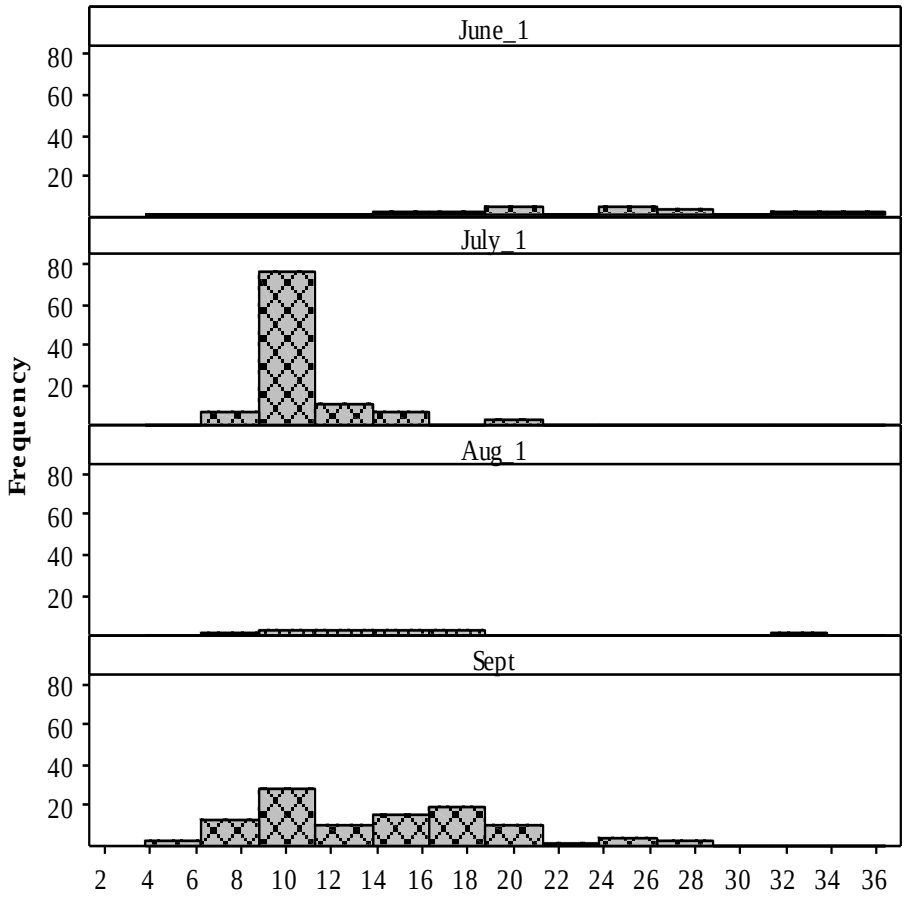

Figure 22 Length-Frequency distribution of *Galeoides decadactylus* (beach seine net fishery)

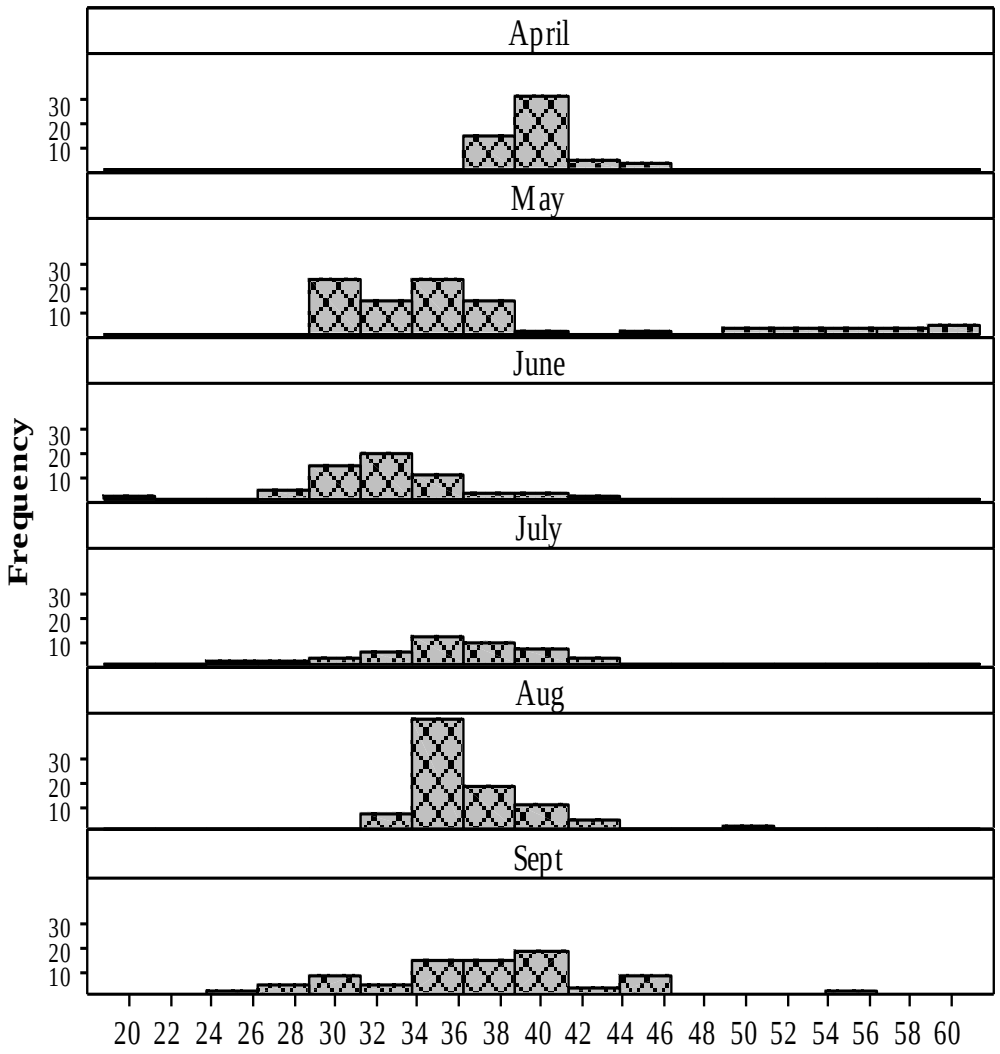

Figure 23 Length-frequency distribution of *Pseudotolithus Senegalensis*

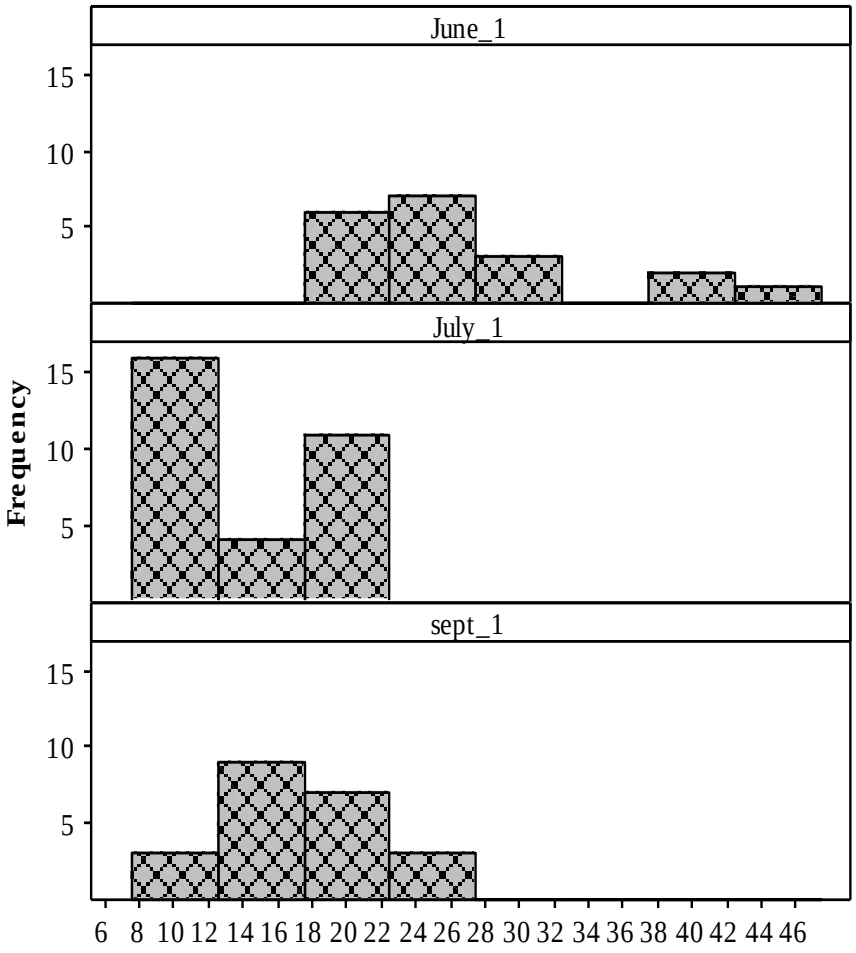

Figure 24 Length-frequency distribution of *Pseudotolithus senegalensis* (beach seine fishery)

3.6 Otoliths and Scales

A total of 20 otoliths and 20 scales were removed from each species for growth studies per month. In all 120 scales and 120 otoliths are preserved for each species (overall total of 720 scales and 720 otoliths) with respect to growth studies for the six months period. No scales have been preserved for specimens of *P. quinquarius* because all individuals encountered had not developed scales.

4. COOPERATIVE RESEARCH

Fishermen and fish processors have been very cooperative and always eager to learn**.** So far they are able to effectively collect length-based data and information regarding weight (body weight and gonad weight). They can also adequately determine the sex of the species. However, macroscopic staging of the gonads remains a little difficult, nonetheless they are gradually picking up and with time they may be good at collecting such information.

A total of 12 fishermen were trained and are engaged with the project to identify samples, help with data measurements and record information. Initially fishermen were hesitant to help us and engage in this research. They always demand compensation for their work. We convened several informational meetings about the project through the chief fisherman and with the assistance of the Senior of Fisheries Advisor. By the 3rd month, we managed to establish a group of fishermen and women processors who were leaders within the community. They understood the value of the research and their engagement in the overall fisheries management.

We recommend holding a stakeholders workshop for 2 days in Takoradi to recruit more fishermen and women processors in this type of collaborative research.

So far focus has been dedicated to the collection of information related to assessment of demersal stocks. There are seven months (October 2015 – May, 2016) of data collection yet to be done. During this period focus will be on collecting information regarding the social, economic and cultural related issues of the fisheries resources. Biological data collection will continue throughout the remaining time of data collection. Periodic analysis of collected data will be done where possible to observe patterns in biological variables.

The next quarter will involve gear inventory regarding the fisheries and social surveys wherein information related to economic significance, demographic and geographic aspect of the fisheries will be collected. During the twelve month period, management issues regarding the fisheries will also be ascertained.