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## ASSESSMENT OF THE SOCIO-ECONOMIC, FOOD SECURITY AND NUTRITION IMPACTS OF THE 2019 CLOSED FISHING SEASON IN GHANA



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**Cover photo:** Top: Focus group discussions with fish processors at Keta and Bortainor. Bottom: boats on shore demonstrating compliance with the closed season at Nungua Landing Beach.

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## ACRONYMS

ALOs	Alternative Livelihood Options
ANOVA	Analysis of Variance
CCRF	FAO Code of Conduct for Responsible Fisheries
FAO	Food and Agriculture Organization of the United Nations
FC	Fisheries Commission of Ghana
FGD	Focus Group Discussion
GHS	Ghana Cedis
HHS	Household Hunger Scale
IUU	Illegal, Unreported, Unregulated Fishing
KII	Key Informant Interview
M & E	Monitoring and Evaluation
MOFAD	Ministry of Fisheries and Aquaculture Development
MS	Microsoft
NAFAG	National Fisheries Association of Ghana
NAFPTA	National Fish Processors and Traders' Association
NFMP	National Fisheries Management Plan of Ghana
PBS	Population Based Survey
SFMP	Sustainable Fisheries and Management Project
STWG	Scientific and Technical Working Group
URI	University of Rhode Island
USAID	United States Agency for International Development
WDDS	Women's Dietary Diversity Score

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# EXECUTIVE SUMMARY

## Introduction

Ghana's marine and coastal aquatic resources have been a consistent mainstay of the coastal economy, providing essential nutrition, income and livelihoods to many coastal communities. The fisheries sector generates over \$1 billion in revenues each year and provides livelihoods for an estimated 10 percent of the population (MOFAD, 2015). The marine artisanal fleet consisting of approximately 10,000 canoes contributed approximately 73% of marine landings in 2014 (MOFAD, 2015). The artisanal sector employs approximately 100,000 fishermen and over 30,000 fish processors and traders. Consequently, the maritime environment and associated natural resources have become a strategic national asset with considerable interest and attention. There are clear signs of overexploitation of important fish stocks resulting in significant economic losses, and conflicts over management strategies threaten the long-term sustainability of the fisheries and their contribution to nutrition and food security. This current situation calls for urgent development of new and cost-effective approaches to fisheries management which embrace conservation and environmental, as well as social and economic, considerations. As part of implementation of the National Fisheries Management Plan of Ghana (NFMP) (2015-2019), the Ministry of Fisheries and Aquaculture Development (MOFAD) declared a month-long closed season for 2019 from 15<sup>th</sup> May to 15<sup>th</sup> June for the artisanal and inshore fishery, and from 1<sup>st</sup> August to September 30<sup>th</sup>, 2019, for the industrial fishery.

The primary objective of this socio-economic study was to assess the short-term socio-economic impacts - positive, neutral or negative - of the closure on artisanal sector canoe fishing households. The findings and recommendations provide inputs for formulating possible national arrangements and mechanisms on fisheries closure policies and management strategies, and how implementation of such measures can be strengthened. The main methodology adopted for the study involved administration of a survey questionnaire by trained enumerators on a mobile network (paperless) KoBoToolbox Kit in eleven (11) communities during three designated phases relevant to the closed season: pre-closed, closed and post-closed seasons. In addition, focus group discussions and key informant interviews took place in the sampled communities.

## Socio-economic impacts of the closure on fisherfolks and their households

Since the closure removes fishing effort from the system for a period, decreases in fish yields commensurate with reduction in effort were expected and observed. This reduction in effort resulted in temporary loss of household income and livelihood for canoe fishing households during the closed season. Similarly, fish processors and other related businesses (transport, sale on nets, fuel, ice block producers, etc.) were found to be confronted with several socio-economic impacts. Notable among these impacts as stated by focus group participants were an increase in fish price; reduced availability of fish in the diet; reduction in social activities; inability of parents to care for children; and a perceived increase in poverty and negative nutritional impacts.

The survey data showed declines in reported fishing-related income during the closure period and that was also reported in focus group discussions. While marine fishing was stopped during the closure, some income was still earned from processing and marketing, and fishing in estuarine or freshwater areas. This drop was temporary, and a rebound in fishing related income was seen after the closure. While this loss is temporary during the closure, recovery of those

losses through improved stocks and catches will take years, and this should be viewed as a significant sacrifice by fisherfolks in the short term in expectation of future long term gains. Considering the alternative of no action or no closed season would likely be even bleaker due to the likely collapse of the small pelagic stocks, continuation of declining catches and related fisheries incomes, thereby pushing more and more fisherfolk into poverty. A fishery rebound on the other hand, would reap long term gains. For instance, Lazar et al. (2018) reported that with improved management, the revenues from small pelagic fishing annually could increase 4.5 times current levels from US\$ 11.1 million to US\$ 50 million annually, which is consistent with a World Bank estimate that US\$ 50 million is currently lost annually in Ghana's marine fisheries due to poor management.

There were no measurable changes in non-fishing livelihood activities reported during the periods before and during the closure, implying that non-fishing livelihoods were lacking as a coping strategy. This observation was further corroborated by the household income data showing that non-fishing household income did not increase during the closure. The survey showed that fishing households are highly dependent on fishing with few alternative sources of income to fall back on during this closed season as approximately two-thirds of households had no livelihoods other than fishing related.

Use of savings represented the main coping strategy to address the loss of fishing income. Other forms of impacts reported by people interviewed other than fishing income included spending operating business capital which would have been used for fishing activities as well as being unable to provide money for household needs, especially the welfare of children.

While some people in the focus group discussions indicated engagement in secondary livelihood activities during the closed fishing season, most of the household survey respondents showed very few changes in non-fishing livelihood activity over the survey periods and no increase in non-fishing income during the closure. This suggests that there are few short-term opportunities available to fisherfolks during the one month closure or those that do not produce much income.

Some concerns were expressed before the closure that fishermen would migrate to neighboring countries to fish and thereby negate the effects of the closure on the regional stocks. This did not occur, as less than two percent of respondents said they migrated during the closed season.

### **Impacts of the closure on food and nutrition**

The assessment of food and nutrition impacts was designed to provide understanding of fishing household food coping strategies during the closed season and assess the impacts of reduced local fish supply on household hunger levels and dietary practices and patterns among women of reproductive age. Levels of moderate to severe hunger rose by 6.4 percentage points during the closure, impacting an estimated 2,560 households. Dietary diversity of women of reproductive age was significantly reduced during the closure. There was an increase in those with low dietary diversity and a decrease in those with high dietary diversity during the closure. An estimated 2500 additional women experienced lower dietary diversity during the closure. Women's diets showed significant declines in consumption of meat and fresh fish, fruits and vegetables, nuts, and legumes, as well as milk products, most likely due to reduced income during the closure. All these impacts were temporary and were nullified after the closure as hunger and dietary conditions returned to levels prevalent before the closure.

## **Communication on the closed season**

In contrast to the observation made from respondents concerning the duration and timing of the closed fishing season for canoe fishermen which was well known, many respondents had no idea about the time frame for the closed fishing season for trawlers and the inshore fleet. Collectively, a greater percentage of respondents preferred obtaining information about the closed season from the media and other sources. The most preferred sources of information were from the TV, chief fisherman, national radio, community meeting, loudspeaker, and community radio. The least preferred sources of information on the closed season included Konkohene, the Fisheries Commission, friend or family member, religious authority, district official, and newspaper.

## **Fisherfolk opinions for government action and support**

If the government were to provide some form of assistance to fisherfolk during the closed season most respondents preferred some form of cash assistance, either cash for work or a pay-out from the pre-mix community development fund, or some form of direct food assistance or other form of livelihood support.

## **Perceptions of compliance with the closed season.**

Information from key informants, focus group participants, and survey respondents indicate that most people felt compliance with the closed season by canoe fishers was high, with all or most complying with the closure and not fishing. This is a significant and important outcome demonstrating that with sufficient stakeholder dialogues, leadership support within the canoe association and sufficient communications, artisanal fisherfolks will voluntarily comply with important management measures to rebuild fish stocks.

## **Recommendations**

Some of the practical recommendations on how to facilitate and strengthen the implementation of future closures include but are not limited to the following:

### ***Reduce Uncertainty***

- Standardize the annual period of the closure so that fishing households and other stakeholders can plan better coping strategies, and so that the government can streamline communications and monitoring.

### ***Securing livelihoods***

- Mitigating temporary loss of livelihood and income during the closures.
- Investment in training and support for alternative or diversified livelihoods such as aquaculture, vocational (e.g. soap making) and other types of agriculture related businesses (e.g. poultry, snail farming and fish farming).
- Consider cash compensation or cash for work programs during seasonal closures.
- Further develop fisher insurance-savings blended products that allows for a payout if elected by the beneficiary during the closed season and promote enrollment in such plans.
- Promote mechanisms to assist fisherfolks strategically manage savings, especially for women to use for the welfare of children during the closure.

- Provide access to credit just prior to the closure every year (especially small-scale processors and traders) to enable stockpiling of processed fish to make more money during the closed season when price may increase due to scarcity.

### ***Ensuring food security during closures***

In order to mitigate these impacts in future seasonal closures, the following is recommended:

- Provide food subsidies for fishers during the closed season. In this regard, MOFAD should seek funding from Parliament to compensate fisherfolks for loss of jobs and livelihood until the stocks recover.
- Distribute nutritional supplements to women of reproductive age during closures.
- License fisherfolk associations to import fish during closed seasons.

### ***Improving communications with stakeholders about future closed seasons***

- Collaboration of MOFAD with the stakeholders in the fishing industry to raise awareness that fisheries is heading for disaster to win the support by parliament.
- Take a critical view of the definition of the period of the closed season from the point of view of reduction in fishing effort based on scientific data rather than on cultural benefits.
- Improved communication, education programs and participatory decisions by key stakeholders on the period for the closed season. This will require improved fisheries extension and communications campaigns.

### ***Adoption of an adaptive fisheries management approach***

Despite these impacts, most fishers strongly agreed that the closure will improve future catches. As a result, most respondents indicated their acceptance for the institutionalization of the closed season. Thus, while advocating for the application of the closed season as a management strategy, this initial attempt at a closure by MOFAD may be considered as a learning phase for stakeholders to assess the closure and allow them to adopt possible future coping mechanisms leading to a positive response and harnessing of the expected benefits derived from rebuilding of the stocks. Consequently, the closure may be considered as a 'learning by experiment or testing' and should continue in subsequent years to enhance adaptive management of the fisheries supported with monitoring and data collection by FSSD to facilitate modification of the adaptive management interventions with time.

## I. INTRODUCTION

In Ghana, fishing is a major source of food and employment. Fishing and the fisheries value chain is an integral part of the economy of Ghana providing direct and indirect benefits to a large segment of the population. The fisheries sector generates over \$1 billion in revenues each year and provides livelihoods for an estimated 10 percent of the population (MOFAD, 2015). The marine artisanal fleet consisting of approximately 10,000 canoes contributed approximately 73% of marine landings in 2014 (MOFAD, 2015). The artisanal sector employs approximately 100,000 fishermen and over 30,000 fish processors and traders. Many Ghanaians also derive tangible and intangible benefits from the country's fisheries resources through cultural values and attachments. Demand for fish and fish products has increased with increasing population over the years. The response of fishers to meet the ever increasing demand for fish by increasing fishing effort with little or no management and regulatory oversight within an open access regime translated into intense pressure on most of the important fish stocks, especially the high value small pelagic fish species. This led to overexploitation and the current state of near collapse of most of the fish stocks in the marine environment threatening national food security. The situation calls for urgent action and development of new and cost-effective approaches to fisheries management which embrace environmental conservation, as well as social and economic considerations.

The FAO Code of Conduct for Responsible Fisheries adopted in 1995 (FAO, 1995) requires that member states conduct fishing with due regard for the environment and marine life. Where appropriate, suggested interventions should include technical measures related to fish size, mesh size of gear, discards, closed seasons and areas and zones reserved for selected fisheries, particularly artisanal fisheries. In this regard, the National Fisheries Management Plan (NFMP) 2015-2019 outlined several actions that must be taken to sustain Ghana's fisheries resources with the objective of reducing fishing effort. In consonance with the objectives of the National Fisheries Management Plan, a two-prong approach aimed at solving the problem of overfishing in Ghanaian coastal waters has been suggested by the USAID/Ghana Sustainable Management Project (Tobey, et al., 2016). The first was confronting overfishing, over-capacity, and irresponsible fishing; the second was stock rebuilding measures such as closed seasons and fish sanctuaries.

Implementing one of the measures enshrined in the NFMP to sustain the fisheries, the Ministry of Fisheries and Aquaculture Development (MOFAD) declared closed seasons from the 15th May – June 15th, 2020 for the artisanal fishery and inshore fishery, and from 1st August - September 30th, 2019 for the industrial fishery. The closed seasons represented a moratorium on fishing with the objectives of increasing the recruitment of juveniles of targeted species through safeguarding of remaining adult members of depleted stocks, especially during the spawning period. Concomitant to the declaration of the closed season was the need to ascertain its short-term socio-economic impacts; positive, neutral or negative concerns associated with the closure on various sectors within the fishing industry involving canoe fisherman – owners and crew, fish processors and any potential impacts on consumers of seafood. This report focuses on the socio-economic, food security and nutrition impacts of the 2019 closed fishing closed season declared by MOFAD for the marine artisanal sector in Ghana.

## 1.1 Objectives and Scope

The overall objective of the study is to assess the short-term socio-economic impacts, positive, neutral, or negative, of the closure on the artisanal sector within the fishing industry including canoe fisherman – owners and crew, fish processors and marketers. More specifically, the study seeks to:

- Assess the short-term impacts of the 2019 closed fishing with respect to livelihoods, income, food security and nutrition in coastal fishing households.
- Based on these findings, recommend national arrangements and mechanisms for formulating and institutionalizing fisheries closure as fisheries policy and management strategy and make practical recommendations to facilitate implementation of the policy and ways to mitigate socio-economic impacts if any.

The assessment of food and nutrition impacts of the closed season was designed to answer the following questions:

- What were the coping strategies for households of fisherfolk for offsetting food lost due to the closed season?
- Did fisherfolks change dietary and food consumption patterns during the closed season compared to before and after and are there possible nutritional impacts of these changes?
- Did fishing households eat less due to reduced income or food availability and did this increase moderate and severe hunger during the closure?
- What were the most preferred communications channels for information on the closed season and extent to which communications campaigns made fishermen aware of the dates and duration of the various closures on each fleet?
- What were the types of support that fisherfolks would prefer if the government provided some form of support or compensation during closures?
- What national arrangements and mechanisms or approaches could be taken to strengthen future closures and minimize short term impacts.

## 2. METHODOLOGY

Given the nature of the study, multiple methods of data collection were adopted. This includes quantitative and qualitative methods to collect both primary and secondary data.

### 2.1 Description of Methodology

#### 2.1.1 Literature review and desktop work

Desktop work was carried out to review existing literature on seasonal closures, and socio-economic impacts. The purpose of the desk study was to set out basic but essential programmatic information necessary to creating a detailed understanding of the assessment.

#### 2.1.2 Research instruments and indicators

##### Fisherfolk key informant Interviews and focus group discussions

To obtain information from the fishers, a face-to-face interview technique was applied (Figures 1-5) to obtain candid and in-depth responses to understand the impacts from the closed season. Similarly, to appreciate fishers' knowledge on national fisheries policies and regulations as well as capacities of different fishers to address or cope with the impacts of the closed season. A semi-structured questionnaire was developed for the Focus Group Discussions (FGD) and Key Informant Interviews (KII) (see Appendix I). Key informants and focus group discussion members were selected with the assistance of staff from the Fisheries Commission, local Chief Fishermen and local NGOs. The individuals were selected with the assistance of Fisheries Commission staff. The Fisheries Commission staff are the first point of contact in any fishing community, they know the various stakeholders in the communities, those that can give data, those that keep records, those that can help fisheries management. Five key informants were interviewed in the Western, Central and Greater Accra regions and three were interviewed in the Volta region.



**Figure 1: Key informant interview at Apam main fish landing beach**





**Figure 2: Key informant interview at Atorkor fish landing beach**



**Figure 3: Focus Group Discussion (men only) at Bortianor fish landing beach**



**Figure 4: Focus Group Discussion (men only) at Keta fish landing beach**



**Figure 5: Focus Group Discussion (women only) at Shama fish landing beach**

### Survey questionnaire

A structured survey questionnaire was developed for the field assessment. Appendix II presents the survey instrument and programming for the questionnaire using KoBoToolbox. The tablet-based questionnaire was pre-tested at Teshie in the Greater Accra Region (Figure 6) which

helped to identify and expose any weaknesses and/or limitations of the questionnaire, thus, enabling the necessary modifications before the final survey was undertaken.



**Figure 6: Pre-testing of questionnaire and field training of enumerators on the application of KoBoToolbox at Teshie**

*Sample frame and sampling strategy*

In order to select the households and individuals to be sampled along the coastline, the fishing villages recorded in the Report on the 2016 Ghana Marine Canoe Frame Survey, conducted by the Fisheries Scientific Survey Division of the Fisheries Commission, Ministry of Fisheries and Aquaculture Development, comprised the initial sampling frame. This report estimates the number of fishermen along the coast as 107,518 fishermen in 186 fishing communities with 292 landing sites. The number of fish processors and traders is not known but they are generally a proportionate to the number of canoes and fishermen. Figures often stated by Fisheries officials estimate between 30,00-60,000 processors and a similar or fewer number of traders. The number of canoe fishing households is not known but considered proportionate to the number of fishers.

Since the measures used in the survey include quantitative as well as qualitative (nominal and ordinal) variables, power analysis for several statistical analyses were used to ensure that enough respondents have been included in the survey to guarantee the detection of changes with a probability (power) of 0.80. To detect a medium effect size when comparing three proportions (three sampling periods – pre, during, and post-closure), the needed sample size will range between 166 and 435. That is, a sample size of over 435 respondents will

guarantee a power of 0.80 (or larger) when comparing three population proportions (see Crawford et al 2016 for detailed discussion of the power analysis for sampling of canoe fishing households in Ghana). Using an [on-line sample size calculator](#) with an estimated population of 130,000 fisherfolks, a sample size of 382 individuals are needed to obtain a confidence level of 95% with a margin of error of 5 percent. Assuming 60,000 fishing households, a similar sample size is needed to obtain a confidence level of 95% with a margin of error of 5 percent. However, assuming fewer households would be sampled than individuals as there are one or more persons involved in fishing livelihoods per fishing household, a sample of 250 households obtains a confidence level of 95% with a margin of error of approximately 6 percent. Hence, a target of approximately 400 -450 individuals was set for sampling during each survey period.

The sampling design used called for random canoe fishing household sampling with proportional allocation per region based on number of fishermen and further stratified to include small, medium and small fishing communities. In addition, the sampling design called for interviewing several people per household: those involved in fishing (generally men), processing and/or trading (generally women), so the sample represented not just canoe fishermen but small scale processors and traders, as well as men and women. While other groups of individuals are likely to be impacted by fishery closures (e.g. trawler and inshore vessel crew members, fishing gear supply stores, ice vendors, etc.) due to time and cost constraints and complexities of selecting a random sample of other occupational categories, this survey explicitly focused on canoe fishing households and the small scale processors and traders of the canoe fishery, as this represents the largest segment of those expected to be directly impacted.

The number of fishermen and percentage of total fishermen per region from the frame survey is shown in Table 1. Eleven communities were targeted for sampling (see Table 1) due to cost and time considerations. As the Volta region has proportionally fewer fishermen, only two communities were targeted to be sampled in the Volta region and three communities were targeted to be sampled in the Western Central, Greater Accra regions. Grouping of coastal fishing communities into small, medium and large communities was done from the frame survey data; small sized community (< 50 canoes), medium sized community (50-100 canoes), and large sized community (>100 canoes). This led to the random selection of a small, medium and large fishing community each in the Western, Central and Greater Accra regions. The Volta Region had no communities classified as large, so only a small and medium sized community were selected for sampling.

Systematic sampling of artisanal canoe fishing households (e.g. every 6<sup>th</sup> household) was used in each fishing community targeted, with a target sample per region of approximately 400 individuals per sample period, or approximately 36 - 40 individuals per community per sample period. This sampling strategy provided the basis to obtain a representative sample of fisherfolks and fishing households for the entire Ghana coastline. Table 1 also shows the actual number of individuals and households surveyed per region. Comparing actual percentages sampled to the proportion of the fishermen population per region, the Western and Central regions were slightly under-sampled and the Greater Accra and Volta regions slightly oversampled. The slight deviations between actual versus target were due to logistical and time constraints in each community and the varying length of time to conduct an interview per interviewee, and by having multiple enumerators in each community conducting interviews at the same time.

**Table 1: Communities sampled from the coastal regions**

Communities sampled per region	Region	No fishermen per region and percent of total	Number individuals sampled per region and percent of total	Number households sampled per region and percent of total
Sekondi, Half Assini, and Abuesi	Western	33,602 (31.3%)	364 (29.7%)	245 (28.9%)
Elmina, Winneba and Apam	Central	33,373 (31.0%)	324 (26.5%)	213 (25.1%)
Bortianor, Nungua and Tema	Greater Accra	25,844 (24.0%)	314 (25.7%)	226 (26.7%)
Keta and Atorkor	Volta	14,699 (13.7%)	222 (18.1%)	164 (19.3%)
	Total	107,518 (100%)	<b>1224 (100)</b>	<b>848 (100%)</b>

Table 2 shows the actual number of households and individuals that completed interviews during each survey period. Pre-survey interviews were conducted from April 30 – May 12, 2020; surveys conducted during the closure took place from June 5 – 14, 2020, and surveys conducted post-closure took place from July 15 – August 20, 2020. An equal number of males and females were interviewed with a greater proportion of fishers (approximately half) interviewed than processors and traders, which is generally consistent with their estimated proportion in the population.

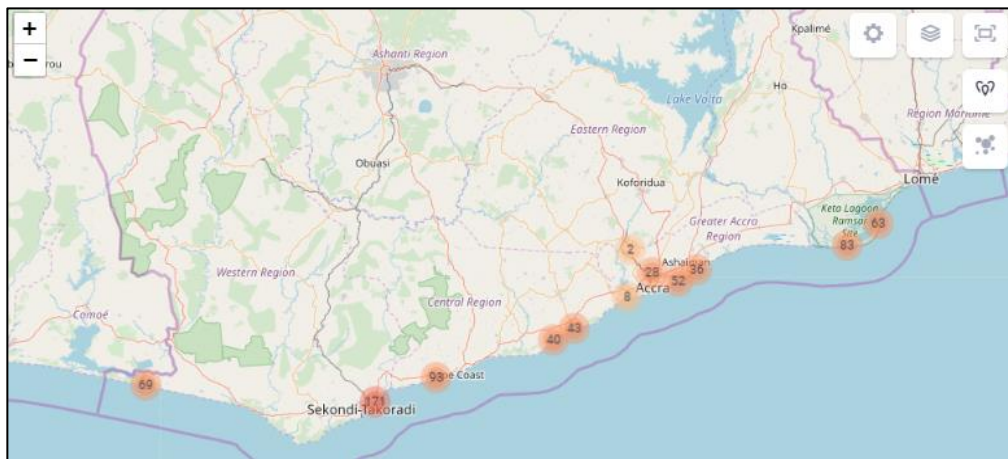
**Table 2: Number of households and individuals interviewed per sample period**

Level/Region	Pre	During	Post	Total
<b>Households</b>				
Western	83	84	78	245
Central	77	68	68	213
Greater Accra	84	73	69	226
Volta	59	53	52	164
<b>Total</b>	<b>303</b>	<b>278</b>	<b>267</b>	<b>848</b>
<b>Individuals</b>				
Western	125	125	114	364
Central	120	110	94	324
Greater Accra	121	90	103	314
Volta	80	70	72	222
<b>Total</b>	<b>446</b>	<b>395</b>	<b>383</b>	<b>1224</b>

Only fishing households were sampled which meant that at least one person in the household had to be engaged in a fishing related activity such as fishing, processing or trading. Households were defined as a single structure or unit where people reside. It can include a single-family unit as well as others such as grandparents, spouses of married children, and

children of the children of the family or others unrelated. In each fishing household sampled, the household head (either a processor, trader or fisher), and the household food preparer were interviewed. Household head was defined as the individual, male or female, that generally makes decisions for the household as a whole or a main income earner or provider for the household. Food preparer was defined as the person in the household who generally cooks the meals served to people in the household. Other than the household head, other adults involved in fishing, processing, and/or fishing were interviewed. Any female interviewed that was of reproductive age (18-49 years old) was asked a subset of questions concerning dietary diversity.

Figure 7 presents visual distribution of the selected communities along the coast of Ghana and was extracted as an output image from KoBoToolbox.



**Figure 7: Visual distribution of the selected communities along the coast of Ghana and numbers sampled in each location**

Survey questions and variables

Data collected from each household included household livelihood and income information from the head of the household, household hunger information from the household food preparer, dietary diversity information from women of reproductive age (18-45 yrs. old), and other information from members that were either fishers, fish processors and/or fish traders. Details of the questions asked of household members are presented in the questionnaire shown in Appendix II. Indicator definitions and collection for income, livelihoods, household hunger scale and dietary diversity score, are also presented below. Additional commentary on the rationale for choice of indicators and modifications from USAID standardized indicators and are provided in Appendix III.

**Household income** – Income changes over time was considered for this survey to be the best approach to measure potential economic losses of fishing households resulting from the fishing closure. Income data was collected for the household, which is defined as the economic unit, not the individual. Data was collected from the identified household head for the entire household. The household head identified all livelihood activities the household was engaged in and asked for the estimated income generated from each over a 48 hour period. For reporting purposes, 48 hour income data reported by respondents was converted to a daily household

income by dividing by two. Income was summed for all fishing related livelihoods (fishing, processing and/or trading) as well as non-fishing related income and total household income.

**Livelihood** was defined as a productive or income generation activity of persons in the household. All livelihood activities that all household members were engaged in was asked of the household head, not just those engaged in by the household head. The number of livelihoods a household was engaged in was used as a measure of household economic resilience. The larger the number of household livelihoods, the more resilient the household. In addition to summing total household livelihoods, the number of fishing and non-fishing livelihoods was also calculated to determine level of household dependence on the fishery alone and potential ability to adjust or rely more on non-fishing livelihoods during the fishing closure.

A **household hunger scale** (HHS) was used as a measure of food security or food insecurity. It measures the quantity of food accessible to the household. This indicator is used in the USAID Feed the Future (FtF) Population Based Surveys (PBS) in northern Ghana. The data collection and scoring methods are found in Zereyesus et al. (2012) and Ballard et al. (2011). This indicator uses a scale of 0 - 6 (0-low, 6-severe hunger) from which median scores can be calculated or converted to an ordinal rank of little or low, moderate, and severe hunger in the household. The data is collected from the food preparer in the household. Our sampling procedure was slightly different than that used in the Ghana PBS and is explained in Appendix III, and therefore, it is not statistically comparable with PBS data.

The **Women's Dietary Diversity Score** (WDDS) was used as a measure of nutritional food security. It measures nutritional quality and adequacy for women of reproductive age (15-49 years old) given the importance of adequate diet during pregnancy and while breast feeding infants. This indicator is used in the USAID Feed the Future (FtF) Population Based Surveys (PBS) in northern Ghana. The data collection and scoring methods can be found in Zereyesus et al. (2012) and Kennedy et al. (2011). This scale uses a measure of nine food groups and is somewhat different but like the 12-point food group scale used by Swindle and Bilinsky (2006). The data on consumption of food groups over a 24-hour recall period is summarized into an overall household score from 0-9 and then categorized into low, middle or high dietary diversity.

**Changes in food groups consumed** was also assessed by looking at the nine individual food categories constituting the WDDS score. An in-depth breakdown of several of these categories was also made. Changes in fish consumption and type of fish consumed was assessed as the fishing closure would make locally caught fish supply less available during the closure. While this data is for women of reproductive age only, we assume it is generally representative of overall household food consumption as suggested by Kennedy et al. (2011)

#### Training of enumerators

The objectives of the training provided (Figure 7 below) were to give enumerators; (1) a wider understanding of the closed season,(2) specific skills in recording responses of interviewees and in the use of mobile tablets equipped with KoBoToolbox application (software), a paperless survey instrument and cloud-based data storage platform that facilitates field data collection. It has the following features: ability to create forms, collect data offline and upload when online to a cloud-based server to store data, and ability to download the database in several formats for analysis.



**Figure 8: Enumerators undergoing training at the USAID-SFMP Office, Accra**

## **2.2 Data Analysis**

Data was downloaded from the KoBoToolbox cloud into an Excel data sheets and analyzed using both Microsoft Excel Statistical Tool Pac and SPSS. Charts and tables were generated using Microsoft Excel and SPSS. For all statistical analyses, statistical significance was set at  $p < 0.05$ . meaning that the chance the differences in the values of the indicators between time periods or regional differences is random is less than 5% or a greater than 95% change they are real differences in the . This implies that the probability of the pattern of findings from the sample is not generalizable to the broader population of fisherfolks is very small—less than a 5% chance, or conversely, there is a 95% chance the findings from the sample are generalizable to the entire population of fisherfolks.

Where statistical differences were found, the values of the test statistic (e.g. Chi-square value, t-test t-value, ANOVA F statistic, etc.) are reported along with degrees of freedom (df). and the overall sample size (N) used for the statistical calculation. These will be of interest more to the social scientist that may read this report rather than more general lay audiences.



## **3. RESULTS**

### **3.1 Literature Review**

#### **3.1.1 Seasonal fishing closures**

Conventional fishing effort control measures have repeatedly failed to achieve the expected conservation goals (Nenadovic et al., 2012). As a result, fish stocks have severely declined in abundance and yield due to increasing harvest rates (Pauly et al., 2002; Myers and Worm, 2003; Clement et al., 2007), with some stocks risking collapse. Commensurate with stock declines are dwindling socio-economic benefits for fisherfolks. This implies threats to the food and economic security of billions of people in the world, with the most vulnerable populations in the developing countries. Responding to this challenge, significant attention has been given to finding ways to better manage fisheries resources, including co-management and ecosystem management approaches that complement traditional management methods (Cochrane et al., 1997, 2004; Berkes et al., 2001; Holtzhausen et al., 2001; Sowman et al., 2003; Clement et al., 2007). In most cases, it has been realized that the implementation of fisheries management measures such as gear restrictions, marine protected areas, total allowable catch, fishing holidays, and minimum size limits have not been effective in sustaining fish stocks and promoting local development. Fishing closures have been adopted as a better management tool to reverse declining fish stocks.

Fisheries in the tropics and subtropics are characterized by highly variable recruitment and with a rapid growth in one season (Ye, 1998). Fishing closures at this “rapid growth season” ensures high survival rate and successful spawning. Therefore, a fishing closed season is considered a cost-effective solution to rebuild declining fish stocks in tropical and subtropical countries (Ye, 1998; Agardy, 1997; Nenadovic et al., 2012). A closed fishing season is most often targeted at the peak breeding period of harvested fish stocks to protect adult members of the species with matured gonads ready to spawn and the juveniles of such species (Clement et al., 2007), with the primary expectation of a greater reproductive output on seasonal and annual time scales. Widely adopted in the late 1990s (Agardy, 1997), closed seasons have proven to be an efficient effort control measure for sustainable fisheries. Ghana has adopted and implemented a fishing closed season as a measure to reverse the declining fish stocks and restore associated socio-economic benefits. This approach was adopted for the trawler fleet in 2016 and was applied for the first time for the canoe and inshore sub-sectors in May-June of 2019.

#### **3.1.2 Socio-economic impact of seasonal fishing closure**

Fishing is important for national economies, food security, nutrition, and coastal social stability (FAO, 2018;). Specifically, the canoe/artisanal fisheries sector plays critical roles for local socio-economic development, poverty alleviation and food security in developing countries. People in coastal communities in developing countries depend heavily on fisheries as their major source of income and livelihood. Evidence from Ghana indicates that the fishery is a main income source for approximately 92 percent of coastal populations (Asiedu and Nunoo, 2013).

Fisheries in Ghana support the livelihood of over 3 million people, with an estimated 150,000 fishers and 30,000 fish processors (MOFAD, 2018). Canoe fishers constitute 92 percent of the fishers in Ghana (FASDP, 2011), and their catches make up 80 percent of all fish landed (MOFAD, 2018). Consequently, fish harvest restrictions can be expected to impact the artisanal fishery and exacerbate vulnerabilities in coastal communities. The impact could be felt by

fishers and fish processors/traders and could be severe among children and poor elderly people in households that depend solely on the fishery for their livelihood. The level of the impact may vary among the different stakeholder groups and within stakeholder groups based on different socio-economic status.

A fishing closed season is expected to impact income, expenditure, food, nutrition and health of fishery-dependent households. The level of impact could depend among other factors on; educational level, skill diversity, organizational membership and village savings/loans. Education level can affect an individual's income and adaptation opportunities (Ellis, 1998; Asiedu et al., 2013; Colwell and Axelrod, 2017), and skill diversity may also allow for livelihood adaptation when fishing is restricted. Furthermore, organizational membership indicates whether fisherfolks have social capital which could impact income/financial capital and increase adaptation pathways (Putnam, 1993; Colwell and Axelrod, 2017). Village savings/loans associations may also influence whether fisherfolks have financial coping capacity or access to financial capital during a fishing closure.

There have been few socio-economic impact studies of seasonal fisheries closures. A Philippines study (Rola et al., 2018) of a three-month sardine fishery during the spawning season resulted in increased catches after the closure, and increased incomes of crews as a result of the increased catch. Fish processing factory workers found alternative livelihoods during the closure and had increased working hours/wages after the closure. They concluded a positive impact to society overall from the closure.

Colwell et al. (2017), in a study of a 45-day seasonal fishery closure in Tamil Nadu, found less politically powerful groups such as female fish traders to be disproportionately impacted. While they found no difference in pre- and post- income levels of fisherfolks, they did find that women fish trader incomes were more impacted by the ban than fish transport workers. Mechanized fish laborers (crew) lost almost all income and more than boat owners. Crew, mainly males, reported high levels of unemployment and did not revert to alternative employment. Educational level mitigated income loss and as women had lower educational levels, were more impacted as a result. Higher impacts were found among those with an inability to diversify income – generally lower educated fisherfolks. While the government provided a R2000 (approximately \$56) relief payment during the ban to registered fisherfolks, it did not help fisherfolks during the closure as it was paid afterwards.

With respect to Ghana, there have been no previous studies on closed seasons as this is the first instance when they have been implemented. However, some studies are worth noting in relation to timing and duration of a closure and promotion of livelihood diversification. Arizi (2019) conducted a modeling exercise of the Ghana sardinella fishery and concluded that a closed season of only one-month duration would not improve the fishery and would have to be of longer duration or coupled with cessation of capture of undersized juveniles. He also concluded that longer annual closures from 2-3 months would make the fishery recovery faster. This is often cited as an intervention to reduce fishing effort or through alternative livelihoods reduce the impact of seasonal closures. Cobbina (2018) conducted a study on the willingness of fisherfolks in Tema to exit the fishery or accept alternative livelihoods. She found that 77.5 percent of respondents were unwilling to stop fishing (exit the fishery). When asked more specifically if they would switch livelihoods if it offered a livelihood with similar income as fishing, only 44.6 percent were willing to switch. Respondents who came from a family of fishers tended to be more willing to exit. Those willing to exit preferred livelihood options that required few skills or education, as most had little educational attainment or specialized skills.

This literature review suggests that annual closed seasons in Ghana can work towards the long term goal of rebuilding depleted marine fish stocks but will come at some level of social and economic cost during closures, with differing socio-economic benefits accruing at some later date. Another lesson from this review is that differential impacts are likely based on occupational, socio-economic, and educational status as well as degree of livelihood diversification of fisherfolks.

## **3.2 Focus Group Discussion**

### ***3.2.1 Institutionalization of the closed season***

Focus group respondents were asked whether the closed season should be institutionalized (done regularly or annually) or not. Most of the respondents indicated their acceptance for the institutionalization of the closed season. This was because it will allow the “seas to rest” while ensuring rebuilding of the fish stock. However, most respondents indicated the need for the closure to apply to all the fishing sectors at the same time. Nonetheless, a few of the respondents rejected of institutionalization of the closed season. They attributed their perspectives to the fact that canoes do not go far from the beach in terms of fishing grounds, and that no appreciable benefit was observed after the closed season. These respondents also pointed out that trawlers rather than canoes, harvest a majority of the fish designated for the artisanal sector and as a result the trawlers should be included in the period of closure for the artisanal fishery sector.

### ***3.2.2 Socio-economic impact***

#### **Fish price**

The focus group discussion participants indicated that the price of fish would increase prior to and during the closure. The report on the biological survey of the closed season impacts showed a price increases after the closure (Lazar et al., 2019) although there was only one pre-closure sampling period to compare with.

#### **Nutrition**

The focus group responded to questions on dietary impacts and expressed several concerns: not eating a balanced diet/ inadequacy of fresh fish in the diet, eating cold store fish, high cost of fish, eating small sized fish and unavailability of fresh fish as their main responses.

#### **Fish catch**

Most focus group respondents felt that fish catch would improve after the closed season.

## **3.3 Key Informant Interview (KII)**

### ***3.3.1 Impact on family members***

The key informants were asked what they thought the impact of the closed season would be on their family. Many of the informants prior to the closure pointed out that the closure would have adverse impacts on them during the pre-closure survey. In the post closure survey, many key informants pointed out that the closure did in fact did affect their families. Other high frequency responses included the difficulty in taking care of their households. It had adverse impact on their livelihoods and contributed to increased hunger.

One senior official of the Fisheries Commission indicated that fishing households would have to spend more money in buying fish for the family. Further a Konkohema in a fishing

community in the Central Region said that the closed season will affect the income level of the family, leading to no money to pay the expenses of school going children as well as the provision of nutritious food for the family.

### **3.3.2 Impact on income**

Key informants stated that the main impact of the closed season on household income would be a reduction or no income. Living on savings made over the years comprised the next most frequent response given. Other forms of impacts on income mentioned were spending down operating business capital which would have been used purposely for fishing activities. Some said the closure had no impact on them. Some respondents indicated that they depended on savings and other forms of income during the closed season.

A senior official in the Fisheries Commission thought that most of the fishermen would experience a decline in income levels except for those that have alternative livelihoods. During the post closed season interview, a Chief Fishermen in the Volta region agreed that there was low income for fishing households as an outcome of the closed fishing season.

### **3.3.3 Impact on spouse**

The main impact of the closed season on spouses as indicated by key informants was the adverse impact on their livelihood as a result of the fact that they have no other form of income and survival. Also mentioned was inability to provide money for household expenses, especially the welfare of children. During the closed fishing period, a District Fisheries Officer reported that fishermen were not getting fish for their wives to process. This situation was also affirmed by a member of the National Fish Processors and Traders Association (NAFPTA).

Some individuals claimed increased marital stress as a result of the closed season and the economic hardship resulting from it.

### **3.3.4 Impact on children**

Regarding impact on children, key informants stated that closed fishing season made children unhappy as parents who depended on fishing were unable to provide for their needs. Another important impact on children was a reported increase in school dropout during the closed fishing season due to the inability of parents of fishing households to pay school expenses. Another impact of the closed season on children as revealed by key informants was reduction in the feeding frequency of children (i.e. less than three times a day) which has implications on the nutritional wellbeing of children. An executive member of NAFPTA in Greater Accra reported that she would not be able to take her children to school, especially paying their school expenses and also feeding them. A Chief fisherman indicated that the closed season will result in unavailability of food for his children and paying of school fees will be an issue, thus affecting their academic performance. Nonetheless, key informants stated that during the post closed season period, things returned to normal as parents of fishing households were able to provide for the needs of their children including feeding them three times a day and paying for school expenses as well.

### **3.3.5 Impact on poverty level**

Key informants reported that the impact of the closed season on poverty level was high because they had no work to do and hence no source of income for their upkeep. For instance, an official at the Fisheries Commission felt the poverty level of fishermen deepened. However, boat owners, processors and fishermen with saving habits would not be affected. Similarly, a

member of NAFPTA in the Western Region believed that poverty levels increased as there was no fish to process and sell for money.

### **3.4 Survey Questionnaire**

This section includes background information on the socio-demography of respondents and how the closed fishing season impacted the livelihoods and food security of fishing households. It also includes information on perceptions of compliance to the closed fishing season, issues for developing effective communication strategies aimed at fisherfolks, and suggestions for government actions and support.

#### **3.4.1 Socio-demographics**

##### **Individual characteristics of respondents**

Some individual demographic data was only collected for the pre-survey period to reduce time of the interview and costs for the subsequent survey periods. Therefore, some of the data reported below is for all three time periods as indicated and for others only for the pre-closure survey period.

The mean and median age of the respondents interviewed over all three survey periods (N=1227). was 46 years. The minimum age was 19 years (Note that only adults, age 18 years and over were interviewed) and a maximum age was 85 years. A large majority of the respondents surveyed during the pre-closure period can neither read nor write in any language (77%) with respondents in Volta and Greater Accra Regions having relatively higher literacy rates compared to the Central and Western regions. Most respondents surveyed in the pre-closure period were married (75%) followed by widowed (9%), and cohabitating (6%) and other categories (10%). Regarding nationality, most of the respondents were Ghanaian, with only a few being non-Ghanaian in the Volta Region.

##### **Household characteristics of respondents**

The following are based on answers by the household head interviewed about all household livelihoods and all income for the of fishing households sampled during the pre-closure survey period. The mean number of persons in a household was 8.26 persons. The mean number of persons engaged in fishing, fish processing and fish trading in a household was 1.74, 1.43 and 0.89 respectively with an overall mean of 4.06 persons engaged in fishing related activities per household showing that fishing was the somewhat more dominant fisheries related occupation among household members.

Table 3 below shows the percentage of respondents engaged in various livelihood activities across the four fishing regions for all time periods combined. Most of the households were engaged in fishing followed by both fish processing and trading. However, many households were also engaged in other non-fishing related activities.

**Table 3: Percent of households engaged in various livelihood activities**

Livelihood Activity	Central	Greater Accra	Volta	Western	N	Chi-square
Fishing	81.65	77.9	76.8	79.5	847	1.92
Fish Processing	44.6	55.6	60.4	89.0	847	108.14*
Fish Trading	46.9	50.9	51.2	87.7	845	106.59*
Farming food crops	1.4	1.8	16.6	2.5	840	62.39*
Farming plantation crops	0	0.4	8.1	1.6	839	34.94*
Livestock rearing	4.7	0.4	50.6	10.6	846	231.81*
Remittance	6.3	2.7	8.6	4.5	839	7.30
Other	20.9	9.9	39.0	23.0	839	46.90*

(Total responses sum to more than 100% as respondents can have multiple responses. \*are those with statistically significant differences between regions  $p < 0.05$ )

From Table 4 below, fishing was mentioned as the most important livelihood by almost two thirds of households. This was followed by fish processing, and fish trading. Non-fishing (farming) and “other” livelihoods’ were the most important livelihoods for less than 2 percent of households. Responses to the most important household livelihoods across the three-sampling periods were not statistically significantly different.

**Table 4: Most important livelihood to fishing households**

Livelihood Activity	Total
Fishing	66.9%
Fish processing	23.0%
Fish trading	8.2%
Farming food crops	0.2%
Farming plantation crops	0.1%
Others	1.2%

N = 848

(Other livelihoods include seamstress, teacher, food vendor, mason, carpentry, mason and trade in soap, cloths, beverages and provisions)

The second most important activity of the household as mentioned by respondents are presented in Table 5. The second most important livelihood was fishing, followed by fish processing and fish trading. The percentages stating fish processing and trading as the second most important livelihood were much higher compared to the responses of the most important livelihood as seen in Table 4 above. Summing all non-fishing categories for the second most important livelihood, summed to 12.6 percent in Table 5 compared to only 1.5 percent in Table 4 who stated these as their most important livelihood.

**Table 5: Second most important livelihood**

Livelihood Activity of household	Total
Fishing	27.5%
Fish processing	30.2%
Fish trading	29.4%
Farming food crops	1.4%
Livestock rearing	1.3%
Others	9.4%
Remittance	0.5%

N = 848

Other livelihood activities in Table 5 above summed to 9.4% of responses. Of those 259 respondents that mentioned other, the breakdown of these responses is shown in Table 6 below. Popular among these include trading, followed by transport business, carpentry, and teaching.

**Table 6: Components of other second most important livelihood**

Other activities	Percent of respondents
Trade in soap/food/drinks	62.9%
Trade in charcoal/Firewood	6.9%
Transport business	4.6%
Carpentry	3.9%
Teaching	3.9%
Mechanic (cars/ milling machine/outboard motor)	3.5%
Hairdressing	3.1%
Masonry/Laborers	2.3%
Trade in clothes	2.3%
Cold store operation	1.9%
Farming	1.5%
Seamstress	1.2%
Cosmetics	1.2%
Livestock rearing	0.8%

### 3.4.2 Fishing gears used

The most frequent gear used by the 404 respondents that said they were involved in fishing during the pre-closure survey period was the “*poli watsa*” (a purse seine used for small pelagic fishes). This was the major fishing gear used across three out of the four coastal regions, (Table 7), with the exception of Volta region. In the Volta Region, the dominant fishing gear used was the set net while in the Central Region, the use of hook and line was dominant.

**Table 7: Main gear used by fishermen respondents**

Gear	Central	Greater Accra	Volta	Western	Total all Regions
Poli watsa (purse seine)	34%	73%	0%	62%	46%
Hook and line	39%	11%	0%	2%	14%
Beach seine	3%	2%	61%	2%	13%
Set net (set gillnet)	8%	3%	39%	3%	11%
Long line	1%	0%	0%	23%	7%
Ali net (drift or encircling gill net)	2%	4%	0%	9%	4%
Drift gill net	6%	3%	0%	0%	2%
Trawl	3%	1%	0%	0%	1%
One-man canoe	0%	2%	0%	0%	0%
Other	6%	1%	0%	0%	2%

### Changes in gear types and fish targeted

The majority (of the respondents did not change the type of fishing gears used 98 %) or the type of species targeted (98%) after the closed season.

### **3.4.3 Type of trader**

The majority (69 % and 83 %) of the respondents were retailers with the Western region having a high percentage of retailers and Volta Region having a high percentage that are both wholesalers and retailers (Table 8). The type of trader varied significantly across regions ( $X^2$  test = 65.09, N=112, df=6, p-value < 0.001).

**Table 8: Type of traders among respondents surveyed during the pre-closed season**

Trader Type	Central	Western	Greater Accra	Volta	Total all regions
Retail	69%	39%	83%	15%	54%
Wholesale	19%	58%	14%	15%	28%
Both	13%	3%	3%	70%	18%

### **3.4.4 Number of fish smoking ovens**

The mean number of smoker ovens owned among fish processors was 5.6 ovens.

### **3.4.5 Livelihood impacts of the closed season**

Respondents were asked prior to the closed season what livelihood would be most affected by the closure. From Table 9 below, the livelihood activity that 303 respondents said would be or was most affected by the closed season was fishing. This was followed by fish processing and fish trading. Fishing related livelihoods made up 91% of the responses concerning livelihoods affected. Farming of food crops and rearing of livestock were the least affected livelihoods. There were statistically significant differences in fishing gear used between regions (Chi-square = 52.72, p<0.01, n=303), with the Volta region having the highest percentage of respondents saying fishing would be affected most and the least percentage saying fish trading would be most affected.

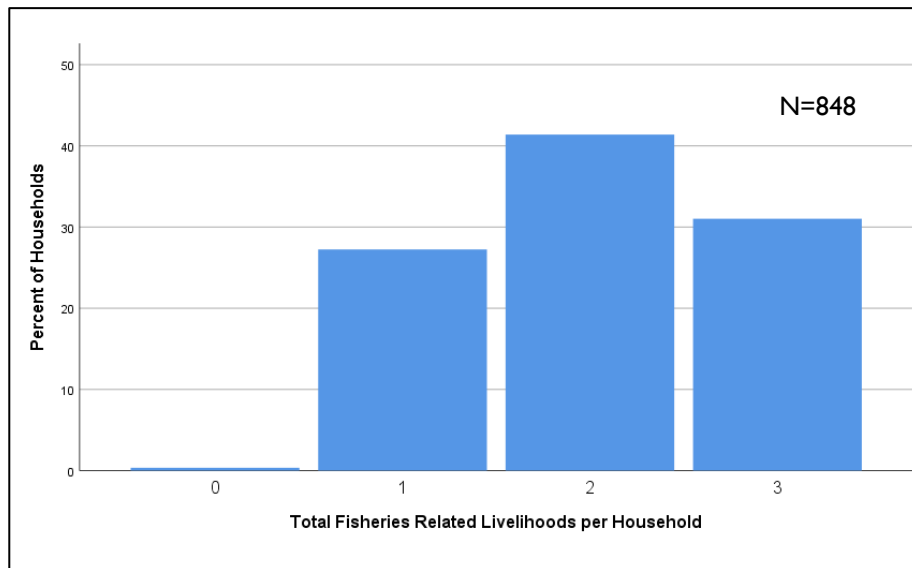
**Table 9: Respondents perceptions of household livelihoods affected by the fishing closure**

Affected livelihoods	Central	Greater Accra	Volta	Western	All regions
Fishing	42%	44%	66%	37%	46%
Fish processing	27%	23%	25%	33%	27%
Fish trading	23%	11%	5%	29%	18%
Farming food crops	0%	1%	2%	0%	1%
Rearing livestock	0%	2%	2%	1%	1%
Other	8%	19%	0%	1%	8%

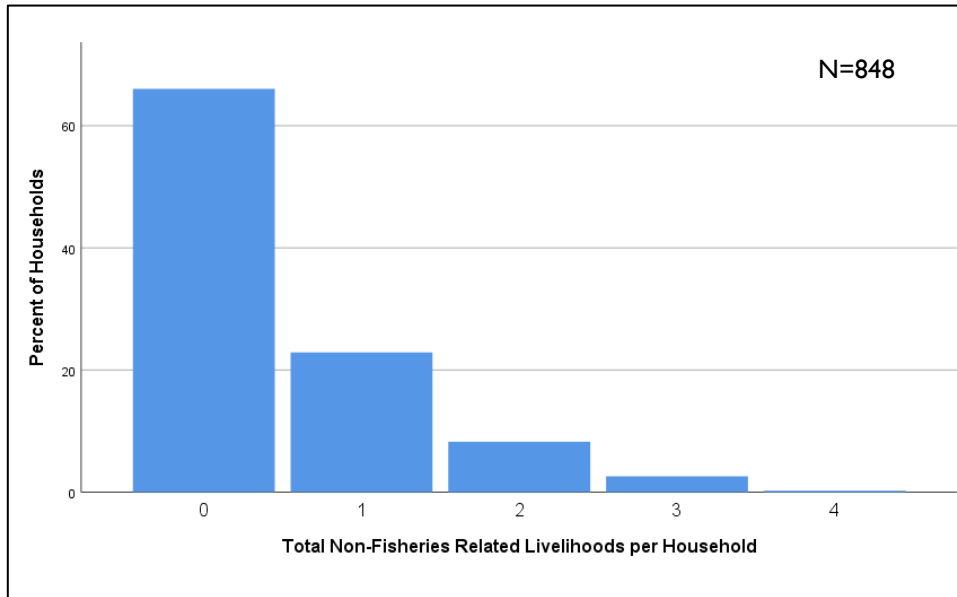
In order to get a measure of fishing household resilience or occupational diversity, the total number livelihoods engaged in by household members and as reported by the head of



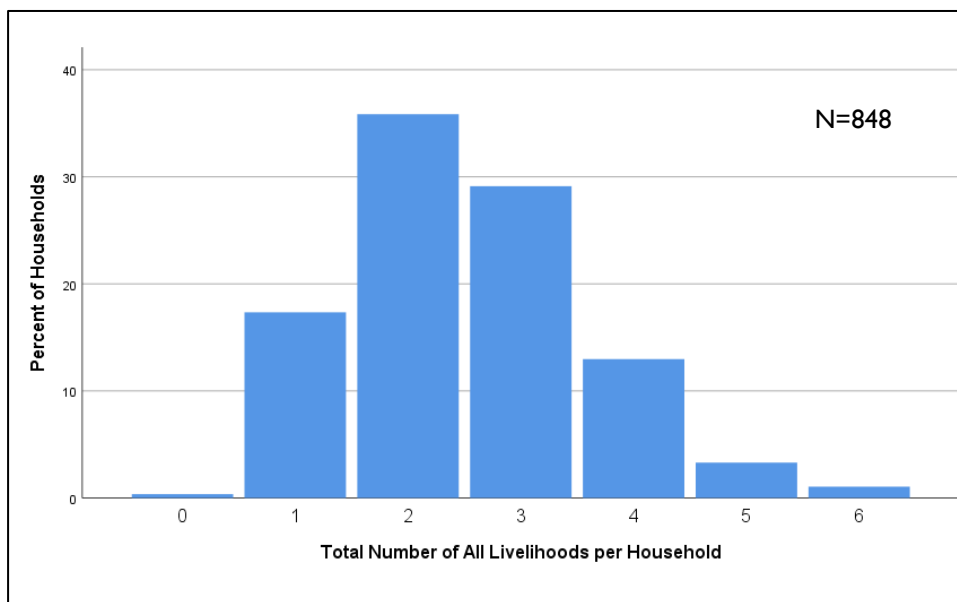
household for their entire household (see Table 9 above for types of livelihoods) were grouped into three types; total livelihoods, fishing livelihoods, and non-fishing livelihoods. Figures 9, 10 and 11 below show the frequency distribution of the number of livelihood types per household over all three survey time periods. More than 60% of respondents reported their households had no other livelihood except fishing related. However, over 80% reported their households had more than one fishing related livelihood. The majority of households had more than one livelihood activity.



**Figure 9: Frequency distribution of the total number of fisheries livelihoods per household**



**Figure 10: Frequency distribution of the total number of non-fishing livelihoods per household**



**Figure 11: Frequency distribution of the total number of all livelihoods per household**

Table 10 shows the percent of households engaged in various livelihood activities as reported by the household head over the three survey periods. There were no statistically significant differences across the time periods except for farming food crops and remittances, both of which showed declines over time.

**Table 10: Households engaged in various livelihood activities across the study periods**

Livelihood Activity	Pre	During	Post	Chi-square	N
Fishing	79.2%	81.6%	77.5%	1.391	847
Fish Processing	63.6%	63.7%	62.9%	0.039	847
Fish Trading	60.5%	63.6%	57.9%	1.672	845
<b><i>Farming food crops</i></b>	<b><i>7.7%</i></b>	<b><i>4.4%</i></b>	<b><i>1.9%</i></b>	<b><i>10.508</i></b>	<b><i>840</i></b>
Farming plantation crops	2.3%	1.8%	2.3%	0.214	839
Livestock rearing	15.8%	15.2%	11.3%	2.747	841
<b><i>Remittance</i></b>	<b><i>8.7%</i></b>	<b><i>4.7%</i></b>	<b><i>1.9%</i></b>	<b><i>13.435</i></b>	<b><i>839</i></b>

(% are the number of ‘yes’ responses per household for that survey period. N is the total number of households responding to the question across all survey periods. Chi-square values in ***bold italics*** are livelihoods that had statistically significant differences across the time periods at  $p < 0.05$ .  $df = 2$  for all chi-square tests.)

Table 11 shows the mean number of livelihood types and total per household reported by individual respondents for each of the three reporting periods: pre-closure, during and afterwards. There were no statistically significant differences between the mean number of fishing livelihoods between pre closure, closure and post closure periods. (ANOVA  $F=1.411$ ,  $df = 2$ ,  $p > 0.05$ ,  $n=848$ ). There were significant differences between time periods for mean non-fishing livelihoods (ANOVA  $F=4.171$ ,  $df = 2$ .  $p=0.031$ ) and for mean total livelihoods (ANOVA  $F=7.50$ ,  $df=2$ ,  $p=0.04$ ,  $n=848$ ) where both declined over time. The decline in non-fishing related livelihoods provides the largest contribution into the overall decline in mean total number of livelihoods over time. In other words, these results show a slight decline in overall household resilience after the closure as measured by the mean number of total livelihoods.

**Table 11: Mean number of household livelihoods by type**

Household Livelihood Category	Pre	During	Post
Fishing related	2.03	2.08	1.98
Non-fishing related	0.56	0.47	0.39
Total all categories	2.59	2.56	2.37

### 3.4.6 Changes in income

Household heads were asked how much income the household earned over a two-day period for those livelihoods they identified the household was involved in. As income is a very difficult number to get precise and accurate information on within a fishing household due to high levels of daily and seasonal variability (see Appendix III for further discussion on this issue), the data is presented in a more qualitative way in income ranges rather than treating the information as a precise continuous quantitative variable. Income was converted to a daily amount for easier understanding.

Comparing the number of people reporting fishing related income across the three survey periods, 23% reported no fishing income prior to the closure compared to 92% during and 47% after the closure. Prior to the closure, those reporting income between 1-250 GHS was 53% compared to only 8% during and 43% after the closure. The overall picture presented from Table 12 is that fishing income dropped considerably during the closure and seemed to have rebounded comparable to pre closure levels but somewhat lower overall than the pre-closure

period. By comparison, very few households had any form of non-fishing income prior to, during and after the closure (77%, 84% and 87% respectively) and there was very little change between the survey periods.

**Table 12: Percent of respondents reporting daily income (GHS) ranges during the three survey periods**

Daily income range reported (GHS)	Pre	During	Post
<b>All fishing related income</b>			
None	22.8	92.1	46.8
1-100	30.0	6.1	29.2
101-250	23.1	1.8	13.5
251-500	10.6	0	8.3
More than 500	13.5	0	2.2
N	303	278	267
<b>All non-fishing income</b>			
None	76.6	84.2	86.5
1-100	19.1	13.3	12.4
101-250	3.0	1.1	0.7
251-500	1.0	1.0	0
More than 500	0.3	0.4	0.4
N	303	278	267

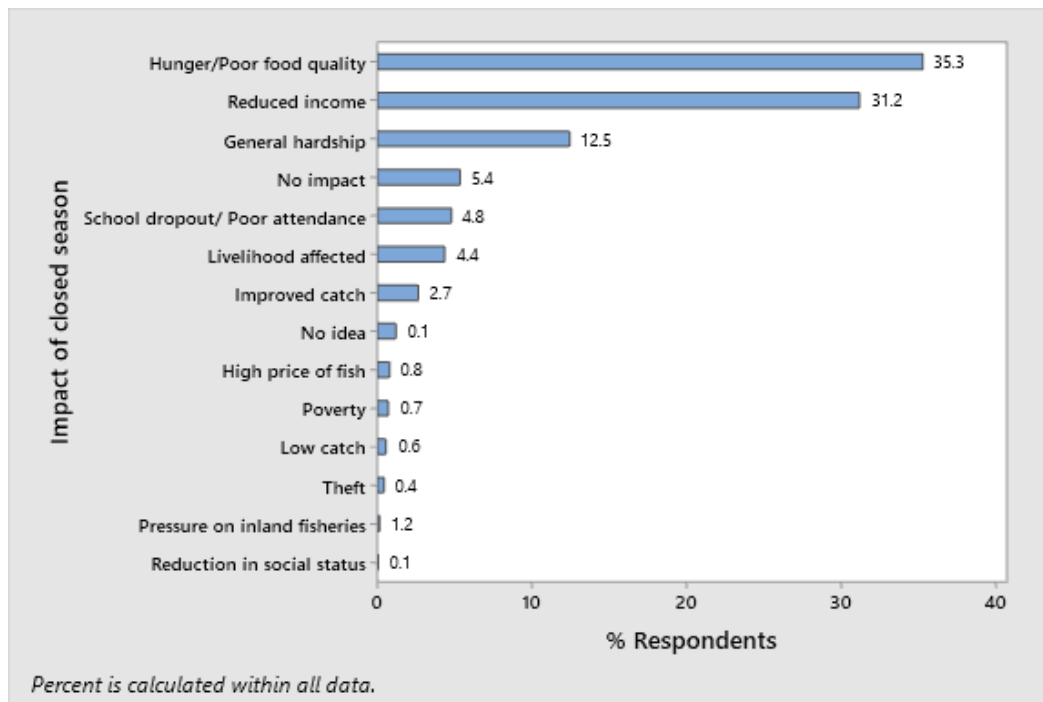
The prior section demonstrated that fishing households are highly dependent on fishing livelihoods (see Table 11) with few non-fishing alternatives. Table 12 also demonstrates that fishing income tends to make up a larger amount of income compared to non-fishing income. To understand this better, Table 13 shows the percentage of household income reported that is derived from fishing related livelihoods. During the pre and post closure periods, it provided all the household income for approximately three quarters of all households. During the closure, that dropped to less than one third of all households and the number reporting no income from fishing during the closure rose to almost two-thirds of fishing households from less than 6 % prior to the closure.

**Table 13: Percentage of income from fishing related livelihoods for those that reported fishing and non-fishing income**

Percentage of income from all fishing related livelihoods	Pre	During	Post
0%	5.6	63.9	12.9
1-25%	1.7	1.7	0.6
26-50%	3.2	1.6	1.8
51-75%	4.8	1.7	1.9
>75%<100%	13.3	3.2	4.9
100%	71.4	27.9	77.9
N	248	61	163

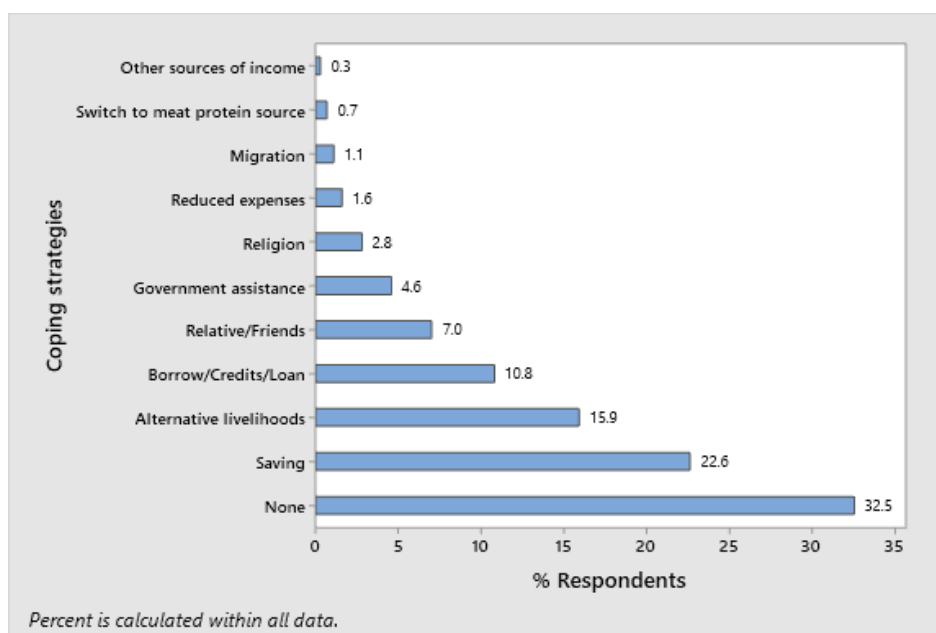
### Perceptions of economic impacts of the closure

Figure 12 below shows the responses of 1,225 individuals for the three survey periods combined to an open-ended question on what respondents thought the impact of the closed season would be or were. Dominant among the reported impacts mentioned include hunger and poor food quality (35.3%), reduced income (31.2%) and general hardship (12.5%). However, not all impacts documented were negative as some respondents indicated positive impacts such as improved catch after the opening of the fishery. Least mentioned among these impacts were pressure on inland fishing (i.e. lagoon fishing), reduced social status and theft.



**Figure 12: Major perceived impacts of the closure on families of respondents**

Figure 13 below shows the responses from 1,225 individuals to an open-ended question on what respondent's stated their various household coping mechanisms would be or were during the closed fishing season for all three survey periods combined. The most frequent response was none (32.5%) which implies they had no idea how to cope or plan for the closure. Of the remaining coping strategies, the dominant was living on saved resources (22.6%) which included either cash or food stuffs (i.e. smoked fish), alternative livelihoods such as petty trading (15.9%) and borrowing from friends or taking loans (10.8%). Only 4.6% of the respondents were expectant of government assistance either in the form of cash or food. Least among the coping strategies mentioned by respondents were migration, switching from fish protein to meat protein and living on reduced expenses.



**Figure 13: Perceived coping mechanisms by fishing households during the closure**

**Impact on migration of fisherfolks**

While the prior table showed that a small percentage (1.1%) of individuals planned to migrate as a coping strategy prior to the closed season. They were also asked after the closure if they did migrate to another country. During the 2018 closure announcement (later postponed until 2019) the press reported that many fishermen were planning to migrate to another country as fishing in neighboring countries was not closed. If this was the case, and many migrated, then the impact of the closure on reducing fishing effort and protecting fish during spawning would be diminished. However, the overwhelming majority (more than 98%) of the respondents surveyed after the closure said they did not migrate to other countries during the closure in Ghana.

Table 14 and Table 15 below provides responses of 380 respondents after the closure as to a reason for a decision to migrate or not to migrate. Only 1.6 percent of respondents said they migrated (6 respondents out of 380 that responded to this question) with family upkeep and no other available work stated as the main reasons (Table 14).

**Table 14: Reason for migration among respondents who migrated during the closed fishing season**

Reasons	% of Respondents
Family upkeep	28.6
No other available work	28.6
Financial reasons	14.3
No fish	14.3
High cost of cold store fish products	14.3

Table 15 shows the reasons for which 374 respondents decided not to migrate during the closed fishing season. The most frequent response stated was financial constraints. Others also did not

have anywhere to go, largely due to absence of any agent or link in the various supposed destination. Again, most did not have any interest in migration particularly because of the short period of the closure, generational attachment to natal fishing communities and the curiosity to understand or witness the outcome of such a novel fisheries management option. Family reasons was also cited (13.9%), some said they did not migrate as they had families to take care of, especially aged family members. Of those that migrated, an equal number said their income was either higher or lesser due to their migration, suggesting migration was not a useful coping strategy.

**Table 15: Reasons for not migrating among respondents who did not migrate during the closed fishing season**

Reasons	% of Respondents
Financial constraints	25.4
No place to go	17.3
No interest	16.6
Family issues	13.9
No reason	10.6
Switch to alternative livelihoods	7.5
No agent for migration	4.3
Health factors	2.1
High cost of cold store fishes	1.1
Social gathering	0.3
No documentation	0.3
Other	0.6

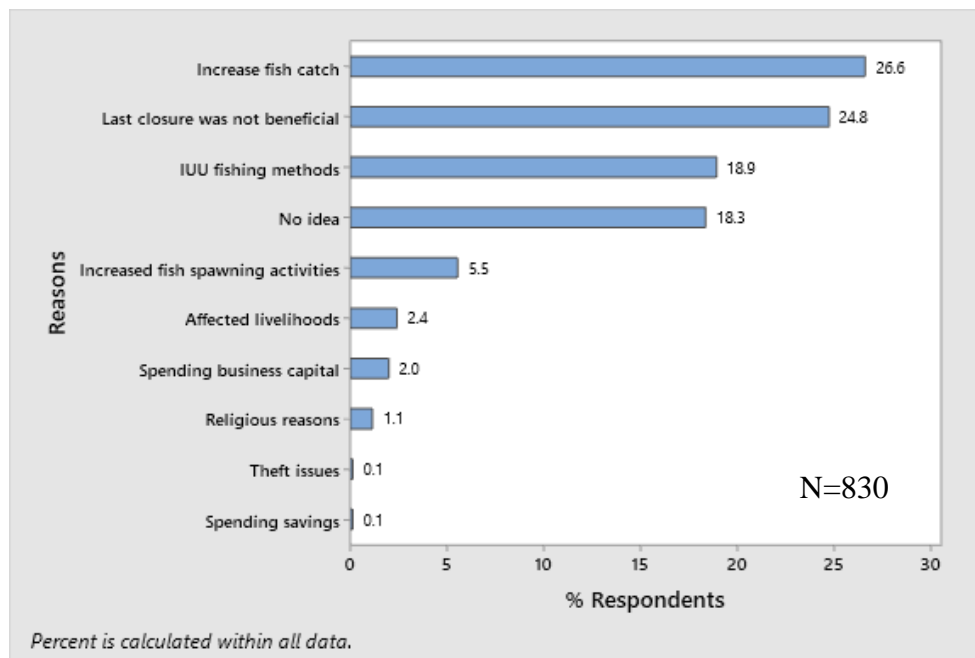
***Perceptions of fisherfolk on impacts on fishing businesses and income***

Table 16 shows the opinions of respondents on the closed seasons impact on next year’s business. Before the closed season, most respondents believed their fishing business would be better next year (2020) due to the closed season. This viewpoint declined after the closed season. Those that thought it would be about the same or worse increased. The number of people who did not know how it would affect their businesses after the closed season declined relative to before the closed season. These differences over time are statistically significant (Chi square = 118.75, <0.01, n= 829).

**Table 16: Opinion on impacts of the closed season on next year’s business**

Outcome	Pre	Post
better	69.4%	30.6%
about the same	33.3%	66.7%
worse	30.5%	69.5%
don’t know	72.4%	27.6%
No answer	80.0%	20.0%

Figure 14 shows the various reasons provided by 830 respondents with respect to their responses on the impact of the closed season on next year’s fishing business. Many respondents had a positive view and said it would increase catches (26.6%) next year or would increase spawning activity (5.5%). However, a number of respondents had negative views with 24.8% indicating that the closure would not be beneficial as they did not observe a bumper catch immediately following the opening. Another 18.9% of the respondents expected no beneficial impact due to IUU (illegal unreported and unregulated) fishing methods such as light fishing. A smaller percent of respondents mentioned it affected livelihoods, forced them to spend business capital or live on savings or created theft issues. Also, 18.3 percent had no idea how it would impact their fishing businesses, demonstrating a degree of uncertainty or ambivalence. Furthermore, about 1.1% of respondents believed that the Almighty God will see them through the closed season period (i.e. religious reasons).



**Figure 14: Opinions expressed by respondents on the reasons for impacts of the closure on fishing for next year**

Respondents were asked to rank the economic impact of the closure on their families. Most said that the closed season would greatly affect the economy of their families (Table 17). There were no statistically significant differences in responses between the pre- and post-closure survey periods ( $p > 0.05$ ,  $N = 829$ ).

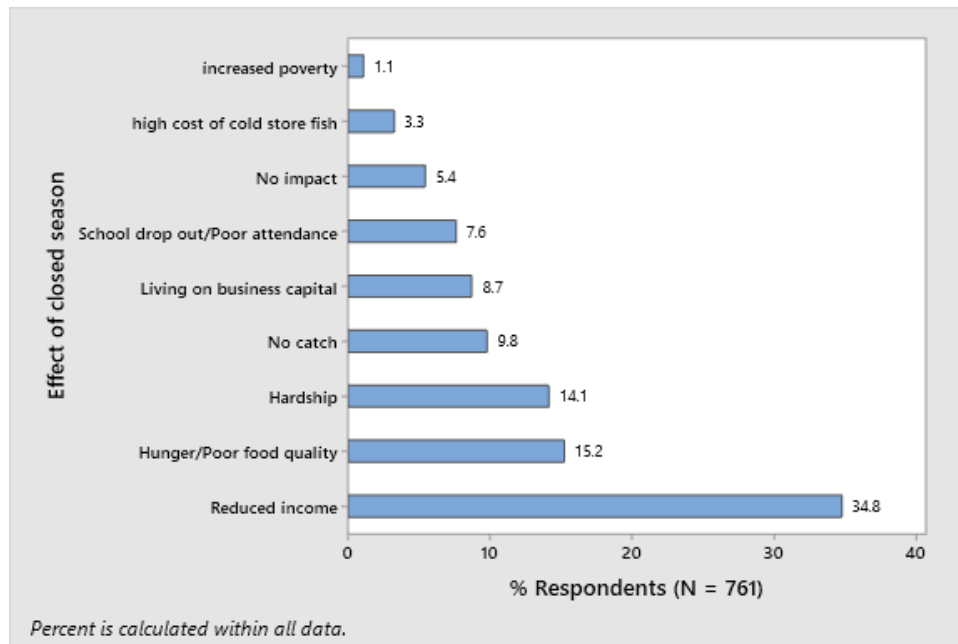
**Table 17: Opinion on the economic impact of closed season on fishing families**

Effect	Pre	Post
Greatly	69.7%	71.5%
Somewhat	24.7%	26.4%
Not at all	5.2%	2.1%
Don't know	0.4%	0.0%

Nine general impacts of the closed season on fishing households were mentioned by the survey respondents (Figure 15). The most frequent responses were reduced income (34.8%), hunger/poor food quality (15.2%) and general hardship (14.1%) as well as no catch, living on



business capital reduced school attendance, comments about high price of cold store fish (a processors concern) and a small percent (1.1%) mentioned increased poverty. Only a few (5.4%) mentioned no impact.



**Figure 15: Types of closed season impacts on fishing families**

### 3.4.7 Food security

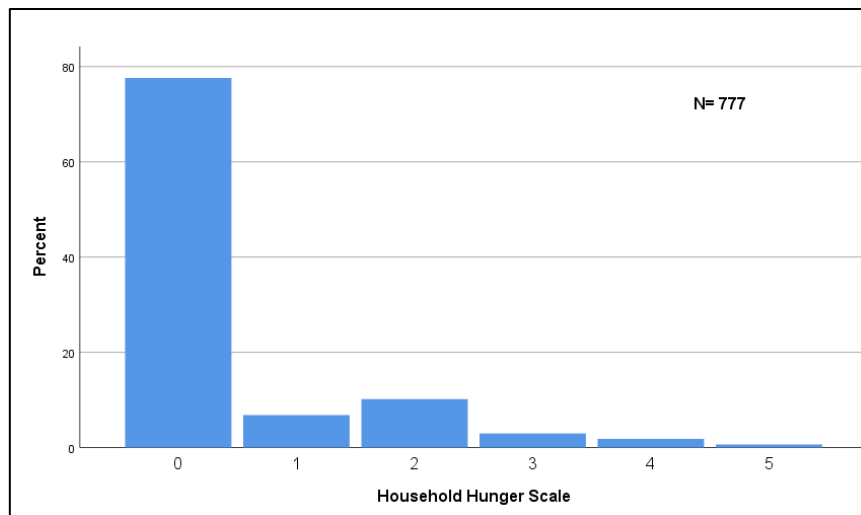
The artisanal and inshore fishing closure took place in the May – June period. This tends to be the lean fishing season when catch is lowest during the year, especially for the small pelagic species which make up the main catch of the artisanal canoe fishing fleet. Catches are most abundant during the peak upwelling season from August through September. The closed season also fell during a time of year that also tends to be the lean season for harvesting of food crops. Most fishing households do not own land and are not engaged in agriculture as shown by the livelihood and income data presented above, so farming does not provide a significant source of self-grown food or income for fishing households. As such, most food stuffs need to be purchased with income, usually obtained from fishing. Fishing provides both income and also small portions of the fish catch are often retained by fishers or provided as in-kind payment for services such as offloading fish from canoes. When catch is low, income is low and the supply of in-kind fish to a household will also be low.

For these reasons, the closed fishing season took place at a time when fish catches and income are at a low period of the year and hence food insecurity would likely be highest for coastal fishing households. The short time frame for the three survey periods when most of the data was collected between late May through late July means that the household hunger and dietary diversity data was collected in the lean period for fishing. Clustering data by the pre, during and post time periods therefore would not be confounded by data collection in both lean and high fishing seasons when availability of food and income would be necessarily lower or higher and correlated with these sampling periods. These measures are most often associated with agricultural households, and also recommended to be collected during the

lean period when we would expect hunger to be higher and dietary diversity to be lower from a seasonal cycle. This is generally the case for this survey sampling period.

**Household hunger scale (HHS)**

Food preparers from each household were surveyed in each of the three survey periods (pre - 285, during – 253 and post closure – 242 persons) for a total of 780 respondents. The frequency distribution of the HHS of all respondents over all three periods combined can be seen in Figure 16.



**Figure 16: Frequency distribution of the Household Hunger Scale (HHS) Responses**

Table 18 shows the frequency distribution between time periods of the HHS rank and the mean scale value per time period. As the HHS data is not normally distributed and is an ordinal measure<sup>1</sup>, the Kruskal-Wallis Test was used to determine if the differences between HHS over the time periods are significantly different. The HHS differences between time periods are significant (N=777, Test Statistic=6.99, df = 2, Sig. = 0.031). The frequency of moderate and severe hunger both increased during the closure and then decreased afterwards. There was no statistically significant difference in the HHS between the pre and post closure periods.

**Table 18: Differences in the Household Hunger Scale rank and mean across time periods**

Household Hunger Scale Rank	Period Relative to Closure		
	Pre	During	Post
Low or Little Hunger	84.9%	78.6%	84.2%
Moderate Hunger	10.2%	16.3%	12.5%
Severe Hunger	4.9%	5.2%	3.3%
Sample size	284	252	240
HHS Mean	0.41	0.57	0.42

<sup>1</sup> The HHS is from 0-6 where 0-1 represents little to no hunger, 2-3 moderate hunger, 4-6 severe hunger in the household.

Households with a greater number of livelihood activities tended to have higher HHS ranks in the moderate and severe range (T-test=2.009,  $p < 0.05$ , N=774). Households with fewer livelihood activities had higher percentages of low or little hunger. These findings are counter to our hypothesis that greater household livelihood diversification would be a strategy to mitigate hunger impacts.

Households with low hunger score ranks had higher total income compared to those with moderate to severe hunger ranks (T-test=2.105,  $p=0.44$ , N=774). Fishing income made up 92% of the overall household income reported over all time periods and the loss of fishing income accounts for the significant total household income drop during the closure. The significant drop in total household income due to the drop in fishing income is related to a significant increase in the HHS during the fishing closure.

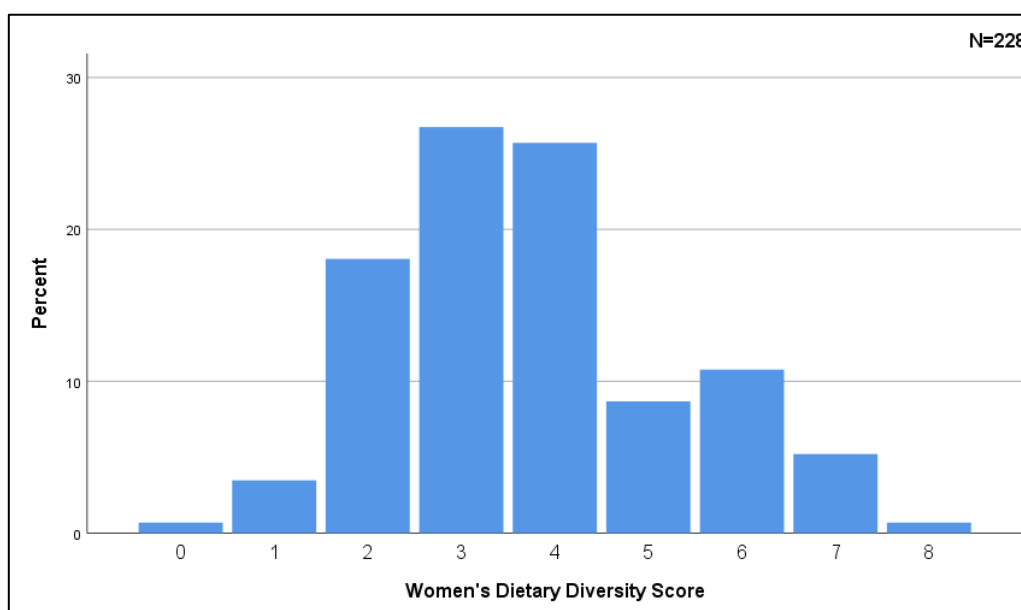
#### Women's dietary diversity score (WDDS)

There were 288 women of reproductive age that responded to the WDDS<sup>2</sup> questions. Their mean age was 35.6 years and median age of 37.0 years. Respondents with no education are more likely to have a lower HHS rank than either those with primary or secondary education (N= 103, Kruskal Wallis Test statistic = 6.59,  $df = 2$ , Sig. = 0.04). There was no significant relationship between household size, marital status, age, or literacy with WDDS.

The frequency distribution of WDDS of respondents can be seen in Figure 17. Table 19 shows the frequency distribution of the WDDS rank and mean WDDS per survey period. As the WDDS is an ordinal measure, the Kruskal-Wallis Test was used to determine if the differences are significantly different. The differences between time periods are significant (N=288, Test Statistic=17.53,  $df = 2$ , Sig. <0.001) with a decrease in percentages with a high WDDS rank and increase in low dietary diversity during the closed season compared to prior. Differences between the pre and post closure periods are not statistically significant.

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<sup>2</sup> The WDDS ranges from 0-9 with a higher score indicating higher dietary diversity. The women's dietary diversity rank of low is a score from 0-3, middle from 4-5, high from 6-9.



**Figure 17: Frequency distribution of the WDDS responses**

**Table 19: Differences in WDDS rank and mean across time periods**

WDDS Rank	Pre	During	Post	Total
Low	40.0%	64.2%	45.8%	49.7%
Moderate	33.6%	29.5%	38.6%	33.7%
High	26.4%	6.3%	15.7%	16.7%
Sample Size	110	95	83	288
WDDS Mean	4.19	3.23	3.67	3.44

Women with a higher WDDS rank tend to be from households that have a higher number of total livelihoods and non-fishing livelihoods, (ANOVA  $F=7.706$ ,  $p < 0.01$ ,  $N=92$  and ANOVA  $F=6.316$ ,  $p < 0.01$ ,  $N=92$ ) but it is not related to the number of fishing household livelihoods. Total household income, fishing income and non-fishing income was not related to the WDDS rank. Women with moderate and high WDDS ranks was significantly associated with larger household size compared to women with a low WDDS rank (T-test = 2.247,  $p = 0.025$ ,  $N=287$ ). WDDS and HHS are not significantly correlated.

#### **Food consumption types**

Changes in food groups consumed are shown in Table 20. Six out of the nine food groups showed statistically significant declines during the closure except starchy staples, dark green leafy vegetables and eggs. Fruits and vegetables, meat and fish, legumes and milk products all showed significant declines. Teasing out fish consumption (Table 20), fish showed one of the largest declines of 17.5 percent comparing before and during the closure.

**Table 20: Changes in percentages of WDDS food groups consumed by respondents during different survey periods**

The nine food groups for the WDDS	% Respondents			Chi-square
	Pre	During	Post	
Starchy staples	99.1	97.9	100.0	1.94
Dark green leafy vegetables	44.5	32.6	34.9	3.50
<b>Other vitamin A rich fruits and vegetables</b>	<b>71.8</b>	<b>55.8</b>	<b>54.2</b>	<b>8.11</b>
<b>Other fruits and vegetables</b>	<b>37.3</b>	<b>25.3</b>	<b>50.6</b>	<b>12.18</b>
<b>Organ Meat</b>	<b>2.7</b>	<b>0.0</b>	<b>7.2</b>	<b>7.74</b>
<b>Meat and Fish</b>	<b>83.6</b>	<b>67.4</b>	<b>72.3</b>	<b>7.65</b>
Eggs	17.3	13.7	7.2	4.20
<b>Legumes and Nuts</b>	<b>33.6</b>	<b>16.8</b>	<b>19.3</b>	<b>9.29</b>
<b>Milk and milk products</b>	<b>29.1</b>	<b>13.7</b>	<b>21.7</b>	<b>7.08</b>

(**Bold** are statistically significant differences across the time using Chi-square statistic at  $p < 0.05$ ,  $df = 2$ ,  $N = 288$ )

Table 21 shows the changes in the type of fish and animal protein sources consumed. Demersal and fresh small pelagics showed significant declines during the closure. Smoked small pelagics, large pelagics and tilapia (mainly farm raised) showed no statistically significant increases during the closure. Fish was the largest portion of the animal protein groups consumed. All the animal protein sources showed statistically significant declines during the closure. All food groups with significant declines during the closure showed rebounds afterwards.

**Table 21: Changes in the percentages of type of fish consumed and changes over the survey period for those that consumed fish**

Fish type	% Respondents			Chi-square
	Pre	During	Post	
<b>Demersal</b>	<b>40.5</b>	<b>7.3</b>	<b>42.3</b>	<b>20.85</b>
<b>Small pelagics - fresh</b>	<b>62.0</b>	<b>38.2</b>	<b>51.9</b>	<b>7.39</b>
Small pelagics –smoked or dried	60.8	65.5	61.5	0.36
Large pelagics	16.5	25.5	25.0	2.08
Tilapia	17.7	20.0	7.7	3.55
<b>Animal protein type</b>				
<b>Fish</b>	<b>76.4</b>	<b>58.9</b>	<b>63.9</b>	<b>7.52</b>
<b>Liver and organ meats</b>	<b>2.7</b>	<b>0.0</b>	<b>7.2</b>	<b>7.74</b>
<b>Any meat including beef, port chicken</b>	<b>24.5</b>	<b>13.7</b>	<b>28.9</b>	<b>6.50</b>
<b>Grubs, snails and insects</b>	<b>5.5</b>	<b>2.1</b>	<b>12.0</b>	<b>7.67</b>

(**bold** are statistically significant differences using Chi-square statistic at  $p < 0.05$ ,  $N = 186$ )

### 3.4.8 Communications

In this section, questions were designed to measure whether the communications programs about the closed season by MOFAD and the USAID Ghana SFMP were effective in creating widespread understanding of the reason for and whether fisherfolk knew the declared time and duration for the various fleet closures. Questions were asked in the pre-closure period as well as the post -closure period to gauge whether changes had occurred after communications and outreach initiatives were implemented both before and during the closure.

**Purpose of the closed season**

Table 22 shows the respondents view on the purpose of the closed season. Many of the respondents correctly believed that the main purpose for the closed season was to protect fish during the spawning period and allow them to spawn before being caught (46.9%) as well as to reduce fishing pressure and make sure there are enough in the sea for the next fishing season (15.4%). Another 19.6 % percent believed it was so they could grow bigger and worth more when sold, which is also a correct response if not the main purpose of a spawning closure. The percentage of respondents who correctly choose the main purpose as to protect fish during the spawning period and allow them to spawn before being caught increased greatly from 26.9% before the closure to 70.3% after the closure. This percentage of respondents who did not know the purpose of the closed season reduced drastically from 26.7% before the closure to 2.4% after the closed fishing season. The differences are statistically significant (N = 826, df = 6, Chi-square = 576.43, p=0.000).

**Table 22: Respondents opinions on the purpose of the closed fishing season**

<b>Purpose</b>	<b>pre</b>	<b>post</b>
Let fish grow bigger so they are worth more when sold	22.2%	16.6%
Protect fish during the spawning period and allow them to spawn before being caught	26.9%	70.3%
Reduce fishing pressure so we do not catch all the fish in the sea and make sure there are some for next year to catch	20.4%	9.5%
Allow the trawlers to catch fish when the canoe fleet is not fishing	0.0%	0.3%
None of the above	3.1%	0.8%
Don't know/No response	26.7%	2.7%

**Duration of the closure**

Over the two sampling periods combined, 90.7 percent of the respondents interviewed correctly knew that the duration of canoe fishing season was one (1) month. The number who correctly identified the closure as one month increased from 84.8% before the closure to 97.6 percent after the closure. These were statistically significant differences (N = 829, df = 1, Chi=quare = 61.16, p=0.000) across the survey periods (Table 23).

**Table 23: Respondents perceptions on the duration for the canoe closed season**

<b>Duration canoe</b>	<b>pre</b>	<b>post</b>
1 week	0.0%	0.3%
2 weeks	0.0%	0.3%
1 month	84.8%	97.7%
2 months	0.7%	1.6%
3 months	1.3%	0.3%
1 year	0.2%	0.0%
Don't know/ No answer	13.0%	0.0%

In contrast to respondents' correct understanding concerning the one month duration of the closed fishing season for canoes, large percentages had no idea about the correct time frame

for the closed fishing season for trawlers (see Table 24) which was for two months. In addition, many thought the trawler closure was for only one month. Less than 7% correctly identified the duration as two months prior to the closure and this declined to 5.7 percent afterwards indicating no improvement in correct responses of the duration between pre and post periods. These findings were statistically significant (N = 829, df=1, Chi-square = 99.00, p=0.000)

**Table 24: Respondents perceptions on the duration for the trawler closed season**

<b>Duration trawler</b>	<b>pre</b>	<b>post</b>
1 month	28.0%	22.5%
2 months	7.0%	5.7%
3 months	6.3%	32.1%
1 year	0.4%	0.3%
Don't know	53.8%	38.6%
No answer	4.5%	0.8%

Like the trawler closure above, most did not know the duration of the semi-industrial inshore vessel closure and only 23.7 % of all respondents combined for both periods correctly identified the timing as for one month (Table 25). The percent correctly identifying the semi-industrial closure for one month declined from 30 to 17 percent between pre and post surveys and the number incorrectly believing it was 3 months increased from 5 to 32 percent between pre and post survey periods. Differences across time periods is statistically significant (N = 829, df=1, chi-square = 118.47, p=0.000)

**Table 25: Respondents perceptions on the duration for the inshore closed season**

<b>duration inshore</b>	<b>pre</b>	<b>post</b>
1 month	29.8%	16.7%
2 months	5.8%	6.0%
3 months	5.2%	32.9%
1 year	0.7%	0.3%
Don't know	53.6%	43.1%
No answer	4.9%	1.0%

**Timing of the closure**

Table 26 shows responses of 829 interviewees that were asked to identify the months of the canoe closure. Only monthly choices were provided so anyone selecting May and/or June is considered correct for the mid-May to mid-June 2019 canoe closure. Most of the respondents (88.2%) correctly indicated the months of May and/or June as the months of the closure for canoe vessels before the closure and 80.4% after the closure. The percentage of respondents who responded 'Don't know' reduced from 9.3% before the closed season to 1.5% after the closed fishing season.

**Table 26: Respondents knowledge on months of the closure for canoes**

Month of closure	Pre-closure	Post-closure
Jan	0.2%	0.0%
Feb	0.2%	0.0%
<b>May</b>	64.7%	35.7%
<b>Jun</b>	23.5%	44.7%
Jul	1.2%	17.0%
Aug	0.0%	0.6%
Sep	0.3%	0.3%
Oct	0.2%	0.0%
Nov	0.2%	0.1%
Dec	0.2%	0.0%
Don't know	9.3%	1.5%
No Answer	0.2%	0.1%

Of the 829 respondents, few knew the correct closed months for trawlers (i.e. August 1 – September 30) (see Table 27). Nonetheless, respondents who did not know the timing for the trawlers reduced from 54.4% before the closed season to 34.9% after the closed season. Those correctly identifying it as in August and/or September increased from 9.2% before to 31.2% after the closure. The percentage incorrectly identifying the timing as in May declined from 20.2% to 5.6

**Table 27: Respondents knowledge on months of closure for trawlers**

Months of closure	Pre-closure	Post-closure
Jan	0.6%	0.2%
Feb	0.4%	0.3%
Mar	0.4%	0.0%
May	20.2%	5.6%
Jun	4.9%	6.7%
Jul	2.9%	10.7%
<b>Aug</b>	5.9%	15.6%
<b>Sep</b>	3.3%	15.6%
Oct	1.2%	6.2%
Nov	0.2%	1.8%
Dec	0.4%	0.2%
Don't know	54.4%	34.9%
No Answer	5.3%	2.4%

Table 28 shows responses of 829 respondents concerning their knowledge on the month of closure for inshore vessels. About 25.7% of respondents had the timing correct (i.e. May-June – same as the canoe fleet) but had it wrong during the post closed fishing season (0.7%). Before the closed fishing season, many respondents (50.8 %) did not know the months for closing the



fishery for inshore vessels, although the percentage reduced to 39.9% by the post-closure period.

**Table 28: Respondents knowledge on months of closure for inshore vessels**

Months of closure	Pre-closure	Post-closure
Jan	0.2%	0.2%
Feb	0.2%	0.3%
Mar	0.2%	0.0%
Apr	0.2%	0.0%
<b>May</b>	20.1%	0.0%
<b>Jun</b>	5.6%	0.7%
Jul	8.4%	10.0%
Aug	5.4%	18.9%
Sep	2.0%	18.3%
Oct	0.6%	6.6%
Nov	0.4%	1.8%
Dec	0.7%	0.5%
Don't know	50.8%	39.9%
No Answer	5.2%	2.8%

The following tables describe the opinions of respondents regarding their views of the best timing for the various fleet closures. Table 29 shows the opinion of 829 respondents on the best months for canoe closure. Prior to the closure, the greatest frequency of responses indicated May – June as the best months for the closed season for artisanal fishermen while only 12.9% reported July as the best month before the actual closure. However, in the post closure period, the highest frequency of responses indicated the best months for the closed canoe fishing season to be June and July.

**Table 29: Opinion on best months for canoe fishing closure**

Best Month	Pre-closure	Post-closure
Jan	0.5%	0.0%
Feb	0.2%	0.0%
Mar	0.9%	0.1%
Apr	2.2%	1.3%
May	35.4%	16.4%
Jun	23.9%	21.0%
Jul	12.9%	27.5%
Aug	8.3%	17.3%
Sep	2.0%	1.5%
Oct	0.8%	0.4%
Nov	0.2%	0.6%
Dec	0.5%	0.3%
Don't know/no answer	14.4%	13.4%

Table 30 shows the opinion of 829 respondents on the best months for trawler closure. Prior to the closure, the highest frequency of responses indicated May – July as the best months for the closed season for trawler fishermen. However, in the post-closure period, the highest frequency of responses indicated the best month for the closed trawler fishing season to be July - August.

**Table 30: Opinion on best months for trawler fishing closure**

Best months	Pre-closure	Post-closure	Total
Jan	3.6%	5.4%	4.6%
Feb	2.7%	5.0%	4.1%
Mar	4.0%	4.9%	4.5%
Apr	4.6%	5.4%	5.1%
May	<b>12.8%</b>	7.5%	9.7%
Jun	<b>12.4%</b>	9.0%	10.4%
Jul	<b>12.1%</b>	<b>12.2%</b>	12.2%
Aug	11.9%	<b>13.0%</b>	12.5%
Sep	6.8%	8.6%	7.8%
Oct	4.9%	7.5%	6.5%
Nov	4.5%	6.7%	5.8%
Dec	4.5%	6.3%	5.6%
Don't know/no answer	<b>15.3%</b>	<b>8.4%</b>	11.3%

Table 31 shows the opinion of the 829 respondents on the best months for inshore closure. The months of July and August were most preferred with May and June showing higher response frequencies pre-closure compared to the post-closure survey period.

**Table 31: Opinion on best months for inshore vessel fishing closure**

Best months	Pre-closure	Post-closure
Jan	3.5%	5.2%
Feb	3.5%	4.9%
Mar	3.8%	4.9%
Apr	4.5%	5.2%
May	12.3%	7.4%
Jun	<b>12.2%</b>	8.9%
Jul	<b>12.5%</b>	<b>12.4%</b>
Aug	<b>12.2%</b>	<b>13.4%</b>
Sep	6.6%	8.4%
Oct	5.4%	7.3%
Nov	4.7%	6.9%
Dec	4.4%	6.4%
Don't know	10.4%	6.4%
No Answer	3.9%	2.2%

Respondents were asked whether the timing of the closures should be the same for all fleets. This was one of the recommendations of the Science and Technical Working Group (Lazar et al., 2016). Most of the 827 respondents agreed that the closure should be at the same time for both survey periods, before the closure 68% agreed and after the closure 70.5% agreed. (Table 32). Generally, reasons for agreeing with the same timing for a closure for all fishing fleets included increasing the abundance of fish stocks, enhancing the reproductive output, rebuilding potential of fish species, avoiding conflicts and confusion among fishermen, or to avoid illegal, unreported and unregulated fishing practices. A minority of the respondents disagreed that the

closed fishing season should be for all fleets at the same time for the following reasons; fishing is the main source of livelihood and food to most fishing communities, existence of IUU fishing methods particularly by the Chinese, there is an all year round abundance of fish, and, artisanal fishermen catch less fish compared to trawlers and inshore fishers. There were no statistically significant differences across the sampling periods.

**Table 32: Opinion of respondents regarding a closure for all fleets**

Opinion	Pre	Post
Yes	68.0%	70.5%
No	32.0%	29.5%

**Perceptions on the benefits of the closed season**

Respondents were asked two questions both before and after the closure as to whether they thought the closed season would improve abundance of fish in the sea (perception of fish biomass) and fish catches afterwards. Before the closed fishing season, most respondents (68.2%) strongly agreed or somewhat agreed with the statement that the closed season will improve the abundance of fish in the sea (Table 33). This percentage reduced slightly to 63.9% after the closed season. A much smaller percentage disagreed strongly or disagreed somewhat that the closure would improve fish abundance, with an increase in the percentage disagreeing after the closure (20.6% pre- vs 32.9% post-closure). Differences are statistically significance across survey periods (Chi-square = 41.82, df = 1, P<0.00, N=829)

**Table 33: Perception on whether the closed season will improve fish abundance**

Opinion	Pre	Post
Strongly agree	44.4%	33.9%
Somewhat agree	24.0%	29.8%
Somewhat disagree	11.9%	15.7%
Strongly disagree	8.5%	17.5%
Don't know	10.8%	3.1%
No answer	0.4%	0.0 %

From Table 34, 42.6% of the respondents strongly agreed with the statement that the closed season will improve fish catches next year and 25.8% somewhat agreed when asked before the closed fishing season started. While the percentage strongly agreeing declined after the closed season, the percentage both strongly agreeing and somewhat agreeing was only a bit less than before the closure (68.2% vs 64.6%). Only 31.0 % of respondents in the post closure period somewhat or strongly disagreed that the closed season will improve fish catches next year. Differences across the survey periods is statistically significant (Chi-square = 29.99, df = 1, p<0.001, N=829)

**Table 34: Perception on whether the closed season will improve fish catches the following year**

<b>Opinion</b>	<b>Pre</b>	<b>Post</b>
Strongly agree	42.6%	33.2%
Somewhat agree	25.8%	31.3%
Somewhat disagree	10.5%	14.1%
Strongly disagree	10.1%	17.2%
Don't know	10.3%	4.2%
No answer	0.7%	0.0%

Respondents were asked after the closure whether they thought the closure was beneficial and improved fish catches after the fishery was opened. Most of the respondents (65%) strongly agreed or somewhat agreed that the closure was beneficial and improved the catch after the opening (Table 35) whereas 21% somewhat or strongly disagreed that closing the fishing season was beneficial and improved fish catch after the opening. This finding was statistically significant across the sampling areas ( $N = 383$ ,  $df = 12$ ,  $\chi^2=147.6$ ,  $p<0.001$ ) with Central, Volta and Western regions having a majority agreeing whereas the Greater Accra Region had a majority disagreeing.

**Table 35: Perception after the closed season that the closure was beneficial and improved catch**

<b>Responses</b>	<b>Central</b>	<b>Greater Accra</b>	<b>Volta</b>	<b>Western</b>	<b>Total all regions</b>
Strongly Agree	25.5%	4.9%	70.8%	41.2%	33.2%
Somewhat Agree	38.3%	27.2%	11.1%	42.1%	31.3%
Somewhat Disagree	14.9%	26.2%	2.8%	9.6%	14.1%
Strongly Disagree	18.1%	39.8%	6.9%	2.6%	17.2%
Don't know	3.2%	1.9%	8.3%	4.4%	4.2%

Respondents were asked after the closed season ended about their perception as to whether the closure increased the size of the fish caught. Biologically, the older the fish live, the longer its length until it reaches a maximum size, so fish should have been a bit larger after the closure. Most respondents (58%) somewhat or strongly disagreed that closing the fishing season increased the size of the fish caught after the opening (Table 36). However, 39% somewhat or strongly agreed that closing the fishing season increased the size of the fish caught after the opening. This finding was statistically significant across the sampling areas ( $N = 383$ ,  $df = 15$ ,  $\chi^2=123.22$ ,  $p<0.001$ ). The Central and Western regions had a high number of respondents somewhat or strongly agreeing it increased the size of fish whereas the Greater Accra and Volta regions had a majority somewhat or strongly disagreeing.

**Table 36: Perception after the closed season that the size of fish caught increased**

Response	Central	Greater Accra	Volta	Western	Total all regions
Strongly Agree	33.0%		6.9%	15.8%	14.1%
Somewhat Agree	23.4%	15.5%	6.9%	46.5%	25.1%
Somewhat Disagree	18.1%	28.2%	18.1%	19.3%	21.1%
Strongly Disagree	25.5%	52.4%	63.9%	16.7%	37.3%
Don't know		3.9%	4.2%	0.9%	2.1%
No answer				0.9%	0.3%

**Sources of information on the closed season**

A communications campaign was implemented both prior to and during the canoe and inshore closed season concerning messages about its purpose, duration and timing. This included mass media campaigns on the news, radio and through community meetings and newspaper coverage. The following questions were asked to assess the extent to which respondents heard messages and through which communication channels. Questions were asked over the three reporting periods as to whether they heard messages and frequency of hearing messages during the different survey periods with the assumption or hypothesis that this would increase over time. Respondents were also asked about their preferred source of information about closed seasons during the post closure period. These questions both help assess whether the communications campaign was effective and sufficient on getting messages heard, and for the future, which communications channels fisherfolks prefer or trust most.

Collectively, from Table 37 below, an overwhelming majority of respondents reported obtaining information about the closed season from the media and other sources during the three sampling periods. Variation in responses was statistically significant (N = 1224, df = 2, chi square = 39.02, p=0.000) during the three sampling periods with a slight increase in those responding no in the post survey period.

**Table 37: Percentage of respondents who received information about the closed season from the media or other sources**

Opinion	Pre	During	Post
Yes	98.9%	99.0%	92.1%
No	1.1%	1.0%	7.9%

From Table 38, most of the respondents (53.7%) over the three survey periods revealed hearing about the closed season 3 – 10 times (i.e. sometimes), and another 38.9% of respondents heard about it often (more than 10 times). The variation in responses was statistically significant over the sampling periods (N = 1185, Chi-square= 21.71, p=0.005). The percentage of respondents stating rarely decreased over the three survey periods and the percentage stating sometimes increased over the three survey periods. The percentage stating often decreased a bit in the post closure survey period when communication campaigns about the closed season ended.

**Table 38: Frequency of hearing about the closed season from media or other sources**

Frequency	Pre	During	Post
Rarely (1-2 times)	10.5%	5.2%	4.8%
Sometimes (3-10 times)	48.8%	53.9%	59.8%
Often (more than 10 times)	40.8%	40.7%	34.5%
Don't know/no response	0.0%	0.3%	0.9%

After the closure, the most preferred sources of information on the closed season as stated by 383 respondents (Table 39) were local sources: community radio (25.8%) community meeting/loudspeaker (18.0%), and chief fisherman (17.6%). This was followed by national media sources; national radio (15.1%) and TV (14.1%). Some of the least preferred sources of information on the closed season included Konkohene, Fisheries Commission, friend or family member, religious authority, district official and newspaper.

**Table 39: The most preferred source for information on the closed fishing season**

Most Preferred	Total
Community/Local radio	25.8%
Community meeting or local speaker announcement	18.0%
Chief fisherman	17.6%
National Radio	15.1%
TV	14.1%
Friend or family member	1.1%
Traditional leader	0.8%
Fisheries Commission	0.6%
District official	0.6%
Religious authority	0.0%
Konkohene	0.0%
Newspaper	0.0%
Other	0.0%
Don't know or no response	7.8%

### 3.4.9 Fisherfolk Perceptions on Compliance

Respondents were asked about their perceptions or opinion of level of compliance with the fishing closure during all three survey periods. From Table 40 below, before the start of the closed fishing season, only 37.7 % of respondents thought that all fishermen would fully comply with the closed season. This percentage was much higher during the closure (88.6%) and post closure periods (78.9%), indicating that as the observed and experienced the closure, their perception of compliance improved considerably. Most media and key informant reports on compliance during the closure suggested that there was almost 100% compliance, which is consistent with this survey finding. Variation in responses over the three survey periods were statistically significant (N = 1221, df = 10, chi-square=357.53, P=0.000)

**Table 40: Perceptions of respondents on the level of compliance by fishermen with the closed season**

Level of Compliance	Pre	During	Post
All fully	37.7%	88.6%	78.9%
Most but not all	30.5%	6.6%	3.9%
Some but not all	28.5%	4.1%	9.5%
None	0.9%	0.3%	6.1%
don't know	2.2%	0.5%	0.8%
No answer	0.2%		0.8%

### 3.4.10 Fisherfolk Opinions for Government Action and Support

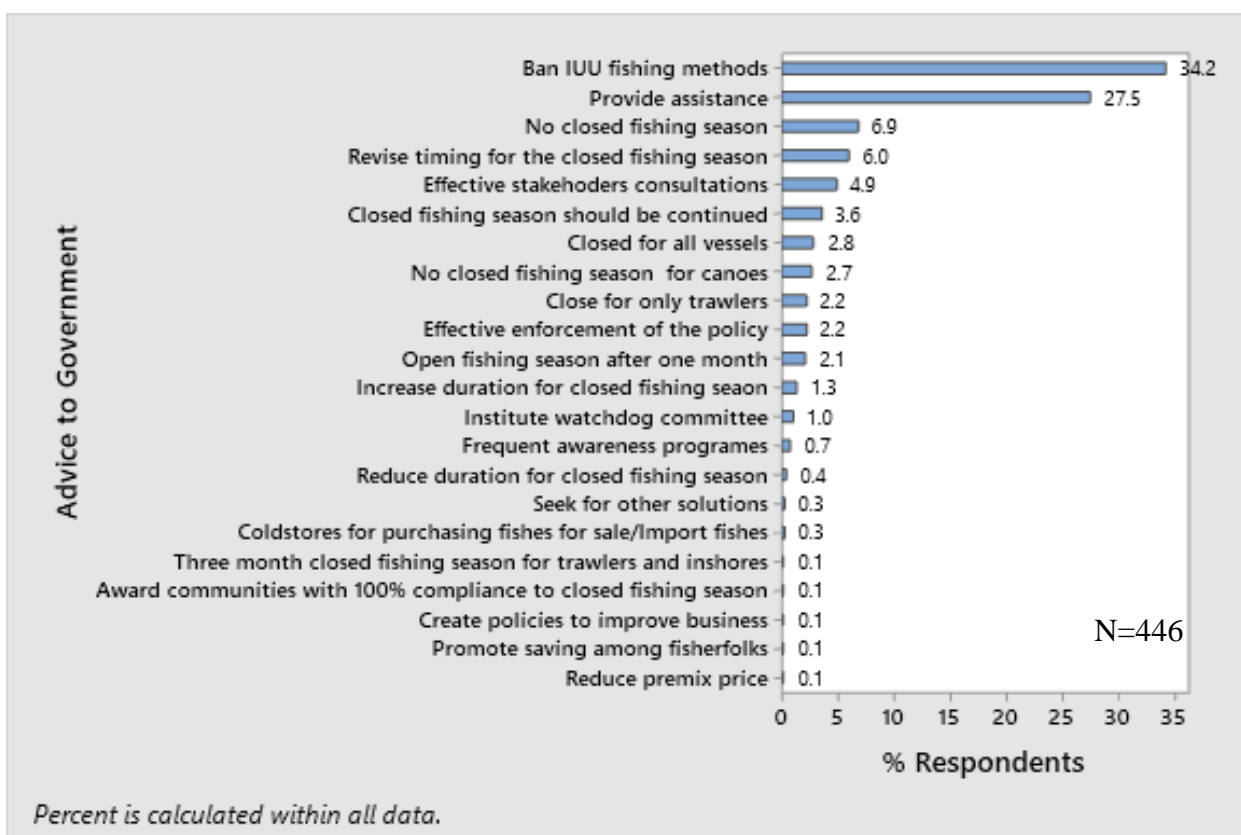
In the build up to the declaration of the closed season and immediately afterwards, there was discussion both within government and among the fishing communities about whether the government should provide compensation to fishermen for losses that would be incurred during the no fishing period. Therefore, this survey included a question on this issue. Prior to the closure, respondents were asked about what sort of assistance they would prefer if assistance were to be provided by the government. Table 41 shows the choices provided to respondents.

**Table 41: Fisherfolks preferred type of assistance from government if it were to be provided**

Responses	Central	Western	Greater Accra	Volta	Total all regions
Cash for work	79%	18%	33%	35%	41%
Allocation of rice / gari / cassava or other direct food assistance	10%	33%	7%	24%	18%
Cash pay-out from the pre-mix community development fund by the landing beach committee	5%	31%	27%	0%	17%
Other	3%	16%	26%	40%	20%
Government should not provide any assistance during the closed season	2%	2%	3%	1%	2%
Don't Know	0%	0%	3%	0%	1%
No answer	1%	0%	0%	0%	0%

The most frequent responses of the forms of assistance that fisherfolks prefer from Government during the closed fishing would be cash for work (41%), followed by direct food assistance and cash payout from the pre-mix fund. There were statistically significant regional variations in responses ( $N = 446$ ,  $df = 18$ ,  $185.13$ ,  $p < 0.001$ ). For instance, a majority from the Western Region preferred assistance in the form of food assistance whereas the Central Volta and Greater Accra regions preferred cash for work. There were many “other” responses in terms of assistance preferred and these included: financial support, foodstuff, alternative livelihoods, and cash for compliance.

Figure 18 presents a list of advice to the government concerning the implementation of the 2019 closed fishing season from 830 respondents. In all, twenty-two (22) different forms of advice were mentioned by respondents across the four coastal regions. The most frequent responses were banning IUU fishing (34.2%) and providing assistance to fisherfolks (27.5%). Most fishermen hinted that the closed season was a good measure, but IUU fishing mars the expected benefit from this management measure. Also, most respondents affirmed the need for Government to provide some form of assistance to fisherfolks before embarking on such a management strategy as fishing, fish processing and fish trading are the main source of livelihoods. A small percentage said there should be no closed season (6.9%) and 6.0% said the timing should be revised. Other forms of advice were for effective stakeholder consultation with fishermen and that the closed season should be continued among other comments.



**Figure 18: Suggested advice to the government by respondents on implementation of the closed season**



## 4. DISCUSSION

People have always harvested fisheries resources they need in order to survive. However, the management of fishery resources is based on a simple basic principle: fishing must not exceed the natural ability of fish to renew themselves. If human populations were small and the methods of collection is not destructive to the marine environment, people could sustainably capture fish in their waters. In Ghana and many developing countries, the increase in human population, rise of industrial capitalism among others have greatly accelerated demands for natural resources including fisheries. The result is overfishing, which is the main reason for the decline of fish populations in the country. This study focuses on closure as one of the technical measures proposed to arrest the declining harvest of fish in the Ghanaian coastal waters. The desire to protect a spawning stock at its most vulnerable times during the year is a major guiding principle of the closed season (Lazar et al., 2016). Thus, the scientific approach is to close fisheries on the spawning grounds during the spawning period (i.e. a period during which most of the matured female fishes are ready to deposit eggs). This management measure is intended to contribute to rebuilding fish stocks by allowing fish to reproduce during the peak of the spawning season before capture.

If the spawning period for a fishery is closed and the fishing effort and catches which would have been taken were not simply displaced elsewhere, or to later in the year, this management strategy could be very effective. Unfortunately, the misperception by many fishers in this study was that it should be possible for them to catch a higher quantity of fish just after one month of closure. If this is the case, a spawning season closure may not be effective as it shifts effort off spawning fish onto juvenile fish, an undesirable situation. Even if this does not happen and the same effort shifts to the same fish later, the effect will only be a one-off boost to the spawning stock. Thus, the benefits to be made from the closed season may not be realized in simply closing the fishing season for one month or one event, rather it must be a continuous process and not a single year event. It must also be coupled with other measures to protect juveniles by enforcing the ban on use of fine mesh nets, and eventually a cap and reduction in fishing effort.

In order to facilitate national mechanisms for advising on the closure in fisheries policy and management strategy, the results from this study on the assessment of the short-term impacts of the 2019 closed fishing with respect to livelihoods, income, food security and nutrition in the artisanal sector of the fishing industry are very relevant to MOFAD and all stakeholders. The findings of this study are discussed as follows.

### 4.1 Livelihood and Income Impacts

This study shows that fishing, fish processing and fish trading are an important and main source of livelihood support and income for most fishing households in coastal communities of Ghana. With declining marine fish stocks, livelihood and incomes are affected. The livelihoods most affected by the closed fishing season were fishing (44%), fish processing (28%), and fish trading (18%).

The reported household income from fishing, processing, and trading declined by large amounts during the closure which represents a significant loss of household income during that period. This was to be expected but also serves as an indirect indicator of high compliance by fisherfolks as 92 percent of households surveyed reported no fishing income during the closure.

While some households reported fishing income during the closure, when asked further about this, most said it was from fishing in the estuaries and freshwater areas which were not closed. Some of this may have been from fishing illegally in marine waters as not everyone surveyed agreed there was total compliance with the closure even though most said compliance was very high, but we have no evidence to support this.

The survey data also showed that income did not fully recover during the post survey period immediately following the closure. There are several possible reasons why income did not recover in the period immediately after the closure. It is possible that (1) the pre closure income was higher than normal in a race to fish heavily just before the closure in order to save income to use during the closure. When asked about this finding, key informants stated that some fishermen did do this. In addition, (2) there could be a lag time to get back fully into fishing after the closure if savings were spent down, resulting in a lack of funds to finance fishing trips once the closure ended. When queried, key informants, including some fishermen, also said that this indeed was a problem for many of those in the fishing industry.

Fishing income is highly variable depending on lunar cycle, seasonality, strength of the Guinea Current ocean upwelling annually, or just the luck of the day concerning encounter of fishing schools. Fishermen key informants said that they fish some gears less during the full moon period and more during the new moon period. The light from the moon tends to make catches of some fish low during this period so many fishermen do not fish around the full moon and only during the new moon period. Therefore, an additional possibility (3) is that the timing of the survey relative to the lunar cycle and intensity of fishing pre and post closure could explain this difference. Fishing income reported post closure could be lower if there were more surveys conducted during the full moon period compared to pre closure.

We tested this hypothesis of lunar variability in income related to lunar variability in fishing effort. Survey data was dichotomized into new and full moon fishing periods defined as the week before and following the full or new moon phase and based on the date the survey was conducted. Mean fishing income was then compared between these lunar periods. We then compared mean fishing income between the survey periods and the percent of surveys conducted during each of the lunar periods.

The statistical results (Table 42 below) show that fishing income is significantly different (T-test 3.698, df = 846, p<0.001) and lower during full moon periods compared to new moon periods confirming the hypothesis that fishers tend to earn more income during these periods, and less during full moon phases.

**Table 42: Comparison of mean fishing incomes across new and full moon fishing periods**

<b>Fishing Income</b>	<b>Lunar Phase</b>	<b>N</b>	<b>Mean (GHS)</b>
Income – 24 hr. period	<b>full moon</b>	278	45.51
	<b>new moon</b>	570	168.65

Survey data was then compared between the lunar phase and the survey period (see Table 43 below). Results show that during the pre-survey period, there were significantly more surveys conducted during the new moon (high fishing) period compared to the post survey period (more low fishing periods) (Chi-square 134.21, df=4, p<0.001). Combined with the results above, we

would therefore expect the post closure income to be lower than the pre-closure period as the timing of the surveys was biased more towards low fishing periods, or full moon periods for the post closure surveys.

**Table 43: Percent of surveys conducted during the two lunar phases**

Survey Period	Lunar Phase		Total	N
	Full	New		
Pre	10.2%	89.8%	100.0%	303
During	35.6%	64.4%	100.0%	278
Post	55.1%	44.6%	100.0%	267

With respect to changes in household livelihoods practiced during the different time periods, few showed any significant changes. The higher percentages of farming food crops and remittances during the pre-closure period, followed by the closure period, and lowest during the post-closure period, suggests these may have been supplemental sources of food and income before and during the closure as one form of coping mechanism, and abandoned to some extent after the closure.

The survey findings are similar to the responses of key informants that stated the main impact of the closed season was a reduction in income from fishing. Living on savings made over the years comprised the next most frequent response given. Other forms of impacts mentioned were spending operating business capital which would have been used purposely for fishing activities. This also supports key informant opinions that returning to fishing after the closure was slow to pick up due to lack of operating capital for fishing trips such as fuel and food. These overall findings show that the artisanal fishing community suffered significant but temporary economic consequences by complying with the closure.

The fact that most fishing households have few alternatives other than fishing, and fisherfolk have low education and literacy rates, make it difficult to find short term livelihood and income alternatives during a one month closed season. Also, few fisherfolk own or have access to land for farming (Crawford et al., 2016) and this did not seem to be a widespread coping opportunity or alternative source of income alternative as mean household farming income did not significantly change during the closed season. The same is true for aquaculture as most fisherfolk do not own land for ponds or engage in aquaculture (Crawford et al., 2016), and the lack of suitable sites in or near large urban and peri-urban fishing communities limits these options as well. The most likely alternatives are low wage short term labor jobs or petty trading, but even here, fisherfolk with no prior experience may face challenges as there is already a ready supply of untapped labor due to high unemployment.

The high proportion of income derived from fishing as compared to other sources indicates high household income dependence on fishing, fish processing and fish trading activities. Non-fishing income reported did not increase during the closure and therefore alternative livelihood income did not make up for lost fishing related income as some may have thought. This is likely due to several factors mentioned above regarding the difficulty of finding temporary employment.

While income losses for fisherfolk during the closure seem large, without a closure and enforcement of other management measures needed to rebuild the fishery, the future economic prospects may be even bleaker due to the likely collapse of the small pelagic stocks, a

continuation of declining catches and related fisheries incomes, thereby pushing more and more fisherfolk into poverty over the long term. Lazar et al. (2018) reported that with improved management, the revenues from small pelagic fishing could increase 4.5 times current levels from US\$ 11.1 million to US\$ 50 million annually, which is consistent with a World Bank (2013) estimate that US\$ 50 million is lost annually in Ghana's marine fisheries due to poor management.

## **4.2 Food Security Impacts**

### **4.2.1 Household hunger**

The level of hunger in the moderate to severe categories combined rose from 15.1 percent prior to the closed season to 21.5 percent during the closure, for an increase of 6.4 percentage points. Assuming approximately 40,000 households are engaged in fishing along the coast (assuming 160,000 men and women employed directly in the fishery / 4 adults per household engaged in fishing as reported in this survey) approximately 2,560 households experienced increased hunger during the closed fishing season. On the positive side, the increase in household hunger was temporary in nature and returned to pre household hunger levels after the closure. In addition, the levels of severe hunger were relatively low in all periods ranging from 3.3 to 5.2% percent compared to elsewhere in Ghana. For instance, comparing moderate to severe hunger levels in northern Ghana averaged 39.4% in the USAID zone of influence, affecting an estimated 370,000 households (Zereyesus et al., 2014). The mean levels of moderate to severe hunger in this survey over the three time periods (17.4%) were much lower than those reported in the Zereyesus survey conducted in 2012 and slightly below those reported in the USAID SFMP baseline survey (21.3%) conducted in 2015 (Crawford et al., 2016). However, even temporary bouts of increased food insecurity and repeated instances can have long term effects on the health of children and youth (Kirkpatrick et al., 2010).

The best predictor of moderate to severe hunger was total income. The mean household income for those with severe hunger was GHS 64.53 per day, and with a median household size of 8.5 persons, this translates into a per capita income of GHS 7.59, below the international poverty line set by the World bank of \$1.90 per day ( $\$1.90 \times \text{GHS } 5.4/\$ = \text{GHS } 10.26$ ). Those households with moderate hunger had a mean daily income of GHS 78.25 and a per capita income of GHS 9.78 which is just about at the World Bank international poverty line using a recent exchange rate of  $\text{GHS}5.4 = 1 \text{ US\$}$ . Therefore, the poverty threshold could be used to target assistance through a cash payout, or in targeting food assistance to those fisherfolks at or below the poverty line. The costs of such a program would be much lower than a payout to all fishing households as it would target only about 20% of the fishing households. However, the challenge would be determining who is in the poverty category and who is a bona fide fisherfolk.

### **4.2.2 Women's dietary diversity**

Dietary diversity of women of reproductive age was reduced significantly during the closure with percentages of respondents with low dietary diversity increasing from 40.0 percent before to 64.2 percent during the closure. The percentage with high dietary diversity decreased significantly from 26.4 percent to 6.3 percent. In both cases this decrease in nutritional quality of the diet rebounded after the closure implying the impact was temporary. The mean scores show a similar decline and rebound

Women of reproductive age made up 24% of the women in this survey. Estimates of the number of women processors and traders is not well documented but a figure of 30,000 fish processors and traders is often quoted by officials in the Fisheries Commission. This would translate to approximately 7200 women fish processors and traders of reproductive age. Since there was an increase of 14.2 percentage points of women in the low WDDS rank during the closure, extrapolating to this population would suggest that almost 1022 women of reproductive age were nutritionally impacted. The decline of 20.1 percentage points of those in the high WDDS rank would translate into another 1,447 individuals impacted. While the household dietary diversity scale was not measured here, it is assumed that a similar pattern would apply to fishing households and individual members of those households including children and other adults.

While declines in women's dietary diversity scores were temporary, even a temporary decline in dietary diversity and a related decline in adequate nutritional intake of mothers could have significant consequences for the children of women that were pregnant or lactating at the time of the closure. More alarming perhaps is that women of reproductive age in fishing households, even without a fishing closure, show a much higher prevalence of low dietary diversity compared with the food insecure northern regions of Ghana, and is a similar finding with the Crawford et al. (2016) study. The caveat with this comparison is that the methodology for women's dietary diversity in this survey varied slightly from those in other studies so may not be directly comparable. Nevertheless, future studies should examine this more closely as it suggests very poor levels of nutritional quality in fishing communities that have been previously thought.

#### **4.2.3 Changes in food consumption types**

This study showed that there were significant decreases in overall dietary diversity scores as well as in most of the food group categories used to construct the score. The scale only measures type of foods consumed and not quantity or quality of food consumed, so while there was no drop in starchy foods consumed, we cannot be assured that even minimal caloric intake was being fully met. However, increases in the moderate and severe household hunger scale categories during the closure would suggest that quantity of food consumed also dropped. While the level of some animal protein (eggs) and vegetables (dark leafy vegetables) remained the same, other food sources to maintain a healthy diet significantly declined including animal sourced proteins (meat and fish), nuts, milk products as well as fruits and vegetables. This represents a rather broad based change in diet and is not just limited to declining fish protein expected from reduced local fish supply available during the closure.

Demersal and fresh small pelagics are the main catches of the canoe fishermen and those supplies were expected to decrease during a fishing closure, although imported fresh/frozen small pelagics are typically available at any time from cold stores. Imports showed no discernable changes with prior year. The decrease in fresh demersal and small pelagic fish availability and consumption was not compensated for by eating more smoked and dried fish or farm raised or freshwater caught tilapia. Instead, as shown in the responses of women surveyed for this report, they just ate fish less frequently during the closure. Tilapia and smoked fish have to be purchased with cash income, also in short supply during the closed season as shown by the decline in overall household and fishing income during the closure. A portion of locally caught fish such as the demersals and fresh small pelagics are frequently provided off the boat to crew as a share of their labor compensation and does not require a cash purchase. Even small children are compensated with fish if they help move pails of fish from boats to the shoreline. The dependence of households on in-kind compensation of food fish and

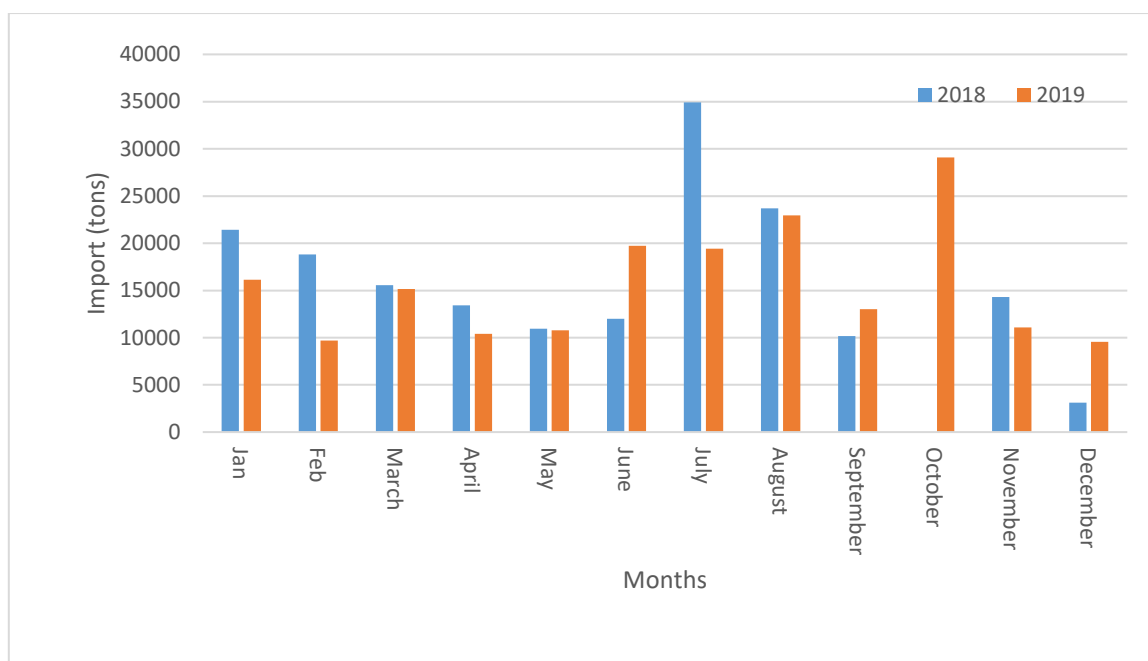
its cut-off during the closed season coupled with a decline in income makes substitution to other forms of animal protein through cash purchases difficult and are the most likely reasons for the decline in the frequency of fish consumption observed in this survey.

Imported fresh/frozen small pelagics are typically available at any time from cold stores but are usually purchased by small scale processors, smoked and then made available for sale. A continued supply of smoked fish from stockpiles before the closure and from cold stores likely kept these supplies abundant, resulting in no decrease in their consumption during the closure. Fresh small pelagic fish consumption declined during the closure but remained high at 38.2% when presumably no local fresh supply was being landed. This supply likely came from cold stores and imports. The percentage of respondents involved in farming was 2.1%, and livestock rearing was 14.2 percent. The data suggest that most household's coping strategy was to consume a less diverse diet, particularly those food items that are not directly produced by many coastal households (e.g. fruits, vegetables, meats) and require cash purchases. However, a diet of starchy staples as well as smoked fish which is high in vitamins and micronutrients was not impacted.

#### **4.2.4 Fish imports**

Ghana is a net importer of fish, with the average per capita fish consumption is 20 kg with a total of 192,131 MT of fish imported and valued at 131,388,230. USD in 2016 (MOFAD, 2017). From Table 43 below imports rose to 178,355 MT in 2018 and up further to 186,999 MT in 2019. This suggests a trend of increasing fish imports over time and is to be expected as population grows and increases demand, and as local fish supply declines from the collapse of local fish stocks. However, as local fish availability was low during the closed season, one question that arose in this study was whether fish imports made up for any of the local supply shortages or not, and whether this may have affected fish price.

Figure 19 below shows the monthly imports of fish for 2018 and 2019 from January to December. In May of 2018, the imports recorded was slightly higher than recorded in May of 2019. Imports of fish during June of 2019 was higher than recorded in June of 2018. Imports in July of 2018 were higher than recorded in July of 2019. Analysis indicated no significant difference between imports recorded in 2018 and 2019 (T-Test value = 0.21, df = 21, p-value = 0.84). Table 44 below shows the volumes by month, subtotal for the months around the closed season and annual totals. From these data we draw no conclusions about any form of significant change in imports in 2019 compared to 2018 either for the total annual amount or for the months bracketing the closed season



**Figure 19: Monthly fish imports (tons) for 2018 and 2019**

(Source: Fisheries Commission, 2020)

**Table 44: Imports of Fish (tons) by month for 2018 and 2019**

Month	Imports(tons)	
	2018	2019
Jan	21417.70	16149.72
Feb	18804.31	9691.17
March	15570.17	15139.57
April	13415.73	10412.57
May	10944.47	10764.97
June	11989.52	19734.00
July	34907.89	19415.09
August	23709.81	22956.33
September	10160.57	13016.27
October	-	29077.70
November	14313.67	11097.27
December	3121.90	9544.49
<b>Subtotal May - July</b>	<b>71257.61</b>	<b>60326.63</b>
<b>Total Jan - Dec</b>	<b>178355.74</b>	<b>186999.15</b>

(Source: Fisheries Commission, 2020)

#### 4.2.5 Migration as a coping strategy

Fears that many fishers would migrate and fish in neighbouring countries during the closure and therefore, diminish the impact of the closure on the regional stocks were unfounded as very few fishers said they migrated in this study, less than two percent. Of those who did, half said

they made more income and half said they made less income compared to if they had stayed in Ghana, so for only about one percent of those surveyed did this strategy pay off in sustaining better income during the closure.

### **4.3 Communications Impacts**

The questions were designed to measure whether the communications programs about the closed season by MOFAD and the USAID Ghana SFMP were effective in creating widespread understanding of the reason for and whether fisherfolks knew the declared time and duration of the various fleet closures. The results provide the following insights on the effectiveness of communication programs adopted in creating awareness about the closure that were implemented by OFAD/FC as well as SFMP.

#### **4.3.1 Sources of information on the closed season**

Most respondents to the survey had heard about the closure on multiple occasions demonstrating that at least some information was well disseminated and fisherfolks were aware of the closure. However, what is important is that most preferred sources of information are local community radio, community meetings and chief fishermen (over 60 % of respondents prefer these channels of communication) demonstrating the importance of using these communication channels in the future to disseminate information. National media is not as widely preferred but national radio and TV is preferred by another 30% of the respondents so can still be used to some extent to communicate information. Newspapers are not widely preferred, and this may be related to the low literacy rates of individuals in fishing communities. The low preference for the Fisheries Commission as a direct source of information may indicate a credibility gap or the fact that the level of staffing and resources for direct communications is limited. However, the Fisheries Commission can and should play an important role in providing accurate technical information that is then recycled through community meetings, chief fishermen, community radio and on national TV and radio programs.

#### **4.3.2 Purpose of the closed season**

Many respondents believed correctly that the main purpose for the closed season was to protect fish during the spawning period and allow them to spawn before being caught and that understanding improved over time. This indicates that the biological purpose of closed season is now widely known within the fishing community, a success of the past communications campaigns. This bodes well for the implementation of a closed season for 2020 where the emphasis of the communication messaging could be guided from the past to address gaps in current fisherfolk knowledge as noted in the sections below.

#### **4.3.3 Duration of the closure**

More than 80 percent of respondents interviewed during both sampling sessions knew that the duration of the canoe closed fishing season was one (1) month. In contrast to the observation made from respondents concerning the duration of the closed fishing season for canoe fishermen, many respondents had no idea about the duration for closed fishing season for trawlers and the inshore fleet. This suggests that extra effort should be made through future communication campaigns and adequate interaction with the fisherfolk on the duration of the closure not only for the canoe fleet but for the other fleets as well.



#### **4.3.4 Timing of the closure**

The majority of the respondents (88.2%) correctly indicated the months of May and June as the months of closure for canoe vessels and the percentage of respondents who resounded ‘Don’t know’ declined to 1.5% after the closed fishing season. By contrast, fewer fishermen knew the duration of the trawler and inshore fleet closures or the correct timing. The highest frequency of responses indicated that the best month for the canoe closed fishing season to be in the June or July – and a smaller number are in favor of August. Respondents preferred the July – August period for the inshore and trawler closures. This indicates some level of consensus is building for similar timing of the closures for all fleets in the July and/or August period, while still some resistance to August for the canoe fleet. On a positive note, this means that fisherfolk opinion is moving to be more consistent with the scientific recommendation of July, August and September as the best months from a biological standpoint (Lazar et al., 2019).

#### **4.3.5 Perceptions on the benefits of the closed season**

Before the closed fishing season, the majority of respondents strongly agreed that the closed season will improve the abundance of fish in the sea for the next fishing season. Collectively, 32.9% of the respondents disagreed that the closed season will improve the abundance of the fish species in the sea for the next fishing season. This shows significant belief among the fisherfolks of the closed season benefits and therefore increases legitimacy of the management measure and in part helps explain the high compliance observed for the 2019 closure. While overall, this is an encouraging and positive finding, there more education of fisherfolks on the benefits of the closed season could push the supporting percentages even higher. In particular, more communications work is needed on getting fisherfolks to understand that the stock rebuilding process will take years to accomplish and also requires other measures such as reduction in the capture of juveniles by trawlers, inshore vessels and by canoe fishermen.

#### **4.3.6 Perceptions on government interventions**

Given the livelihood, income and food security impacts among fishing communities during the closed season, this report provides a level of justification for some form of community assistance to be considered by government during the seasonal fishery closures, assuming this becomes an annual event. The preferred package of benefits as expressed by fisherfolks is some form of cash payout and/or food assistance.

## 5. CONCLUSIONS AND RECOMMENDATIONS

High compliance by fishermen with the 2019 closure demonstrates a strong commitment by fisherfolks to apply this management approach in spite of significant sacrifices, mainly lost income during closures. Most understand the purpose of such closures and attitudes are moving towards adjusting the timing to within a period recommended by the scientific evidence. This result should be built on and future closures

### ***Standardize the annual period of the closure***

Standardizing the timing and duration of closures would reduce economic uncertainty for fishing households. Focus group discussants and key informants suggested that adequate advance notice of closures should be given so they have time to prepare and cope. Some felt that over time if this is known to be an annually recurring event, that fishing households will adjust as in the past before light fishing, there were natural periods of no fishing and they managed just fine back then and can in the future. Certainty is key, so coping mechanisms and investments are seen as addressing long term needs. This recommendation if implemented does not require significant direct costs by government and compensation to fisherfolks but could have high gains in terms of de-risking the economic environment for fisherfolks.

### ***Securing livelihoods***

**Promote diversified livelihoods and economic resiliency for fisherfolks so they can better cope with periods of lack of income when there are fishing closures:**

Investment in training and support for alternative livelihoods or fisherfolks other than fishing related, should be considered. In this regard, the National Board for Small Scale Industries may be consulted for direction in the development of appropriate alternative small-scale businesses appropriate for each community. In the long term, diversifying livelihoods among fishing households to activities other than fishing during the closure can be a means of mitigating increased food insecurity caused by seasonal closures which will likely become an annual norm in the years to come.

However, livelihood diversification in Ghana fishing households will be a challenge as the current level of livelihood diversity among fishing households is quite low. Crawford et al. (2016) noted an average of 2.67 livelihoods per fishing household, of which on average only 0.52 livelihoods were non-fishing related. This equates to 81% of household livelihoods on average being fishing related and is similar to this study which showed an average of 82% of household livelihoods being fishing related. This corresponds to the income data in this study that showed a large proportion of household income reported came from fishing related livelihoods, further illustrating the high dependence on the fishing sector by fishing households. This study also showed that higher household livelihood diversity can reduce prevalence of low dietary diversity but unlikely to mitigate moderate to severe hunger unless it boosts income or maintains income above poverty levels. As Ghana fishing households are not economically resilient due to the high dependence on fishing, increasing household resilience through livelihood diversification among fishing households should be a policy goal in the long term.

Empirical research on livelihood diversification does not demonstrate a high rate of success in fishing communities for many reasons (Pomeroy et al. 2017, Tobey and Torell, 2012) and past donor efforts in this regard are littered with failures. First, it is more difficult to create new livelihood opportunities compared to building on or increasing income from existing

livelihoods. In addition, fisherfolks in Ghana have low levels of formal education and low literacy rates as demonstrated in the Crawford et al. (2016) study and shown in this study, meaning they have few skills to move into other than low wage and unskilled labor opportunities. In addition, such efforts would need to be done at large scale for 160,000 potential beneficiaries, and this has never been accomplished to our knowledge in the fishing sector at a national scale and would be costly.

Research has also demonstrated that fisherfolks are often reluctant to leave fishing for other occupations (Pollnac and Poggie, 2008, Pollnac et al., 2012). Cobinna (2019), in her study of Ghana fisheries, also concluded that most Ghana fishermen enjoy the occupation of fishing and most are not willing to change to other occupations. In addition, the temporary loss of income from fishing during the closure is only for a short period of time and finding temporary employment for over 100,000 fishermen and 30-60,000 women for a month-long period could prove difficult.

Therefore, supporting Ghana fishing households to switch livelihoods or diversify into non-fishing livelihoods will be difficult and needs to consider different approaches than have been used in the past with disappointing results. In this context, other options that could be considered to mitigate lost income and increased food insecurity during temporary closures which could include cash compensation not to fish during fishing periods, or large-scale cash for work programs. Livelihood diversification should be looked at more as a longer-term strategy, particularly if the closed season will be ongoing annually and if other proposals to reduce fishing capacity are implemented in the future. Another long term strategy would be to provide opportunities and grants for youth of fishing families for vocational training or scholarships to stay in primary and secondary school so that if they choose not to pursue a career in fishing, they can have options. It may be easier to keep fewer youth from going into fishing in the long term than trying to take fisherfolks currently in the occupation out. Evidence to support this approach comes from studies in other countries that show those fisherfolk most willing to exit the occupation tend to be younger, have more years of formal education, and have less years of fishing experience (Pollnac et al., 2012; Muallil et al., 2011).

**Consider cash compensation or cash for work programs during closures:** Costs of such programs would need to be estimated and could be significant. Considering a daily poverty rate payment of \$1.90 per day for 160,000 men and women involved in the fishery for 14 days (not every day of the month is a fishing day) would total \$4,256,000. This expense could be offset by applying the savings on the pre-mix fuel subsidy not expensed during a closed season. The fuel subsidy to the artisanal sector is estimated to cost the government \$44 million annually, or about \$3.67 million monthly (Tobey et al. 2016). The amount saved from less pre-mix subsidy payments would just about cover the estimated costs of a cash payout program as noted above and would therefore not necessarily represent any additional costs to government but rather providing a current artisanal fisherfolk subsidy through other means.

A fuel subsidy is considered a capacity enhancing subsidy which exacerbates the overfishing problem compared to cash payouts not to fish, which is considered a neutral subsidy with no effect on fishing effort. Determining who should get a payout and is considered a bona fide fisherman raises another set of concerns for implementing a cash payment as there is no current registry by the Fisheries Commission of who are full or part time fishermen, processors and traders, all of whom are impacted by the closure.

Of course, ways and means to identify who should receive such compensation and at what level would have to be worked out and distribution mechanisms decided as well. The canoe

identification card launched by the Fisheries Commission provides a means of identifying legitimate canoe owners that could receive cash benefits or food assistance which they could then distribute to their crew. However, that does raise some risks of whether the crew would ultimately receive such benefits or whether it would just be pocketed by the owners. That approach also does not provide a compensation mechanism to processors and traders that are overwhelmingly women operated businesses. However, it could be a short term means while a better mechanism is developed. Important to consider in a payout program would be the need to provide access to both men and women involved in the artisanal fishery, including fish processors and traders as well as fishermen, as all are impacted economically.

A fisherfolk registry could be another means but would take a while to get up and running and criteria to identify only bona fide fisherfolk would be needed so the registration rolls does not get padded by the addition of non-fisherfolk. Direct cash payments via mobile money could reduce the possibility of “leakage” and work to help ensure payments get into the hands of fisherfolk without passing through intermediaries. Approximately 94% of fishing households own a basic or smart phone (Crawford et al. 2016) so this approach could reach most fisherfolks. One idea provided by a key informant on the issue of compensation suggested that national fishing associations be involved in identifying bona fide fisherfolks. Savings on reduced expenses for pre-mix fuel during the closure can somewhat offset total costs of such a program to government and the income lost estimates in this report provide some degree of estimation of the value or scale of the benefits to be considered.

Some expansion of the LEAP program could be another possible option where the payouts are targeted only at those in the lower income bracket. Regardless, there will need to be political and financial support for some form of closed season compensation and much policy work will be needed on how it could be effectively and transparently implemented if the government wishes to consider such options.

**Increasing the importation of fish during the closed season:** In order to keep fish price stable, importation of fish more fish prior to and during the closed season could be an option to consider. The secondary data comparing imports between 2018 and 2019 showed not significant increased or changes in monthly patterns of importation. This practice has been adopted in the Philippines by importing the so-called poor man’s fish ‘*galunggong*’ as prices of the commodity shot up during a three-month closed season for the sardinella fishery (Simeon, 2019). This would help ensure a stable supply of fish and fish products for consumers during the closure. Current importers should be asked to plan and stock stores of frozen fish prior to the closure in anticipation of shortages in local supply and to help keep prices stable. This requires that the timing of the closed season also be made well in advance so importers can plan ahead given time lags in supply chains from ordering shipping and arrival in-country.

**Licensing canoe fisherfolk to import of fish:** The Ghana National Canoe Fishermen’s Council (GNCFC) and the National Fish Processors and Traders Association (NAFPTA) have both expressed interest in importing fish during the closed season for sale and processing. Following this approach, NAFPTA as an organization and or its member fish processors and traders could be issued with special fish import licenses after consultation on the modalities and assessment of quantum of fish to import during the closed season. This would help ensure a stable supply of fish and fish products for consumers during the closure as well as help sustain income of fish processors and traders during the closure as this survey documented steep declines not only for fishermen from fishing but all processors and traders

If most of this importation is processed into smoked and dried product, it would not likely change fish consumption patterns or dietary diversity during a closure as there was little change in smoked and dried fish consumption during this closure. However, importation of fish by these association members during a closure could help reduce those experiencing moderate to severe hunger if it helps maintain or increase income for those below the poverty threshold that would trade and process the fish.

**Exploration of enrollment of the fishers in insurance schemes:** These can be tailored to address closed season income losses either through partial premium payouts during the closed season, or blended products that encourage savings that can be used during the closures, similar to the current Future Plan offered by miLife and Vodafone. The National Insurance Commission may be consulted to come out with tailored insurance packages for the fishers. In addition, a subsidized pension scheme for fishers through consultation with the fishers and the Social Security and National Insurance Trust could be explored.

**Promote savings among fisherfolk:** Use of savings was the most frequently cited closed season coping strategy by respondents to this survey. Building on this to improve the volume and strategic management of savings should be a high priority. The range of opportunity to do this is great as it can be driven by fisherfolk associations themselves, private sector actors and others in addition to any support for such initiatives that government could provide. Many fishing entrepreneurs, especially processors and traders said that lack of capital and savings prohibit them from for instance smoking larger quantities of fish for stockpiling and sale during the closed season. Government, donors and CSOs should work to build mechanisms of better savings and credit and financial literacy within the fishing community, such as promotion of Village Savings and Loan Associations or targeting government discounted low interest loans through MASLOC. and increase ability to avail of loans. Standardizing the closed season period annually would also have a strong impact on facilitating initiatives that promote savings and credit, as well as insurance schemes mentioned above.

### ***Ensuring food security***

**Provide a food subsidy for fishers during the closed season:** In this regard, MOFAD may seek funding from parliament to support loss of jobs and livelihood until the stocks recover. Given the collapse of the fish stocks, it could be viewed as emergency aid and provided for a limited duration. It could also be considered a security assurance program as increasing poverty in fishing communities could lead to increased criminal activities as a coping strategy among some groups or individuals. Fisherfolk association can help identify those most in need and ensure that if limited assistance is available it goes to vulnerable households most in need. Key informants suggested that if food assistance is provided, the food provided should be regionally appropriate as not all regions have the same starch preferences although some felt rice would be acceptable in most places.

**Distribute nutritional supplements to women of reproductive age in fishing communities during the closure periods:** The impact of reduced dietary diversity during the closed season could be mitigated by the distribution of nutritional supplements of one form or another, such as providing prenatal vitamins to women of reproductive age. Some people have suggested food aid be considered as well. However, if that aid is in the form of starchy staples such as cassava, maize, or rice, it is doubtful that would ameliorate the reduced dietary diversity experienced during the closure as this food group showed no change in frequency of consumption. We do not know the extent to which the quantity of starchy staples being

consumed was reduced during the closure, but such food aid could possibly reduce prevalence of those experiencing moderate to severe hunger.

### ***Improving communications with stakeholders***

**Continue and intensify education and awareness on the status of the fish stocks and rationale for closed seasons and other responsible fishing practices:** The results of this study indicate that messages to fisherfolks about the closed season are best facilitated by TV and radio campaigns, involvement of the chief fishermen, community meetings and community radio. Design of future educational and communications campaigns using the Mass Education and Participatory Approach Concept, should be implemented as well as consider assistance from the Ministries of Education; and Social, Gender and Children Welfare. MOFAD should encourage and seek support from international donors for such educational and communications campaigns. This study has also shown that more education is needed on building consensus on future dates of the closed season, with July – suggested for the Canoe and inshore sector, and July – August for the trawl sector. The July, August and September months are the peak periods of spawning (Lazar et al., 2019). More information needs to be provided in such communications campaigns to fisherfolk on the timing and duration of closures for all fleets, especially due to the poor understanding at present among fisherfolk of the timing and duration of closures for the trawlers and inshore fleet in particular.

### **Improved communication, education programs:**

#### ***Adoption of adaptive management***

**Promote learning and adaptative management with respect to seasonal closures and other management actions:** The moratorium on fishing during a closure not only protects fish to spawn during a critical life stage, but also removes fishing effort from the system for a period of time, which can decrease fishing effort and yield that would otherwise be harvested if the access to the resources were permitted. This loss is reflected in the survey results that show loss of fishermen’s income during the closer. Similarly, fish processors and traders and related businesses (transport, sale on nets, fuel, ice block manufacturers etc.) are found to face some adverse socio-economic impacts requiring coping mechanisms by stakeholders. In spite of these challenges, the results of this study indicate positive views among fisherfolk on institutionalization of an annual closed season. Thus, this initial closure attempt by MOFAD may be considered as a learning phase by stakeholders to assess the closure and take on better coping mechanisms to enable the fishery to recover from its near collapse and where ultimately fishing communities can reap the benefits of a recovered and healthy fishery. Furthermore, the closure may be considered as a first step in the right direction by MOFAD and fishermen to work together and provide avenues for adaptive management through “experimentation of the closure”. The experience gained will provide the basis for future considerations of a seasonal closure from the point of view of future biological and socio-economic benefits for rebuilding of the stocks.

Many of the survey respondents and key informants also felt that the timing of the closures should be consistent across all the fleets – canoe, inshore and trawlers, rather than different periods depending on the fleet as happened in 2019.

Lastly, as the small pelagics are a shared stock, Ghana should make effort to coordinate a regional wide closure strategy. In the absence of a regional strategy, Ghana should still continue with annual seasonal closures and demonstrate leadership in promoting sustainability of the shared stocks and as Ghana’s landings make up about 80% of the regional landings.

**A critical review of the timing and duration of the period of the closed season is needed:**

The closed season must be seen from the point of view of protection of spawning stock during a critical life stage of the small pelagics and as reduction in fishing effort and should be based on scientific data more so than on cultural considerations such as taboos and timing of cultural festivals. While taking cognizance of the cultural values, the period of the closed season must strongly be guided by views from the scientific community especially from the STWG in collaboration with MOFAD. As noted above, there is room to have a more scientifically timed closure as well as accommodate some cultural needs especially festivals during the early August period. In this regard, STWG, NAFAG, the GNCFC and NAFPTA need to be meeting with MOFAD and the Fisheries Commission to develop a consensus moving forward and for the 2020 season. Traditional leaders can support the seasonal closure through ceremonies that close and open the sea similar to the *Bakatue* festival and related ceremonies practiced for the opening and closing of the estuary in Elmina.

**Recommendations on further applied research:** Long term studies on income variability, diversified livelihoods, and potentially increased social vices during closures and due to declining catches.

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## APPENDIX I: GUIDES FOR FOCUS GROUP DISCUSSIONS AND KEY INFORMANT INTERVIEWS

### FOCUS GROUP DISCUSSION GUIDE\_PROCESSORS & TRADERS SOCIO-ECONOMIC, FOOD SECURITY AND NUTRITION IMPACT ASSESSMENT OF THE 2019 CLOSED FISHING SEASONS IN GHANA

**Instruction:** Introduce yourself and explain reason for the discussion

#### FOCUS GROUP DISCUSSION GUIDE

Community Name	
District	
Region	Central <input type="checkbox"/> Western <input type="checkbox"/> Volta <input type="checkbox"/> Greater Accra <input type="checkbox"/>
Date of FGD	
Target Audience	
Total Participants	

Do you think fish you processed/trade have reduced in size?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
If yes, what do you think is the cause?	
Can something be done about it?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
Why? (For both Yes and No)	
Has the government engaged you about the FISHING CLOSED SEASON?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
If yes, to what extent have you been engaged by the government?	
What has been some of the bottlenecks of the arrangements of the engagements?	
Are you aware of the 2019 FISHING CLOSED SEASON?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
What is the purpose of the FISHING CLOSED SEASON?	1.
Are you in agreement with the FISHING CLOSED SEASON?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
Why? (For both Yes and No)	
Do you think the FISHING CLOSED SEASON should be instituted by the government at the artisanal fishery level?	Yes [ <input type="checkbox"/> ] No [ <input type="checkbox"/> ]
Why? (For both Yes and No)	
Do you think the FISHING CLOSED SEASON will have a positive or negative impact in the medium to long term rebuilding of the marine fish stocks?	Positive [ <input type="checkbox"/> ] Negative [ <input type="checkbox"/> ]
If positive impact, explain:	

If negative impact, explain:	
Will the FISHING CLOSED SEASON have any adverse impact on your general operations as a processor/trader?	Yes [ ] No [ ]
If yes, explain how	
How will it impact your income?	
How will it impact your spouse?	
How will it impact on your children/dependents?	
How will it impact your nutrition?	
How will it impact your health?	
How will it impact fish price?	
How will it impact your social life?	
How will it impact your role in the household?	
What alternative means will you use to gain additional income during the FISHING CLOSED SEASON?	
Will you need any kind of assistance during the FISHING CLOSED SEASON?	Yes [ ] No [ ]
If Yes, in what form?	
Will you be ready to venture into any other livelihood activity?	Yes [ ] No [ ]
What kind of training/skills will you require?	
What is your advice to the government about the implementation of the FISHING CLOSED SEASON?	

THANK PARTICIPANTS FOR THE FGD. REMIND THEM OF ANOTHER DISCUSSION AFTER THE CLOSURE

KEY INFORMANT GUIDE\_SOCIO-ECONOMIC, FOOD SECURITY AND NUTRITION  
IMPACT ASSESSMENT OF THE 2019 CLOSED FISHING SEASONS IN GHANA

Targeted Key Informants

- Regional/Local Dept. of fisheries officer, fisheries field extension agent, and fisheries data collector at a landing site
- Community Leader/Chief Fishermen
- Konkohene/hemaa
- Key associations (GNCFC, NAFPTA, DAA, CEWEFIA)
- Respected women leader (formal or informal) from a fishing household

**Instruction:**

*Tell the informant that you are grateful for his/her time and willingness to participate in the interview. Tell the informant he/she have been strategically selected because he/she offer valuable insight and knowledge about the issue/topic. Thank the informant and assure he/she that his/her responses will be kept confidential and will not be linked to his/her name and only used in aggregate form.*

**General**

Are there any local fisheries associations in your area and if so, what do they do?	
Are there any fisheries management committees in your area?	
Are there other local committees that handle fisheries issues?	
How will (is) the fishing closed season affecting your (members) operations?	

What strategies are you (members) using to deal with the impacts of the fishing closed season?	
Do you think that fishing closed season will help rebuild the fish stocks and improve livelihood?	

**Socio-Economic Impact**

What do you think will be the major impact of the fishing closed season on your family?	
How will the fishing closed season impact your income?	
How will the fishing closed season impact your spouse?	
How will the fishing closed season impact your children/dependents?	
How will the fishing closed season impact your poverty level? <i>Low/high (explain)</i>	
How will the fishing closed season impact your role in the household?	



### **Nutritional and Food Security Impacts**

How will the fishing closed season impact your (members) nutrition?	
How will the fishing closed season impact your (members) health?	
Are there any situation when you (members) go a whole day without eating anything because there was not enough food?	
How often did this happen?  ●	

### **Communication**

Have you heard information about the closed season in the media or from other sources?  <i>If Yes, indicate the source</i>	
How often have you heard information about the closed season?	
What do suggest should be done in communicating about the closed season?	

## APPENDIX II: EXCEL PROGRAM SHEETS FOR THE SURVEY INSTRUMENT.

### Survey Sheet

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	Survey: Closed Season Impact Assessment							
	<b>Section A: General Survey Information</b>						w4	
yes	A1. Survey period						w1	
yes	A2. Date of interview					#{today}	w1	
yes	A3. Name of interviewer						w1	
yes	A4. What language is the interviewer using?						w1	
	<b>Section B: Community Identification</b>						w4	
yes	B1. Region:						w2	
yes	B2. Community:						w2	cf=#{region}
	B3. GPS Coordinates of location							
	<b>Section C: Head of Household Livelihood and Income Questions</b>						w4	
	<b>Note to Enumerator:</b> Find the head of household to start the survey. If head of household is unavailable, interview the next senior-most person in the household as the household head.							
	<b>**NOTE TO ENUMERATOR:**</b> You need to obtain verbal consent from the respondent before you can administer the survey. Carefully read aloud the consent form and clarify any ambiguities. Answer the following question based on the response from the respondent.							
yes	Do you, the enumerator, affirm that you have read aloud the consent statement to the participant and they have consented to the interview, as well as providing information that will be used for follow-up interviews in subsequent years?						w4	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	<b>Section C: Head of Household Questions</b>						w3	
yes	C1. What is the name of the head of household?		\${consent_house}='1' and \${survey_period}='1'				w1	
yes	C2. What is the phone number (mobile) where the head of household may be reached?		\${consent_house}='1' and \${survey_period}='1'				w1	
	House ID		\${consent_house}='1' and \${survey_period}='1'			concat(\${house_head_name}, '-', \${house_mobile})		
yes	C3. Number of persons in the household		\${consent_house}='1' and \${survey_period}='1'				w1	
	<b>Section C: Head of Household Questions continued 1</b>						w3	
	C4. Number of adults engaged in fishing?		\${consent_house}='1' and \${survey_period}='1'				w1	
	C5. Number of adults engaged in fish processing?		\${consent_house}='1' and \${survey_period}='1'				w1	
	C6. Number of adults engaged in fish trading activities?		\${consent_house}='1' and \${survey_period}='1'				w1	
	<b>Section C: Head of Household Questions continued 2</b>						w4	
yes	C7. Are members of your household engaged in fishing?		\${consent_house}='1'				w1	
	C7a. How much income in GHS have you made in the last 2 days from it?		\${consent_house}='1' and \${house_act_fish}='1'				w1	
yes	C8. Are members of your household engaged in fish processing or fish smoking?		\${consent_house}='1'				w1	
	C8a. How much income in GHS have you made in the last 2 days from it?		\${consent_house}='1' and \${house_act_proc}='1'				w1	
	<b>Section C: Head of Household Questions continued 3</b>						w4	
yes	C9. Are members of your household engaged in fish trading?		\${consent_house}='1'				w1	
	C9a. How much income in GHS have you made in the last 2 days from it?		\${consent_house}='1' and \${house_act_trade}='1'				w1	
yes	C10. Are members of your household farming food crops (Cassava, vegetables, etc.)?		\${consent_house}='1'				w1	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	C10a. How much income in GHS have you made in the last 2 days from it?		`\${consent_house}='1' and \${house_act_food}='1'`				w1	
	<b>Section C: Head of Household Questions continued 4</b>						w2	
yes	C11. Are members of your household farming plantation crops (cocoa, rubber, palm, etc.)?		`\${consent_house}='1'`				w1	
	C11a. How much income in GHS have you made in the last 2 days from it?		`\${consent_house}='1' and \${house_act_plant}='1'`				w1	
	<b>Section C: Head of Household Questions continued 5</b>						w4	
yes	C12. Are members of your household rearing livestock?		`\${consent_house}='1'`				w1	
	C12a. How much income in GHS have you made in the last 2 days from it?		`\${consent_house}='1' and \${house_act_livestock}='1'`				w1	
yes	C13. Are members of your household receiving remittances from someone outside of your community?		`\${consent_house}='1'`				w1	
	C13a. How much income in GHS have you made in the last 2 days from it?		`\${consent_house}='1' and \${house_act_rem}='1'`				w1	
	<b>Section C: Head of Household Questions continued 6</b>						w3	
yes	C14. Are members of your household engaged in other livelihood activities?		`\${consent_house}='1'`				w1	
	C14a. What is the other livelihood activity?		`\${consent_house}='1' and \${house_act_other}='1'`				w1	
	C14b. How much income in GHS have you made in the last 2 days from it?		`\${consent_house}='1' and \${house_act_other}='1'`				w1	
	<b>Section C: Head of Household Questions continued 7</b>						w2	
yes	C15. Which livelihood activity is the most important to your household? (check only one)		`\${consent_house}='1'`				w1	
no	C15a. Other most important activity.		`\${consent_house}='1' and \${house_active_most}='7'`				w1	
	<b>Section C: Head of Household Questions continued 8</b>						w4	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
no	C16. Which livelihood activity is the second most important to your household? (check only one)		\${consent_house}='1'				w2	
no	C16a. Other second most important activity.		\${consent_house}='1' and \${house_active_second}='7'				w2	
yes	C17. Which livelihood activity that you mentioned above will be affected most by the fishing closure?		\${consent_house}='1' and \${survey_period}='1'				w2	
no	C17a. Other activity most effected by closure.		\${consent_house}='1' and \${house_activity_effected} }=7'				w2	
	<b>Section D: Nutritional and Food Security Impacts (Household Level)</b>						w4	
	** Note to Enumerator ** If this is not the food preparer you need to ask if the food preparer is available for the interview. Then get their name and telephone number and interview them. If no food preparer is available answer no and skip to the Individual Sections.							
yes	D1. Are you responsible for food preparation (cooking) in your household?		\${consent_house}='1'				w2	
	D2. Name of the person doing the food preparation.		\${consent_house}='1' and \${food_prep}='1'				w2	
	D3. What is your phone number? (if they have a phone, this is the phone for the person doing the food preparation, if no phone, leave blank)		\${consent_house}='1' and \${food_prep}='1'					
	create food preparer ID		\${consent_house}='1' and \${food_prep}='1'			concat(\${food_prep_name},'-', \${food_prep_phone})		
	**NOTE TO ENUMERATOR:** You need to obtain verbal consent from the respondent before you can administer the survey. Carefully read aloud the consent form and clarify any ambiguities. Answer the following question based on the response from the respondent.							

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	<b>Section D: Nutritional and Food Security Impacts continued 1</b>						w1	
	Do you, the enumerator, affirm that you have read aloud the consent statement to the participant and they have consented to the interview, as well as providing information that will be used for follow-up interviews in subsequent years?		$\{\text{consent\_house}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	<b>Section D: Nutritional and Food Security Impacts continued 2</b>						w4	
	D4. In the last 4 weeks, was there ever no food to eat of any kind in your dwelling because of lack of resources to get food?		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	D4a. How often did this happen in the last 4 weeks		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_resources}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	D5. In the last 4 weeks, did you or any household member go to sleep hungry because there was not enough food?		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	D5a. How often did this happen in the last 4 weeks		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_bed\_hungry}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	<b>Section D: Nutritional and Food Security Impacts continued 3</b>						w2	
	D6. In the last 4 weeks, did you or any household member go a whole day and night without eating anything at all because there was not enough food?		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_prep}\}='1'$				w1	
	D6a. How often did this happen in the last 4 weeks		$\{\text{consent\_food}\}='1'$ and $\{\text{food\_day\_night}\}='1'$				w1	
	<b>Note to Enumerator:</b> Individual Level questions below are to be repeated if more than one target respondent (fisher, processor , trader) interviewed per household.							
	<b>Start of Repeat Sections for Additional Respondents in the Household</b>							
	<b>Section E: Socio-Demographic Background of Respondents (Individual level)</b>							

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	<b>**NOTE TO ENUMERATOR:**</b> You need to obtain verbal consent from the respondent before you can administer the survey. Carefully read aloud the consent form and clarify any ambiguities. Answer the following question based on the response from the respondent.							
	<b>Section E: Socio-Demographic Background of Respondents continued 1</b>						w4	
yes	Do you, the enumerator, affirm that you have read aloud the consent statement to the participant and they have consented to the interview, as well as providing information that will be used for follow-up interviews in subsequent years?						w4	
	<b>Section E: Socio-Demographic Background of Respondents continued 2</b>						w5	
yes	E1. Name of Respondent						w1	
	E2. Mobile phone number						w1	
	E3. Who owns the phone						w1	
yes	E4. Enter age in years						w1	
yes	E5. Gender						w1	
	survey period							
	<b>Section E: Socio-Demographic Background of Respondents continued 3</b>						w3	
	Unique ID							
yes	E6. Level of education?						w1	
yes	E7. Can respondent read and write?						w1	
yes	E8. Marital Status?						w1	
	<b>Section E: Socio-Demographic Background of Respondents continued 4</b>						w4	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
yes	E9. Nationality of respondent is Ghanaian?		`\${consent_food_ind}`='1' and `\${survey_period}`='1'				w2	
	E9a. What is the respondent's nationality?		`\${consent_food_ind}`='1' and `\${survey_period}`='1' and `\${SocD_nationality}`='2'				w2	
	<b>Section E: Socio-Demographic Background of Respondents continued 5</b>						w4	
	E10. Type of respondent, main livelihood.		`\${consent_food_ind}`='1' and (`\${survey_period}`='1' or `\${survey_period}`='3')				w1	
yes	E10a. Main gear used.		`\${consent_food_ind}`='1' and `\${SocD_livelihood}`='1' and (`\${survey_period}`='1' or `\${survey_period}`='3')				w1	
	E11. Main or primary species group targeted or processed/sold or traded.		`\${consent_food_ind}`='1' and `\${survey_period}`='1'				w1	
	E12. Second rank of importance of type of fish caught/sold or traded.		`\${consent_food_ind}`='1' and `\${survey_period}`='1'				w1	
	<b>Section E: Socio-Demographic Background of Respondents continued 6</b>						w6	
	E10b. Did you change gear type after the closed season compared with before?		`\${consent_food_ind}`='1' and `\${SocD_livelihood}`='1' and `\${survey_period}`='3'				w1	
	E10c. New gear type?		`\${consent_food_ind}`='1' and `\${SocD_livelihood}`='1' and `\${survey_period}`='3' and `\${SocD_gear_change}`='1'				w1	
	E10d. Did you change fish type targeted after the closed season, compared with before?		`\${consent_food_ind}`='1' and `\${SocD_livelihood}`='1' and `\${survey_period}`='3'				w1	



required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	E10e. New species targeted?		\${consent_food_ind}=1' and \${SocD_livelihood}=1' and \${survey_period}=3' and \${SocD_new_fish}=1'				w1	
	E10f. Number of smoker ovens owned?		\${consent_food_ind}=1' and \${SocD_livelihood}=2' and \${survey_period}=1'				w1	
	E10g. What type of trading?		\${consent_food_ind}=1' and \${SocD_livelihood}=3' and \${survey_period}=1'				w1	
	<b>Section F: Communications Impact (Individuals)</b>						w4	
yes	F1. What is the main purpose of the closed season? (select only one)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w4	
	<b>Section F: Communications Impact continued 1</b>						w3	
yes	F2. How long is the closed season for canoes? (select only one)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w1	
yes	F3. How long is the closed season for trawlers? (select only one)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w1	
yes	F4. How long is the closed season for inshore China boats? (select only one)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w1	
	<b>Section F: Communications Impact continued 2</b>						w6	
yes	F5. What <b>are the months</b> for the canoe closure? (check all that apply)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w2	
yes	F6. What <b>are the months</b> for the trawler closure? (check all that apply)		\${consent_food_ind}=1' and (\${survey_period}=1' or \${survey_period}=3')				w2	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
yes	F7. What <b>are the months</b> for the inshore closure? (check all that apply)		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
yes	F8. What do you think <b>should be the best months</b> for canoe closure? (check all that apply)		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
yes	F9. What do you think <b>should be the best months</b> for trawler closure? (check all that apply)		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
yes	F10. What do you think <b>should be the best months</b> for inshore closure? (check all that apply)		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
	<b>Section F: Communications Impact continued 3</b>						w6	
yes	F11. Why are these the best months to close canoe fishing?		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2 horizontal	
yes	F12. Why are these the best months to close trawler fishing?		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2 horizontal	
yes	F13. Why are these the best months to close inshore fishing?		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2 horizontal	
	<b>Section F: Communications Impact continued 4</b>						w4	
yes	F14. Do you think the annual closed seasons should be for all fishing fleets including canoes, trawlers, and the inshore fleet?		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
yes	F15. Why or why not close one fleet or all fleets?		`\${consent_food_ind}`='1' and (`survey_period`='1' or `survey_period`='3')				w2	
	<b>Section F: Communications Impact continued 5</b>						w4	
	NOTE TO ENUMERATOR: Tell the respondent, I will read a number of statements and tell me if you agree or disagree, strongly or somewhat, with each statement.							

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
yes	F16. I think closed seasons will improve the abundance of fish in the sea.		`\${consent_food_ind}`='1' and (`{survey_period}`='1' or `{survey_period}`='3')				w1	
yes	F17. I think the closed season will improve fish catches next year.		`\${consent_food_ind}`='1' and (`{survey_period}`='1' or `{survey_period}`='3')				w1	
yes	F18. The closed season was beneficial and fish catch has improved after the opening.		`\${consent_food_ind}`='1' and `{survey_period}`='3'				w1	
yes	F19. The size of the fish caught has increased after the closed season.		`\${consent_food_ind}`='1' and `{survey_period}`='3'				w1	
	<b>Section F: Communications Impact continued 6</b>						w4	
yes	F20. Have you heard information about the closed season in the media or from other sources?		`\${consent_food_ind}`='1'				w4	
	<b>Section F: Communications Impact continued 7</b>						w4	
yes	F21. Where did you hear about it? (check all that apply)		`\${consent_food_ind}`='1' and `\${Comm_informed}`='1'				w4	
	<b>Section F: Communications Impact continued 8</b>						w4	
	F21a. What TV channel did you hear about the closure on?		`\${consent_food_ind}`='1' and `\${Comm_informed}`='1' and selected(`\${Comm_how_heard}`, '1')				w1	
	F21b. What national radio channel did you hear about the closure on?		`\${consent_food_ind}`='1' and `\${Comm_informed}`='1' and selected(`\${Comm_how_heard}`, '2')				w1	
	F21c. What local radio channel did you hear about the closure on?		`\${consent_food_ind}`='1' and `\${Comm_informed}`='1' and				w1	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
			selected(\${Comm_how_heard},'3')					
	F21d. What newspaper did you read about the closure in?		\${consent_food_ind}='1' and \${Comm_informed}='1' and selected(\${Comm_how_heard},'4')				w1	
	F21e. What other sources did you hear about the closure from?		\${consent_food_ind}='1' and \${Comm_informed}='1' and selected(\${Comm_how_heard},'13')				w1	
yes	F22. How often have you heard about the closed season?		\${consent_food_ind}='1' and \${Comm_informed}='1'				w1	
	<b>Section F: Communications Impact continued 9</b>						w4	
yes	F23. For information on the closed seasons, what source do you prefer or trust the most? (check only one)		\${consent_food_ind}='1' and \${Comm_informed}='1' and (\${survey_period}='1' or \${survey_period}='3')				w4	
	F24. Which source is your second preferred choice of information? (check only one)		\${consent_food_ind}='1' and \${Comm_informed}='1' and (\${survey_period}='1' or \${survey_period}='3')				w4	
	F25. Which source is your third preferred choice of information? (check only one)		\${consent_food_ind}='1' and \${Comm_informed}='1' and (\${survey_period}='1' or \${survey_period}='3')				w4	
	<b>Section G: Socio-Economic Impacts (individual level)</b>						w4	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
yes	G1. What do you think will be the major impact of the closure on your family?		\${consent_food_ind}='1'				w2	
yes	G2. How will you and your family cope through the closed season?		\${consent_food_ind}='1'				w2	
	<b>Section G: Socio-Economic Impacts continued 1</b>						w5	
yes	G3. During closed season, did you go to a neighboring country to fish, process fish or trade fish?		\${consent_food_ind}='1' and \${survey_period}='3'				w1	
yes	G4. Why?		\${consent_food_ind}='1' and \${survey_period}='3'				w2	
yes	G5. Which country or countries did you visit to fish?		\${consent_food_ind}='1' and \${SEI_other_country}='1' and \${survey_period}='3'					
	<b>Section G: Socio-Economic Impacts continued 2</b>						w4	
yes	G6. In your opinion, consider the amount of income you would have earned if you stayed in Ghana and were allowed to fish during the closed season, compared to the amount of income you earned during time in those countries: Was it:		\${consent_food_ind}='1' and \${SEI_other_country}='1' and \${survey_period}='3'				w2	
yes	G7. If the government was to provide assistance to fisherfolk during the closed season, what type of assistance would you prefer?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
	G7a. What kind of Government assistance?		\${consent_food_ind}='1' and \${survey_period}='1' and \${SEI_gov_assistance}='4'				w1	
	<b>Section G: Socio-Economic Impacts continued 3</b>						w4	
yes	G8. What is your advice to the government about the implementation of the closed season?		\${consent_food_ind}='1' and (\${survey_period}='1' or \${survey_period}='3')				w4	
	<b>Section G: Socio-Economic Impacts continued 4</b>						w4	
yes	G9. Will the closed season make your fishing business next year better or worse or no effect?		\${consent_food_ind}='1' and (\${survey_period}='1' or \${survey_period}='3')				w1	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
yes	G10. Reason for your response about next year's fishing?		{consent_food_ind}='1' and ({survey_period}='1' or {survey_period}='3')				w1	
yes	G11. The closed season will economically effect my family.		{consent_food_ind}='1' and ({survey_period}='1' or {survey_period}='3')				w1	
yes	G12. How has the closed season effected your family?		{consent_food_ind}='1' and {survey_period}='3'				w1	
	<b>Section H: Nutritional and Food Security Impacts</b>						w1	
	<b>(This section is only for women of reproductive age: 18-45 years old.)</b>							
	NOW I WOULD LIKE TO ASK YOU ABOUT (OTHER) LIQUIDS OR FOODS THAT YOU ATE YESTERDAY, DURING DAY OR NIGHT. I [ENUMERATOR] AM INTERESTED IN WHETHER YOU ATE THE ITEM EVEN IF IT WAS COMBINED WITH OTHER FOODS. PLEASE DESCRIBE EVERYTHING THAT YOU ATE YESTERDAY DURING THE DAY OR NIGHT, WHETHER AT HOME OR OUTSIDE THE HOME. (See additional note card to probe deeply on this question.)							
	<b>Note to Enumerator:</b> ONCE THE RESPONDENT FINISHES RECALLING THE FOODS EATEN, READ EACH FOOD GROUP WHICH WAS NOT MARKED "YES", AND ASK THE FOLLOWING QUESTION, AND MARK EITHER "YES", "NO" OR "DON'T KNOW" FOR THE GROUP:							
yes	H1. What foods have you eaten in the last 24 hours?		{consent_food_ind}='1' and {SocD_gender}='2' and ({SocD_age}>'17' and {SocD_age}<'46')				w1	
	H1a. Enter what other foods eaten, separated by commas, not in the list above.		{consent_food_ind}='1' and {SocD_gender}='2' and ({SocD_age}>'17' and {SocD_age}<'46')				w1	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
			and selected(\${WDD_foods},'21')					
	H1b. What kind of fish?		\${consent_food_ind}='1' and \${SocD_gender}='2' and (\${SocD_age}>'17' and \${SocD_age}<'46') and selected(\${WDD_foods},'13')				w1	
	<b>Section I: Women and Men's Empowerment</b>						w4	
	<b>Note to Enumerator:</b> Tell the respondent, both males and females, now we will begin a new group of questions on finance, training and empowerment.							
yes	I1. Do you own a cell phone?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I2. Do you have a savings account either as a member of a VSLA, revolving fund group (susu) with a rural or commercial bank?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I3. Do you use any mobile money accounts or mobile wallets for business and/or personal financial transactions?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I4. Do you have any form of health or accident insurance?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
	<b>Section I: Women and Men's Empowerment continued 1</b>						w4	
yes	I5. Have you ever received any business development trainings?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I6. Have you ever received any numeracy or literacy training?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I7. Have you received any training on improved fish handling and/or processing practices?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I8. Have you received any training on fisheries management and/or fish biology?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	

required	label	repeat_count	relevant	constraint	constraint_message	calculation	appearance	choice_filter
	<b>Section I: Women and Men's Empowerment continued 2</b>						w3	
yes	I9. Have you received any training on public advocacy or leadership skills building?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I10. How comfortable are you in advocating publically for a closed season among your fellow peers (fishermen, processors, traders – use which applies to this respondent)?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I11. How comfortable are you advocating publicly to other groups (fishermen, processor or traders (fishermen, processors, traders – use which applies to this respondent) to support the closed season?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
	<b>Section I: Women and Men's Empowerment continued 3</b>						w2	
	The next questions concern to what extent do you consider yourself an influential person in your community and among occupational peers.							
yes	I12. Which of the following statements applies to you?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
yes	I13. Can you influence opinions of members of the opposite sex?		\${consent_food_ind}='1' and \${survey_period}='1'				w1	
	<b>Section J: Law Enforcement and Compliance</b>						w4	
	<b>Note to enumerator:</b> Now we will ask a question on law enforcement.							
yes	J1. How many fishermen will comply with the closed season?		\${consent_food_ind}='1'				w4	
	<b>Note to enumerator:</b> thank people in the household for conducting the survey. Remind them you will return during the closure for a short follow-up and then again after the closure Submit completed survey and move to next household.							



## Choices Sheet

list name	name	label	cf
region	central	Central	
region	western	Western	
region	greateraccra	Greater Accra	
region	volta	Volta	
community	winneba	Winneba (Aboadze)	central
community	apam	Apam Main	central
community	elmina	Elmina/ELMINA MAIN	central
community	bortianor	Bortianor	greateraccra
community	nungua	Nungua/Tsienaa	greateraccra
community	tema	Tema/AWUDUN	greateraccra
community	keta	Keta/VODZA	volta
community	atorkor	Atorkor/DAKORDZI	volta
community	assini	Half Assini (Fanti-Line)/SAMAN-ADZE	western
community	abusei	Abusei	western
community	sekondi	Sekondi	western
yes_no	1	Yes	
yes_no	2	No	
yes_no_dk	1	Yes	
yes_no_dk	2	No	
yes_no_dk	98	Don't Know	
yes_no_dk	99	No Answer	
respondent_type	1	Head of Household	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
respondent_type	2	Gender-Opposite Seniormost Member	
gender	1	Male	
gender	2	Female	
marital	1	Single	
marital	2	Married	
marital	3	Co-habiting	
marital	4	Separated	
marital	5	Divorced	
marital	6	Widow(er)	
marital	98	Don't know	
marital	99	No Answer	
survey_period	1	Pre-closure	
survey_period	2	During-closure	
survey_period	3	Post-closure	
language	1	Fante	
language	2	Ga-Dangbe	
language	3	Ewe	
language	4	Nzema	
language	5	other	
comm_size	1	small	
comm_size	2	medium	
comm_size	3	large	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
comm_type	1	Urban	
comm_type	2	Peri-urban	
comm_type	3	Rural	
house_active	1	Fishing	
house_active	2	Fish Processing / Smoking	
house_active	3	Fish Trading	
house_active	4	Farming Food Crops (cassava, vegetables, etc.)	
house_active	5	Farming Plantation Crops (cocoa, rubber, palm, etc.)	
house_active	6	Livestock Rearing	
house_active	8	Remittances	
house_active	7	Other (specify)	
likert_often	1	Rarely (1-2 times)	
likert_often	2	Sometimes (3-10 times)	
likert_often	3	Often (more than 10 times)	
likert_often	98	Don't know	
likert_often	99	No response	
own_phone	1	Own Phone	
own_phone	2	Household Member	
edu_level	0	No School	
edu_level	1	Primary	
edu_level	2	Middle School / Junior High	
edu_level	3	Secondary	
edu_level	4	Post-Secondary	
edu_level	5	Tertiary	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
edu_level	6	Vocational / Technical	
edu_level	7	Non-formal	
main_livelihood	1	Canoe Fisher	
main_livelihood	2	Processor	
main_livelihood	3	Trader/Marketer	
gear_type	1	Hook and line	
gear_type	2	Drift gill net	
gear_type	3	Beach seine	
gear_type	4	Ali net	
gear_type	5	Poli wattsa	
gear_type	6	Set net	
gear_type	7	One man canoe	
gear_type	8	Trawl	
gear_type	9	Long line	
gear_type	10	other	
species_type	1	Small pelagics - anchovy, herring, sardine, and/or mackerels, etc.	
species_type	2	Large pelagics - tuna, marlin, sharks, etc.	
species_type	3	Demersal - cuttlefish, grouper, snapper, cassava fish, etc.	
species_type	98	Don't know	
species_type	99	No answer	
trader_type	1	Retail	
trader_type	2	Wholesale	
trader_type	3	Both	
trader_type	98	Don't Know	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
trader_type	99	No Answer	
closed_purpose	1	Let fish grow bigger so they are worth more when sold	
closed_purpose	2	Protect fish during the spawning period and allow them to spawn before being caught	
closed_purpose	3	Reduce fishing pressure so we do not catch all the fish in the sea and make sure there are some for next year to catch	
closed_purpose	4	Allow the trawlers to catch fish when the canoe fleet is not fishing	
closed_purpose	5	allow canoe fleet to catch fish when trawlers are not	
closed_purpose	6	None of the above	
closed_purpose	98	Don't know	
closed_purpose	99	No answer	
how_long	1	1 week	
how_long	2	2 weeks	
how_long	3	1 month	
how_long	4	2 months	
how_long	5	3 months	
how_long	6	1 year	
how_long	98	Don't know	
how_long	99	No response	
months	1	January	
months	2	February	
months	3	March	
months	4	April	
months	5	May	
months	6	June	
months	7	July	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
months	8	August	
months	9	September	
months	10	October	
months	11	November	
months	12	December	
months	98	Don't know	
months	99	No response	
likert_agree	1	Strongly Agree	
likert_agree	2	Somewhat Agree	
likert_agree	3	Somewhat Disagree	
likert_agree	4	Strongly Disagree	
likert_agree	98	Don't Know	
likert_agree	99	No response	
comm_hear	1	TV specify channel	
comm_hear	2	National Radio: specific channel	
comm_hear	3	Community/Local radio specify	
comm_hear	4	Newspaper: specify name	
comm_hear	5	Community meeting or loud speaker announcements	
comm_hear	6	Chief fishermen	
comm_hear	7	Traditional leader	
comm_hear	8	Friend or family member	
comm_hear	9	Religious authority	
comm_hear	10	Fisheries Commission	
comm_hear	11	District official	
comm_hear	12	Konkohene	
comm_hear	13	Other specify	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
comm_hear	98	Don't know	
comm_hear	99	No response	
comm_hear_trust	1	TV	
comm_hear_trust	2	National Radio	
comm_hear_trust	3	Community/Local radio	
comm_hear_trust	4	Newspaper	
comm_hear_trust	5	Community meeting or loud speaker announcements	
comm_hear_trust	6	Chief fishermen	
comm_hear_trust	7	Traditional leader	
comm_hear_trust	8	Friend or family member	
comm_hear_trust	9	Religious authority	
comm_hear_trust	10	Fisheries Commission	
comm_hear_trust	11	District official	
comm_hear_trust	12	Konkohene	
comm_hear_trust	13	Other	
comm_hear_trust	98	Don't know	
comm_hear_trust	99	No response	
likert_amount	1	More	
likert_amount	2	About the same	
likert_amount	3	Less	
likert_amount	98	Don't know	
likert_amount	99	No answer	
neighbor_countries	1	Cote Ivoire	
neighbor_countries	2	Togo	
neighbor_countries	3	Benin	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
neighbor_countries	4	Other	
gov_assist	1	Cash for work - payment in exchange for community service such as beach or street clean-up of trash, mangrove replanting. Etc.	
gov_assist	2	Allocation of rice / gari / cassava or other direct food assistance	
gov_assist	3	Cash pay-out from the pre-mix community development fund by the landing beach committee	
gov_assist	4	Other	
gov_assist	5	Government should not provide any assistance during the closed season.	
gov_assist	98	Don't Know	
gov_assist	99	No answer	
likert_outcome	1	Better	
likert_outcome	2	About the same	
likert_outcome	3	Worse	
likert_outcome	98	Don't Know	
likert_outcome	99	No Answer	
likert_effect	1	Greatly	
likert_effect	2	Somewhat	
likert_effect	3	Not at all	
likert_effect	98	Don't know	
likert_effect	99	No answer	
fish_type	1	Demersal - cuttlefish, grouper, snapper, cassava fish, etc.	
fish_type	2	Small pelagics, fresh - anchovy, herring, sardine, and/or mackerals, etc.	



<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
fish_type	3	Small pelagics - smoked/dried, anchovy, herring, sardine, and/or mackerals, etc.	
fish_type	6	Large pelagics - tuna, marlin, sharks, etc.	
fish_type	4	Tilapia	
fish_type	5	Other	
fish_type	98	Don't know	
fish_type	99	No answer	
likert_compliance	1	All fully	
likert_compliance	2	Most but not all	
likert_compliance	3	Some but not all	
likert_compliance	4	None	
likert_compliance	98	Do not know	
likert_compliance	99	No answer	
we_influential	1	I am a very influential person and others follow my lead on matters concerning the fishery	
we_influential	2	I am somewhat influential, and others will follow my lead sometimes on matters concerning the fishery	
we_influential	3	I am not very influential, and few will pay attention to what I say on matters concerning the fishery	
we_influential	98	Don't know	
we_influential	99	No answer	
we_gender_influence	1	Yes, both men and women respect my opinions	
we_gender_influence	2	No, I can only influence people of my gender, other men/women only	
we_gender_influence	3	I cannot influence either gender	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
we_gender_influence	98	Don't know	
we_gender_influence	99	No answer	
we_comfortable	1	Very comfortable	
we_comfortable	2	Somewhat comfortable	
we_comfortable	3	Somewhat uncomfortable	
we_comfortable	4	Very uncomfortable	
we_comfortable	98	Don't Know	
we_comfortable	99	No Answer	
WDD_foods	1	Milk such as tinned milk, powdered, or fresh animal milk	
WDD_foods	2	Tea or coffee	
WDD_foods	3	Any other liquids such as juice or cocoa	
WDD_foods	4	Bread, rice, noodles, or other foods made from grains (Kenkey, Banku, Koko, Tuo Zaafi, Akple, Weanimix)	
WDD_foods	5	Pumpkin, Red of Yellow Yams, Carrots, Sweet Potatoes that are yellow or orange inside	
WDD_foods	6	White Potatoes, White Yams, Manioc, Cassava, Cocoyam, Fufu, or any other foods made from roots, tubers, or Plantain.	
WDD_foods	7	Any dark green, leafy vegetables (Kontomire, Aleefu, Ayoko, Kale, Cassava leaves)	
WDD_foods	8	Ripe Mangoes or Pawpaw	
WDD_foods	9	Any other fruits or vegetables (e.g. Bananas, Avocados, Tomatoes, Oranges, or Apples)	
WDD_foods	10	Liver, Kidney, Heart, or other organ meats	

<b>list name</b>	<b>name</b>	<b>label</b>	<b>cf</b>
WDD_foods	11	Any meat, such as Beef, Pork, Lamb, Goat, Chicken, or Duck	
WDD_foods	12	Eggs	
WDD_foods	13	Fresh or dried fish or shellfish (e.g. Prawn, Lobster)	
WDD_foods	14	Any foods made from beans, peas, lentils, nuts or seeds?	
WDD_foods	15	Yogurt, Cheese or other milk products?	
WDD_foods	16	Any oils, fats, or butter or foods made with any of these?	
WDD_foods	17	Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or biscuits?	
WDD_foods	18	Condiments for flavor, such as chilies, spices, herbs, or fish powder?	
WDD_foods	19	Grubs, snails, or insects?	
WDD_foods	20	Foods made with red palm oil, red palm nut, or red palm nut pulp sauce?	
WDD_foods	21	Other foods?	

## Settings Sheet

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Closure Impact Survey Final	closure_survey	theme-grid

## **APPENDIX III: SUPPLEMENTAL INFORMATION ON SURVEY INDICATORS AND APPROACH**

### **Income as a measure of the closed season impact:**

Cessation of fishing is expected to result in revenue from fishing in the marine waters to be completely cut off. Some fishing in estuarine and freshwater areas is possible as the closure pertained only to marine waters. As local fish supply is cut off during the fishing closure, processing and fish trading income would also be expected to decline dramatically as well although some income could be derived from stockpiled smoked and dried fish being sold or relying on fish supplies from cold stores for smoking drying and sales during the closed season.

Income data is known to be difficult to collect as most people in artisanal fishing households do not file income tax returns annually or receive a weekly or monthly paycheck. Fishing income also varies daily, seasonally and annually based on the environmental considerations or just the luck of the day in catching fish. Past experience has shown that fisherfolks have difficulty recalling an income figure for a monthly or annual period due to lack of record keeping or due to the high variability noted above. For these reasons, we used a 48 hour recall period to obtain estimates from the household heads for fishing related and well as all other household income. This short recall period approach is similar to that used for the women's dietary diversity score described below and would enable collection of income occurring within a few days or weeks before, during or after the closed season. Income collection over longer time periods would not be discreet enough to get an estimate solely for a survey periods just before, during, and just after the one-month closure. Collecting income data only for periods May June July would help to minimize differences caused by seasonal variations as well (e.g. not over both the lean and bumper season periods).

Other household economic measures were ruled out. For instance, material style of life scales based on ownership of household durable goods or contents and household structure are unlikely to change over the short periods between the surveys. Household consumption expenditures was also ruled out as it is very time consuming and costly to collect and was beyond the budget allocations for this survey. In addition, this method requires collecting data weekly, monthly and annually which could then blur the short-term changes we were looking for over a matter of a few weeks. See METSS (2012) Ghana FtF baseline protocols for more details on the household consumption expenditures method.

Gross revenues or sales was also ruled out as fishing operations often have high gross revenues generated from vessels with very low profit margins, and in this case, the economic unit is a canoe not a household. The gross revenues of a fishing trip are derived from the sale of landings. The amount that any one individual gets as their share from the trip varies considerably depending on whether you are a crew, captain or owner. After the sale of fish, trip expenses are deducted and then shares of the net revenues are allocated. All crew receive a share of the net revenues in a "lay" system whereby canoe owners and gear and engine owners get a larger percentage share based on the ownership of these assets. Captains or bosons typically get higher shares than average crew. Hence a gross or net revenue from one canoe fishing operation does not translate to the economic unit we were evaluating. In this case, the share or wage or income of an individual crew, captain or owner makes most sense to estimate. In addition, most canoe fishing trips are only for one or a few days, so this fishing trip period corresponds with the 48-hour recall period.

The 48 hour recall may have underestimated some other sources of income such as from farming or livestock rearing where income is not obtained daily or weekly. Nevertheless, as the loss of fishing income was expected to be the most significant economic impact on fishing households, this was considered to be the best approach given the circumstances.

### **Livelihood and livelihood diversification as a household coping strategy**

The concept of livelihood resilience or risk reduction is based on the ability of a household to change livelihood behaviors to accommodate for changes in income from one livelihood or another due to man-made economic or environmental changes that affect income. Livelihood and consequently income diversification can also take place within a fisheries livelihood by diversifying the types of fish targeted and gears used in response to management measures implemented, as well as diversifying to non-fishing livelihoods to reduce economic risk and income variability (Kasperski and Holland, 2012). Examples of livelihood resiliency and adaptation in Asian fishing households to economic and environmental shocks are illustrated by Sievanen et al., (2005) and; Crawford and Dunbar, (2012).

### ***Women's Dietary Diversity score modifications in this survey***

The method for collecting data on the women's dietary diversity indicator was slightly altered for this survey compared to that of the USAID Ghana Population Based Survey (PBS) with respect to age group sampled. While data was collected only from adult women of 18-49 years of age in this study, the PBS study collected data from women of 15-49 years of age. This difference was made in our study to save time and costs that would be required to obtain informed consent from parents of children and as we had authorization only to interview adults age 18 years and older from The URI institutional review board for human subject research. In addition to the age difference, we did not interview all the women of reproductive age in the household as was done in the PBS and collected WDDS information only on women of reproductive age that were interviewed as the food preparer, or who were fishers, processors, traders, or head of household. While our results and the PBS data therefore are not exactly comparable, the altered methodology and age grouping was consistent in our survey and therefore sufficient for looking at changes over time within this surveyed group. Despite these differences with northern Ghana surveys, we believe gross qualitative comparisons between our data from fishing households and the PBS data are useful from a qualitative standpoint.

There are other standard nutritional measures that we could have used for our survey. For instance, there is a household dietary diversity score (HDDS) (Swindle and Bilinsky, 2006) and child dietary score as well. We did not use these measures and only used the WDDS as there was no comparable FtF data on HDDS. WDDS is a specific measure for assessing impacts on women and on pregnant and lactating women and their children. Kennedy et al. (2011) state there is some evidence that this reflects household access to food as well. The use of the same indicator for this study as was used for the USAID FtF baseline allows for a rough comparison with similar data collected in the USAID zone of influence in the northern farming regions of Ghana to provide a level of benchmarking with other targeted beneficiary groups. To date, we are not aware of any past comparisons on differences between women's dietary diversity between farming and fishing communities in Ghana and therefore useful to make some qualitative comparisons.