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Effects of the Closed Fishing Season on the Livelihood of Fisheries Workers: A Case Study of Fisheries Workers in Elmina in the Central Region of Ghana

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Abstract A closed fishing policy is intended to reduce fish stock. Nevertheless, this type of fishing regulation can pose serious livelihood repercussions for fisheries workers, who are highly dependent on fisheries activities for their livelihood. This study examines the effects of a fishing ban during the closed season and factors likely to influence fisheries workers' ability to meet basic livelihood needs in Elmina in the Central Region of Ghana. Structured interviews were conducted with 390 respondents involved in various fisheries activities. The results indicate that almost all of the respondents (91.0%) consider fishing and fisheries-related activities to be their main occupation and a major source of income. On average, the survey respondents rated their ability to meet basic livelihood needs at 1.77 on a five-point Likert scale. This rating suggests that the fisheries workers surveyed find it difficult to meet basic needs, such as having access to food and paying hospital and utility bills, during the closed season. Only 45 (11.5%) of the respondents reported meeting basic livelihood needs with ease during the closed season. To survive during the closed season, the respondents employ a number of coping strategies. The results of a binary logistic regression indicate that three factors (alternative livelihood, government assistance, and buying basic needs on credit) make statistically significant contributions to a respondent's ability to meet basic needs with ease. Having an alternative livelihood was the most important factor in the regression model. While having an alternative livelihood appears to be a promising strategy for addressing the vulnerability of fisheries workers during the closed season, these workers typically lack the knowledge and skills required for ventures such as farming. Agricultural extension services should engage with fisheries workers and assist them in acquiring the necessary skills for supplementary occupation.

Keywords: *closed fishing season, livelihood needs, fisheries workers, alternative livelihood, agricultural extension service*

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1. Introduction

An estimated 5 million people in the Gulf of Guinea depend on fisheries activities. The fisheries sector is a major source of income, employment, and livelihood for millions of rural populations along the coast of the Gulf of Guinea [1,2]. Ghana is a regional fishing nation with approximately 550 km of coastline and a total continental shelf of more than 24,300 km^2 that supports the fisheries industry. Fisheries is an important sector of Ghana's economy that serves as a major source of livelihood and employment for millions of its population and accounts for 5% of its agricultural gross domestic product (GDP) [3,4]. The Ghanaian fishing industry comprises the marine and inland sectors, with the marine sector producing approximately 85% of total catches. The marine fisheries sector serves as the primary source of income for 189 coastal villages and provides direct or indirect livelihoods for approximately 10% of the population [5]. Marine fisheries consist of the artisanal, inshore, and industrial subsectors. Artisanal fisheries is the most important fisheries sector in terms of its contribution to production and local fish supply. The sector contributes approximately 70 to 80% of the total annual marine fish landings and employs approximately 98% (107,518) of all fishermen in the country [4,6,7].

The fisheries industry's contribution to Ghana's GDP was approximately 7% in the 1970s but declined to 4.5% by 2009 and declined to its present level of 1.1% by 2016, for many reasons, including illegal fishing and overfishing [3,8,9]. The volume of sardine production in Ghana has been increasing in recent decades, but this trend reversed in 2007, when sardine production dropped by almost 44% (approximately 91,000 metric tons) [3,4]. The vast majority of fish species breed by female fish releasing their eggs into the water to be fertilized by male fish [1].

The sudden decline in 2007 raised concerns about the sustainability of the sardine supply. In addition, the number of people depending on fisheries for their livelihood has been decreasing because fish stocks decline [10]. It is worth mentioning that the survival of the fisheries industry depends on the regular reproduction of female fish into the sea [1]. To ensure the sustainable supply of fisheries resources in Ghana, the Ministry of Fisheries and Aquaculture Development has focused on halting and potentially reversing the declines in fish volumes through measures such as closed seasons to protect the livelihoods of millions of people in coastal communities and protect the food security of the nation.

A season fishing ban is a conservation management regulation under the Marine and Illegal Fishing Act 2006 in Ghana. The closed fishing season policy was enforced for one month within a 12-month period in 2019 and was re-enforced in 2021 [11]. The conservation area covers 13,987 km^2, comprising portions of Accra, Tema, Winneba, Apam and Cape Coast and Secondi-Takoradi and Axim [12]. Although the closed fishing season aims to reverse a decline in fish stock, its practice imposes socio-economic costs that affect workers whose income is directly dependent on their employment in the fisheries sector. The fishing ban means no work for the fishery workers, and the situation can cause financial burdens due to a decreased number of working days and lost income. In addition, fishery workers' lack of cash is closely related to food insecurity and health challenges [13]. Generally, fishing households' incomes are very low in the sub-region. Considering the already existing marginal income of fishery workers, any further decline in fish stocks could cause millions of fishery workers and their dependents to risk falling into poverty and deprivation. According to [14], fishery workers are most likely to continue to fish until the last species is caught unless fishing pressure is reduced by the provision of alternatives. Considering the fact that the closed fishing season has economic repercussions on fishery workers, some fishery workers tend to find other livelihood coping strategies, such as engaging in farming activities during the fishing ban [1]. Since the implementation of the closed season policy in Ghana, there have been divergent views of its effects on the fishery workers. A review of the closed season by the government authority in charge of fisheries reported increased catches immediately after the fishing ban. In fact, some fishery workers complained of difficulties in meeting basic livelihood needs during the ban (data not available). Information on the effects of the closed season on fishery workers' livelihood in Ghana is scanty. The author has found only one study on the socio-economic impacts of the 2019 closed season on the fisheries sector. That study was conducted about three months afterwards [12]. An additional study on the effects of the closed season on the fishery workers' livelihood would provide a more comprehensive understanding that is necessary for an effective policy debate about continuing the seasonal fishing ban. Therefore, this study aims to assess the effects of fishing ban during the closed season and factors likely to influence fisheries workers' ability to meet basic livelihood needs.

2. Literature Review

Fishing is the main livelihood of the people along the Gulf of Guinea and an important source of nutritious food. Because of declining fish stocks and overdependence on the fishing sector, the fishing industry is heading toward a collapse [1,15]. Ghanaian fishermen no longer generate enough revenue to afford their basic necessities. This situation creates food insecurity and livelihood challenges for fishers along the coast of the Gulf of Guinea [5,15]. These trends suggest that Ghana is losing its position in food security provision in the sub-region. MOFAD [11] reported that in 2012, Ghana imported approximately 191,428 MT of fish valued at $137,020,551 from other nations, including Spain, France, and the United Kingdom [1,11].

Government regulatory bodies often enforce seasonal fishing bans to regulate the depletion of fish stocks. A seasonal fishing ban is a commonly recognized conservation measure that promotes the preservation of a species by limiting fishing and protecting the spawning brood stock of small pelagic species during their spawning season [16,17]. Fishing bans are usually implemented to control fishing efforts, improve spawning potential by protecting adult fish during their spawning season, or protect juveniles from depletion during times of recruitment [18]. Nevertheless, Gulland [18] notes that there is little justification for seasonal closures in most instances. During the closed seasons, fishing is discontinuous, with fishers and boats inactive for long periods, which could have significant adverse economic effects on the fisheries industry. Fisheries workers are economically cut off from fishing, on which they are entirely dependent for their livelihoods. Unless alternative resources are available, fishers may be unemployed during closures [14,18]. Gulland further noted that subsequent increases in landings after a seasonal closure might be short-lived, and fishers tend to work harder and overfish to compensate for their lost income during the closure. For more than two decades, the incomes of Ghana's small-scale fishers have decreased by as much as 40% as fish populations have declined. It has been argued that persistent poverty among fisheries workers is a key driver of excessive fishing efforts and consequent fish decline in the Gulf of Guinea [5,15]. According to Asiedu [19], income poverty has been associated with increased fishing pressure and stock decline. De Graaf and Garibaldi [2] observed that approximately five million people in countries along the Gulf of Guinea engage in fisheries activities as their major source of income. Declining fishing income attributable to declining fish stock leads to a vicious cycle for the fishers. This situation is complicated by the lack of alternative livelihoods for the fishers. Fisheries and agricultural extension services must help fisheries workers undertake situation analyses and develop appropriate alternative livelihood strategies [19,20].

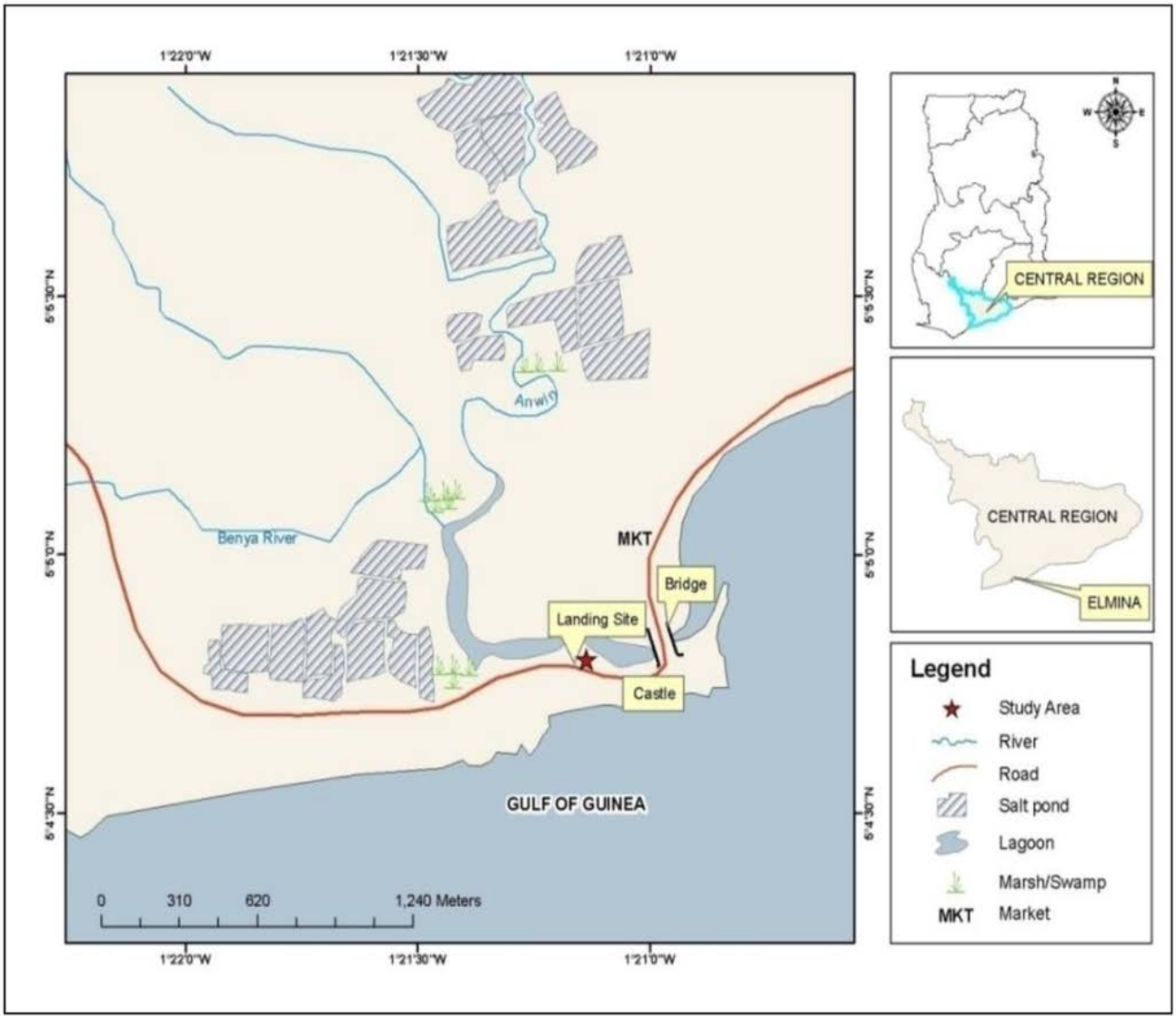

Figure 1. A map of the study area

3. Methodology

3.1. Design and Study Area

The study utilized a survey research design to assess the effects of fishing ban during the closed season and factors likely to influence fisheries workers' ability to meet basic livelihood needs. The study was conducted in Elmina (5°5'0"N 1°21'0"W), a major coastal fishing community in the Komenda-Edina-Eguafo-Abrem (KEEA) district in the Central Region of Ghana (Figure 1)**.** Elmina has a population size of 32,819 and is a center for numerous fishing related and commercial activities [21,22]. The Elmina fishing harbor in the Central Region is the third largest fish landing site in Ghana and serves as a landing site for many canoes and semi-industrial boats engaged in traditional fisheries. The average fish production in the KEEA district for the past five years was 10,571 metric tons per annum [23]. A study by Amador et al. [24] revealed that about 2632 fishermen, 231 canoes and some semi-industrial vessels are involved in the fishing operation in the Elmina town. A report by KEEA [22] indicated that about 75% of the population of Elmina are involved in fisheries activities for their livelihood. Thus, the choice of Elmina fish landing site for this study is primarily based on its level of fishing activity and the role it plays as a major source of livelihood within the community.

3.2. Study Population and Sample Size

The study population included all individuals who are engaged in and derive income from fisheries activities at the Elmina fishing harbor. The study sample size was based on the International Fund for Agriculture Development's (IFAD) formula for unknown population. A register of fisheries workers at Elmina and the harbor does not exist. The sample size of the fisheries workers for the study is determined using the IFAD's formula for unknown population [25,26].

The IFAD's formula for unknown population is:

$$n = \frac{t^2 x\, p(1-p)}{m^2}$$

where

t= confidence level set at 95% (Z score = 1.96)

p= estimated proportion of target population with similar characteristics (set at 50% or 0.5)

m= margin of error set at 5% (standard value= 0.05)

By substituting the value into the formula,

$$n = \frac{(1.96)^2 x0.50(1-0.50)}{(0.05)^2}$$

$$n = \frac{3.8416x0.25}{0.00255}$$

$$n = 384.16$$

The computed 384.16 is estimated sample size. In the view of this, 390 individual fisheries workers at the Elmina fishing harbor were selected for the study. The study applied convenient sampling in selecting the individuals who were willing and ready to participate in the study since random sampling is impractical [27].

3.3. Research Instrument and Data Collection

A structured interview schedule was utilized to collect information from the 390 respondents as the majority of the fisheries workers could not read or write in English. The structured interview schedule consisted of three main sections. The first section covered the demographic characteristics of individuals, such as gender, marital status, age, educational level, and household size. The second section captured information relating to individual engagement in fisheries activities while the third section focused on the effect of the fishing ban on the fisheries workers livelihood. The data collecting instrument was pre-tested on twenty individuals in Elmina. The pre-test helped to improve the internal consistency of the instrument [27,28].

3.4. Data Analysis

Descriptive statistics was used to analyze the demographic characteristics and fisheries activities of the respondents. Bivariate analysis was conducted to understand the relationship between respondent's ability to meet basic needs and their coping strategies during the fishing ban. Binary logistic regression was run to assess factors likely to influence the fisheries workers ability to meet basic livelihood needs during the closed season.

4. Result

4.1. Demographic Characteristics of Respondents

The summary of the descriptive statistics of the demographic characteristics of survey respondents is provided on Table 1. The analysis showed that out of the 390 respondents, the males were 219 (55.8%) while the remaining 172 (44.1%) were female. About 277 (71.0%) of respondents were married. The minimum age of the respondents was 18 years with a maximum age of 75 years, while the mean age was 42 years. The majority of the respondents (70.3%) had formal education distributed among the levels of educational attainment as follows: primary education–27.7%; Junior High/Middle School-34.4%; Senior High-6.4%; Vocational/Tehnical-1.0% and post-secondary education - 1.8%. The average household size of the respondents is 8.

Table 1. Demographic Characteristic of Respondents

Characteristics	Frequency	Percentage
Gender		
Male	218	55.9
Female	172	44.1
Marital Status		
Married	277	71.0
Not married	113	29.0
Educational Level		
Formal education	274	70.3
No formal education	116	29.7
Age (Years)		
Mean	42	
Minimum	18	
Maximum	75	
Household size		
Mean	8	

4.2. Respondents' Fisheries Activities

The study respondents were found engaging in various fisheries activities. The percentage distribution of the various activities of the fisheries workers consisted of fishing (43.3%), off-loading the fishing boat, cleaning and mending net (10.8%), dressing and/ or packaging of fresh fish (12.6%), frying, smoking and selling the processed fish (10.8%) and trading of fresh fish (22.6%). Almost all the respondents (91.0 %) indicated that fisheries is their main source of livelihood. About of 53 (13.6%) the fisheries workers admit that they are engaged in alternative livelihood. The respondents have been exposed to fisheries related activities for a long time, as the results showed that the respondent had on average 19.48 years of fisheries experience.

Table 2. Characteristic of Respondents' Fisheries Activities

Characteristics	Frequency	Percentage
Type of fisheries activities		
Fishing	169	43.3
Off-loading boat, cleaning and mending net	42	10.8
Dressing and/ or packaging of fresh fish	49	12.6
Frying, smoking and selling the processed fish	42	10.8
Trading of fresh fish	88	22.6
Fisheries as a major source of livelihood		
Yes	355	91.0
No	35	9.0
Engage in Alternative livelihood		
Yes	53	13.6
No	337	86.4
Years in fisheries business (years)		
Mean	19.48	

4.3. Fisheries Worker Ability to Meet Basic Livelihood Needs

The livelihood of many small-scale fisheries worker depends directly on their fisheries activities. However, the sustainability of the small-scale industry is increasing

under threat due to the declining fish stock. During the closed fishing season, the fisheries workers are more vulnerable to poverty and may find it difficult to meet their basic livelihood needs. To assess whether the fishing ban affected the fisheries workers livelihood, they were asked to respond either positively or negatively. As shown on Figure 2, 93.3% of the fisheries workers reported that they were negatively affected in meeting their basic livelihood needs during the closed season while the remaining 6.7% thought otherwise.

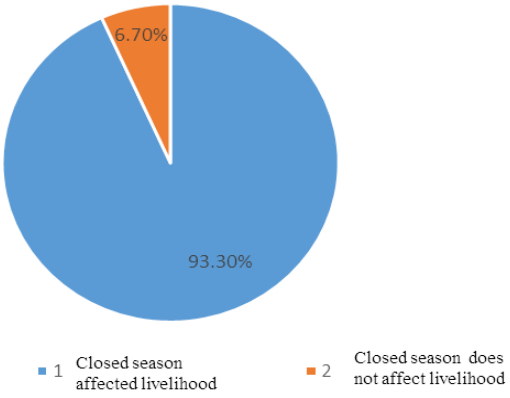

Figure 2. Fisheries workers livelihood affected by closed season

To confirm the respondents' assertion that their livelihood was negatively affected during the closed season, the author examined the fisheries workers' ability to meet their basic livelihood needs. They were asked to rate a three-item statements; able to have access to food, able to pay hospital bills, and able to pay utility bills. The response options ranged from very difficult (1), difficult (2), not sure (3), easy (4) and to very easy (5). The data analysis shows that the respondents' ability to have to access to food score a mean of 1.81 while their ability to pay hospital or utility bills indicates a mean score of 1.75 (Table 3). This implies that, in general, the fisheries workers found it difficult to meet their basic livelihood needs during the closed season. On the average, only 45 (11.5%) of the respondents reported that they were able to meet their basic livelihood needs with ease during the closed season. The remaining 345 (88.5%) reported having difficulty in meeting their basic livelihood needs.

4.4. Respondents' Use of Coping Strategies During the Closed Season

The closed fishing season was a challenging period for the fisheries workers. Apart from income loss, respondents were under pressure to meet their basic livelihood needs such as having access to food, paying of hospital and utility bills. To survive, the respondents employ a number of coping strategies during the fishing ban**.** The common coping strategies employed by the fisheries workers include living on saved resources which comprised either cash or food stuffs (67.7%), engaging in alternative livelihoods such as vegetable farming and petty trading (13.6%) and borrowing from relatives (29%) or sold their personal items (12.30%). Some of the fisheries workers turned to consume low quality food or items (40%) or bought basic needs on credit (37.1%). About 6.7% of the respondents stated they received government assistance in the form of food items (Figure 3).

4.5. Bivariate Analysis

4.5.1. Association Between Respondents' Ability to Meet Basic Livelihood Needs and Coping Strategies During the Closed Season

Table 4 summarizes the Spearman correlation (Rho) between respondents' ability to meet basic livelihood needs and the different coping strategies employed during the closed season. Living on saved resources (stored food, money), sale of personal items and engaging in alternative livelihood (job) are found to be positively corrected with the fisheries worker ability to meet basic survival needs. In contrast, consume low quality food, buying basic needs on credit, borrowing from relatives, and government assistance are negatively associated with the fisheries worker ability to meet basic survival needs (Table 4).

Table 3. Respondents' Ability to Meet Basic Livelihood Needs

Statements of respondent ability to meet basic needs	Very difficult	Difficult	Not sure	Easy	Very easy	Total	Mean score
Able to have access to food	168 (168)	171 (342)	17(51)	24(96)	10(50)	707	1.81
Abel to pay hospital bills	174(174)	166(332)	28(84)	16(64)	5(25)	679	1.75
Able to pay utility bills	175(175)	168(336)	19(57)	25(100)	3(15)	683	1.75

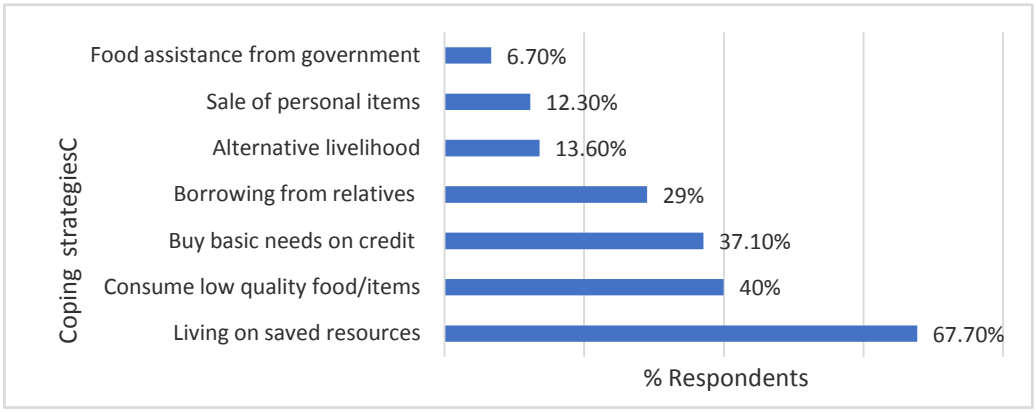

Figure 3.

Table 4. Association Between Respondents Ability to Meet Basic Need and Coping strategies

Variables	*Rho*	Significant
Living on saved resources	.131	.896
Consume low quality food/items	-1.071	.285
Buy basic needs on credit	-.396	.000***
Borrow from relatives	-2.14	.032**
Alternative livelihoods (job)	.964	.336
Sell personal items	.342	.732
Government assistance (food)	-1.745	.032**

Significant for coefficients: *p**<.05; *p***< .01; *p****< .001.

4.6. Factors Influencing the Likelihood of Fisheries Workers Ability in Meeting Basic Livelihood Needs During the Closed Season

The study examined the factors likely to influence the fisheries workers' ability to meet their basic livelihood needs during the fishing ban.

4.6.1. Model Specification

To determine the relative contribution of significant factors likely to influence fisheries workers' ability to meet their basic livelihood needs with ease, a binary logistic regression was utilized. The binary logistic model is a useful statistical technique to determine the likelihood of an event occurring [28].

A logistic model states that the probability, P, of an even occurring is given by

$$P_i = exp^Z / 1 - exp^Z \quad (1)$$

Where,
Z = a random variable (i.e the stimulus index) that predicts the probability of the ith event occurring.

The final form of the model therefore becomes

$$Zi = \beta o + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots \beta nXn \quad (2)$$

Where,
β is an unknown parameter, and
X1+……+ X12 are the predictor variables contributing to dependent factor.

The unknown parameter associated with each contributing factor X can be determined by a standard logistic analysis [28].

4.6.2. Dependent Variable

In this study, the dependent variable is the ability of the fisheries workers to meet basic livelihood needs (have access to food, pay hospital bills, pay utility bills) with ease. Fisheries workers who scored 4 or 5 on five-point Likert scale for their ability to meet basic livelihood needs are coded 1, otherwise 0. The descriptive statistics indicated that only 45 (11.5%) of the respondents reported of been able to meet their basic livelihood needs with ease during the closed season.

4.6.3. Predictor Variables

Previous studies have shown that the likelihood of a fisheries worker to meet basic livelihood needs during vulnerable period could be influenced by predictor variables such as individual's demographic characteristics, income and coping strategies [12,20,29]. The specific predictor variables consider in this study to influence fisheries worker's ability to meet basic livelihood needs are gender, household size, education status, mean annual income, living on saved resources, consume low quality food/items, buy basic needs on credit, borrow from relatives, alternative livelihoods, sale of personal items and receiving government assistance.

4.6.4. Preliminary Diagnostic

For a good fitting logistic model, it is required that multicollinearity among the predictor variables is nonexistence [28]. The computed variance inflation factor values associated with each of the predictor variables show low VIF values, with a range of .023-.447. These values indicate the nonexistence of multicollinearity among the predictor variables (Table 5).

Table 5. Collinearity Statistics on Predictor Variables

Variables	Tolerance	VIF
Gender	.913	.095
Household size	.877	.141
Education	.987	.023
Mean annual income	.838	.193
Living on saved resources	.881	.136
Consume low quality food/items	.730	.370
Buy basic needs on credit	.716	.398
Borrow from relatives	.691	.447
Alternative livelihoods	.905	.105
Sale of personal items	.870	.149
Government assistance (food)	.923	.077

Table 6. Logistic Regression of Predictor Variables on Respondents' Ability to Meet Basic Livelihood Needs

Independent Variables	β	S.E	Sig.	Odds Ratio	95% C.I. for Odd ratio	
					Lower	Upper
Gender	.703	.394	.74	2.020	.934	4.369
Household size	.035	.028	.210	1.035	.981	1.093
Education	-.011	1.143	.993	.989	.105	9.293
Government assistance (food)	.653	.722	.366	1.921	.467	7.907
Alternative livelihoods (job)	1.002	.459	.029	2.723	1.107	6.699
Annual income (mean)	.000	.000	.001	1.000	1.000	1.000
Living on saved resources	.277	.434	.523	1.319	.564	3.086
Borrow from relatives	.273	.482	.720	1.313	.510	3.380
Buy basic needs on credit	-1.643	.597	.006	.193	.060	6.23
Consume low quality food/items	.408	.424	.335	1.504	.656	3.450
Sell personal items	.008	.595	.989	1.008	.314	3.236
Constant	-5.383	1.627	.001	.005		
-2Log-Likelihood	193.262					
N	390					
Pseudo R Square	.213					
Hosmer & Lemeshow	.822					
Goodness-of-Fit Prob >chi2=	.000					

4.7. Estimating Factors Influencing the Likelihood of Fisheries Workers Ability in Meeting Basic Livelihood Needs

In investigating the factors that are likely to influence fisheries workers' ability to meet basic livelihood needs during the closed season, a logistic analysis was conducted. The model contained 11 independent variables (gender, household size, education, mean annual income, living on saved resources, consume low quality food/items, buy basic needs on credit, borrow from relatives, alternative livelihoods, sale of personal items and received government assistance) (Table 6). The full model containing all predictors was statistically significant, $\chi 2$ $p < .000$, indicating that the model was able to distinguish between respondents who reported been able and not been able to meet basic livelihood needs with ease. A good-fitting logistic model requires that its Hosmer and Lemeshow statistics is greater than .05 [28], and this is true for the presently estimated model.

The model as a whole explained 21.3% of the variance in respondent's been able to meet his or her basic livelihood needs, and correctly classified 87.7% of cases. As shown in Table 6, only three of the independent variables (alternative livelihood**,** mean annual income, buy basic needs on credit) made a statistically significant contribution to the model. The strongest predictor of the three of the independent variables is alternative livelihood (job), recording an odds ratio of 2.723. This indicated that fisheries workers who had the opportunity to engage in alternative livelihood during the fishing ban were 2.7 times able to meet their basic livelihood needs with ease than their counterparts who could not engage in alternative livelihood, controlling for all other factors in the model.

5. Discussion

The serious decline of Ghana's marine fisheries has crucial implications for the income, food security, and economic development of fishing communities along Ghana's coast. Recent assessments estimate that Ghana's small pelagic fishery could soon collapse without robust management intervention [6]. Ghana's Ministry of Fisheries and Aquaculture Development has implemented one-month fishing bans every year since 2019. This regulatory policy is aimed at addressing the declining fish stock and promoting the long-term conservation of fisheries resources, sustainability of the local fishing industry, and job security. Since the implementation of the closed season in Ghana, there has been little study of its effects on fisheries workers, and views on those effects diverge. Additional research on the effects of the closed season would provide a better and more comprehensive understanding that is necessary for effective policy consideration.

The primary objective of the current study was to assess the effects of the fishing ban during the closed season and the factors likely to influence fisheries workers' ability to meet livelihood needs in Elmina in the Central Region of Ghana. Data were collected from 390 respondents at the Elmina fishing harbor on their demographic characteristics and fisheries activities and the effects of the closed season on them during the fishing ban. Of the 390 respondents, 219 (55.8%) were male, and 172 (44.1%) were female. The respondents had a mean age of 42 years, and most had been engaged in the fisheries business for more than 19 years. Although the majority of the respondents (70.3%) had some formal education, 62.1% of these had completed only primary and junior high school. The average household size of the respondents was 8.

As the closed fishing season sets in, fisheries workers who depend entirely on fishing for income cannot earn any income. Of the 390 respondents in this study, 86.4% of the fisheries workers have no alternative employment during the one-month fishing ban, meaning they are left with no choice but to absorb the full impact of income loss during the imposed fishing ban. This financial contraction has a significant bearing on the socio-economic well-

being of fisheries workers [14]. In this study, 88.5% of the surveyed fisheries workers complained of difficulty in meeting their basic financial needs. This finding is consistent with the finding of [30] that a closed fishing season can have adverse socio-economic impacts on the livelihoods of fisheries workers. To alleviate the difficulties posed by the income loss, the fisheries workers employed various coping strategies, including living on saved resources, consuming low-quality food and other products, buying basic needs on credit, borrowing money from relatives, engaging in other work, selling personal items, and receiving government assistance.

The results of a logistic regression analysis of factors likely to influence the fisheries workers' ability to meet their basic needs indicated that only three factors (alternative livelihood**,** mean annual income, and buying basic needs on credit) made statistically significant contributions to the fisheries workers' likelihood of meeting their basic financial needs during the fishing ban. Of these, the most influential factor was having an alternative livelihood (job). The odds ratio for this factor was 2.723, meaning that fisheries workers who had the opportunity to engage in alternative livelihoods were approximately 2.7 times more likely to be able to meet their basic livelihood needs with ease during the closed season than their counterparts who did not have an alternative livelihood. Having an alternative livelihood appears to be a promising intervention strategy that allows fisheries workers to make extra income even during fishing bans [20]. Unfortunately, the finding of this study shows that only 13.6% of the study respondents were engaged in alternative livelihood. This observation might be attributed to fisheries workers' lack of relevant knowledge and skills for alternative livelihood.

Asiedu and Nunoo [20] found that 73% of Ghanaian fishers are willing to diversify their fisheries jobs to other sectors. However, they also noted that most of these fishers (approximately 50%) did not have the skills required to work outside the fisheries industry. For example, a need assessment conducted by a student of the Department of Agricultural Extension of the University of Cape Coast in a fishing community in Ada East district in the Greater Accra Region of Ghana revealed that many fishers are highly willing to supplement their fishing occupation by growing vegetables for sale for extra income.

However, only a few of the fishers were engaged in vegetable production because they lacked the necessary knowledge and technical skills [31]. A scooping assessment report on sustainable livelihoods in the fishing communities of the Central Region of Ghana, conducted by Far Dwuma Nkordo with the sponsorship of the European Union and German cooperation, revealed that most fisheries workers along the coast are willing to engage in alternative work in the areas of crop farming, animal rearing, beekeeping, and snail farming [32]. Unfortunately, most of these fisheries workers have little or no formal education and lack the skills and knowledge required for effective farm productivity.

To empower these fisheries workers to overcome the skills and knowledge deficits they face in pursuing alternative livelihoods, agricultural extension services in Ghana have been providing extension services to many of these small-scale farmers [4]. Agricultural extension in Ghana has mainly been in the public sector domain, namely, the Ministry of Food and Agriculture [4]. Agricultural extension as a system betters the living, social, and educational standards of rural people by assisting individuals and farm families, through educational activities, in improving farming techniques and increasing their production efficiency and income [33,34]. The main goal of the extension approach is to increase the productivity of subsistence farmers who grow food crops. Agricultural information and technologies are available that are not being used by prospective small-scale farmers. It is believed that agricultural productivity would increase if these information and technologies were transferred to those who need them [4,35]. Many extension staff members employed in various agricultural development units in the districts, regions, and national headquarters are responsible for introducing innovations to prospective farmers [4]. The agricultural extension services should be contacted to assist fisheries workers in engaging in alternative livelihoods to ensure steady income to meet their basic needs [35].

6. Conclusion

This study contributes to a better understanding of the socio-economic effects of closed fishing seasons on fisheries workers. The findings can serve as reference point information and guidance for policy makers in improving the implementation of the closed fishing season regulation and particularly in safeguarding the socio-economic well-being of affected fisheries workers. Engaging relevant institutions in promoting alternative livelihood programs among fisheries workers would effectively reduce their income losses and mitigate the challenges they face in meeting their basic financial needs.

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