Impacts of Illegal Fishing and Ocean Dependence on the Livelihoods of Coastal Fisherfolk in Ghana

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Abstract

This paper investigates illegal fishing practices and their impacts on the livelihoods of small-scale coastal fisherfolk. A qualitative case study approach was employed, consisting of 53 semi-structured interviews with fisherfolk and key stakeholders in the fisheries industry. The results reveal that the use of unapproved nets, chemicals, explosives, detergents, and light fishing, are the main illegal fishing practices. These illegal fishing activities have resulted in overfishing, decline in fish catch, and the destruction of the marine ecosystem. Fishermen's intensification of light fishing together with the application of chemicals and explosives as a livelihood strategy to avoid decreasing fish catch and low income are unsustainable. Illegal fishing activities threaten the sustainability of coastal fisheries and the livelihoods of fishing households. The implications of the findings relate to the necessity of reducing illegal fishing practices and rebuilding coastal livelihoods. We recommend the strict enforcement of fisheries laws related to illegal fishing and the provision of complimentary jobs during lean fishing season.

Keywords: Small-scale fisheries, illegal fishing practices, sustainable, coastal livelihoods, Ghana.

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Introduction

Worldwide losses due to illegal fishing are estimated to be between US$10 billion and US$23.5 billion per year. West African waters are considered among the highest levels of illegal fishing in the world, and account for up to 37% of the region's catch (EJF, 2018). Illegal fishing poses a serious threat to sustainable fishing as it has the potential of destroying the marine environment with devastating sequential effects on coastal fishing communities (Owusu, 2019; Crawford et al., 2016). Illegal fishing has a detrimental effect on the world's marine and coastal ecosystems' sustainability, particularly on coastal communities that rely heavily on fishing and its related activities such as processing and trading (Doherty et al., 2021; Owusu & Andriesse, 2022)**.** Africa loses between US$7.6 and US$13.9 billion and US$1.8 and US$3.3 billion annually in economic and income impacts, respectively, because of illegal fishing activities (Sumaila et al., 2020). A significant proportion of these losses are due to unreported catches by large industrial vessels (Sumaila et al., 2020).

Illegal fishing in this study is concerned with the non-adherence to existing fisheries laws and regulations among small-scale fisheries (SSF). Some of the documented illegal fishing practices among the SSF includes- light fishing, the use of chemicals (dichlorodiphenyltrichloroethane (DDT), cyanide), explosives (carbide and dynamite), and the use of unapproved gear such as monofilament nets (Finegold et al., 2010; Nolan, 2019; Owusu & Andreisse, 2020*).* Illegal, unreported and unregulated (IUU) fishing on the other hand, refers to industrial fishing activities that do not adhere to national, regional, and international fisheries regulations (Doherty et al., 2021). This may include fishing without permission, the harvesting of prohibited fish species, the use of unprescribed fishing gears, the under- reporting of catch weight, unreported fishing to relevant fisheries management organizations and fishing in unregulated areas (Song et al., 2020; Doherty et al., 2021). It is important that these activities be differentiated from those of the SSF, which fall under different management regulations and reporting regimes (Song et al., 2020).

The present study is focused on small-scale fisheries (SSF), defined as fishing and its related activities such as processing and trading that are operated by individuals and families in coastal communities (Owusu & Andriesse, 2022). Fisherfolk in this study refer to fishers, fish traders, and mongers, as well as any other person whose livelihood depends on fishing and its related activities. This paper explores the impacts of increasing illegal fishing activities on the livelihoods of small-scale coastal fisherfolk in Cape Coast, located in the Central Region of Ghana.

Across the Global South, fisheries remain a major source of livelihood in many coastal communities. The number of people working in fishing (excluding aquaculture) in Africa increased from 2.3 million in 1995 to 5.7 million in 2013 before declining to about 5.4 million in 2016 (FAO, 2018). Small-scale fisheries in West Africa have suffered from rapidly declining marine fish landings, resulting in decreased income and severe economic hardships (Yang et al., 2019; World Bank, 2016; Adusah-Karikari, 2015). Overexploitation, illegal fishing activities, climate change, and offshore oil production activities are perceived have contributed to the decreasing fish catch and declining SSF opportunities (Yang et al., 2019; Adjei & Overå , 2019; Atta-Mills et al., 2004; Owusu & Adjei, 2021; Penny et al., 2017). The fishing industry plays a key role in providing food security and employment opportunities to both small-scale fishers who rely on fishing for food and income and to consumers who buy fish for consumption (Hasselberg et al., 2020). It is estimated that approximately 200 million Africans rely on fish as their primary source of animal protein. Another 90 million people depend on the fishing sector as part of a diversified livelihood strategy (Motta, 2015).

Fishing is a major economic activity in Ghana's coastal regions, and Cape Coast is no different. For generations, fishing has provided jobs for fishermen, boat builders, canoe repairers, and fish processors and marketers, as well as their families. The small-scale fisheries sector consists of 13,000 canoes, employs 107,518 fishers and 1.9 million fish processors and traders, and accounts for about 80% of the total annual marine fish catch by volume (MoFAD, 2016). The fisheries sector supports

the government's efforts to achieve food security, with fish constituting about 60% of the animal protein intake of Ghanaians (MoFAD, 2016).

Previous studies on illegal fishing activities in coastal communities have focused on IUU fishing involving the industrial and distant water fleets (Doherty et al., 2021; Nolan, 2019; Penny et al., 2017). However, there have been few empirical studies on illegal fishing practices among the SSF and their impact on fishery livelihoods and marine sustainability (Afoakwah et al., 2018). This study fills that gap to investigate the impact of illegal fishing activities on the men and women engaged in small-scale fisheries in Cape Coast, located in the Central Region of Ghana. Using the Sustainable Livelihoods Approach (SLA), we show that the natural, financial, human, and physical types of capital assets of fisherfolk have been negatively impacted due to the increasing activities of illegal fishing. The paper contributes to the literature on development studies and rural coastal development by investigating the various illegal fishing activities adopted by fisherfolk. The paper addresses these three research questions:

(i) What are the common illegal fishing practices among small-scale coastal fisherfolk?

(ii) What are the impacts of illegal fishing activities on the livelihoods of fisherfolk?

(iii) What are the implications of the study results for reducing illegal fishing practices and promoting sustainable marine capture in West Africa?

The rest of the paper is organized as follows: the next section presents the conceptual framework of the study, which is followed by the introduction of the study area and research methodology. After that, the results and discussion are presented. The study concludes, by highlighting the implications of our findings for sustainable fisheries management.

Conceptual framework

The Sustainable Livelihood Approach (SLA) examines the relationship between household assets and the activities in which individuals or households can engage with a given set of assets and the

mediating policies, institutions, and processes (PIPs) such as social relationships, markets, and organizations (Carney et al., 1999; Scoones, 2009; Allison & Ellis, 2001; Allison & Horemans, 2006). The SLA has been applied in rural coastal communities of developing countries, with the household as the focus of the study (Andriesse, 2018; Owusu & Andriesse, 2020; Owusu, 2019). It has also been increasingly beneficial for understanding the economic activities of rural households and for improving coastal fisheries management in the global south (Owusu & Andriesse, 2020).

The interaction between the capital assets (human, social, physical, economic, and natural), the vulnerability context, and institutions, organizations, policies, and legislation, culminate in livelihood strategies that determine livelihood outcomes (Allison & Horemans, 2006; Sumadio et al., 2017). Fisherfolk utilize their available assets to construct their livelihoods. Their human capital is made up of knowledge and skills in fishing and other related activities such as processing and trading. They utilized their social networks and membership in associations to bargain for prices and other issues that affect their job. They have other assets, such as boats, nets, and other materials used for fishing, which constitute their physical capital. Remittances, loans, and personal savings make up their financial capital. The ocean serves as the natural capital from which they extract fish. These livelihood assets are often subjected to different forms of vulnerability, which makes it difficult for fishing-based households to achieve a decent standard of living (Badjeck et al., 2010).

The vulnerability context within the SLA refers to the insecurity among individuals, households, and communities (Serrat, 2008). Fishing households are vulnerable to both natural and anthropogenic factors (Belhabib et al., 2016). The vulnerability context comprises shocks and trends. The shocks include storms, droughts, and famines (Allison & Horemans, 2006). Increasing waves and heavy storm destroy fishing boats and nets, resulting in the disruption of the livelihoods of fisherfolk (Owusu & Andriesse, 2022). Trends may include seasonal fluctuations in the fisheries and changes in the prices of fish. Fishing households are vulnerable to overfishing and illegal fishing activities due to the negative consequences on their capital assets and livelihoods (Amadu et al., 2021). The study

positions the various forms of illegal fishing activities, such as light fishing, the, use of chemicals and explosives, detergents, and the use of unapproved fishing nets, as a major threat to the livelihoods of fisherfolk and coastal communities (Figure 1). As noted by Amadu et al. (2021), the practice of light fishing together with the use of chemicals to catch more fish, negatively affects fish stock and the coastal ecosystem. Particular attention will focus on how light fishing affects the natural, financial, and human capital development of fishing households. Natural capital is most often subjected to intensive illegal fishing and overexploitation as well as stress, which have repercussions and ripple effects on other types of capitals such as financial and physical (Badjeck et al., 2010). In this regard, Mantey & Tey (2021) posit that livelihood assets should be viewed as interdependent.

In the fisheries literature, livelihood strategies are usually classified into marine- and non-marine-based livelihoods (Owusu, 2019). Marine-based adaptation may include the intensification of fishing activities and the use of illegal fishing gears. Intensification may include changing fishing gear to target new species and increasing fishing efforts. Fisherfolk could also migrate to nearby coastal towns and other distant destinations for fishing and other related fishery work in response to declining catches and low income and the emergence of new evolving markets with high demand for fish (Finegold et al., 2010; Marquette et al., 2002; Owusu & Andriesse, 2022). There is also seasonal migration within Ghana in response to the seasonal migration of fish stocks. Non-marine-based adaptation strategies may include diversification into petty trading, farming, tourism activities, and artisanal works such as carpentry and masonry (Yang et al., 2019; Castells-Quintana et al., 2018). Depending on the type of adaptive strategies employed, less revenue can be earned, leading to an increase in vulnerability, rise in food insecurity, unsustainable use of environmental resources, and vice versa.

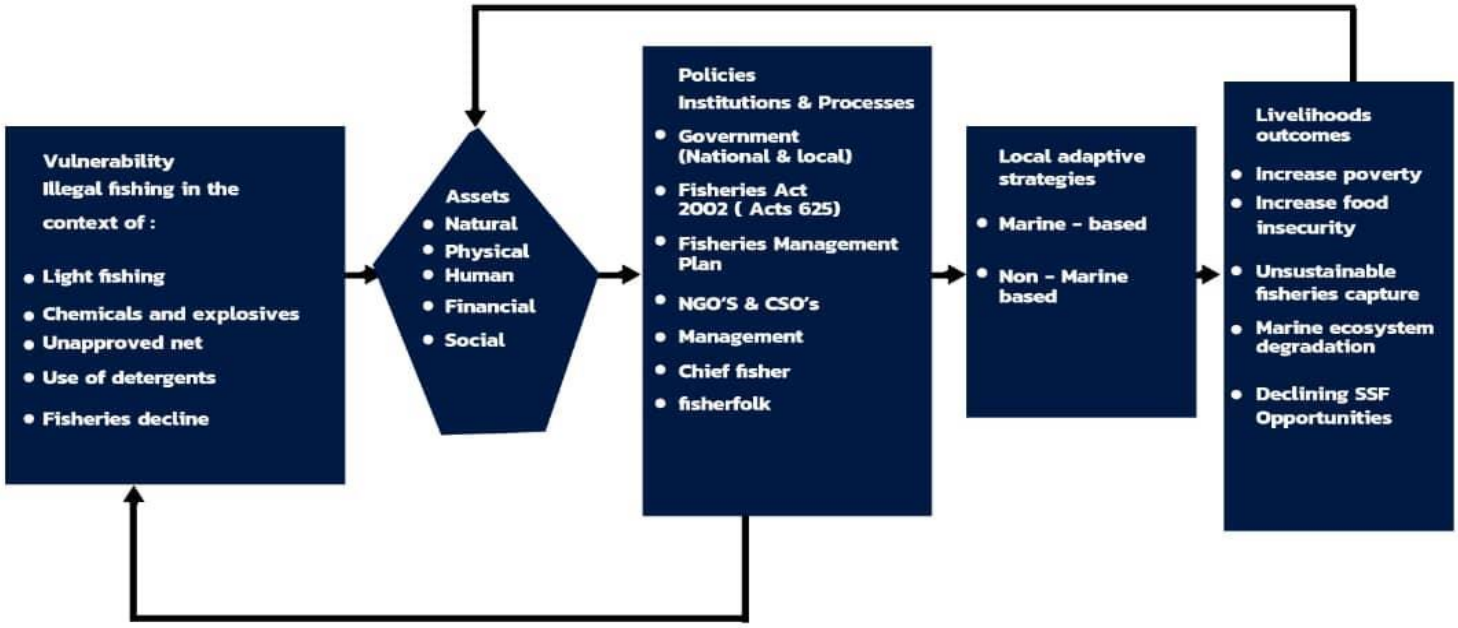

Figure 1. Analytical framework

Source: Adapted from (Carney et al., 1999)

Study context and research methodology

A brief overview of fishing and fisheries regulations in Ghana

Ghana has a coastline of approximately 550 km and a maritime domain of 228,000km^2, including the territorial sea and the Exclusive Economic Zone (EEZ) (MoFAD, 2016). Ghana's fishing industry began in the 1700s as an artisanal fishery with primitive and inefficient gear and methods and operating near coastal waters (Finegold et al., 2010). Despite the simplicity of their gear and methods, Ghanaian artisanal fisherfolk traveled as far as Liberia and Nigeria for fishing as early as the 1800s

and early 1900s (Finegold et al., 2010; Marquette et al., 2002). Later in the 20th century, the commercial fishery sector began to emerge with the introduction of the outboard motor and heavy investments in distant water fleets (Finegold et al., 2010). The rapid growth of the fisheries witnessed the adoption of light fishing practices and the use of monofilament gillnets beginning in 2000 (Finegold et al., 2000).

The fisheries in Ghana comprise three sectors, namely, marine, inland, and aquaculture. While marine species are caught in the territorial seas, freshwater fish are caught from Lake Volta and other water bodies. The marine fisheries sector, which is the focus of this study, consists of three main types of fishing fleets. These include industrial vessels, semi-industrial vessels, and small-scale fisheries. The small-scale fishers fish in the inshore exclusive zone up to 30 m depth, whereas the semi-industrial vessels fish in the inshore waters between 30 and 50 m depth (Antwi-Asare & Abbey, 2011). The industrial vessels fish in coastal waters ranging from 50 to 75 meter deep and further out in the open seas. Some of the industrial vessels frequently access fish in the shallow waters/ inshore exclusive zone reserved for canoe fisherfolk (Antwi-Asare & Abbey, 2011; Finegold et al., 2010; Penney et al., 2017). Over the past few decades, the fortunes of the fisheries sector have witnessed a continuous downturn. The SSF have continued to record very low fish landings. Fish production in the artisanal sector decreased from 179,721.80 metric tons in 2016 to 159,726 metric tons in 2018 (Owusu, 2019). The number of fishers working in the artisanal fisheries sector nationwide decreased from 139,155 in 2013 to 107,518 in 2016, representing a 22.7 % decrease rate (MoFAD, 2016). These trends illustrate the declining status of fishing-based livelihoods.

There have been several laws enacted to regulate and promote sustainable fishing activities. These include the Fisheries Act 2002 (Act 625), Fisheries (Amendment) Act 2014 (Act 880), Fisheries Regulations 2010 (L.I. 1968), and Fisheries (Amendment) and Regulations 2015 (L.I. 2217). The Fisheries Regulations 2010 (LI 1968) prohibit the use of light in fishing. According to the Fisheries Regulation 2010 (L.I. 1968),

11(1) A person shall not

(a) Use light to attract fish, carry portable generators, a switchboard, a 1000-watt bulb, and a long cable to facilitate light production.

(b) use any other prohibited fishing method that renders fish more easily caught for the purpose of aggregating fishing.

The Fisheries Act 2002 (Act 625) also prohibits the use of chemicals and explosives in fishing. According to the Fisheries Act 2002,

88. (1) A person shall not

(a) permit to be used, use, or attempt to use any explosive, poison, or other noxious substance for the purpose of killing, stunning, disabling, or catching fish, or in any other way rendering fish more easily caught;

(b) carry on board or have in his or her possession or control, without lawful authority, at any place within a two-kilometer radius of any shore or river, any explosive, poison, or other noxious substance, indicating an intention to use such substance for any of the purposes referred to in paragraph (a).

Despite the ban on light fishing and the use of chemicals and explosives, many fishermen still engage in these activities (Agyekum, 2016; Crawford et al., 2016).

Ghana's marine and coastal fisheries provide important nutrition, income, and livelihoods to coastal dwellers (Tsamenyi, 2013). Cape Coast is one of the nine coastal districts in the Central Region of Ghana and serves as the capital city of the Central Region. According to the 2021 Population and Housing Census, Cape Coast Metropolitan has a population of 189,925 people. The main occupation of the people in coastal communities is fishing. The main fish species caught are the threadfin (*Galeoides decadactylus*), chub mackerel (*Scomber japonicus),* and burrito (*Brachydeuterus auritus),* with 1,451 fishermen and 203 canoes (MoFAD, 2016).

Three coastal communities within Cape Coast were selected for the study: Ekon, Brofoyedur, and Anaafo. The men usually engage directly in fishing and its related activities, such as the weaving of nets and building of the boats, whereas the women are mostly involved in all forms of fish processing (drying, smoking, and salting), marketing, and trading. The study areas were selected because of the similarities and differences they have in terms of socio-economic activities. The primary economic activity is fishing. There are varying degrees of the impacts of illegal fishing activities, and there are concerns about the declining fisheries livelihoods.

Table 1 shows that fishing households have large families. The majority of fisherfolk have a family size of between 5 and 10 people. This is higher than the national household average size of 4 people (GSS, 2019). Perhaps, the high demand for labour in fishing and its related activities, such as processing and marketing, partly explain the large family size in coastal communities (Owusu, 2019; Marquette et al., 2002).

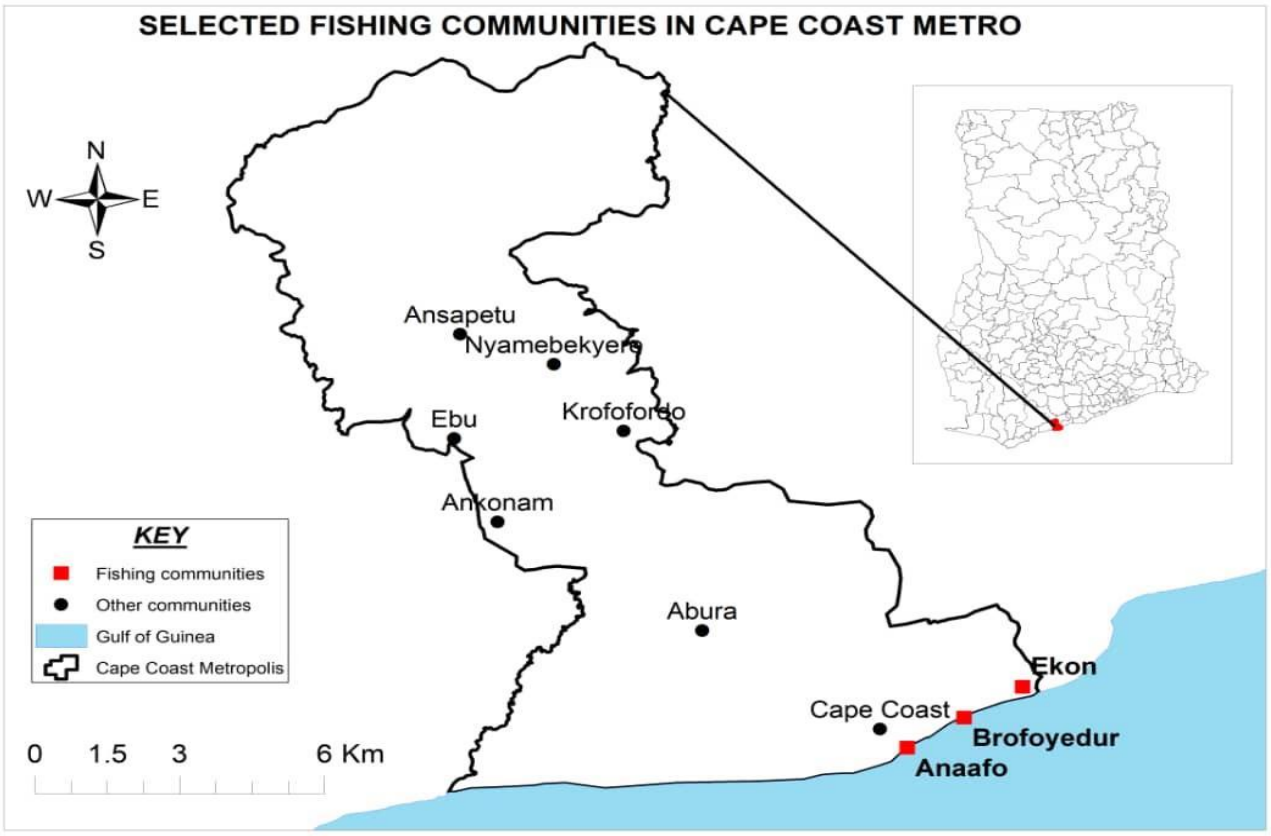

Figure 2: Map showing the study areas in the Cape Coast Metropolis

Table 1: Selected demographics of fisherfolk (n=48)

Demographics	Percentage
Age	
Less than 30	(11) 23.3%
30-59	(34) 70%
60+	(3) 6.7%
Gender	
Male	(36)75%
Female	(12) 25%
Educational Level	
No formal Education	(32)66.6%
Basic Education	(10)20.6%
Secondary School	(3)6.7%
Tertiary	(3)6.7%
Marital Status	
Married	(29)60%
Cohabitating	(13)26.7%
Single	(6)13.3%
Household size	
less than 5	(12)24%
5-10	(33)69.6%
More than 10	(3)6.4%

Research Methodology

The study adopted a qualitative case study approach using a semi-structured interview and other secondary data sources. A case study approach allows for an in-depth understanding of respondents' experiences (Freduah et al., 2018). The semi-structured interview guide was used to solicit information from respondents regarding their knowledge of illegal fishing activities and its consequences on their livelihood. Respondents comprised of 36 fishers (12 from each study community), 12 fish processors and traders (4 from each study community), 3 community leaders (1 from each study community), and 2 government officials.

The interviews were conducted between June and July 2021. Fisherfolk were selected through a combination of purposive and snowball sampling techniques. Purposive sampling was used to identify key informants, with the subsequent use of snowball sampling to expand the sample size. Government officials and local community leaders were selected because of their involvement with and knowledge of fishing activities. Snowballing and the purposive sampling technique are efficient data gathering methods in fisheries studies and have been used by several authors to investigate fisheries livelihoods and coastal development in the Global South (Owusu & Adjei, 2021; Penny et al., 2017; Yang et al., 2019; Owusu & Andriesse, 2022).

The interview guide was divided into three broad thematic areas covering basic socio-economic and demographic information, types of illegal fishing activities, and fisheries livelihoods. Some of the main questions asked included but not limited to what are the main types of illegal fishing activities, what are the impacts of illegal fishing practices on fisherfolk livelihoods and marine sustainability?

The results from the interviews were transcribed, manually coded, and organized into relevant themes based on the objectives of the study. Secondary data were collected from publications, online newspaper articles, and internet sources to support the analysis of the study.

Results

Types of illegal fishing activities

Despite the efforts of government and other non-governmental organizations to reduce illegal fishing activities in the country, results of interviews with boat/net owners, fishermen, fishmongers and traders, chief fishers, and the fisheries directorate clearly show that illegal fishing activities still persist. The Fisheries Act, 2002 (Act 625), Fisheries Amendment Act, 2014 (Act880)) Fisheries Regulations, 2010 (L.I.1968)) and Fisheries Amendment Regulations, 2015 (L.I.I2217) all prohibit illegal fishing such as the use of unauthorized nets, light fishing, pair trawling, use of chemicals and

explosives in the coastal waters of Ghana. However, the results displayed in Table 2 show that illegal fishing is widespread. Fishers reported four main illegal fishing activities in which they are engaged. These includes the use of unapproved nets (small- size monofilament net), light fishing, and the use of detergent, chemicals, and explosives.

Light fishing

Light fishing was found to be the dominant form of illegal fishing activity practiced by fisherfolk in the study areas (Table 2). Among the illegal fishing activities, light fishing activities have been reported as the most pervasive and destructive fishing practices in the artisanal fisheries sector in Ghana (Freduah et al., 2019; Crawford et al., 2016; Owusu, 2019). Some of the fishers reported that about 10 to 15 years ago, they only used kerosene and lanterns for their light fishing operations.

Table 2. Socio-economic characteristics of fisherfolk (n)=48

Variables	Percentage
Experience in fisheries related activities	
Less than 5 years	(3) 6.7%
5-10 years	(19) 40%
More than 10 years	(25) 53.3%
Catch quantity changes (Over the past 10 years)	
Increased	(3)6.7%
Decreased	(45)93.3%
Unchanged	-
Income changes (Over the past 10 years)	
Higher	-
Lower	(43)90.3%
No change	(5) 9.7%
Other jobs besides fishing	
Yes	(6)13.3%
No	(42)86.7%
Type of illegal fishing activity engaged in	
Light fishing	(29)60%
Use of chemicals and explosives	(3)6.7%
Use of unapproved mesh	(7)20%
Use of detergent	(6)13.3%

However, in recent years, they have used generators and lightbulbs to catch the fish. There is a strong perception among fishermen that the use of light attracts prey species, which in turn attract fish, as illustrated in the interview extract below:

> *We go with a generator and light bulb; we use the generator to power the bulb, and then, with the aid of a pole, we lower the light into the sea. The light attracts the fish, and they congregate around it. We then cast our net to catch fish (Fisher, Anaafo).*

The major concern with light fishing is that the majority of the catch are fingerlings, and with motorized canoes, fishing operations can be done throughout the year without a break (Owusu, 2019;

Finegold et al., 2010). Interviewed fishermen reported that some fishers combine light fishing operations with the use of other illegal fishing materials, such as chemicals and explosives. The explosives and chemicals are used to immobilize the fish, after that the light is then placed in the sea for easy capture (Afoakwah et al., 2018). Even though fisherfolk acknowledge that light fishing is not permitted under the fisheries laws and regulations, they blame the industrial trawlers for engaging in various forms of illegal fishing activities that have negatively affected the local fisheries sector. Light fishing is practiced as a survival mechanism to remain in the fishing business. Other studies, such as Agyekum (2016), suggests that low penalties and poor enforcement for lawbreakers are the major reasons why fishermen do not comply with the ban on light fishing operations in the coastal Ghana. A canoe owner and a community leader in Ekon commented.

> *Illegal fishing is a problem, but personally, I blame the big boats (industrial trawlers). They don't obey the laws in the country; they fish where they are not supposed to and catch small fish in areas reserved for canoe fishers. They sometimes engage in confrontation with our fishermen. We can't sit down; we must also eat.*

Many fishermen pointed out that without the use of light in fishing, they would have been catching very low fish. They further emphasized that even with the use of light in fishing, they are still not catching enough to earn more income to support their family.

Use of an unapproved network

The use of monofilament nets with a mesh size less than seventy-five (75) millimeters is considered illegal for fishing in the coastal waters of Ghana (Afoakwah et al., 2018; Finegold et al., 2010). However, a common view expressed by fishermen was that the use of smaller mesh- size nets help them to catch more fish:

> *Yes, the majority of us use illegal means to fish. Some use gears like rubber (monofilament) nets. There are approved nets, but most of the fishermen use unapproved nets to catch the fish. We catch more fish with the small mesh size nets. (Fisher and canoe owner, Ekon)*

Some of the fishermen also questioned the rationale behind the ban on the use of monofilament nets.

> *I don't see the reason why the government says we shouldn't use monofilament nets. Do you know the industrial trawlers also use unapproved nets? How do these nets get into our hands, if not through the harbor? If the government is really against it, why don't they confiscate them at the port when they are imported? If the government wants us to stop, then the trawlers must be stopped or they must be made to stay in their zone and not encroach on the inshore exclusive zone meant for us, the artisanal fishers. (Fisher, Anaafo).*

Song et al. (2020) noted that the SSF sector in Ghana often becomes the target for the enforcement of fisheries regulations in relation to illegal fishing.

The use of chemicals and explosives

Compared with light fishing practices and the use of unapproved nets, respondents reported low usage of chemicals and explosives in fishing activities (see table 2). According to the fisherfolk, using explosives such as dynamite is very dangerous, and when not done with care, one could easily kill himself or cause severe harm to other parts of the body. The use of chemicals and explosives in fishing is more prevalent among fishers on the Western and Central coasts of Ghana (Afoakwah et al., 2018; Owusu & Andriesse, 2022). The commonly used chemicals are DDT and cyanide, together with explosives such as dynamite. After spotting fish, the dynamite is set off to explode, which produces a vibration (shock) in the water and stuns the fish. Chemicals such as cyanide and DDT are then sprayed or poured on the surface of the sea before the fish are caught (Afoakwah et al., 2018).

A fisherman and canoe owner from Ekon also opined:

> *Some fishermen use these chemicals and explosives because it has become very difficult to catch fish these days.*

The use of detergent

The use of local detergents such as Omo[1] in the fishery is a recent phenomenon among fisherfolk.

[1] Omo is a local detergent used for domestic activities such as washing and cleaning of household gadgets.

The omo is a mixed with gari[2] and petrol and is used as a bait to attract the fish. A respondent from Brofoyedur had this to say on the use of detergent:

> *With the use of the detergent (OMO), we mix it with gari and petrol. The gari serves as bait, and when the fish eat the gari, its makes them weak. This allows for easy capture. (Fisher, Brofoyedur)*

Another fisherman from Anafo also opined:

> *Apart from using the detergent to catch fish, some fishermen also use the detergent, mostly "Omo," to wash the blood from the canoes, especially after the use of explosives like dynamite or carbide. (Fisher, Anaafo).*

Other recent studies by Owusu (2019) have also reported the use of locally made detergents such as "Omo" in fishing operations in the Western Region of Ghana.

Impact of illegal fishing activities on the livelihoods of fisherfolk

The following were found to be the main effects of illegal fishing activities on the livelihoods of fisherfolk: overfishing and decline in fish catch, decline in the quality of fish catch, and destruction of the marine ecosystem.

Overfishing and decline in fish catch

Overfishing occurs when a stock is subjected to excessive fishing and the rate of removal from the stock is unsustainable (MoFAD, 2016). Two illegal fishing activities were found to be the main drivers of overfishing. These are light fishing and the use of unapproved nets. According to the fishermen, light fishing and the use of small mesh nets have contributed to the rapid depletion of fish stocks.

A fisherman and canoe owner opined:

[2] Gari is a granular flour extracted mainly from the roots of cassava.

> *I'm 32 years old now, I started fishing when I was 12 years old. As a result of the activities of light fishing and the use of unapproved nets, the quantity of fish caught has drastically reduced. The use of light fishing and small mesh nets catches large quantities of fingerlings. This makes it difficult for the fish to reproduce. (Fisher, Anaafo)*

Another fisherman from Brofeyedur opined that:

> *Previously, we used to catch fish up to the quantity of 40 trays in just one fishing trip. Now, that is not possible because of light fishing activities. We seldom make even 10 trays per week. This is because of the illegal activities perpetuated by some of my colleagues (artisanal fishers). This activity causes overfishing of the pelagic fish. (Fisher, Anaafo)*

The problem with light fishing and the use of small mesh size nets is that the bulk of the catch is fingerlings, which exacerbate overfishing and result in the decline of the sustainability of the local fisheries industry (Owusu, 2019; Agyakum, 2016; Mgana et al., 2019). According to Nguyen and Winger (2019), using light in fishing produces both positive and negative outcomes. The authors argued that the positive benefits of light fishing include increases in catch rates, reductions in bycatch, and savings in energy, while the negative effects may include ecological damage, overfishing, production of plastic and marine litter, and greenhouse gas emissions. In this study, interviewed fishermen contend that light fishing has contributed to the reduction in fish catches and declining incomes. Table 2 shows that the volume of fish caught by fishermen has declined considerably, with negative consequences on the income levels of fishing-based households. These findings are consistent with previous studies (Crawford et al., 2026; Yang et al., 2019; Owusu & Andriesse 2022). Illegal fishing results in food and nutritional insecurity, loss of jobs, and loss of income to local fishers and national economies (Sumaila et al., 2020). Illegal fishing activities have further exacerbated these vulnerabilities through the reduction of fish reproduction, with consequences for the natural capital of coastal communities. According to the fishermen, because of the decreasing fish catch, they now have to spend more days at sea, which requires the purchase of more premix fuel. This has increased the cost of fishing operations. A fisherman and canoe owner in Ekon observed that:

> *The decline in fish catch has affected us a lot because we normally work with loans, and if you are not able to pay back the loan on time, the interest on it keeps increasing. Fishing is the only source of livelihood for most of us (fishers), and because we don't get enough catch, our financial situation keeps on worsening.*

Fish processors and traders also shared their views on the impact of the low catch on their business. They complained that they do not get enough fish to sell because of the low volumes of landed fish. They further explained that sometimes they go to the landing beach to buy fish but return home with empty pans. Interviewed fish processors and traders perceive that the combination of light fishing and the use of chemicals has resulted in decreasing catches.

A fish processor and community leader opined:

> *When fishers use light and other chemicals to catch fish, they just don't catch their target fish; they end up catching fingerlings or juvenile fish. Also, with the use of dynamite, after the explosion, some of the dead fish end up at the bottom of the sea. All this causes the depletion of fish stocks in our waters, making it difficult for us to get more fish to sell (Fisher processor, Brofoyedur).*

Table 2 show that over 80 % of respondents do not have any other job beside fishing. This means that there is high dependence on the natural capital (ocean) to support their livelihood. The over dependence on the ocean for their main source of livelihood and income exacerbates overfishing, resulting in unsustainable marine capture.

Decline in the quality of fish catch and destruction of the marine ecosystem

Another major stressor the study found on the livelihood of fishermen as a result of illegal fishing activities is the low quality of fish as well as the destruction of the marine ecosystem. Both the fishers and the fish traders, and processors can identify the differences in the quality of fish caught with illegal gears and those caught without illegal gears.

A fish trader and community leader based in Anafo gave some insights on the quality of fish caught with chemicals and other explosives.

> *Illegal fishing activity is having an effect on our business. When fishers use chemicals like DDT together with dynamite to catch fish, it has an effect on the quality of the fish, and this affects our sales. Such fish have low quality in terms of their taste and their shelf life, so we don't get a good price. (Fish trader and community leader, Anaafo)*

According to the fisherfolk, most of the fish caught with light fishing, together with chemicals, explosives, and detergents, are not healthy for human consumption. In terms of taste, the fish irritates and causes itching in the mouth when consumed. They emphasized that this situation makes it difficult to get buyers. However, because there are many fish traders at the market, they are compelled to sell below the normal price, which makes them lose money.

Another fishmonger also opined:

> *When they use dynamite to catch the fish, the fish spoils in a short time as compared to fish caught with proper fishing gear. The fishers further exacerbate the problem through the addition of detergent (Omo). With the application of the detergent, the fish become very frail, especially at the processing stage. Also, in the course of processing the fish, we sometimes get sores around our fingers (Fishmonger, Brofoyedur).*

The use of illegal fishing methods reduces the quality of fish landed; such fish become brittle and crumble during processing and are unhealthy for human consumption (Freduah et al., 2019; Afoakwah et al., 2018).

With respect to the destruction of the marine ecosystem, we found that light fishing combined with the use of chemicals and explosives changes the habitat of the fish and reduces the quality of the marine ecosystem to support fisheries production. Fisherfolk perceive that when light is put into the ocean, that area becomes warmer or hotter. As soon as they switched off the light, those fish that remained unharvested moved to other parts of the sea. Therefore, during another fishing trip, they have to travel a further distance before they can catch fish. They reported that just a few years ago, fishermen could catch fish near the shore, but this is no longer the case. According to Crawford et al. (2016), catching fish near the shore has become more difficult among fishers in the Central and Western regions of Ghana. Fishers reported that the use of dynamite and chemicals results in dead

fish that float on the surface of the water while most of them sink and settle at the bottom of the sea. Those dead fish that sink to the bottom of the sea pollute the area and affect marine environments. This means that for about two to three weeks they cannot go fishing at that location. The use of explosives and chemicals in fishing can be extremely destructive to the surrounding ecosystem, as the explosion often destroys the underlying habitat (Agyekum, 2016; Afoakwah et al., 2018). The quality of the marine ecosystems is reduced when light fishing is combined with chemicals and explosives to increase fish catch.

Illegal fishing has a negative impact on natural, human, and financial capital because it leads to a decrease in fish catch as well as a decrease in income and savings. The reduction in income and savings could affect investment into other productive assets such as the purchase of premix fuel for fishing, regular repairs of broken nets, and other materials needed for fishing activities. With respect to human capital, environmental pollution has a negative impact on the well-being of fishing households. Because of illegal fishing, the oceans are polluted, particularly by those who use chemicals and explosives. This clearly shows that illegal fishing practices have negative impacts on the livelihood assets of the fisherfolk.

Discussion

The results from the interviews with fishermen, fish traders and processors, and other stakeholders in the fisheries clearly show that illegal fishing activities are having a detrimental effect on coastal livelihoods. The main illegal fishing activities reported by fisherfolk include light fishing, unauthorized nets, the use of chemicals and explosives, detergents, and across all the study areas, light fishing was found to be the most dominant form of illegal fishing (Table 2). The major motivation behind the increase in light fishing was to avoid low catch and remain in the fisheries

despite its consequences on the marine environment. The use of unapproved nets is also considerably high.

Because of the fear of possible accidents at sea, fishermen reported low usage of explosives and chemicals. Some fishers have lost their lives and other parts of their bodies because of the use of dynamite (Afoakwah et al., 2018). This implies more fishermen are practicing light fishing without using explosives and chemicals. More so, the use of smaller mesh monofilament nets is on the rise. However, these nets are mostly made of rubber and take years to decompose, making them environmentally unfriendly. The use of small mesh nets has resulted in the degradation of marine environments and their ecosystems, including the capture of juvenile fish (Finegold et al., 2010).

Across all three (3) communities, it was evident that the impact of illegal fishing activities has resulted in overfishing, a decline in the quantity of fish caught, a decline in the quality of fish, and a decline in the livelihood of fisherfolk. This has culminated in a general decline in the livelihood assets of the fishermen. Fishermen who engage in the use of obnoxious materials, such as light, dynamite, and monofilament nets, in catching fish jeopardize the sustainability of the industry, and this has a dire consequence for food security. It is worrying to know that most of the fishers, due to a lack of sensitization, contribute to overfishing.

The fishers claim that industrial trawlers have also contributed to the decline of fish by engaging in illegal fishing activities such as the use of unapproved nets and fishing in areas reserved for the artisanal canoes. This situation has also compelled them to intensify the use of illegal fishing activities. In a related study conducted by Koranteng (2022), fisherfolk argued that the illegal fishing activities of industrial trawlers have compelled them to also resort to the use of unapproved fishing methods and gears in order to avoid low catches and decrease income.

Overall, multiple factors account for illegal fishing practices and their resultant impacts on the livelihoods of coastal communities and marine sustainability. The use of chemicals like DDT, carbide, and explosives like dynamite may pose a serious health hazard to fish consumers and the fisherfolk

as well. It was reported that some fish processors had suffered severe bruises on their fingers during the processing of fish that was perceived to have been caught with illegal gear. This has serious consequences for the well-being and human capital development of fishing households. According to Afoakwah et al. (2018), consuming large amounts of food containing DDT for a short period could have an adverse effect on the nervous system. The authors also suggested that consuming fish caught with chemicals could also lead to dizziness and nausea as well as sweating, headaches, and nausea.

Fishermen contribute to the decline in the quality of the fish catch through the use of substances like DDT, carbide, and dynamite. This does not only affect the marine ecosystem but also has dire consequences for the livelihoods of fishers and fishmongers as well as final consumers. The financial implication of illegal fishing activities on fishing-based households cannot be underestimated. Fishermen are more likely to receive low prices for their landed fish due to poor quality of the fish. The capital assets are at the focal point of the livelihood of fishing households. Stresses brought about by illegal fishing have an impact on the capital assets of fishing households. Here, illegal fishing by some fishers has had an adverse effect on fisherfolk livelihoods. The use of destructive fishing gears such as chemicals, explosives, and light in fishing further contributes to decreasing fish catches, with negative implications on fisheries-based livelihoods and health (Fredual et al., 2019).

Although the findings from our study cannot be assumed representative of the situation in other coastal communities, the results reveal the need to take much more seriously into account the holistic causes of illegal fishing among SSF and its implications on the livelihoods of fishing households and coastal communities. We therefore provide two implications for SSF-related policies: regular education of the fisherfolk on the negative effects of illegal fishing activities through conferences and meetings in collaboration with NGO's and other state agencies and the provision of complimentary jobs during lean fishing season.

The stakeholder engagements must include actors from the other fisheries sectors, such as industrial trawlers and traditional authorities. This will provide the opportunity to have a more informed

knowledge of the dynamics and a broader overview of illegal practices and possible solutions to remedy them. The involvement of fishers in the decision-making process will also deepen participation at the local level, which could influence fishers' compliance with the laws on illegal fishing. According to Mikalsen and Jentoft (2001), because of the close proximity of coastal communities to the sea, they cannot be left out of any decision-making that has to do with fishing and marine-related issues. As part of the conferences and stakeholders' engagement, the government must make proper fishing gear available at affordable prices. There is also a need to strengthen the monitoring and enforcement of the fisheries laws at the local level. More supervision is needed at the community level.

The provision of supplementary livelihoods for fisherfolk is recommended because of their lack of interest in engaging in other economic activities beside fishery -related works. Other studies, such as Owusu (2019) and Freduah et al. (2019) revealed that canoe fishers are less likely to exit their fishing job completely. It is therefore, important to support them with some supplementary livelihood program instead of encouraging them to exit the fishery completely for other jobs. These supplementary livelihood support programs could be provided during the minor fishing season. Some of these programs may include livestock rearing, casual laborers in the construction and or manufacturing industries, and rural enterprise development schemes. As noted by Mantey and Teye (2021) broadening poor people's livelihood options is fundamental to the security of their natural capital base.

Conclusion

This article investigated the common types of illegal fishing practices among SSF, their negative impacts, and the implications of stopping illegal practices on sustainable fisheries livelihoods and coastal communities. The sustainable livelihoods framework served as an important analytical

framework for ascertaining and analyzing the various vulnerabilities associated with illegal fishing practices in coastal Ghana. The study revealed that there are various illegal fishing activities in the study areas, which include light fishing, the use of chemicals (DDT, cyanide, carbide, dynamite, and detergent), and the use of unapproved nets. These illegal fishing activities have a negative effect on the livelihood of fisherfolk. The effect of illegal fishing activities ranges from a decline in the quality of fish catches to overfishing and the depletion of fish stocks, as well as a decline in the livelihood of fisherfolk.

Fishers' intensification of light fishing, together with the use of chemicals and explosives as a livelihood strategy to avoid low fish catch and low income, is unsustainable. Illegal fishing activities threatens the sustainability of coastal fisheries and the livelihoods of fishing -based households.

The prevalence of light fishing in the study areas require concerted efforts from all relevant stakeholders and the political will of the national government to enforce the laws on light fishing. We recommend continuous stakeholder engagement and sensitization programs at the community level on the necessity of ending illegal fishing practices. This qualitative research focused mainly on Cape Coast. Thus, future studies can consider multiple case study sites of coastal areas, both using qualitative and quantitative approaches. Future studies should consider a comparative analysis of the illegal fishing activities of small-scale fishers and industrial trawlers using a political ecology approach.

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