



## Fisheries resources of Ghana: present status and future direction

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### Abstract

Ghana is considered one of the suitable regions for fisheries in the world. Ghana abounds with water and around 10% of the entire land surface of the country is covered with water. Thus the potential for the fishing industry is immense. This paper gives an overview on the performance of fisheries in Ghana using data collected from Ministry of Fisheries and Aquaculture Development and related unpublished grey literatures. The findings within describe recent growth within Ghanaian fisheries sector (2016 – 2017). The increase in aquaculture production has been made possible with the implementation of scientific and technological modernization. From 2010 to 2016, aquaculture increased from 10,200 to 57,405.31 tons a much improvement than wild capture production which decreased from 402,457.62 in 2010 to 390,787.56 tons in 2017. Ghana in 2016 imported \$135 million worth of fish. Fisheries production is well below production target despite the large gains in the aquaculture sector.

**Keywords:** Ghana, inland and marine capture, import and export, marketing, regulations, aquaculture

### 1. Introduction

Ghana, with its rich inland waters and river systems, has significant capture fishery and aquaculture potential. The favorable geographic position of Ghana comes with a large number of aquatic species and provides plenty of resources to support fisheries potentials. Fish is the most preferred and widely consumed animal protein in Ghana, with annual per capita consumption estimated at 26 kg compared with the global average of 20 kg <sup>[1]</sup>. The fisheries sector can broadly be classified into three categories: inland capture fisheries, inland aquaculture and marine fisheries, of which marine fisheries is contributing more than 70% of the total production <sup>[2]</sup>. The fisheries sector of Ghana provides livelihood support to 2.4 million people and plays a very important role in the national economy, contributing 1.5% to the nation's gross domestic product (GDP). Over the past two decades the fisheries growth was fairly steady and at an average of 3% per annum, falling short of its expected potential. Foreign exchange earnings from fisheries increased from US\$ 165.7 million in 2010 to US\$ 309.7 million in 2015, with a corresponding increase in the overall fish production by volume of 9.3% between 2010 and 2015 <sup>[3]</sup>. Given proper government support, the fisheries have ample potential in creating various types of ancillary industries in rural areas that often have a high rate of economic return. These employment opportunities for poor rural citizens would also stem their migration to urban areas.

Despite Ghana's long coastline and large fresh water and marine water bodies, fisheries are underdeveloped compared to other industry sectors. Inland aquaculture production has escalated over the past few years, but the productivity per hectare water area is not yet attained at its optimum. Over the years, the bulk of the production has been obtained from marine (70%), freshwater (17%) and aquaculture (13%).

In 2017, total fishery production of Ghana was 448,192.87 tons; of which 314,033.9 tons was obtained from marine capture fisheries, 76,753.66 tons from inland capture fisheries and 57,405.31 tons from inland aquaculture production <sup>[2]</sup>. (Table 1). There have been few overviews of the development and potentials of fisheries and aquaculture in many parts of Ghana published and no studies have been published on the present status of fisheries in Ghana.

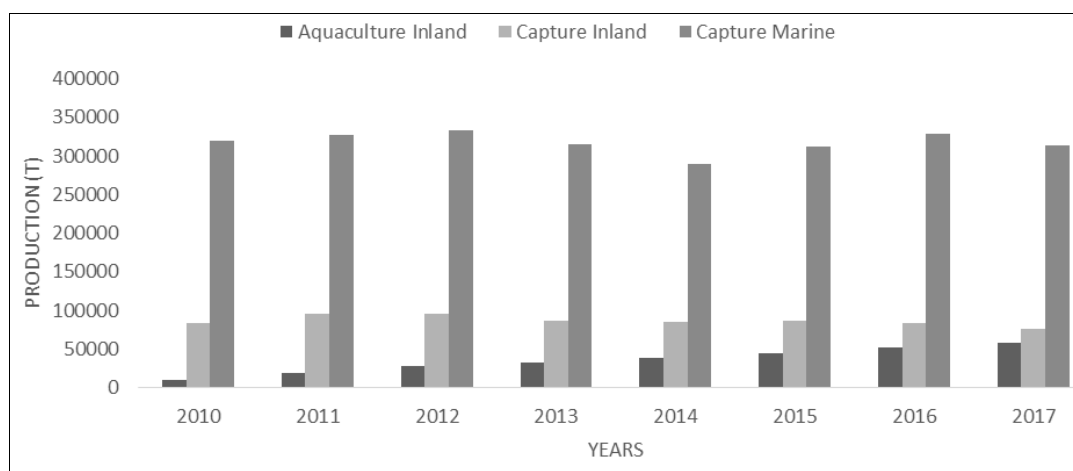
### 2. Production

#### 2.1 Marine fisheries

The coastline of Ghana is rather monotonous, except for relatively large coastal lagoons that are located at its eastern and western extremities, with continental shelf (i.e., waters to 200 m depth) is relatively narrow, and ranges from 24 to 80 km offshore, with an area of 23,821 km<sup>2</sup> Ghana's Exclusive Economic Zone (EEZ) covers 225,661 km<sup>2</sup> It has a total of 0.56% of the world's tropical coral reefs, a seamount of 0.007% of the world (Figure 1).



**Fig 1:** The Exclusive Economic Zone (EEZ) and shelf area (to 200 m depth) of Ghana. (Source:Nunoo *et al*,<sup>[4]</sup> 2014)



**Source:** Production data were extracted from the Ministry of Fisheries and Aquaculture Development database (MoFAD, 2018)<sup>[2]</sup>

**Fig 2:** Total production from marine and freshwater fish production (tons) from Ghana waters between 2010 and 2017.

The marine sub-sector is the most important source of local fish production delivering about 70% of the total fish supply in Ghana. Average annual domestic production between 2010 and 2017 was about 314,000 tons and was approximately 70% of overall fish supply<sup>[2]</sup>. (Figure 2) the marine sector has three sub-sectors, small scale (artisanal or canoe), semi-industrial (or inshore) and industrial. The artisanal sector is most important in terms of output, with about 70% of the total

marine supply<sup>[2]</sup>. It is operated from 304 landing centers in 189 fishing villages located along the coast and about 1.5 million people depend on it for their livelihood. The semi-industrial (or inshore) sector exploits both small pelagic and demersal species and operates from only 7 centers. It contributes 2% of the total marine catch. The industrial sector is made up of trawlers, shrimpers and tuna vessels.

**Table 1:** Total marine production (tons) of various fish species in Ghana between 2003 and 2014

Fish species	Years											
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Triggerfishes	0	0	0	0	0	0	0.04	0.01	9.58	12.77	12.79	12.93
Grey triggerfishes	8.01	8.8	8.8	8.79	8.79	9.58	11.97	14.36	0	0	0	0
Atlantic bumper	7.19	5.7	7.99	9.32	9.86	9.84	2.6	7.44	10.93	6.94	12.19	11.12
Red Pandora	3.42	4.88	8.66	7.76	9.03	6.4	3.88	4.82	4.25	4.33	3.84	3.9
Crevalle jack	4.35	9.03	8.13	6.01	6.62	12.19	2.18	6.19	11.35	6.57	10.29	12.88
Atlantic bonito	8.01	9.7	8.8	9.65	8.77	9.59	11.98	14.78	9.58	12.78	12.82	12.79
Bigeye tuna	5.49	10.67	5.27	0.9	4.85	2.54	3.93	3.92	2.76	3.94	5.56	3.6

Blue runner	13.61	14.96	14.96	14.95	14.94	16.29	20.36	24.42	16.28	21.7	21.7	21.7
Yellow tuna	9.52	13.9	8.07	4.36	7.35	5.64	7.58	7.88	4.4	6.07	8.64	6.1
Jacks pompanos	6.3	5.78	5.82	4.59	10.67	13.46	7.61	6.02	8.69	7.35	10.18	10.88
Anchovies,round herrings	17.79	9.83	6.77	7.79	2.53	14.27	21.17	10.31	14.23	11.8	16.71	17.96
Bigeye grunt	7.66	26.23	16.69	19.59	21.75	17.62	17.32	13.64	8.07	13.1	7.26	7.13
Bullet tuna	0	0	0	2.58	2.3	1.5	2.79	3.6	2.3	2.61	2.86	3.31
Mackerels,tunas, bonitos	9.08	18.27	19.44	15.33	10.94	18.5	27.45	28.65	21.89	18.22	27.32	29.6
Mardeiran sardinella	17.54	30.3	15.93	24.14	12.83	20.6	8.5	13.69	13.64	11.73	10.06	8.62
Skipjack tuna	24.34	32.93	37.81	13.24	32.02	18.12	19.05	23.93	18.09	28.96	25.1	19.61
Herrings, sardines, menhaden	22.33	22.21	16.03	16.99	15.78	17.08	15.04	12.53	13.98	11.73	16.4	17.56
Sardinellas	2.79	4.21	0.44	0.41	0.44	0	0.41	1.82	1.21	1.79	1.14	0.09
Round sardinellas	86.81	92.26	73.03	78.86	49.35	35.57	26.42	44.46	29.2	31.33	34.68	30.33
.Other marine species	95.51	96.43	111.37	97.58	142.05	151.79	154.87	113.86	128.65	132.86	144.48	134.44

**Source:** Catch data were extracted from the Sea Around Us database (www.seaaroundus.org).

**Table 2:** Value of most abundant marine fish species (Real 2010 US\$ value) in Ghana waters between 2009 and 2014.

Species name	Years					
	2009	2010	2011	2012	2013	2014
Anchovies,round herrings	29.84	35.8	23.86	18.67	31.82	10.16
Blue runner	17.57	21.91	14.05	6.61	18.80	9.82
Bigeye grunt	22.07	19.44	11.50	14.88	10.34	14.41
Mackerels,tunas bonitos	9.67	21.12	13.87	16.08	16.47	26.14
Skipjack tuna	10.72	13.63	8.06	10.09	15	9.09
Round sardinella	7.66	7.89	5.45	57.17	11.11	25.6
European anchovy	72.8	62.51	59.37	-	26.64	-
Other marine species	156.82	191.92	200.27	199.08	239.09	228.02
Total	327.15	374.22	336.43	322.58	369.27	323.24

**Source:** Value data were extracted from the Sea around Us database (www.seaaroundus.org)

Nunoo *et al* <sup>[4]</sup>, listed 347 exploited fish species in Ghanaian coastal waters, i.e., 72% of the 485 species reported by FishBase (www.fishbase.org) from Ghanaian waters. In addition to 347 fish species belonging to 82 families, Ofori-

Adu, <sup>[5]</sup> listed 17 cephalopod species in 5 families, and 25 crustacean species in 15 families. In Ghanaian fisheries, pelagic and demersal species contribute about equally to the national catch <sup>[4]</sup>.

**Table 3:** List of some threatened marine fish species reported in Ghana waters.

Species	Fish Base name	Threat Category	Occurrence
<i>Thunnus obesus</i>	Bigeye tuna	Vulnerable (VU)	Native
<i>Pseudotolithus Senegalensis</i>	Cassava Croaker	Endangered (EN)	Native
<i>Trachurus trachurus</i>	Atlantic-horse- Mackerel	Vulnerable (VU)	Native
<i>Sardinella Maderensis</i>	Madeiran Sardinella	Vulnerable (VU)	Native
<i>Balistes punctatus</i>	Blue-spotted triggerfish	Vulnerable(VU)	Native
<i>Pristis Pristis</i>	Common sawfish	Critically Endangered (CR)	Native
<i>Rhinocodon typus</i>	Whale Shark	Endangered (EN)	Native

**Source:** Species data were extracted from the Sea around Us database (www.seaaroundus.org)

## 2.2 Inland open water (capture) fisheries

The inland fisheries sector is made up of the inland capture fisheries (freshwater) and the inland culture fisheries (culture based fisheries and aquaculture). The estimated inland water area of Ghana is about 11,000 km<sup>2</sup> <sup>[6]</sup> Lake Volta which is the largest manmade lake in Africa is the single most important source of inland capture fishery providing livelihood for about three hundred thousand people who live around the lake <sup>[7]</sup>. The lake was estimated to have produced over 70,000 tons of fish in 2002 which is about 16% of total domestic production and 85% of inland fisheries output.

**Table 4:** Ghana inland water bodies and their fishery potentials

Lakes and Reservoirs	Area (Km2)	Fishery Potential ( t/Year)
Volta Lake	8482	40000
Lake Bosumtwi (the only natural lake in Ghana)	49.0	600
Weija	37.0	420
Kpong	36.5	-
Tano	18.6	22.5
Barekese	6.4	80
Others	117.0	145
Total	8746.5	41267.5

**Source:** Data were extracted from the Food and Agriculture Organization database (FAO, 2018) <sup>[6]</sup>

The Volta Lake is rich in fish and about 140 species of fish could be identified in it. Landings are dominated by tilapia species (38.1%), *Chrysichthys* spp. (34.4%), *synodontis* sp. (11.4%), *Labeo* (3.4%), Mormyrids (2.0%) *Heterotis* (1.5%) *Clarias* sp. (1.5%), *Clarias* spp. (1.5%), *schilbeide* (1.4%), *odaxothrissa mento* (1.4%), *Bagrus* spp. (1.35) and *Citharinus* spp. (1.2%) and the rest which are less than 1% include *Alestes* sp., *Brycinas* sp. *Distichodus* spp., *Gymnarchus* spp.; *Hydrocynus* spp. and *Lates niloticus* [6].

There are more than 50 coastal lagoons of various sizes in Ghana. These lagoons provide an important source of protein and other livelihoods for the dwelling communities. The lagoons also contribute significantly to the diversity and status of fish stocks in coastal waters as many fish species spend part of their life cycle in these lagoons. With time, the ecosystem of many of the lagoons has changed as a result of pollution from industries, domestic waste, urbanization and demand for land for other purposes. The mangrove forests that fringed many of the lagoons have been lost and the fisheries in the lagoons are either overexploited or threatened. Other lake fisheries include Bosomtwi, Weija, Barekese, Tano, Ve and Kpong. Other inland fish sources include numerous rivers covering approximately one million hectares, and over 50 lagoons covering 40,000 hectares. Popular inland fish species include various species of tilapia, African perch (*Lates niloticus*) and *Bagrus* sp [8].

Production from inland fisheries over the years has been fairly stable (Figure 2). This is because important stocks of Lake Volta have been overfished since the early 1990s [7]. Measures have now been taken to manage the lake fisheries. Productions from marine fisheries on the other hand have been fluctuating over the years (Figure 2). Periods of low landings correspond to periods where there is low upwelling which normally leads to low harvest of small pelagic such as the *Sardinella* sp. and mackerels which normally form the bulk of landings during the bumper seasons. The upwelling index calculated in 2008, for instance, was 18.3 as compared to 11.7 in 2007, favoring high production and abundance of fish [9]. However, it is reasonable to assume that the marine fisheries have limited potential for further growth in the future.

### 2.3 Inland closed water (culture) fishery

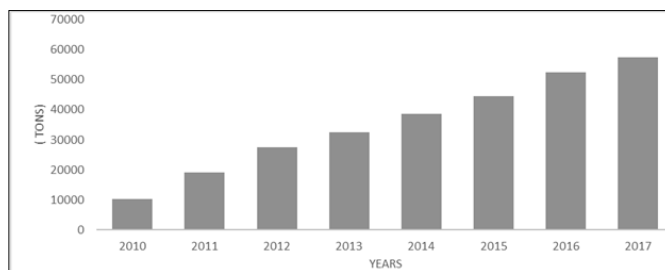
Aquaculture in Ghana is dominated by small scale operators. Ghana has a great potential for aquaculture development and this potential is largely underexploited [10]. The sector's contribution to the national economy has not been disaggregated from the overall contribution of fisheries to the national economy. The development of aquaculture in Ghana over the years has been based on two different approaches. One has been to target communities for adoption of communally owned and managed ponds. This was a means of bringing benefits in the form of fish for nutrition and cash to communities so as to reduce poverty. This approach was adopted in Ghana when aquaculture started in the country in the 1950s.

The government's main goal with promoting aquaculture was to develop culture-based fisheries in freshwater environments to try to take an advantage of the huge potential that the country has for aquaculture which has been underutilized for years. Although there was a massive entry into the aquaculture

industry, the program was not sustainable. At the end of the 1980s, about 23% of ponds constructed had been abandoned and those remaining in operation were not very productive [12]. The reason for the failure was that the government did not support its campaign with advice and extension services.

Little support was available for new adopters on issues such as pond siting, pond size, necessity of drain ability, fertilization, pond management and harvesting strategies. Errors in any of these may place the entire operation in jeopardy. This was the case during the 1980s surge.

Despite earlier failures, effort is still being made to promote aquaculture development in the country.



**Source:** Production data was extracted from the Ministry of Fisheries and Aquaculture Development database (MoFAD, 2018) [11].

**Fig 3:** Total aquaculture fish production in Ghana from 2010 to 2017.

In recent years' production from aquaculture in Ghana appears to be growing at a near exponential rate, growing from less than 11,000 tons in 2010 to over 57,000 tons in 2017. According to a survey conducted by the MoFAD [11], this rapid growth is attributed to increasing production from commercial operators which account for about 75% of the production since 2010. The aquaculture sub-sector is comprised largely of small-scale farmers who practice on a subsistence basis using the semi-intensive system of production in earthen ponds. Extensive culture is also practiced but mostly associated with dams, dugouts ponds and small reservoirs. These commercial initiatives have contributed to the increase in production (Figure 5) and have also provided employment. Aquaculture development efforts in Ghana have always focused on the freshwater environment and no projects have yet been developed in marine environments [8].

Earthen ponds account for over 98% of the existing farms, dominating the southern and middle belts of the country. Concrete ponds, used more rarely, are normally small and mostly used in hatcheries. Pens and cages are more recent additions since 2003. The use of cages is however growing in the commercial sector which currently accounts for less than 5% of the existing farms.

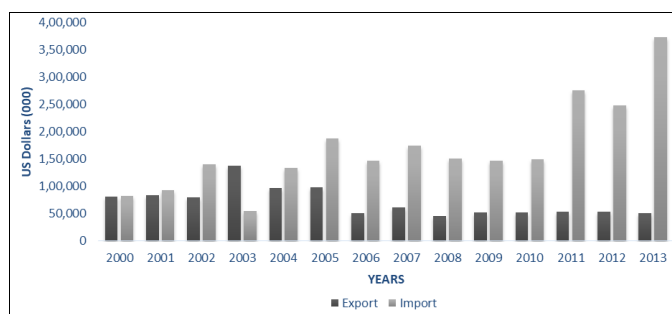
Fish production in ponds ranges from about 35kg to 25,750kg/ha/year [13]. Maximum production from about 60% of the fish farmers ranges from less than 1,000kg/ha/year to 5,000kg/ha/year. In addition, less than 10% of fish farmers exceeded production levels of 20,000kg/ha/year. Most of who are expected to be commercial producers. Production cycles range from three months to two years with an average production cycle for non-commercial farming of one year, and that for the commercial farm of about 7 months. The sizes of tilapia at harvest range from 50g to about 400g with an

average size of 170g. Less than 30% of the farmers are able to produce tilapia larger than 200g [8].

The main species of fish cultured is the *Tilapia niloticus* species which represents 80% of aquaculture production. The remaining 20% is comprised of tiger prawn (*Penaeus monodon*) catfish (*Clarias gariepinus* and *Heterobranchus* species). These are cultured in monoculture or poly-culture with *Tilapia niloticus* in which case the catfish is used to control the population of the tilapia which can be highly prolific. *Heterotis niloticus* is another species that is also cultured. Other species which have been introduced and grown on an experimental scale are *Oreochromis macrochir* and *silver carp* [8].

#### 4. Exports and imports

There are two large tuna canneries in Ghana. These are the Pioneer Food Cannery, and the Ghana Agro-Food Company. The export destination of these companies is mainly EU countries such as Spain, Portugal and Greece and USA and Japan. Fish exports from Ghana are made up of high value tuna (whole, loins and canned), frozen fish (mostly demersal species), shrimps, lobsters, cuttlefish and dried and smoked fish. Fish imports grew from 182,400 to 191,428 MT. Frozen horse mackerel; chub mackerel, yellowfin as well as sardinella are imported through the Tema and Takoradi Ports and distributed through the internal trade channels, during the lean season November to May [9]. The five top suppliers of fish are Mauritania (20%), UK (14%), Poland (8%) and Netherlands (6%). Other suppliers are Morocco, Norway, the Netherlands, Belgium, Senegal, Namibia, and the Gambia. Many local Ghanaian fishing companies, such as Mankoadze Fisheries, which prospered throughout West Africa in the 1960s and 1970s, have either ceased operations or are engaged in the importation and retailing of fish [12].



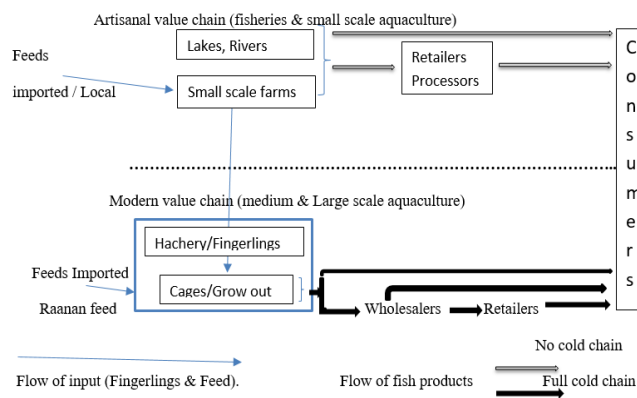
**Fig 4:** Total imports and exports value of fishery products of Ghana between 1980 and 2014 Source: Value data were extracted from the Food and Agriculture Organization database (FAO, [11] 2018)

The balance between supply and demand shows the country satisfies only 59.4% of the demand and rely heavily on imports to keep the per capita around 26 kg.

#### 4. Aquaculture and fisheries market chain

Two value chains exist in Ghana, the artisanal value chain and the modern urban-based value chain are presented in (Figure 7) Artisanal capture tilapia from lakes, rivers and farmed tilapia from small scale farms are sold to traders and/or processors

who in return sell them to the final consumer or sold directly at farm gate. Processed fish products include salted and dried, or smoked tilapia, but this only comprises a very small part of total output. Tilapia from large scale fish farm are sold whole, alive straight from the farm, and gutted on ice. They are kept in cold chain storage and sold to wholesalers or retailers and these resell in return to consumers. In some cases producers sell directly to final consumers, hotels and restaurants at the landing sites or farm gate [1].



**Fig 5:** Artisanal and modern value chain in Ghana according to (Antwi-Asare *et al* [15] 2011).

#### 5. Legal arrangements for the Ghanaian fisheries sector

Fisheries in Ghana are currently governed by the Fisheries (amendment) regulations, 2015 (l.i. 2217). These Regulations were passed to amend the Fisheries Regulations, 2010 primarily regarding measures to curb and eliminate Illegal, Unreported, and Unregulated (IUU) Fishing. Measures include international cooperation, access control, and record of fishing vessels flying the flag of Ghana. The new lead office in fisheries administration in Ghana is the Ministry of Fisheries and Aquaculture Development, under which the Fisheries Commission operates. The Directorate of Fisheries is the executing arm of the Ministry and so is the Fisheries Commission. The Directorate of Fisheries has five sections under the supervision of the head of the Directorate. A deputy director is appointed to each section along with staff, and they are responsible for performing day-to-day business operations, notably the devising of fishery policies, the issuance of fishing permits, the collection of fisheries statistics and the supervision of fisheries. Ghana already had a fishing industry long before the introduction of mechanized fishing in 1946 [16]. From 1960 onwards, serious attempts were made to modernize Ghana's fisheries. In those early days, there was a very powerful canoe-fleet using methods such as 'ali'-nets, beach-seines, hooks, cast nets, and set-nets [4]. Thus, even in the pre-mechanization era, the fishing industry was having an impact on the economy by providing food for the population and employment for coastal people. It may be stated that the Fisheries Department, formed in 1946 by the Colonial Administration was not designed to start an industry, but only to mechanize and modernize the one which already existed [4]. Acts and rules and their implication for fisheries (Source: MoFAD, 2018: Lamptey, 2016) [11, 17].

Table 5

Important Acts, Regulations, Laws and Policies related to Fisheries	Implications for fisheries management
Fisheries Law, Act 625 of 2002	The Act makes provision for the establishment of the Fisheries Commission and defines its powers, functions and organizational structure, provides for the establishment of a Fisheries Development Fund and its use and regulates the management and conservation of fishery resources of Ghana including aquaculture and small-scale fishing.
Fisheries Regulations L.I. 1968 of 2010	These Regulations implement provisions of the Fisheries Act, 2002, and make provision with respect to a wide variety of matters regarding fisheries management and conservation, aquaculture and trade in fish products such as: fishery plans prepared under sections 42 to 45 of the Act; registration and marking of local, industrial and semi-industrial fishing vessels; use of fishing gear; fishing license; dumping or transshipment of fish; fishing in foreign waters; compliance measures and monitoring.
National Fisheries & Aquaculture Policy (2008)	It was designed to enable Ghana take advantage of its biophysical and socio-economic environment; strong research capacity; to significantly bridge the huge gap between national fish demand and supply in the medium term.
Fisheries (amendment) regulations, 2015 (L.I. 2217) Fisheries Law, 1991 (Law No. 256 of 1991).	These Regulations amend the Fisheries Regulations, 2010 principally concerning measures to deter and eliminate Illegal, Unreported, and Unregulated (IUU) Fishing. Measures include international cooperation, access control, and record of fishing vessels flying the flag of Ghana. Part (I) concerns licenses for building or import of motor fishing vessels. The building and sale of such vessels is supervised by the Shipping Commissioner. Part (II) concerns the licensing of fishing crafts. All fishing operations are prohibited without license in the "coastal waters and riverine system of Ghana"

## 6. Discussion and conclusion

Fisheries sector of Ghana face several obstacles such as lack of research findings to direct policy formulation, over exploitation, over capacity and over fishing, as a result of non-limitation of fishing efforts, poaching of the fish stocks (Illegal, Unreported and Unregulated (IUU) fishing) and the disregard to closed season. The others are the lack of political will to effectively enforce the fisheries laws, the absence of provisions for community participation in the fisheries regulations; and the deferment in the passage of regulations, as a result of inadequate staffing and logistics.

Overcoming these obstacles, therefore, needs a commitment to achieving responsible and effective governance of the oceans as a crucial resource for humanity as a whole, and to neutralize the effects of climate change.

The sources of Ghanaian fisheries are marine and inland waters. The marine waters are endowed with fishery resources with sardine fishery as the mainstay of the fisheries industry of the country.

There are about 13,000 artisanal (canoe) fishermen, 400 semi-industrial (inshore) fishermen and 75 industrial trawlers. There are also 334 artisanal, 7 semi-industrial and 2 industrial landing sites in the country<sup>[4]</sup>.

Within Ghana's fisheries waters, there is a steady decrease in the stocks of fish as a result of increased fishing activity. The Sustainable Fisheries Management Project (SFMP) Fish Stock Report, 2016, for instance, shows that total landings have been in sudden decline since 2000, reaching their lowest level in 2015 at 19,608 tons, representing 14% of the highest recorded landings of 1996 138,955 tons<sup>[4]</sup>.

Reports indicate that the average zero catch (vessel spending more than 20 hours searching for fish and returning with no catch) has increased with preliminary estimates showing more than 25% of vessels in Tema returning to harbor without any catch. Fishing communities (Axim, Dixcove, Shama, Anomabo, Apam and Winneba) have also reported that oil exploration activities have contributed to the zero catch scenario and the decline in fish stock landed. Several factors

account for the rapid depletion of many fish species, causing ocean fisheries to generate US\$ 50 billion less per year than they could.

For artisanal fisheries, the obstacles range from open and free access to the fisheries; non-adherence to laws and regulations, use of unapproved mesh nets, use of explosives and chemicals, use of monofilament nets, operation of beach seines close to estuaries, landing of undersized fish/juvenile fish, and offshore petroleum activities in Ghana. Trawlers operating in the Inshore Exclusive Zone (IEZ) less than the 30m zone, pair trawling, and vessels operating without license have also been recognized as offences committed by trawlers and shrimpers in the industrial fisheries sector.

Strategies to overcome these will include: a rapid evaluation of fisheries stocks by species in the Ghanaian waters, development of national fisheries policy, registering of all mechanized vessels and fishing licensing, strict monitoring should be maintained for fishing to ensure adherence to all acts, rules and regulations and implement seasonal ban to protect spawn and juveniles<sup>[18]</sup>.

The inland aquaculture production is constrained mainly by three problems related to seed, feed and extension service.

To overcome these challenges, purity of brood stock of indigenous tilapia and other indigenous fish species conserving the natural breeding spawning, nursery and grow out areas to complete the whole lifecycle and natural reproduction process should be maintained. Government must monitor the production, import and marketing of fish and feed, feed ingredients, minerals and vitamin premix, and other inputs, in which the private sector plays a key role.

A number of steps have been taken by the government for increasing fish production. These steps included the launching of youth in aquaculture programme, augmenting of open water capture fishery, ensuring access of the poor and genuine fishers to fish cultivation, accelerating aquaculture farming, developing technologies through supporting fishery research, promoting private sector, improving fish marketing and processing system, quality control etc. An increase in

domestic demand has stimulated profitability and growth of fisheries activities. The fishery sector in Ghana has been earning a notable amount of foreign exchange. There has also been a notable change within the fishing industry as open water fisheries declined while closed aquaculture grew.

Going forward, it is therefore, imperative to develop a national strategic framework to halt further decline and rebuild the fish stocks. The fisheries ministries therefore, developed the Fisheries Management Plan (2015-2019) in 2014, to reverse the trend of stock depletion to support the socio-economic development and food security for present and future generations of Ghanaians. The key objectives of the management plan are: (i) to reduce the excessive pressure on the fish stocks, (ii) to ensure that fish stocks within the marine waters of Ghana are exploited within biologically acceptable levels, (iii) to ensure that effective fisheries legislation is implemented to protect the nation's fish resources, (iv) to protect marine habitats and bio-diversity, (v) to contribute to enhancing export opportunities and strengthening value addition, (vi) to strengthen participatory decision making in fisheries management (co-management), and (vii) to meet regional and international obligations in fisheries management [11].

In conclusion, the Ghanaian fisheries have ample scope of development to strengthen the national economy. To realize the potential, there must adjustment to existing laws and legislation of the country for a comprehensive resource management and for conservation of the fisheries resources. Ghanaian fishers and the general public need to understand these issues, to be involved in the development of management policies, and to benefit from the whole process. Concerned government departments, development partners, researchers and non- governmental organization can play important role in the wide – ranging advancement of the fisheries sector.

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