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Fish and fisheries of the Sisili-Kulpawn river basin in the Northern region, Ghana

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Abstract

The importance and contribution of fish and fishing to the national and local economy cannot be discounted. The study examined fisheries in 4 communities of the Sisili-Kulpawn river basin in Ghana with focus on characteristics, fish species, level of catch and challenges. Fishing was the main occupation. Fishing gears used by the fishermen were cast nets(6.7 %), gill nets(73.2 %), hook and line(6.7 %), drag net(6.7 %)and traps(6.7 %). Averagely, each fisherman owns 8 fishing gears and 92.3 % own a non-motorize canoe. During bumper harvest, the quantity of catch per canoe per day averaged 20.5 kg. Dominant fish species included; *Synodontis* spp., *Citharinus citharus, Auchenoglanis occidentalis, Labeo* spp., *Brycinus nurse, Schilbe* spp., *Sarotherodon galilaeus and Lates niloticus* whilst *Tetraodon lineatus, Parachanna obscura* and *Malapterurus electricus* have disappeared. Consumer preference of fish species is dependent on level of scales, shelf life, flesh quality and taste. Investment in the fishing business by fishermen annually was noted to average $ 187.50 whilst average monthly proceeds were $ 64.5. Challenges of the fishing business were poor transport system and high cost of transportation, lack of storage facilities, processing facilities, electricity, ready market, capital, low market prices, presence of tree stumps in water and high cost of fishing materials. The business of fishing has a high potential of contributing towards poverty alleviation of the rural communities in the study area especially in the provision of employment.

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Introduction
The importance and contribution of fish is not limited to the food it provides but ranges from; contribution to GDP of a nation, creation of direct and indirect employment for fishermen and increase income level of fishermen.

Food fish currently represents the major source of animal protein contributing more than 25% of the total animal protein supply for over one billion people in more than 39 countries worldwide and about 60% in Ghana, making Ghana the largest consumer of fish in Africa. (Obodai *et al.,* 2011; FAO 2008). The role of inland fisheries is as a source of revenue including foreign exchange is also reported to improving Africa's food security (Bene and Heck, 2005).

Processing of fish and fish products into oil, medicine, vitamins, margarine, lubricants, varnishes, soap and cosmetics makes a valuable resource. Prevention of fish from deteriorating is very paramount to fishers.

Different types of fishing gears are used in the riverine systems of Ghana, from the streams, dams, reservoirs, dugouts to ponds, rivers and lakes which forms the basis of inland fisheries sub-sector (Seini *et al.* 2003). The type of fishing gear used is determined by the size and target species specific.

The difference in habits and habitats of a fish species in a particular water body, accounts for the difference in gears used for capturing fishes (Tagagoand Ahmed, 2011).

Quarcoopme *et al.* (2008) attributed poor management practices and the use of inappropriate fishing gears and methods to the relative scarce and expensiveness of fish in the rural areas. In the study area however little or no current information on fishing activities have been studied. this therefore brings the need for the current study in providing information on the practices and the business of fishing in the Sisili-Kulpawn.

The study however examined the fisheries of the Sisili-Kulpawn river basin with emphasis on the methods and gears used by fisher-men, the common fish species and their level of catch and the business systems common to the fisheries sector in the area.

Materials and methods
Study area
The study was conducted on the Sisili and Kulpawn rivers in the Mamprugu-Moagduri District of the northern region of Ghana. The district is located within longitudes 0°35'W and 1°45'W and latitude 9°55'N and 10°35'N (Fig. 1).
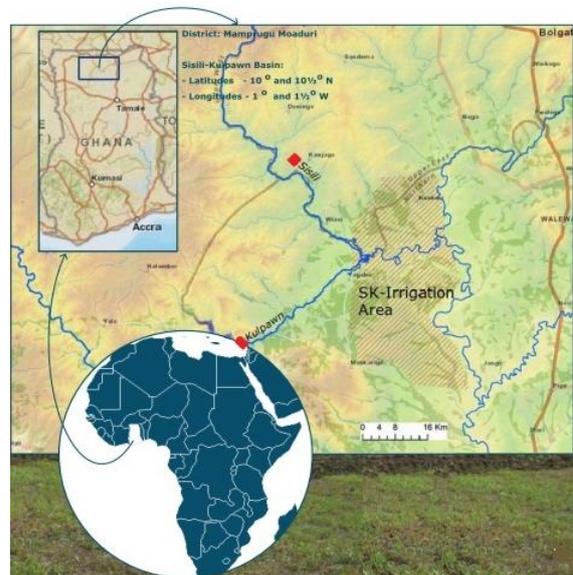
Fig. 1. Map of Ghana showing the Sisili-Kulpawn Rivers (Source: IWAD, 2013).

The Sisili-Kulpawn basin form part of the main tributary of the White Volta which is also one of the main sources of water feeding the Volta Lake (IWAD, 2013). The Sisili Riverhasa catchment of 12,633 km² and springs in Burkina Faso whilst the Kulpawn River with a catchment of 11, 737 km² springs in Ghana near the border to Burkina Faso.

Sampling Design and Data Analysis
Fifteen (15) fishermen from four (4) communities along the river banks were sampled and 2 of the fishermen interviewed were from Weisi, 4 from Kuuba, 4 were from Goriba and 5 were from Yabaga.

Semi-structured questionnaires were administered purposively to obtain data on types of fishing gears used, seasonal variation of fish catch, fish species and management practices adopted by fishermen. IBM SPSS 23 Statistics and Microsoft Excel 2016 were used to analyze the data and results presented in tables, charts and graphs.

Results and discussions

Characteristics of Fishermen

The study results pointed to the fact that all fishermen interviewed were engaged in fishing as a full time occupation. 53.3% of the fishermen interviewed undertake their fishing activities in both rivers (Sisili and Kulpawn) whilst 26.7 % and 20 % fish in only the Sisili and Kulpawn rivers respectively.

Out of the total number of fishermen interviewed, 13 (86.7%) were noted not to have had formal education but with only 13.3% being educated at the Senior High School level. Unlike studies conducted by Davies and Kwen (2013) and Alhassan *et al.* (2014) who observed during their studies that most fisher folks have basic education the current study results point contrary but indicating a high level of education amongst fishermen at the Senior High School level.

The fishermen had their ages ranging from 20 to 40 years indicating the youthful nature of the individuals in the business of fishing as a main occupation. Similar studies by Tagogo *et al.* (2011), Olaoye *et al.* (2011).

Sanni *et al.* (2011), Adeyemo (2011) and Davies and Kwen (2013) mentioned that fishing activities are mostly done by people within the age range of 30 to 40 years. With the results of the current studies, fishermen had varied level of fishing experience in the industry and this range from 1 to 30 years thus pointing to the fact that some fishermen started at their early ages. 57.1% of the fishermen have been in the business for between 11 to 20 years, 35.7% between 21 to 30 years and 7.1% between 1 to 10 years.

Riverine Activities

Farming is the major environmental activity that is undertaken along the river banks of the Sissili and Kulpawn rivers. It was noted that organic farming is dominant along the river banks and accounting for 84.6% whilst inorganic farming activities which involves the use of agrochemicals was about 15.4%.

It was noted that farmers who practice inorganic farming commonly use weedicides, pesticides and DDT which is known to be a banned chemical and these can be said to have a marked effect on aquatic life especially fish.

The farmers through the interviews indicated that the use of chemicals have effect on the river and the organisms (90.0 %) such as fish which live in the rivers.

### Fishing Gears Used in the Rivers

Four different types of fishing gears used by the fishermen either in combination or alone were cast nets (6.7%), gill nets (73.2%), hook and line (6.7%), drag net (6.7%) and traps (6.7%).

Averagely each fisherman owns 8 fishing gears, in the following form 3 cast nets, 15 gill nets, 13 traps, 13 hook and lines, 3 drag nets. 92.3% own the non-motorized canoe they use whilst 7.7% use their friends canoes in fishing. 92% of the fishermen own and use canoes in their fishing activities whilst 7.7% use canoes of their relations.

Mo FA (2003) identified twelve fishing gears with gillnet being dominant on Volta Lake and Akong-yuure *et al.* (2015) identified four fishing gears with gillnet being dominant in Otis river and these were observed to have high catch among other gears.

It therefore be concluded that the 73.3% dominance of the gill nets in the study area is due to the high catch associated with its use. Reed (1997) noted that over fishing is caused by the increasing number of fishing gears and their increasing efficiency in catching fish, particularly the use of fine mesh nets which remove all fishes even the young and immature ones thereby, leading to growth of over fishing.

The selection and use of a particular fishing gear is based on certain factors in the study area and these are presented in Fig. 2.
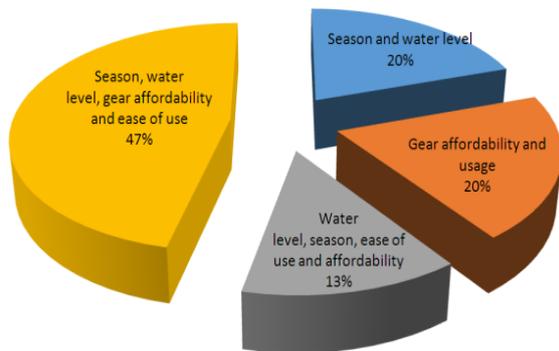
Fig. 2. Reasons for use of a fishing gear.

For the 2015 fishing year, fishermen spent a total average amount of $ 281.25 on the purchase of fishing materials.

Spoilt fishing gears are handled different by the various fishermen and this is shown in Fig. 3. The level of use of spoilt fishing net was noted to be low and therefore the environment effect of abandoning or burning them cannot be discounted.
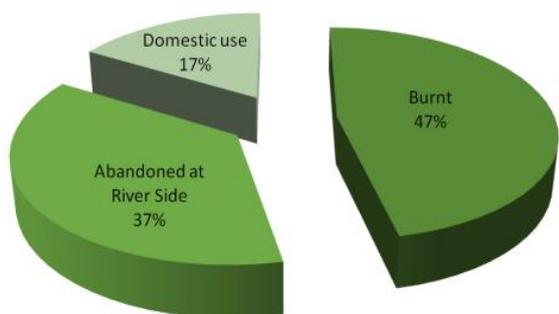
Fig. 3. Use of spoilt fishing gears.

Level of Fish Catch and Use of Baits
During the period of bumper harvest, the quantity of catch per canoe per day was observed to average 20.5kg but in the following ranges; between 11-20kg (20%), 21-30kg (26.7%) and above 30kg (53.3%). These quantities were however noted to be high when compared with the study by Alhassan *et al.* (2014) who estimated catch per unit effort (CPUE) was 2.7 kg/fisherman/day in the Bontanga reservoir.

The difference in the results could be attributed to the different water systems between the current study (river) and their study (reservoir). All the fishermen (100%) agreed that, the present catch is far lesser than the catch in 5 years ago. 63.6% of the fishermen indicated that there were by-catches whilst 36.4% have noted that there are no by-catches. When by-catches occur, it was noted that 14.3% of them are thrown back into the water, 24.3% indicated that by-catches are usually taken home to feed family, 67.1% are processed to sell whilst 8.6% are used as baits for fishing.

Fishermen use different baits when traps or hook and lines are used for fishing. These baits are either used alone or in combination and they include; river fishery resource (57.1%), earthworms (7.1%), river fishery resource and earthworms (21.4%), river fishery resource and domestic foods (7.1%) and river fishery resource, earthworms and domestic foods (7.1%). These baits are commonly obtained from homes, rivers and along river banks. About 73.3% of these resources are obtained from rivers with the remaining 26.7% from any of the other sources or a combination of them. With the use of fishery resource, fishermen use either juvenile fin (92.9%) or adult fin (7.1%) fishery resources as baits. 60% of the fishermen sell their catch to fish mongers, food sellers and market women, fish mongers and food sellers (13.3%), fish mongers and market women(13.3%) and food sellers and market women (6.7%).

There is no catch quota and closed seasons for fishing, however good catch is as a result of reduction in water level (90.9%), decrease in number of fishermen (4.5%) and high demand for fish (4.5%) and low catch is due to high rainfall (68.8%), high cost of fishing materials (18.8), climate change (6.3%) and low water level (6.3%). Alhassan *et al.* (2014) observed that low catch recorded during the survey period was due to the high water level in the reservoir due to heavy rains prior to the study, making it difficult for fishermen to set their fishing gears.

Fish Species and Level of Catch

The study revealed the following as dominant species in the two rivers according to fishermen observation on their level of catch; *Synodontis* spp. (28.1%), *Citharinus citharus* (17.5%), *Auchenoglanis occidentalis* (17.5%), *Labeo* spp. (17.5%), *Brycinus nurse (7.0%)*, *Schilbe* spp. (7.0%), *Sarotherodon galilaeus* (3.5%) and *Lates niloticus* (1.8%). However, *Tetraodon lineatus* (60.9%), *Parachanna obscura* (26.1%) and *Malapterurus electricus* (13.0%) were noted as species which are extinct from the Sissili and Kulpawn rivers according to the fishermen.

Fish species which had low preference level by the populace or not like at all include *Heterotis niloticus, Protopterus annectens, Synodontis* spp., *Heterobranchus* spp and *Parachama obscura*. *Gymnarchus niloticus*, *Lates niloticus*, *Mormyrus* spp, *Cichlids*, *Distichodus* spp., *Marcuseinus* spp., *Hydrocynus* spp. and *Bagrus* spp. were more preferred. Reasons for the preference of these fish species include; less scales (20 %), longer shelf life (5 %), quality flesh (35%) and good taste (40 %).

The level of catch of fish from the rivers depend on some factors and these were mentioned by the fishermen as reduction in water level (90.9%), decrease in number of fishermen (4.5%) and high demand for fish (4.6%).

According to Abobi *et al*. (2013), in the northern part of Ghana where long dry seasons and a single unreliable rainy season prevail, fishing and other agricultural activities are influenced by water levels. However, low levels of fish catch was said to be caused by climate change (6.3 %), high cost of fishing materials making fishermen use low quality fishing gears which are associated low efficiency (18.8%), high rainfall level (6.3 %) and low water level (68.8 %).

Fishing Business Management

Alhassan *et al*. (2012) stated that in Ghana, various methods are used to preserve fish; namely, refrigeration, smoking, salting, drying and steaming.

Most of the fishermen sell the fish either fresh or in smoked form which accounts for 86.7% of the fish catch and fresh, smoked or salted representing 13.3%.

Investment in the fishing business by fisher men annually averaged $ 187.50 but ranged from $ 62.5-312.50 as presented in Fig. 4.
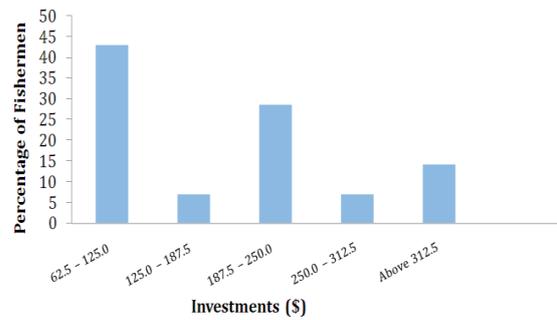
**Fig. 4.** Annual investment of fishermen at sisili-Kulpawn river basin, Ghana.

During the 2015 fishing year, fishermen acquired their fishing gears at different prices but the cost of these were averaged as $ 131.4 for cast nets, $ 225 for gill nets, while traps and hook and line cost $ 93.8.

Out of these investments, monthly proceeds averaged $ 64.5 but varied from fishermen to another and ranged from $ 4 – 50 (61.5%), $ 75 (15.4%), $ 75 - $ 100 (15.4%) and $ 100 - $ 125 (7.7%).

Proceeds from the fishing business were invested in the following form: business investments, housekeep-ping, payment of fees e.g. Schools, health insurance, and savings. Fig. 5 presents the details of the use of the proceeds or gains from the fishing business.

Fishermen are not licensed to fish in the rivers but preference is given mostly to members of comm.-unities that border the rivers.

There is no catch quota in the fishing activities as there is no regulatory body for fishing in the rivers. Fishing in the rivers is all year round as there is no closed season.
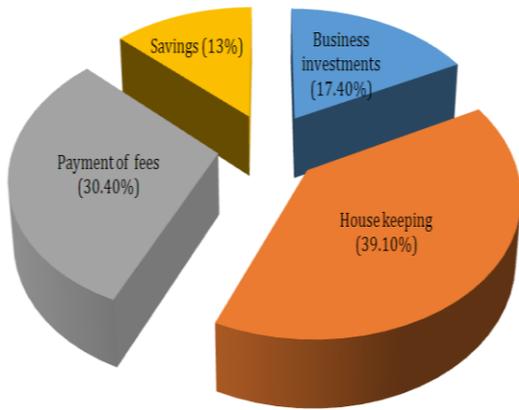
Fig. 5. Use of Financial Resources as Gains from Fishing.

Fishermen indicated that they have association or groups to which they belong (86.7%) whilst the remainder (13.3%) indicated that they do not belong to any group or association.

The survey revealed that, all the fishermen (100%) are not licensed and none is aware of the body responsible for licensing of fishermen in Ghana.

Challenges of Fishing Activities and Support Needed

Some challenges of the fishing industry of the fishermen in the Sisilli and Kulpawn Rivers were observed by the fishermen in the four communities and presented in Table 1.

Table 1. Challenges associated with fishing activities in Sisilli-kulpawn rivers.

Challenges of Fishing Activities	Percentage (%)
Poor transport system and high cost of transportation	11.5
Lack of storage facilities	27
Lack of processing facilities	18
Lack of electricity	18.4
Lack of ready market and low market prices	11.5
Lack of capital	5.6
Presence of tree stumps in water	3.8
High cost of fishing materials	3.8

According to Alhassan *et al.* (2014) lack of cold storage facilities to keep the catches before they could be processed or transported fresh to Tamale due to the absence of electricity in the communities sometimes leads to post-harvest losses in the area. Also, the low level of water and flow in the rivers especially during the dry season and the presence of tree stumps in the rivers affect the fishing activities of fishermen.

The fishermen mentioned that they needed some support to promote their fishing business so that there will be able to supply at a better quantity and quality of fish for the market. To overcome some of these challenges, fishermen mentioned some support levels needed to improve upon their activities and these were: support in the acquisition of fishing materials (62.5%), support with fish processing facilities (4.2%), improvement of transport system (16.7%), ban on use of chemicals e.g. DDT (4.2%) and improvement in the marketing system (12.5 %).

Conclusion

The business of fishing has a high potential of contributing towards poverty alleviation of the rural communities in the study especially in the area of provision of employment. Investment in the provision of the needed support for the growth of the sector in the various fishing communities therefore has the potential of growing the sector. Most unemployed youth can be engaged either directly or indirectly.

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