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Environmental and Occupational Hazards Exposures Faced by Coastal Fishermen in Tanji, The Gambia

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Abstract

In The Gambia, the smallest West African country with a population of about 2 054 986, fishing is a major industry. Most previous studies on coastal fishing have focused on fishing methods, fish protection, and fish preservation. The aim of this study was to assess the environmental health hazards to coastal fishermen in Tanji. A descriptive cross sectional study was carried out on 36 fishermen in Tanji Coastal Fishing Centre. Structured questionnaire and observational checklist were used for data collection. Responses were analysed using SPSS version 22 descriptive statistics. The study found that50% of coastal fishermen in Tanji were Non-Gambian nationals. The fishermen were generally artisanal and use planked canoes without-board engines during the process of fishing. Common hazards among fishermen during fishing operations include falls, fish, fishing gear,and extreme weather conditions. The fishermen reported that the activities including pushing boat into sea, removing catch from fishing gears, transporting catch, controlling boat engine, setting fishing gear, strenuous and repetitive work among others as injury causing factors during fishing operations. Seventy-two percent of the fishermen reportedly used robber gloves, and 94% used lifejackets while fishing. However, the usage of most essential personal protective equipment while fishing was low.Coastal fishing in Tanji is labor intensive and hazardous. The fishermen are exposed to both fatal and nonfatal injury causing factors. Fishermen should be engaged in formal safety training by the authorities. Further research on occupational and environmental hazards faced by the coastal fishermen in Tanji is recommended.

Risques environnementaux et professionnels auxquels sont exposés les pêcheurs côtiers de Tanji, en Gambie

Abstrait

En Gambie, le plus petit pays d'Afrique de l'Ouest avec une population d'environ 2 054 986 habitants, la pêche est une industrie majeure. La plupart des études antérieures sur la pêche côtière ont porté sur les méthodes de pêche, la protection du poisson et la préservation du poisson. L'objectif de cette étude était d'évaluer les risques pour la santé environnementale des pêcheurs côtiers à Tanji. Une étude transversale et descriptive a été menée sur 36 pêcheurs du centre de pêche côtière de

Tanji. Un questionnaire structuré et une liste de contrôle par observation ont été utilisés pour la collecte des données. Les réponses ont été analysées à l'aide des statistiques descriptives SPSS version 22. L'étude a révélé que 50% des pêcheurs côtiers de Tanji étaient des ressortissants non-gambiens. Les pêcheurs étaient généralement artisanaux et utilisaient des canots à planches sans moteur pendant le processus de pêche. Les risques courants chez les pêcheurs pendant les opérations de pêche comprennent les chutes, les poissons, les moteurs de pêche et les conditions météorologiques extrêmes. Les pêcheurs ont indiqué que les activités comprenaient de pousser le bateau dans la mer, enlever les prises des moteurs de pêche, transporter les prises, contrôler le moteur, installer des moteurs de pêche, effectuer des travaux pénibles et répétitifs. Soixante-douze pour cent des pêcheurs auraient utilisé des gants de voleur et 94% auraient utilisé des gilets de sauvetage pour pêcher. Cependant, l'utilisation de l'équipement de protection individuelle le plus essentiel lors de la pêche était faible. La pêche côtière à Tanji nécessite beaucoup de main-d'œuvre et c'est dangereuse. Les pêcheurs sont exposés à des facteurs à la fois fatals et non mortels. Les pêcheurs devraient suivre une formation formelle sur la sécurité par les autorités. Il est recommandé de poursuivre les recherches sur les dangers professionnels et environnementaux auxquels sont confrontés les pêcheurs côtiers de Tanji.

Introduction

The Gambia is a small country with about two million population and is known for its fisheries and tourism. Fisheries are the third largest contributor to the Gambian economy after land based agriculture and tourism. It provides livelihood to about 200,000 people and earns an appreciable amount of foreign exchange for the country (GBoS, 2013). Fishermen play a significant role in food security and nutrition for Gambian populations.

Although, the Gambia has a coast line measuring only 80km, its waters can be fished all year round. There is also a reciprocal arrangement with the neighboring country, Senegal which allows licensed vessels from each country to fish in their waters. Fisheries in The Gambia are divided into two sub sectors: (a) The artisanal sub-sector which is widely dispersed throughout the country and is mainly based on pirogues (canoes) without-board engines, and(b) The industrial sub-sector which comprises a small number of mainly foreigners with trawlers. It is believed that the maximum sustainable yield for all species of fish in The Gambia territorial waters stands between 150,000 metric tons and 200,000 metric tons. Total annual fish production in 2002 was circa 43,000 metric tons of which only 573 tons were exported (Government of The Gambia, 2007). Most of exports are aimed at European Union markets.

The fishing industry is noted for various hazards and dangers (FAO, 2018). A study from USA during 2000-2006 period, reported an annual fatality rate of 115 deaths per 100,000 fishermen. The report also documented 182 deaths of fishermen as a result of falling overboard in the period between 2000 and 2010 (Robert, 2009). Most of the reported vessel disasters were due to instability of flooded vessels, large waves and severe weather conditions. Common causes of fishing related deaths were due to vessel disasters, falls, overboard and on-board injuries.

In The Gambia, researches on fisheries are mainly on fishing methods, and fish preservation and protection. This study builds on previous studies conducted in fisheries, and enhances existing knowledge on the environmental and occupational health and safety of fishermen in The Gambia. This study is aimed at obtaining demographic information on coastal fishermen in Tanji, identify common exposures to environmental and occupational hazards during

fishing related activities, and develop mitigation measures which may be disseminated to fishing communities for their safety and wellbeing. Findings from this study can be useful in making policy formulations, strategies and procedures for the improvement of safety issues and interventions in the fishing sector.

Materials and Methods

Study area

Tanji Fishing Centre is located in Tanji Village in Kombo South District of Gambia. Tanji Fishing Centre is found on the 80km long Atlantic Coast of the Gambia. The Tanji Community Fishing Centre harbor was upgraded and inaugurated in 2001 and is one of the seven major coastal artisanal fishing communities in the country. It was developed with grant in aid (US $4.5 million) from the Japanese Government. The most prominent features of the fishing centre are its dim shade smoking sheds, lines of majestic African pirogues parked onshore and decorated in bright geometric shapes, hired hands and housewives lining the shore waiting for the afternoon catch, fishmongers and customers haggling over prices, boys handling wheel barrows with mounds of fish and women making a living as bucket carriers of fishermen's catch.

Coastal fishermen work in harsh weather and they often face external risk factors, including extreme temperatures, rough seas, and challenges of fatigue and physical stress (Jeżewska, *et al.,* 2012). Coastal fishermen often work at distances that are far from medical care or rescue services (Roberts, 2009).

Study design

A descriptive cross-sectional study was carried out on fishermen who go to the sea for harvesting fish from The Atlantic Coast of Tanji Fishing Centre. Pretested structured questionnaire and observational checklist were used to collect primary data from the coastal fishermen. The questionnaire included questions on socio demographic data of study participants that came from an observational ethnography reviewed by Anne Wallis (2015). The checklist was in two parts. Part one contained questions on common hazards among coastal fishermen during fishing operations. This part was partly adapted from that of the US National Institute of Occupational Safety and Health (2015). Part two gathered information on the use of low cost and important equipment to be on board while fishing adapted from Danielsson, *et al.,* 2010.

Study population and sampling

Fishermen take shelter in *mbaarsin Tanji* which are shed like structures with low roof on wooden frames without walls, doors, or windows. The fishermen spend their day chatting, and mending nets. The *Mbaars* face the coast of the Atlantic Ocean. Two to eight fishermen take shelter in every *mbaar.* There were 524 fishermen. The sample size was calculated using Epi-Info software version 6.1 and 36 fishermen were selected for this study assisted by the Fishing Centre authorities. Fishermen were selected using 2-degree probability random sampling method. First, simple random sampling was used to select the 36 *mbaars* (out of 84 *mbaars*) that participated in the study. Second, for each *mbaar,* simple random sampling was used to select one participant for the interview. The *mbaars were* named. The name of each *mbaar* was assigned a random number on Microsoft Excel program (2013). The same program was used to pick replacement of 36 numbers at random. The 36 numbers picked represented 36 different *mbaars.* In each *mbarr,* the number of fishermen and their names were obtained. Their names were assigned random numbers on Microsoft Excel program (2013). One number was picked using the same program. The number represented the interviewee (respondent). The Tanji fishing facility and the types of fish are shown in Figure 1.

Figure 1: The Tanji fishing area showing the typical boats, *Mbaars* and fishes caught

Data Collection and Management

Three interviewers (Research Assistants) were selected from students of Gambia College School of Public Health and trained on the questionnaire and the checklist. The data collection process was through one-to-one personal interview. The collected data were cleaned and computerized. The data was analysed using SPSS Program version 22.0 descriptive statistics. Data were presented as frequencies and percentages.

Ethical and consent processes

This study was reviewed by the Republic (Research and Publication Committee) of the University of The Gambia and The Gambia Government/Medical Research Council Joint Ethics Committee. When approval was sought, permission was finally granted by the Ethics Committee to conduct the research (RO15-015V2.1). Consent of the fishing center authorities and study participants was sought and obtained.

Results

Socio-demographic characteristics of Tanji community

The age of the fishermen ranged from 25 to 69 years, with a mean age of 48 years and a standard deviation of 11. Twenty-eight fishermen (i.e. 66%) belonged to either the Wolof or the Serer ethnic group. About half (50%) of the fishermen were Non-Gambians. Fifty-six percent (n=20)

of the fishermen were currently living in rented houses while the rest (44%) of them were either living in their own houses or living with relatives. Seventy-two percent of the fishermen went to school. Of these, 43% attained secondary level of education. Most of the schooled fishermen reported that they can read and write. As shown in Table 1, 61% (n=22) of respondents are currently smoking. All of the fishermen are using stimulants with majority of them using more than one stimulant. The most common stimulants used were tobacco, *café touba*, coffee and China green tea.

Occupational characteristics

All the fishermen used planked canoes with out-board engines. The engines of these boats ranged from 4 to 60 Horsepower;67% of the engines are either 15 or 40 HP;72% of the fishermen used boats with lengths of between 10 and 20 m; 16% used boats between 21 and 30 m and the rest used boats less than 10 m long. Sixty-seven percent of the crew sizes of the fishermen were 10 or less people per fishing trip and 5% of crew sizes of more than 20 people per fishing trip. Eighty-nine percent spent 5 to 18 hours on the sea per fishing trip, the rest spent 2 to 8 days on the sea per fishing trip. The most common gear used for catching fish was fishing net (used by 50% of the fishermen), 11% used hook and line and about 39% used both fishing net and hook and line. The most targeted fish species is B*onga*. Most fishermen work as hired workers or family members (56%) but 39% worked with both hired workers and family members. Table 2 shows that 61% of the fishermen never received safety training on fishing.

There was some specialisation among the fishermen as 44% (n=16) of them did one task and 56% did multiple tasks at the same time during fishing operations. Most of the specialized fishermen were engine controllers/skippers. The different tasks included skipper, deckh and, mate, and mechanic.

Little over 83% (n=30) of the fishermen

Table 1: Frequency Distribution of Socio-demographic Data of the Fishermen

Socio-demographic features		**Number of Fishermen (n=36)**	
		Number	**%**
Nationality	Gambian	18	50.0
	Senegalese	16	44.4
	Conakry Guinean	2	5.6
Age category			
	20 - 29	8	22.2
	30 – 39	12	33.3
	40 – 49	10	27.8
	50 – 59	4	11.1
	60 and above	2	5.6
Marital status			
	Married	20	55.6
	Single	14	38.9
	Divorced	2	5.6
Educational level			
	Read only	2	5.6
	Read and Write	26	72.0
	Neither read nor write	8	22.5
Smoking habit			
	Smoker	22	61.1
	Non-smoker	14	38.9

reported not belonging to any association specific to fishing. Forty-three percent reported owning the boat they use for fishing and 83% of the fishermen travelled a distance of 25km or more into sea to catch fish.

Reported Health Hazards/Risks by the Respondents

About 61% of the fishermen reported being ever involved in close to fatal incident during fishing and 8 (22.2%) of them were involved in such incidents for five or more times. Boat capsises was the single most frequent reported incident to fishermen (41%, n=15). Other incident types included collision, grounding, and engine problem. Some fishermen were involved in more than one incident type. More than three quarters (78%) of the fishermen reportedly saved another fisherman`s life in sea while fishing and 67% (n=24) of them indicated that they needed help from outside their fishing boat while fishing.

Rope, knife, life jacket, GPS, flashlight and anchor were reportedly used by all the fishermen at all times while fishing. Most of the fishermen (77.8%) reported that they always go with enough fuel at sea during fishing. However, first aid kit, fire extinguisher, and spare engine were never used during fishing by two-thirds of the fishermen and less than 6% of them occasionally go to sea with certified mechanic. All the fishermen reported falls, fishing gear, boat instability, windstorm, and combustible items as common hazards onboard during fishing. Noisy engine sections were reported by 67% of the fishermen. Eighty-three percent indicated risk of being crushed or dragged into fishing gear while 61% reported risk of electric shock. The fishermen reported that the activities including pushing boat into sea, removing catch from fishing gears, transporting catch, controlling boat engine, setting fishing gear, strenuous and repetitive work among others as injury causing factors during fishing operations.

Use of Personal Protective Equipment during Fishing

From Table 3, the most common PPE types used by the fishermen were gloves, wellington boots, rain coats, and life jackets. Most of the fishermen used more than one PPE type in combination. The most common combination was: gloves, and life jackets, which was reported by 50% of the fishermen. Some 83% (n=30) of the Fishermen also used charms for protection. The most common charm types were *juju* and *concussion.* Ninety-four percent (n=34) of the fishermen carried cell phones while fishing. However, a few fishermen reported that they were unable to use the cell phones at times due to distance beyond network coverage. About 83% reported that they used meteorological information before going to sea. Meteorological information was sent to most of them from Senegal through cell phone calls.

Table 2: Frequency distribution of occupational characteristics of the fishermen

Occupational Characteristics		Number of fishermen (n=36)	
		Number	%
Length of fishing experience	10 – 14 Years	8	22.2
	15 – 19 Year	10	27.8
	20 – 24 Years	4	11.1
Average time spent on sea	25 Years and above	14	38.9
Whether fishermen ever received safety training	2 – 8 days	4	11.1
	5 – 18 hours	32	88.9
	Yes	14	39.0
	No	22	61.0

Table 3: Use of personal protective equipment

Personal Protective Equipment Types used	Number of fishermen (n=36) Number	%
Rubber Gloves	28	72.4
Life Jacket	36	94.3
Rain Coat	34	84.9
Wellington Boots	10	34.3
Hat	1	2.6

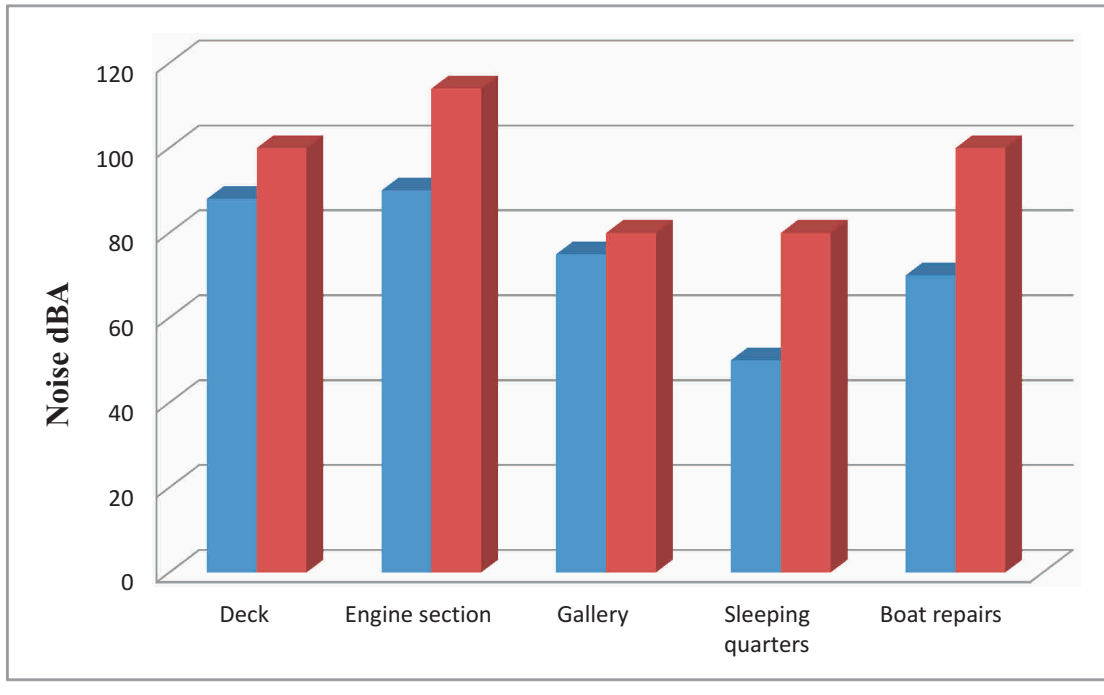

Figure 2: Noise levels on a typical mechanized fishing boat

Noise Levels on a Typical Mechanized Fishing Boat

Fishing activities are also associated with noise. However, a mechanised boat will have more noise by virtue of the nature of activities and equipment used on sea. The typical noise levels are shown in Figure 2.

Hazards and Health Risks Associated with the Tanji Facility

Fishermen encounter incidents at sea, since they are always at their guard with life jackets, casualties do occur but these are the unfortunate ones who could not have been saved at sea that succumb to their death depending on the nature of the incident. However, such incidents are uncommon ashore but they do encounter hazards including cuts while packaging and cleaning fish. Treatment is either done in designated hospitals or locally using their own traditional ways of managing wounds. But, the facility is not fitted with health and safety personnel or first aid kit. Since the sea is in close proximity with locals in the community they are not put at risk but instead locals particularly youths, both male and female, visit the site when boats loaded with fish land ashore to vehemently steal the fish. Such a menace is reported to authorities including the police; they give less heed but would rather hold fishermen in custody. This is an ongoing social situation that foreign fishermen call disturbing, since they

are under-represented in government and their voices are not heard. Besides they lack the leadership portfolio that can give a voice to their predicament.

Discussion

This study has shown that about half of coastal fishermen around the Atlantic Coast of Tanji are Non-Gambians and belong to five different ethnic groups. Similar to what was reported by El Saadawy*et al.,* among fishermen in Alexandria City (El-Saadawy, *et al.,* 2014), more than half (55%) of the coastal fishermen in Tanji are less than 40 years' age group. About 47% of them reported that they started fishing when they were less than 14 years. Although, about 72% of fishermen have been to school, about 43% of the fishermen had secondary level of education. These are suggestive of low educational level of the fishermen.

This study has described the fishing culture of coastal Tanji. The commonest boat types used by the fishermen are planked canoe without-board engine. The boats are open to the wider environment making the fishermen exposed to the external environmental factors including unfriendly weather. The engine power is mostly 15 Horse Power. Most of the boats are of lengths between 10 and 20 m. It has been observed that boats longer than 20 m mostly used engines of powers more than 15 HP. All coastal fishermen learnt the job of fishing either by apprenticeship or inheritance, that is, they received on the job training. This is consistent with findings of this study that fishing in Coastal Tanji is mostly a family enterprise and a less formal one. As reported by other studies in Africa (Udolisa, *et. al.,* 2013; El-Saadawy, *et al.,* 2014), more than half of the average crew sizes per fishing trip in this study is made up of ten people or less. The consistency could be that, the studied fishermen are mostly from the artisanal sector. The findings of this study are not different from conclusions of the fisheries framework survey of 2007 of the Government of The Gambia, where, the reported commonest fishing gears used by coastal fishermen (in The Gambia) are fishing nets, and hook and line. More than half of the fishermen used the fishing net to catch fish. The most targeted fish species is *bonga.* However, other fish types including barracuda, octopus, snipper, and other fin fish types. The coastal fishermen in Tanji spend either 5 to 18 hours or 2 to 8days at sea from the time they leave port to the time they land their catch. The former is called *dem dick* and the latter called *Mare.* The majority of the fishermen practice *dem dick.* Unlike what was reported by El-saadawy, *et al,* (2014), most coastal fishermen in Tanji are less specialized on the job while fishing, as more than 50% of them reported having been involved in more than one type of task on the boat during fishing operations. Such tasks that fishermen are involved in during fishing operations as shown by this study include skipper or captain, mate, and deckhand which, imply that coastal fishing in Tanji is largely laborious.

Smoking and drug abuse is another glaring problem at Tanji. In contrast with another study by El-Saadawy, *et al.,*(2014), where more than 80% of fishermen in Alexandria, Egypt are smokers, less than three in every four(61%) coastal fishermen in Tanji are smokers, yet the prevalence rate of smoking among the fishermen is above the national average, 36.1%(GBoS, 2013, WHO, 2017). All the fishermen in this study used stimulants with majority of them (70%) using more than one stimulant. The single most commonly used stimulant was China green tea (86%) amongst others including tobacco, *café touba,* tea, and coffee. The fishermen claim that these stimulants help them to keep warm when temperatures are low at sea. The *mare* fishermen brew China green tea while fishing.

This study found 46 fishing health hazards and risks. Some of the hazards and risks are life threatening while some are moderate. Most of the hazards and risks are preventable. Boat incidents are common among coastal fishermen. Boats capsising account for about half of boat incidents. The frequent boat capsizes could be due largely to the relatively small size of planked canoes used by the fishermen as 87% of fishermen use boats of lengths less than 20 m. The use of life saving devices as well as PPE was found to be low. Most of the fishermen reported that they can swim and 64% of them indicated that they use charms for

protection. However, the fishermen are continually exposed to sharp objects such as nets, knives, and fishes as well as harsh weather while at sea. All of them reported that windstorms are common harsh weather, and they often fish at distances that are far from emergency medical care and rescue services. The fishermen do not have first aid kit boxes with them nor fire extinguishers while fishing. Similar findings were also indicated by Jeżewska, *et al.,* (2012).

Conclusion

From this study, it is concluded that most coastal fishermen in Tanji are with low levels of education, less than half of them never received any safety training and do not belong to any association specific to fishing. Coastal fishing in Tanji is generally hazardous. Most notorious injury causing incidents are working tools and fish. Forty-six hazards that could be categorized as environmental, biological, physical, or ergonomic were reported to be common during fishing among the coastal fishermen. The use of personal protective equipment was moderate, yet the use of most of the essential PPE types was rare. Certain safety and preventive measures are recommended. These include mandatory safety training for fishermen at start of the career and at periodic intervals, organizing themselves into associations that are specific to fishing activity, and data collection and update for better understanding of issues around fishing in coastal Tanji.

Conflict of interest

There is no conflict of interest.

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