The socio-economic implications of illegal fishing practices in Lake Victoria: a case study of three Villages in Tanzania

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Abstract

Illegal fishing is a threat to the sustainability of fisheries in Lake Victoria and this paper examines the influence of socio-economic factors on illegal fishing practices. The study was conducted in three villages around Nyegezi Bay of Lake Victoria where a total of 240 households were surveyed. Results indicate that there is highly significant correlation between illegal fishing and ages in one of the study villages, but this was not the case in the others, which suggests that age alone is not a sufficient factor to explain illegality. Further findings reveal that there is highly significant positive correlation between income and education on one hand and on another hand income and residence, which suggests that poverty is a driver of illegalities when linked to the education and residence. In addition, there is highly significant negative correlation between residence and education revealing a migration of poorly-educated people, probably for search of employment opportunities. Generally, the study has shown that there exists direct correlation between socio-economic factors with illegal fishing practices. Based on the findings, we suggest that improving the social and economic statuses of these community through improving education and increasing opportunities for alternative sources of livelihoods may help address the issue of illegality in these areas.

Keywords: Age, Employment, Illegal fishing, Income, Management measures, Poverty,

Introduction

With a surface area of 68,800 km^2, Lake Victoria is the largest African lake and the second largest in the world. It supports one of the world's largest inland fisheries with an annual fish catch of about 1,000,000 t per annum, generating about US$400 million per year (Marshall and Mkumbo, 2011; LVFO, 2014). Despite attempts to manage and regulate the fishery, persistent illegal fishing is cited as one of the causes of the decline of fisheries resources in the lake (Njiru *et al*., 2008; 2009: Ikwaput-Nyeko *et al*., 2009: Kayanda *et al*., 2009: Sobo, 2012). The three partner states that share the lake (Kenya, Tanzania and Uganda) have taken several measures to control illegal fishing (LVFO/FAO, 2004). These include a prohibition on the use of destructive gears and methods, and seasonal and area closure to protect breeding and nursery grounds and biodiversity (Luomba *et al.,* 2016). Other regulatory measures include slot size regulation of 50-85cm total length for Nile perch *Lates niloticus* and 25 cm total length for Nile tilapia *Oreochromis niloticus* (Njiru *et al*., 2009; Msuku *et al*., 2011). In addition, there are regulations controlling mesh size and fishing grounds for dagaa *Rastrineobola argentea* (LVFO, 2007). Furthermore, a co-management system was introduced with the formation of Beach Management Units (BMUs) in all the landing sites (LVFO 2005: Salehe, 2008). However illegal fishing involving the use of destructive fishing gears such as monofilament gill nets, beach seines, cast nets and splashing of water are still prevalent (URT/MALD, 2015).

Different explanations have been given for the persistence of illegal fishing. Understanding the socio-economic factors that influence illegal fishing in Lake

Victoria fisheries may provide the underlying reasons that make the problem persist despite the alleviation strategies. Little research has been conducted on the influence of socio-economic factors on the depletion of natural resources in Tanzania, apart from some work on a forest reserve around Lake Victoria. A study of deforestation at Bereku Forest Reserve found that livelihood activities and the length of residence close to forest significantly influenced deforestation, while household size, education, awareness of the management of the reserve and its boundaries did not (Giliba *et al*., 2011). Around Lake Victoria, land use changes in the Musoma Municipality, revealed that there is a strong relationship between human activities and land use (Musamba *et al*., 2011). A study of the factors that influence people's decision to become fishermen in the central region of Ghana found that household size was a significant factor that positively influenced this decision (Acquah and Abunyuwah, 2011).

The study examined the relationship between socio-economic factors and illegal fishing practices in three villages adjacent to Nyegezi Bay in Lake Victoria. It identified the characteristics of households using descriptive analysis techniques and analysed the socio-economic determinants that influence illegal fishing practices and their implications using correlation matrix test of differences.
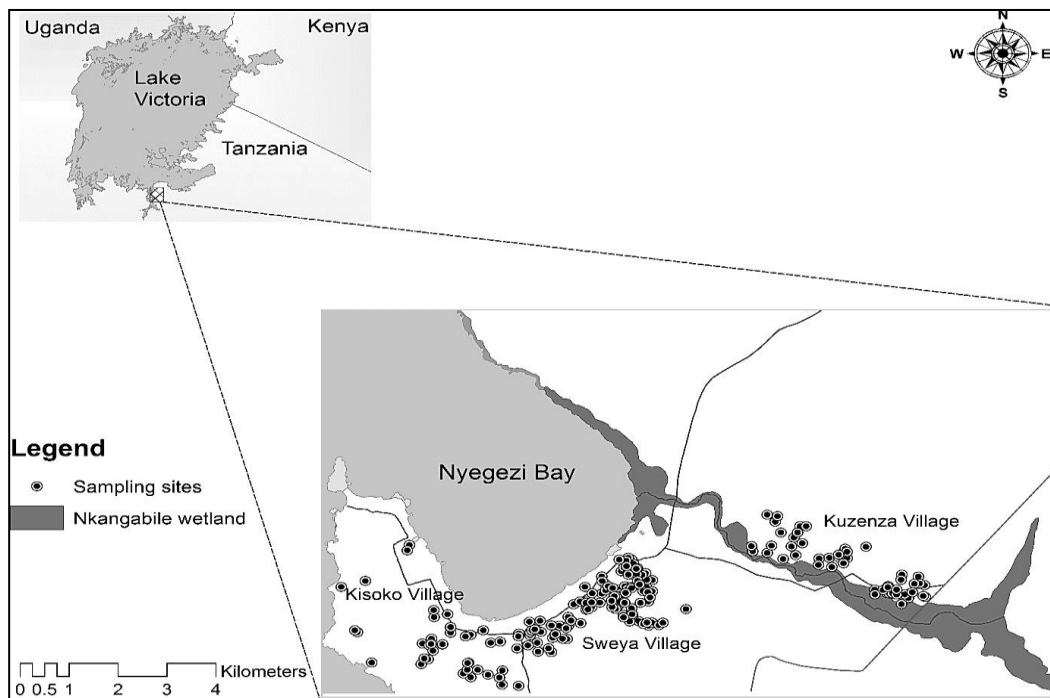

Figure 1. The location of households in the three villages in Nyegezi Bay, Lake Victoria.

Methods
This study was carried out in the villages of Kisoko, Sweya and Kuzenza, located around Nyegezi Bay in Lake Victoria, Tanzania (Figure 1). These villages have a total of 1,522 households with Sweya being the largest (50% of households), followed by Kuzenza (26%) and Kisoko (23%) (URT, 2012). Nyegezi Bay is gazetted as a critical habitat (URT, 2009) and is also recognized as a hotspot for biodiversity by virtue of being a breeding and a nursery ground for many fish species. There are over 58 fishing crafts targeting commercial species such as Nile perch, Nile tilapia and dagaa (URT/MALD, 2015). Fishing in these villages is also carried alongside farming, fish farming, grazing and gardening. The villages are essentially unplanned settlements.

Data for the socio-ecological baseline survey were collected through structured and unstructured questionnaires for primary respondents. Other information was collected through review of relevant published and unpublished documents and personal observation. Most variables in the structured questionnaire were pre-coded making it easy to administer by enumerators. These questionnaires were

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administered to household heads while the unstructured questionnaire went to village leaders and environmental committee members from the three villages. The unstructured questionnaires were used to gather some in-depth understanding about the villages and issues that could not be completed in the structured ones. A total of 240 households completed the structured questionnaire. Sampling of the households was based on government records and information from the village leaders at each village. To ensure that all households along Nyegezi Bay participate in the study the purposive randomly sampling was employed.

Results

The general trends were examined by drawing up a correlation matrix based on the entire sample of 240 respondents (Table 1). There was a highly significant positive correlation between income and education, which was to be expected since better-educated individuals will have greater opportunities for secure employment. There was also a highly positive significant correlation between income and period of residence, which suggests that people with steady jobs will stay longer in one area. There was a similar positive correlation between residence and age, also to be expected because older people are more likely to have spent longer periods in the same village. On the other hand, there was a highly significant negative correlation between residence and education, suggesting that poorly-educated individuals move around more, perhaps in search of employment. The only other significant positive correlation was between age and illegal fishing.

Table 1: A correlation matrix based on the entire sample (N= 240). The values shown are correlation coefficients (r) with significance based on 200 degrees of freedom. $* = p < 0.05$, $** = p < 0.01$.

	Income	Residence	Education	Age
Illegal fishing	0.001	0.097	-0.077	0.169*
Age	0.031	0.315**	-0.058	
Education	0.358**	-0.323**		
Residence	0.214**			

The results from each village were then examined separately and a more complex picture emerged. The incidence of illegal fishing increased steadily with age at Kisoko village, rising from about 20% in the 15-25 age group to 55% in the 65+ group (Figure 2). At the other two villages, illegal fishing declined in the 26-45 age groups but increased in the 46-55 age group and decreased in the 56+ group, especially at Kuzenza village. There was a highly significant correlation between age and illegal fishing at Kisoko ($r = 0.96$, $p < 0.01$) but not at Kuzenza ($r = 0.39$, p > 0.05) or Sweya ($r = 0.65$, $p > 0.05$), which suggests that age alone is not sufficient to explain illegal fishing.

One of the factors that might explain the pattern in Figure 2 is household income, which differs greatly between the three villages (Figure 3). Kisoko is the poorest village with no respondents earning more than TZS 300,000 per month and the incidence of illegal fishing was around 60% in all income groups. Sweya village was richer, with some respondents earning over TZS 6,000,000 per month, and here illegal fishing peaked at 43% in the TZS 1-2 million category declining steadily thereafter to 20% in the highest income category. This was the only village where illegal fishing was significantly correlated with income ($r = -0.91$, $p < 0.01$). The lowest incidence of illegal fishing was recorded in Kuzenza village, probably because it is populated with retirees earning pensions and has fewer people engaged in the fishery. When data from Kisoko and Sweya villages were combined (excluding Kuzenza village), there was a significant correlation between income and illegal fishing ($r = -0.71$, $p < 0.05$). This suggests that poverty was a much more important driver of illegal fishing than age in Kisoko and Sweya villages.
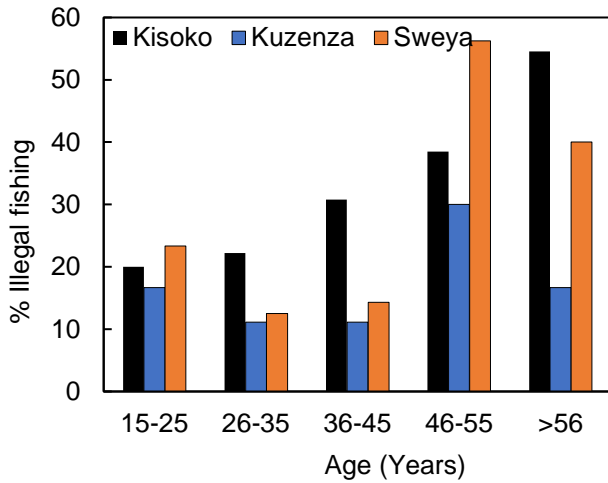
Figure 2. The proportion (%) of respondents who have been involved in illegal fishing in relation to the age in each village.
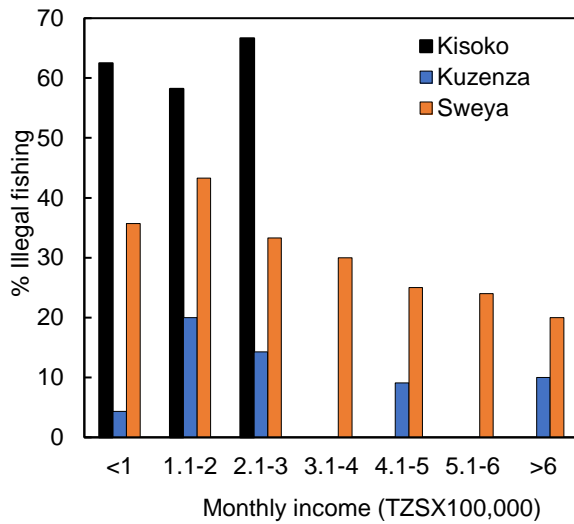

Figure 3. Proportion (%) of respondents who have been involved in illegal fishing in relation to their monthly earnings in each village.

There was no significant relationship between level of education and illegal fishing (Table 1). However, there was a higher level of illegal fishing amongst respondents without education at Kisoko and Sweya villages (Figure 4). This indicates that poverty is linked to a lack of education, which prevented respondents from obtaining secure jobs or seeking decent alternative livelihoods. Illegal fishing was generally low at Kuzenza because the level of education was higher and the retirees living in this village did not have to rely on illegal fishing to maintain their life styles.
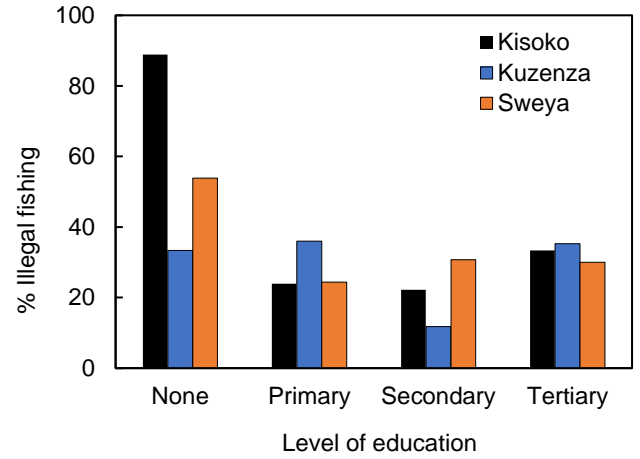

Figure 4: The proportion (%) of respondents who have been involved in illegal fishing in relation to their level of education in each village.

There was a highly significant correlation between the length of time that respondents had lived in Kisoko village and the extent of illegal fishing ($r = 0.99$, $p < 0.001$) but this was not the case at Sweya village ($r = 0.31$, $p > 0.05$) (Figure 5). This was probably the case at Kuzenza village as well, although there were too few data for any statistical analysis. These data draw attention to the role of poverty as a driver of illegal fishing. Kisoko village was poorer than the other two with a higher proportion of respondents with no education. The lack of education is likely to be greater amongst order people who may have lived in the village for a longer period. Their age and lack of education would leave them with fewer options for earning a living.
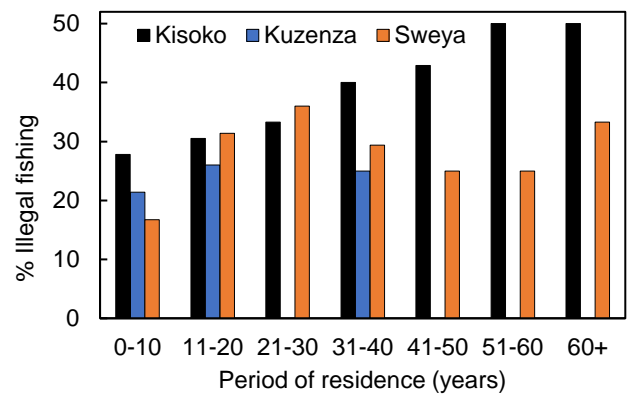

Figure 5: The proportion (%) of respondents who have been involved in illegal fishing in relation their length of residence in each village.

Discussion

One of the most important findings of the study is the direct correlation between socio-economic factors and illegal fishing practices. For instance, there was a highly significant correlation between illegal fishing and ages in one of the study villages, but this was not the case in the others. This implies that age alone is not a sufficient factor to explain illegality. Further findings reveal that poverty was linked to education and residence and was a major driver of illegalities. Education helps individuals to understand the advantages and disadvantages of their activities (Shalli 2003; Mitinje *et al.,* 2007; Giliba *et al.,* 2011). In fisheries, education is important in assisting fishers to understand fisheries management measures. The failure of understanding may lead to increased illegalities and may partly explain why they persist in this fishery.

Perhaps more importantly, a lack of education may prevent individuals from obtaining sufficient income to support themselves. Thus, poverty was found to be a major driver of illegal fishing. Similar observations elsewhere show that poverty causes environmental degradation and therefore has a significant impact on natural resources because poor people depend more directly on natural resources to earn a living (Duraiappah, 1998). The highly significant negative correlation between residence and education, suggests that poorly-educated individuals move around more, perhaps in search of employment. For example, the growth of the Nile perch fishery led to the migration of people to Lake Victoria, either to work for established fishermen or to fish for themselves (Odonkara and Ntambi, 2007). Based on these findings, we recommend that addressing illegalities in Lake Victoria should not only focus on combating the use of destructive fishing gears and methods but should address the underlying socio-economic factors. This is a paradigm shift from the usual technical fixes applied to management.

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