



Compliance and Enforcement of the Fisheries Regulations on Lake Malawi in Nkhatabay District

Ghambi C* and Mzengereza K

Department of Fisheries Science, Mzuzu University, Malawi

Submission: September 18, 2016; Published: October 13, 2016

*Corresponding author: Ghambi C, Mzuzu University, Department of Fisheries Science, Private Bag 201, Mzuzu, Malawi.

Abstract

Both enforcement and compliance with fisheries regulation affect the sustainable exploitation and conservation of the fisheries resources in Lake Malawi. The study analyzed the factors that affect compliance with fisheries regulations and also the challenges that affect success of government's enforcement of fisheries regulations. The study was conducted in Nkhata Bay district, northern Malawi. Qualitative data was collected using questionnaires from 78 fishery resource users selected using simple random and purposive methods. Factors for both challenges faced by government's enforcement and compliance by resource users with fisheries regulations were analyzed in SPSS (version 20) using regression models at 95% confidence level. The results show that self-interest and awareness of regulations ($P < 0.05$) contribute to non-compliance of fisheries regulations by resource users while sufficiency of funds, shortage of personnel and limited support by stakeholders ($P < 0.05$) affect the success of government's enforcement of the regulations. Interventions are, therefore, required to improve enforcement by training fisheries protection officers as outlined in the Malawi Fisheries act 1997 and reduce the level of noncompliance by means of thorough sensitization of fisheries regulations to the user communities.

Keywords: Closed Seasons; Resource Users; Lake Malawi

Introduction

The management of fisheries in Malawi conforms to the National Fisheries and Aquaculture Policy whose primary objective is, "to enhance the quality of life for fishing communities by increasing harvests within safe, sustainable yields," [1-3]. To ensure that there is sustainable management of fisheries resources, the department of fisheries has put in place laws and regulations which are, as outlined in the Fisheries Conservation and Management Act, Closed seasons or areas; Gear limitations; Fish size limits; and Licensing of fish gears. These are common fisheries management measures applied to various water bodies in Malawi including Lake Malawi and were formulated either in centralized management or participatory management [3-4].

There are three types of fisheries governance systems that are used to manage fisheries resources in Malawi. These systems are the traditional, government-centered and co-management [5,6]. The traditional system relies on traditional chieftaincy as guiders of fisheries resources. Furthermore, in this system, there is almost total independence from any form of government mediations as the system purely follows taboos and tenurial rights [7]. On the other hand, control of the fisheries resources

fall in the hands of the government, a system referred to as government-centered system. The system is based on a wide range of scientifically guided regulations and is the predominant system in Malawi. However, an intermediate governance system exist where there is a partnership and sharing of power and responsibility between the government and the resource users to control the fisheries resources. This system is referred to as co-management.

In co-management system, committees such as the Beach Village Committees (BVCs) are created and work together with the government to counteract on noncompliance with the fisheries regulations by resource users to avoid over-exploitation and other related problems. Co-management was given regal recognition in form of a new Fisheries Conservation and Management Act and the policy was revised to incorporate co-management approaches [1], the Fisheries Act was developed mainly to achieve biologically sustainable exploitation of Chambo (*Oreochromis spp*) stock through fisheries regulations [5]. Enforcement units have partnerships with competent courts where violators of fisheries regulations are prosecuted and

sentenced. The police are also involved in the investigation and apprehension of non-complaint fisher folks. Both enforcement by the government and compliance by resource users play important roles in safeguarding the stock of fishes.

The future sustainability and benefits from fisheries have been negatively affected by illegal fishing activities and noncompliance of fisheries regulations which has become a global problem thereby presenting acute threat to regeneration of fish stocks [8-10]. Despite the formulation of the fisheries management and conservation act 1997 and fisheries conservation and management, fishing regulations 2000, there is still a decrease in the fish catches. Over the years, there has been over-exploitation of fish stocks and subsequent collapse of Chambo fishery and other fish species. Increased population of fishermen as well as consumers has been a major cause of such occurrence.

Furthermore, fisheries policy, including technical measures and regulations has largely failed to prevent over-exploitation and the collapse of some important fish species, and this has been attributed to the lack of compliance with fisheries regulations by resource users, glitches in management and top-down control of fisheries by the government [4]. Likewise, efforts to manage, conserve, and enhance ecosystem productivity and production when at same time addressing the needs such as meeting the economic and social well-being of the growing population naturally involves challenges of law enforcement [11]. The available literature and research is not clear on whether there has been success in enforcement of the Fisheries Act and if the fishing communities comply to the Fisheries Act in Malawi. Therefore the present study analyzed the capacity of the government to conserve the fisheries resource through regulations and if enforcement and compliance with those regulations by resource users in Nkhatabay district is effective.

Methodology

Study location

The study was conducted in Nkhatabay district. The fishery in Nkhatabay stretches approximately 200 kilometers between the neighboring northern and southern district coastline villages.

Research design

A cross-sectional study method as described by Creswell [12] was used with the aim of collecting different views about compliance on the fisheries regulation. Qualitative data was collected using questionnaires, interviews. Primary data was collected from fisheries law enforcement personnel, the District Fisheries Officer, fishermen and chairpersons in the Beach Village Committees (BVCs). Secondary data was gathered from Nkhatabay district Fisheries Office which included catch and effort data. The study involved purposive sampling technique where key informants were selected based on expertise [13].

The sample size comprised of 78 respondents of which 39 were fishers and 39 were non fishers.

Data collection

Qualitative data was collected using questionnaires, interview guides, and observational check list. On the other hand, secondary data was obtained through a review of documents on catches of fish reports on enforcement of fisheries regulations and statistics on gear owners in Nkhatabay district.

Data analysis

Both demographic characteristics of the resource users, level of sensitivity of respondents towards fisheries regulations and also level of enforcement and compliance in the district. Logistic regression was performed in SPSS version 20.0 to use examine the factors that affect resource user's compliance with fisheries regulations and challenges of enforcement by the government. Logit (Y_2)= $\text{Ln} (P_i/(1-P_i)) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_8 X_8$ Equation

Where Y_2 is compliance or noncompliance of fisheries regulations (dependent variable); Ln is Natural logarithm; P_i is probability of compliance with fisheries regulations; β_0 is the intercept and $\beta_1, \beta_2, \dots, \beta_9$ are regression coefficients of X_1, X_2, \dots, X_8 respectively. In this equation X_1 is age, X_2 is gender, X_3 is education Status, X_4 is self-interest, X_5 is ethics, X_6 is awareness of regulations, X_7 is Severity of sanctions and X_8 is poverty.

Logit (Y_1)= $\text{Ln} (P_i/1-P_i) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_9 X_9$ Equation 2

Where Y_1 is success or failure of enforcement of fisheries regulations (dependent variable); Ln is Natural logarithm; P_i is probability of enforcement of fisheries regulations; β_0 is the intercept and $\beta_1, \beta_2, \dots, \beta_9$ are regression coefficients of X_1, X_2, \dots, X_9 respectively. In this equation X_1 is Age, X_2 is open access, X_3 is education status, X_4 is sufficiency of funds, X_5 is adequacy of personnel, X_6 is resistance by resources users, X_7 is corruption by law enforcers, X_8 is support by stakeholders

Results

Implementation of fisheries regulation in Nkhatabay, Malawi

92% of the respondents had knowledge about the existence of fisheries regulations and the remaining 8% of the respondents lacked such knowledge. 90 % of the resource users have been sensitized and only 10 % are not yet sensitized about the fisheries regulations in Nkhatabay district. There are several channels through which the knowledge of fisheries regulation is spread to the user communities. Some of these are director of fisheries through media, the DoF through meetings, members of the FCCs and BVCs and Law enforcement officers. Below is graph showing percentage of sensitization delivered by each channel to the user community in Nkhatabay district. About 10% of sensitization of the regulations has been delivered through

the media by The Directorate of Fisheries, 77% by the DoF of Nkhatabay District, 18% by the Law enforcement unit and 28% by members of FCCs or BVCs.

Factors that affect Compliance with fisheries regulations in Nkhatabay, Malawi

Results of the present study (Table 1) show that self-interest (X_4) and awareness of fisheries regulations (X_6) were significant (0.027 and 0.001 respectively) factors that affect compliance with fisheries regulations by resource users in Nkhatabay. Factors that were found not to be significant are not included in the final equation of the model such that the model contains only significant variables as shown below

$$\text{Logit}(Y_2) = (-0.248) + (-1.286X_4) + (2.129X_6) \text{ Equation 2}$$

Awareness of fisheries regulations has a positive logistic coefficient while self-interest has a negative logistic coefficient. Results (Table 2) of the present study show that insufficient funds (X_3), shortage of personnel (X_4) and support by stakeholders (X_7) were significant challenges that the government faces during enforcement of fisheries regulations in Nkhatabay. Factors which were found not to be significant are not included in the final equation of the model such that the model contains only significant variables as shown below:

$$\text{Logit}(Y_2) = (0.065) + (1.745X_3) + (-1.143X_4) + (-1.096X_7) \dots \dots \dots \text{Equations 3}$$

Support by stakeholders and shortage of personnel have negative logistic coefficient while insufficiencies of funds has a positive logistic coefficient.

Discussion

Implementation of fisheries regulation in Nkhatabay, Malawi

According to FAO [14], "The effective management of natural resources requires engagement of the resource users and attendant communities through sensitization as a starting point to achieve successful enforcement operation". People's lack of knowledge of their responsibilities in bringing about a favourable environment for a sustainable fishery may also weaken their effective participation in the management of natural resources and fisheries in particular [15]. Therefore, empowering the communities through sensitization on the fisheries regulations is the first step toward effective management and consequently sustainable utilization of fisheries resources.

Results (Figure 1) of the present study show that the majority (92%) of resource users are aware of the existence of fisheries regulations. Therefore, it can be speculated that the resource users in the area comply with the fisheries management regulations. In addition, the current study (Figure 2) found that 90% of the resource users have been sensitized about the fisheries regulations with Nkhatabay District Fisheries Office taking a large part (77%). Thus, the majority of

responsibilities pertaining to the fishery including sensitization of the regulations are centralized to the government of Malawi through the district fisheries office. The level of participation in sensitization of fisheries by Beach Villages Committees (BVCs) is quite low (28%).

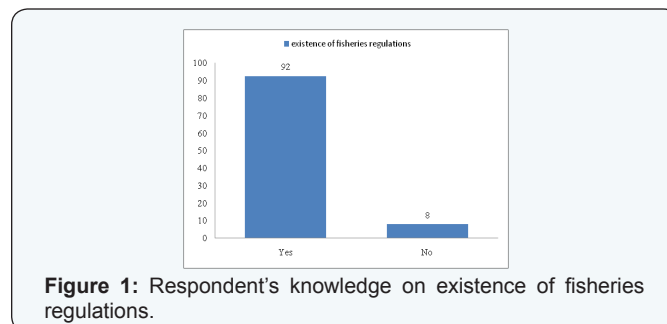


Figure 1: Respondent's knowledge on existence of fisheries regulations.

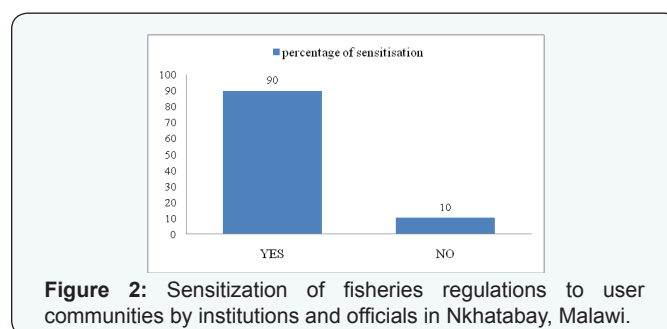


Figure 2: Sensitization of fisheries regulations to user communities by institutions and officials in Nkhatabay, Malawi.

Evidence exists that lack of knowledge about their duties and responsibilities as outlined in the fisheries act, and the motivation to carry out the activities prevents the BVCs from performing their key role in creating awareness on fisheries regulations to the fishing communities. The enforcement personnel as a channel of sensitization have less influence and this has been blamed on the poor interface between the enforcers and resources users because of the way resource users perceive law enforcement personnel. Resource users deem the enforcers are there to confiscate fishing gears and apprehend violators but not disseminate information.

Factors that affect compliance with fisheries regulations in Nkhatabay, Malawi

Results (Table 1) of the logistic regression show that self-interest ($P = 0.027$) affect fisher folks compliance with fisheries regulation on Lake Malawi waters in Nkhatabay district. The findings are in line with Kuperan [16], who reported that self-interest is an important determinant of compliance with fisheries regulations. Self-interest has a huge impact on compliance since it entails freedom of entry to the lake by the population to exploit the resource. Apparently, Nkhatabay district has 1530 gear owners whereas in 2015 it was reported that there were about 1,324 representing a 13% increase. Therefore, with such fishing pressure, gear owners have resorted to violating fisheries regulations with the justification that they make more profit than others who use appropriate mesh sizes and gear length.

Table 1: Logit regression table of factors that affect compliance of fisheries regulations.

Dependent variable	X _i	β coefficient	S.E of coefficient	Wald	P Value	Odds ratio
Age	X ₁	0.373	0.658	0.321	0.571	1.452
Gender	X ₂	-0.303	1.044	0.085	0.771	0.738
Education status	X ₃	0.004	0.572	0.000	0.995	1.004
self-interest	X ₄	-1.286	0.583	4.861	0.027*	0.276
Ethics	X ₅	-0.229	0.697	0.108	0.743	0.795
Awareness of regulations	X ₆	2.129	0.632	11.334	0.001*	8.403
Sanctions	X ₇	-1.191	0.693	2.957	0.086	0.304
Poverty	X ₈	-0.162	0.692	0.055	0.815	1.176
Constant		-0.248	0.652	0.145	0.704	0.780

*indicates significance at 0.05 probability level

Hosmer and Lemeshow (H-L) test for goodness of fit $\chi^2 = 7.629$; $df = 8$; $P = 0.471$

-2 Log like hood = 83.679

Cox and Snell R2 = 0.269

Nagelkerke R2 = 0.359

Prediction of success = 74.4%

This argues well with the theory of compliance which states that the willingness to comply basing on moral obligation is centered on the perceived legitimacy of the authorities charged with implementation of the regulations [17]. To substantiate the foregoing theory, the study present study reports that Sanga stratum had a greater number of gear owners (90%) who attest that moral obligation affects compliance. This is also in corroboration with, most gear owners who perceive the department of fisheries, Ministry of Agriculture as just a tax collecting entity and that Sanga shows more resistance to enforcement activities. Therefore, this affirms that the moral obligation is indeed intertwined with the legitimacy of regulatory authorities.

Awareness of regulations ($P = 0.001$) (Table 1) is another factor that positively influences compliance of fishing regulations by resource users in Nkhatabay district. The result, however, contradicts the findings (Figure 3) on implementation of fisheries regulations which showed that the majority of resource users have knowledge of the existence of fisheries regulations and they had previously been sensitised about compliance with fisheries regulations. This can be attributed to poor sensitization of fisheries regulations such that the majority of fishermen undermine its purpose with regard to conservation of the fisheries resources. In addition, enforcers of fisheries regulation have thrown much emphasized on licensing of the fishing gear overlooking other equally important fisheries regulations. For instance, the present study has observed that most gears exceed the maximum head length of the fishing gear and therefore affirming the use of fishing illegal gears in Nkhatabay waters of

Lake Malawi.

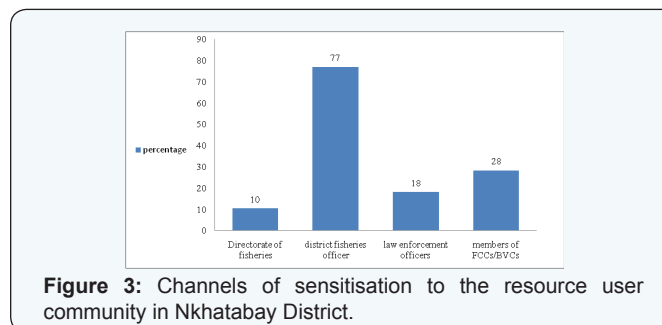


Figure 3: Channels of sensitisation to the resource user community in Nkhatabay District.

Challenges that affect the success the government’s on enforcement of fisheries regulations in Nkhatabay, Malawi.

Enforcement is one of the fundamental concepts towards sustainable exploitation and conservation of the fishery resources. The current study shows that there are several challenges negatively affecting the success of enforcement of fisheries regulations in Nkhatabay. The most significant challenges are insufficient funding, shortage of personnel to enforce fisheries regulation and limited support by stakeholders. Results (Table 2) of the present study show that insufficient funding ($P= 0.002$) and odds ratio (5.726) influences enforcement of fisheries regulations. The result is in tandem with Jamu et al. [4], who highlighted that lack of financial resources prevents managers from efficient inspection. Enforcement of fisheries regulations in Nkhatabay district is exclusively funded by the government of Malawi through the directorate of fisheries.

Table 2: Logit regression table of challenges that affect enforcement of fisheries regulations.

Dependent Variable	X _i	B Coefficient	S.E of Coefficient	Wald	P Value	Odds ratio
Open access	X ₁	-0.124	0.543	0.052	0.819	0.883
Education status	X ₂	-0.250	0.680	0.135	0.713	0.776
Sufficiency of funds	X ₃	1.745	0.557	9.830	0.002*	5.726
Shortage of personnel	X ₄	-1.143	0.580	3.887	0.049*	0.319
Resistance by resource users	X ₅	-0.026	0.530	0.002	0.961	0.974
Corruption	X ₆	.397	0.580	0.470	0.493	1.488
Support by stakeholders	X ₇	-1.096	0.549	3.983	0.046*	0.334
Constant		0.065	0.574	0.013	0.910	1.067

*indicates significance at 0.05 probability level Hosmer and Lemeshow (H-L) test for goodness of fit X² = 9.446; df = 8; P = 0.306

-2 Log likelihood = 85.545,

Cox and Snell R²=0.212,

Nagelkerke R²=0.283

Prediction of success = 66.7%

However, the insufficient monetary resources for enforcement activities lead to minimal enforcement activities undertaken per year in Nkhatabay. For instance, patrols on the lake are conducted once or twice per year and this may have also contributed to over-exploitation of fish stocks through the use of illegal fishing methods and gears. A higher probability of detection from enforcement activities discourages people from committing illegal activities [18,19]. Therefore, with insufficient funds and less activities to conduct, the probability of detecting violators is narrowed, a development that is posing a challenge to effective enforcement.

Shortage of personnel (P= 0.049) is one of the significant challenges that the government face in enforcement of regulations. Inadequate personnel lead to low probability of detection which consequently results in ineffective enforcement of regulation [20-22]. In Nkhatabay district, the number of staff is limited to length of the shoreline (approximately 200 km) and a large number of fishing vessels (2,552) operating various types of fishing gears. This may be attributed to lack of enough training institutions that produce individuals who are equipped with necessary skills that are appropriate for the tasks of enforcements. Limited support from stakeholders (P = 0.046) also affects the government’s success with enforcement of fisheries regulations. One attribute constituting this challenge may be lack of spirit and patriotism in the workers to seek external sources of financial aid to support their activities including enforcement.

Conclusion

Self-interest and awareness of regulations are major factors that affect compliance of fisheries regulations by all players in

Nkhatabay district. Self-interest negatively affects compliance with fisheries regulation. On the other hand, awareness campaigns on fisheries regulation enable the fishery users to be kept abreast with relevant information and they understand the rationale for complying with the fisheries regulations. The present study has also found that sufficiency of funds enhances enforcement of fisheries regulations since important activities are carried out such as frequent patrol son Lake Malawi waters aimed at confiscating illegal gears or catching illegal fishing. However, shortage of personnel and limited support by stakeholders negatively impact on the success of government’s effort to institute enforcement activities.

Recommendations

There is need for the resource users to be thoroughly sensitized on fisheries regulations, more emphasis must be placed on gear limits, closed seasons acceptable fish sizes, and the adverse environmental effects that are aftermaths of illegal fishing. The government must strengthen enforcement by building capacities of all fisheries protection officers through training in order to cover for shortage of personnel that the department of fisheries face and also pump in more money to improve the regularity and frequency of patrols and other enforcement activities. The district fisheries office should develop projects which will solicit funding from external sources apart from the government which are NGOs in order to improve enforcement activities.

Acknowledgement

Authors would like to express their profound gratitude to staff at NkhataBay District Fisheries Office for their support during the study period.

References

1. Government of Malawi (2000) Fisheries Conservation and Management, Fishing Regulations.
2. Government of Malawi (2001) Ministry of Natural Resources and Environmental Affairs: National Fisheries and Aquaculture Policy. Department of Fisheries.
3. Njaya F and Donda S (2007) Fisheries Co-Management in Malawi: An Analysis of the Underlying Policy Process. World Fish Center.
4. Jamu D, Banda M, Njaya F and Hecky R (2011) Challenges to sustainable management of the lakes of Malawi. *Journal of Great Lakes Research* 37: 3-14
5. Hara M (2006) Restoring the Chambo in Southern Malawi: learning from the past or reinventing the wheel. *Aquatic Ecosystem Health* 9(4): 419-432.
6. Njaya FJ (2007) Governance challenges for the implementation of co-management: experiences from Malawi. *International Journal of Commons* 1(1): 137-153.
7. GTZ (2002) Back to basics: Traditional inland Fisheries Management and Environment Systems in Sub-Saharan Africa and Their Potential for Development.
8. MEA (Millennium Ecosystem Assessment) (2005) Ecosystems and Human Well-Being: Current State and Trends, Global assessment reports 1.
9. Sumaila RU, Alder J and Keith H (2006) Global scope and economics of illegal fishing. *Marine Policy* 30(6): 696-703.
10. Abusin S (2015) Approaches and Methods Used to Analyse Compliance with Fisheries Regulations: African. *Journal of Agricultural Research* 10(19): 2104-2112.
11. Kar TK, Pahari UK and Chaudhuri KS (2004) Management of a single species fishery with stage structure. *International Journal of Mathematical Education in Science and Technology* 35(3): 430-414.
12. Creswell JW (2003) Research design, qualitative, quantitative and mixed methods approach (2nd Edn.), Sage Publication, New Delhi, India, pp. 156.
13. Palinkas LA (2015) Purposeful Sampling for Qualitative Data Collective and Analysis in Mixed Method Implementation Research. *Administrative Policy Health* 42(5): 533-544
14. FAO (2001) The International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing.
15. Ntiba MJ, Kudoja WM and Mukasa CT (2001) Management issues in the Lake Victoria watershed. *Lakes and Reservoirs Resource Management* 6(3): 211-216.
16. Kuperan VK (1992) Deterrence and voluntary compliance with the zoning regulation in the Malaysian Fishery, University of Rhode, Kingston, UK.
17. Kuperan K and Sutinen J (1998) Blue Water Crime: Deterrence, Legitimacy, and Compliance, In *Fisheries. Law and society review* 32(2): 309-338.
18. Jamal A and Hussin A (2010) Impact of Enforcement and Co-Management on Compliance Behavior of Fishermen International. *Journal of Economics and Finance* 2(4): 113-124.
19. Abusin S and Hassan R (2014) Legitimacy and ethics or deterrence factors more important for compliance with regulations among artisanal fishers of Sudan. *African Journal of Agricultural Research*.
20. Sutinen JG and Kuperan K (1999) A socio-economic theory of regulatory compliance. *International Journal of Social Economics* 26(1, 2, 3): 174-93.
21. Eggert H and Lokina (2009) Regulatory Compliance in Lake Victoria fisheries. *Environment and Development Economics*, Cambridge University Press, London.
22. King DM and Sutinen JG (2010) Rational noncompliance and the liquidation of Northeast ground fish resources. *Marine Policy* 34(1): 7-21.