Open access challenges in attaining Sustainable Development Goals in Lake Tanganyika: The Case Study of Kabonga in Burundi and Kagunga in Tanzania Landing Sites

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Abstract
Lake Tanganyika is located in the western branch of the East African Rift Valley and is shared by the Republic of Burundi (8%), the Democratic Republic of Congo (45%), Tanzania (41%) and Zambia (6%). About 12.5 million people live in the lake basin, of which more than one million depend entirely on its resources for a living. As a result, some species, particularly species of economic importance, have declined sharply and conflicts have increased due to uncontrolled changes and gear changes in the pursuit of more fish (TAFIRI 2016). For example, the 2011 joint survey of the entire lake revealed a significant increase in the number of active fishers, motorized fishing vessels and prohibited fishing gear since 1995 (LTA 2012b). Most recently, the emergence of modified gillnets of unlimited length has been reported. These are nicknamed by data collectors of this study as 'Abnormal Active gill net fremaya brush-kamatia chini' net (Locally known as Fremaya brush for Burundi and fremaya makila kamatia chini for Tanzania) and may impact the sustainability of food and rights of other fisheries in the area. Lake management and control efforts are hindered, alongside other factors, by the low rate of adoption of harmonized fisheries policies, processes and procedures between the riparian states of the lake. The case of closing seasons and the illegality of gillnets on the Burundian side of the lake is compared to legality of gillnets in the Tanzanian part of the free access fishery. Using the case study of the Kagunga Landing Site in Tanzania and its nearby Kabonga Landing Site in Burundi, this study explores bottlenecks arising from non-harmonized fisheries management laws, policies, and practices among fisheries in riparian states of Lake Tanganyika.

Keywords: Open Access, modified Gillnet, Overfishing, Fisherman, Harmonized Laws, Fisheries Management, Lake Tanganyika

1. INTRODUCTION

The current population of the Lake Basin is above 12.5 million but, in terms of fish consumption, considering only the population living near Lake Tanganyika shore is dangerously misleading. Population in Burundi alone is already 11 million and although only one million live on the lakeside, all households now eat fish from the lake rather than from the fish-farming sector, which is under-developed but growing. Kagunga is geographically located at 4° 29' 0" South, 29° 39' 0" East 18 and Kabonga at Latitude of 4.4072°, and Longitude of 29.6739°.

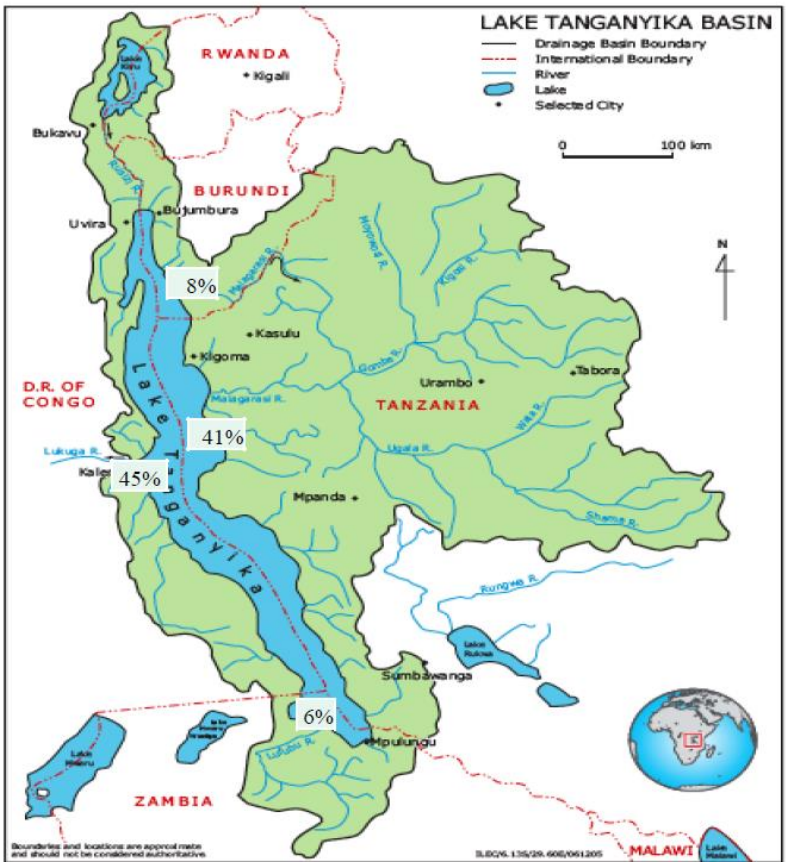

Figure 1. Map of Lake Tanganyika with country.
Source: Williun Apollinaire.

Since the year 2016, the collapse of the wild adult pelagic fish stocks was reported to Lake Tanganyika Authority from all over the lake, even at places that are not intensively fished. 2017 was reported as similar, and the reporters (Mlimbwa & Chubwa, for 2017 and 2018) described it as an even worse situation for the first six months of 2018. Although not yet fully proven but reasoned from the responses of indigenous knowledge sources, both study sites concurred that the initial collapse of the stocks (2016) could be caused by prevailing use of Active Abnormal gill nets. Nonetheless, in order to compensate for their economic losses due to the absence of high value, adult fish, a majority of fishers adopted irrational fishing practices, consisting mostly of the capture of their juveniles of low essential value. This hastened the deterioration of the fish resource, and overfishing explained the catastrophic landings by the offshore fisheries in 2018.

The Lake Tanganyika Authority Secretariat, since its origin, has coordinated and supervised some major actions at the regional level in partnership with member states, FAO, NGOs and donors to implement projects in fisheries management, to contribute to an increase of food security and to improve livelihood. More efforts and funds are yet needed to ensure sustainable fisheries management and utilization.

1.1 Description of the fishery

Lake Tanganyika provides the second-largest freshwater fisheries on the African continent with an annual fish production potential of the four countries bordering the lake estimated to vary in the range of 165 000 – 200 000 metric tonnes (mt). Recently, it was reported that annual yields fluctuate between 20 t (Burundi) and 184 000 t (Tanzania) (Philippe, 2013). The lake is shared between Burundi, Democratic Republic of Congo, Tanzania and Zambia. Small and medium scale fishing predominates with two distinct but often overlapping fisheries: 1) offshore fisheries (pelagic zone), which mainly target two species of sardine-like clupeids and four species of perch; and 2) nearshore (littoral zone) fisheries, which target a wide diversity of species (LTA, 2016).

Table 1. Significant commercial species from Lake Tanganyika.

Offshore (pelagic species)	Maximum length (mm)*	Type of Gears (2018)	Abundance (2014)
1. Lates stappersii	450	Lt, RN, MAGN, AP	Abundant
2. Stolothrissa tanganicae	102	Lt, RN, MAGN, AP	Abundant
3. Limnothrissa miodon	170	Lt, RN, MAGN, AP	Frequent
4.Lates angustifrons	2000	Lt, RN, MAGN, AP,HL	Infrequent
5. Lates mariae	750	Lt, RN, MAGN, AP.HL	Infrequent
6. Lates microlepis	850	Lt, RN, MAGN, AP,HL	Frequent
7. Hydrocynus goliath	2500+	BS, MAGN, RN	Rare
Nearshore (littoral) and marshes species	**Maximum length (mm)***		**Abundance (2014)**
Boulengerochromis microlepis	800	BS, MAGN, RN,HL	Frequent
Limnotilapia spp	260	BS, MAGN, RN	Frequent
Tylochromis polylepis	435	BS, MAGN, RN	Frequent
Bathybathes fasciatus	397	BS, MAGN, RN	Frequent
Bathybathes ferox	362	BS, MAGN, RN	Frequent
Chrysichthys graueri (catfish)	360	BS, MAGN, RN	Frequent
Clarias gariepinus (catfish)	1700	BS, MAGN, RN,HL	Frequent
Dinotopterus cunningtoni (catfish)	1750	BS, MAGN, RN.HL	Rare (frequent in DRC)

LT- Lift net, AP- Apppdo
RN- Ring net, MAGN- Modifies active abnormal gill net,
Bs-Beach seine HL- Hook line

Source: LTA, 2016.

All the pelagic fish species of Lake Tanganyika are commercially exploited. The artisanal fleet, using catamarans with lift-nets in most of the lake or ring-nets in the extreme south, operates further offshore and catches the pelagic species of commercial value; two Clupeids and four Centropomids. The main species are the sardine *Stolothrissa tanganicae* and the perch *Lates stappersii* (previously *Luciolates stappersii*) which represent 98 percent of the total landings of the offshore fishery (Philippe and Tom, 2015). They provide between 25 percent, and 40 percent of the animal protein consumed in the region and the annual estimated value of the fisheries is USD 700 million (Philip, 2013). The offshore fish production is characterized in normal times by two annual peaks of abundance for the two main species, leading to the quick and improper processing of the large surpluses and the temporary collapse of fish price.

However, the sustainability of fisheries resources and the attendant business are jeopardised by a number of factors. To name just a few: there is an increase of population in the lake basin; an increase of fishing capacity; an extraordinary increase of bad fishing practices such as illegal modified gill nets, locally known as “fremaya brush” for Burundi and “fremaya makila kamatia chini” for Tanzania; and the use of generator

and solar-powered LED lighting systems which are overtaking the conventional kerosene-powered pressure lanterns (LTA, 2018; Sweke et al., 2013).

Recently, fisher communities, stakeholders and government have been experiencing unexpected massive catches of juveniles of *Luciolates spp* and *Stollothrissa tanganyicae* (LT sprat) fry, both of which are indigenous to Lake Tanganyika. In this study, the increase was reported to be an increase of bad fishing practices above. These gears are catching tremendous amounts of juvenile *Luciolates* species and sardine fry.

In realization of these threats to the sustainability of the lake, the LTA countries and different stakeholders of the lake established national and international management measures. The measures are diverse; they include conservation, fisheries frame surveys, scientific studies, policies, frameworks, laws, surveillance, and so forth (see Bunting, 2001). However, fish stock assessment has never been conducted in 20 years, and the implementation of management measures is still limited — some need to be reviewed so as to slow down the fishermen marathon toward immature catching behaviour.

LTA aims to implement its convention on the Sustainable Management of Lake resources for the livelihoods of riparian communities, using an FAO questionnaire on tenure and user rights in capture fisheries to collect information. This includes the case study of the transboundary landing sites of Kabonga of the Republic of Burundi (KB) and Kagunga of the United Republic of Tanzania (KT).

The study aimed to provide vivid evidence of how a lack of harmonized policy with an open access practice can lead to fisheries resource depletion, environmental degradation, socio-economic conflict and poverty among fisheries communities. The information was gathered from 54 fishers aged 19 to 46 years, among which 4 were women, 50 were men and the other 4 governmental officials. The 54 respondents consisted of fish operators, owners of different fishing gears and vessels, and boat builders.

Table 2. Information on fishing capacity and gears at Kabonga and Kagunga sites.

Gears type	No. of Engine	Measurements	Size of the Fish adult/juvenile/ both	Numbers of fishing Gears			Number of boats			No. of Fishermen employed		
				KB	KT	Total	KB	KT	Total	KB	KT	Total
Catamaran Lift net	86	length: 40m Depth: 25 -35m,	Both	06 40	11 86	126	20	140	160	280	516	**796**
Planked Ring net	12	length: 35- 40m Depth: 25 -50m,	Both	0	7	07	20	28	48	60	84	**144**
Planked Gill net abnormal	20	length: 1000 - 3000m Depth: 25 -30m	Both	0	20	20	0	40	40	0	60	**60**
Appolo Appolo lift net	75	length: 30-40m Depth: 25 -50m,	Both	70	0	70	34	0	34	490	0	**490**
Gill net normal-passive	NA	length: 80-100m Depth: 1-1.5	Larger	30	20	50	60		60	60	0	**60**
Hooks-Passive	NA	30 -50 hooks/fisher	Larger	100	15	15		13	13	200	30	**30**
Total	193			125	128	243	134	221	355	930	690	**970**

NA= Non-motorised gear; KB= Kabonga landing site in Burundi, KT=Kagunga Landing site in Tanzania

The statistics show that in this study, numbers of fishers have increased in both landing sites over these eight seven years (168 in 2011 to 930 fishers in 2018 for KB; 111 in 2011 to 690 fishers in 2018 for KT). Noncompliance was observed and reported by fishers involved in the study in both sites. The nonconformity includes immature fishing and illegal modification of gears, as well as prohibited measurements, mesh sizes, fishing times and areas. For instance, ring nets are illegal in shallow water in the Fisheries regulations of both countries. Their operation is only allowed in deep waters in both countries at night hours, but this stipulation is not adhered to. Operation is illegal when done in shallow or even breeding areas for pelagic species, where it collects fry and juveniles of *Luciolates* and sardine, which leads to the decline of fish stock. However, fishers in both Kabonga and Kagunga were reported and observed to be using such nets any time as long as there is fish to fish (personal communication, 2017).

1.2 Economic contribution and social implications of the fishing activity

The lake basin provides about 12.5 million people with food, drinking water, and a transportation corridor. Many more millions of people residing within the wider trading orbit of the Tanganyika basin benefit from its resources as consumers of fishery products. Fishing activities in the study area are benefiting more than 35 000 of the population, both directly and indirectly.

In the study area, there were more than 1 620 fishermen who are directly employed under fishery (Report from Fisheries Extension officers working in the study area). About 85 percent of 54 respondents are fishers who are earning about 26-50 percent of the earnings that is divided to the number of fishers, and the remaining is for owners, i.e. 15 percent. However, the sustainability of this lake, its resources and the attendant business are at the limit, due to the increases of illegal fishing and population in the basin.

Most fishers are occupied full-time, except when there is fish scarcity. Out of 54 fishermen, only eight were not full-time fishers. The activities are not done on a daily basis, and other livelihood activities performed by the respondents from May to July were transport and retail business. Only 12 and eight percent from Kabonga and Kagunga respectively mention participating in agriculture activities. They confirmed that it is not easy for fishermen to change to different activities. Those who can readily change are owners. In both sites, six species were mentioned to greatly contribute food and income to individuals, households and local governments, among which clupeids contributed about 80 percent of the catch followed by *Luciolates*. Other species consumed locally are Lake Tanganyika Sardine Tanganyika Lates, Giant cichlid and *Limnotilpia.* The findings are close to those of the study conducted in Kigoma, which is about 60km south of the study area under analysis. The work in Kigoma indicated that 70 percent and 25 percent of the catch was *Luciolates* and Luciolates (Kimerei, 2006). The catch, particularly sardine *Stollostrissa*, is traded within the sites and in nearby cities like Burumbura and Kigoma. They are also traded in Eastern D.R.Congo and other international markets such as Canada and Belgium (LTA, 2017). Other species such as *Lates*, Giant clupeid, and *Limnotilapia* are caught in littoral waters and are commonly sold at the local markets for household consumption.

<u>Conflict and conflict resolution in open access fishery</u>

The existence of conflicts was investigated using FAO questionnaires, but there was no conflict between fisheries and other livelihood sectors in the two sites. The only conflicts pointed out were due to resource competition at the fishing ground between fishers who operated different gears and targeted the same fishing ground/species. It was reported, however, that local fisheries institutions of Burundi and Tanzania respectively would resolve such antagonisms whenever they arise. It was reported that leaders of these institutions could solve almost 90 percent of the antipathy. If parties failed to settle their confrontation, they appeal to the higher governments authorities in their respective areas.

In the study area at KT, a misunderstanding of resource competition among fishers with different gears was mentioned. A good example was the relationship between fishers who are using lift nets, those who use modified gill nets, and those who use ring nets. It was reported that fishers that are modified gill net and lift net operators did not like each other because they fished the same species (*Luciolates* and Sardine *Stollostrissa*) at the same fishing ground (pelagic).

The gill net was reported to have four problems. First, it occupies a large volume of space (1 000- 4 000 meters long, 25-30 meters deep) compared to a lift net, which has a circumference of 24 meters with a depth of 25 - 40 meters toward the cord end. Second, during fishing operation, gill nets drift toward the area where the lift net is set, provoking lift net owners. It was reported that proximity of nets during the hauling caused nets of different fleets to interweave, sparking blame games between the groups. The current modified gill net drifts dredging hauling toward the area where lift nets are set for fishing. Sometimes unravelling of the tangled nets took lots of time, and pieces must be cut and then left in the water. This damages fishing gears wastes time and loses catch.

The third problem is that the modified gill net is suspected of collectingten fish that are intended to be hauled by the lift net fishers. Out of the 54 fishers interviewed in each site, those who have supported the occurrence of this antagonism rated at 87 percent at Kabonga and 93 percent at Kagunga. Fourthly, it was mentioned that modified active abnormal gill nets actually destroy fish; they have an unacceptable ply net that catches massive amounts of sardine fry of *Stollothrissa tanganincat,* as well as *Luciolates* juvenile and other species. Based on the misunderstandings, it was suggested that a timetable be made for different fishing operators by governmental officials.

It was learned that KB closes its fishing season for about ten days in each month during the full moon to comply with its national regulation of closing fishing season and landing site. At the same time, KT does not practice this measure. The disgust was that fishers in KB felt their reserves were being harvested by their neighbours. Additionally, there was a feeling among those implementing closure season felt their neighbours were getting more money as they starved during the closure. The ten days closure concerning growth parameters of the intended species might not bring positive results; therefore, a research profile might be helpful to suggest the period of closure in the future plan.

2. MANAGEMENT OF THE FISHERY AND OPEN ACCESS

2.1 Management of the fishery

Fishery in this study area is transboundary and multinational with a single unified convention on the Sustainable Management of Lake Tanganyika Article 2(a) and 7(1,2). This convention insists on the cooperation of the Contracting States in planning and managing activities that negatively affect a Contracting State and are under its jurisdiction. The states also shall promote broad participation in fisheries management and co-operate to promote sustainable fisheries management on Lake Tanganyika. They shall also take, as a matter of priority, appropriate measures to prevent and reduce as far as possible adverse impacts from fishing activities under their jurisdiction or control. It is through this that fishers are directly involved in fisheries management.

The case study illustrates how the ability of the fishing institutions to be proactive depends chiefly upon training and working facilities support from the government. In this case, KB was found to be more active than KT. It was mentioned that members of the fishing community who lack alternative livelihoods more easily violate fisheries regulatory measures toward resources. Therefore, the cross-collaboration in terms

of capacity building, conduct research based on the prevailing needs, awareness-raising to change the defaulters' behaviour and support small economical intervention that they can deal with during closure seasons.

The responsibility for managing the fishery resources resides with government member states, fisher communities sharing the lake, and other stakeholders. The government recently agreed to promote community participation through fisher officials, registered groups and Fisheries federations in Tanzania and Burundi respectively. In Burundi, the fisheries federation is strong compared to other states, due to empowerment from the government. They conduct patrol in confiscating illegal gears, and thereafter they submit the gears to be destroyed by government officials. Government has empowered them to collect some fees from defaulters who used to fuel patrol boats, though these penalties are low and insufficient. Fishermen and other stakeholders in the study areas are organized and registered locally known as Fish Federation and Beach Management Unit for Burundi and Tanzania, respectively.

The management system used for fishery resources is a combination of government management and co-management. However, National fisheries policy and regulations of all riparian states emphasize community involvement, but still, the top-down management exists. Nevertheless, the degree of involving fisher communities increased more than ten years ago to both sides (LTA, 2018). In these two landing sites, the effectiveness of community involvement and direct communication with the government is higher in KB than KT. Such an example is when fishermen advised government to burn the modified Active abnormal Gill net (fremay brush- kamatia chini') nets in KB. The government, in collaboration with fishermen, took action to burn the gear.

Input into management:

In this management system of these study areas, individual fishers, authorities staff, fisher associations, and NGOs who are stakeholders all propose opinions, which are finally embraced by the government and thereafter at regional level (LTA, 2012a). Therefore, national regulations on the study area provide a platform where all fisheries/stakeholders such as fishers, fisher groups, regional fisheries management organisations (RFMOs), and fisher communities are called by their government to get involved in rule setting that governed this resources. For example, the suggestion of burning modified active abnormal gillnets 'fremaya-brush kamatia chini' in Burundi.

Management measures:

Management measures are undertaken by individual country while waiting on the approval of the Frameworks Fisheries Management Plan. Regulations, implemented at a low level, were found to be means of collecting government revenue, rather than impactful management tools. These include restricting fishing gear (e.g. mesh size restrictions), closed areas (e.g. 50m from shoreline), lunar break observations, and licensing. Other measures, which have been mentioned, are closure season, control, surveillance and enforcement (e.g. burning illegal gears such as modified gillnets).

The rare application of the measures was seen to be caused by a combination of factors. These included open-access nature of the fisheries, a shortage of manpower, a lack of surveillance facilities due to financial constraints, logistical constraints, a lack of awareness by the fisheries communities, and an inadequacy in the dissemination of relevant information.

Monitoring and enforcement:

Generally, enforcement is engineered by government entities with the involvement of fisher local communities, such as the Fisheries Federation for Burundi and Beach Management Unit for Tanzania.

Strong involvement of the local and central government authorities was mentioned to be a success; RFMO is playing a key role of harmonizing fisheries policy and regulations, disseminating proper information related and promoting proper fisheries management to rescue transboundary resources for sustainable regional livelihoods. It was found that on one site enforcement measures can be somewhat effective, but on another site, there were a number of challenges, including lack of patrol boats. One strength noticed in KB sites is that if there is a strong involvement of other sectors. At both sites, there were claims of inadequate and lack of surveillance facilities and funds.

Using the FAO questionnaire, the most hazardous events mentioned by respondents included storms and piracy. Both led to the bankruptcy of fishers, thereby removing them from fishing activities or forcing them to resort to cheaper illegal gears to survive. It was reported that piracy would occur at night, where their gears would be taken, and some of them would be drowned.

3. CONTRIBUTION OF THE OPEN ACCESS APPROACH TO ACHIEVING SUSTAINABILITY

3.1 Sustainable use of the resources

Among other challenges, one is the undefined suitable mesh size to be used in the fishery, to minimize pressure on exploiting immature sardine and *Luciolates spp*. Using indigenous knowledge and other research findings, it was recognized that immature *Luciolates spp* was 160 mm in length. From this point of view, together with the occurrence of Stollothrssa juveniles (Kimerei, 2016), changes were noticed. Additional change was observed and reported in catch composition during our study, whereby ten percent of sardine *Stollothrissa* against 90 percent of juveniles of *Luciolates* has increased from that which is reported. The abundance of Clupeids, which have a short-term breeding circle, has remained unchanged. Likewise, rest of species like Lake Tanganyika *Lates*, Giant Cichlid, *limnolitapia* spp have decreased in size and catch. This is probably due to bad fishing practices in onshore waters.

The modified and active abnormal gill net, which is illegal at shallow water, is greatly impacting fishery stock biologically, with its unacceptable length, mesh size and active fishing operation of cruising. This is because such nets have heavily caught immature fish, and they interrupt the growth of the fish. With lift nets, mesh size is also causing the same impact. Ring net operation at a shallow fishing ground as well as its mesh size both lead to biological impact and hence destroy fisheries' biodiversity by blocking fish recruitment systems; this may lead to the total collapse of the fishery. These effects are brought by countries' slow decision-making to harmonizing management frameworks, and also by a lack of alternative livelihoods. During the concluding meeting with interviewers at the study area, they reported not to be happy with the situation of ending up with immature fish and let the government harmonize the regulation regarding the destructive fishing practices (Mr Chubwa and Eliasa- BMU leaders of KB and KT).

3.2 Economic viability of the resource

Generally, fishing efforts have increased six-fold in Kabonga and Kagunga landing sites. There were 930 fishers in KB and 690 fishers in KT, compared to that of 2011, where there were 186 and 111 respectively. An increase of immature fish due to the increase of gears and fishers has reduced economic value within the fish chain. This also contributes to a weakening of food security in the area. The losses are demonstrated in the tables below:

Table 3. Value of one box of fresh immature Lates stappersii (Luciolates) compared to mature fish from the same box (BIF = Burundi Franc; Tsh = Tanzanian Shilling).

Species	No if individual fish/ per box	Value /portion/BF	Total value per box (Assume one box contains 50 portions
		BIF/Tsh	
Luciolates, immature	126 x 50 portions = 6300	1000/126 pieces	50 portions x 1000 = 50 000 BF
Luciolates, at maturity/adult	250 pcs/box 6300 =25 boxes	3000/7pieces	(25boxesx250)/7pcs
			=892x3000=2.6M
		Loss by selling immature	-2.55 BF millions

Table 4. Social loss of immature catch versus mature catch among Luciolates species.

Average fish consumption rate in LTA states is between 2 to 10 kg/prs/year			
Species	No if individual fish/ portion	Required pieces to attain 10/kg	No.People benefitting from one box
Luciolates - immature	126pcs =1kg	1260 piece of fish	5 people
Luciolates - at maturity/adult 1 box = 6300fish/ 7= 900kg	7pc = 1kg	70 piece of fish	90 people
		Social Loss by selling Immature	8 persons

Because of these realities, selling immature fish brought about poverty to the community and blocked increasing fish consumption rates. Furthermore, it reduces government revenue, as well as social services that could be supported by the government. Economically immature fishing at the open-access transboundary fish with unharmonised regulatory frameworks is not viable. It also runs contrary to the aim of promoting food security in the region.

4. MAIN CHALLENGES AND WAY FORWARD

4.1 Challenges for the fishery

There are several important challenges to confront in the study areas:

- Unharmonized fishery regulatory measures and standards amongst member states.
- Low compliance rates with fisheries laws and regulations, and inadequate enforcement of these leads to a prevalence of immature fishing and marketing in the study areas.
- Ineffective involvement of all stakeholders in the fisheries management process.
- Conflict between fishers due to resource competition.
- Limited scientific findings, as well as other sources of knowledge to provide sound data that can be used for decision-making in the management plan. Among the reasons for this are a shortage of manpower, financial constraints, and lack of awareness by the fisheries.
- Changing gears consistently in order to catch pelagic fish leads to a loss of pelagic and littoral. fisheries resources, as well as a reduction of fish, and social/economy impacts.
- A loss of aquatic biodiversity and ecosystem services, and habitat degradation.
- Lack of alternative activities for fishers.
- Population increase.

4.2 Improving fishery sustainability in the future

Sustainable use of the fisheries resources depends much on evidence from well-collected data. This can inform proper decision-making on management measures, regulation amendment, and government/community commitment to enforcing regulations. This is especially important since every day fishers seek to deviate from the regulations.

In order to increase the fishery's sustainability, economic viability and social equitability, the following is therefore suggested:

- Harmonize regulatory frameworks (e.g. control immature fish, closures (both spatial and temporal), minimum mesh sizes and size limits) on minimum legal lengths that our collaborators LVFO are implementing.
- Immediate meetings involving fishermen, women fishmongers, youth and technical government fisheries officials are highly required to agree and propose administration and management rules, so as to rescue fishery stock as well as to improve the economic wellbeing and food security of the fishery community and the larger region.
- Conduct training and awareness campaigns against illegal practices and abolish immature fish marketing.
- FAO and other fisheries practitioners are invited to support LTA riparian states with interventions to support fishery attainment of SDGs:
    a) Conduct research on suitable mesh size of commercially exploited species in order to suggest the appropriate mesh size for use in the fishery (TAFIR, 2006).
    b) Urgently conduct a study on the economic loss from the immature fish, to show how many resources are wasted from individual perspectives, and the region/nation as a whole. This will show how negatively fish per capita consumption is reduced, which is currently is 2 kg and 9 kg/prs/year for Burundi and Tanzania.
    c) Approval of LTA aquaculture protocol that shall support the creation of alternative activities in fisheries during the closure system, through the promotion of environmentally friendly cage culture.
    d) Conduct a socio-economic study on the importance and contribution of the fishery resources of the lake to community livelihoods.
    e) Establish legal slot size of the *Luciolates spp* so at to rescue its stock; currently, there is none and when people are caught some politician is using it as an excuse for people to continue to trade the immature fish.
    f) Support fishmonger women with savings schemes and communal cage culture.
    g) Research the months which fish-breeding and member states should institute closing seasons, as per researchers' advice.

- Diminish immature/juvenile fishing through developing sensitization programs for the population. These would illustrate the negative impact of buying immature fish on future economic viability in order to change behaviour.
- Develop an immediate intervention that restricts the sale of juvenile fish, like seizure and destruction of all juvenile pelagic fish landed or the prohibition of transportation and local or domestic sale.

ACKNOWLEDGEMENTS

LTA would like to express its greatest gratitude to the people who have helped and supported the study and seen its success. We would like to express our deep gratitude to FAO, who supported LTA to attend the User Rights 2018 Conference and made all necessary arrangements for its success. We are thankful to LFVO for their good collaboration and the Republic of Burundi under the Minister of Environment, Agriculture and livestock (fisheries chain promotion) for their good cooperation in data collection the timely sharing of information. Our grateful thanks are also extended to the United Republic of Tanzania, Ministry of Livestock and Fisheries through their Fisheries field officer and fishermen organizations, for their efforts and frankness in responding to various questions collected to equip the preparation of this case study.

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