Emerging frontiers for blue growth in African Great Lakes: The potential for recreational fishing industry in Lake Victoria, Kenya

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Emerging frontiers for blue growth in African Great Lakes: The potential for recreational fishing industry in Lake Victoria, Kenya

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Sport fishing for Nile Perch and Tilapia are key attractions to recreational anglers on Lake Victoria. Existing hospitality establishments promote sport fishing with angling as the main form of recreational fishing. Development of this industry is expected to generate accrued benefits of eco-tourism and community empowerment by providing alternative sources of income from the already strangled commercial and subsistence fisheries calling for diversification within the fishing industry. Key informant questionnaires were administered to County tourism and fisheries representatives, hotel directors or managers, and officials of Beach Management Units while questionnaire-led-interviews were conducted at the beaches or community recreation sites. Seven tourist resorts, one yacht club, and seven beaches/fish landing sites were assessed. The study aimed to assess the current status of recreational fishing and identify growth opportunities within the industry. Recreational fishing was concentrated around Mfangano Island targeting Nile Perch using artificial baitfish as a tackle. On average, boat hire charges including fishing tackle were USD 30 per trip (< 3 hours) and USD 100 per day per fishing trip. "Blue tourism" rating was low across the respondents with the 2007 political unrest said to have heavily impacted the number of tourists to the region. Water Hyacinth and poor water quality remain a key challenge within Winam gulf while overfishing posed a major concern in the open lake with the number of longline fishers reported to be on the rise. Resource spatial planning should be instituted to cater for the different players in the Blue Economy. The strict enforcement of the Nile Perch slot size is recommended and cooperation among industry players on access and use of the products from recreational fishing. A national census survey on recreational catches should be conducted if its full potential is to be realized in promoting blue growth.

Keywords: angler, fishing tackle, Nile Perch, status, recreational catch

Introduction

Recreational fishing refers to the harvesting of aquatic animals for pleasure; this type of fishing does not constitute an individual's primary resource or intended to meet his or her essential physiological needs. Fish caught is generally not meant for sale (Arlinghaus and Cooke, 2009; FAO 2016a). It is also known as sports fishing with a history that dates back to the 15th century among

3

the Japanese using fly-fishing. Dame Juliana Berners was the first person to write an essay on recreational fishing. In her writings, the theme 'Angling' is the first of text to appear in Europe in 1496. According to her, the sport was an exercise for noblemen after war and a substitute to war. Publishing of her work "Treatyse of Fysshynge wyth an Angle" in 1496 revolutionized this sport giving a description of angling techniques applied in recreational fishing (Cowx, 2001). Economic benefits accrued from recreational fishing include income generated at local, regional, and national levels in fishing expenditure-dependent commercial activities. This is usually in the form of excise taxes, licenses (fishing and facilities/ clubs), stamps, and registration fees for equipment (Arlinghaus and Cooke, 2009).

In Kenya, marine sport fishing dates back to the 1950s but gained prominence in the 1980s. The industry is strongly associated with tourism-related activities, which provide alternative sources of livelihoods for coastal communities. Offshore anglers mainly use hook and line while trolling, drifting and spinning is common in shore-based fishing. Sport fishing charters operate from all major ports moving 35 - 55 km offshore with activities concentrated around Watamu, Malindi, Shimoni, and Mombasa with 22,000 fishing trips that were recorded at the Resort of Malindi alone between 1990-2008 (Le Manach et al., 2015). Visiting anglers to the Kenyan waters mainly target the sailfish and other large pelagic species (FAO, 2016b). Data on recreational fishing is limited even though the industry has existed for decades. Catch re-construction estimates reported 34 metric tons (mt) in 1951 to around 1,300 mt in 2010 (Hughes, 2015). Marine capture fisheries production contributes approximately 10% of the total national fishery production valued at KES 1.6 billion with monthly catch estimates of 1,200 to 3,400 mt. Out of the entire production network, 80% of it is by small-scale artisanal fishers while 20% is from industrial and semi-industrial fishers. There are approximately 100 vessels (private and charter fishing) operating as recreational vessels along the Kenyan coastline (Ochiewo et al., 2018)

Within Kenyan's freshwaters, the sport dates back to the early 1900s with the introduction of trout in the high altitude regions (6000 ft) of Mt. Kenya and the Aberdares. Two species were introduced: the brown trout (*Salmo trutta*), in 1905 from Lock Leven, Scotland and the rainbow trout (*Onchorhynchus mykiss*), that was introduced in the same period and later in 1910 from South Africa for recreational fishing and aquaculture (Gichuru et al., 2018). The pristine fast flowing rivers of Mt. Elgon with all year round clean and cool water with temperatures ranging between 10-20 degrees Celsius were found to be ideal for sports fishing which saw the introduction of trout in the 1930s.

The sport became well developed on the lakes and mountain streams of Mt. Kenya and the Aberdares where it is still practiced to date. The first sports fishing club in the country 'Kenya Angling Association' now referred to as the Kenya Fly Fishers Club (KFFC) was established in 1919. The club has remained active to date with active sports fishing on a catch and release basis recording 805, 916 and 983 trout catches in 2017, 2018 and 2019 respectively. Aberdares National Park, under the Kenya Wildlife Service (KWS), has a regulated catch and release recreational fishery where tourists are allowed to fish a maximum of two fish per person. Biological baits are recommended to minimize injury in the case of catch-and-release. Currently, there are seven fishing camps in Central Kenya, five of which are gazetted. The success and uptake of the industry post-independence was varied in the regions where it was practiced. History alludes to the enactment of the Trout Ordinance (Cap 380) in 1948 to regulate its exploitation banning locals from participating. This may not have resonated well with the local communities, most of whom did not take up the sport post-independence (Ogada et al., 2013; Gichuru et al., 2018) which saw most of the stocked rivers and dams around Mt. Elgon degraded and abandoned. However, the potential for the revival of trout fishing around Mt. Elgon is immense and offers a wealth of opportunities for the sport fishing enthusiasts. The Forest Act of 2005 legally entrenched the participatory forest management (PFM) policy giving birth to Community Forest Associations (CFAs), who, in collaboration with the Kenya Forest Services (KFS) have partnered towards the prudent management of resources in the forest reserves through protection and conservation activities. This is key in addressing common challenges from anthropogenic disturbances within the catchment which have seen the riverine habitats

degraded in both the Mt. Kenya and Mt. Elgon ecosystems (Kenya Forest Service, KFS 2021; Mogoi et al., 2012).

Within Lake Victoria, recreational fishing industry is underdeveloped and with limited data. Information is largely limited to online web-based sources from industry players and service providers with fishing charters across Kenyan waters to popular sports fishing destinations in Uganda and Tanzania. Historically, the northern shores off Rusinga-Mfangano Islands in the Kenyan waters form the hotspots of recreational fishing. Large Nile Perch (*Lates niloticus)* specimens weighing 30 kg - >100 kg have been reported from commercial Nile Perch catches in the deeper waters from Luanda-Kotieno towards the open lake making it a competitive game fishing spot.

Whilst it has not been economically quantified for the recreational fisheries in Kenya, fisheries production in the country accounts for 0.5% of the GDP in 2018 (KNBS, 2019). The fishing industry in Lake Victoria provides employment opportunities to over 220,000 people directly involved in fisheries with approximately 47,976 fishers in 2020 in Kenya representing the largest fishery in the country (about 90%). One of the biggest problems in the lake is the increasing fishing effort and capacity. The density of fishers had increased from 9.7 fishers per km^2 in 2016 to 11.45 per km^2 on the Kenya waters of Lake Victoria. Frame Surveys (2000-2020) show a marked increase in the number of motorized boats and a decrease in traditional crafts. Similarly, the numbers of fishing crew and active crafts have been on the rise from 38,431 crew operating 11,515 vessels in 2000 to 43,799 crew operating 14,365 crafts in 2016 (Aura et al., 2020). This number has further increased to 47,976 fishers recorded in 2020 operating 15,463 crafts excluding 80-foot fishers (Frame survey, 2020; LVFO, 2016).

To sustain economic growth in the Lake Victoria region, there is a need to diversify economic activities for stronger and inclusive blue growth. The tourism sector in Kenya ranks second in foreign exchange earnings contributing about 10% in GDP. In 2016, it generated about US$ 6.7m to GDP with a contribution to employment at 3.5%. During the 2016-2017 assessment period, Kenya ranked 12th in Africa in terms of tourist arrivals (KIPPA, 2017).

Albeit this development, product quality and diversity have been cited as major challenges in Kenyan tourism, with wildlife tourism accounting for over 80% of the total visitors. As such, there is a need to diversify tourism products and address unexploited and underdeveloped products (Kenya Sessional Paper No.1 2010).

This study forms a baseline on the revitalization of sport fishing within Lake Victoria, Kenya, beyond commercial and subsistence fishing in promoting Blue Economy in the region. It presents a highlight of present recreational fishing dynamics including challenges and opportunities for Lake Victoria's blue growth. Further, it proposes structures or instruments that would promote its growth thereof.

Materials and methods

Study area

Lake Victoria is the second-largest freshwater lake in the world measuring 66,973 km^2 with a shoreline of 7,142 km and currently 985 islands. The maximum depth is approximately 80 m with a mean depth of 40 m (Hamilton, 2016). It is shared between Kenya 6%, Uganda 43%, and Tanzania 51% (Talling, 1966). It is one of the richest lakes in the world in terms of fish species diversity and home to over 500 haplochromine cichlids species which constitute a species flock of un-paralleled diversity with over 1500 species found within the East African Great lakes (Witte et al., 2007; Salzburger et al., 2005). There are a total of 342 gazetted fish landing sites along the shores of Lake Victoria, Kenya (KeFS, 2019) in five riparian counties: Kisumu, Siaya, Homabay, Busia, and Migori. This study was carried out within Kisumu, Busia, Homabay, and Migori counties (Figure 1). Homabay county has historically been a hotspot for recreational fishing participation. This county is also the largest in size and records the highest contribution to fisheries catches and revenue among the five (KNBS, 2019). A total number of seven public beaches and/or fish landing sites, one community recreational site, one yacht club, and six tourist resorts/hotels were sampled during the survey. Four of these resorts were on Mfangano, Rusinga and Takawiri Islands in Homabay county.

Data collection and analysis

Primary data was collected using questionnaire-led-interviews, focused group discussions (FGDs), and key informant questionnaires. Secondary data were collected from official fisheries statistics of the Lake Victoria Fisheries Organization (LVFO, Frame surveys and Catch Assessment Surveys), Kenya Marine and Fisheries Research Institute (KMFRI), as well as the Kenya National Bureau of
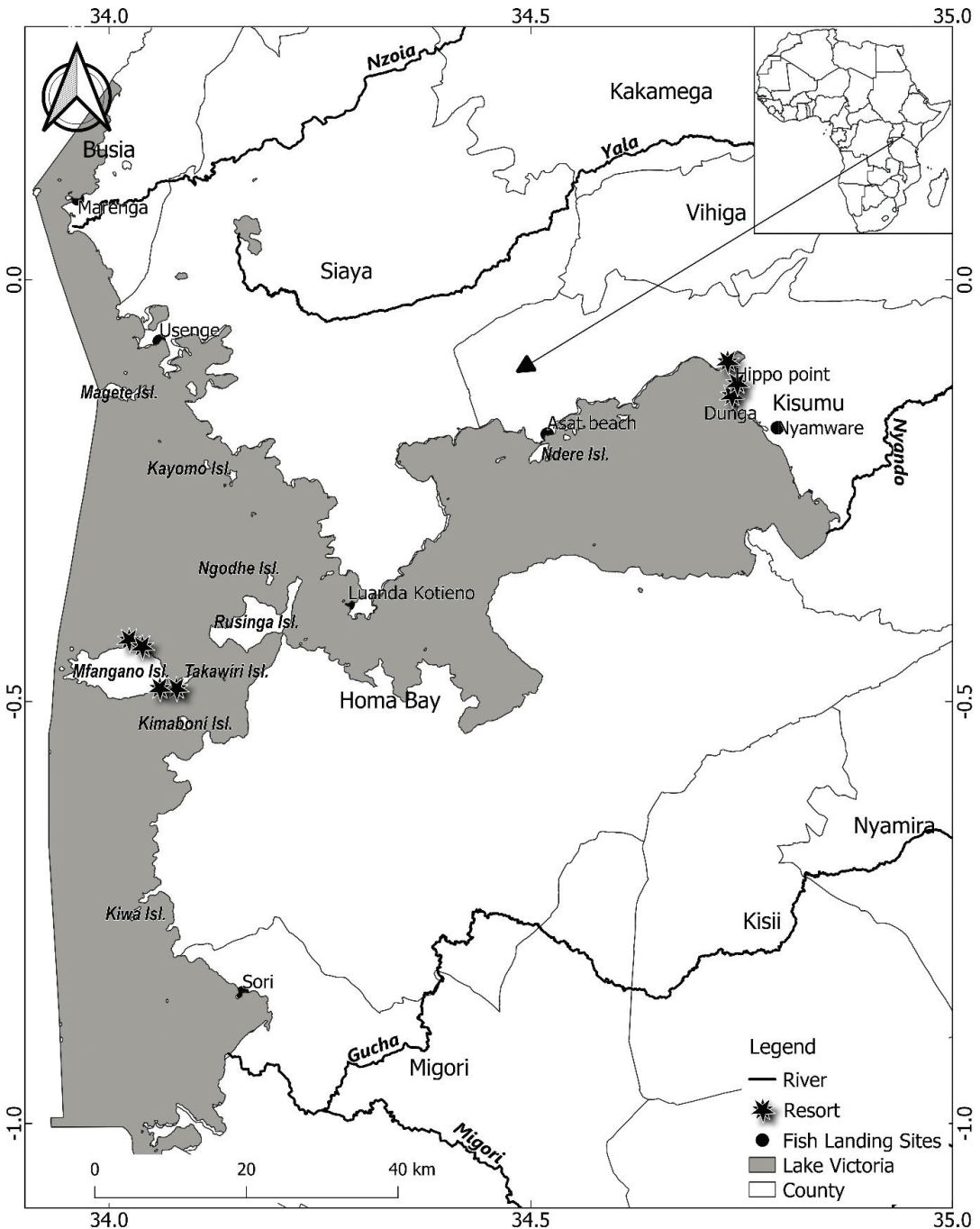

Figure 1. Map of Lake Victoria, Kenya showing beaches/fish landing sites and resort locations where the survey was conducted.

Statistics (KNBS). Three approaches were applied in the sampling as follows: Key informants for i) Policymakers at the county level, i.e. County fisheries officers, County tourism director or representative, ii) Tourist resorts and hotels directors or managers, and iii) Beach Management Units (BMUs) official's. Questionnaire-led interviews were administered to non-fishers BMU members at beaches involved in recreation and tourism related activities whereas focused group discussions/in-person interviews were conducted among fishermen at selected beaches and fish landing sites. Social indicators used were adopted from the Food and Agriculture Organization of the United Nations (FAO, 2016a) with additional indicators developed to suit the regional dynamics. Attributes assessed were: Visitors to the area (hotel/resort/fish landing sites), cultural or sports events, number of tourists' or visitors' potential activities in an area, challenges in the industry, opportunities, and proposed structures towards the development of this industry. Rating of the responses was assessed against a Likert scale (Vagias, 2006) and data analyzed using R-statistical software. Three categories were developed to cluster the respondents: A-Public beaches/fish landing sites and community recreational sites, B-Resorts/hotels, and C-County tourism and fisheries representatives in Kisumu and Homabay counties.

Results and discussion

Recreational fishing on Lake Victoria is not a new sport (Plate 1). Survey results show the existence of the sport for over 5 decades where recreation on the lake was conducted though mainly dominated by sailing. Existing recreational activities include water sports and annual competitions predominantly the Lake Victoria boat racing competition (Sitatunga boat race) and Rusinga Festival. The activities besides leisure, are a celebration of culture as well as awareness creation and conservation as is the case of the Sitatunga boat race. Whilst it may not be possible to quantify the number of fishing trips/charters to date, 60% of the respondents with hotel establishments reported an average of 3 fishing trips per day during the peak seasons between 1990-2000 dominated by international tourists. These trips were part of a comprehensive expedition that combined wildlife

tourism with fishing trips in the lake. A marked decline in sports fishing was observed following the 2007 unrest but present establishments reported a resurgence in recreational fishers from 2015 onwards dominated by local tourists.

Plate 1. Nile Perch (*Lates niloticus*) weighing 12 kg caught in 2018 by angler Sukh Sandhu near Bird Island (also known as Mbasa) between Mbita and Takawiri islands, Lake Victoria, Kenya.
Source: Takawiri Island resort

Boats used in recreational fishing on the lake include twin-powered speed boats and fiberglass "canoes" powered by an outboard engine hiring at USD 30 including the fishing tackle for recreation for a trip of less than three hours. A day fishing trip costs USD 100 on the same vessel. At all beaches and community recreation sites, locally made wooden boats powered by an outboard engine were in use charging USD 25 for a boat ride with a capacity of 10-15 individuals. A luxury boat of the same capacity charged USD 100 per hour while a Kayak charged USD 10 for the same period.

Recreational fishing dynamics varied between public beaches community recreation sites *vis-a-vis* hotel establishments. While it was evident that beaches and community recreational sites lacked proper recreational infrastructure and personnel,

recreational facilities were made available by hotels and resorts to the clients. These include the fishing boats with the crew, the fishing tackle of choice, and a sports fishing license. One of the key concerns among hotels and resorts offering recreational fishing on the lake was overfishing from commercial exploitation leading to low catches during fishing trips mentioned by 92% of respondents (Figure 2). Indeed, the number of longline fishers, who target Nile Perch has been on the rise with a marked increase in number of hooks from 1,039,893 in 2000 to 2,507,893 in 2016 and 2,959,726 in 2020. Hand lining was predominantly used in the Tilapia fishery, but with the dwindling Tilapia stocks, the fishery became unattractive which saw a shift to the Nile Perch fishery. Subsequently, this led to an increase in the use of longlines and the number of fishermen targeting Nile Perch (Frame Survey, 2021; Aura et al., 2020; LVFO, 2016)

Water Hyacinth coverage and poor water quality were major concerns (58%) among industry players within the Winam Gulf (Figure 2). Water Hyacinth has been observed to exhibit cyclical patterns of proliferation with the highest coverage (approximately 5,000 ha) recorded within the Winam Gulf versus < 200 ha reported in the open lake (Ongore et al., 2018). This supports the findings from the current study as it was deemed significant among recreational fishing practitioners within the gulf. Similarly, the high eutrophication levels within the gulf (Lung'ayia et al., 2001; Sitoki et al., 2010) have led to algal blooms on the lake shores particularly around urban developments like Kisumu city and Homabay town. Plastic waste, constituting used bottles and plastic bags that washed up on shores, was not only an eyesore but attracted considerable costs in beach clean-ups exercises. However, this was ranked lowly at 25% whilst 42% did not consider it a problem (Figure 2). This was not because plastic wastes are not a concern, but based on lakeshore dynamics and physical factors, certain beaches were predisposed to plastic waste deposition characterized by a continuous turnover of depositional material (Fanini and Bozzeda, 2018). Beaches and community recreational sites had poor recreational infrastructure making weather fluctuations a cause for concern to a small percentage of the sample assessed (25%). Proximity to an emergency casualty health facility was cited as an impediment to water sports that go hand-in-hand with recreational fishing. Most visitors would shy away from these sports or engagement in recreation for this reason.
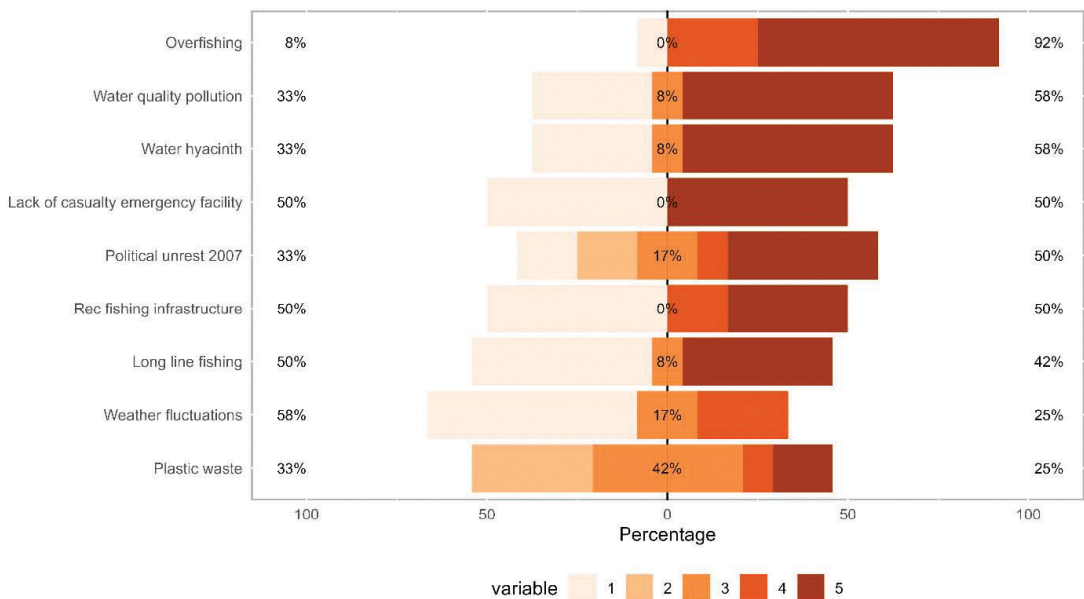

Figure 2. Likert bar analysis of challenges in the Recreational fishing industry on Lake Victoria, Kenya. Colour scale 1 indicates low priority/least concern by the percentage indicated while scale 5 indicates high priority among the percentage of respondents indicated.

Le Manach et al. (2015) reported a sharp decline in sport fishing from the collapse of coastal tourism in Kenya during the 1997-1998 political riots. The scenario is similar for the Lake Victoria recreational fishing where the 2007 political unrest delved a major blow to the industry which saw a record decline in the number of tourists to the region and near collapse of recreational fishing that was highly dependent on foreign tourists (50%). This attribute was rated highest amongst hotels/ resort owners. Currently, a few fishing trips are reported by the BMU's around the northern shores of the Kenyan waters (at Naya-Luanda Kotieno fishing grounds off the Mbita channel) during the December holiday with the rest of the year being dormant.

On the assessment of structures that can be put in place to promote the industry, several key points were highlighted. They included: the development of a lake-wide spatial plan and the gazetting of recreation sites to minimize resource use conflicts; conducive government structures particularly on licensing/ permits, plastic waste management; and water Hyacinth management within the gulf. Investors supported a lake front upgrade and enhancement as a tourist circuit along the major cities and towns, electricity coverage and infrastructure development on Islands and setting up of tourist police sub-stations at public beaches. There was a proposal on the upgrade and re-opening of Mfangano Airstrip to facilitate revival of fishing safari's that combined wildlife tourism from the Mara to fishing charters on the lake giving Kenya a competitive edge over the vast waters of Tanzania and Uganda. This should be coupled to sensitization of the local communities as well as marketing of blue tourism. The development of recreation fishing infrastructure at public beaches and capacity building of crew and recreational fishing handlers is important in promoting local participation by BMU's thus opening up opportunities for economic growth for youths and women.

Conclusion and recommendations

Recreational fishing presents a development opportunity for community empowerment and growth in the hospitality industry. It provides prospects for national economic growth, creation of jobs, generation of local revenue, and multipliers from fisheries related activities. However, cooperation is key towards removing barriers and creating accessible fishing opportunities. With the Lake Victoria commercial fishery an already established industry, access should be guided by sound data coupled with risk assessment and management approaches that meet conservation objectives while managing competition among fisheries players. Commercial fish harvesting should be guided by regional policies and a strict enforcement of the recommended slot size for Nile Perch by industry players to deter harvesting of larger Nile Perch beyond the upper limit that would otherwise constitute game fishing. A permit option for game fishers who may not necessarily fish at a designated spot can be considered by respective county governments to enable easy access to different fishing grounds within their jurisdiction.

To support growth and sustainability of the industry, we recommend the development of a co-management framework between the recreational industry players, county fisheries departments, and the BMUs on access and the use of products from the activity to deter commercialization of recreational catches. Herein, the application of a "catch and release" policy is proposed and adherence to a bag limit for daily catches. The utilization of revenues generated should be anchored on the existing legal framework as prescribed in the Fisheries Management Act (Cap 378).

Resource spatial planning should be instituted in order to cater for the different industry players in the Blue Economy. Possible policy options would include the gazetting of tourist and community recreational sites and development of a Recreational Industry Development Strategy by the National and county governments. A national census survey on recreational catches should be considered if its full potential is to be realized in promoting the Blue Economy. We propose that fish catch data from recreational fisheries be anchored in routine Catch Assessment Surveys (CAS). There is need for infrastructure support and capacity development among the BMU's and sensitization of the local communities on recreational fishing.

An integrated watershed management approach is recommended to curb the problem of nutrient enrichment as well as the proliferation of water Hyacinth in Lake Victoria. It is important to

consider the involvement of the instituted CFAs as custodians and managers of the forestry resource, working with the county governments in the revitalization and sustainability of the sports fishing industry within the Lake Victoria basin.

We recommend further studies on the Nile Perch long line fishery and its effect on recreational fishing as well as an assessment of anthropogenic litter deposition in the Lake.

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