TANZANIA FISHERIES RESEARCH INSTITUTE-TAFIRI

A REPORT ON SITES OF HIGH POTENTIAL FOR CAGE FISH FARMING IN THE MWANZA GULF OF LAKE VICTORIA WATERS

SUBMITTED TO: MARA RIVER ENVIRONMENTAL CONSERVATION CO. LIMITED

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Sites of high potential for cage fish farming in the Mwanza Gulf of Lake Victoria waters

Brief background

Lake Victoria, the largest tropical lake and single fresh water fishery in the world, is appreciated as important source of fish for domestic and international markets (Boyd 2007). However, the same as what has happened in most global fisheries, the fisheries of this lake has leveled off or declining and can hardly quench the ever increasing demand of fish protein in the region, and productions from aquaculture seem to be the only important option (FAO 2006). Despite its importance, the status of aquaculture in the East Africa Region is yet to takeoff and still dominated by pond productions (Mwanja et al., 2006). Irrespective of the fact that the East African countries are rich of fertile land and water which are important in pond production systems, there is quite little hope for increased farm production from ponds for export purposes (Boyd 2007).

In regard to the size of Lake Victoria and availability of other infrastructure important for fast growth of aquaculture industry, it is quite likely that initiation of cage fish farming in the Lake Victoria waters can lead to fast growth of the industry and increased fish production for domestic and export purposes (Boyd 2007).

Generally, growing fish in cages may have negative environmental consequences. The possible consequences associated with cage culture farming include discharge of particulate and dissolved nutrients through uneaten waste feed, fecal matter, and excretory products (Masser 2008). And, this may negatively impact the environment by causing anoxic conditions in sediments (due to organic enrichments) underlying the cages, thus changing the invertebrates abundances and compositions (Ngupula and Kayanda 2010). In addition to that, it may cause eutrophication due to nutrient enrichment of the water column (Ngupula et al. 2012). Moreover, farmed fish may escape and interact with other fish in the wild, and this may cause spread of diseases and parasites (Heuch et al. 2005; Hindar et al. 2006). All these may result into ecological simplicity, and decrease in genetic diversity (due to genetic dilution) and increased mortality of the wild stocks (due to transferred diseases) (Krkosek et al. 2005). Therefore, most of the negative effects associated with cage fish farming must be avoided in the initial planning, site selection and during the undertaking of the practices (Kashindye et al., 2015).

This project aimed at surveying of suitable sites for cage fish farming in the Mwanza Gulf of Lake Victoria waters. According to the Fisheries Act No. 22 of 2003 and Regulations of 2009, areas of Nyashishi Bay, Nyegezi Bay, Kasomeko Bay, Igalagala stream, Gabalema A and B, Saanane Island, Butimba Bay, Kasimiko Bay, Shady Bay and Nganza Bay in the Mwanza region are marked as critical habitats for fish breeding and feeding grounds of juveniles. Therefore in this survey, apart from excluding areas with possible conflicting use including beach areas for recreational purposes; also the above mentioned critical habitats were not surveyed for the purpose.

Methodology

Criteria for site selection and evaluation

With regards to site selection and evaluation, TAFIRI categorizes two types of areas for possible cage fish farming in the lake. Those are areas of small or medium cage installations (small or medium farms) and areas of large cage installations (large farms).

A. **Areas designated for small or medium farms are:**

- Areas close to bays with minimal distance of 300 m from shore. This is because areas around most bays and very close to shore are important as nursery and breeding grounds for most local fishes.
- Areas with minimum depth of 7.0 m to allow 3.0 m of ground clearance.
- Areas with minimum visibility of 1.2 (120cm) to 1.5 m (150cm) and somehow open to water currents (parallel to prevailing winds) to transport away debris from cages. However, sites quite open to water currents are not good for the sitting of cages as strong water currents many dismantle cage system leading to major losses.
- Areas with minimum dissolved oxygen (DO) of 5mg/l for bottom water.
- Areas far from known source of pollution (approximately 1000m minimum distance).

B. Areas designated for large farms are:

- Areas with minimum depth of 30.0 m
- Areas with minimal distance of 300 m from shore to avoid interference with the nursery and breeding activities of most local fishes.
- Areas with minimum visibility of 2m (200cm), however not so much open to strong water currents as currents may destroys cages.
- Areas with minimum dissolved oxygen (DO) of 5mg/l for bottom water.
- Areas far from known source of pollution (approximately 1000m minimum distance).

Generally, TAFIRI desires that sites designated for cage fish farming in the Lake Victoria should be having minimum environmental threats, not confined to other uses like shipping lines, game reserve or critical habitats, and at least not quite far from human settlements for security purposes as piracy seem to be a challenge to the safety of fish in the cages.

Study site

This study was undertaken in the Mwanza Gulf area of Lake Victoria (Figure 1).The Mwanza Gulf is one of the largest Gulfs at the southern end of Lake Victoria. It extends southward about 60 km, has an average width of 5 km and surface area of 500 square km. It has mean depth of 6 m, maximum depth of 25 m and lies at altitude of 1134 m.

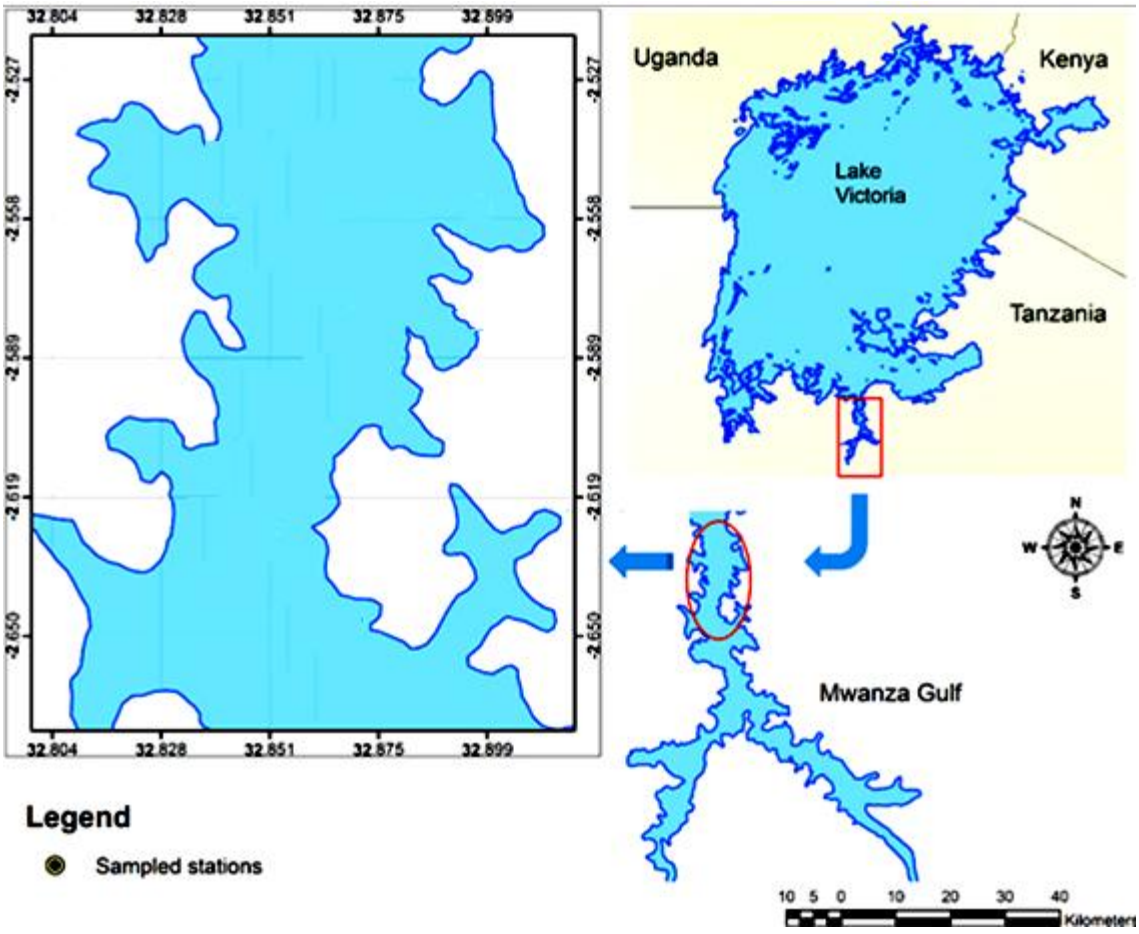


Figure 1: The Mwanza Gulf of Lake Victoria.

To select and evaluate sites according to set criteria, a team of TAFIRI scientists with varying expertise, a technician and a boat crew went onboard a fiber boat powered with engine for a two days survey. While in the survey, depth was

measured using Echo sounder device and the bathymetry of the Gulf mapped using Arch GIS software. Water clarity was measured using a Secchi depth painted black and white. All surveyed sites were geo-referenced using a GARMIN GPS (Garmin GPS MAP 78 Series). In all sites, activities undertaken around were recorded and presence of any possible source of pollution was assessed. Also, in each site all factors known to cause water currents were analyzed.

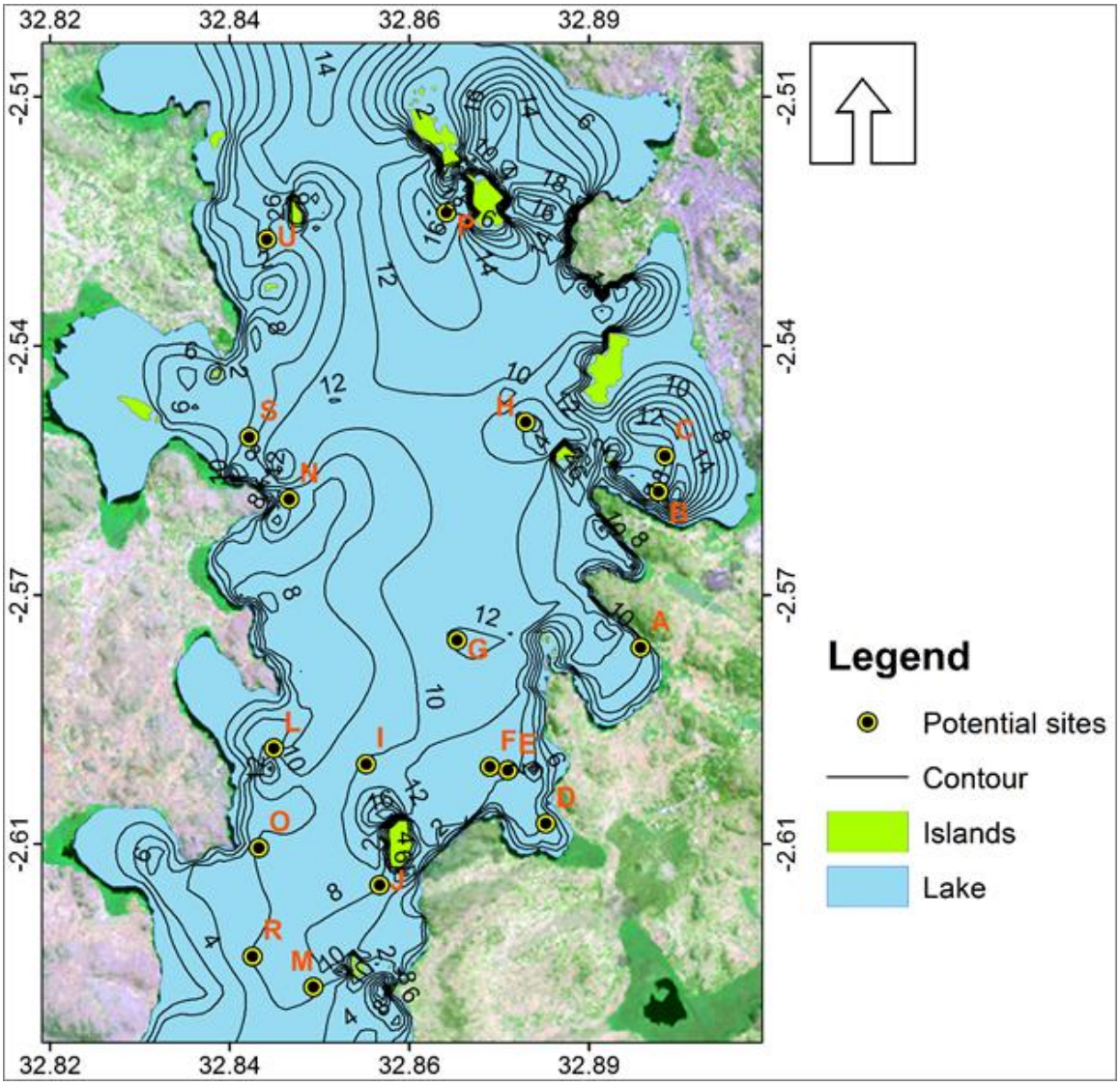
Results

Table 1 shows sites that were analyzed for their suitability for cage culture in the Mwanza Gulf of Lake Victoria waters.

Table 1: Sites that were analyzed for their suitability for cage culture in the Mwanza Gulf of Lake Victoria waters.

Sites	**Latitude**		**Longitude**		**Depth**	**Secchi Depth**
	Deg	**Min**	**Deg**	**Min**		
Nyegezi_Bay	2	34.865	32	53.657	6.9	1.0
Mkuyuni Bay	2	33.619	32	53.802	7.6	1.5
Mkaa (Behind Butimba and Nyegezi Bay)	2	33.334	32	53.852	7.8	1.2
Kishimba "KwaDrGirioma"	2	36.27	32	52.902	6.15	1.5
Kishimba_area A	2	35.844	32	52.6	8.75	1.25
Kishimba area B	2	35.817	32	52.457	8.5	1.5
Off-Damu	2	34.806	32	52.194	12.5	1.75
Off_Saanane (Chakende)	2	33.063	32	52.741	14.8	2.1
Off_Nyamuruguru	2	35.796	32	51.469	10.5	1.4
Nyamatala	2	36.761	32	51.578	8.2	1.95
Shadi_area	2	38.785	32	52.168	4.8	1.0
Nyarwambo A	2	35.669	32	50.733	6.5	1.3
Nyamatala B	2	37.576	32	51.048	9.16	1.5
Nyarwambo B	2	33.679	32	50.855	8.5	1.3
West_Nyamatara	2	36.465	32	50.614	9.1	1.25
North Capripoint (Bagarema)	2	31.39	32	52.11	15.5	2.0
Off_Shadi B	2	39.732	32	52.373	5.9	1.2
South_West_Nyamatara	2	37.333	32	50.563	8.35	1.25
South_Kamanga	2	33.184	32	50.538	7	1.5
Off_Shadi A	2	39.609	32	51.807	6.6	1.2
Hippo (Near Hippo island)	2	31.604	32	50.677	10	1.3

Figure 2 indicates the bathymetry of Mwanza Gulf area and sites that were analyzed for their suitability in cage culture.



A: Nyegezi Bay, B: Mkuyuni Bay, **C**: Mkaa ,**D**: Kwa Dr. Girioma, **E**: Kishimba area A, F: Kishimba area B, **G**: Off Damu, H: Off Saanane,I: Off Nyamuruguru,**J**: Nyamatara, K:Shadi area, L: Nyarwambo A, M: Nyamatara B, N: Nyarwambo B, **O**: West Nyamatara, **P**: Gabalema, **Q**: Off Shadi B.

Figure 2: The bathymetry of Mwanza Gulf area and sites that were analyzed for their suitability in cage culture.

Figure 3 indicates the distribution of suitable sites for cage fish farming in Mwanza Gulf of Lake Victoria basing on the set criteria.

Cage sites in the Mwanza Gulf of L. Victoria

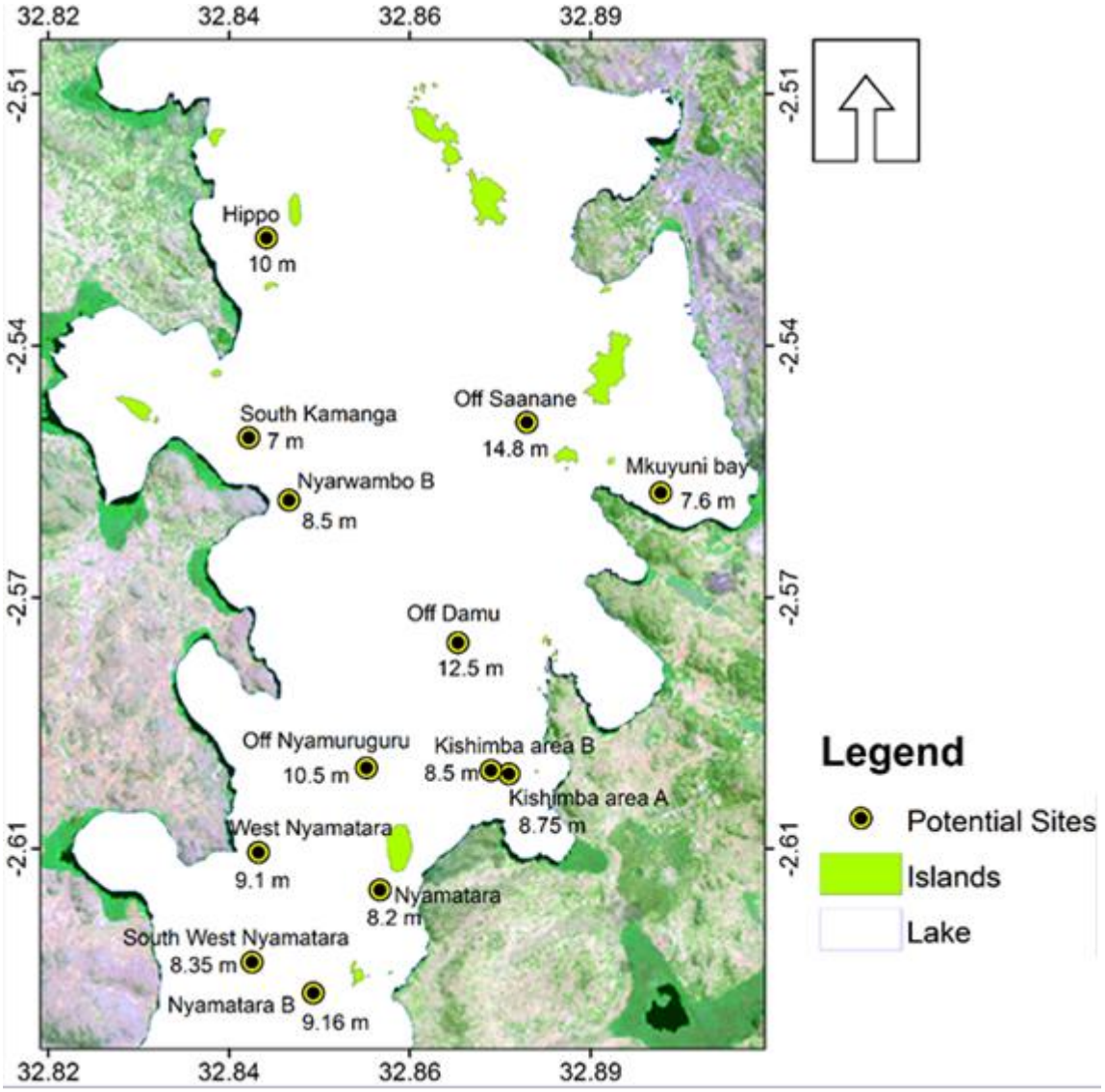


Figure 3: Distribution of suitable sites for cage fish farming in Mwanza Gulf, Lake Victoria waters.

Conclusion and recommendations

A number of sites in Mwanza Gulf appear suitable for cage fish farming.However, before an installation of cages could take place, a consultation of other authorities such as the National Environmental Management Council (NEMC), Lake Victoria Basin Water Council, Surface and Marine Transport Regulatory Authority (SUMATRA) and Local Government Authorities is recommended. Despite the negative effects of cage farming, there are much more positives out of it, and the practice seem to be unavoidable in Lake Victoria waters, but the effects can be minimized during initial planning, monitoring and management of farms. For the purposes of commercializing fish farming in the country and its increased

productions, friendly investors on cage culture are welcomed in the water bodies of Tanzania.

This study suggests quick mapping of all potential cage sites in the lake while estimating the total area of sites and set limits of allowable feed use per day. The identified sites with an estimation of area can be advertised to attract more suitable and friendly investors.

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