LAKE VICTORIA FISHERIES RESEARCH PROJECT PHASE II

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LAKE VICTORIA FISHERIES MANAGEMENT PLAN

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LAKE VICTORIA FISHERIES MANAGEMENT PLAN

PREPARED FOR

THE LAKE VICTORIA FISHERIES ORGANIZATION

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ACRONYMS

BMC	Beach Management Committee
BMU	Beach Management Unit
CBD	Convention on Biological Diversity
CBO	Community Based Organisation
CCRF	Code of Conduct for Responsible Fisheries
CIFA	Committee for Inland Fisheries of Africa
CITES	Convention on International Trade in Endangered Species
CPUE	Catch per unit effort
DED	District Executive Director
DFO	District Fisheries Officer
DoF	Department of Fisheries
EAC	East African Community
EDF	European Development Fund
EU	European Union
FAO	Food Agricultural Organization of the United Nations
FD	Fisheries Division
FIDAWOG	Fisheries Assessment Working Group
FIRRI	Fisheries Resources Research Institute
FMC	Fisheries Management Committee
FMP	Fishery Management Plan
FRI	Fisheries Research Institute
FTI	Fisheries Training Institute
GDP	Gross Domestic Product
GLOW II	Great Lakes of the World II (second symposium)
HACCP	Hazard Analysis Critical Control Point
IDRC	International Development Research Centre
ILMS	Integrated Lake Management System
KMFRI	Kenya Marine and Fisheries Research Institute
LMC	Landing Management Committee
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organization
LVFRP	Lake Victoria Fisheries Research Project
LVMC	Lake Victoria Management Council
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MCS	Monitoring, control and surveillance
MNRT	Ministry of Natural Research and Tourism
MRALG	Ministry of Regional Administration and Local Government
NARO	National Agricultural Research Organisation
NEAP	National Environmental Action Plan
NEMA	National Environmental Management Authority
NEMC	National Environmental Management Committee
NES	National Environmental Secretariat
NGO	Non Governmental Organisation
PSC	Policy and Steering Committee
SAP	Structural Adjustment Program
SEDAWOG	Socio-economic Working Group
SIDA	Swedish International Development agency
TAFICO	Tanzania Fisheries Corporation
TAFIRI	Tanzania Fisheries Research Institute
TL	Total length
WTO	World Trade Organisation

EXECUTIVE SUMMARY

Over 30 million people live in the Lake Victoria Basin and depend directly or indirectly on the lake's resources. Fisheries contribute up to 3% to the GDP of the riparian states and they are major sources of income, food, employment and foreign exchange earning. Lake Victoria is the most important source of fish in East Africa, as well as being the most important source of freshwater fish on the African continent. The lake is also important in conservation terms because of the great biodiversity of endemic fish species. Additionally, the lake an important moderator of regional climate.

In the last three decades, the lake has been subject to the influence of a number of powerful factors which have altered, and continue to alter, its environment. Of these changes, probably the most telling in terms of biological, social and economic impact, has been the depletion of the commercially-important fish species due to over-fishing. Pressure initially focussed on indigenous species, and then turned to concentrate on the introduced tilapia and Nile perch as these grew in commercial importance. As a result of the heavy fishing pressure and the impact of the introduced species it is believed that about 60% of the original fish species are feared to have become extinct.

Furthermore, there are rapid changes going on in the catchment area with demographic growth and urban development affecting land use, the discharge of pollutants, agriculture and forestry practices, all of which in turn affect the lake environment.

Commercial fish yields increased dramatically following the establishment of Nile perch (*Lates niloticus*) and Nile tilapia (*Oreochromis niloticus*) and expansion of the enzootic small, pelagic cyprinid, *Rastrineobola argentea*. It was the Nile perch fishery, however, that created a remarkable stream of economic benefits, which have ranged from the expansion of the artisanal fishing industry and availability of Nile perch to consumers in the region to the development of a multi-million dollar export industry for chilled and frozen fillets.

The lake's fisheries are currently in decline and the biological picture is one of great instability. Heavy fishing pressure has removed too many breeding adults and presently threatens to reduce stocks even further by targeting juveniles. The issues involved are complex and this fisheries management plan has therefore taken the following components into account:

- excessive fishing effort due to unrestricted access to fisheries;
- use of destructive fishing gears and methods;
- limited involvement of fishers and lakeside communities in the management process;
- degradation of fish habitats associated with excessive inputs of nutrients and contamination from the catchment area due to poor agricultural practices, deforestation, increased sewage discharge, degradation of wetland and riparian zones, and infestation by the water hyacinth;
- problems with fish quality attributed to lack of proper facilities, methods and attitudes to improve handling, processing and storage of the raw material;
- high demand for fish by the existing processing plants;
- prospects for increased capacity within the processing industry;
- outdated laws and fisheries regulations;
- inadequate enforcement and extension services;

- lack of trained manpower and resources for capacitation;
- poor dissemination of management information to the fishers and lakeside communities.

The purpose of developing a Fisheries Management Plan (FMP) is to sustain the livelihoods of the communities who depend on the fishery resources of Lake Victoria, and to reduce poverty, food insecurity and unemployment. It is believed that establishing a viable system for the management of the lake fisheries and restoring the ecosystem will contribute to the development of sustainable fisheries. It is believed that a key element to this strategy will be achieved through mobilizing and involving stakeholders at local, national, regional and international levels in the management process. This is one of six strategic areas that the plan is designed to address. They are covered in the main body of the report under the following headings:

- regulation of fishing pressure;
- harmonizing of activities especially in the context of community participation in the day-to-day management of the fisheries;
- establish an institutional environment that can manage sustainably a modified property and access rights regime;
- adoption of the FAO Code of Conduct for Responsible Fisheries policy matrix in a Lake Basin Management context to develop strategies;
- strengthening of institutional capacity;
- developing proper handling, preservation, processing and storage for fish and fish products.

The strategic areas were then used as the basis for identifying composite groupings of projects, which can be developed to help achieve the goal of sustainable fisheries for the lake, identified as:

- enforcement of fisheries laws and regulations;
- training of fisheries staff and other stakeholders;
- developing an integrated approach to management of the lake's resources;
- integrating community participation in the management process;
- gathering and dissemination of materials from the biological, limnological, technological, economic and social science research areas;
- development of appropriate handling, preservation, processing and storage methods.

The proposed FMP builds on current efforts to manage the fisheries of the lake by Departments/Directorates of Fisheries (DoFs) and Fisheries Research Institutes (FRIs) of the riparian countries; and donor projects, notably LVFRP and LVEMP. These institutions and projects have generated information on eutrophication, fishing gears and methods, fishing effort, population characteristics of major commercial species and areas valuable for biodiversity conservation; socio-economic aspects of the fisher communities, and have initiated processes of co-management. They are also developing a fish levy as a means of funding fisheries development, research and management.

The FMP seeks to integrate existing national, regional and international protocols, agreements, policies, laws and regulations under co-management in order to manage the fisheries and the environment of Lake Victoria. It draws on guidelines provided in the FAO Code of Conduct for Responsible Fisheries and the International Conventions such as the Convention on Biological

Diversity, Agenda 21, the Convention for International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the RAMSAR Convention on Wetlands of International importance. It has been guided by: the East African Community (EAC) Treaty; the convention establishing the Lake Victoria Fisheries Organization (LVFO), the agreement on the tripartite management program for Lake Victoria, and the Technical Co-operation for the Promotion of the Development and Environment Protection of the Nile Basin (Tecconile). The FMP has been constructed taking note of the developmental policies of the East African countries, especially liberalisation, privatisation, decentralisation, gender issues, and integration of environmental concerns in development projects. It builds upon existing laws and regulations, specifically those targeting the management of fisheries resources and the aquatic environment in each of the three countries. It is intended that the FMP once implemented will lead to these laws and regulations being updated nationally and harmonized regionally. It is anticipated that the lakeside communities will make byelaws that can be enacted and incorporated nationally.

It is intended that the proposed FMP will operate an Integrated Lake Management System (ILMS) at regional, national and local levels (up or down to the beach level). The national and regional institutions will be linked with each other to bring about participatory management, which involves institutions and communities working together. The regional level will be spearheaded by the LVFO and will focus on harmonisation of national and regional efforts including donor projects such as LVFRP, LVEMP, SIDA. The national level will be spearheaded by the Lake Victoria Management Council (LVMC) and will include DoFs, Fisheries Research Institutes (FRIs), the Fisheries Management Committee (FMC) and agencies involved in water resources, environment, wetland and land use management. The FRIs will generate and disseminate the information to guide management options. These will be discussed at the FMC then passed to the LVMC and harmonized at regional level then passed down for implementation. Periodic reviews will be made right from the community through the national to regional level.

The activities of the FMP will include the approaches grouped under the following sub-headings.

Harmonisation

- strategies and action plans for a self-supporting system for management of the fisheries and identifying actors;
- developing an integrated approach to management of the lake's resources;
- defining fisheries development, research and establishing policies;
- entering into agreements and memoranda between different players on regulation, management, conservation of biodiversity, protection of the aquatic environment and utilisation of fisheries resources;
- developing laws and regulations that can be applied across the region.

Optimising production

- developing sustainable funding mechanisms and reviewing, monitoring and evaluating the impacts and benefits accruing from interventions;
- assessing alternative livelihoods systems required during the initiation of conservation of the resource;
- ensuring acceptable fish quality standards for local consumption and for export including improving landing infrastructure, collecting, disseminating and updating technical data and information.

Human resource development

- improving the efficiency and effectiveness of extension services;
- sensitisation especially at the grassroots level;
- promoting equity with respect to gender concerns.

Monitoring

- monitoring of the fisheries resources and adequate reporting infrastructure;
- defining management options;
- identifying existing opportunities for improved management.

Finally, the FMP does not identify the costs associated with project management activities. This cannot be undertaken until the different activities have been agreed upon and prioritised by stakeholders. However, in allocating resources it will be necessary to note that previous efforts have mainly targeted top national and regional institutions with much less support for 'grass roots' interventions. The FMP focuses on the beach communities. It is therefore recommended that at least 50% of the budget should be devoted to beach level activities.

1 INTRODUCTION

Lake Victoria is one of the African Great Lakes, and the second largest lake in the world covering 68,000 km^2. The lake is shared by Kenya (6% by area), Uganda (43%) and Tanzania (51%)(see Fig. 1). It has a mean depth of 40 m, maximum depth of 84 m, shoreline of 3450 km, a water retention time of 140 years and a catchment area of 193 000 km^2, which extends into Rwanda and Burundi.

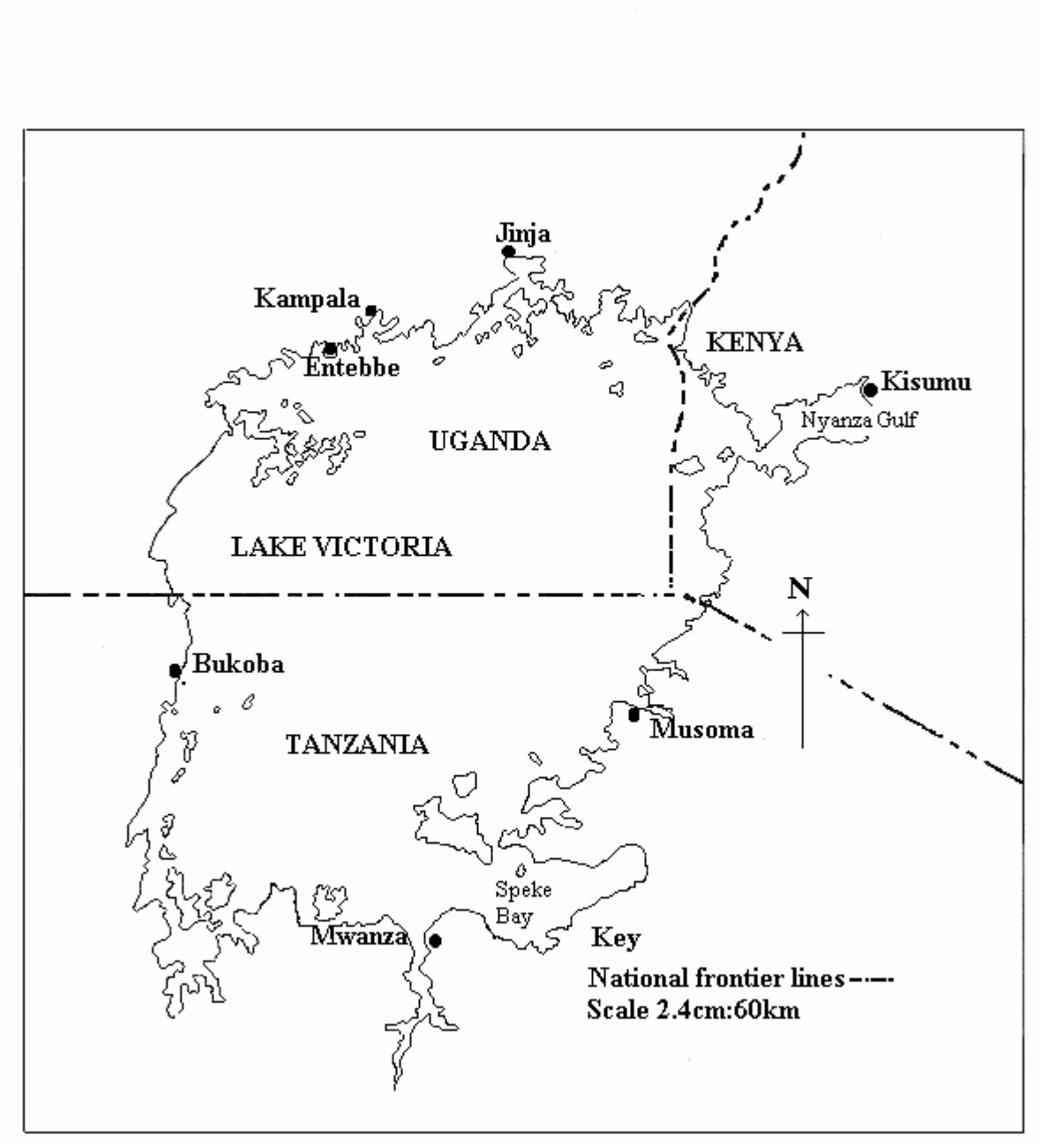

Figure 1. Lake Victoria showing the international boundaries

Lake Victoria is a source of affordable protein food in the form of fish. It provides employment, income, and export earnings to the riparian communities. It is a source of water mainly taken without treatment, and is also used for transport. As well as their food value, the fish species are of important evolutionary significance and have been extensively studied.

Attempts to manage Lake Victoria's fisheries date from 1927 when Graham (1929) conducted the first fishery survey. At that time, it was noted that the gillnet fishery was negatively affecting the stocks. Thus a minimum mesh size of 5 inches was set by 1933. In 1947, management and research of the lake's fisheries were placed under the Lake Victoria Fisheries Service (LVFS), (NB, LVFS was dissolved in the early 1960s). With the collapse of the East African Community (EAC) in 1977, the Food and Agriculture Organization of the United Nations (FAO), through the CIFA sub-committee for Lake Victoria, continued to co-ordinate the activities of the riparian states on Lake Victoria's fisheries. FAO also assisted the three riparian states to establish the Lake Victoria Fisheries Organization (LVFO) in the 1990s, which has its headquarters at Jinja, Uganda. During the 1990s two other projects were established, namely the Lake Victoria Fisheries Research Project (LVFRP), financed by the European Union, and the Lake Victoria Environment Management Project (LVEMP), financed by the World Bank and the Global Environmental Facility (GEF).

The Lake Victoria Fisheries Research Project (LVFRP) Phase II, implemented by the research institutes of the riparian countries of Kenya, Uganda and Tanzania, started in June 1997. The main objectives were to encourage sustainable development of the Lake Victoria basin by assisting the LVFO in the creation and implementation of a viable regional fisheries management plan and the knowledge base required for the regional management of the fisheries of the lake. The project also advanced the management capacity of the fisheries institutions and was expected to prepare a resource management plan based upon the co-management concept.

This document provides a regional management framework for the fisheries of Lake Victoria. The plan may be defined according to the FAO Technical Guidelines for Responsible Fisheries Vol. 4 (FAO 1997) as **"a formal or informal arrangement between fishery management authority and interested parties which identify the partners in the fishery and their respective roles, details the agreed objectives for the fishery and specifies the management rules and regulations which apply to it and provides other details about the fishery which are relevant to the task of the management authority"**.

In preparation of the plan, the following (amongst others) were examined:

- developmental objectives and policies of the riparian states and the contribution of fisheries to the sustainable development in these countries;
- national, regional and international policy agreements relating to fisheries;
- the history of the fisheries and how they have changed;
- the interest groups of the fisheries sector (stakeholders);
- existing institutional decision-making processes in the fisheries sector, including recognized participants;
- constraints to sustainable benefits from fisheries;
- objectives for different aspects of the fishery in relation to the plan including the resource base, environmental issues, lake productivity processes, biodiversity conservation, technological requirements, socio-economic issues and gender equality in access to the resources.

Current information pertinent to the management of the fishery includes: ecology of the major commercial species; current status of the fish stocks; status of the aquatic ecosystem; non-fishery utilisation of wetlands and riparian zones (agricultural and forestry practices); population changes; habitat degradation and pollution; rights of access to the fishery; measures for management of the fishery (effort, gears etc.). This information was used to identify the issues impacting on the sustainable development of the fisheries and suggestions for the sustainable exploitation of the stocks, conservation of fish species diversity and management of the environment are made. Options, or a combination of options, for the management of the fishery are proposed. Proposals, arrangements and responsibilities for monitoring, control, surveillance and enforcement, detailed plans for extension, training and education for interest groups are defined.

2 BACKGROUND INFORMATION

East African countries are amongst the poorest in the world. In 1999, for example, the GDP *per caput* for the East African nations ranged between US $154 and $270. The economies of these countries depend mainly on agriculture, which includes fisheries. The countries are harnessing their agricultural resources to improve the welfare of their citizens. The national developmental objectives of these countries, in relation to agriculture, are to ensure food supply at adequate nutritional levels, increase and diversify the production of agricultural export commodities, provide adequate agricultural raw materials for domestic, agro-based, export industries, create sufficient employment opportunities in the agricultural sector, and conserve the natural resource base. The fisheries sector contributes about 3% to the GDP of Uganda and Tanzania and 0.5% to the GDP of the Kenyan economy. Fish has traditionally been the most affordable source of animal protein with an average regional *per capita* consumption of about 12 kg. Fish is an important source of revenue and an important export commodity. In 1994, revenue from fish landings in Uganda was US$ 77.13 million, whilst in Kenya in 1998 the revenue from fish was US $ 80 million. For Tanzania in the same period the revenue was US $200 million. In 1998, export revenues for fish from Uganda reached US$ 82 million, in Tanzania it was US $103 million while in Kenya it was US $ 35 million (SEDAWOG 1999b).

The fishing industry provides employment for between 0.5 and 1 million Ugandans, more than 0.5 million Tanzanians and 0.8 - 1.5 million Kenyans. Most of the fish landed within Uganda, Kenya and Tanzania comes from Lake Victoria. Lake Victoria contributed 48.3% of the fish landed in Uganda in 1994, 90% of the fish landed in Kenya in 1998 and 60% of the fish landed in Tanzania in 1998. There is, therefore, no doubting the value of the lake fisheries to the economies of the riparian countries and there is a need to have a plan to ensure that this benefits stream is sustained.

The information and data required to prepare the FMP were obtained by: examining existing documents related to the fisheries of the lake and fisheries management plans for other lakes; reports from the Fisheries Departments and the Fisheries Research Institutes of the riparian states; reports from current projects, especially the LVFRP and the LVEMP; interviewing relevant persons in Government and the private sector, especially the Fisheries Departments, the Fisheries Research Institutes, the Secretariat of the LVFO, participants at the Lake Victoria 2000 Conference, held in Jinja, Uganda in May 2000, local administration, government agencies, non–government organizations (NGOs), community-based organisations (CBOs), fishermen, fishmongers, fishing communities, fish farmers and fish processors (see Appendix 1).

3 USES AND IMPACTS ON THE LAKE VICTORIA BASIN

3.1 Uses

The lake moderates the local climate, which in turn influences the abundance of rainfall. The rainfall pattern within the basin tends to affect lake productivity, fish reproduction and recruitment peaks. The lake acts as a receptacle for runoff in the drainage basin, and is a source of clean water both for livestock and domestic use. The lake is further used for transport and the catchment is a source of minerals, with the mining of gold and sand occurring on the shores of the lake. In addition swamps are being (mis-)used for a variety of industrial and farming purposes; and the aquatic environment is being used to dispose of industrial and human wastes. Other key human activities include subsistence and commercial fishing, aquaculture, pastoralism, agriculture, harvesting for timber and fuel wood, harvesting of wetlands, human settlement, hydropower generation and tourism. The fisheries in the region constitute not only a potential source of animal protein but also an alternative means of livelihood and earnings for many people. The lake had, and may still have, a high diversity of endemic fish species.

3.2 Impacts

All the above activities impinge on the lake resources in one way or another. For instance, excessive fishing effort has led to the depletion of fish stocks. Poor agricultural practices and deforestation have led to land degradation, soil erosion and siltation of the lake. Use of fertilizers, and industrial and sewage discharges enhance the nutrient enrichment of the lake leading to eutrophication. The main sources of pollution in Lake Victoria are: point source pollution arising mainly from industrial and municipal waste water discharge, non-point sources arise from use of agro-chemicals (especially pesticides), soil erosion, sedimentation, urban run off and solid waste, and uses of wetlands. Pollution also arises from small-scale gold mining in Geita and Bondo Districts in Tanzania and Kenya respectively. Other pollution sources could be through leakage of oil products from vessels that use the lake. Excessive application of pesticides and discharges of heavy metals residues from industries lead to the pollution of the lake ecosystem and contamination of fish.

Since the 1960s, the composition of the zooplankton community has changed from one dominated by larger types (calanoid copepods and cladocerans) to one where small species of cyclopoid copepods are abundant. This has probably been due to changes in water transparency, food availability and fluctuations in the abundance of predators. The changes in the zooplankton and fish community have resulted in simplification of the food web of the lake. The depletion of the trophically complex haplochromine community and the changes in zooplankton community have reduced the grazing pressure which has left unconsumed much of the organic matter produced in the lake. Decomposition of excess organic matter has depleted the water column of oxygen resulting in expansion of the anoxic waters in parts of the lake deeper than 40 m, with some 50% of the lake bottom affected during periods of pronounced thermal stratification (Rutashobya 1996). The expanded anoxic layer has enabled chironomid and chaoborid larvae and *Caridina nilotica* to proliferate. This in turn has resulted in the generation of large swarms of lake flies (chaoborids and chironomids). These are currently common in the lake. Phytoplankton production doubled between 1960s and 1990s and algal biomass increased four to five times in the same period. The composition of algae changed from the dominance of larger types of diatoms (e.g. *Melosira*), which

were the preferred food of native tilapias, to nitrogen fixing blue green algae and smaller diatoms (e.g. *Nitzschia*). This has caused a four-fold decrease in water transparency (R. Hecky, personal communication). At the same time declining catch per unit effort (CPUE), increasing juvenile fish harvest rates, decreases in the average size of fish caught, especially of Nile perch and *R. argentea*, have been observed. There is also an alarming rate of biodiversity loss (Tweddle & Cowx 1999). An examination of the biological characteristics of Nile perch shows that the condition factor has deteriorated and there are fewer females than previously reported. Also observed is the reduction in size at first maturity of females. These changes may ultimately affect the rate of replacement of stocks (Tweddle & Cowx 1999).

Lake Victoria was, in 1990, infested by a noxious waterweed, the water hyacinth. This posed a major threat to fishing, hydropower generation, water transport and aquatic life. It occupied shallow, sheltered bays, which are important breeding, nursery and feeding grounds for fish and affected fish breeding success. Although the large expanses of water hyacinth have been brought under control, the potential for its resurgence is still high. There is the need to sustain the control efforts and to monitor the factors that promote resurgence, especially the increase in nutrient inputs. Recently it has been reported that hippo grass (*Vossia*) is on the increase especially in areas formerly occupied by the water hyacinth.

The climate of the African Great Lakes' region seems to be warming up due to global climatic change. Higher temperatures were recorded in Lake Victoria in 1989 and 1990 compared to 30 years ago and similar observations have been made for other East African Lakes, such as Lake Albert (R. Hecky, personal communication). An increase in temperature makes the lake more unstable and enhances the persistence of anoxia. It also creates an environment conducive to other exotic biota at the expense of the indigenous ones. Due to ozone depletion, UV-ß radiation is increasing and there are concerns about impacts on the phytoplankton community of the surface waters (Gray 1997).

The key environmental impacts of activities on the lake can be summarised as:

- eutrophication (excess nutrient loading resulting in high algal populations and blooms which cause taste and odour problems, high water treatment costs, algal toxins, deoxygenation, associated pathogens and alteration in consumer food webs);
- contamination and toxic effects (heavy metals especially mercury, persistent organochlorines, currently used pesticides);
- BOD (excessive loading of oxygen consuming substances);
- siltation (excessive turbidity and sedimentation);
- alteration of physical substratum causing loss of fish habitat;
- effects of urbanisation and industrialisation of the catchment on the traditional users;
- biological pollution and loss of biodiversity (species introductions modifying food webs and causing uncertainty about future resource base, plus disruption of haplochromine species flock);
- overexploitation of the fisheries, reducing the stock sizes, thus modifying food webs and causing instability of the ecosystem.

4 STATUS OF THE FISHERIES OF LAKE VICTORIA

4.1 Production trends

Until the 1970s, Lake Victoria supported a multi-species fishery dominated by tilapiine and haplochromine cichlids. There were important subsidiary fisheries for more than 20 genera of non-cichlid fishes, including catfish (*Bagrus docmak* (Forskåll), *Clarias gariepinus* (Burchell), *Synodontis* spp. and *Schilbe intermedius* (Rüppell), the lungfish (*Protopterus aethiopicus* (Heckel)) and *Labeo victorianus* Boulenger (Kudhongania & Cordone 1974). Signs of overfishing were reported as early as 1970s when catch rates for the native tilapiine fish of Lake Victoria, *Oreochromis esculentus* and *Oreochromis variabilis* that were originally the backbone of the commercial fishery, were reduced by selective fishing and the failure to control fishing effort (Jackson 1971; Fryer 1993).

Stocks of most of these species further declined and others disappeared following the introduction of four tilapiines (*Oreochromis niloticus* (L.), *O. leucostictus* (Trewavas), *Tilapia rendalli* Boulenger and *T. zillii* (Gervais)) and Nile perch (*Lates niloticus* (L.)) during the 1950s. The contribution of haplochromines (cichlids) to fish biomass decreased rapidly from 83% during 1970s to less than 1% by the mid-1980s (Fig. 2) due, in part, to predation by Nile perch. *Oreochromis niloticus* on the other hand, hybridized and competed for food and space with *O. variabilis* and *O. esculentus,* leading to the decline of endemic tilapiines. It is believed that more than 60% of Lake Victoria's endemic fish species have become extinct between 1970 and 1986 with the remaining species reduced to insignificant levels (Fig. 2). The establishment of the Dutch Government sponsored Fish Meal Plant in Mwanza in the 1970s also contributed substantially to the decline of the haplochromines in the lake since the factory targeted this fish group. The Lake Victoria fishery has changed from the complex multi-species fishery of the late 1970s, to one dominated by three species, namely *L. niloticus*, *O. niloticus* and the native cyprinid species, *Rastrineobola argentea* (Pellegrin) (Fig. 2). However, since the mid-1990s, Nile perch, the dominant species in the fishery, has shown signs of decline. Changes in the efficiency of fishing gears, motorisation of canoes and increase in total fishing effort to maintain production were observed. Extension of fishing grounds was also evident, but all against a continued decrease in catch per unit effort and mean size of fish caught (Mkumbo & Cowx 1999). Recent studies, however, have revealed that some species feared extinct, for example the zooplankton-feeding haplochromines, are reappearing in the lake thus posing a threat to *R. argentea* whose food requirements are similar.

In Kenya, total fish landings increased from about 19 000 t in 1977 to approximately 220 000 t in 1992 due to increases in the contribution of Nile perch. Catches have now fallen to around 160 000 t as a result of a fall in catches of Nile perch. In the Uganda, total fishery yield increased from 11 000 t in 1977 to 120 000 t in the early 1990s. This was again due to an increase in the contribution of Nile perch. Although data are fragmented in the 1990s, and no discernible trends are possible, except landings in 2000 were of the order of 141 000 t. In the Tanzania, the quantity of fish landed increased from 72 000 t in 1983 to 231 000 t in 1990, again due to landings of Nile perch increasing from 274 t in 1981 to 175 000 t in 1990. Poor quality catch assessment data have prevented any evaluation of trends in yield in recent years.

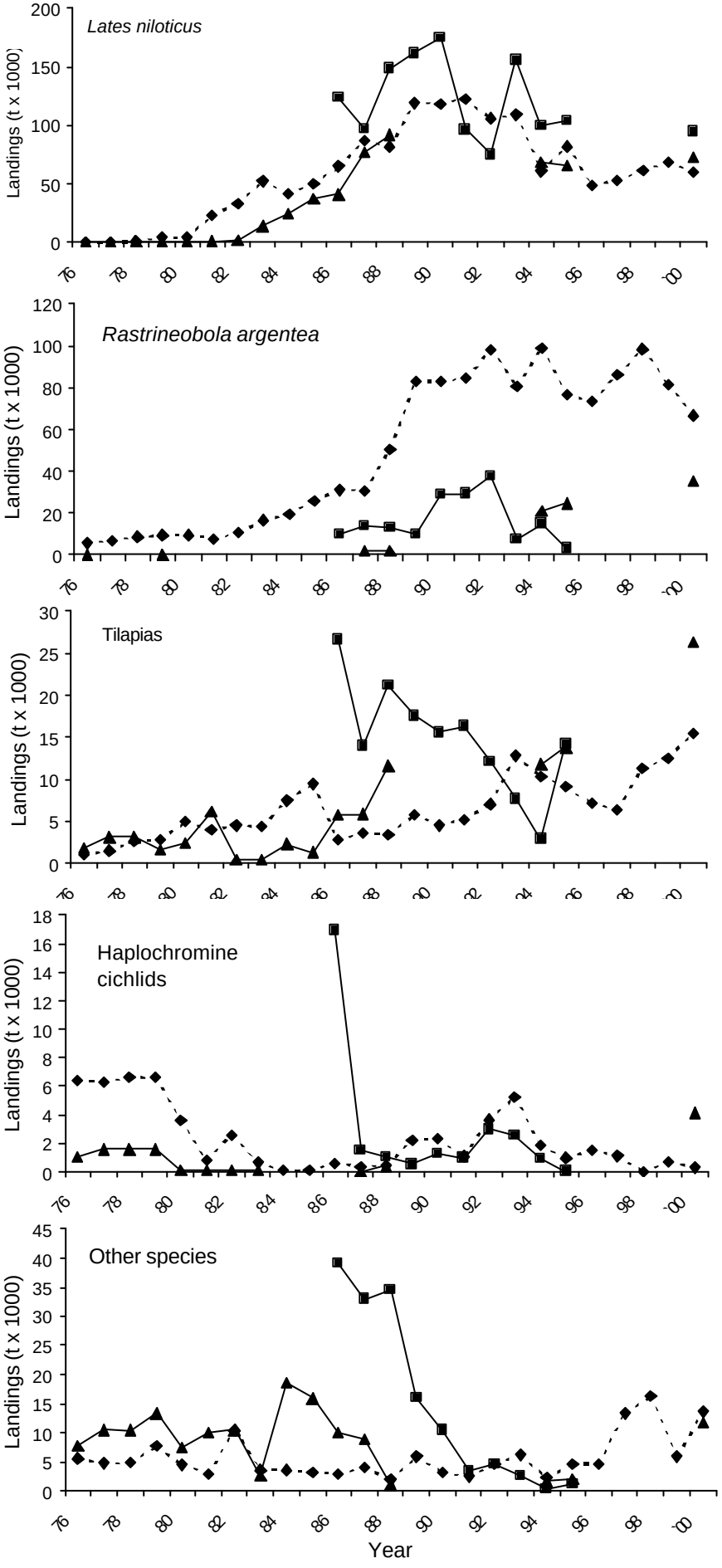

Figure 2. Trends in landings (t) of major fish species and species groups in the riparian countries of Lake Victoria (? Kenya; ¦ Tanzania; ? Uganda)

4.2 Stock abundance

Currently Nile perch stocks in the whole lake based on trawl surveys (LVFRP programme) are estimated to be of the order of 10 tonnes per km^2. The lake-wide abundance rose to a peak of 912 000 t in the third quarter of 1999, then it declined to 630 000 t by the end of 2000. Thus, there was a reduction of almost 30% in the Nile perch stock during 2000 (Mkumbo *et al*. 2001). Experimental trawl surveys, however, reveal that few individual fish greater than 60 cm TL are caught. Although this is partially due to gear efficiency, because large fish are caught by long lining, the proportion of large Nile perch, above the size of maturity is undoubtedly low, raising questions about sustainability of the stocks

Hydro-acoustic surveys indicated that the total biomass in the lake is fairly constant, approximately 2 million tonnes. However, the components of the biomass during 1999 and 2001 have changed, with Nile perch decreasing from an estimated 1.5 to 0.9 million tonnes while the small pelagics (*R. argentea* and haplochromines) increased concurrently from an estimated 0.5 to 1.2 million tonnes. Evidently there are substantial changes in the abundances of particular species within the relatively steady total.

4.3 Distribution of fishing effort

The disposition of fishing effort, lake wide and on a country-by-country basis is reflected in the results of the frame survey conducted in March 2000 and summarized in Tables 1 and 2. This clearly demonstrates the intensity of fishing effort being expended in recent years. The two major trends in the fishing effort are the increases that have occurred since previous frame surveys and the use of 'illegal' gears, i.e. below recommended or legal mesh sizes and banned gears. In all three countries, effort in terms of boats and number of fishermen has more than doubled in the past 10 years (Asila 2001). Mesh sizes have progressively declined over the past 10 years with 24% of the nets (LVFO 2000) in Uganda now below the recommended mesh size of 5". However, more recent beach surveys (L. Muhoozi, personal communication) suggest this is now as high as 50%. In Kenya and Tanzania, 3 and 18% respectively, of the gillnets are below the legal mesh size limits. In addition, beach seines and trawls (10 of which were operating in Kenyan waters until recently; M. Njiru, unpublished data) are banned gears in the region.

4.4 Indicators of exploitation

The Nile perch fishery of Lake Victoria is currently undergoing a transition associated with exploitation and ecosystem change. The fishery exhibits, where measured, classic indicators (Caddy & Mahon 1995) of overfishing. These can be summarized as a reduction in age/length at maturity, higher mortality, especially caused by fishing pressure, reduction in catch per unit effort, reduction in mesh size of nets used and an increased proportion of immature fish in the catches. These indicators are of concern with respect to the long-term sustainability of the fishery if urgent action is not taken in the near future.

The fishery exploitation indicators also point towards heavy fishing pressure beyond that which the fishery can sustain in the long term. Mesh sizes have progressively declined over the past 10 years.

This has been coupled with an increase in fishing effort (and associated fishing mortality) in the past 10 years and a progressive decline in catch per unit effort (Table 2).

Table 1. Summary of Frame Survey 2000 showing distribution of landing sites, crafts and gears between countries (values in brackets are density by country per km^2)

Item	Kenya	Tanzania	Uganda	Total
Area km^2	4080	34,680	29240	68000
Landing sites	297(0.07)	604(0.02)	597(0.02)	1498
Fishers	33037(8.10)	56443(1.63)	34889(1.11)	124369
Canoes	10014(2.45)	15533(0.45)	15544(0.53)	41091
Gillnets – total	136227(33.38)	226063(6.52)	291329(10.09)	653619
<2.5 inch	4388		675	5063
2.5 inch	5176		321	5497
3.0 inch	8298	4253	3014	15,565
3.5 inch	6714	618	9626	16958
4.0 inch	5716	893	20235	26,844
4.5 inch	2828	935	20473	24,236
5.0 inch	8058	12153	51357	71,568
5.5 inch	10955	3807	16294	31,056
6.0 inch	29320	11317	94771	135,408
6.5 inch	8856	2740	8067	19,663
7.0 inch	22284	4047	52590	78,921
7.5 inch	1992		1398	3390
8.0 inch	2404	407	8014	10825
9.0 inch	2502	53	1776	4331
10.0 inch	3527	28	5709	9264
>10 inch	3203		625	3828
Long lines (hooks)	972087(238.26)	2221081(64.06)	254453(8.63)	3443385
Beach seines	5245(1.29)	1020(0.03)	811(0.03)	7076
Trawlers	15			
Cast nets	4418(1.08)	63(0.001)	1276(0.04)	5757
Hand lines	27789(6.81)	14355(0.41)	4585(0.15)	46729
Traps	3192(0.78)	2584(0.07)	11349(0.39)	17349
Mosquito seines	11265(2.76)	3278(0.09)	2452(0.08)	16995
Engines (outboard/inboard)	509(0.12)	1526(0.04)	2031(0.08)	4066
Other gears	1706(0.42)	1146(0.03)	71(0.002)	2923

The increased fishing effort for Nile perch, especially with smaller mesh-sized nets, has led to a high proportion of the fish caught being below the size at first maturity ($Lm_{50} \approx$50-70 cm). This exhibits an unsustainable tendency for the Nile perch fishery as fish are being caught before they can contribute to the regeneration of the stocks. Currently trawl survey data suggest that the proportion

of mature adult fish in the stocks is very low. The trawl catches also indicate that large numbers of juveniles are present in the stocks. Thus there appears to be no recruitment bottleneck at present.

Table 2. Trends in catch per unit effort for Nile perch in commercial fisheries of Lake Victoria (kg boat-day^{-1}) (source Okaranon *et al*. 1999; Othina & Tweddle 1999)

Year	Gillnets	Long lines	Beach seines	Mosquito seines
1989	145.2	64.7	387.8	256.6
1990	92.3	63.9	449.8	240.8
1991	66.9	59.8	339.2	221.4
1992	64.6	44.3	301.7	220.2
1993	45.5	43.1	222.3	203.8
1994	36.4	43.3	52.3	210.0
1995	41.0	30.9	118.7	147.4
1996	67.3	42.5	108.7	113.8
1997	58.9	45.5	120.6	133.7
1998	47.3	53.8	164.7	164.4

There are several key indicators of intense exploitation in the Nile perch fishery in addition to the declining CPUE. Firstly, there has been a progressive decline in modal length of fish caught by experimental trawling over the years. In 1988 the modal length was 70-80 cm TL (Ligtvoet & Mkumbo 1991), while it decreased to 50-60 cm TL in 1992 and even further to 40-50 cm TL in 1994 and it remained around the same level to the end of the 1990s (Nsinda, Mkumbo & Ezekiel 1999). Much of this decline in size at first capture has been linked to a reduction in mesh size, which now seems to have stabilized around 12.5 cm (5").

Reduction in size at first maturity is a sign of heavy fishing pressure on stocks. In Tanzanian waters this has decreased from 60 cm TL in males and 95-100 cm TL in females in 1988 (Ligtvoet & Mkumbo 1991) to 50-55 cm TL and 70-80 cm TL in males and females respectively in 1999.

The paucity of larger fish (>50 cm) in the Nile perch populations in each zone is another sign of overfishing. This suggests good recruitment to the population, probably to compensate for the overfishing, but the relatively small numbers of large, mature fish is of concern as there is potentially a lack of spawning stock. Although Nile perch is a very fecund species and it has lowered its size at first maturity to compensate, its ability to sustain the stocks in the long term under such intense pressure is questionable.

It is well known that there is a very high demand for Nile perch from the filleting factories, but worse is the preference for fillets from juveniles of 0.5-1 kg for some export markets. If the export markets dictate the size at first capture this will inevitably lead to a collapse in stocks because too few fish will reach spawning size. The domestic market at present is equally open for under-sized fishes and thus urgent remedial measures have to be considered.

Similar trends in the indicators of exploitation are found in tilapia and *Rastrineobola*. Currently the catch rates for the *Rastrineobola* fishery are high in terms of the effort expended in the fishery, but

the species does show some indication of high fishing pressure. The size at first maturity has fallen in recent years (from 44 mm for both males and females in 1990 to 39 mm in 2000). Also CPUE from the mosquito seine fishery (Table 2) is declining and the fishing mortality on the stocks is very high. There is evidence to suggest that juveniles are recruited to the fishery in the August to October period. This recruitment coincides with growth of the fish to about 40 mm from spawning events, which takes place some 12 months previously.

Catch rates from the 5-mm and 10-mm mosquito nets are similar for *Rastrineobola argentea* in Tanzanian waters, exploiting a high proportion of immature fish. However, the 5-mm net catches a significant component of *Caridina nilotica*, which was virtually absent in the catches of the 10-mm net, whilst the 10-mm nets catches a higher proportion of haplochromines, possibly because the fishers using these nets operate further offshore.

For *Oreochromis niloticus*, fishing mortality has increased dramatically in Kenyan waters since the early 1990s (M. Njiru, unpublished data). The species also has a faster growth rate and matures earlier (females at around 23 cm compared with 35 cm in the early 1990s).

4.5 Post-harvest sector

The remoteness of some of the landing sites and the inadequate transportation infrastructure impose severe constraints on the post harvest sector of the Lake Victoria fishery. Handling facilities, ice plants, storage facilities, sanitary conditions (including boats with insulated containers) are either lacking or inadequate at landing sites. These are some of the factors contributing to poor fish quality.

The major commercial species are processed using a variety of methods including smoking, sun-drying and freezing. *Rastrineobola argentea* is mainly sun dried. The problem with sun drying is the lack of racks at beaches, hence the drying is carried out on sand. Smoking is generally for rejected Nile perch and juvenile tilapiines. Frying is applied to haplochromines and to the frames and viscera of Nile perch that remain after filleting. In Kenya, the above processing methods are carried out mainly by women, who are well represented in the fisheries post-harvest sector around the lake, and appear to constitute a majority of the small–scale processor/ trader population at the landing sites

Nile perch is processed by chilling or freezing. The fish is purchased and processed mainly by the large-scale processors, who are based in urban centres either around the lake or in the hinterlands.

4.6 Fish marketing and distribution

The marketing of Lake Victoria's fish was localised within the riparian states during the pre-Nile perch era. As most fish filleting factories were established in the 1990s, both the regional and international trade expanded. The international export market for the Nile perch is truly global and no longer confined to the traditional EU and Middle Eastern markets (SEDAWOG 1999a). Besides these destinations, the Nile perch is now sold to Japan, Australia, northern and southern America. Although data on Nile perch exports (Table 3) are scant and considered unreliable (an issue that needs addressing), the information available indicates export trends and potential contribution the resource is making to the economy.

The role of economic growth in Lake Victoria's fisheries, in relation to the dispersion of benefits between user groups, however, is not fully understood and further analysis is required. What is apparent is that economic growth *per se* is not a means of poverty eradication and may well entrain environmental unsustainability.

Table 3. Export quantities for Nile perch fillets between 1988 and 1999 (in tonnes) (Source: Fisheries Department, Entebbe; Gibbins 1997; Statistical; Bulletin, Department of Fisheries Kenya, Unpublished LVFO data)

Year	Kenya	Uganda	Tanzania
1988			37
1989		18,347	87
1990	4350	1590	
1991	6364	4751	
1992	11,312	7831	9850
1993	8189	6337	6123
1994	9439	6564	8454
1995	10,983	12,971	9904
1996	16,472	16,397	15,000
1997	11,167	9839	
1998	10,126	13,755	
1999	9765		

Reynolds and Greboval (1995) estimated that between 1975 and 1989, the Nile perch fishery alone generated net economic benefits of US$ 280 million per year. While much of this sum has accumulated and been concentrated in the hands of relatively few industrial processing firms, it does not deny that fishing communities themselves may have benefited. What is of concern is that those sums that do make it to fishing communities may not be invested in sectors or activities that might, in the long-run, contribute to the fishery's sustainability.

4.7 Socio-economic aspects of the lake fisheries

There have been remarkable changes in the incomes of fishers and the lake communities over the past two decades. During the pre-Nile perch era, most fishers were engaged in subsistence fishing. The fishing communities were at that time classified as being part of the rural poor. With the upsurge in abundance of Nile perch in the lake, however, a new fishery developed and along with it, greater employment opportunities. More fishers were attracted to the fishery. This included wealthy people from urban areas who purchased fishing gears and vessels to access the resource. Fish filleting factories employing many people sprang up in the towns of Kisumu, Nairobi, Jinja, Entebbe, Kampala, Musoma, and Mwanza (see Fig. 1). Compared to the pre-Nile perch era, the fisheries have improved the welfare of the lakeside communities. The fish trading, processing and marketing sectors have been dominated by large and medium scale operators. This feature of the industry, combined with vertical integration of the catching, trading, processing and marketing sub-sectors, has opened up access to markets beyond the lake. This has brought with it opportunities to trade fish products in the East African region, Europe, Asia and North America.

In terms of annual incomes it is estimated that Kenyan fishers earn US $3269 per annum. Elsewhere the fishers of Tanzania earned US $2294 p.a. and in Uganda US $1157 p.a. Earnings of fishers tend to vary with both species targeted and number of boats operated (SEDAWOG 1999b). The gap between the richest and poorest fishers in some beaches is widening. The gap between the benefits obtained from the fishery by vessel owners and labouring classes is also growing. Lack of infrastructure including roads and beach facilities (including sanitation) is a problem since these deficiencies contribute to lower earnings in fish businesses.

Market demand appears to be determining the methods and means of reallocating the benefits obtained from exploiting the fisheries resources. High demand for Nile perch by the export market has created a new socio-economic dimension. Processors are providing loans to some fishers who then repatriate outlays through catches to the companies. The scarcity of fish has increased fish prices at the landing areas. Thus those firms that have the financial muscle are able to displace the less-well positioned processors, some of whom have been forced to close down. This has led to serious impacts in the fisheries sector and has intensified the existing conflicts between users (Yongo 2000).

Fishers provide varied reasons for catch declines, often with marked differences between Kenyan and Tanzanian data. Wilson (1993) collected 128 responses to queries concerning the causes behind catch declines in Tanzania. Thirty five percent of respondents attributed these to changes in the weather, 20% to overfishing, 13% to too many gears operating in the lake, and 9% to predation by the Nile perch. In 1992/1993, nine percent attributed declines in stocks due to fish poisoning. Furthermore, in the Kenyan study (Geheb 1997), 25% of the responses attributed catch declines to the use of illegal fishing gear or deleterious fishing techniques. Seventeen percent of the respondents thought that excessive fishing effort was to blame whilst 15% believed that the capture of under-sized fish was responsible. In a 1999 LVFRP study of 1066 fishers in all three countries of the lake, 33% of respondents linked declines in the stock to the contravention of fishing regulations, 32% felt this was due to excessive fishing effort and 11% to pollution or the presence of the water hyacinth (SEDAWOG 2000). In most cases, the reasons provided above for catch declines indicate a widespread acknowledgement amongst the lake's fishing communities that effort levels are excessive, that damaging fishing techniques are in use and that regulations are generally ignored.

These trends, however, are only symptoms of broader social, economic and developmental dislocations. Over-fishing and the use of damaging or illegal fishing gear is only in part a reflection of the failure of centralised management strategies on the lake. The trends described above represent a grave threat to the sustainability of Lake Victoria's fisheries.

Wilson *et al.* (1999) observed that the economic and social 'distance' is growing along three dimensions: between migratory fishers and sedentary populations of both fishers and non-fishers; between the owners of large and smaller fishing operations; and between the owning and non-owning classes. Some of the 'losers' or displaced groups have resorted to unorthodox means of fishing, adversely affecting fish stocks, consumer confidence and the lake environment. There is conflict between some of the different user groups that prosecute the fisheries. Those exploiting Nile perch, for example, believe that mosquito seining should be banned since it interferes with Nile perch recruitment. There is also conflict between lift net and gillnet operators. Theft (of fishing gears, vessels etc) and piracy are rampant on the lake, and may become worse as the disparity in

distribution of benefits from the fishery becomes more polarised. The deteriorating security situation on the lake poses serious threats to the fisheries, fishers, fishing communities and Lake Environment. In an effort to contain the problem the riparian governments are looking to empower local communities to actively enter the management process especially in the area of the monitoring, surveillance and control of all activities associated with the fisheries economy. There is an interest both at the centre of government, and the lake communities, to take on the challenge of security and the fisheries management process. The government of Tanzania has set up Beach Management Units (BMUs) empowered to take on management functions at a local level. Similarly in Uganda there is interest in devolving powers to Landing Management Committees (LMCs). These interventions are at an early stage of development. So far in Kenya there has not been any measurable progress in either decentralising or devolving power to the lakeside (fishing) communities.

5. INSTITUTIONAL FRAMEWORK AND POLICY OBJECTIVES IN THE MANAGEMENT OF LAKE VICTORIA FISHERIES

5.1 Institutional framework

5.1.1 *Institutional framework and organisation at the regional level*

In recognition of their common interest in the well being of Lake Victoria and its living resources, and their rational management and sustainability for the benefit of present and future generations, Kenya, Uganda and Tanzania formed the LVFO. The LVFO brings together institutions concerned with the development and management of Lake Victoria's fisheries. It is therefore central to the development of a fisheries management plan for the lake. It must be emphasized, however, that stakeholders at all levels must be drawn into the process of deciding how resources are allocated to implement the various components of the FMP. This will be a difficult and intensive process that will of necessity continue over a long time scale.

The functions of the LVFO in the FMP will be in accordance with the convention establishing the organisation. The supreme body of the LVFO is the Council of Ministers consisting of the ministers responsible for the fisheries of the Contracting Parties or their authorized representatives. Below the Council of Ministers is the Policy Steering Committee, which consists of the Chief Executive Officers of the Ministries dealing with fisheries matters or their representatives. Below the Policy and Steering Committee is the Executive Committee, which consists of six members composed of the heads of the departments responsible for fisheries management and the heads of departments responsible for fisheries research in each of the three countries. The East African Community Secretariat is represented in the Executive Committee without voting rights. Representatives of key regional projects on the lake (in the three countries) are from time to time invited to participate without voting rights.

There is a Fisheries Management Committee and a Scientific Committee whose functions are to advise the Executive Committee on matters within their areas of competence. These are the Technical committees of the LVFO. The Fisheries Management Committee consists of the heads of the departments (or their authorized representatives) responsible for fisheries management of the three countries. There is provision to co-opt other committees, sub-committees and working groups as deemed necessary.

The activities of the LVFO are coordinated by a secretariat headed by an Executive Secretary who is assisted by a deputy Executive Secretary. It has two professional staff, a senior Scientist and a Socio-economist, one Administrative Officer in charge of information and database and one Administrative Officer in charge of Finance and Administration. (See Appendix 2 for an organisational chart of LVFO). The functions of the different organs of the LVFO and how they relate to national institutions in the FMP are best illustrated bottom-up, starting with the Management and Scientific Committees which are the technical committees of LVFO.

The Fisheries Management Committee forms the entry point for national and regional efforts in the development and management of the fisheries. The Scientific Committee forms the entry point for the national research institutes to participate in regional activities. The recommendations of the Management and Scientific Committee are passed on to the Executive Committee.

The functions of the Executive Committee are to:

(a) Consider and agree on immediate and appropriate management measures to be implemented at national levels.
(b) Review the management and scientific activities of the LVFO and make proposals for consideration by the Policy Steering Committee and the Council of Ministers.
(c) Monitor the implementation of management measures at national and regional levels.

The recommendations of the Executive Committee are passed on to the Policy and Steering Committee (PSC). The functions of the PSC relevant to the FMP are to:

(a) Review reports and recommendations submitted to it by the Executive Committee concerning the situation in Lake Victoria's fisheries.
(b) Submit recommendations to the Council of Ministers concerning the state of Lake Victoria's fisheries;
(c) Review proposals on the management and conservation measures to be adopted by the Council of Ministers.

The recommendations of the PSC are passed on to the Council of Ministers. The function of the Council of Ministers relevant to the FMP is to adopt management and conservation measures, and to take such decisions as it may deem appropriate for the conservation and management of Lake Victoria's fisheries. The management and conservation measures adopted by the Council of Ministers will then be passed down through the DoF to the local authorities to implement.

5.1.2 *Institutional framework and organisation at national level*

Each of the three East African countries has fisheries policies. The overall goal of each of the fisheries sub-sectors is to ensure optimal and sustainable fish production. The key objectives of the fisheries sub-sector are to: increase fish production; protect the aquatic environment in which fish is produced; ensure food security through self sufficiency in animal protein supply; have a reasonable amount of fish for export to contribute to foreign exchange earnings; reduce post harvest losses; improve the quality of fish products both for domestic and export markets; create employment; and improve the economic and social status of the fisherfolk especially women and under-privileged groups.

Uganda

In Uganda, the development and management of fisheries resources is carried out at two major levels: the central government and the district local authorities. At the centre, fisheries development and management is vested in the Fisheries Resources Department of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). The organisation chart of the Fisheries Resources Department within MAAIF is illustrated in Appendix 3. The department is responsible for the formulation of policies in the fisheries sector, development of national plans and strategies, and monitoring and supervising the performance of decentralised fisheries functions. There is a Zonal Protection Fisheries Officer who is a Fisheries Department staff member with lake-wide responsibility of law enforcement on each main water body.

The Fisheries Resources Research Institute (FIRRI) of the National Agricultural Research Organization (NARO) carries out fisheries research in Uganda. The mandate of FIRRI is to undertake, promote and streamline fisheries research and to ensure dissemination and application of research results. The mandate areas include: capture fisheries; fishing technology, fish production processes, aquatic environmental health, aquaculture and post harvest processes. This is achieved by enhancing knowledge of staff and practices that are used to: increase and sustain fisheries resources; conserve aquatic biodiversity, control pollution and the degradation of the aquatic environment, and to enhance economic benefits from fisheries.

Fisheries extension has been delegated to the districts. The districts are under the Ministry of Local Government (see Appendix 3). There is one District Fisheries Officer (DFO) at the district answerable to the Department of Production of the district. A Secretary for Production (SP) heads the Department for Production. The DFO is answerable to the Chief Administrative Officer (CAO) and not to the SP. This has problems in transmission of technical information from the SP to the District and lower levels. At the local level fish guards patrol between two to three beaches, mainly for revenue collection. The beach communities equivalent to the Tanzanian BMU are the LMCs.

Tanzania

The organisation of the fisheries sector in Tanzania is generally similar to that in Uganda with Central Government and Regional/Local Government functions (see Appendix 4). At the centre, fisheries are under the Ministry of Natural Resources and Tourism (MNRT). Fisheries administration is vested in the Fisheries Division (FD), which is headed by a Director of Fisheries.

The MNRT liases with the Ministry of Regional Administration and Local Government (MRALG). The District Fisheries Officer (DFO) falls under the Natural Resources and Environment sector of MRALG. When dealing with technical matters, the Director of Fisheries communicates directly with the DFO through the District Executive Director (DED). Unlike in Uganda, the DFO receives funds for fisheries activities from the Director of Fisheries, but these funds are channelled through the DED. Some of the funds sent by the DF through the DED for fisheries activities are, however, sometimes diverted by the DED to non-fisheries activities. The Fisheries Department is developing a system of funding fisheries activities directly without going through DED to overcome this problem. The DFO is in charge of extension, licensing and surveillance. In Tanzania, the government at the district level has developed management partnerships involving fishing villages, known as Beach

Management Units (BMU,) which are charged with enforcing and implementing the national fisheries regulations.

In Tanzania, the Tanzania Fisheries Research Institute TAFIRI carries out fisheries research. Its functions are generally similar to those of FIRRI in Uganda.

Kenya

The organisation of the fisheries sector in Kenya is slightly different from that of Uganda and Tanzania with no clear central-local Government demarcation. The Fisheries Department falls under the Ministry of Agriculture and Rural Development (see Appendix 5). The Director of Fisheries has two deputies; one for Capture Fisheries and the other for Aquaculture. Administration of the department is divided into four regions each headed by a Regional Director who is supported by Regional Assistant Directors who are responsible for a group of Districts. The Regional Assistant Directors have Senior Fisheries Officers who are in charge of districts and responsible for both extension and enforcement.

Within the Districts are Divisions, where Fisheries Officers oversee the activities undertaken by Assistant Fisheries Officers. These are supposed to have Fisheries Assistants who are in charge of the frontline groups. The latter group perform both Enforcement and Extension functions.

In Kenya, the Kenya Marine and Fisheries Research Institute (KMFRI) conducts fisheries research and its functions are similar to those of FIRRI and TAFIRI.

5.2 The Lake Victoria Fisheries Organization policy objectives

The policy objectives for the management of the fisheries of Lake Victoria are encapsulated in the strategic vision of the Lake Victoria Fisheries Organization (LVFO 1999). The LVFO's broad vision is:

> *A common systems/resource management amongst the Contracting Parties in matters regarding Lake Victoria, with the goal of restoring and maintaining the health of its ecosystem and ensuring sustainable development to the benefit of the present and future generations.*

The implied ecosystem concept gives rise to five specific vision statements.

> ***A Healthy Ecosystem Vision:*** *The Lake Victoria Fisheries Organization is committed to the rehabilitation and protection of a healthy aquatic ecosystem for Lake Victoria, the development and implementation of appropriate methods for the control of pollution and noxious weeds, and the fostering of collaboration among institutions involved in research and management of the lake ecosystem.*
>
> ***Research Vision****: The Lake Victoria Fisheries Organization is mandated to coordinate research programmes, acquire, and disseminate scientific information for sustainable management of the fisheries resources of the Lake Victoria basin.*

Integrated Fisheries Management Vision*: The Lake Victoria Fisheries Organization is committed to initiate, strengthen, and coordinate institutional policy, and legal framework towards consensus building to foster integrated fisheries management in the Lake Victoria basin.*

Information Generation, Flow and Exchange Vision*: The Lake Victoria Fisheries Organization is mandated to the establishment of common data standards; shared databases; and also coordinated/joint data collection and analysis to foster effective and efficient information generation, flow and exchange for Lake Victoria.*

Institutional/Stakeholder Partnerships Vision: *The Lake Victoria Fisheries Organization is mandated to forge partnerships and collaboration with institutions and stakeholders, and consolidate the relationships with mutual arrangements, through joint delivery of complementary programmes focussed on the health of Lake Victoria's ecosystem for sustainable fisheries resource utilization and socio-economic development of the riparian communities.*

It is against this background that management of the lake must focus, and issues that affect progress towards these objectives must be addressed. However, there are further policy considerations that must be taken into account.

5.3 National government policies

The national policies, which relate to management of fisheries, include: economic liberalisation, privatisation, decentralisation, environmental protection and gender balance.

5.3.1 *Privatisation*

All three East African governments encourage investment through tariff and tax incentives, profit repatriation and protection against expropriation of assets. These policies have, in respect to the fisheries sector, stimulated the establishment of fish processing factories in the region with positive and negative consequences. For instance, fish quality requirements have included HACCP criteria, and enabled the import of inputs such as gillnets and outboard engines. Some of these may have negative consequences on the fisheries, e.g. through the importation of destructive fishing gears. Privatisation has involved the transfer of ownership of business enterprises from government to the private sector. This has been in recognition of the limited capability of government to effectively conduct business. In this regard, governments are now confined to enforcing market rules, collecting taxes and providing an enabling environment for business. This is expected to free public resources for infrastructure and service provision undertakings. Privatisation of landing beaches as practiced in Uganda, has led to improvements in the hygiene of such beaches. This reduces reliance on government spending. It is recommended that fish processors should be urged to cooperate with the beach leaders to establish 'modern' landing beaches.

5.3.2 *Liberalisation*

Trade liberalisation has been implemented in the three countries as a part of Structural Adjustment Programs (SAP). This was expected to create an environment conducive to private sector

competitiveness and investment. In some of the countries, like Uganda, this has involved: easing of customs import and export procedures; removal or minimizing of export taxes; replacing of import quantities controls with tariff-based controls and seeking common market arrangements such as those being developed under the East African Community (EAC).

5.3.3 *Decentralisation*

The three East African governments have adopted a decentralisation policy. This is aimed at improving access to the public sector services. This is to be achieved through a process of devolution under which some decision-making, planning responsibilities and resources are transferred from the central government to the lower levels of administration, namely, the district and sub-counties.

5.3.4 *Gender*

The policy on gender balance seeks to ensure equity and gender sensitivity in access to opportunities, resources and services to nationals, to ensure participation by less advantaged groups. The FMP seeks to address gender concerns.

5.4 International conventions and agreements

Kenya, Uganda and Tanzania are signatories and/or subscribe to, a number of international and regional conventions, agreements and treaties. The regional agreements relevant to the fisheries of Lake Victoria include: Global Environment Facility; Technical Co-operation for the Promotion of the Development and Environmental Protection of the Nile Basin (Tecconile); Initiative for Nile Basin Management; the Convention for the Establishment of the Lake Victoria Fisheries Organization (LVFO); the Agreement on the Preparation of a Tripartite Management Program for Lake Victoria and the Treaty establishing the EAC. The International conventions and agreements include: the Convention on Wetlands of International Importance; the Convention for International Trade in Endangered Species of Wild Fauna and Flora; the Convention on Conservation of Biological Diversity; and the Code of Conduct for Responsible Fisheries (CCRF). The three states should incorporate and apply the relevant requirements of these agreements and protocols.

Among the international protocols, the CCRF provides major guidelines for development and management of fisheries, which will be useful in the management of the fisheries resources of Lake Victoria. The FMP should endeavour to develop responsible fishing practices for Lake Victoria.

6. ISSUES AND OPTIONS

Comparison of the policy objectives for Lake Victoria with the status of the fisheries, from an holistic perspective, identifies the shortcomings in present fishery management practices. To meet the objectives, the issues identified need resolving and options available for their resolution need to be formulated. The key issues and options for management of the fisheries of Lake Victoria are summarised in Appendix 6, and are supported by the following narrative.

6.1 Ecological dimension

6.1.1 *Lake ecology*

The lake's ecosystem and food web have changed and are still evolving. Increased pollution and clearing of the peripheral wetlands, which served as fish nurseries and habitat, may seriously affect the fisheries and the lake resources in general. Much of the centre of the lake is affected by de-oxygenated bottom water for part of the year. Furthermore, hydro-acoustic surveys show that the deep waters below the thermocline are poor quality with increased anoxia at the bottom. Some areas of the lake have been affected by bottom debris such as the decomposing remains of water hyacinth. Very low catches of fish have been obtained from areas that had recently been covered by water hyacinth and the water at such sites was both turbid and registered low levels of oxygen.

6.1.2 *Fish production*

Nile perch

The Nile perch fishery of Lake Victoria is currently undergoing a transition associated with exploitation and ecosystem change. The fishery exhibits classic signs of overfishing. These include: reduction in age/length at maturity, higher fishing mortality, lower catch per unit effort, smaller mesh-sized nets being used and an increased proportion of immature fish being caught.

Before deriving a strategy to manage these stocks it is essential that issues relating to the exploitation of the fishery and the biological needs of the stocks be put into context. For a stock to be self-sustaining there should be no bottleneck in the life cycle. For the Nile perch of Lake Victoria, no evidence exists that the habitat is inappropriate or limiting to spawning and juvenile survival, particularly with respect to spawning habitat or food supply. A bottleneck is most likely to occur because too few fish reach the size of maturity, i.e. the spawning stock biomass becomes inadequate. The high exploitation on fish between 35 and 60 cm by gillnets, long lines and beach seines leaves little opportunity for fish to escape to grow on to maturity. The reduction in mesh sizes and increasing fishing effort are exacerbating the problem. Indeed the former is a response to the few larger specimens in the fishery and desires to maintain catch rates. This is a classical response to a declining fishery.

Another problem that arises is that of definition of unit stocks. It is easy to use the physical boundaries of the lake to suggest there is only one population, and manage it accordingly. Hauser *et al.* (1999), however, indicated that at least three sub-populations exist in the lake and trawl survey data suggest the stocks in different areas are behaving differently with respect to fishing pressure. Unfortunately no detailed information exists on the discrimination between sub-populations but this needs to be considered in future as a management issue. Notwithstanding this, trying to manage each sub-population separately is probably impossibly cumbersome and beyond the resources of the region (Hilborn & Walters 1992).

Associated with the declining CPUE has been a shift in exploitation patterns. Apart from the reduction in gillnet mesh sizes, a number of other gears, which are highly destructive, have been introduced. Trawling is a banned gear in Lake Victoria and in June 2001 the ban was fully implemented.

Beach seining is also prevalent in all countries, especially Kenya. Many of these gears use very small mesh sizes and capture small-sized fishes for bait for the long lines or other purposes, including

smoking. The pressure on the juvenile, immature, Nile perch is intense, but other species, especially tilapia, are equally affected. These gears are prohibited in all countries but the number of nets in current use is increasing, partly because it overcomes the problem of theft encountered with gillnets.

Long lining is the other method commonly used to catch Nile perch. This gear catches a high proportion of larger individuals (21% of the catch is >70 cm) although there is no evidence of selectivity according to hook size. It appears that bait size is more important in regulating size of capture.

All the above features provide input into possible ways of regulating the Nile perch fishery. However, before any recommendations are proposed it is important to recognise what driver exploitation of the fishery. The most obvious is the large number of processing factories established around the lake. The capacity of these factories is about 120 000 t despite the total landings for the lake being in the region of 210 000 t. The breakdown for individual countries is shown in Table 4. Many of the fish processed are small sized because demand from export markets is fillets from small sized individuals, which are less fatty and they provide portion-sized fillets.

Table 4. Capacity of fish processing factories (t) (figure in brackets = proportion of operating capacity) (1999) and annual landings (t) (2000) for the three riparian countries

	Capacity of factories	Annual landings	Maximum sustainable yield
Kenya	35 360 (49%)	64 000	39 200
Tanzania	104 520 (69%)	95 000	98 500
Uganda	74 100 (45%)	72 632	75 500

There are also other markets in the region for fresh (local), and smoked and salted fish (e.g. Democratic Republic of Congo). These markets apparently utilize some of the smaller sized fish rejected by the factories.

Thus the exploitation of Nile perch in Lake Victoria is primarily driven by the export markets and enacted through the processing factories. The unrestricted access status of the lake linked to increasing and crippling fishing effort, and minimal ability for enforcement of the existing legislation are other issues that should be considered when establishing management interventions. The question that must be addressed is "What management initiatives should be taken to ensure long term sustainable fishing in Lake Victoria?"

A number of well established management interventions are used in heavily exploited fisheries throughout the world. Whether they are successful is open to debate but unless action is taken in the near future, the fishery is likely to recede to a fraction of its current level. These actions include regulatory and fiscal measures (gear restrictions, close seasons and closed areas, taxation and levies etc.), catch and size restrictions, and regulation of access. Which actions are applicable depends upon the objectives of the fishing, i.e. whether it is managed for maximum biological yield, food security for the region, maximum economic yield, or to maximise employment and social values, or a combination of the above.

In Lake Victoria the imposition of Draconian (drastic) measures to regulate the fishery is considered inappropriate because of the huge social implications it would have on the 1 million people linked to the fishery. Furthermore, imposition of such measures is impossible to implement without huge investment in human resources and infrastructure. Consequently a balance of measures aimed at retrieving the fishery is required.

Attention should first be given to gear controls because some fishing methods are destructive to the stocks, especially the younger life stages. In principle, priority should be given to "enforcing" existing legislation on fishing gears; in particular the ban on trawling and beach seining should be firmly imposed. This will protect juvenile stocks of Nile perch and other species as well as spawning areas of tilapia. The use of small meshed gillnets below the legal limit of 127 mm (5") should be restricted, but consideration must be given to the "knock-on" effect on other fisheries, e.g. tilapia. In reality the 127 mm mesh-size will still catch a large proportion of immature fish but this should be seen as a first step towards increasing mesh size to 152-177 mm (6-7") perhaps over 3-5 years, which is more appropriate for protecting smaller fishes.

To help support the implementation of the mesh size regulation, a size restriction should be imposed on the main markets, the fish processing factories. The size restriction recommended is an allowable slot size of 50-85 cm TL for whole fish at the factory gate. This is equivalent to 5"-9" mesh sized nets. The factories should be given a maximum 3-5% non-compliance leeway between 45 and 100 cm but this must be strictly adhered to. Coupled with this measure must be strict penalties for compliance failure, including loss of licence to export or to operate for some periods of time, 12 months for instance. The process of monitoring the compliance should be undertaken by the competent authorities within each country, coordinated by LVFO. Care must be taken when imposing a slot size because the fishery could be heavily exploited within the slot size to the effect that no net benefit is accrued.

Every effort should be made to reduce fishing pressure, and post-harvest fisheries losses, plus maximising value-added products. Whilst these activities will not necessarily ensure sustainability of the fisheries they would certainly help to optimise economic benefits from the fisheries.

Perhaps one of the key areas where management action should be taken is in restricting access to the fishery. Riparian states should recognise the fishery resource is finite and that a continuous build up of effort is unsustainable. Attention should be paid to alternative employment opportunities for the lakeside communities and the Governments must recognise the lake resources are not a panacea for resolving poverty in the region. Indeed, the current rate of exploitation is unsustainable and the long-term prospects will be towards poverty eradication. How access can be regulated is complex. The normal approach is through licensing of boats, fisheries or gears. For a well-structured fishery with central landing ports this is feasible, but in the fragmented and highly dispersed fishery of Lake Victoria alternative solutions to enforcement are required. This will undoubtedly focus on beach-level management enacted through co-management initiatives.

The option of imposing close seasons and closed areas for the fishery is considered impractical because too little is known about the Nile perch spawning behaviour and nursery areas. In the latter case, the areas to be closed are probably too expansive to be of value. Imposing close seasons on

the factories is also considered inappropriate because of the potential consequences for rural livelihoods if implemented.

Nile tilapia

Nile tilapia is an important component of the fisheries of Lake Victoria and the mainstay of fish supply to the local communities, although an export market exists especially in Uganda. Although no definitive data on the stock biomass are available, fishing mortality on the stocks is very high and there are indications of intense exploitation in the population characteristics. Options for managing the fishery are limited to classical mesh size regulations and possible protection of nursery areas. In this respect, gears that disrupt or damage spawning activities should be severely regulated or banned. In addition, restrictions on use of small-meshed nets targeting *Rastrineobola argentea* and other juvenile fishes should be imposed. For example, *Rastrineobola argentea* fishing could be banned within 800-1000 m of shore. This will also have the effect of protecting juvenile *Rastrineobola argentea*, which are prevalent close to shore. Finally, management of the tilapia fish stocks should adopt the precautionary approach, i.e. at least maintain the *status quo*, to avoid potentially unsustainable increase in exploitation of the stocks.

Rastrineobola argentea

Fishing pressure on *Rastrineobola argentea* has increased considerably in recent years, concomitant with a steady increase in the biomass of the stocks. However, the fish stocks are exhibiting signs of overexploitation similar to those found for Nile perch. Whether this fishery is able to sustain the pressure is unclear as small pelagics are remarkably resilient. Scientific data suggest that the mosquito nets employed in the fishery (principally 5 and 10-mm mesh nets) do not exploit a high proportion of immature fish, but in Tanzania at least, they also catch a high proportion of haplochromines.

Options to manage the exploitation are limited. There is to date no scientific evidence to support the imposition of a 10-mm mesh size regulation. However, reduction of a mesh size regulation of 5-mm carries with it the risk that the fishers will use even smaller mesh sizes (<5 mm) that would be damaging to the fishery. Mesh sizes lower than 5-mm must be prohibited and all costs. Close seasons will be difficult to implement because spawning is continuous, and can only be considered in relation to the time of recruitment to the fishery, which is August to November in Tanzania and Uganda, and indeterminate in Kenya. Closed areas are also problematic because breeding grounds appear to be in all inshore waters, although juveniles have also been found offshore. However, close areas to protect other species, particularly tilapia, would be advantageous and may be used appropriately and at the discretion of management.

6.2 Fisheries post-harvest

Within the fishery in general there is a need for infrastructural development. Two key issues emerge when examining the landing and market infrastructure:

- the hygiene and sanitary facilities at the landing beaches are poor or non-existent;
- the post harvest losses as a result of spoilage are high due to lack of appropriate storage and preservation materials on the fishing and transport boats and at the landing beaches, although in the case of Nile perch most of the fish is moved directly to the processing factories.

Consequently there is a need for development in both these areas. Options for management include:

- upgrading landing facilities and improving sanitation;
- introducing quality control systems and HACCP protocols, including upgrading of appropriate laboratory facilities;
- improving the availability of ice for transport vessels and at the markets, and encouraging its use;
- training in post harvest processing, preservation methods and quality assurance.

6.3 Data management

The LVFRP and LVEMP programmes have considerably improved the knowledge of fish stocks. It is essential that this information flow is maintained and continually upgraded if the resources are to be managed on a sustainable basis. Financial and human resources must therefore be made available to continually monitor the status of the stocks and to allow management processes to respond to changes in the stocks in a timely and appropriate manner. Consequently, fish stock assessment, including analysis and timely reporting, should be a programmed activity by the research institutions in collaboration with the Fisheries Departments, and answerable to the LVFO. The LVFO should then be charged with producing an annual report to collate all available information, with appropriate interpretation, on the status of the stocks, exploitation patterns and socio-economic indicators to aid formulation of policy. It is imperative that information is accessible to all stakeholders. Reports must be written in a language, which both the layman and professional stakeholder can understand.

Data exchange is an integral part of the reporting and dissemination procedures needed for management of the stocks. It is therefore essential that the regional database established under LVEMP/LVFRP is maintained and upgraded as appropriate.

6.4 Regulation of effort through control of entry to the fishery

The three riparian countries have high rates of annual population growth (about 3%) in the Lake region. At the same time the lakeshore has a savannah type climate and experiences low and erratic rainfall over most places. There is therefore a scarcity of agricultural land and hence a shortage of employment opportunities in the area. It is therefore imperative to note that increasing population numbers would affect the fishery by increasing entry into fishing and fishery related occupations, especially for the landless youth. On the other hand the development of internal and external markets has contributed greatly to overfishing. The growth of markets and demand for fish has increased demand for juvenile fish, decreased the average size of individual fish caught, and accelerated the rate of biodiversity loss. It has also created thousands of job opportunities.

The main issue here is the control of effort through restricted access to the fishery. This will require the introduction of incentives and disincentives to encourage communities to diversify their activities into other sectors including integrated fish farming, crop propagation, forestry and irrigation. These are potential avenues that could reduce pressure on the lake's natural resources by creating new employment avenues.

There is a need to control investment in the fishing industry at the harvesting and processing levels. It is also vital to have food policy considerations that include fish as a source of protein. Successful policy implementation, however, must be based on solid biological, technological and socio-economic and socio-cultural information.

6.5 The human dimension

Information on the human dimension on Lake Victoria's fisheries is available from reports of Regional Project for Inland Fisheries Planning, Development and Management in Eastern/Central/Southern Africa and the LVFRP (Greboval 1990, 1992; SEDAWOG 1999a, 1999b).

6.5.1 *Fisheries as a livelihood*

The population of the lake region shows a high growth rate at about 3.0% per annum. The rainfall distribution around the lakeshore is low and erratic. Due to the above, most of the areas along the lakeshore experience a scarcity of agricultural land and a shortage of employment opportunities. The available agricultural activities are basically at subsistence level. Within the region and especially among the riparian communities many fishers believe that fishing provides a daily income unlike farming. Furthermore fishing is regarded as traditional since it is passed down from father to son. With few alternative sources of livelihood, most riparian communities turn to fishing (Geheb 1997). Due to the above, a significant percentage of fishers in the lake are young people who have dropped out of school after primary education. Regionally, 63% of fishers have had primary school education but only 22% of the people have secondary education (SEDAWOG 1999b). This shows that fishing communities are becoming more literate which contradicts earlier perceptions. This change is welcome for management in terms of information flow to the fisher communities who are now able to receive, understand and act. The increase in education levels may also reflect that people are currently finding fisheries as the only alternative for earning a living. Furthermore, with the current structural adjustment reforms and civil service retrenchment ongoing in the region, alternative jobs are difficult to come by and so in the near future there will be more entrants drawn to fishing. Furthermore, because of problems with drought conditions, many farming communities have abandoned their farms and are now fishing.

6.5.2 *Increasing demand for fish*

In the lake region, traders and processors have generally experienced supply problems due to declining catches. Most of the processing plants suffer from lack fish supply problems. Regional plant processing capacity is 823 t of whole fish per day, but most of the factories operate well below capacity (SEDAWOG 1999a).

In order to fill gaps in local market demand for fish, Nile perch skeletons (frames) are collected from the processors, and sold to low-income groups as source of protein.

Although there is a high demand for fish, especially the Nile perch, some processing plants have had to close due to a lack of support. For some of the processors to operate, they avail credit or loans to fishers who in return sell their fish to the processor. The overall impact of this restructuring of the industry has been to concentrate harvesting capacity in the hands of a small number of fishers who

use a less diverse set of gear and techniques. This is bound to have implications for fisheries management (Wilson *et al*. 1999).

In addition, domestic demand from the growing riparian human population is also increasing.

6.5.3 *Resource user and access rights*

Lake Victoria's fisheries basically operate under an unrestricted access regime whereby everyone is free to enter into the fishery after paying for a fishing licence. This situation represents a serious threat to the sustainability of both the fishery and the fishers' incomes. The only restriction is the national boundaries, although unregulated passage between these boundaries in the open waters of the lake occurs, especially between Kenya and Uganda.

The majority of fishers interviewed are very much opposed to limiting access (Wilson *et al*. 1999). Where access to valued resources is unrestricted, one can expect conflict, overuse, and the potential for destruction. Unrestricted access increases both vulnerability and risks to fishers. To maintain a share of the catch in a situation where the number of entrants to the fishery is ever increasing has encouraged some operators to use illegal gears. In many areas the use of small meshed nets is prevalent as is the use of beach seines. This is typical of the short-term measures that many fishers feel obliged to adopt even though there is widespread awareness of the damage that this is inflicting on the resource base and market (Geheb 1999).

It is argued that it will not be possible to establish an effective fisheries management regime for Lake Victoria without a well-defined user rights/resource access regime. This presupposes, however, the will to make changes at all levels and a commitment from a very wide base of stakeholder groups. There might well be merit in examining the feasibility of establishing defined geographical areas in which the fisheries resources and management functions are vested in the local stakeholder groups supported by the appropriate local, national and regional authorities. It is through resource ownership and control that fishing communities will attain a measure of autonomy from outside influences and hence greater control over entry. The proposed local ownership by the fishers will require collaboration of communities and priority access and control over the resources adjacent to them, which happens to be most important for their sustainability. This will necessitate the adoption of a common property resource management system (Geheb 1999). It will be imperative for local communities to have the desire and aptitude to take action to address problems in the lake environment and fisheries resources. They need to be in a position to devise fisheries byelaws, which once ratified by the government, become enforceable under national laws.

6.5.4 *Gender participation*

Women occupy a central place in the fishing sector. They dominate the onshore (post harvest) sub-sector of Lake Victoria's fisheries. Women account for between 70% to 87% of all fish traders involved in the artisanal fish trade. Despite being in the majority and of great importance (and contribution) to the fishing industry, they have received little attention from both governments and non-governmental organisations (NGOs). The participation of women in the onshore (post harvest) sub-sector has been hindered by cultural, social, economic and political factors. There is a high rate of illiteracy reported amongst women in fishing communities. The majority of women have either

never been to school or left after finishing primary school (Aloo *et al*. 2000). As women are the main actors in the onshore sub-sector, their contribution to fish handling quality, processing and preservation cannot be over-emphasized (Amia 2000). In Lake Victoria, women traders are almost excluded from the trade in Nile perch except for small and/or rejected fish and processing of swimbladders. They operate the main marketing channels for fishing units that use mosquito seines, catch tilapia and use beach seines. Unfortunately much of the catch made by these methods consists of immature fish.

Women affect the lake and its resources through activities in other sectors. They perform a multiplicity of roles including collecting firewood, which is used to smoke fish and cook food. Some women utilise reserves such as forests, wetland and other marginal lands for agricultural purposes and other related activities including cutting papyrus for mat making. All these activities contribute to deforestation and the clearing of wetlands.

The interaction of women with the lake environment indicates the role women can play in the management of lake resources. Women have to be sensitised to the need to participate in decisions that affect the lake since these also affect their lives. It is therefore essential that the lake's management organisations recognise the role of women, empower these actors and draw them into the management process. Women must become involved in the strategies deployed to manage the resources of the lake basin.

6.6 Institutional framework

Fisheries Departments in Uganda and Tanzania fall under two Ministries. This creates difficulties in administration, information flow from top to the village level and vice versa. The Fisheries Acts of these countries bestows management powers on the relevant Minister and it is important to note that it does not delegate powers to local authorities within whose jurisdiction the inland waters are situated, although in revenue collection powers have been delegated in Uganda and Tanzania. In all the three states extension personnel are also charged with enforcing fisheries regulations. To be more effective there needs to be a separation of the extension and enforcement functions. Fisheries extension services should be placed under the Director or Commissioner of Fisheries in the case of Tanzania and Uganda.

Those assigned duties of enforcing regulations at village level have been accused of accepting bribes, and since their numbers are limited by on-going retrenchment in the region the performance of enforcement has been poor. The issue has been further aggravated by poor logistics and lack of motivation. The institutions in the region charged with management and research on fisheries, are all under-funded. In most cases the funds received from the central government pay only the salaries of employees. This leaves no extra funds to undertake research activities and management activities including Monitoring, Control and Surveillance (MCS). There are no funds to purchase equipment nor to employ additional research and management personnel.

The research carried out has been mostly concerned with ecology and biology of fish species including stock assessment and limnology, which essentially provides information only on trends in stock size and composition. There has been very limited involvement of socio-economic criteria or methodologies in developing the strategies proposed to tackle the issues of declining stock size and

adverse compositional changes. This shortcoming has contributed to managers being ill equipped and exacerbating problems associated with the failure to regulate and manage the fisheries of the lake.

A further organisational difficulty is the poor relationship between fisheries research institutes in the region and their associated fisheries departments. There has been criticism about duplication of research effort. This should be resolved by key research areas being identified by the management arm and then given to the research institutes to investigate. This is one way by which rivalry between the two organisations might be minimised.

Relationships between the lakeside communities and the fisheries departments need to be improved. Since this has partly contributed to the fishers' ignorance of regulations, there has to be capacitation of extension staff to facilitate the fisheries training programme. The communities need to be mobilised, sensitised, and trained to know their responsibilities with regard to management of the resource. The relationship between local authorities and fisheries departments should be well regulated and defined.

To overcome management problems in the region, it is necessary for the state to co-operate with community organisations such as the BMUs in Tanzania, LMCs in Uganda and BMCs in Kenya in the management of the fisheries resource. The states need to empower and strengthen the community institutions and set in place mechanisms to sustain them. The government would still have to be central within any system of co-operative fisheries management since it is an effective source of legitimacy in rule making and enforcing. The trained community members would be involved in data collection for monitoring purposes. Furthermore, the communities would be involved in the enforcement of regulations and surveillance

6.7 Legal framework

6.7.1 *Existing legislation*

Each of the riparian countries has Fisheries Acts specifically for the management of their fisheries resources. There are a number of other acts, which apply to the management of other aspects related to fisheries, and these may be valuable to the overall management of the Lake Victoria fisheries. The existing Fisheries Acts include: Fisheries Act Chapter 378 of 1991 in Kenya; Fisheries and Crocodiles Act, Chapter 228 of 1964 and amended Chapter 3 of 1967 in Uganda; and Act, No. 6 of 1970 in Tanzania. These Fisheries Acts provide for the control, conservation, purchase, sale, marketing and processing of fish and fish products.

Key features of the Fisheries Acts for regulating fisheries exploitation include:

- Trawling is prohibited in Kenya and Tanzania.
- The minimum mesh size of gillnets in Kenya and Tanzania is 127 mm (5 inches), but this is only recommended in Uganda.
- Only hook sizes 8-11 are permitted in Tanzania.
- The minimum size of fish to be landed in Kenya is 250 mm, while in Uganda it is 280 mm for tilapia and 460 mm for Nile perch.
- Use of noxious or poisonous substances to fish is prohibited in all three countries.

- Tanzania outlaws monofilament gillnets, non-return valve traps, drift nets, spear guns and harpoons.
- In Kenya the Director of Fisheries is empowered to declare close seasons for specific areas, species or methods of fishing. In Tanzania the Minister may declare a controlled area in relation to all fish and fish products. The regulations also provide for fishing restrictions in specified bays and river mouths in Lake Victoria. The Minister in Uganda can declare that at a specified period of the year it shall be an offence to fish for any species as specified in the order.
- There is adequate provision for licensing fisher folk and fishing vessels, illegal fishing methods and gears, fish landing times, gazetted areas and fish landing stations.

The existing Fisheries Acts thus have some inadequacies in various areas. They require improvements, strengthening and additions before a FMP can be implemented. However, this should not delay implementation of the FMP because the acts are flexible.

The major problem concerning the current fisheries acts has been their implementation. It will be necessary for the current regulations to be revised to reflect the current situation in the fishery. There is also a problem of enforcement of the existing laws and regulations. For instance, there are a number of destructive fishing gears and methods such as beach seining and gill nets (of certain sizes) that are by law, illegal. However, some of these are still extensively used on the lake. The results of the Frame Survey of 2000 confirm the presence of large numbers of illegal fishing gears and vessels in the riparian states.

The lake being a shared resource requires national legislations to be coordinated. It is recommended that the harmonized regulation should be specific to the fisheries resources of Lake Victoria. The management of the fisheries will further require determination to act promptly and in a concerted way. This means that all statutory regulations on illegal gears, different gears, fishing methods and practices have to be streamlined, and no new gear or fishing method be introduced into the lake without scientific evaluation of its impact. A crucial component of legislative reform would be the provision of legal rights and protection for local fishing communities to be involved in the planning, formulation and implementation of the regulations. Riparian communities should be given legal backing and be involved in planning, formulation, implementation and enforcement of legal provisions relating to the management of Lake Victoria.

6.7.2 *Wider stakeholders' interests in the basin*

Other laws and regulations relevant to fisheries: There are laws covering management of the environment, water quality and wetlands, which are applicable to fisheries management, especially with respect to protecting the health of fish habitats. The three countries are party to common agreements. Among these are the establishment of the LVFO, the RAMSAR Convention, CITES, and the Biological Diversity Convention of Agenda 21 of the Rio Conference.

Environmental protection: The three East African countries are implementing National Environmental Action Plans (NEAPs) which provide a framework for integrating environmental concerns when designing and implementing projects. These can be applied to maintain the health of the water bodies in which fish live by: taking measures to avoid excessive nutrient enrichment,

pollution of fish habitats and introduction of organisms that threaten fisheries. In Uganda, an Environmental Management Statute was enacted in 1995. Each country has instituted a National Authority to oversee compliance with legislation standards, e.g. NEMA in Uganda, NEMC in Tanzania and NES in Kenya.

Management of wetlands: Wetlands play an important role as habitats for young fish and in trapping contaminants that would otherwise enter the aquatic environment. As indicated above, the East African governments are signatories to the convention on Wetlands of International Importance. Some countries have policies and plans for the management of wetlands. Uganda put in place a national policy for conservation and management of wetland resources in 1995. The policy provides for the development of capacity for the conservation and management of wetlands up to the district level.

Management of water quality: There is provision within the environmental management policies for protection of water quality. In addition, some of the East African countries have specific water policies and laws. The Uganda government has a water policy and the Water Statute 1995. The Water Statute provides guidelines for use, protection and management of water resources and has an institutional framework for the management of water resources.

Local government: In all of the three countries, there is a Local Government Act, which specifies the services to be undertaken by local governments. One of the services that have been decentralized to the local governments in Uganda is fisheries extension. Local governments have also been charged with protection of the environment, including the banks of lakes, rivers, streams and wetlands.

6.8 Conclusion

The above overview shows that Kenya, Tanzania and Uganda have adequate policy and legal frameworks for the management of fisheries resources and the fish habitat. The biggest weakness has been the lack of enforcement. The FMP should, therefore provide a mechanism for stimulating action. There is therefore the need to have a clear institutional mechanism for management of the fisheries and the fish habitats of Lake Victoria.

7 OPTIONS FOR MANAGEMENT OF THE FISHERIES

7.1 Introduction

Recent developments in the debate on the management of natural resources has generated a large number of conceptual perspectives and managerial styles. This section provides an over-view of these, which, where appropriate, the FMP incorporated into its structure. Co-management is emphasised because this provides the main theoretical inspiration to the FMP. Once the discussion on these perspectives has been completed, the main problems in the management of Lake Victoria's fisheries are summarised, and an administrative structure that should be able to remedy these difficulties is proposed. This structure aims to cope with the strategic goals forwarded in Section 8, and should be capable of implementing the projects subsequently identified.

7.2 Ecosystem management

An impact on any part of Lake Victoria is likely to affect the entire lake. Any stresses affecting fishery resources rarely act singly, and often have complex interactions and impact several levels of the aquatic ecosystem so that remedial management must address problems on a comprehensive whole-system basis. This management system therefore requires:

- raising community awareness and participation in formulation and implementation of rules and regulations;
- resolving conflicts among incompatible activities that have an adverse impact upon the Lake Victoria ecosystem including cross-sectoral departments, e.g. tourism, forestry, power generation and agriculture;
- utilisation of resources on a sustainable basis;
- maintenance of fish production;
- coordinating and harmonising fishery and other environmental needs and objectives at regional levels;
- protection and rehabilitation of the aquatic habitat;
- incorporate international legal instruments such as the RAMSAR Convention, FAO Code of Conduct for Responsible Fisheries (CCRF), Convention on International Trade in Endangered Species of world fauna and flora (CITES) and the Convention on Biological Diversity (CBD);
- biodiversity conservation;
- rehabilitation of depleted stocks of desirable species, especially the haplochromines and non-cichlids.

7.3 Adaptive management

Variations enveloped within the nature of Lake Victoria fisheries require flexible management systems that have the ability to absorb perturbations. The management approach for the lake needs to be sufficiently resilient but lead to rules that are flexible enough to respond quickly to changes in the economy and/or ecosystem. An adaptive management approach is necessary to respond to stock fluctuations, and the incidence of habitat and biological production changes as are experienced in Lake Victoria. The management structure also needs to be adaptable to changes in market conditions, both local and international, since such changes are likely to alter demand on the sizes and type of fish species to be landed.

The adaptive approach requires management regulations that will allow adjustments in the fishing pressure to be undertaken without delay, but at the same time promoting long-term sustainability of the fisheries. The adaptive management approach cannot work in a central government system since the system takes a longer process and time to change rules. Such an adaptive management system would be most appropriate under a co-management approach since decisions to change the rules of the fishery or the communities involved would reach introduction faster through byelaws.

In Lake Victoria, adaptive approaches are necessary, especially with respect to monitoring changes taking place as a result of the effect of gear regulations and mesh sizes limitations on fish production.

This action may be undertaken by either LVFO or the Fisheries Management Committee every year or as may be deemed necessary, hence the reason for annual reporting of accurate statistics on catch composition, size structure and population characteristics.

7.4 Precautionary management

Lake Victoria fisheries is faced with numerous variations arising from climatic changes and anthropogenic activities within the lake and the catchment. The lake effectively a three species fishery with more than one hundred identified fish species. The species mature at different sizes and over 80% of the fish species are found within the inshore area. Consequently, the fishers and the consumers have tastes for various types of species and size groups. To harvest the stocks would therefore require various gear types, mesh sizes and technologies to be applied. The complexity of biotic systems and the interrelatedness of their components require that the lake ecosystem be managed as a whole system. Piecemeal management of single species will not succeed. However, because of the complexity of the system there will never be a complete picture of the inter-relationships between all components. The appropriate management approach should therefore involve multi-disciplinary system, which will protect resources in a data limited scenario, support by the best available information. Consequently, a precautionary management approach is required where insufficient is known to make rational decisions based on sound science. This should be linked to continuous monitoring of biological characteristics of the lake, catches, ecosystem and environmental change, and the human dimension of the fishery in an effort to improve our understanding of the ecosystem dynamics. Only when sound scientific evidence is available can more affirmative management action be taken.

7.5 Holistic management

The holistic perspective is realized in fisheries management strategies that recognize the basic interrelatedness of limnological, biological and anthropogenic activities and effects linked to the fishery. This indicates the need to cope with uncertainty and complications through the use of multi-disciplinary approaches, including those that are based on scientific and non-scientific knowledge.

The process also requires whole system capability since the three commercial species are distributed throughout the lake. A further imperative is that the lake's ecosystem, including, the fish species, both demersal and pelagic, need to be understood and managed as one system. This is the essence of having harmonised regulations for Lake Victoria's fisheries.

7.6 Proprietorship

Where valued resources are exposed to unrestricted access one can expect conflict, overuse, and the potential of destruction. For effective management of the fisheries in Lake Victoria it is necessary that the fisheries resources and their management be owned and controlled within a defined geographical region. The proposed local ownership by the local stakeholders, i.e. proprietorship, will require collaboration of communities and priority access and control over the resource adjacent to them, which happens to be most important for their sustainability. Proprietorship should increase both the effectiveness of regulations, including the byelaws and the legitimacy of management.

The sustainability of Lake Victoria fisheries requires application of the above processes. However, before implementation considerable consultation with the communities involved is necessary since interviews with fishers indicate that a large percentage are not in yet in favour of the proposed system. It is further suggested that the implementation could be initiated in the remote areas of the lake before reaching the central areas.

7.7 Policing: community involvement in monitoring, control and surveillance

The FAO CCRF characterises monitoring, control and surveillance (MCS) activities as indispensable to effective management. Responsible fishing requires effective MCS, which is dependent on the collection, collaboration and analysis of accurate and relevant data and information (FAO 1997). In view of the current trend of restructuring programmes or retrenchment in the civil service of the region, it is recommended that the fisheries departments involve co-operative management with the community institutions since it is an alternative mechanism to provide the additional manpower for the exercise. The system will require more accurate and continuous data collection after the end of both LVEMP and LVFRP. Persons to be deployed in the exercise that currently lack the necessary training in accurate statistical data collection will need to be trained.

The benefit of co-management in the fisheries sector to government would be that conservation measures necessary to exploit fish resources on a sustainable basis become a community responsibility. An associated benefit would be the reduced cost of enforcing fisheries regulations.

7.7.1 *Fishing and non-fishing sector interactions*

The success of pursuing responsible fisheries cannot ignore the processes operating across the larger socio-economic environment with which a local fishing industry has to be managed and developed. The developments in other sectors of the national economy at the local, national or regional levels may be either beneficial or cause damage to the fishing industry. At the national level these impacts arise directly from competing demands for use of the aquatic resource base. Examples include: wetland reclamation of areas such as the Yala swamp; tourism on Takawiri Island; hydroelectric power generation on the River Sondu-Miriu. It should also be recognized the Lake Victoria basin has various activities apart from fishing. Some of these include: use of wetlands; mining within the basin; pollution impacts from industries and municipal discharges; and agricultural practices.

The region suffers from drought conditions, and this has had some impact on agricultural production. Problems have also arisen in the region due to Structural Adjustment Programs (SAPs), leading to retrenchment, hence unemployment. Requirements of the international fish markets have also had major impacts in the fisheries, e.g. in terms of the ban imposed by the EU market and also the current situation in which the international market tends to be dictating the fish sizes to be harvested.

Management of fisheries resources will require the use of integrated development strategies and the lake area management at the local level to accommodate the complex interactions and conflicts between fishing and non-fishing activities. At the national and regional levels, there will have to interventions aimed at creating economic diversification thereby reducing pressure on the fisheries resources.

7.7.2 *Integrated management of the lake basin*

The driving forces behind the devastating lake region resources depletion include:

- high rates of population growth;
- poverty exacerbated by dwindling resources, over-exploited fisheries and lack of alternative livelihoods;
- quick-profit, commercial enterprises which degrade resources and conflict with the interests of the community;
- lack of awareness about management for resource sustainability among the communities and policy makers;
- lack of understanding of the economic contribution of the various resources within the basin to the communities;
- for the lake resource system to remain productive, their management requires a holistic and comprehensive approach.

From these areas of concern the management of the lake basin region requires a policy support that calls for:

- establishment of an effective general framework for dealing with conflicts arising from interactions of the various users of the lake basin resources;
- assessment of the economic, social and cultural values that attach to different resources within the lake and including the basin;
- promotion of community awareness of the lake resources, conservation and management needs and of community participation by affected parties in the management process;
- use of multi-disciplinary approaches to monitor the lake basin management.

The research done on the Lake Victoria region under both LVEMP and LVFRP is a good beginning for the development of the lake basin management approaches. This task should be spearheaded by the LVFO.

7.8 Partnership: Co-management

The current top-down approaches in managing the fisheries resources in the three countries have met with great difficulties. These have been caused by understaffing and poor motivation among others. It is proposed that co-management, which aims at increasing local participation and involvement in decision-making, implementation, monitoring and enforcement, be given legal backing. The co-management approach might lead to lower transaction costs at the planning and implementation phase because fishermen can provide information on fishing patterns, catches and the status of the resources (Sen & Nielsen 1996). The success of the co-management will depend on political commitment on the part of the governments to fisheries management, and the commitment would require support by appropriate legislation, and adequate technical and financial resources. Under co-management new institutions would have to be developed. It is important to note that this will take time and that it is a long-term process.

7.9 A summary of management problems on Lake Victoria

There is general consensus that there has been a widespread failure of 'command and control' management systems. Reasons for this are complex but revolve around some/all of the following:

- difficulty of defining and adopting coordinates for 'sustainable fishing' when dealing with turbulent biological and socio-economic environments;
- heavy reliance on trying to manage socially-constructed management problems by setting biological limits;
- poor working relationship between fishers and those who set out to plan, develop and manage fisheries;
- limited roles of fishers in the management process, especially with respect to MCS;
- poorly defined (unworkable) access to, ownership of, and responsibility for the resource;
- resistance of fishers (and other stakeholders) to take on role of self-policing;
- weak spatial correlation between the fishers (and their communities) and the distribution and abundance of fish resources;
- lack of robustly-constructed management strategies (too data hungry, excessively bureaucratic; centre unwilling to decentralise power etc.);
- unwillingness of all stakeholder groups to confront problems and debate, negotiate agreed courses of action;
- unwillingness of central authorities to devolve management to (and or empower) local/regional level;
- weak institutions representing fishers; and
- problems associated with providing useful biological information to guide management: excessive discards; difficulty of applying management measures in multi-species setting; poor commercial catch data; difficulty of accounting for external variables.

The outputs from LVFRP and literature on fisheries management suggest that progress has been made in countermanding some of the problems listed above. Extensive research and development in other parts of the world has shown that improvements can be made to fisheries management regimes by:

- accepting that it is not possible to manage fisheries (and fishers) solely by laying down biological limits;
- adopting management strategies that allow for biological, technical, social, economic and environmental factors for example, amongst others, the FAO Code of conduct for Responsible Fishing, that is based on the principles of: Partnership, Proprietorship, Policing, Process and Precaution;
- taking note of the specific management interventions which have met with some success, e.g.
  - creating a culture of debate, negotiation and consensus at all levels of stakeholders associated with resource exploitation,
  - adopting community-based strategies for exploitation/management of the resource,
  - developing institutions, perhaps in geographical divisions to improve the definition of resource access and ownership,
  - creating 'nested' support for community organisations,

- privatising access to the resource.

7.10 Components of the Fisheries Management Plan

In the case of Lake Victoria, the results from the LVFRP have shown that for the FMP to be meaningful, and have a chance of succeeding at the implementation phase, the following key tenets must form part of the structure and *modus operandi*. The strategy (Geheb *et al*. 2002) must:

- be founded on beach institutions, which will be at the front line of law enforcement;
- take on board that state involvement should occur at the next level;
- accept that laws and regulations under the plan would be generated by negotiation and consensus;
- appreciate that to be successful the beach institutions should be 'nested' within a wider framework providing, in the main support and facilitating services;
- be able to feed into other political and administrative structures not necessarily related to fisheries;
- be able to operate with minimal scientific and financial inputs;
- be flexible and be able to respond to change (to cope with fluctuating economic, social, political, ecological and limnological conditions);
- be amenable to gradual implementation, so that governments can adjust to the new conditions;
- give the lakeside communities time to adjust to their new responsibilities;
- be backed by a comprehensive legal package that enables communities the right to organise and enact their own fishing byelaws consistent with relevant national laws;
- wholeheartedly embrace 'transparency' at all levels and between all stakeholders/stakeholder groups;
- be widely disseminated to all stakeholders and they should be briefed on the changes that occur over time.

In order to identify a management plan that has broad acceptance, it is best to consider a range of alternatives. The strategies may differ in their basic approach or in detail. However, a management plan must indicate which management measures are to be applied, and the circumstances under which the measures are to be varied.

A fisheries management plan is an explicit arrangement between the fisheries departments and other recognized stakeholders. It should identify the stakeholders and clarify their respective roles, rights and responsibilities. It should list the objectives agreed on for the fishery and the harvesting strategy, and the rules and regulations applied to realise those objectives. It should describe the mechanisms for on-going consultations, and the arrangements to ensure compliance and other information relevant to the management of the fishery.

7.10.1 *Proposed institutional framework for co-management*

There is a need to form three levels of institutions, which will participate in the management of the lake (Fig. 3). These three lie at the beach, district and national (lake-wide) levels. The first two levels have the Lake Victoria Fisheries Management Council (LVFMC) as the umbrella body at national level and the LVFO as the co-ordinating body at regional level.

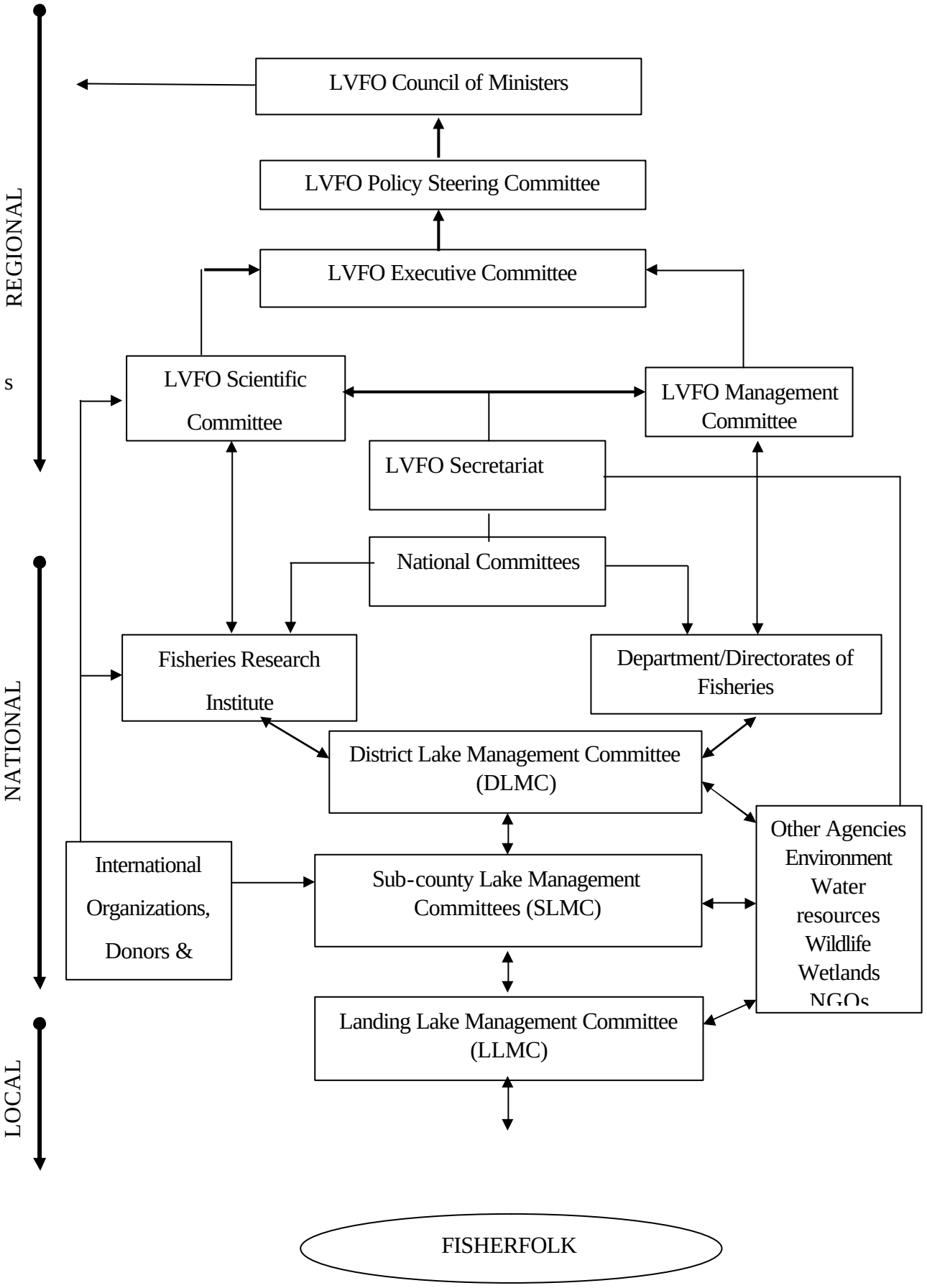
REGIONAL
s
NATIONAL
LOCAL
LVFO Council of Ministers
LVFO Policy Steering Committee
LVFO Executive Committee
LVFO Scientific Committee
LVFO Management Committee
LVFO Secretariat
National Committees
Fisheries Research Institute
Department/Directorates of Fisheries
District Lake Management Committee (DLMC)
International Organizations, Donors &
Sub-county Lake Management Committees (SLMC)
Other Agencies
Environment
Water resources
Wildlife
Wetlands
NGOs
Landing Lake Management Committee (LLMC)
FISHERFOLK

Figure 3. Proposed institutional framework for implementation of the Fisheries Management Plan

7.10.2 *Nature and composition of the organisations*

Beach level

At this level there are already in existence Beach Management Units (BMUs) in Tanzania, Landing Management Committee (LMCs) in Uganda and Beach Management Committees (BMCs) in Kenya. These comprise fishermen, fishmongers, boat makers and net repairers and crew. Both fisheries departments and processors should attend as observers. These should be formed at designated landing beaches. The institutions mentioned above should be able to undertake the following duties:

- preparation of byelaws for management of the fisheries resource, stating clearly fines for various offences to help minimize conflicts;
- support and enforcement of the Fisheries Acts;
- banning fish poisoning and plant derived poisons to kill fish;
- banning destructive fishing methods and gears; enforcing regulations banning the capture of fish less than or above the agreed minimum and maximum sizes;
- banning fishing in established closed areas and during closed seasons;
- prosecution of offenders and resolution of disputes;
- community participation in licensing procedures.

District level

These should comprise at least three representatives from community groups including processors in the District /Municipal Council and a Fisheries District representative (District Fisheries Officer) and non-governmental organisations and community-based organisations with interest focuses in fisheries. These will comprise Fisheries Management Committee (FMC).

National (lake-wide) level

Two representatives from each of the FMC, the Fisheries District Headquarters, non-governmental organisations and the research institutes should constitute the organisation at the national level. These will comprise the Lake Victoria Fisheries Management Council. The committees formed at this level should be co-ordinated by LVFO. Roles to be undertaken by research institutes and Fisheries Departments include:

- provision of information and monitoring capability (information required would include the recommended mesh sizes in addition to information explaining ecological, biological and limnological changes within the fishery. Such information is intended to enable the user-communities respond to changes as they occur);
- play a key role in the alleviation of uncertainty in the fish markets; hence enabling fishermen to adjust for price fluctuations;
- assist in law enforcement in areas where the community system of punishing offenders fails, e.g. the issue of piracy in the lake;
- assist fishers in monitoring the types of gears used beyond local boundaries;
- decide on distribution of fishing rights based on consultation with user groups;
- liaise with other departments in other sectors (such as agriculture, since farming activities are likely to impinge on fishing related activities);
- mobilisation, sensitisation, train, motivate and support of the user groups;

- encourage community collaboration, co-operation and partnership so as to avoid competitive and conflicting management efforts;
- make available funds for collective fisheries decision-making, which will involve dealing with fisheries problems, participating in meetings, making policies, rules and regulations, and communicating with local and central fisheries authorities;
- provide technical capacity including extension services;
- encourage the development of alternative sources of fish resources/income generating activities;
- organise workshops, seminars for the user groups where they can express their opinions and priorities;
- provide benefits/incentives to members of the communities who sacrifice time and effort to bring people together for decision-making and enforcement.

In carrying out the above, the fisheries departments will be developing the communities to a level that will enable them to take charge of the management process. The departments will have to ensure that the communities manage the resource on a sustainable basis even after external resources are withdrawn. It is mandatory for the departments to strengthen the community institutions and set in place a mechanism (or mechanisms) for sustainability.

Any institutional arrangement for the lake must address the issue of sustainable funding. In order to achieve this, dependence on donor funds should be limited to the initial periods, not for long-term expenditure. Under the FMP, it is proposed that funds be generated from the following sources:

- royalties / fees from exporters;
- revenues from migratory fishers;
- revenue from collector trucks;
- revenue from licenses for canoes;
- collection from penalties/ fines;
- enhanced budgetary allocation by the three states.

Wangila (1995) recommended the formation of Fisheries Levy Trusts (FLT) in each country to collect fees. He further recommended the formation of a Fisheries Development and Conservation Board (FDCB) through an Act of Parliament to uphold policy and supervise the FLT. It was proposed that FDCB draws its members from stakeholders including fisheries departments. The main purpose would be to ensure that management development and research, on the resource are addressed and financed by the FLT account.

It is recommended that offences considered to be minor be incorporated in byelaws made by the communities and executed by them, whereas those considered to be more serious, for example piracy, be executed by the fisheries management through the local communities.

8 MANAGEMENT ACTIONS

This document has, so far, set out the background and recent history of the development and attempts to manage the fisheries of Lake Victoria. Thereafter the key factors that on the one hand

threaten and weaken the position of the lake's fisheries economy and on the other offer opportunities and prospects for maintaining the flow of benefits from fisheries exploitation are analysed. Inevitably the success of the stakeholders in marginalizing the threats and capitalising on the opportunities will depend on bringing order to this diverse array of factors. The necessity for stakeholder participation and collaboration at all levels has been promoted strongly and will be required to establish a common perspective on sustaining the lake's fisheries production systems. The way that this might be achieved in terms of the organisations, the functions at different levels and the policies they will need to use has been covered. The need to adopt the global approach to addressing the lake' problems as laid down in the FAO Code of Conduct for Responsible Fisheries is stressed. This in turn, amongst other key concepts, advocates the importance of conducting planning, management and development activities within the ethos of 'proprietorship' and 'partnership'. It is thus appropriate that the next stages of defining the detail and implementation conditions of the FMP are conducted by the relevant stakeholder representatives at the appropriate levels and with cognisance of the resources at their disposal.

To act as a guide as to how these activities be conducted the following section of the FMP takes a series of strategic goals and develops criteria that will serve to initiate the planning and implementation processes. It is not by accident that the logical framework approach (LFA) planning technique has been selected. In the first instance the technique is eminently participatory and when properly instituted will draw in the key stakeholders to develop a workable matrix to approach the solution of often complex problems. Furthermore, the LFA is widely used to bring not only stakeholders together to focus on common problems but serves as a tool that can take the solutions generated forward to implementation. In the context of the recent history of development of lake-based research and development activities, the interventions chosen are set in the context of (discrete) projects. It would therefore not be untoward to suggest that implementation of the FMP should be projectised, with linked groups of projects being finalised to a planning stage and implemented when resources become available. The LFA fits in with the project approach, and this further reinforces the value of its inclusion in this document.

The way forward in the management of the lake is to identify strategic goals from the related high priority options discussed in Section 6, which should address the key issues identified. The main elements of the management plan relate to those policy initiatives or practical actions (immediate objectives) that are required to help set the overall management stage or alternatively relate to problems demanding immediate attention because of potentially serious sustainable impacts (see Appendix 7). The development objectives being addressed are:

- To earn foreign exchange for the three governments and improve the standard of living in the riparian communities.
-
- To increase fish supply to the riparian communities (through more effective use of available fisheries resources at regional and national levels).
- To create employment opportunities, particularly for riparian communities.

These actions can then be implemented through an institutional framework such as that given in Figure 3, where all stakeholders are represented.

8.1 *Strategic goal 1: Regulation of fishing effort within the framework of an adaptive management approach*

Information available indicates over-exploitation of the stocks, with signs of stock decline. The commercial species including Nile perch and *Rastrineobola argentea* have reduced in size of capture. To change the current trends in stock abundance and catches will require the banning of illegal fishing gears and fishing methods. It may also be desirable to introduce regulations that closed areas and close seasons and thus help the stocks recover, but information on spawning and nursery areas is limited to support such actions. Consequently, efforts should be made to access indigenous knowledge to support identification of closed areas, and possibly seasons, and the practicalities of implementing such actions evaluated. High priority (immediate objectives) must be given to regulating fishing effort.

8.1.1 Project Title: Enforcement of fisheries laws and regulations

Immediate objective
To enforce fisheries laws and regulations by banning illegal gears and fishing methods, whilst observing well defined close seasons and closed areas, where applicable.

Inputs
- Financial resources.
- Personnel, especially communities.
- Necessary logistics / equipment.
- Establishment of a revolving fund to be managed with involvement of the fishers, and to be loaned to fishers to enable them to replace illegal gears.
- Introduction of rewards for beach communities with outstanding compliance on the recommended gears.
- Support from stakeholders.

Activities
- Setting up adequate and appropriate MCS system.
- Setting up a credit system to support purchase of recommended gears.
- Determine optimal access arrangements for the fishery.
- Assess 'access' requirements for the filleting factories.
- Improve and harmonize fisheries legislation to take account of access, fishing effort and environmental issues.
- Design appropriate fishing vessels with adequate safety measures.
- Progressive withdrawal of illegal gears.
- Active promotion of use of the recommended gears and fishing methods.
- Promotion of rewards for beach communities with highest compliance on recommended gears.
- Annual review to determine the efficiency of the management process.
- Sensitise fishers about the need for appropriate closed areas and seasons.
- Effect training of beach communities on MCS system.

Outputs

- Increased use of recommended gears.
- Phasing out the use of illegal gears.
- Fisheries laws and regulations harmonised and enforced.
- Destructive fishing gears and methods effectively banned.
- Practical slot–sizes for the commercial species controlled.
- Processing plants and access to fishing regulated
- Closed areas and seasons demarcated and controlled.
- Reduction of subsidies paid to fishers.
- Establishment of a monitoring, control and surveillance system
- Increased participation of the beach communities in all aspects of fisheries management promoted.
- Retraining of fishermen displaced from fishing.

Indicators

- Increased numbers of spawners.
- Increased fish biomass.
- Increase in size and number of fish caught.
- Increased biodiversity of fish species.
- Reduced cases of theft of nets and piracy in the lake.

8.2 *Strategic Goal 2: Harmonizing and strengthening of the institutional environment for fisheries, development, research and management on Lake Victoria*

Several shortcomings have been noted regarding the institutional arrangements for the fisheries sub-sector of Lake Victoria. The present institutions are weak due to various factors. On the other hand it is envisaged that for proper management to be effected, some relevant institutions need to be set up. In order to ameliorate the current shortcomings of the institutions and harmonize the institutional environment the following priority actions (immediate objectives) are necessary.

(a) Provision of adequate funds to the sub-sector from central governments and other sources, including bilateral, multi-lateral and NGO contributions. A fish levy trust should be developed to take a lead in this area. With sufficient funds the research institutes should be able to provide the knowledge on stocks and fishing activities needed for effective fisheries management.
(b) Enhance training of managerial staff, especially policy-makers and the extension staff. This is intended to support the proposed co-management initiatives.
(c) The BMUs, BMCs and LMCs have to be well organized, legitimized as accredited local institutions and trained in fisheries management activities so they can undertake the responsibility for lake management.

8.2.1 Project Title: Develop a training programme for fisheries staff and stakeholders

Immediate objective
To improve human resource development (HRD), both within fisheries management and communities; to enhance fisheries management capabilities through co-management.

Inputs
- Financial resources.
- Personnel.
- Support from stakeholders.
- Funding of workshops, training and fieldwork.
- Provision of logistics / equipment.

Activities
- Determine training needs.
- Establishment of training courses relevant to the project aims.
- Participation in training programmes, short courses and workshops.
- In-service training programmes identified and implemented.
- Establishment and implementation of staff development programmes for managers and researchers.
- Prepare job descriptions for staff.

Outputs
- Trained fish quality inspectors.
- Trained fisheries managers and scientists.
- Trained support staff and extension service.
- Community groups trained in book keeping, accounting and monitoring of the resources.

Indicators
- Involvement of management staff in co-management and fish handling.
- Involvement of communities in co-management activities.
- Increased active participation of communities in monitoring, control and surveillance.
- Increased compliance by communities.

8.3 *Strategic goal 3: Establishment of an institutional environment that can sustainably manage a modified use and access rights regime using local community structures and mechanisms*

Unrestricted access to the fisheries Lake Victoria has caused a number of problems, including conflict, overuse and bringing the fishery near to collapse. Due to lack of adequate funding, provision of logistics and inadequate manpower, little enforcement of regulations or continuous monitoring, control and surveillance has undertaken.

It is imperative that central authorities devolve power, such that communities are able to participate in management more effectively. Lack of knowledge in the communities calls for education and

sensitisation before they can take charge. The fisheries departments need to consult with relevant institutions as to how territorial boundaries should operate. Initially this may be piloted in a few remote beaches since it is a sensitive area in the management process.

8.3.1 Project Title: The integration of community participation in the management of the fisheries of Lake Victoria

Immediate objective
To strengthen, devolve power to and legalise the Beach Management Units, Beach Management Committees and Landing Management Committees to make byelaws in order to participate actively in enforcement of fisheries laws and regulations and monitoring of the fisheries.

Inputs
- Financial input.
- Support of the stakeholders.
- Equipment and transport on both land and water.
- Camping equipment.

Activities
- Organise and strengthen the formation of beach community institutions.
- Train and equip the beach community institutions for fisheries management.
- Legitimise the status of the beach community institutions at national and regional levels.
- Sensitise and encourage community participation in meetings to draft byelaws and obtain appropriate gazetting of the byelaws.
- Sensitise community institutions on the importance of conflict resolution committees.
- Strengthen the MCS units of the Fisheries Departments with logistics and funds to undertake responsibilities on the lake, especially in offshore waters.
- Gradually shift responsibility of MCS to beach institutions.

Outputs
- Formation of beach institutions in identified zones.
- Gradual devolution of power to the beach institutions.
- Establishment of sub-committees to undertake various assignment including MCS within the beaches.
- Co-management awareness, sensitisation and education undertaken.
- Co-management encouraged and promoted.

Indicators
- Increased compliance by the communities.
- Reduced costs of carrying out enforcement and MCS.

8.4 *Strategic goal 4: Adoption of CCRF policy matrix with Lake Basin Management and Integrated Development Strategy models as policies to match the complexities of the fisheries*

Policies need to be formulated and made adaptable to the characteristics of the resource system, uncertainty and complexity, as well as stakeholder interests. There is need to align key policies to conform to other FAO member states. The need for conflict resolution is imperative to reduce rivalry and misunderstanding between fishers, between processors and between traders, which currently is creating mismanagement of the fisheries. The three governments' needs for priority action include:

(a) adoption and implementation of the CCRF to adjust fisheries policies in line with those of other FAO member states;
(b) adopting and pursuing management policy directions in support of:

- adaptive management practices that allow for management of fishing pressure and to cope with the different circumstances around the lakeshore,
- a multi-disciplinary monitoring capability that will integrate both scientific and non-scientific information,
- partnerships with community groups in management decision-making to fashion the modalities of enforcement and compliance,
- allocation of access and fishing rights at the community level, and
- use of integrated development strategies and lake basin management models at the local level to accommodate complex interactions and possible conflicts between fishing and non-fishing communities.

Project Title: The adoption of CCRF, the integrated development strategies and the Lake Basin Management models

Immediate objective
To adopt the CCRF policy matrix and principles for lake basin management models as well as integrated development strategies in formation of policies to match complexities, plural interests and interactions of the fishery with other sectors.

Inputs
- Financial resources.
- Publicity of CCRF.
- Support of stakeholders.
- Equipment.

Activities
- Undertake Environment Impact Assessments on the lake ecosystem whenever a project is to be established.
- Sensitise user groups on the impacts of pollutants on fish resources.
- Sensitise communities on the importance of protecting satellite lakes and protecting reserves.
- Sensitise communities on good agricultural practises, afforestation and conservation of wetlands, and encourage their use.
- Hold meetings and sensitise the industrialists and urban councils on the need for their involvement in the treatment of urban and industrial effluent
- Resolving conflicts among incompatible activities impacting on the aquatic system, including cross-sectoral activities, e.g. forestry, transport agriculture and hydroelectric power generation.

Outputs
- Implementation of the CCRF by LVFO.
- Adoption and pursuance of management policy directions in support of adaptive management practices, multi-disciplinary monitoring capabilities, partnership with communities, allocation of access and fishing rights to the communities and the use of integrated development strategies and lake basin management models at the community level.

8.5 *Strategic goal 5: Strengthening of capacity building and the institutional environment for fisheries management, development and research on Lake Victoria*

There are problems with the management of the resources of Lake Victoria. Some of the issues relate to gaps in areas of research and poor flow of information from the fisheries authorities to the communities/stakeholders, and between fisheries management and the research institutes. Gaps in research are due to poor planning of research programmes, lack of funds, lack of experience and commitment in data collection. Poor information flows have been caused mainly by professional rivalry and lack of commitment. Another problem is weak extension services within the fisheries management to disseminate information and enable feedback from the fishers to managers.

8.5.1 Project title: Enhance information gathering and dissemination and continue research on biological, limnological and socio-economic aspects of the fish species of Lake Victoria

Immediate objective

To continue research into environmental, biological and socio-economic aspects of the fisheries of Lake Victoria, with enhanced information gathering and dissemination to enable the management, including stakeholders, to formulate the most appropriate means to manage the resource.

Inputs

- Financial resources.
- Equipment for research, information gathering and dissemination.
- Trained personnel for information technology and research.
- Expert to identify and adapt skills needed for the fishing industry

Activities

- Recruit and train world-wide website designers and information technology (IT) specialists.
- Provide additional equipment and upgrade library facilities.
- Create a system of discussing management issues and research findings to improve flow of information and feed back among the stakeholders.
- Establish and improve national, regional and international information networking.
- Maintain strong liaison with existing programmes.
- Establish a clearing house and database for information on Lake Victoria (LVFO).
- Carry out stock assessment, conduct research on the biology and ecology of species of commercial importance to fill existing gaps in knowledge.
- Strengthen data collection mechanism at beach levels.
- Carry out frame surveys bi–annually.
- Construct new research vessels.
- Develop GIS for management of the lake fishery.
- Develop a new bathy metric map for Lake Victoria.
- Conduct a macro economic analysis for the Nile perch fishery
- Prepare a needs assessment for the fishing industry.
- Establish genetic integrity of stocks of major commercial species.

Outputs

- Skills needed for the fishing industry identified and sought.
- Results on stock assessment analysed and published.
- New research vessels constructed.
- Frame surveys designed and carried out.
- Information technology specialists trained.
- Well-stocked national and regional libraries.
- Improved national, regional and international information networking.
- Stocks sampled and genetic analysis completed.
- Improved information sharing, established.
- Established clearing house and database for information on Lake Victoria.

- Spatial planning of Fisheries Framework put in place.

Indicators
- Increased compliance on management of the resources.
- Improved communication among stakeholders.

8.6 *Strategic goal 6: The developing of improved post harvest methods and infrastructure to optimise value added for fish from Lake Victoria*

The remoteness of the landing sites and general transportation infrastructure impose severe constraints on the post-harvest sector of the Lake Victoria fisheries. Value, quality and quantity of fish are lost by what happens to the fish after removal from the water. Inappropriate handling, including inadequate icing, is a major impediment to the full utilisation of the present catch from the Lake. One of the serious bottlenecks is the availability of ice especially in the remote areas of the lake.

The successful implementation of the strategic goals given above will be facilitated by the implementation of the immediate objectives of the FMP in the context of the '5Ps' (Proprietorship, Partnership, Process, Precaution, Policing) of the FAO Code of Conduct for Responsible Fisheries, as outlined in Table 4.

8.6.1 Project Title: Develop appropriate handling, preservation, processing and storage methods for harvested fish both for local and export markets

Immediate objective
To develop appropriate methods of handling, preserving, processing and storage of the harvested fish, for both local and export markets, so as to enhance quality of the fish and their products, in order to attract high prices for the fishers, traders and processors and guarantee for safety and quality to consumers.

Inputs
- Financial resources.
- Personnel.
- Equipment and other logistics including infrastructure.

Activities
- Improvement of cured fish processing techniques and facilities.
- Construction of hygienic beach landing facilities.
- Improvement of marketing infrastructure.
- Improve sanitary conditions.
- Providing or upgrading existing electricity supply, access roads, telecommunication, etc.
- Enhancement of quality assurance systems and fish inspection through:
    - provision of up to date analytical laboratories in the three riparian states and a referral laboratory in the region;
    - improvement of public fish handling facilities including sorting sheds.

Outputs

- Enhanced safety and quality assurance systems, and fish inspection by providing analytical laboratories in the three states and one referral laboratory in the region, and improvement of fish handling facilities at the landing sites.
- Improvement of electricity supply, access roads and other means of communication.
- Improved cured fish processing techniques and facilities.
- Reduction of post harvest fisheries losses.
- Adequate fish landing facilities established at the landing sites.
- Provision of adequate sanitary and hygienic fish handling facilities, at the identified landing sites (e.g. roads, jetties, fencing, toilets).
- Improved standard of health, education and water about the selected fishing villages and surrounding riparian communities.

Indicators

- Reduced post harvest losses.
- High quality fish both for local and export markets.
- Improved earnings to the fishers and traders.

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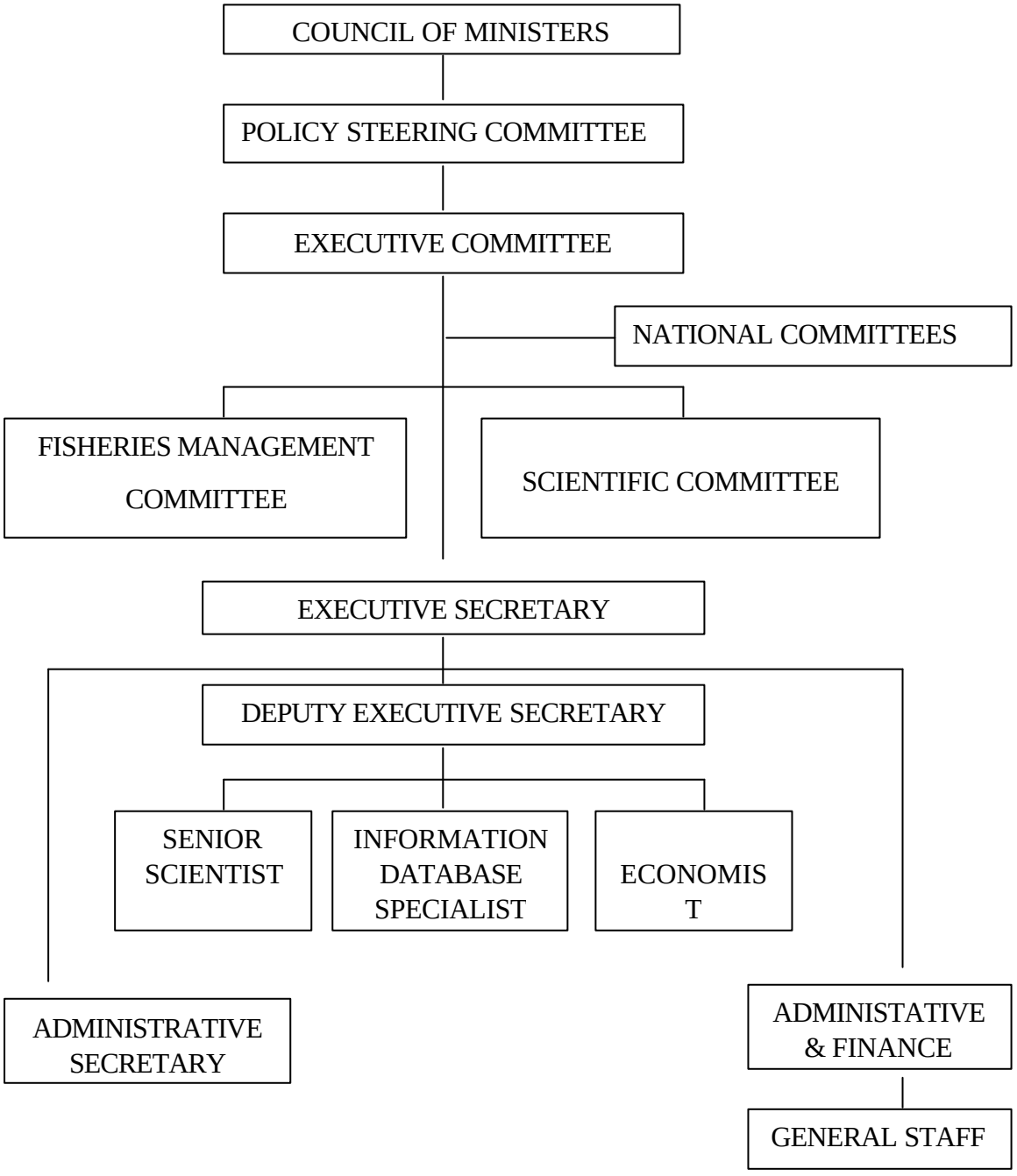
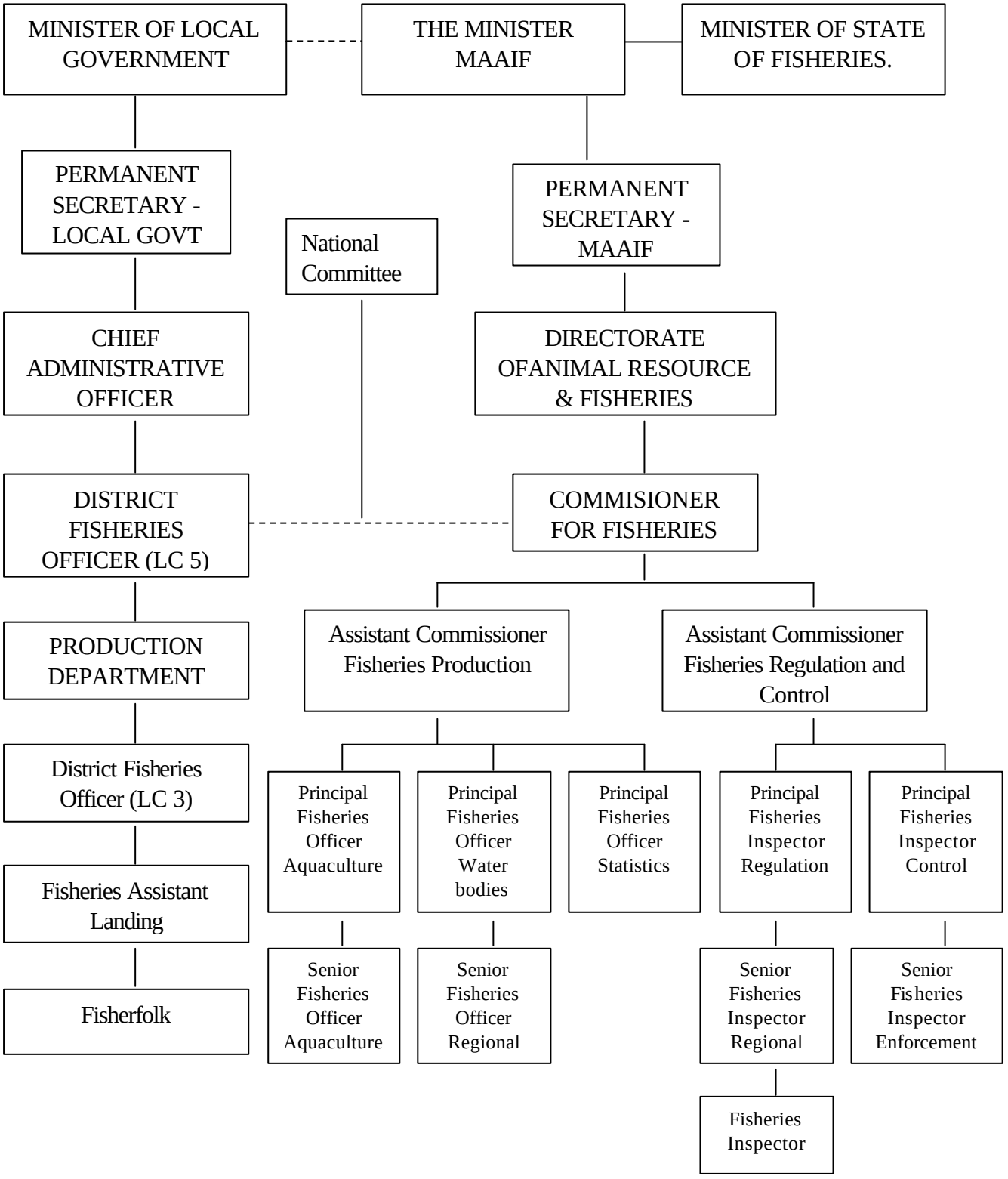
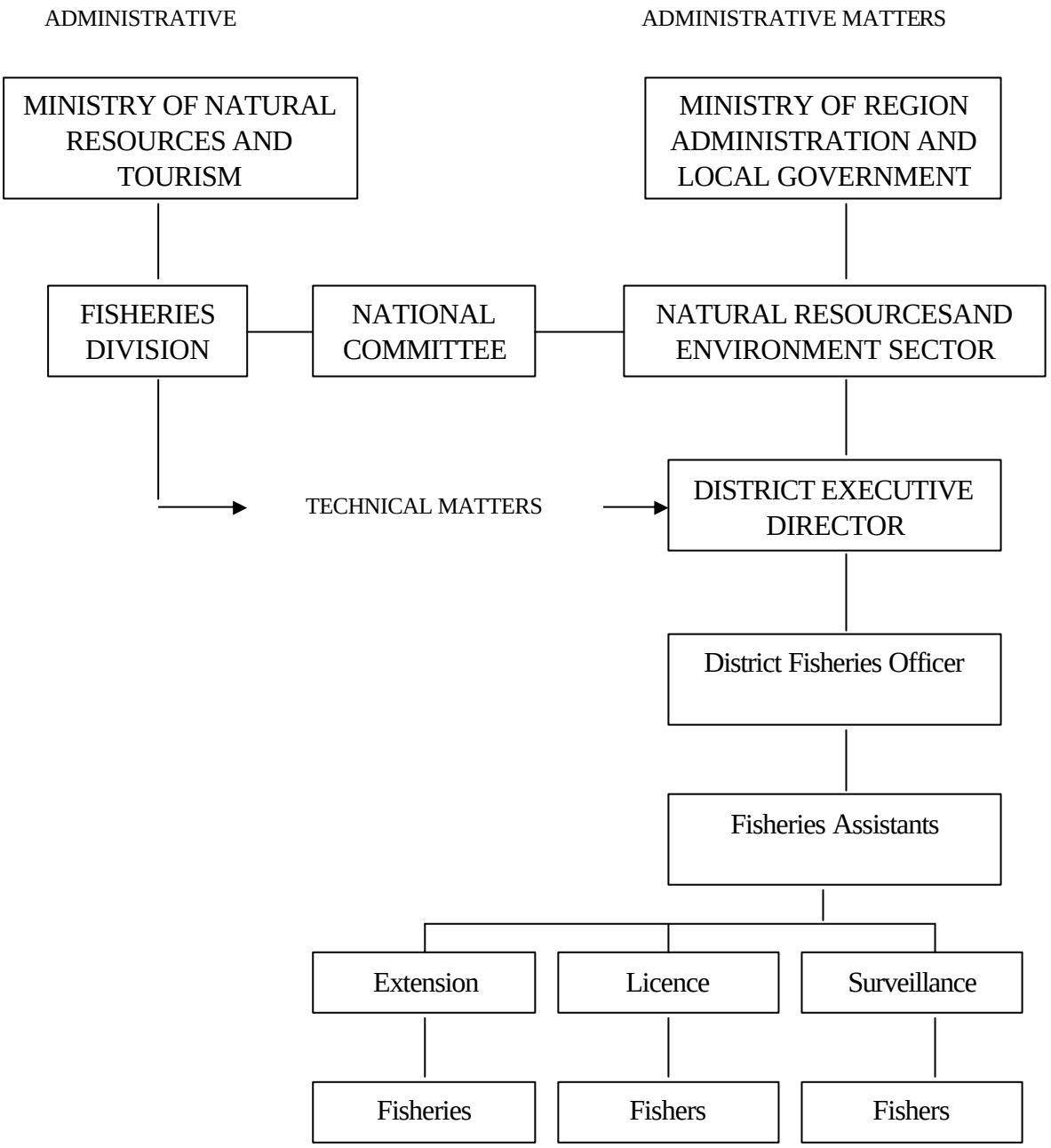
Appendix 2 - Organisational structure of the Lake Victoria Fisheries Organization



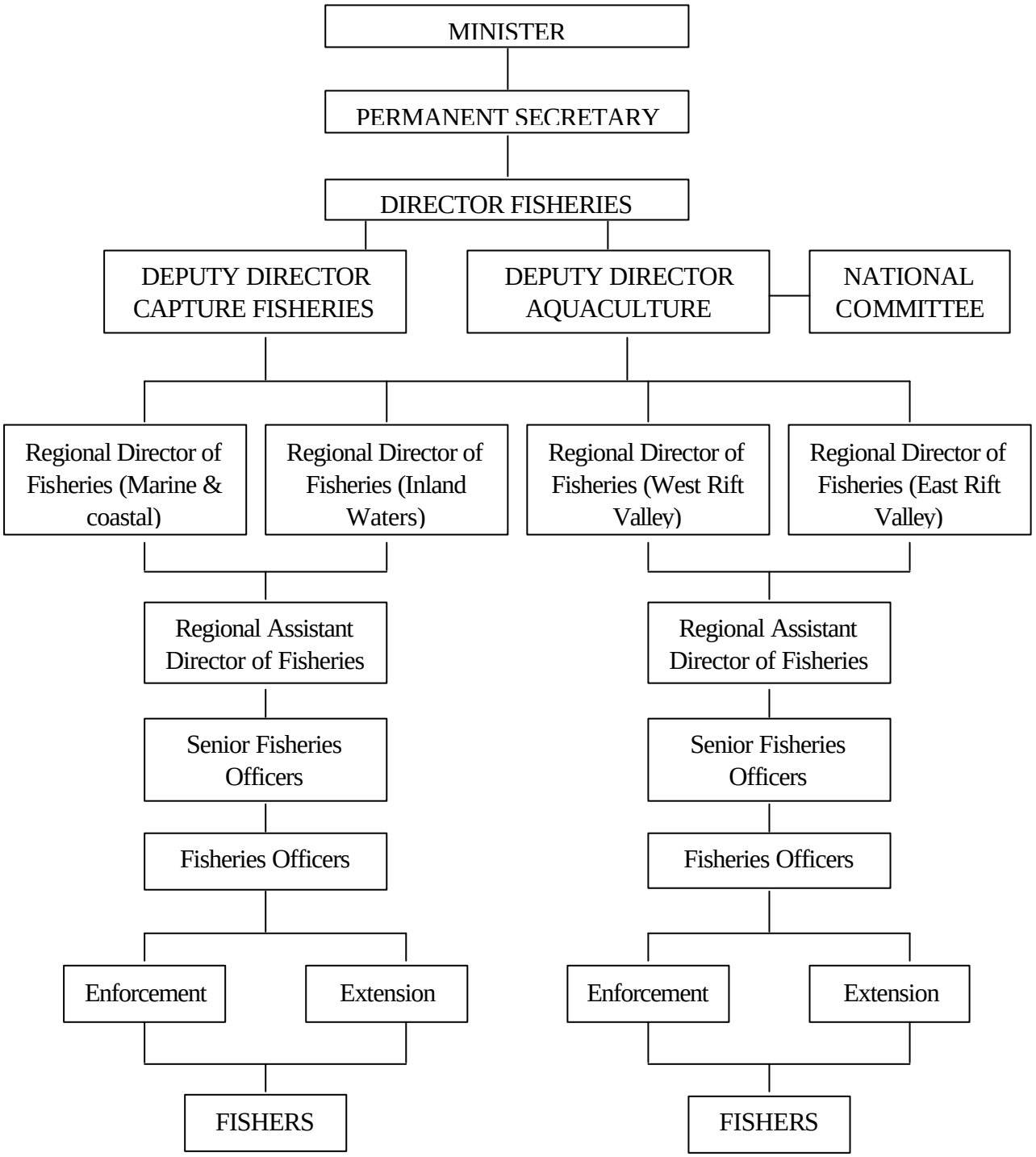
Appendix 3 - Organisational structure of the fisheries sector in Uganda



Appendix 4 - Organisational structure of the fisheries sector in Tanzania



Appendix 5 - Organisational structure of the fisheries sector in Kenya



Appendix 6. A summary of the key issue and options, advantages and disadvantages for management of the fisheries of Lake Victoria

Issues /Constraint	Options/interventions	Advantages	Disadvantages	Priority option	Actors
Capture and aquaculture fisheries					
Excessive fishing effort resulting in declining CPUE	Promote family planning to reduce population growth.	Reduce fishing pressure	Reduction of labour force	Medium	LVFO, FRI, Min. Labour, Min Health, NGOs, BMUs, BMC, Processors, Traders, consumers
	Enforce fisheries laws & regulation	Promote rational exploitation of the resource	Unemployment	High	
	Restrict access to fishing	Regulate fishing effort	Unemployment	High	
	Regulate processing factories	Minimise over-exploitation	Unemployment	High	
	Establish alternative employment in region	Disperses pressure on natural resources	Added pressure in other sectors	Medium	
Use of illegal fishing gears & methods	Improve monitoring, control and surveillance	Reduces use of illegal gears	Take time to be effective	High	LVFO, FRI, NGOs, CBOs, BMUs BMCs, SLMCs, Traders, Processors, Consumers
	Introduce licensing system for gears	Reduces pressure of stocks	Loss of income to affected fishermen	Low	
	Introduce quota system	Reduces pressure of stocks	Requires adequate CAS. Encourages discards	Low	
	Provide affordable legal fishing nets	Promotes sustainable fishing	Unsustainable costs	Medium	
	Sensitise communities on negative impacts of destructive fishing methods	Reduce illegal fishing and methods	Takes time	High	
	Enforce fisheries laws and regulations	Increases fish sizes	Reduces catches in the short and medium term	High	

Capture of immature fish	Sensitise communities on dangers of harvesting immature fish	Reduce the number of juveniles caught	Displaced fishers	High	DoF, FRIs, NGOs, CBOs
	Regulate the markets for under-sized fish, especially the processors	Improvement in medium term yield	Decreases fish supply in market in short to medium term	High	
	Enforce laws and regulations	Restore the fish population	Reduces catches in the short and medium term.	High	
	Increase mesh size	Increases quality of catch	Fisher dissatisfaction	Medium	
	Ban importation of small-meshed nets	Non-availability will promote compliance	Difficult to implement	Medium	
	Educate fishermen over damage	Reduces illegal fishing	Takes time	High	
Capture of breeding fish	Reduce effort	Increased number of spawners	Reduced catches	High	LVFO, DoF, FIRs BMUs, BMCs, LMCs, Processors, Traders
	Empower community to protect breading areas	Increase number of recruits	Displaced fishers	High	
	Regulate capacity of fishing boats	Minimise overexploitation	Displacement of fishers	High	
Fisheries Research, Information and Database					
Insufficient knowledge of fish stocks and fishing activities	Encourage research on the fisheries biology, ecology, limnology and socio-economic aspects	Results from LVEMP and LVFRP are available	No-known disadvantage	High	LVFO, DoF, Resource users, FRIs, Donor Communities
	Prepare needs assessment for the fishing industry	This forms the basis of research	Compliance may be lacking from institutions	High	
	Prepare needs assessments of research institutions	Issues within the research institutions would be known	Inadequate funds	High	
	Increase support for research	Accelerates research activities	Increases rivalry among institutions	High	

Inadequate dissemination and application of research results	Enhance central database and improve access	Increases availability of data to all and	Compromises data ownership and increases professional rivalry	High	DoF, FRI, LVFO, LVFRP, LVEMP, NGOs, CBOs, BMUs, BMCs, SLMCs.
	Create a system of discussing management issues and research findings	Increase collaboration	Some Managers and researchers are not ready to be criticised	Medium	
	Disseminate information at appropriate technical level to meet demands of end users/recipients	Improve communication between institutions	Professional rivalry	High	
	Improve flow of information and feedback between researchers, management and resource users	Widens knowledge base and promotes sustainable fishing	Professional rivalry	High	
	Introduce funding linked to delivery of research findings	Promotes delivery of results	High costs	High	
Potential for aquaculture	Create awareness on value and economic viability of aquaculture	Provide source of *Clarias* used as live baits	New introductions	Medium	DoF, FRIs, LVFO
		Reduces harvesting of immature fish	Increase harvesting of Nile perch	Low	

Biodiversity Conservation					
Threats to aquatic biodiversity, including impacts on resurgence of haplochromines	Introduce regulations on live baits for longlining	Stops usage of haplochromines as bait	Loss of income to poorest sector	Medium	DoF, FRI, Min. Agric. Min. Env & and Natural Resources, Min Trade, Water Dept, Urban authorities, LVEMP, User communities
	Protect satellite lakes and introduce protected areas/ marine parks.	Improves species diversity	Displaced fishermen.	High.	
	Limit access to fishery	Regulates harvesting of certain fish species	Unemployment.	High	
	Encourage good agricultural practices, afforestation and conservation of wetlands	Provides environment for recolonisation	Limited land for other activities.	High	
	Encourage treatment of urban and industrial effluent	Provides conducive conditions for recolonisation	Some urban centres and industries may not be willing	High	
Environmental Issues					
Adverse changes in water quality and quantity affecting fisheries	Enforce regulations on industrial and municipal discharge	Improves quality of effluents	Reduced profit margin	High	LVFO, Min. Agric., Min Industry, Water Dept, User Groups, Forestry, Min Trade; NGOs, CBOs, LVEMP
	Sensitise user groups on impacts of pollution on fisheries	Incidence of pollution may reduce.	Lack of logistics may hinder sensitisation	High	
	Encourage good agricultural practices, afforestration and regulated utilisation of wetlands	Reduced erosion	Displaced persons	High	
	Regulate mining activities and control pollution	Prevents contamination of waters	Expensive and difficult to implement	High	

Threat of new introductions and potential for resurgence of water hyacinth and invasion of the aquatic weeds	Enforce regulations governing new introductions of flora and fauna in the catchment. Monitor and control resurgence.	Regulates new introductions Control of resurgence	Lack of awareness Need for logistics	Medium Medium	LVFO, DoF, FRI, Min. Agric, User groups, NGOs, CBOs.
Fish quality assurance					
High post-harvest fish losses	Develop fish handling infrastructure at fish landings Develop proper preservation, processing and storage methods Encourage private investment in the fishing communities Train fish quality inspectors and fishers in fish handling Encourage using of icing	High standard of hygiene High quality of fish for local & export market Minimises costs to Governments More income to fishers, traders and processors Reduces post harvest losses	Higher demand for fish More entrants into the fishing industry. Investors unwilling to support infrastructural development High maintenance expenses Unwillingness to use ice and costs	High High Medium High High	DoF, LVFO, FRIs, Processors, User groups, Donors.
Inadequate fish quality assurance	Improve sanitary conditions at landing sites Construct laboratories for quality assurance	Maintain high fish quality for both local and export markets High quality fish attracting higher prices	Out of reach of the local consumers Less fish available in the local market	High High	DoF, LVFO, User groups, FRIs
Marketing Systems					
Competition between domestic and export market	Clear policy on fish for export and domestic use	Management tool	No-known disadvantages	Medium	DoF, Min. Trade, commerce, Min. Agric, LVFO

Equity Gender Roles					
Inability to define gender roles in fisheries	Incorporate gender perspective in the development and management of the fisheries	Empowerment in participation of management of the fisheries	Discrimination and culture barriers	Medium	DoF, FRI, LVFO, NGOs, CBOs.
Gender relations and their role in fisheries	Study cultural set up of fisheries communities in relation to gender	Identification of their impact on promoting or hindering involvement of women in fisheries activities	No known disadvantage.	High	FRI, NGOs, CBOs, DoF, LVFO.
Organisation and capacity of service institutions					
Inadequate trained staff fisheries and related fields	Develop a training program for fisheries staff in various disciplines. Train community leaders in various disciplines Educate the women in various disciplines	Improved management of the resource Improved monitoring, control and surveillance Improved management of the resource	Expensive undertaking Some trained members may move elsewhere Additional funding	High High High	DoF, FRI, NGOs, Min of Culture, Donors, Communities LVFO.
Funding for the fisheries sub-sector					
Inadequate funding for development and management of fisheries	Develop sustainable funding mechanism. Streamline funding and resource utilisation at the regional, national and local levels	Monitoring, control and surveillance Sustained management of fisheries resources	Increased taxation on stake holders Government may not honour their obligations	High Medium	Min. Finance, DoF, LVFO, FRI

Fisheries Policy and Legislation					
Outdated fisheries legislation, lack of national and regional harmonisation, lack of common fisheries policy, lack of regional binding agreements	Improve MCS system by providing appropriate funding	Provides support for fishery enforcement	Resentment from fishers	High	DoF, LVFO, Judiciary, User communities
	Develop well-defined fisheries policy at national levels and harmonise at regional level	Enhance fisheries management	No-known disadvantage	High	
	Update and harmonise fisheries legislations at regional level	Make policies and legislation	No-known disadvantage	High	
	Adopt the FAO, CCRF	Conform to international laws		High	
	Encourage communities to enact byelaws for fisheries management	Enhance compliance	Offenders may receive light penalties	High	
Management and Extension services					
Poor regulatory and enforcement mechanisms	Legalise and encourage community participation in MCS	Reduce costs for MCS	High initial costs	High	LVFO, DoF, FRI, Judiciary, NGOs, CBOs, User communities and Donor communities
	Enforce existing laws and regulations	Prevents over exploitation	Loss of income to the affected fishers	High	

Gear theft and piracy	Enhance MCS Encourage local ownership and control	Increases use of passive gears Enhance compliance	Increased costs initially	High High	DoF, FRI, CBOs, NGOs, LVFO,
Community Participation					
Lack of definition of community roles in fisheries management	Delegate and devolve responsibilities Capacity building for user communities Devolution of authority to District level	Involve fishers, processors and traders. Benefit directly many user communities Decentralisation to the districts	Lack of capability may delay process Funding required Lack of expertise may hinder progress.	High High High	DoF, NGOs, CBOs, FRI, LVFO, User communities and Donor communities.
Limited socio-economic benefits to fishing communities	Train fishers in investment skills Encourage fishermen to form groups	Increased economical sustainability Increased economic equity	Costs	High High	DoF, FRI, LVFO, NGOs, CBOs, User groups and communities.

Appendix 7. Lake Victoria Fisheries Management Plan: main elements

Initial action (strategic goal)	FFMP recommended action (immediate objectives)	CCRF 'Principal P' Reference point
Regulation of fishing pressure within the framework of an adaptive management approach.	Promote family planning to reduce population growth.	Process, Partnership
	Enforce fisheries laws and regulations	Partnership, Policing, Proprietorship
	Limit access to fishing	Partnership, Policing
	Regulate processing industries.	Policing, Partnership
	Improve MCS.	Partnership, Policing, Proprietorship
	Sensitize committees on negative impacts of destructive fishing gears and methods.	Partnership, Proprietorship
Harmonisation and strengthening of the institutional capacity building and environment for fisheries management, development and research on Lake Victoria.	Prepare a needs assessment for the fishing industry	Process, Partnership, Policing
	Develop sustainable funding mechanisms.	Partnership, Policing, Proprietorship
	Develop a training program for fisheries staff and stakeholders.	Process, Partnership, Policing
	Continue research on the fisheries biology and ecology and improve and involve communities in MCS.	Process, Partnership, Precaution, Proprietorship, Policing
	Carry out a frame survey biannually	Partnership, Proprietorship, Process
	Improve extension services including flow of information	Partnership, Policing, Proprietorship,
Establishment of an institutional environment that can sustainable manage a new user and access rights regime using community organisations and mechanisms for monitoring control and surveillance	Strengthen and obtain legal backing from the department of fisheries so as to enable the BMUs, BMCs and SLMCs to start operating.	Partnership, Policing, Proprietorship,
	Encourage formulation of byelaws for management of the resource, including appropriate fines for	Process, Partnership, Proprietorship, Policing

	violation. Provide the logistics necessary for the uncertainty of MCS by the community.	 Process, Partnership, Proprietorship, policing
Adoption of CCRF policing matrix the Lake Basin Management and integrated development strategies as policies to match the complexities of the fisheries.	Adoption and implementation of the CCRF by the fisheries management of the riparian states. Adoption and pursue management policy directions in support of: i) adaptive or interactive management; ii) multi-disciplinary monitoring capability and change across biophysical and socio-economic dimensions; iii) partnerships with communities in management decision making and fashioning modalities of enforcement and compliance; iv) allocation of access fishing rights at community level; v) use of integrated development strategies and lake basin area models.	Process, Policing, Partnership Proprietorship, Precaution Process Process, Precaution Partnership, Policing Partnership, Policing Process, Partnership
Develop proper handling, preservation and storage to ensure quality fish for both local and export markets.	Develop fish handling infrastructure at fish landings. Develop proper preservation, processing and storage methods. Improve sanitary conditions at landing sites Construct laboratories for quality assurance with at least one referral laboratory in the Region. Build capacity to handle the fish quality component.	Process, Partnership, Proprietorship, policing, Process, Partnership, Proprietorship, policing Partnership, Proprietorship, policing Partnership, policing Partnership, Proprietorship, policing

