UGANDA FISH STOCKS AND THE NECESSARY MEASURES TO OBTAIN ACCuRATE INFORMATION ON THEm

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The scope of this paper covers two areas. The first part considers the current stock size of Lakes Victoria and Kyoga, Lake Albert, Lakes George/Edward and the minor Lakes. The second part looks at the necessary measures for obtaining essential information on the fish stocks and the water environment. These measures are aimed at improving the National fish yield while maintaining the water quality for the different user interests.

A. Current fish stock size

About 17% of the surface area of Uganda is covered by water in the form of numerous lakes, rivers, dams and swamps. This gives an indication of the potential extent of the fishery as a National rosource.

The stock size of any exploited fishery can be defined from accurate stock assessment and catch statistics data. In Uganda available stock assessment and catch statistics data are not adequate for defining current stock size accurately. This is due to the lack of the necessary research and extension service in-puts for collecting and processing the needed information. The scanty data available, together with considerations on catch rates, fish size, catch composition, fishing pressure, etc. have been used to show catch trends as an indirect measure of stock size. Although lakes have been emphasized, rivers, dams and swamps are also important ecological components of the aquatic system and in their potential contribution to fish yield.

1. The fish stocks of Lakes Victoria and Kyoga

Lakes Victoria and Kyoga have similar fish faunas. At least ten different traditional fish species were exploited *in* commercial quantities by the artisanal fishing industry on each of the two lakes. The traditional fisheries were very lucrative in terms of variety and catch rates.

Following the development of increasing fishing pressure the catch rates started to decline. Localised over-fishing was reported as early as 1929. To make up for the declining catches exotic tilapiine species and Nile perch were introduced into the two lakes, although at different periods *in* time. The combined effects of over-fishing, use of destructive fishing gears, competition between the native and introduced species, and predation have been dramatic *in* recent years. There has been continued decline *in* the native fish species, many to the extent of extinction, while the catches of the introduced Nile perch and Nile tilapia have increased tremendously.

At the moment the once multispecies fisheries of Lakes Victoria and Kyoga are dominated by only three species (Nile perch, Nile tilapia and Rasrineobola argentea i.e. mUkene). The three species are exploited *in* Lake Victoria while the mukene of Lake Kyoga is not being exploited. It is significant to note that although the variety of fish species landed has greatly declined the total annual yields have increased significantly, mainly due to increased landings of Nile perch and Nile tilapia. In recent years the average annual catches have increased to about 100,000 m.t for Lake Victoria while *in* Lake Kyoga the catches sho·t up to a high figure of 167,000 m.t. *in* 1978 but declining later to less than 90,000 m.t. during the late 1980·s. There are indications that fishing pressure has increased tremendously while the average size of the fish caught is declining. It appears that the two lakes are being exploited at their respective maximum levels, if not being over-fished.

Following the dramatic changes *in* species composition the trophic relationships have also altered. In addition, the ecological efficiency in utilizing the available resources within the water environment *is* bound to be different while there is evidence that certain limnological variables have also changed. These .are issues which need to be quantified by effective research investigations *in* order to assess the future prospects for the fisheries.

2. The Fish stocks of Lake Albert.

Lake Albert is shared between Uganda (57%) and Zaire (43%). The lake has a multispecies fishery composed of 42 species although only 20 are caught *in* commercial quantities. The southern sector of Lake Albert has fewer species than the Northern which is shallower. The fishery has been operating on the basis of free entry for all.

The fishery is exploited using various fishing gears which include gill-nets, beach seines, various traps, hooks and lines. Because of the differences in size of mature fish of the different species control of the fishing gears or se13ction of the optimum gill-net mesh size becomes complex. Accordingly the gill-net mesh sizes used on the lake range from 2 inches (for catching small-sized species) to 8 inches for larger species like Nile perch. The consequence is that juvenile fish of certain species are also caught. Illegal use of beach seines and heavy fishing in spawning areas has been reported. The use of seine nets has reduced catches of certain species such as Citharinus citharus.

There has been a decline *in* the annual fish landings in the Uganda part of Lake Albert from 22,000 m.t. in 1971 to only 3.2 m t.

in 1986. The average annual catch for the Uganca portion of the lake is about 10,000 m.t. while for the whole lake the figura is estimated at 23,000 m.t. This is probably due to the frE3 movement of the landed catch across the border. In 1989 the main commercial fish species landed were Tilapia (38%), Hydrocynus (24%), Lates (12%), Bagrus (7%), Clarias (5%), Alestes (4%), Syncdontis (3%), Labeo (2%), Protopterus (1') ard other species (4%).

The existance of a nultispecies fish faura for years in Lake Albert despite the presencE of Nile perch in that lake casts serious doubts or the accusations that Nile perch was responsible for the disappearance of numerous fis, species from Lakes Victoria and Kyoga. One would neej to explain why Nile perch could eat up the fishes of akes Victoria and Kyoga (where *it* was introcuced) and not those in Lake Albert. Stuoies in this line would be needed *i,* order to davelop proper strategies for maintenance and management of the Nile per=h fishery.

3. The fish stocks of Lakes George and Edward

Lakes Edward and George are connectec by the 30 km long <azinga Channel which flows i,to Lake £dward. Therefore, there is considerable fish population intEractions between the two lakes. Lake George lies entirely in Uganda. he Uganda portion of Lake Edward which is 670 km^2 (29%) is shallower and more productive than the Zaire side of the lake.

Available researc, information on thEse water systems is sketchy due to lack of research facilities although research manpower is available. Due to lac< of facilities to collect statisti=al data, catch records are

also incomplete and the deep water fishery on Lake Edward is not clearly known. The state of the fishery is therefore derived indirectly from the fishing effort and size of catch.

The Major commercial fish species include Tilapia, aagrus, Protopterus, Clarias and aarbus, in that order of significance. Control measures for Lake Edward/George do exist but are not adhired to by the fishing communities. This is mainly due to lack of facilities for enforcement of the management regulations. for instance, there has been increasing fishing pressure by illegal entrants (248 licenced canoes with 200 unlicenced on Lake Edward), fishing with illegal gill-net mesh sizes of less than 5 inches and the use of more than the authorized 10 nets per ~~canoe as authorized.~~

Consequently, fishing is no longer as lucrative as it was ten years ago. The fisheries of Lakes Edward/George and Kazinga Channel have declined from 12,000 m.t. in 1976 to 5,500 m.t. in 1989. The average annual yield for the Uganda part of Lake Edward is between 2,000 and 3,000 m.t. per year as compared to the estimate of 15,000 to 16,000 m.t. for the whole lake. The composition of the catch is Tilapia (60%) Bagrus (13%), Protopterus (12%), Clarias (3%), aarbus (3%), and other species (9%).

Signs of over-fishing are shown by declining fish size, diminishing catch per unit effort, and decreasing annual yield despite the increasing fishing effort (no. of fishermen and nets per canoe). The relative

abundance of the fish caught has also changed. for instance, Tilapia constituted 80% of the total catch in the 1950's but only 40% in 1989.

4. The fishries of the minor Lakes

There are numerous snaIl water bodies dotted throughout Uganda. The total surface area of these minor lakes is about 2.3% of the total surface area of the country and contribute about 4.8% of the total National fish yield annually.

The small water bcdies include Lakes Wamala, Lemwa, Nabugabo, Kijanebarola, Kachera, Mburo, Nakivale, Bunyonyi and mutanda. minor lakes provide the needed animal protein supply and employment opprotunities to numeraLS Ugandans whose access to similar alternative sources uould have been difficult. On Lake Wamala alone the number of licenced canoes increased from 250 *in* 1960 to 450 in 1965 and to 1000 by 1967.

many of these small lakes are not manned for statistical data collections. Catch data from the manned small water bodies give the annual catch range from 10.000 m.t. in 1966 to 1,100 m.t. in 1982. Lake Wamala alone produced 7,100 m.t. in 1967 although only 500 m.t. in 1982. The production from lakes like Wamala was stimulated by the tilapiine species uhich was introduced there *in* the 1950's in an attempt to improve the native fisheries. But the decline in the annual yield afterwards was the result of excessive fishing pressure (increased fishermen, canOES and fisring gears).

Minor lakesdemonstrate the positive impact of the strategy of stocking with suitable fish species and of the tilapia as a versatile ard successful fis,. The lakes also furt,er illustrate the fragility of tropical fish stocks to excessive fishing pressure. These points should always be born in mind while developing management strategies for the Uganda fisling industry.

B, MEASURES TO OBTAIN ACCJRATE INFORmAHON ON THE FISHERIES

1. Optimum Fish Productinn

On8 good thing about fishery reSOL=ces *is* that they are inherently renewable (unlike gold or oil =esources). But one very bad thing about exploited fish stocks is that they are highly amenab:e to to irrepacable damage if harvested blindly. Therefore, in strategic planning for fishe=ies management and development, these two antagonistic dimensions of fish stocks MJst be clearly unde=stood. This is why ' fisheries research is always vital.

For a country like Uganda, criteria for formulating effective research programmes leading to rational management and developmert measures should ain at optimum fish production in relation to National demorgraphic trends. The objective of optimun fish production can be achieved through the following activities among several others:-

(i) To tenderly nurse the existing fish stocks in order to sustain them.

:ii) To etimulate the prcduction of those fish stocks which have dEc:ined bLt still highly desired.

(iii) Dele:oprnent of aquaculture practices for the diversification

of the exploitable resources.

(iv) Improvement in fishing practices and techniques for the efficient utilization of the resources.

2. Sustainable Water Environment

The quality of the water environment determines the magnitude of the potential for fish productivity. But the water quality in natural water systems is influenced either directly or indirectly by activities outside fisheries. These include agriculture, industry, transport, urbanization, forest clearance, domestic water supply, sewage, etc. associated with the water systems. Effects of these activities on water systems may be physical, chemical or biological and are often detrimental (silting, poisoning, pollution, eutrophication) if not watched through timely research.

Therefore, in order to carry out research on water quality for the benefit of the fisheries sector, it is always necessary to harmonize the use and management of the water resources with all major user groups affecting water systems (directly or indirectly). The objective of harmonizing water use and management may be achieved through the following activities:-

(i) Identification of the major users in order to develop collective strategies for dealing with water environment issues.

(ii) Determination of water environment criteria and priorities to harmonize the implementation of environmentally sound practices in those activities affecting water ways.

(iii) Sharing of water environment management responsibilities among the major water users so that water environmental consequencies are fully integrated in decision making.

(iv) Identification of a coordinating centre to carry out research and monitoring for sustainable sound water environment.

3. Priority Measures to Obtain Relevant Information

Exploited fish stocks are dynamic systems in that they are constantly changing. Therefore, information desired about them must be obtained constantly. The information required about the fishery resources of Uganda should aim at sustaining the available stocks as well as improving upon the overall National potential - given the demorgraphic changes and development aspirations.

For research to become effective in obtaining the necessary information leading to rational management and development of the fisheries, the following priority measures are recommended:

(i) To strengthen UFFRO (infrastructure, in-puts, manpower) to become more effective in research and monitoring strategies.

(ii) Establishment of field stations for UFFRO on each of the water bodies of distant from Jinja (Lake Albert, Lake Kyoga, Lakes Edward/George). This would facilitate the timely collection of research data from those lakes.

(iii) Improvement in fisheries statistical data collection, compilation and analysis by providing the necessary in-puts to the Fisheries Department.

(iv) Strengthen enforcement of Fisheries Management measures by facilitating the extension services with the necessary in-puts.

(v) Rehabilitation of the Kajansi experimental station for the deve19pment of aquaculture techniques by UFERO and improvement of aquaculture extension services to fish farmers by the Fisheries Department.

(vi) Strengthen fishing technology investigations for determining optimum fishing gears, and the Fish Technology Laboratory for improvement in the quality of fish and fishery products in order to minimise post-harvest losses.

(vii) Establish cooprative arrangements with the Ministries of Industry, Water and Mineral Resources, and Environment for UFFRO as coordinating research and monitoring centre for sustainable water environment.

(viii) Improve cooperative arrangements for harmonizing research and management strategies with the riparian countries on the shared lakes (Victoria, Albert, Edward).

(ix) Rehabilitate access roads to major fish landings in Uganda to avoid unplanned marketing of the catch to outside countries.

(x) Actively liaise with International Agencies, Donor Countries and the local beneficiary firms for supporting fishery research programmes and fishery management activities.

4. Specific Recommendations

(i) The minimum gill-net mesh size for the exploitation of the Nile perch and Nile tilapia in Lakes Victoria and Kyoga should be set at 127 mm (5 inches). The minimum seine-nets mesh for the exploitation of Rastrineobola (Mukene) should be set at 10 mm. These measures should be enforced immediately.

(ii) While the exploitation of Rastrineobola (Mukene) by the artisanal fishing community, using the 10 rom mesh lampara type of net, should be encouraged, industrial exploitation of this resources should not be authorized before the planned stock assessment survey of Lake Victoria has been conducted. Rastrineobola is a major prey item for the important Nile perch fishery.

(iii) In order to ensure that the local fish market requirements are satisfied no fish processing plants above the current established level of six (6) should be allowed until the planned stock assessment work has been completed. A simple criterion as to whether more processing plants should be encouraged or not would be if the installed capacity of the six existing processing plants of 60 tons per day is being realised while allowing enough fish for local consumption at the same time.

(iv) On socio-economic as well as biological grounds commercial trawl fishing in waters shallower than 20 m should be completely prohibited.