RECOMMENDATIONS FOR MANAGEMENT AND RESEARCH ON THE FISHERY OF LAKE VICTORIA

INTRODUCTION

This report is based on our experience with the Lake Victoria fishery from 1973 to 1975 while working at the E.A.F.F.R.O. substations in Kisumu and Mwanza. We shall first present mangement recommendations on three major topics: the on-going inshore artisanal fishery, the proposed offshore trawl fishery, and the possibility of cage culture. These will be followed by specific recommendations for research.

INSHORE FISHERY

The greatest sustainable yield from Lake Victoria can be obtained by intense cropping of mature fish. The yield from the inshore fishery can be increased in two ways: (1) by eliminating fishing gear which crop fish prematurely; (2) by increasing the intensity of fishing in lightly fished areas of the lake.

Our basic recommendation with respect to fishing gear is that only longlines and gillnets 4" and larger should be used without regulation.

Seines should not be used because the seines in common use on Lake Victoria have small meshes which capture all sizes of fish including juveniles without discrimination. Furthermore, seines are particularly harmful because they disrupt Tilapia spawning grounds.

Small mesh gillnets likewise present a problem of premature harvesting of the larger species. Gillnets between 2 1/2" and 4" should never be used because there are no significant fish stocks in Lake Victoria which are harvested most effectively by these nets (WANJALA and MARTEN 197-; SCULLY 1976). No nets

Because a sudden removal of detrimental gear from the fishery would place an excessive hardship on fishermen who now use such gear for their livelihood, these gear should be phased out over a period of several years. The only effective way we can think to implement this is to control the supply by regulating importation and manufacture.

Turning to more intensive fishing of lightly fished areas, this is primarily a matter of developing the southern portion of Lake Victoria, encouraging transport to lightly fished island areas, and encouraging the exploitation of particular fish stocks which are now underharvested. Transport can be encouraged by means of outboard motors and possibly intermediate-sized boats large enough for an inboard motor.

Examples of particular stocks which are underexploited are (1) Barbus altianalis in the West Lake region near Bukoba (SCULLY 1976); (2) Lates exceeding 50 Kg in weight in the vicinity of the mouth of the Kavirondo Gulf, fish which are too large too be captured by gillnets now in use (MARTEN, WANJALA, and GULUKA 197-); (3) Bagrus which are very numerous in the Kavirondo Gulf (MARTEN, WANJALA, and GULUKA 197-) and might be smoked and exported to Uganda where they have a high value; (4) Protopterus in lightly fished swampy areas such as the Emin Pasha Gulf (SCULLY 1976).

Another consideration in gear regulation is the removal of fish predators. A statistical study of fish catches in Lake Victoria (MARTEN 197- a) has shown that catches of fish such as Tilapia and Haplochromis are strongly stimulated by the heavy use of hooks to remove fish-eating predators such as Clarias and Bagrus from the Lake. A theoretical study by MARTEN (197-b, 197-c) has shown that at the levels of natural mortality now existing in Lake Victoria, yields are a small fraction of what they would be if natural mortality were absent.

Since predation is a major source of natural mortality, it follows that the yields of a fish stock can be influenced as much by fishing predator species as by underfishing or overfishing the stock itself. A level of fishing which is excessive at one natural mortality is not so at a lower natural mortality. A fisherman who catches predators is performing a service for other fishermen. Considering the practical difficulties in reducing the number of fishermen or nets in the fishery, increasing the fishing of predators should be a more feasible strategy for eliminating overfishing than attempting to reduce overall fishing effort.

In other words, economically viable trawling will be restricted to a band between 20 and 60 meters in depth, a region which contains only 55% of the Haplochromis stocks responsible for the 200,000 ton estimate (KUNDHONGANIA and CORDONE 1974). Futhermore, the economically viable band can be expected to contract once trawling commences and offshore stocks are reduced below the virgin levels which prevail today.

Although everyone agrees that trawling in Lake Victoria should be pursued with caution, opinions vary as to what constitutes caution. Assuming a fishing capacity per boat of 1000 tons per year, caution to us means 15 boats initially operating in Lake Victoria.

Because trawlers in Lake Victoria should distribute their fishing effort evenly, they should either be able to land fish at a variety of landings or have cold storage facilities to allow them to move sufficiently far from their home base. They should be large enough to be fully seaworthy under often adverse offshore conditions.

Despite the systematic research that has been done on Haplochromis retention by trawl codends of various sizes (CORDONE and KUDHONGANIA 1974) we have been unable to reach any firm conclusions concerning codend size. Nonetheless, judging from our own experience, an initial prohibition of codends below 40 mm seems justified at least from the point of view of stock conservation.

A 20 mm codend is desirable from the point of view of short term commercial returns because there are areas of Lake Victoria where the Haplochromis are too small for the 40 mm codend to yield a commercially satisfactory catch (MARTEN, GULUKA and WANJALA 197-). The 20 mm codend is questionable from the point of view of stock conservation, however, because with full retention of fish down to 6 mm in length, complete elimination of the larger Haplochromis species can be expected as a consequence of continuous and heavy trawling. A similar result has been observed in Kenya during the past eight years as a consequence of intense gillnetting of Haplochromis with small mesh gillnets and seines (MARTEN, WANJALA, and GULUKA 197- ; WANJALA and MARTEN 197-).

The 40 mm codend can secure a reasonable harvest from virgin stocks which, particularly in offshore areas, contain large numbers of Haplochromis in the 15 to

best management, including development of the offshore fishery, the highest yield from Lake Victoria can be expected to at most double over the present level (MARTEN 197- a) the human population of the region can be expected to double in less than twenty five years. The catch from Lake Victoria has a ceiling, but an industry like aquaculture can grow with the population. Although we feel there is an enormous potential for fish culture away from Lake Victoria, we shall restrict our attention here to fish culture in the lake itself.

Cage culture in the lake can be the kind of low capital, labor intensive industry that will provide opportunitites for expansion of employment among the growing number of fishermen in the region. At the same time, it can attract fishermen from the artisanal fishery and reduce the hazards of overfishing in the more heavily fished parts of Lake Victoria.

Studies of Tilapia held in cages in Lake Victoria have shown they grow rapidly (RINNE 1975, IBRAHIM, et.al. 1975). On the basis of the same arguments presented above for predator removal, holding fish safely in cages until they can be harvested at the proper size is the best way to channel the biological productivity of a lake into human consumption. This would be most effective when either the caged fish feed on phytoplankton (as do Tilapia esculenta and Tilapia nilotica) or when their rations are supplemented with macrophytes or other vegetation, as IBRAHIM et al. (1975) did with Tilapia zillii.

RECOMMENDATIONS FOR RESEARCH

(1) Research on means forimplementing the recommendations for gear regulation in the artisanal fishery. Such research should include:

a)how rapidly detrimental gear can be phased out without excessive hardship to fishermen;

b)realistic means of enforcing regulations.

(4) Research concerning the impact of Nile perch on the fishery. This predator deserves special attention because it is generally blamed by fishermen for the decline in the Tilapia fishery. Nile perch does not appear to us to be generally abundant enough to be responsible for this decline, particularly considering the prevalence of Haplochromis we have observed in the stomach contents of Nile perch. Nonetheless, because the Nile perch is locally abundan and increasing in numbers, present stocks and their food comsumption should be assessed in order to determine whether this fish is in fact an undesirable and detrimental predator and whether it should be selectively removed from the lake

(5) A continuation of the tagging program already in progress to assess the growth and movements of fish (RINNE 1975). Smaller tags or other marking methods (RINNE 1976) are needed in order to include Haplochromis and younger fish in the program. Of critical importance to the success of the program is an intens tag recovery system which reaches and motivates every fisherman operating in areas where there might be tagged fish.

(6) Research on cage culture. Research should be coupled with a pilot experiment which includes engineering factors (such as cost, durability, and efficiency of cages), biological factores (such as stocking densities, supplementary feeding, and production), and socio-economic factors.

(7) Limnology. There is a responsibility to keep a limnological record on Lake Victoria because it is one of the world's major lakes. In addition, limnologic information can be used to tailor management policies to the diverse environmen conditions which prevail in different regions of the lake (KITAKA 1972). Not on can the different conditions be identified which favor different species of fish in different parts of the lake, but the potential production associated with those conditions can be estimated (RYDER, et al. 1973).

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