Kenya

Lake Victoria

# In the balance

**Environmental degradation and human handiwork have combined to destroy the fisheries of Lake Victoria**

In Lake Victoria, a combination of human impact and environmental changes has transformed fishery biodiversity beyond all recognition, destabilizing the fishery and degrading aquatic ecosystem.

This has grave implications for the millions of people in the three riparian countries, namely, Uganda, Tanzania and Kenya, who depend on the lake's fishery. A fishery that once drew on hundreds of species, now depends on just three: the endemic pelagic *Rastrineobola argentea,* the introduced Nile Perch *(Lates niloticus)* and the introduced Nile tilapia *(Qreochromis niloticus).*

Until the 1970s, the Lake Victoria fishery was dominated by more than 400 varieties of haplochromine fish, estimated to comprise over 80 per cent of the lake's total fish biomass. The combined influences of environmental changes and human impact have led to the disappearance and possible extinction of 200 to 300 of these endemic fish varieties, The disappearance of this huge and varied biomass is the likely cause of cascading changes in the ecosystem.

Overfishing of endemic species in the 1950s stimulated the introduction of exotic tilapias, and Nile perch, the latter despite scientific advice against such action. The introduced tilapias have now effectively replaced the lake's two endemic tilapia species.

The haplochromines, many of which feed on bottom sediments and phytoplankton, have been replaced by fish which are essentially secondary and tertiary consumers (the endemic pelagic cyprinid *Rastrineobola argcntea* and the carnivorous Nile perch, respectively). This has grave implications for the sustainability of the lake's fishery. Nile perch now makes up more than 90 per cent of the demersal fish biomass, and 60 per cent of the catch.

There are many who argue that the introduction of the Nile perch to Lake Victoria has generated enormous socioeconomic benefits. The value of fish production and fisheries-related employment has greatly increased for communities around the lake, as has the supply of protein. Due to the Nile perch, more people are eating more fish in more places than was ever the case under the previous fishery regime. Between 1970 and 1990, fish landings have increased fivefold, from 106,500 tonnes to over 500,000 tonnes.

However, a multi-species fishery has been converted into one dominated by three species. At the same time, the lake is becoming increasingly eutrophic, with associated deoxygenation of bottom waters, thereby reducing fish habitats. The removal of endemic haplochromines, which formerly turned over the bottom deposits, have contributed to the eutrophication and deoxygenation of bottom waters. Likewise, the disappearance of phytoplankton-eating fish has contributed to increasing algal blooms, and 'algal mats', which sink to the bottom, where their decomposition further adds to deoxygenation.

**Species exploited**

In the beginning, the main species exploited were *Orcoebrornis esculenta* and 0. *variabilis.* These fisheries collapsed, probably due to overfishing, which led to a switch to the smaller and less valuable *Haplochromis* and *Rastrineobola.* Until the 1970s, the resource base was characterized by the predominance of *Haplochromis* stocks.

Although of great scientific interest, it is claimed that this resource had very little socioeconomic value and remained the food of last resort all round the lake. The fish biomass of the lake also consisted of more valuable species groups: *Oreochromis/Tilapia*, *Bagrus*, *Synodontis*, *Clarias*, *Protopterus*, and *Barbus*.

Until the creation of the Nyanza Fishing and Processing Company, which started with four trawlers in the mid-1970s, the fisheries remained solely exploited by small-scale fishermen.

The Nile perch was introduced, possibly clandestinely, around 1954, and then deliberately in 1962 in Entebbe, mainly from Lake Mubutu, but also from Lake Turkana.

For the first 20 years, it remained relatively unnoticed. In the early 1980s, a huge expansion was observed (although there was a sudden 'eruption' in the Winam (Nyanza) Gulf, Kenya in the mid-1970s).

Fish landings under the current regime of three dominant species would seem to be much higher than under the previous multi-species regime. However, it is questionable whether this can be sustained, and whether the benefits of the current regime accrue to local communities

Can the current regime be sustained or will the lake's fishery collapse under the strain of eutrophication and impoverished biodiversity? What evidence is there for decreasing biomass and increasing yields since the boom of the Nile perch?

It is possible to hypothesize that the fishery is headed for collapse due to a combination of environmental or natural factors (predator-prey relationships and changing biological and chemical balances in the lake), and human-induced factors (pollution and overfishing). It can also be hypothesized that the catch composition is changing or has changed.

What are the economic or nutritional benefits accruing to processors and traders, who are sending fish out of the area, or to local communities which are eating more fish? It may be conjectured that the main economic benefits go to the middlemen and processing companies. Fishermen may derive some benefits, but the local diet has deteriorated as a consequence.

**Fewer choices**

Consumer choices have been diminished. Instead of being able to choose among several species, there are now effectively only three choices. Has this had any impact on the local people's fish-eating habits and diets? The local people do not

eat Nile perch, while the omenta is also of limited use.

The availability of fishery inputs is limited and equipment is costly. Only the more well-off people are able to purchase equipment. The Nile perch market is controlled by large processing companies, which pay the highest prices and monopolize ice.

Eutrophication occurs due to the intensified use of land, human population growth and increased run-off of nutrients into the lake. Also, urban sewage and industrial pollution from the main population centres contribute to eutrophication.

Between the 1960s and the 1990s, a threefold increase has been detected in the nutrient content of rain falling on the lake. This could be the result of increased burning of grass and bushes around the lake. Further, climatic cycles leading to high lake levels, particularly between 1961 and 1964, which drowned riparian bushes and swamps may have accelerated eutrophication.

Clearing of riparian vegetation has removed plants which once acted as natural filters for nutrients draining into the lake. There has also been a reduction in silica and sulphate levels. Also seen is a shift in phytoplankton towards nitrogen fixation, and an increase in chlorophyll and primary productivity. Tree felling for timber, particularly in Uganda, has increased siltation.

Effluents enter the lake from paper mills, particularly the Pan African Paper Mills (PANPAPER) at Webuye in Bugoma, along the River Nzoia, and sugar factories, particularly in Busia district, and also fish processing factories.

The water hyacinth *(Eichornia crassipes)* has probably been in Lake Victoria for no more than ten years. It most likely entered through the Kagera River, from Rwanda and through Uganda. In 1989, it was noticed in Ugandan waters. It was introduced to the African continent at the beginning of the century, first in Egypt and then in South Africa. It consequently spread to other countries in southern Africa and appeared in the Zaire River and upper Nile swamps in Sudan in the 1950s. About 15 African countries are known to have problems with water hyacinth.

The water hyacinth has an impact on fisheries production—by invading spawning, nursery and feeding areas, and by inhibiting light penetration and thus photosynthesis and oxygen levels in the water. By invading and blocking beach areas and harbours, it hinders transportation. By blocking intakes, dams and pumps, it affects hydroelectric power generation and irrigation.

The long-term socioeconomic costs of wastage in post-harvest fisheries involve more than the loss of income and nutritional benefits (to the fisherfolk communities and their dependent consumer populations). These are serious losses, but traditional methods of fish processing place great pressure on valuable and increasingly scarce timber resources. This too represents a kind of post-harvest' loss. The 'Nile Perch Effect' also includes a shifting of channels of product distribution and marketing, and the resultant impact on infrastructure and technology development.

**Future at stake**

The future of the lake now hangs in the balance. The clock can not now be reversed, and the Nile perch can not be eradicated. The collapse of the Nile perch fishery—a distinct possibility—will have very serious socioeconomic consequences for the communities and the economies of the three riparian countries. The rehabilitation of the lake's biodiversity and the institution of a management and regulatory framework must now become the main priorities for the development of Lake Victoria.

This piece comes from the Kenya office of the intermediate Technology Development Group Rugby, UK