ENDANGERED FISH SPECIES OF KENYA'S INLAND WATERS WITH EMPHASIS ON LABEO SPP.

David Kibaara, Kenya Marine and Fisheries Research Institute, Kisumu, Kenya.

ABSTRACT

The importance of water masses, natural or otherwise, in supporting fisheries, and the importance of fish as human food, cannot be over emphasized. The inland waters of Kenya act as habitats for fish, harbouring many different fish species. It has been observed with interest that certain fish species have decreased in numbers over the years within the inland waters. The decline has been at a rate which if left unchecked, will eventually cause total disappearance of the species concerned. Thus those species have been correctly termed "endangered". Among them are Labeo, Schilbe, Alestes, Clarias and Barbus spp.

Most attention is drawn to Labeo spp occurring in Lake Victoria and other inland water systems, namely Lakes Turkana, Baringo and River Tana. The species found in Lake Victoria is Labeo victorianus, in Lake Turkana Labeo horie, in Lake Baringo Labeo cylindricus. In River Tana are found Labeo gregorii and L. cylindricus.

Records have been shown to illustrate that there is a decline in numbers of Labeo spp, especially in Lake Victoria. What is now called for is an effort to curb down this decline, through research that will effect an understanding of the biology of the species in question, which will subsequently be used in management and policy making. Recommendations are given that can help transform the now "endangered" species of "flourishing" species, again more emphasis being laid on Labeo spp. Previous workers on Labeo have attributed the decline to cultural practices, namely overfishing and the use of the wrong gear. This paper explores the possibilities of establishing other causes of decline such as pollution, diseases, parasites and food.

INTRODUCTION

In the world today the general outcry is how to feed the human populations, not only with the correct quantity of food, but also the correct quality. Fish is a major source of protein which is an important part of the human diet. Fish has an advantage over other types of meat in as much as it is cheaper where available (Mathew and Chichester 1979).

*This paper is adapted from the proceedings of the workshop of KMFRI on Aquatic Resources of Kenya, July 13-19, 1981.
The problem of nutrition centres around protein, especially animal protein, (Lerner and Donald 1966). It thus becomes quite easy to see the importance of fish in our aquatic ecosystems.

What can be said about the world can also be said about Kenya. The water system of this country have acted, and still act, as sources of food. Fishing has been going on for many years now, many metric tons of fish being produced each year, of various species. As the exploitation continues, some of the waters have been overfished and some of the fish have faced a threat of becoming extinct in these waters, if the situation is not brought under control. A very typical example is the Lake Victoria, which according to records, once supported flourishing fisheries of certain species which have now almost disappeared from the Lake. There are five major fish species in the lake that are endangered, namely *Labeo, Barbus, Schilbe, Alestes* and *Clarias*, as pointed out earlier.

The species *Labeo victorianus* found in Lake Victoria belongs to the family Cyprinidae. It is an anadromous fish moving up rivers of the Lake Victoria and passing into floodwater pools to spawn. This migration occurs during the two rainy seasons in a year.

The fish measures 20 cm to 30 cm in length (Greenwood 1966). Of all the anadromous fish of Lake Victoria, *Labeo victorianus* is the most commercial important (Cadwalladr 1964). This fact is firmly supported by personal communication with the local fishermen. Indeed, the populations living around the Nyanza Gulf of Lake Victoria consider the fish a delicacy, and give a high price for it.

Unfortunately, the numbers of *Labeo victorianus* in Lake Victoria have been declining over the years, as indicated by catch records for various locations in the Lake and for different years (table 1). Cadwalladr, in 1964 described *Labeo victorianus* as a fishery which "at one time was flourishing, but which has now almost disappeared". In 1965, the East African Freshwater Fisheries Research Organization research coordinating committee meeting in November stressed that catches for *Labeo* had continued to decline over the previous 12 months hence it was agreed that more research was needed into the breeding biology of the species and the effect of fishing methods upon its populations (Annual Report 1965).

There are abundant records that authenticate the decline of *Labeo* in Lake Victoria. Table 1 shows the catch per net (CPN) records for Homa Bay and Port Victoria made by the Lake Victoria Fisheries Service from 1953 to 1962. as quoted by Cadwallard (1964).
Table 1

Catch per net of *Labeo victorianus* for Homa Bay and Port Victoria stations within the Nyanza Gulf and Lake Victoria.

<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>Catch per net</th>
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<tbody>
<tr>
<td>Homa Bay</td>
<td>1953</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>1954</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>1955</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>1956</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>1957</td>
<td>1.6</td>
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<tr>
<td></td>
<td>1959</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>1960</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>1962</td>
<td>0.7</td>
</tr>
<tr>
<td>Port Victoria</td>
<td>1952</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>1959</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td>1960</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>1962</td>
<td>1.2</td>
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Undoubtedly there was a clear decline in CPN from 4.0 in 1953 to 0.7 in 1962 for Homa Bay, and from 10 in 1952 to 1.2 in 1962 for Port Victoria.

The records for Homa Bay are representative of catch at the mouth of River Awach while those of Port Victoria represent catch at the mouths of Rivers Sio and Nzoia.

This decline in numbers of *Labeo* in Lake Victoria has been illustrated not only in the Kenya waters, but also elsewhere. For example, the CPN figures for River Kagera mouth dropped from 13.6 in 1954 to 0.5 in 1963 (Fryer 1973).

Recent data by the Fisheries Department of *Labeo* catch in Lake Victoria (Kenya waters) are also available from 1968 to 1980 (table 2).
Table 2. *Labeo* catch in metric tons in Lake Victoria, Kenyan part from 1968 to 1980

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<tbody>
<tr>
<td>Weight (Tonnes)</td>
<td>595</td>
<td>467</td>
<td>296</td>
<td>228</td>
<td>310</td>
<td>141</td>
<td>59</td>
<td>94</td>
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<tbody>
<tr>
<td>Weight (in Tonnes)</td>
<td>12</td>
<td>62</td>
<td>148</td>
<td>443</td>
<td>482</td>
</tr>
</tbody>
</table>

There was a decline from 595 tons in 1968 up to 228 tons in 1971. The catches rose a bit in 1972. It is interesting to observe that there was a rather sudden rise in 1979. This rise in 1979 and 1980 may be explained perhaps by increased numbers of gillnets of smaller mesh size and beach seines, used especially at river mouths. If this is the case then, it may not be surprising to find a drastic fall in catches by 1982.

The decline in number of *Labeo* in Lake Victoria, Kenya waters has been attributed mainly to cultural practices which interfere with the breeding biology of the species. Cadwalladr in 1964 reported that there was overfishing at the vicinity of river mouths, a practice which removed sexually mature fish (hence potential spawners) before they spawned. This is due to the fact that *Labeo*, being anadromous, migrates upstream to spawn. Alongside overfishing was the extensive use of gillnets, a fishing gear which was more efficient than the weirs and barriers previously in operation.

The species that inhabits Lake Turkana is *Labeo horie* and occurs in relatively small numbers (Hopson 1975). The fish occurs up to a depth of 9.4 m at Allia Bay. During the 1974-75 studies by Hopson, 66.9 kg were caught per 100 m of net per night in Ferguson's Gulf, this being the highest catch in the lake. Generally, *Labeo horie* and *Barbus bayinni* are doing well and producing good yields although at the expense of other immature fish.
In Lake Baringo is found *Labeo cylindricus* Peters, which is one of the four fairly common species. The other three are *Tilapia nilotica*, *Barbus gregorii* and *Clarias mossambicus*. Among other fish occurring here are *Harbus tanensis* and *B. hindii*.

The Tana River is the largest river system in the country, supporting substantial fisheries. It is a habitat for a variety of species including *Alestes*, *Clarias*, *Barbus* and *Tilapia*, to mention but a few. Two *Labeo* species are found in the Tana, namely *Labeo cylindricus* and *L. gregorii*. Both migrate into lateral water at the time of the first floods (mann 1965).

**THE FUTURE FOR THE ENDANGERED SPECIES: NEED FOR MORE RESEARCH TO SAVE THEM.**

Having appreciated the fact that the endangered species are truly declining in numbers (as shown in the case of *Labeo*), and acknowledging the existence of their demand, we should try and work out methods not only stopping the decline, but also restoring these fisheries to where they were in the 1940s.

Cadwalladr (1964) quoted Garrod as having pointed out in 1961 the need for research on the population dynamics of *Labeo victorianus*, and it is not improper to stress that need even here. It is only through comprehensive research of the populations that knowledge can be acquired of the cause of the decline and consequently find solutions to the problem.

In this regard, the following recommendations are made:

1. The difficulty of carrying out research on all the inland waters of Kenya at one particular time is acknowledged, consequently priority should be given to Lake Victoria and later other lakes and rivers. Also, it must be admitted that all the endangered species in Lake Victoria cannot be studied together at once, but that they should be studied individually at a time. Selected locations should be dealt with during a particular period instead of longing to cover the entire lake at once. In this connection, studies of *Labeo* in Lake Victoria ought to be conducted on Rivers Nzoia and Sio. The two rivers are preferred due to the fact that they have adequate numbers of *Labeo* to provide meaningful data, as opposed to, say Rivers Nyando and Sondu, where in a preliminary survey, only four *Labeo* were caught in two nights.
2. Investigations should be centred around the breeding, biology and population dynamics. A knowledge of the species in relation to its environment ought to be stressed. Previous work has attributed the decline of *Labeo* in Lake Victoria to overfishing and use of efficient gillnets at river mouths. It is high time more research was conducted to look into possibilities of the existence of other causes of decline. Enquiry should be made, for instance, into the effect of pollution on *Labeo*, with work being concentrated on the River Nzoia. Parasites, food and feeding behaviour should also be investigated.

3. Ways need to be tried of restocking Lake Victoria with *Labeo* and for it to become a success, the Fisheries Department should use the authority vested in it to administer the programme. In this regard, proper fishing should be enforced and any gear likely to remove fingerlings should be banned at the river mouths, not only during certain periods but throughout the year.

4. The knowledge about *Labeo* in Lake Victoria should then be applied to other waters (lakes and rivers), with modifications as appropriate.

### POLLUTION AS A POSSIBLE CAUSE OF DECLINE OF LABEO

With increased industrialization and modern farming techniques where various chemicals are used as pesticides and for disease control, there is a high likelihood for our water systems to be polluted. The effluents from industries, together with these chemicals contain organic or inorganic compounds that are lethal to fish.

A water system faced with the threat of pollution is the Nzoia River. It passes through agricultural areas where farm chemicals are in use. During the rains, these are washed down by rainwater and get access into the river. Besides that, industries along the river may be sources of pollution. There is the Webuye paper factory and the Mumias sugar factory, both of whose effluents find their way into the river. It is possible that the effluents not only alter river composition, but also fish behaviour as well.

Effluents from Webuye paper factory may be altering the chemical and physical conditions on the water, thus causing biological pollution. For example, samples of water taken from the river showed that there was a marked increase in temperature and a fall in pH on release of effluents, while turbidity, biological oxygen demand (BOD) and dissolved CO$_2$ rose (Balirwa and Bugenyi 1980).
Balirwa and Bugenyi (1980) quote Fox as having stated that pulp-mill effluents deplete oxygen, are toxic to aquatic life and give the water a taste and an odour. Effluents from Webuye paper mills contain an organic compound (α-terpinol), a monoterpenic alcohol which is supposed to be responsible for the taste and odour.

Thorough investigations are, therefore, needed because the River Nzoia is not only a habitat for *Labeo*, but also a nursery for other fish as well. The method of investigation should involve studying the water chemistry of the river from the mouth upstream. This will be done with much help from the chemist at KMFR Kisumu Laboratory. Such phenomena as BOD, pH, dissolved CO₂ and turbidity of the water will be determined for different points along the river. This will be done at various times of the year, on a monthly basis.

Internal organs and muscles of *Labeo* will also be studied to find out whether they contain pesticides or heavy metals. The results obtained from the study of the water chemistry and the fish themselves will be compared with catch of *Labeo* (this may also apply for other fish) at various times and locations. It is hoped a correlation may be found.

**SUMMARY**

It is clear, from the records given, that there is definitely a decline in the number of *Labeo*. It is also clear that there is a necessity to do something if this fishery has to be saved from extinction, especially in Lake Victoria. Thorough investigations into the biology of *Labeo*, together with management policies are the only hope for this species. Research should be directed to those areas that have not been explored yet, to explain the cause of the decline. The implementation of the recommendations made in this paper will go a long way to rescue our endangered fish both in the Lake Victoria and other inland waters of Kenya.

**REFERENCES**

3. EAFFRO (1965) *Annual Report EAFFRO*


