

# An Alternative Approach to Achieving High Fish Yields in Tropical Reservoirs

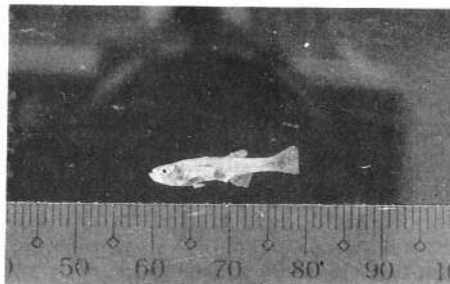
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A recent Naga article (C.H. Fernando and J. Holčík, October 1988, p.8), pointed out that the oriental region has a paucity of natural lakes, and consequently a depauperate, true lacustrine fish fauna, and the fish yields in lacustrine water bodies, particularly in reservoirs, have been increased through introductions. Professor Fernando has been an exponent of this theory for a long time. According to the article, yields in the oriental region have been considerably higher in water bodies which have built up a lacustrine fauna, particularly those using herbivorous littoral and planktivorous species. They further advocated the introduction of deepwater, lacustrine African species, and cautioned against haphazard introductions.

Most of the above arguments are not refuted. Admittedly, the initiation and sustenance of certain inland fisheries such as in Sri Lanka and Papua New Guinea are almost entirely dependent on the introduction of Mossambique tilapia, later known as Java tilapia in Asia, the *Oreochromis mossambicus* (Peters). In a different context the contribution of this species was summarized by Barry Costa-Pierce et al., "No one will ever know the amount of suffering its introduction and spread have saved the poor people of Asia." (in Naga, October 1988, p.10).

Increasing evidence shows that fish yields in reservoirs, particularly in shallow reservoirs, could be substantially increased without further introductions. There is growing concern and controversy with regard to introduction in the tropics. Introductions, however carefully



*Mistichthys luzonensis* Smith (actual adult size shown above), the smallest commercial fish in the world, is believed to have disappeared from Lake Buhi, Philippines, in 1979 due to introductions. Below, tilapia cages abound in Lake Buhi where tilapia was introduced in 1955.

evaluated and carried out, will be associated with an element of unpredictability.

The region has witnessed the extinction, or near extinction, of some species and these are attributed to introductions. Classic examples originate from the Philippines: the disappearance of the small goby *Mistichthys luzonensis* (Smith) from Lake Buhi, and the near extinction of the oriental region's only endemic cyprinid flock (20 species) from Lake Lanao. A complete list of the region's endangered species is given in *Exotic Aquatic Organisms in Asia*,



*Proceedings of a Workshop on Aquatic Introductions into Asia* (Sena S. De Silva, ed., Special Publication No. 3, 1989. Asian Fisheries Society, Manila, Philippines, available free to Society members).

The success of an introduction in one water body does not automatically indicate that introductions elsewhere will be successful, even in water bodies close to each other and with common characteristics. The best example of such a case is the clupeid, one of the Lake Tanganyika sardines *Limnothrissa miodon*, which has been overtly successful in Lake Kariba (T. Petr and J.M. Kapetsky, in the ICLARM Newsletter, July 1983, p. 9-11). However, its reported success in Lake Kivu is now viewed with some skepticism (H.J. Dumont, in Environmental Conservation 13, 1986, p. 143-148).

The view that the introduction of the same species into Lake Malaŵi would

by the Mekong River sardine, *Clupeichthys aesarnensis*, erroneously identified earlier as *Corica goniognathone*.

It seems that the factors that should be considered in evaluating or effecting introductions are not straight forward and clear-cut. In other words, creating a balanced fish fauna by introducing lacustrine fish species, as suggested by Fernando and Holčík, is not an easy task. The success of the individual pelagics depend on the detailed phytoplankton and zooplankton composition, the physico-chemical nature of the water and a host of other factors. This is why Dumont thinks that the introduction of *Limnothrissa miodon* into Lake Kivu might even result in an ecodisaster, and Eccles profusely believes that no clupeid should be introduced into Lake Malaŵi.

If this is the case, then how do we increase fish production in our reservoirs? Here we are not concerned with stocking

shallow, lowland reservoirs, without effecting any introductions. Such evidence is not confined to the oriental region either. In Sri Lanka, which is reputed to have a depauperate indigenous freshwater fish fauna dominated by 'minor' cyprinids, it has been demonstrated that selective fishing using smaller meshed gillnets could support a fishery based on the introduced *Oreochromis mossambicus*, and that these two fisheries could co-exist (S.S. De Silva and H.K.G. Sirisena, in Fisheries Research 6, 1987, p. 17-34 and 7, 1988. Sizeable resources of indigenous small cyprinids and clupeids which are unexploited have also been reported from some African lakes such as the Volta Lake in Ghana (C.J. Vanderpuye, in CIFA Technical Paper 10, 1984, p. 261-320).

It is surmised that large stocks of native riverine species colonize the reservoirs, sustain themselves successfully and actively migrate into the rivers and streams to reproduce. These stocks remain unexploited. One of the primary reasons for not harnessing these resources may be the uniformity of the gear used, and the restrictions imposed on the use of small mesh gillnets. Also, little is known about the extent of the resource and the ability of these stocks to sustain a fishery. This is obviously an area where cooperative research amongst fishery biologists and fishery managers are needed.

According to Eccles, rehabilitating the existing fisheries in Lake Malaŵi would be more cost-effective than effecting an introduction and would not be ecologically detrimental. I advocate an approach close to this: not a rehabilitation, but the establishment of another small-scale fishery, in which two groups of fishermen co-exist. This needs careful management and education of the fishermen on the negative effects of the misuse of the gear and so forth.

In conclusion, I wish to emphasize that introductions, particularly of the tilapias, into the oriental region have paid rich dividends. However, the answer to increasing yields from reservoirs may not necessarily lie with further introductions, but with managed exploitation of the riverine, indigenous stocks which have (successfully?) invaded the lacustrine habitats.

We have had a disproportionately large number of fish introductions into the region. Let us look for other ways of increasing fish production and make a realistic and objective assessment of the introductions made so far. ●



The introduction of the sardine *Limnothrissa miodon* was successful in Lake Kariba, Africa. However, its reported success in Lake Kivu is viewed with skepticism.

result in increased fish yields has been dismissed (D.A. Eccles, in Biological Conservation 33, 1985, p. 309-333). In the oriental region the only success of a clupeid in lacustrine waters that I am aware of is reported from the Ubolratana Reservoir in Thailand. In this instance it was not a deliberate introduction but the result of a natural colonization/invasion

and recapture, but with populations which enhance the yields through natural recruitment.

As much as the tilapias have been successful in some countries in the oriental region (most are not prepared to assess this success objectively!), there is growing evidence of the potential for increasing fish yields, particularly in