Management of Laguna de Bay, Philippines

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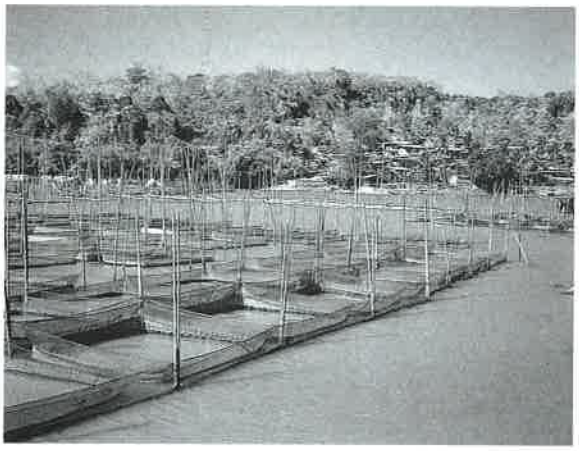
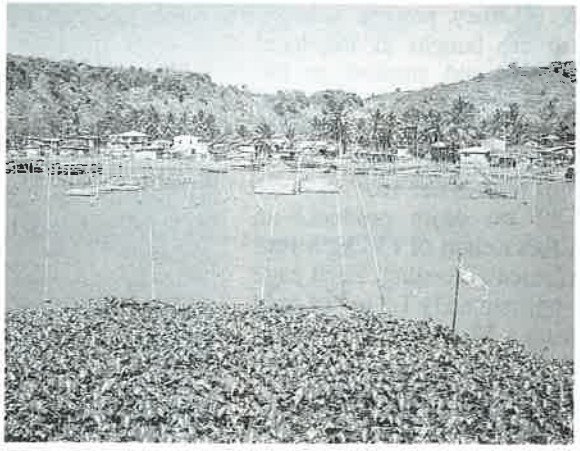




Different faces of Laguna de Bay. Lower photo shows the controversial Napindan Dam, built to prevent entry of saltwater into the lake and render the lakewater suitable for domestic consumption.

Laguna de Bay is a large (90,000 ha), shallow (2.5-3.0 m depth) and eutrophic lake lying just to the southeast of Manila, Philippines. Due to its close proximity to Manila, the industrial and commercial center of the nation, it has a vital role to play in the development of this region as a multi-use resource for fisheries, irrigation, industry and domestic water supply. Traditionally the lake has been the source of livelihood for small-scale fishermen. As will be seen, the effects of such developments have led to conflict with these traditional users of the lake, with the fishermen on the losing end.

In the late 1960s, the fishery catch was declining due to a combination of overfishing and pollution. This prompted the first of such developments as the introduction of fishpen culture. A pilot project set up by the Laguna Lake Development Authority (LLDA) involving the culture of milkfish (*Chanos chanos*) in a 40-ha fishpen gave excellent results. The annual yield from the pen was up to five times the yield from coastal brackishwater fishponds -- the traditional suppliers of milkfish. There is no doubt that fishpen culture in eutrophic lakes is an extremely efficient method for producing fish protein, particularly when using fish such as milkfish which feed low down on the foodchain; and that this introduction could have benefitted the small fishermen enormously.

Yet, 15 years later, many people, particularly the small fishermen themselves, regarded the fishpen experience as a disaster. So what went wrong? First, the capital cost of constructing a fishpen is high. Since no credit facilities were extended to the fishermen, only rich individuals and corporations could afford to build fishpens. Second, because the industry in its early years was seen to be extremely profitable, many entrepreneurs decided to enter it, and due to lack of management and control procedures, the area of fishpens increased enormously to cover over a third of the lake's area (35,000 ha) by 1983. (See ICLARM Newsletter-October 1981, p.11-13, for the status of fishpens then.)

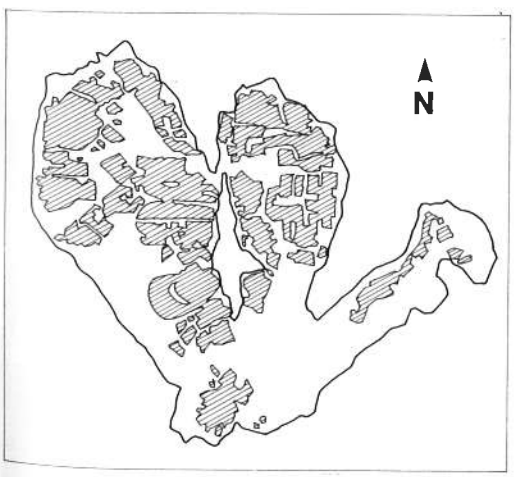
Many of these fishpens were blatantly illegal -- the LLDA regulations limited the fishpen area to 5 ha for individuals and 50 ha for corporations but in 1983 about 50% of the fishpens exceeded these limits, the largest one being a staggering 1,200 ha.

Thus, the fishermen found themselves literally fenced off by rich and powerful outsiders from the lake -- a lake which was supposedly a common resource and

their means of livelihood. Moreover, with fishpens occupying a third of the lake, the open water fishing area was reduced, leading to greater pressure on the open water resources and decreased yield for the fishermen. Concomitant with this was the danger of venturing too near fishpens in order to reach the open water fishing grounds -- many cases of intimidation and even killings of fishermen by armed fishpen guards have been reported. Fishermen's incomes declined substantially over this period. A SEAFDEC study on a fishing village established that the annual fisherman's income fell from ₱10,000 in 1977 to P4,000 in 1983; it was also during this period that the greatest increase in fishpen area occurred.

So, there is no question that the fishpen industry had a negative impact on the small-scale fishermen of Laguna Lake but in a sense, the industry also cut its own throat. The uncontrolled expansion of the fishpens and the increased pressure on the food resources of the lake meant, in all probability, that the carrying capacity of the lake was exceeded. This is supported by the finding that, at the maximum development of the fishpens, the rearing period for milkfish increased from the previous 4 months' growth to marketable size to 8 and even 15 months.

This critical situation was recognized by the new government of the Philippines in 1986 and it prompted officials to set up a Presidential Commission to investigate the problems, promote dialogues with the various users of the lake and to come up with recommendations aimed at alleviating the plight of fishermen. This report was submitted to the government in February 1987. Although the fishermen called for a reduction in fishpen area to just 4,000 ha, the commission proposed a reduction to 10,000 ha, with private ownership to be phased out within five years, and with the remaining fishpens being operated by fishermen's cooperatives.



A map of Laguna de Bay roughly showing areas with existing fish pens.

The future in this respect certainly looks brighter for the fishermen, but many problems remain regarding the future development of the lake's resources. Chief among these is the controversy generated by the proposal to use Laguna de Bay for Manila's domestic water supply early next century. A gated dam, the Napindan Hydraulic Control Structure (NHCS), has been built just above the confluence of the Napindan Channel and the Marikina River which can prevent the entry of saltwater into the lake. This entry of saltwater occurs when the level of the lake falls below that of sea level at the end of the dry season in May, although it is by no means an annual occurrence.

The fishermen and fishpen operators, together with some scientists working on the lake, believe that prevention of saltwater inflow will have a detrimental effect on fish production. It has been observed that when saltwater inflow occurs, the normally turbid water is cleared due to the flocculation and settling out of inorganic particles, a process well known to operate in estuaries. This leads to increased phytoplankton production and fish production. If the NCHS is closed to stop saltwater inflow to render the lake water suitable for domestic consumption, it is argued that the fish production in the lake will be lowered.

There are already indications to this effect. Through 1984 and 1985, when no saltwater inflow occurred, the trend was one of increasing turbidity and lower primary production, which reached critically low levels in some areas of the lake. There is a paradox here as the lake is regarded as highly eutrophic. This is true if one is talking about nutrient concentrations in the water. However, primary production is light-limited due to turbidity for much of the year, and not nutrient-limited.

Pollution

The plans for using the lake for water supply not only mean the prevention of saltwater inflow but also the strict control of pollution. This is going to be very difficult to achieve. The figures speak for themselves: almost 900 industries are located in the lake basin, 90% of which are classified as highly polluting. Only 20% of these have any kind of anti-pollution device to treat wastes discharged into the lake. This is quite apart from the enormous problem of domestic pollution from the ever-increasing population of the lake basin where sewage treatment facilities are almost nonexistent.

The Future

The future exploitation of the lake will be mostly in the hands of the small fishermen with a mixture of capture fishing and aquaculture. Open water fishing will carry on in much the same way as before, i.e., consisting of catches from fish corrals ("baklad") and gill nets ("pante") with bottom trawling for snails as food for the important duck-raising industry around the lake. Catches from the open water at the moment are composed of native fish such as "kanduli" (*Arius* spp.), "dalag" (*Channa striata*), "hito" (*Clarias* spp.), "biya" (Family Gobiidae), and "ayungin" (*Therapon* spp.), together with some introduced species such as "tilapia" (*Oreochromis niloticus*) and "karpa" (*Cyprinus carpio*).

Regarding aquaculture, fish cages will probably gain popularity over fishpens due to their much lower construction costs and the possibility of individual ownership. Tilapia, which can be raised in cages, is becoming more popular compared with milkfish for a number of reasons, chiefly their greater tolerance of poor environmental conditions and the fact that they spawn in the lake. This is important. Milkfish do not spawn in freshwater; it is necessary to purchase fingerlings from an outside source. The production of tilapia fingerlings now serves as an important source of income for some small fishermen and many farmers around the lake. Polyculture involving newly introduced species such as bighead carp *(Aristichthys nobilis)* and silver carp *(Hypophthalmichthys molitrix)* is also likely to gain wider acceptance. Both of these Chinese carps have done well in experimental pens in the lake.

The waters of Laguna de Bay have been turbulent in more sense than one over the past few years. It is hoped that lessons have been learnt from the uncontrolled development of fishpens and that any future development plans will really be aimed at those who most need them -- the small fishermen. ●