

SEAFDEC Contribution to the Ecological Awareness of Philippine Lakes

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Abstract

Since 1976 the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD), through its Binangonan Freshwater Station has been continuously involved in research on various aspects of inland waters, with emphasis on Laguna de Bay. Lakes Paoay, Taal, Sampaloc and Naujan have also been studied to a limited extent. Research efforts focused on monitoring activities of various biological and physico-chemical parameters in the lake; pollution studies; improvement of practices towards an environmentally sound and sustainable aquaculture enterprise; socio-economic impacts of aquaculture on lakeshore communities and other related activities. The Department has been actively collaborating with various national and international agencies as well as non-government organizations in its effort, to improve its research capabilities. The research results have been published in both local and international scientific journals and proceedings.

Introduction

The concern of SEAFDEC Aquaculture Department on the ecological status of the Philippines inland waters dates back in 1976 when the Binangonan Research Station (now Binangonan Freshwater Station) was established. The Station's mandate is to undertake research and development activities on freshwater fisheries and other aquatic resources and *contribute to the proper management of existing natural inland bodies like lakes, reservoirs, rivers and streams in Southeast Asia*. The Station was envisioned to enhance and complement the research and development programs of the SEAFDEC Aquaculture Department in Panay, Philippines which deal primarily with marine and brackishwater species.

The Station is located in a 45-hectare site at Tapao Pt., Binangonan Rizal (14°25' Longitude, 121°13' Latitude) along the western shores of Laguna de Bay, the largest lake in the Philippines. It is accessible by motorized boat either from Binangonan or Cardona town. The site was reserved for use by the Station by virtue of a Presidential proclamation issued on 28 July 1977. Competent researchers and scientists with advanced degrees in various disciplines work in the Station.

Research Activities on Lakes and Inland Waters

In 1976, the Station embarked on the Lake Ecosystem Project for the limnological studies of Laguna de Bay and other lakes in the country. The studies involved collection of benchmark information to evaluate the peculiar behavior of a particular lake, the pollution status and the fitness of the water quality for fishery and aquaculture. Water quality studies and analysis of recurrent fish kills were considered important components for evolving strategies and approaches for the systematic development of the lake. The output of the Project was envisioned to contribute substantive and functional information for a better development and management/conservation plans the government might put up for Laguna de Bay and other lakes. The achievements of the Project became a scientific reference in the formulation of plans and programs for some Philippine lakes.

A total 93 articles were published in international and local journals and in workshop proceedings. Several of these studies have contributed valuable information on the ecological status of Laguna de Bay and other Philippine lakes. Studies with significant implications on the fishery and aquaculture activities on lakes have also been conducted.

Laguna de Bay

The early studies in Laguna de Bay noted that turbidity limits the production of phytoplankton due to the early quenching of light. This observation, later, became an important concern in the management of the lake. Through the sustained ecological studies conducted by the Station in 1980s the relationship between turbidity and the role of the natural occurrence of seawater intrusion in the productivity of Laguna de Bay was understood. Results of the 1980-81 investigation showed that seawater intrusion or the seawater backflow in Laguna de Bay during summer initiated lake clearing. The turbidity equivalent to a Secchi disc transparency of 10-20 cm before seawater intrusion was reduced and water cleared to a transparency of 100 cm a few days after the backflow. The decreased turbidity stimulated the primary production level 5-8 times, increasing the volume and diversity of natural foods in the Lake and promoting a fast growth of fish (Basiao and San Antonio 1986). In 1981, the SEAFDEC researchers presented a paper entitled "The Hydraulic Control Structure - A Threat to the Fishpen Industry in Laguna de Bay" (Nielsen *et al.* 1981). This was the same year the Philippine government project constructed the multi-million peso Napindan Hydraulic Control Structure (HCS) in Pasig River. The HCS would prevent the entry of pollutants and tidal backflow of Manila Bay waters to the Lake via the Pasig River, the only natural outlet of the Lake. The negative ecological impact on the food chain of the lake was shown in the SEAFDEC report and was confirmed by fishpen operators and fisher folk. Another SEAFDEC paper affirmed the importance of seawater intrusion in the natural ecosystem of the Lake (Santiago 1991). These findings have not been ignored to date.

The few pollution studies at SEAFDEC were highly informative and have focused on heavy metals. A study on the mercury levels in sediment, water, and selected finfishes from Laguna de Bay was conducted and showed that fish tissues contain the metal but the concentrations were still well within the permissible levels (Civin-Aralar 1990). In another study, tilapia fry exhibited hyperactivity and erratic swimming after exposure to varying mercury concentrations. Scoliosis, a curvature in the mid-trunk region, was significantly correlated with increasing mercury concentration (Civin-Aralar 1991). The effect of long term exposure to mixtures of the heavy metals mercury, zinc and cadmium on fish were also studied (Civin-Aralar 1993; Civin-Aralar 1994; Civin-Aralar and Aralar 1995). The

accumulation and effect of mercury in water hyacinth (*Eichhornia crassipes*) from Laguna de Bay were also studied (Tabbada *et al.* 1989/1990). These results would become a future reference for managing the heavy metal content of Laguna de Bay specially in gauging the progress of pollution control of the government.

Numerous studies which contribute to the improvement of fishery and aquaculture practices in inland waters, particularly Laguna de Bay have also been implemented. Studies on the culture of various freshwater species in Laguna de Bay, have also been conducted. Most of these are on the culture techniques of Nile tilapia (Bautista *et al.* 1988; Basiao and San Antonio 1986; Basiao 1988), on induced spawning of bighead carp (Fermin and Reyes 1989; Fermin 1990; Fermin 1991) and the polyculture of these species (Tabbu *et al.* 1986). An assessment of the tilapia cage technology and its socio-economic impact on the fishing villages around Laguna de Bay was conducted in the early 1980's (Gonzales 1984). In addition, the interplay of various limnological factors in Laguna de Bay and its influence on fish production was also assessed (Santiago 1988). To minimize the pollution contribution of aquaculture feeds on our inland waters, various nutritional studies have also been conducted by SEAFDEC/AQD. The utilization of various natural food and in fish farming in Laguna de Bay have also been tested (Pantastico *et al.* 1981; Pantastico *et al.* 1986; Pantastico *et al.* 1986) as well as more efficient formulated diets (Santiago *et al.* 1982a; Santiago *et al.* 1982b; Santiago *et al.* 1985; Santiago *et al.* 1986; Santiago *et al.* 1988; Santiago *et al.* 1991).

The aforementioned studies gained recognition for SEAFDEC when the Philippine government included the Station as a founding member of the Inter-Agency Research Committee on Laguna Lake and its environs created by the Presidential Task Force on Laguna Lake. The committee provides direction towards applied ecological researches. Since then, SEAFDEC has cooperated with the Laguna Lake Development Authority in its preparation of the Master Plan for Laguna de Bay and on its crucial decision over the priority use of the Laguna Lake.

Other lakes

In 1981 to 1982, Lakes Paoay, Taal, Naujan and Buhi were visited and studied by a team of researchers. Data gathered indicated that Naujan and Buhi lakes have good potentials for well-managed cage culture of tilapia. Lake Taal has too little production to support tilapia culture so that supplemental feeding would be necessary. True enough those findings in 1981 is now a reality. Taal lake is now the source of the most delicious tilapia in the Manila market. However, as predicted, the commercial fishcage operators in Taal are engaged in intensive feeding. Paoay Lake was recommended for macrophyte-eating carps due to the abundance of submerged vascular plants. A review of zooplankton in Philippine lakes was also published in the mid 1980's (Petersen and Carlos 1984).

Another study that created an impact on lake management is on Sampaloc Lake, one of the 7 crater lakes in San Pablo City. From 1989 to 1991 SEAFDEC conducted an ecological study on the impact of intensive tilapia cage culture on the lake. The findings showed how the lake slowly deteriorated as manifested by the progressive disappearance of dissolved oxygen from the water column as unabated feeding continued. The lake upwelling of 1992 resulted in massive fish kill. Because of SEAFDEC/AQD's involvement, it was made a member of the Multi-Sectoral Task Force on the 7 lakes of San Pablo City formed by the government to help in the rehabilitation of the 7 lakes. The experience of Sampaloc Lake became a lesson-learned to protect the other lakes from the impact of intensive tilapia cage culture.

At present SEAFDEC/AQD through its Binangonan Freshwater Station is involved in a collaborative research on "Laguna de Bay Ecosystem Approach to Sustainable Management" funded by the STD III program of the European Union. SEAFDEC/AQD will continue in its efforts to contribute to the science of the lakes and other inland waters which will serve as the scientific base for the proper management and sustainable utilization of these resources.

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