TILAPIA CAGE CULTURE AND WATER QUALITY IN LAKE TAAL, PHILIPPINES

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by

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ABSTRACT

Water quality of Lake Taal in Batangas, Southern Luzon, Philippines, was assessed and compared in areas with tilapia cage culture and without cage from March 1996 through February 1997. Three stations were considered in the northern basin of the lake namely: Balas, station 1 which serve as control (non-cage area), Sampaloc and Berinayan, as station 2 and 3 (cage areas) respectively. Water samples with two replicates were collected monthly using a van Dorn sampler at 0, 5, 10, 15 m depths in all stations. Below surface water from inside cage was also collected. Water temperature, water transparency, pH, and conductivity were determined *in situ*. Dissolved oxygen, chloride, NO_3, NH_4, PO_4 and Total-P were analyzed in the laboratory. Phytoplankton density and algal biomass through chlorophyll *a* and light-and-dark bottle method was used to measure primary productivity.

Results show that conductivity and DO were significantly different between non-cage and cage areas. Conductivity was significantly different ($P=0.0148$) between control and cage area during the wet season (May to October 1996). Highest conductivity value (2100 μ S cm^{-1}) was observed in July in a cage area (station 3). Mean values of DO gave significant differences ($P=0.0256$) in the different stations throughout the study period. A decrease of DO to 2.5 mg L^{-1} was observed below 10 m depth around the cage areas in February.

Analysis indicates that oxygen depletion occurred in the water column in cage areas. The presence of cage structures decreases the flow rate resulting in weak circulation thus, decrease the supply of oxygen and slows down the removal of toxic waste metabolites from the vicinity of the fish farm. The decay of organic matter on the sediment under the cage may also cause localized oxygen deficiency in cage areas.

The impact of cage culture in Lake Taal appeared to be minor but can alter lake ecosystem if not properly managed. Proper zoning of fish cages and continuous water quality monitoring are needed.

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I. Introduction

Cage culture is a method of rearing fish in an enclosed mesh or netting structure constructed within a large body of water (Coche, 1982; Beveridge, 1984). Cages are advantageous compared to other fish rearing systems because they entail lower capital costs and simple management.

Most of the fish cages in Lake Taal in Batangas, Southern Luzon, in the Philippines, were constructed in the shallower portion of the lake averaging 90 m at the shoreline of Talisay, Laurel and San Nicolas. Fish cages have become increasingly used in intensive culture of cichlid species, *Oreochromis mossambica* and *O. nilotica.* Since 1980, tilapia cage culture has grown to be a viable economic activity in Lake Taal. It has been adopted not only as a supplement to open-water fisheries but as a major component in fish production. At the time of the study, there were almost 3,140 units of fish cages covering an area of 46.4 ha which was about 0.19% of the surface area of the lake. The estimated production for cage culture operation is 63.4 kg m^{-2} y^{-1}. This is 10 times the traditional open water fish catch from the entire lake which is equivalent to a total of 29,437 MT yr^{-1} (UPLBFI 1996).

In general, aquaculture in Lake Taal has followed countrywide trends in the expansion of the area under culture and the use of more intensive and modern technology that involve higher stocking density and inputs of feeds. As a consequence, cage culture which was once considered as an environmentally benign practice is now viewed as a potential polluter of the marine and aquatic