Southeast Asia

Researchers at the Asian Institute of Technology in Thailand undertook a study to evaluate caging densities and pond loading rates for tilapia that were caged and fed within semi-intensive ponds with small tilapia at large. Such a system could be an effective means to produce large tilapia efficiently. Caged tilapia were stocked at five densities, and held in ponds loaded at two rates for 90 days of culture. Growth rates of the caged tilapia were similar regardless of stocking density; however, survival rates differed significantly with cage density, with fish at higher densities exhibiting very high mortality rates. Growth and mortality rates of the uncaged tilapia were similar to rates found using other culture systems, even though the only source of nutrients was the unused feed and excretory products of the caged fish. Water quality did not deteriorate within the ponds at either loading rate. Cage stocking densities of 64 fish per m^3 resulted in good survival and significant growth.

Increasing the carrying capacity of the pond or size at harvest of tilapia requires more intensive management, which largely involves supplemental feeding. Researchers attempted to determine the upper limits to tilapia production using supplemental feeds. Fish were stocked at four densities, and fed to satiation during the 146-day culture period. The highest growth rate and survival occurred in lower-density ponds. Researchers could not explain why the higher densities did not have correspondingly high growth and survival rates. The best recommendation currently is to stock fish at $3/m^2$ under intensive feeding regimes.

Researchers investigated whether adding carp to a tilapia monoculture would increase the productivity of the pond system. Because tilapia are primarily planktivores, researchers hypothesized that the addition of carp would increase productivity by converting currently unutilized benthic matter into fish flesh. Researchers stocked ponds with tilapia and added carp at various stocking rates. Ponds were fertilized weekly with chicken manure, urea, and triple sodium phosphate (TSP). Preliminary results indicate slow, uniform growth for tilapia, possibly because larger tilapia than called for in the experimental protocol were stocked erroneously. Carp growth proved to be extremely sensitive to and inversely related to stocking density. Although turbidity was higher in ponds stocked with carp, there was little indication of any other difference in water quality between the monoculture and the polyculture ponds.

Researchers at University of Hawaii investigated carbon dioxide (CO_2) exchange between pond water and the atmosphere. Although oxygen exchange is routinely estimated in free water studies, far less attention has been given to diffusion of carbon dioxide, which may be significant. Researchers analyzed data from their pond research facility in the U.S. to quantify the rates of exchange of carbon dioxide between pond water and the atmosphere in fertile earthen ponds, and to identify factors which determine these rates of exchange. An analysis of these data showed that total carbon dioxide concentrations varied little during the day, but showed a perceptible dip during midday, reflecting photosynthetic uptake. Wind speeds directly above the water surface were measured, and researchers observed that the windiest periods occurred mainly during daylight hours. Analysis showed that the concentration of free carbon dioxide and wind speed together accounted for 81% of the variation in the diffusion rates during the diel cycle. Thus, prediction of diffusion rates requires only observed carbon dioxide concentrations and wind speed, although photosynthetic demand can be the primary determinant of concentrations under some conditions.

Deep (approximately 2.5 m), rain-fed ponds are more severely density stratified than the commonly used shallow ponds, and are, therefore, less often stirred by convective overturn at night or by wind-induced mixing. This makes oxygen depletion in the hypolimnion more likely. A study was conducted to describe and quantify the diel temperature cycles and dissolved oxygen (DO) stratification in these deep ponds. During sunny, dry season days, the pond had a slightly deeper mixed layer (at least 35 but much less than 75 cm) than is characteristic of ponds at the more sheltered Asian Institute of Technology site. The bottom water below 2 m depth was almost completely isolated from the upper water, receiving only minimal transport of oxygen from above. During the rainy season the isolation below 2 m was maintained even through a dark rainy day. These results show that active mixing may be necessary to maintain deep ponds as suitable culture environments for some animal species.