ZMATH 2010a.00512

Zhang, YuanSi; Wang, ShuoPeng; Cui, Ning

Rebalancing human-influenced ecosystems.

UMAP J. 30, No. 2, 121-139 (2009).

Summary: The primary goal of this year's ICM was to develop an aquaculture scenario that incorporated species from multiple trophic levels to reduce the level of effluent leaving the fish pens for a specific case study in the Philippines. These fish farms are adjacent to coral reefs, thus the target was to improve water quality such that corals could thrive in the area while an economically viable aquaculture industry could also be maintained. The main tasks expected of the teams were as follows: 1. Model the original Bolinao coral reef ecosystem before the introduction of fish farms. 2. Model the current Bolinao milkfish monoculture. 3. Observe the remediation of Bolinao via aquaculture. 4. Maximize the value of the total harvest. 5. Call to action. From the judges' commentary: TheChina Universify of Mining and Technology submission was notable for the impressive array of modeling techniques utilized in attacking the problems. There were other papers with a similar level of modeling, but this group not only described the modeling process clearly but connected the models coherently to the problem at hand. As with many of the teams, the principal models used were differential equations (Volterra models). The team also used the Analytical Hierarchy Process (AHP), as well as nonlinear optimization to improve their models and to address the later requirements of the problem. They propose strengthening the "middle strata of the foodweb" by introducing herbivorous species to the polyculture. They also propose a strategy for harvesting various species while still satisfying the constraint to maintain good water quality in Bolinao. While extremely strong on the modeling, the paper could have been further improved with more depth on the ecological issues and the overall quality of the writing.

Classification: M65 I75
Keywords: mathematical models; ecology; biology; differential equations