



PIMS Mathematical Biology Seminar



**Monday, March 17, 2008
3 pm - 657 CAB**

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Mathematical Models of Marine Protected Areas

Marine protected areas (MPAs) have been promoted as conservation and fishery management tools, and at present, there are over 1300 MPAs in the world. Most researchers suggest that in the long term MPAs provide multiple benefits, including: reduced likelihood of a stock collapsing enhanced spawning biomass, improved recruitment and survival of juvenile fish to become mature, an increased permitted harvest and recovery of the habitat. However, the establishment of MPAs raises significant and open scientific questions that are largely unsolved. It is no coincidence that the majority of the titles of the scientific articles on MPA models end in a question mark.

We introduce marine protected area models with delay that incorporate age-structure, explicit life-history characteristics such as diffusion and larvae dispersal, management criteria, such as the number of reserves, areas allocated to the protected and fishing zones, periodic fishing rates, and selective harvesting strategies. The resulting models belong to a class of nonlinear and non-autonomous systems of differential equations with delay.

We investigate dynamics of MPA models with perennial ecological favourites, such as sign stability, uniform and global stability, persistence and permanence of the steady state solutions. We give ecological implications of the main results and analyze the possible effects of both diffusion and harvesting on the stability of our models. One of the benefits of a theoretical modeling of MPAs is insight into the type of data that should be collected in order that the best harvest strategies can be established in the fishing zones.

Join us for refreshments in CAB 549 immediately following the seminar