On the global asymptotic stability of a class of nonlinear, discrete time, population models

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This paper deals with the global asymptotic stability of a class of non linear discrete time, stage-structured population models of type $\mathbf{n}_{t+1} = \mathbf{A_n}\mathbf{n}_t$ [3].
The non linearity of the model is introduced in the reproduction term, such that fertility coefficients depend on mature individuals population density. The model is compensatory, having a Beverton-Holt [1] density-dependant recruitment function of type $h(N) = \frac{aN}{1+cN}$.
We present conditions under which the non trivial equilibrium point is globally asymptotically stable. Mathematical tools based on monotony hypothesis on the non linear terms were used to prove the stability [2]. They involve the verification of a system of nonlinear inequalities.
The model is applied to an exploited fish population. Results concerning the sensitivity of the equilibrium to fishing effort are compared with a discrete linear model, and are interpreted under a fishery management point of view.
This approach could be applied to other types of nonlinear discrete models.

Keywords Nonlinear discrete population models, Density-dependance, Global asymptotic stability, Monotony, Fisheries Science.

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