

# Allegheny Mountain



## Colloquium



University of  
Pittsburgh

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**Zoom link:** <https://bit.ly/3Xy9Z0N>

**Title:** Square Root Identities for Harvested Beverton–Holt Models



### Abstract:

We introduce the term net-proliferation rate for a class of harvested single species models, where harvest is assumed to reduce the survival probability of individuals. Following the classical maximum sustainable yield calculations, we establish relations between the proliferation and net-proliferation that are economically and sustainably favored. The resulting square root identities are analytically derived for species following the Beverton–Holt recurrence considering three levels of complexity. To discuss the generalization of the results, we compare the square root result to the optimal survival rate of the Pella–Tomlinson model. Furthermore, to test the practical relevance of the square root identities, we fit a stochastic Pella–Tomlinson model to observed Barramundi fishery data from the Southern Gulf of Carpentaria, Australia. The results show that for the estimated model parameters, the equilibrium biomass levels resulting from the MSY harvest and the square root harvest are similar, supporting the claim that the square root harvest can serve as a rule-of-thumb. This application, with its inherited model uncertainty, sparks a risk sensitivity analysis regarding the probability of populations falling below an unsustainable threshold. Characterization of such sensitivity helps in the understanding of both dangers of overfishing and potential remedies

