Size-structured model of prey population controlled by optimally foraging predator.

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We first show how the method of characteristics may be generalized to analyze Radon-measure-valued solutions to the size-structured population model of the McKendrick-von Foerster-type under general assumptions on individuals' growth, birth and mortality rates. Then in this frame we construct a model to describe changes in the size-structure of prey population (zooplankton) when prey-size dependent mortality rate results from the foraging of predator - a planktivorous fish. We propose a new model of foraging which is based on the optimization of the rate of net energy intake by predator as a function of predator's speed. The mortality rate is defined as an operator on a metric space of non-negative Radon measures equipped with the bounded Lipschitz distance. The solutions to the size-structured model of zooplankton population are studied analytically and numerically (using the EBT-like schema). In particular, the numerical solutions starting from Dirac deltas corresponding to distinct cohorts, exhibit regularization in time and convergence to the same stationary state. The talk is based on paper [1] which has been recently accepted for publication.

REFERENCE

[1] J.J. Jabłoński, D.Wrzosek, Radon-measure-valued solutions to size-structured population model of prey controlled by optimally foraging predator harvester, M3AS, to appear, (2019).