

Stochastic Age-Structured Population Models

Authors : Arcady Ponosov

Abstract : Many well-known age-structured population models are derived from the celebrated McKendrick-von Foerster equation (MFE), also called the biological conservation law. A similar technique is suggested for the stochastically perturbed MFE. This technique is shown to produce stochastic versions of the deterministic population models, which appear to be very different from those one can construct by simply appending additive stochasticity to deterministic equations. In particular, it is shown that stochastic Nicholson's blowflies model should contain both additive and multiplicative stochastic noises. The suggested transformation technique is similar to that used in the deterministic case. The difference is hidden in the formulas for the exact solutions of the simplified boundary value problem for the stochastically perturbed MFE. The analysis is also based on the theory of stochastic delay differential equations.

Keywords : boundary value problems, population models, stochastic delay differential equations, stochastic partial differential equation

Conference Title : ICNIS 2022 : International Conference on Mathematics and Information Sciences

Conference Location : Prague, Czechia

Conference Dates : July 12-13, 2022