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Equilibria and stability results for some zooplankton size-structured models

Structured models are increasingly used in biological modelling, particularly to describe marine ecosystems, where the behaviour of individuals is strongly dependant of their size. To modelize zooplankton community, we first have to describe how an individual of some size feeds, and then how it uses the acquired food to grow and reproduce (according to some dynamic energy budget in order to guarantee mass conservation). Since the model includes cannibalism throughout zooplankton population, we obtain a variant of the well-known McKendrick-von Foerster equation with integral terms which appear in growth, mortality and reproduction.

Such models are often hard to analyse mathematically. Nevertheless, with some more hypotheses on the cannibalism behavior, we can find equilibria of the model as fixed points of a function in a finite dimensional space. The linearized system around the equilibrium provides us, thanks to the use of linear semigroup theory, some local (un)stability results about these equilibria.

Results obtained will be applied to a simple version of the model, which allows us to go further into the mathematical analysis.

Keywords : Size-structured models, Zooplankton ecosystem, Cannibalism, Strongly continuous semigroups.

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