

A New and Generalized Theoretical Formalism for Ecological Growth Functions

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Population growth and dynamics have been theoretically studied for the past few decades. Usually this is done by using empirical mathematical representations that appear to work well but have a weak theoretical justification or no theoretical justification at all (Tsoularis, 2002). It is therefore important to frame these formalism with a strong theoretical support.

In this poster, by using the well known Taylor theorem and based on the ideas of the power-law formalism (Savageau, 1980. Voit, 1992. Voit & Yu, 1994. Sorribas et al. (submitted)), a new mathematical formalism is derived.

The form of the equations for one specie and one resource ecosystem is:

$$\dot{N}(t) = \alpha N(t)^g (k_{total} - \beta N(t)^\kappa)^\gamma.$$

This new formalism is then used to derive previously used growth formalism as special cases of this, thus framing them in safe theoretical ground.

Generalization to n species and m resource ecosystem is considered.

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References

- [1] SAVAGEAU, M.A. (1980). Growth equations: A general equation and a survey of special cases. *Math. Biosci.* 48, 267-278.
- [2] SORRIBAS, A, MUÍÑO, J.M, VOIT, E.O. GS-Distributions: a new family of distributions for continuous unimodal variables. (submitted).
- [3] TSOULARIS, A. (2002). Analysis of logistic growth models. *Math. Biosci.* 179, 21-55.
- [4] VOIT, E.O. (1992). The S-distribution: A tool for approximation and classification of univariate, unimodal probability distributions. *Biometrical J.* 7855-878.
- [5] VOIT, E.O. & YU, S. (1994). The S-Distribution: Approximation of discrete distributions. *Biometrical J.* 36, 595-609.