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ENERGY BALANCE GROWTH MODELS: APPLICATIONS TO CEPHALOPODS

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ABSTRACT: The term 'growth model' in fisheries literature commonly refers to equations predicting size-at-age. Applying statistical goodness-of-fit criteria to such equations measures their capacity to describe populations but implies an unstated corollary that some individuals grow 'wrong'. This 'wrongness' may result from techniques misrepresenting age, but, as cephalopods often exhibit ten-fold variation in growth under controlled conditions and have multiple sub-annual cohorts in nature, it may simply be wrong to try to represent a 'population' with a single equation. This article provides a simple spreadsheet model, adjustable daily, that allows tests of a wide variety of environmental and physiological variables' effects on an individual animal's growth parameters. This allows independent elimination of implausible individual errors from statistical analyses and has important consequences for growth models used in an ecosystem context. Growth efficiency during low food intake can be ten-fold lower than at high intakes, so the cumulative error in estimating a population's energetic impact on an ecosystem may be wrong by a hundred-fold. The standard assumptions of this spreadsheet model can be run with no input except size and age, but all assumptions, except that energy can be created or destroyed, can be adjusted, if real measurements such as temperature or feeding rate are available.