

DEB theory report

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As a statistical engineer this course offered me the chance to discover the important application of statistics in biology.

Theory of dynamic energy budgets (DEB) link physiological processes of individual organisms, such as ingestion, assimilation, respiration, growth and reproduction, in a single framework.

It aims to identify simple quantitative rules for the organization of metabolism of individual organisms that can be understood from basic first principles. The word "dynamic" refers to the life cycle perspective of the theory, where the budget changes dynamically over time.

Cornerstones of the theory are:

- conservation of mass, energy and time,
- relationships between surface area and volume
- stoichiometric constraints on production
- organisational uncoupling of metabolic modules
- strong and weak homeostasis
- substrate(s) from the environment is/are first converted to reserve(s) before being used for further metabolism

They are essential to understand evolution of metabolic organisation since the origin of life.

Dynamic energy budget (DEB) theory describe how an organism acquires and uses energy and essential elements for physiological processes, in addition to how physiological performance is influenced by environmental variables such as food density and temperature

According to DEB theory, Reserves are synthesized from environmental substrates (food) for use by the metabolism for the purpose of somatic maintenance, growth (increase of structural mass), maturity maintenance (installation of regulation systems, preparation for reproduction, maintenance of defense systems), maturation (increase of the state of maturity) and reproduction. This organizational position of reserve creates a rather constant internal chemical environment, with only an indirect coupling with the extra-organismal environment.

DEB theory seeks to:

- Find the simplest organisation principles for metabolism on which all life is based
- Understand observations on actual performance of life as variations on this common theme.