DEBkiss

The quest for the simplest energy-budget model

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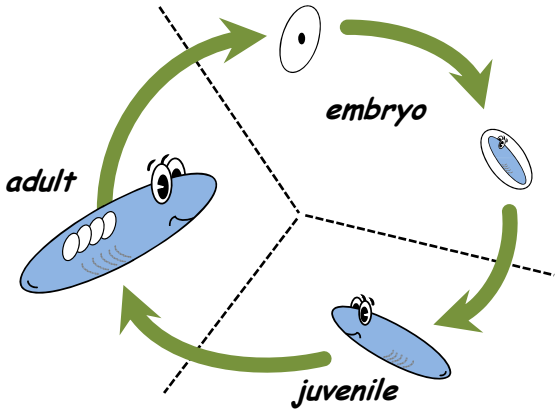
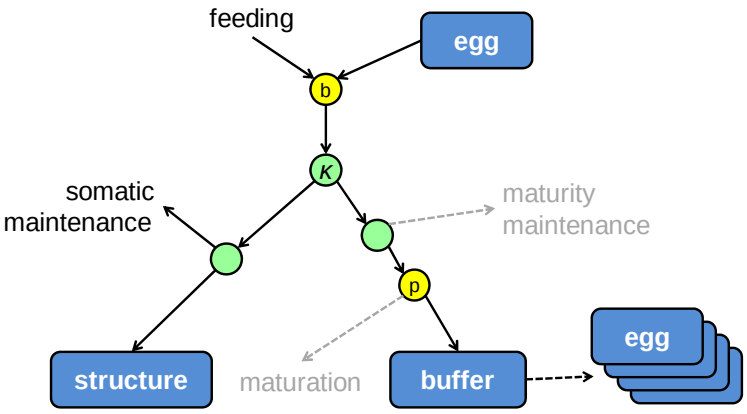
Why do we need simplicity?

DEB theory offers a powerful, formalised, framework for building energy-budget models. However, the standard animal model is often considered too complex for practical applications (e.g., in ecotoxicology and population biology).

What should the model do?

- Growth and reproduction over entire life cycle (incl. embryo), as function of food availability.
- Explicit mass balance, direct access to metabolic processes.
- Simple enough for teaching and easy implementation into software.
- Parameters must be identifiable from common observations only.
- Applicable to small (invertebrate) animals.





Differences DEBkiss and standard DEB

Removing maturity

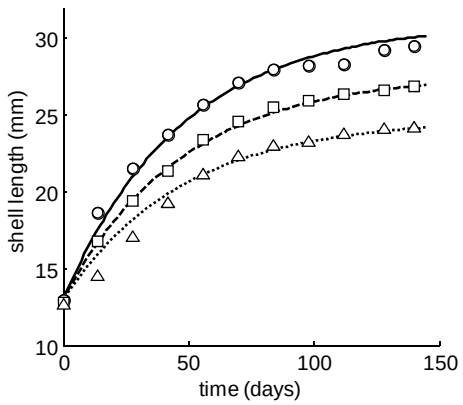
As in many simplified DEB models, we assume a constant body size at puberty (start of investment in eggs). This removes maturity as a state variable, but we can still include maturity maintenance.

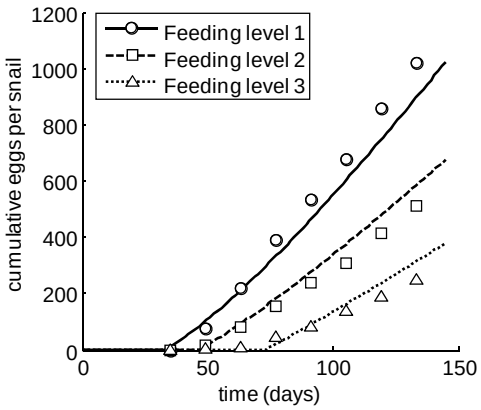
Removing reserve

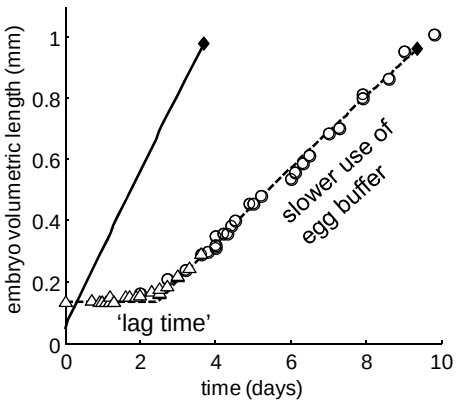
In small animals, the reserve compartment tends to be small, and we remove it completely. Growth and reproduction patterns in small animals do not generally indicate a need for reserve.

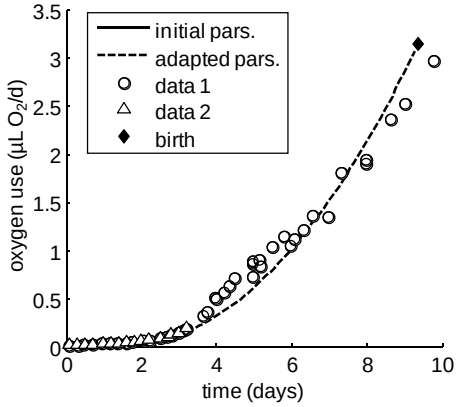
Different embryonic assumptions

Without reserve, embryonic development is sustained by a buffer of assimilates in the egg. The embryo hatches when this buffer runs out. Egg weight is a primary model parameter.









Further reading

www.debtox.info/debkiss.php

Jager T, BT Martin, EI Zimmer (2013). J Theor Biol 328:9–18