DEB 2025

Welcome & Tele-course summary

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MARETEC
CENTRO DE CIÊNCIA E TECNOLOGIA DO AMBIENTE E DO MAR
TÉCNICO LISBOA

LARSyS
Laboratory of Robotics and Engineering Systems

School: 26 May - 3 Jun 2025

University of Crete, Heraklion, Greece

deb2025.sciencesconf.org

Outline

- Orientation, Structure of the practical course, Objectives
- Summary of the tele-course

Orientation
Structure of the practical course
Objectives

Useful resources

- Amp Database
- DEB Manuals (Book, comments of the book)
- Code repositories (GitHub)
- Frequent updates (Packages, documentation, pages)
- Short videos
- Teaching team and DEB experts

Ask questions!

- “There are no stupid questions, only stupid answers”
- We welcome all questions. With a well formulated question one is 99% on the way to a solution
- We all come with a broad spectrum of experience. Cross-disciplinary communication can sometimes be challenging.

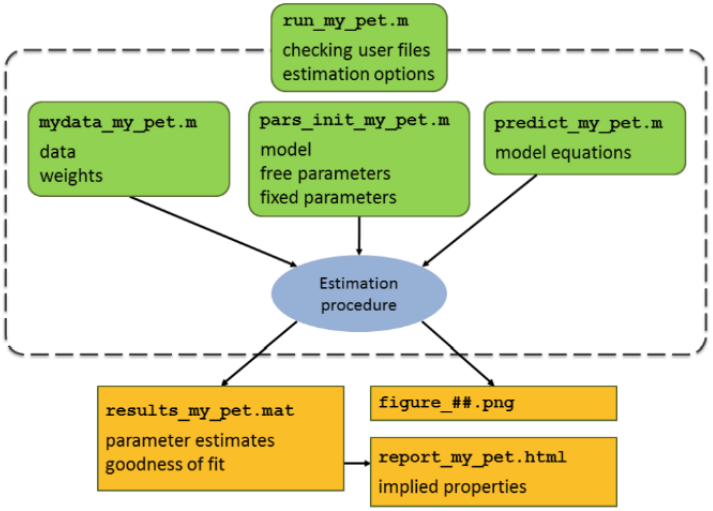
Learning Objectives

- Formulate a research question
- Learn the core DEB concepts and associated alternative concepts
- Acquire the skills necessary to estimate DEB parameters using real-world data
- Critically evaluate and discuss the biological realism of DEB parameters
- Apply DEB (parameter estimation) techniques to support and enhance one's own research projects
- Demonstrate the capacity to apply DEB theory to address contemporary issues in conservation, environmental impacts, and resource management

Content of the practical school

- "AmP workshop" - estimate parameters for your species (14 h)
- "DEB in practice" - guided exercises on applications (11 h)
- Lectures (19 h + 1 h)
- "Group discussions" - present your discussion topic (6 h)
- "Plenary discussions" (2 h)
- "Pet presentations" (3 h)

AmP workshop (14 h)



Lectures (19h + 1h)

Multivariate DEB models

https://www.youtube.com/watch?v=w0aAoVj_diU

Group discussion (6 h)

- Discuss personal research questions
  - Group input and feedback
- Unstructured discussion on general topic
  - Topic 1: From formulae to theories – May 26, 27, 28
  - Topic 2: Good modelling practices – May 30, 31, Jun 02

Plenary discussion (2 h)

- Report to everyone the points discussed on general topics
- Moderation of debate around the topics
- Shuffle groups between topics
- May 28 & May 31

DEB in practice - guided exercises on applications (11 h)

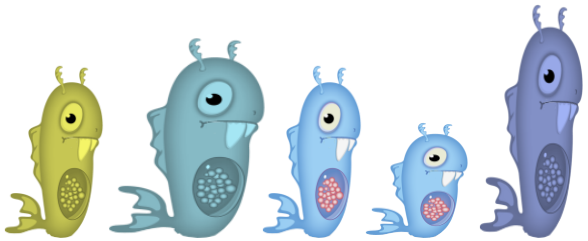
Data

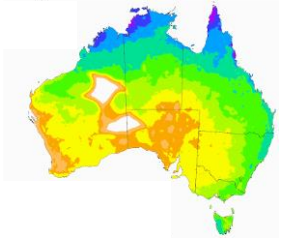
DEB parameters

Life-history

Biophysical modelling

Ecotoxicology





Tele-course Summary

DEB book outline

Chap 1	Chap 2	Chap 3	Chap 4
Individuals Homeostasis Temperature			
	Std DEB model		
		Body size & composition Compounds Macrochemical reactions Synthesising Units (Isotopes)…	
			Uni-variate DEB models Changing shapes Products…

Cornerstones of DEB theory

What are the key concepts (Cornerstones) behind DEB theory?

- **C**
- **H**
- **R**
- **K**

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- **Ho**
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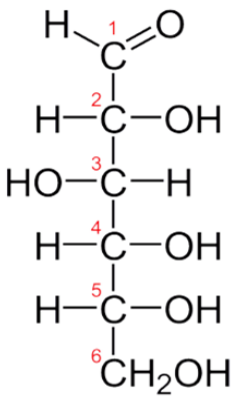
CHORK®
chopsticks & fork

C
H
R
K

Conservation

- Exploiting conservation of mass and energy
- Energy conservation is straightforward
- Mass conservation is not because elements are trapped in molecules and body composition is not homogenous
- C-moles concept



$C_6H_{12}O_6 \longrightarrow$ 6 C-moles of CH_2O

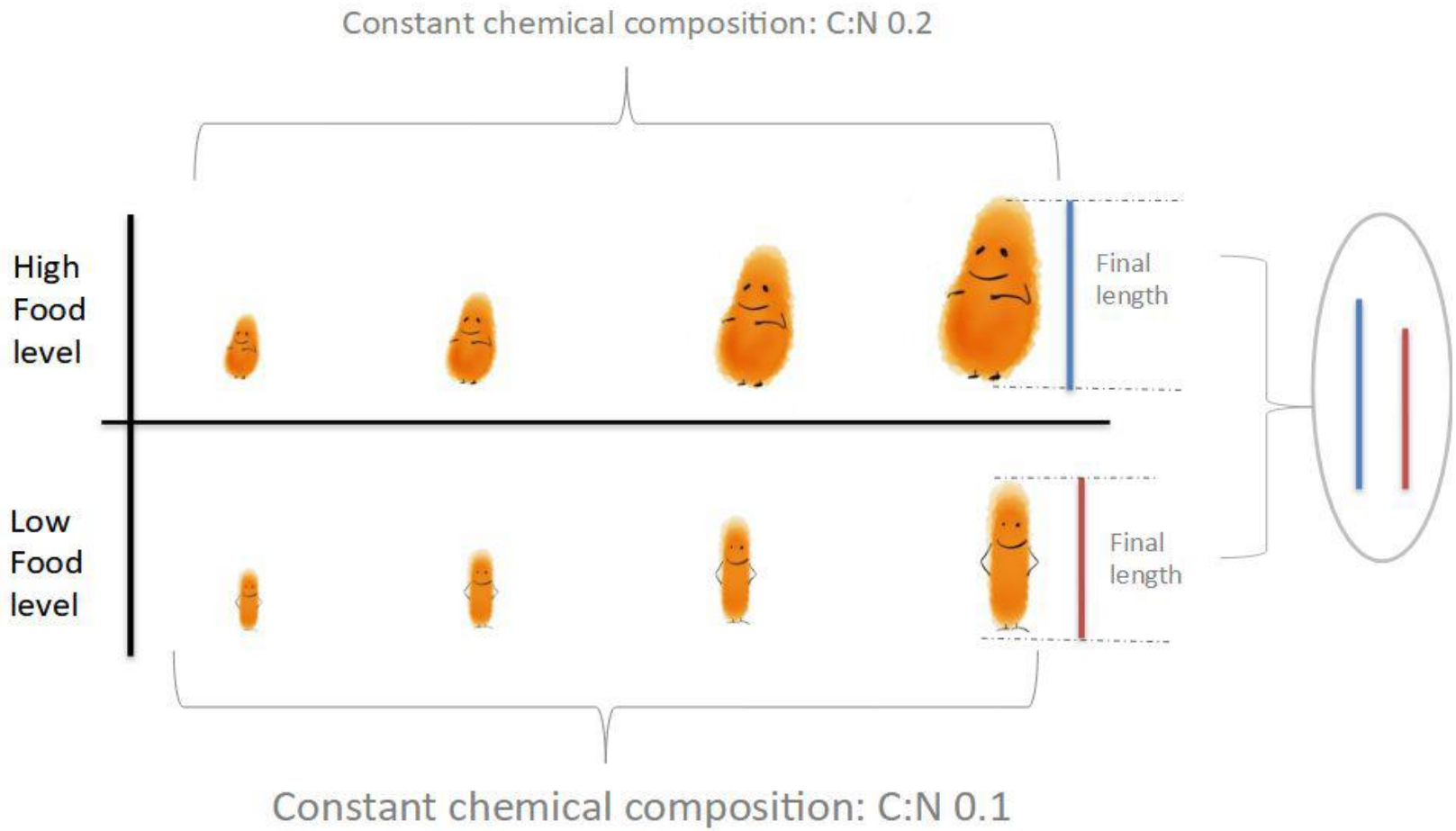
C
H
R
K

Homeostasis

- Strong or Pool
  - Constant composition of pools (reserves, structures)
  - Generalized compounds
  - Stoichiometric constraints on synthesis

C
H
R
K

Homeostasis



C
H
R
K

Homeostasis

- Strong or Pool
  - Constant composition of pools (reserves, structures)
  - Generalized compounds
  - Stoichiometric constraints on synthesis
- Weak or Constant Food
  - Constant composition of biomass during growth at constant food
  - Essential to reserve dynamics

C
H
R
K

Homeostasis

- Strong or Pool
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- Weak or Constant Food
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  - Essential to reserve dynamics
- Structural
  - Constant relative proportions during growth
  - Isomorphy

Standard DEB model

Cornerstones of DEB theory

What are the key concepts (Cornerstones) behind DEB theory?

- **C**onservation
- **H**omeostasis
- **R**eserve
- **K**appa

Other concepts

- Notation
- Basic transformations
- Demand / Supply
- Intensive / Extensive
- Life cycles

Life-cycles: creating maps

- Why are DEB defined life-stages different from terminology used by specialists?
- How to model a complex life-cycle?
  - When does feeding starts?
  - When is puberty reached?
  - Is there a metamorphosis?
- Complex life-cycles as variations of the standard DEB model “std”

Life-cycles: creating maps

	event		life stage
0	start of development	**0b**	embryo (non-feeding)
b	birth (start feeding)	**bj**	larva (juvenile)
x	weaning/fledging	**bx**	baby (mammals), nestling (birds)
j	end of acceleration	**jp**	juvenile (post larval)
p	puberty	**pi**	adult
e	emergence (insects)	**je**	pupa (holometabolic insects)
i	death	**ei**	imago (egg-laying stage of insects)

Thank you

Questions ?