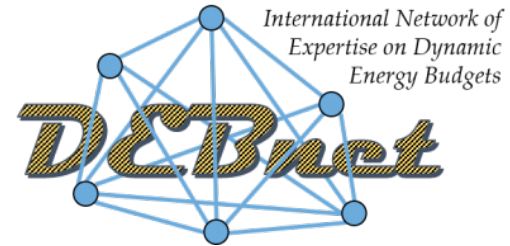# DEB2019
1-12 April 2019 / Brest (France)

Sixth International Symposium and Thematic School
on DEB theory for metabolic organization

Workshop 3:
Environmental stressors, ecotoxicology and DEB theory

Laure Pecquerie – LEMAR, IRD
Brest, France

DEB2019, Brest, April 9th 2019

Context

- Brest DEB node
  12 permanent researchers

International Network of
Expertise on Dynamic
Energy Budgets

DEBnet

Main Page

Welcome to DEBwiki, the wiki for all things DEB 🔗

DEB theory

The Dynamic Energy Budget (DEB) theory unifies the commonalities between organisms as prescribed by the implications of energetics, which links different levels of biological organisation (cells, organisms and populations). The theory presents simple mechanistic rules that describe the uptake and use of energy and nutrients (substrates, food, light) and the consequences for physiological organisation throughout an organism's life cycle, including the relationships of energetics with aging and effects of toxicants. All living organisms are covered in a single quantitative framework, the predictions of which are tested against a wide variety of experimental results at the various levels of biological organisation. The theory explains many general observations, such as the body size scaling relationships of certain physiological traits, and provides a theoretical underpinning to the widely used method of indirect calorimetry. Learn more.

Upcoming events and courses

If you consider a possible participation in an up-coming DEB course, which is not open yet for registration, for yourself or persons working with you, we suggest that you complete the form for expressing your interest 🔗 without any obligations; you will receive an email when the registration opens. We will announce the events also on Facebook and Twitter 🔗.

Event	Location	Dates	
DEB2019: Tele-course 🔗	Online	2019/Jan 24-Feb 28	10ᵗʰ edition of the DEB tele-course: general theoretical part. Focus is in chapters 1-4 of the DEB-book 🔗, which deal with the principles of the theory and (the simplest) univariate DEB models.
DEB2019 🔗: Practical course, Workshop & Symposium	Brest, France	2019/Apr: 1-6 & 8-9 & 10-12	DEB School practical course 🔗 (a continuation of the tele-course, including practical exercises). The course is followed by 2-day DEB workshops 🔗, and the 6ᵗʰ international symposium 🔗. Application for the school and abstract submission are open (deadline October 20th). Previous editions.

See here for all events

DEBnet

DEBnet is a network of DEB experts in a wide range of fields: Aquaculture, Mathematics, Ecotoxicology, Economics, Ecology ...

Other

Internet is a big place, and we are exploring it. Other on-line places to find DEB: Zotero DEB library 🔗, AmP on ResearchGate 🔗, AmP on Facebook 🔗, AmP on Twitter 🔗.

Subscribe to the DEB mailing list here: deblist@univ-brest.fr (allows you to receive and send scientific information and job offers within the DEB community)

Add-my-pet 🔗

Add-my-pet 🔗 is akin to an online library, but with added features. It contains referenced data, implied properties of species, and DEB parameter estimates and code for obtaining them.

Most useful links:

- The wiki style estimation procedure manual. For getting acquainted with the terminology in the collection, data types, parameter estimation, description of model types etc.
- Add-my-pet portal 🔗. Navigate through the pages of the collection, look at plotted energy budgets and parameter patterns. Learn more about the aims, research, and applications. Meet the people involved, find (or add) your name to the contributors list.
- AmPtool description 🔗. This page describes how to use AmPtool 🔗 for analysis of data. AmPtool contains Matlab functions for analysis of patterns in (functions of) parameter values of the Add-my-pet collection. It is an extension of DEBtool_M 🔗 and makes frequent use of it.
- AmPeco extension 🔗. Listed here you can find coding that is used in the AmP collection to specify climate, ecozone, habitat, embryo environment, migration/torpor, food, gender, and reproduction for each AmP entry. Codes can be used for linking ecological properties to DEB parameters. Scripts are still under development.

DEBtool 🔗
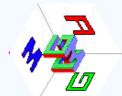
DEBtool is a software package that can be used to illustrate some implications of the Dynamic Energy Budget theory and to apply this theory in the analysis of eco-physiological data. Download the latest version from GitHub. 🔗 Browse DEBtool Manual 🔗.

DEBlab 🔗

For supporting material for the DEB book, access to software package DEBtool and data libraries go to the DEBlab 🔗

DEB Lab

DEBnet

DEBnet is an international DEB network comprising experts in a wide range of fields (aquaculture, ecotoxicology, mathematics, economics, ecology and more). The DEBnodes comprising this network are:

European DEB nodes

- **Belgium**, Ghent, Laboratory of Environmental Toxicology and Aquatic Ecology 🔗 - Keywords: Ecotoxicology, ERA, Population models, IBM. Contact: Josef Koch.
- **Belgium**, Brussels 🔗 - DEB with Antarctic marine species - Contact: Charlène Guillemot
- **Croatia**, Ruder Boskovic Institute 🔗 - Keywords: ecological applications of DEB theory, reptiles (sea turtles), aquaculture, phytoplankton (planned); contact Dr Tin Klanjscek 🔗, Dr Nina Marn 🔗
- **France**, Brest 🔗 - Contact: Dr Laure Pecquerie
- **France**, Lyon, Predictive Modelling and Ecotoxicology Group, University of Lyon 🔗 - Keywords: Bayesian parameter estimation; ecotoxicology; data analysis - Contact: Dr Sandrine Charles.
- **France**, Marseille 🔗 - Contact: Pr Jean-Christophe Poggiale
- **Germany**, Aachen, gaiac 🔗 - Keywords: Ecotoxicology, Ecology, Add-my-Pet, IBM, Population models, Community models, GUTS, ERA, aquatic macroinvertebrates - Contact: Kim Rakel.
- **Germany**, Rossdorf, Ibacon, 🔗 - Keywords: Development, Application, Documentation and Evaluation of ecological and mechanistic effect models - Contact: Benoit Goussen.
- **Greece**, Crete, University of Heraklion 🔗 - Keywords: Aquaculture, fisheries, mixotrophy - Contact: Pr Konstadia Lika
- **Italy**, Palermo, Laboratory of Ecology 🔗 - Keywords: energy, ecosystem, biodiversity - Contact: Dr Gianluca Sara.
- **Portugal**, Lisbon 🔗
- **the Netherlands**, Amsterdam, DEBlab 🔗 - Contact person: Pr Sebastiaan ALM Kooijman
- **the Netherlands**, Texel, NIOZ 🔗 - Contact: Pr Jaap van der Meer
- **the Netherlands**, De Bilt, DEBtox Research 🔗 - Keywords: ecotoxicology, GUTS, DEBtox, DEBkiss - Contact: Dr Tjalling Jager
- **Norway**, Tromsø, Arctic DEBnode Akvaplan-niva 🔗 - Keywords: Add-my-Pet, eco -toxicology & -physiology, environmental quality management - Contact: Dr Starrlight Augustine

Australian DEB nodes

- **Australia**, Melbourne 🔗 - Contact: Pr Michael Ray Kearney

USA DEB nodes

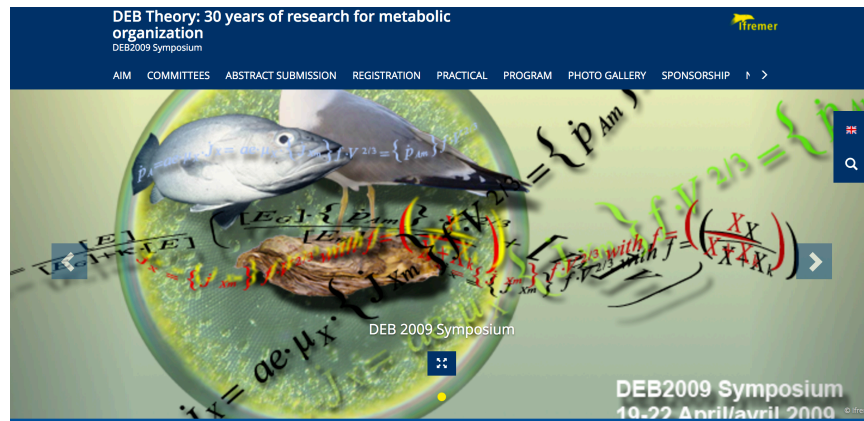- **USA**, Santa Barbara 🔗 - Contact: Pr Roger Nisbet

Context

- Brest DEB node
  12 permanent researchers

- Laboratory of
  environmental marine sciences

- 2009: First DEB practical course and first DEB Symposium

https://wwz.ifremer.fr/deb2009/Photo-gallery/

MEMS Workshop (Sept. 2016)

An example of the contributions of the DEB modeling approach in the interpretation of a bivalve experiment

Rossana Sussarellu[a,1], Marc Suquet[a], Yoann Thomas[a], Christophe Lambert[a], Caroline Fabioux[a], Marie Eve Julie Pernet[a], Nelly Le Goïc[a], Virgile Quillien[a], Christian Mingant[a], Yanouk Epelboin[a], Charlotte Corporeau[a], Julien Guyomarch[b], Johan Robbens[c], Ika Paul-Pont[a], Philippe Soudant[a], and Arnaud Huvet[a,2]

[a]Laboratoire des Sciences de l'Environnement Marin, UMR 6539 UBO-CNRS-Institute Français de Recherche pour l'Exploitation de la Mer-Institute de Recherche pour le Développement, 29280 Plouzané, France; [b]Centre de Documentation de Recherche d'Expérimentations, 29218 Brest, France; and [c]Instituut poor Landbouw en Visserijonderzoek, 8400 Ostend, Belgium

- DEB modeling suggested shift of energy allocation towards organism maintenance (elevated maintenance costs) and structural growth at the expense of reproduction. Endocrine disruptor-like effects suggested by DEB outputs explaining the main effect observed on gamete quality (in agreement by perturbations in transcriptomic profiles)

- *Significant impacts on offspring were observed BUT absence of energetic data on oocytes did not allowed DEB modeling on oyster larval development avoiding testing if energetic status of oocytes were at the origin of the 20% reduction of growth larvae issues from exposed progenitors compared to control*

Combining Modelling and Experimental approaches for marine organisms under stress

1/ Design of experiments jointly experimentalists and modellers

-Testing hypotheses

-Defining the best experimental procedures

-Defining the best sampling times

-Defining the best measurements/proxies
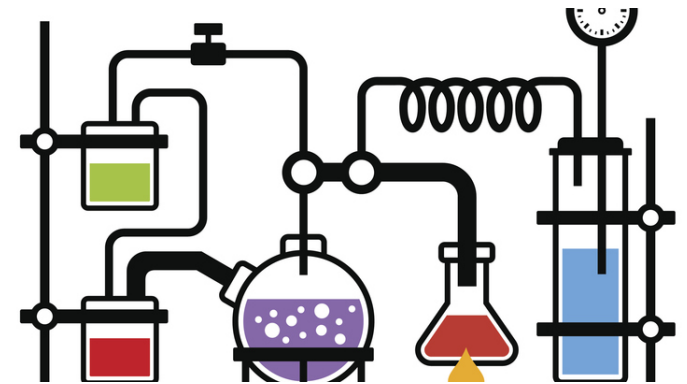
(*e.g.* anticipate samples and energy measurements in oocytes would permit to test if energetic status of oocytes were at the origin of the 20% reduction of growth larvae issues from progenitors exposed to microplastics compared to controls)

Combining Modelling and Experimental approaches for marine organisms under stress

1/ Design of experiments jointly experimentalists and modellers

2/ Integration of biochemical and molecular data (Scale transfer)
How? Quantitative or qualitative information?
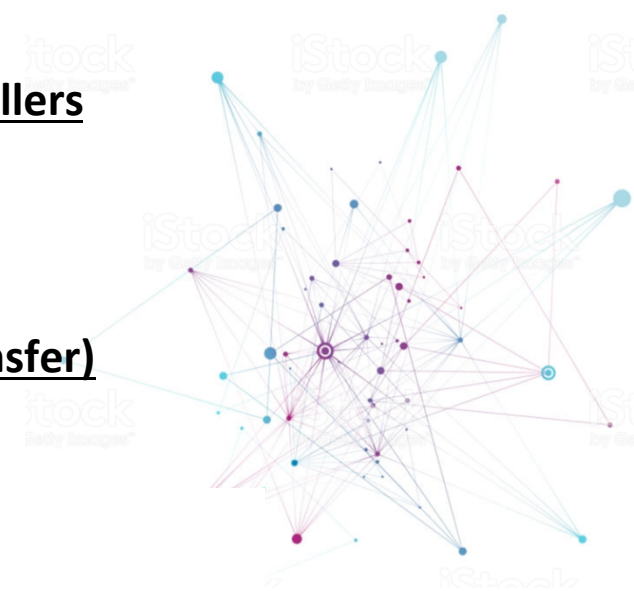
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Description	Participants	Summaries	Products

NIMBioS Working Group
Modeling Molecules-to-Organisms

Topic: Dynamic models to link molecular perturbations to individual impacts for ecological risk assessment of chemicals

Meeting dates: Nov. 16–20, 2015; Apr. 18–21, 2016; Nov. 29-Dec. 2, 2016; Sep 12-15, 2017

Organizers:
Cheryl A. Murphy, Fisheries and Wildlife, Lyman Briggs College, Michigan State Univ.
Roger Nisbet, Ecology, Evolution, and Marine Biology, Univ. of California at Santa Barbara

Combining Modelling and Experimental approaches for marine organisms under stress

1/ Design of experiments jointly experimentalists and modellers

2/ Integration of biochemical and molecular data (Scale transfer)

3/ DEB modeling of the complete life cycle that include transgenerational impacts of stressors (acidification, microplastics…) permitting future scenarios to support decision makers

Workshop objectives

- From a **modelling** point of view:

  – Learn **how to include the effects of** (chemical, physical, biological) **stressors** into a DEB model

  – Get **hands-on experience** with two software packages that include different Physiological Modes of Action and their effects at the population level: **DEBecotox with R** (still under development), **DEB-IBM with Netlogo**

- From an **experimental** point of view:

  – **Past experiments**: Discuss **if and how** my data could be used within a DEB framework?

  – **Future experiments**: Discuss how new protocols could include a modelling task early on in the project (rather than at the end)

Morning program

- Gonçalo Marques (IST, Portugal): **Introduction to DEB theory in ecotoxicology** (assumptions, processes, state variables and parameters)

- Jonathan Flye-Sainte-Marie (UBO, France): Impacts of **environmental stressors** on organisms**: Combining an experimental and a modelling approach**

- Tin Klanjscek (IRB, Croatia and UCSB, USA): **Don't let theory ruin perfectly good data**

- **General discussion** – Moderator: Starrlight Augustine (Akvaplan-niva, Norway)

Afternoon program

- Group 1 (Group 2 will do the other way around)

- Gonçalo Marques (IST, Portugal): Exploring the impacts on *individuals* of several physiological modes of action of toxicants *using R* → **Amphitheater**

- (Me presenting an exercise from) Roger Nisbet (UCSB, USA): Exploring the impacts on **populations** of several physiological modes of action of toxicants *using Netlogo* → **TD Iroise**