

# Dynamic Energy Budget (DEB) course 2017

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## The DEB model as a tool to predict the effects of Multiple Stressors on marine environments

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DEB Essay 08/05/2017

My current research is about the effects of multiple stressors such as microplastics, oil, acidification, hypoxia and the increasing sea surface temperatures on functional and behavioural traits of marine organisms, through the application of bioenergetic predictive models (DEB models). Other interests of mine are the spread of alien species in the Mediterranean sea and the sustainability of modern aquaculture. During my PhD thesis I am currently collecting a lot of experimental data (respiration rates, thermal tolerances and functional responses) of different intertidal and subtidal species.

In particular I started collecting data on the intertidal predator crab *Eriphia verrucosa* (Forsk., 1775) by studying its feeding behaviour and its metabolic response to temperature. I am also exploring the role of a foundation species (*Chromis chromis*, Linnaeus 1758) in providing *Ecosystem Services* through the potential fertilization of habitats and the trophic by-pass of energy and matter from pelagic to benthic habitats with benefits to several species. Although the species was already present in the add-my-pet collection I calculated the specific Arrhenius temperature for the juveniles, and soon I'm going to verify the correspondence with the  $T_A$  of the adults. I collected also feeding-related ( $H_{max}$  and  $X_k$ ) and biometric (shape coefficient) parameters to complete the routine. I am also starting, thanks to my tutor Prof. G. Sarà from the University of Palermo, to parametrize the purple sea urchin *Paracentrotus lividus* (Lamarck, 1816), since no standard DEB model is available for this species yet.

Even if I had already studied on my own DEB Theory, the four weeks of the tele-course gave me the opportunity to better understand the basic theory and principles and to study mathematics and energetic concepts. The Skype sessions with my working group were useful to highlight the studied basic concepts and to explain some doubts. It has been a very interesting experience to discuss with other colleagues working on completely different organism. The predictive ability and the possibility to follow the mechanisms of energy utilisation and ecological responses at individual level of this model really fascinated me, but most of all the possibility to study future effects of multiple stressor on different species. Within the model energy assumes a central role associated with maintenance, growth and reproduction, with a strong dependence of metabolism from environmental conditions (temperature, food). The DEB model fully satisfy the need to link the energy individual flux to the energy derived from food in most marine invertebrates, but also in fishes.

Although the estimation of DEB parameter is complicated, developing a working DEB model for *E. verrucosa*, *P. lividus* and completing the existing routine of *C. chromis* is a stimulating challenge, since several measurement of functional traits are needed. This course gave me many new ideas on how to plan my work and helped me realise how much can be done, and the interesting results I can get in the future thanks to DEB models.