Preparing a special issue in *Journal of Sea Research* in relation to the AquaDEB project, phase II

1. Provisional list of publications –deadline for final submission: 29 Oct. 2010

This 3rd special issue of JSR (after the DEBIB volume 56 (2) and the AquaDEB volume 62 (1-2)) will be published in fall 2011; it aims at gathering main results of the AquaDEB project (phase II; ending up in Dec. 2010) and also from other contributors who would like to point out results on DEB applications and/or recent developments.

N°	Content of the ms (keywords)	Author(s)	(Provisory) Title
1	Introduction of the special issue	Marianne Alunno-Bruscia, Henk van der Veer, Bas Kooijman	The AquaDEB project (phase II): what we've learned from applying the DEB theory on aquatic organisms
2	Bivalve, *Crassostrea gigas*, DEB theory, site comparison, phytoplankton abundances	Yves Bourlès, Danièle Maurer, Olivier Le Moine, Philippe Geairon, Joseph Mazurié, Aline Gangnery, Marianne Alunno-Bruscia, Stéphane Pouvreau, Philippe Goulletquer	Modelling *Crassostrea gigas* growth in different contrasted ecosystems by using Dynamic Energy Budget theory
3	Bivalve, *Crassostrea gigas*, reproduction	Ismaël Bernard, Goulwen de Kermoysan, Stéphane Pouvreau	Effect of environment on the reproduction of *Crassostrea gigas*: investigation through DEB theory
4	Bivalve, *Crassostrea gigas*, isotopes, soft tissues	Antoine Emmery, Marianne Alunno-Bruscia, Bas Kooijman, Sébastien Lefebvre	Describing the dynamics of 13C and 15N in soft tissues of the oyster (*Crassostrea gigas*) in the context of Dynamic Energy Budget theory
5	Bivalve, *Pecten maximus*, phytoplankton proxy	Antoine Emmery, Jonathan Flye Sainte Marie, Frédéric Jean, Eric Rannou, Laurent Chauvaud, Stéphane Pouvreau, Yves-Marie Paulet	How does phytoplankton control *Pecten maximus* energetics?
6	Bivalve, *Pinctada margaretifera*, adults, French Polynesia	Jonathan Fournier, Claude Soyez, Gilles Le Moullac, Stéphane Pouvreau	Application of a DEB model to growth and reproduction of a tropical bivalve, the black pearl oyster (*Pinctada margaritifera)*
7	Bivalve, *Pinctada margaretifera*, larvae, French Polynesia	Yoann Thomas, Pierre Garen, Stéphane Pouvreau	Application of a bio-energetic growth model to larvae of the pearl oyster (*Pinctada margaritifera* L.)
8	Bivalve, *Mytilus edulis,* DEB-growth model, satellite data	Yoann Thomas, Joseph Mazurié, Stéphane Pouvreau, Cédric Bacher, M.	Modelling the growth of *Mytilus edulis* (L.) by coupling a dynamic energy budget model with

		Alunno-Bruscia, Francis Gohin, Patrick Le Mao	satellite-derived environmental data
9	Bivalve, *Mytilus edulis*,	Sofia Saraiva, Tânia Sousa, Marianne Alunno-Bruscia, Stéphane Pouvreau, Jaap van dee Meer, Bas Kooijman	From individuals to ecology in mussel energetics
10	Bivalve, *Mytilus edulis*, site comparison, chlorophyll a, phytoplankton abundances	Marianne Alunno-Bruscia, Rune Rosland, Øivind Strand, Lars Naustvoll, Cédric Bacher, Peter Cranford, Jon Grant, Aad C. Smaal	Multi-site comparison of the growth of cultured blue mussels (*Mytilus edulis*) by using Dynamic Energy Budget theory
11	Bivalve, *Mytilus edulis*, food proxies	Aleksander Handa, Morten O. Alver, Christian Vik Edvardsen, Stein Halstensen, Anders Olsen, Gunvor Øie, Kjell Inge Reitan, Yngvar Olsen, Helge Reinertsen	Growth of mussels (*M. edulis*) in a Norwegian coastal area; comparison of food proxies by DEB modeling
12	Bivalves, *Crassostrea gigas*, *Mytilus galloprovincialis*, Castellammare	Gianluca Sara et al.	Using DEB to assess the effectiveness of integrated multi-trophic aquaculture in the Mediterranean Sea: evidence from *Crassostrea gigas* and *Mytilus galloprovincialis* models
13	Gastropoda, *Hydrobia ulvae*, assimilation rate, maintenance costs, computer model	Natan Hoefnagel, Irene Martins	A Dynamic Energy Budget model of *Hydrobia ulvae*: parameter estimation and model development
14	Crustacean, *Carcinus maenas*,	Jaap van der Meer, Rene Koper, Natan Hoefnagal	A dynamic energy budget model for the shore crab
15	Fish, *Dicentrarchus labrax*, DEB theory, parameter estimation, bio-energetic model, aquaculture	Arnaud Campeas, Béatrice Chatain, Sandie Millot, Jeannine Person-Le Ruyet, Marie-Laure Bégout, Marianne Alunno-Bruscia	Bio-energetic modelling of growth of the European sea bass in aquaculture, based on Dynamic Energy Budget theory
16	Fish, larvae	Laure Pecquerie, Starrlight Augustine, Marko Jusup, Bas Kooijman	Understanding growth patterns of fish larvae in the context of the Dynamic Energy Budget theory
17	Fish, salmon	Laure Pecquerie, Bas Kooijman, Roger M. Nisbet	Variability of salmon life histories in the context of Dynamic Energy Budget theory
18	Flatfish, inter-specific comparison, DEB parameters	Vaniâ Freitas, Henk van der Veer	Interspecies differences in DEB parameters among flatfish species
19	Fish, DEB-growth models	Vaniâ Freitas, Joana Campos, Henk	Growth and development of herring and sprat as

		van der Veer	revealed with the DEB approach
20	Fish, *Anguilla anguilla*,	Jaap van der Meer	The disappearance of the eel from the western Wadden Sea
21	Fish, *Thunnus thynnus*, wild populations, aquaculture	Marko Jusup, Hiroyuki Matsuda, Bas Kooijman	Applicability of Dynamic Energy Budget approach to cultivation of bluefin tuna (*Thunnus thynnus*)
22	Fish, tunas	Olivier Maury, Emmanuel Chassot, Laure Pecquerie, Francis Marsac	What the DEB theory tells us about the physiology and ecology of tropical tunas?
23		Bharath Ananthasubramaniam, Tin Klanscjek, Erik Muller, Roger Nisbet	Synchronous cell division in marine phytoplankton
24		Konstadia Lika, Vaniâ Freitas, Henk W. van der Veer, Bas Kooijman	Marine species diversity as reflected by the DEB parameters
25		Konstadia Lika, Bas Kooijman	The topology of energy allocation in dynamic energy budgets
26	Scaling relationships	Bas Kooijman	DEB-based body mass spectra for planktontic consumers
27		Marcos Mateus, Tiago Domingos, Bas Kooijman	Can we reach consensus between marine ecological models and metabolic theories in ecology? A look at primary producers
28	Matrix population models	Tin Klanjscek, Roger M. Nisbet, Hal Caswell, Michael G. Neubert.	Modeling ocean environments using matrix population models derived from a DEB model
29	DEB-tox, polychaete	Tjalling Jager, Henriette Selck	Stress responses in the marine *polychaete Capitella*
30	DEB-tox, amphipod, population models	Chris Klok, Tjalling Jager, Ingela Dallhof	Analyzing the impact of toxicants in the food chain C. volutator shorebirds using Dynamic Energy Budget- and population models
31	Bivalve, *Cerastoderma edule*	Jeroen W.M. Wijsman, Aad C. Smaal	Growth of cockles (*Cerastoderma edule*) described by a Dynamic Energy Budget model

2. Agenda

The **agenda** for **getting ready to submit ms** to JSR and Elsevier is the following:

* **27-28 April 2010** (AquaDEB meeting): we discuss the content of the different papers and their writing stage; and also a list of potential referees
*** 1 July 2010**: the submission process is opened
* **1 October 2010**: final draft of papers should be finished and readable by everybody
* **from 4 to 28 October 2010**: internal check up of papers

* **30 October 2010**: all the papers must be sent for submission to JSR
* **May 2011**: (ultimate) date for accepting papers to JSR
* **June 2011:** submission to Elsevier
* **September 2011**: publication of “hard copies”

Any submission of ms will be possible from 1 July 2010 til the 29th of October –this issue will be discussed in late April 2010 during the AquaDEB meeting. Reviewing process will start for each ms as soon as it is submitted to JSR and enters the evaluation process. When accepted, the ms will be available on line. The final paper copies will be available/printed likely in fall 2011.

****

Short provisional description (or abstract) and/or content for each contribution –when provided by the authors:

1. ALUNNO-BRUSCIA et al.

Introduction of the special issue

2. BOURLES et al.

Modelling Crassostrea gigas growth in different contrasted ecosystems by using Dynamic Energy Budget theory

Oyster farming is the main aquaculture activity in France, where Pacific oyster (*Crassostrea gigas*) is spatially cultured from the English Channel to the Mediterranean coasts. Oyster growth performance monitored along French coasts are widely heterogeneous among culture sites and over years. Many studies have been carried out to understand the effects of environmental factors on oyster growth and physiology, by using bioenergetics growth models. However, most of these studies were site-specific. As an example, the model developed by Barillé et al. (1997), which was extensively specified with more than 50 parameters, was validated in the Marennes-Oléron Bay, but cannot be successfully applied to other culture sites without re-estimating parameters or re-formulating some processes. In that context, our study aims to develop a generic growth model, i.e. a model than can be applied in various contrasted environments with a constant set of parameters. We used the DEB model designed for the Pacific oyster *C. gigas* based on the DEB theory. The resulting oyster-DEB model is built on 10 main DEB parameters with some extra parameters to consider specific bioenergetics of *C. gigas*. Only one DEB parameter, i.e. the half-saturation coefficient Xk which depends on food quality and therefore on ecosystems, was calibrated for each site in order to evaluate the generality and the limits of the model. The results of simulating oyster growth are presented herein by using the oyster-DEB model in several French ecosystems: Arcachon, Marennes-Oléron and Quiberon bays (Atlantic coastline), Thau Lagoon (Méditerranée), and the Baie du Mont-Saint-Michel and the Baie des Veys (English Channel). Applying DEB model in contrasted environments allows to explain oyster growth variability among rearing areas according to food quantity (e.g. chlorophyll a, phytoplankton abundances) and quality (phytoplankton species), as well as seawater temperature. The variability of spawning events among sites is also successfully simulated according to the spawning processes implemented in the oyster-DEB model.

3. BERNARD et al.

Effect of environment on the reproduction of Crassostrea gigas: investigation through DEB theory

Both the variation of timing and amplitude of spawning event are investigated through DEB theory for the pacific oyster *Crassostrea gigas*. Several improvements of the DEB model are made in order to better describe reproduction pattern on a wide variety of field data. Finally, a simplify rule is derived from DEB theory to calculate the end of gametogenesis and the loss of dry weight at spawning using temperature and phytoplankton count.

4. EMMERY et al. (A)

How does phytoplankton control Pecten maximus energetics?

Short description: We will present simulations of the growth of the great scallop *Pecten maximus* in its natural environment and show how phytoplankton blooms areas may impact the energetics of this bivalve. Our results will be linked to previous observations of the variability of the growth of *P. maximus* in European coastal bays.

5. EMMERY et al. (B)

Describing the dynamics of 13C and 15N in soft tissues of the oyster (Crassostrea gigas) in the context of Dynamic Energy Budget theory

The dynamics of stable isotopes, i.e. d13C and d15N, in the Pacific oyster *Crassostrea gigas* have been studied already in the context of food web to understand and prey/predator relationships. However, most of studies do not quantify both mass fluxes and fractionation phenomenon of isotopes. In our study we propose a mechanistic approach to describe the incorporation and fate of isotopes (d13C and d15N) through assimilation, growth and maintenance in oysters in the context of Dynamic Energy Budgets.

6. FOURNIER et al.

Application of a DEB model to growth and reproduction of a tropical bivalve, the black pearl oyster (Pinctada margaritifera)

Short description: The Dynamic Energy Budget (DEB) model has been adapted to describe the dynamics of growth and reproduction of the tropical black pearl oyster *Pinctada margaritifera* reared under controlled and natural conditions. The values of the model parameters were estimated from available physiological data and from published information.

7. THOMAS et al. (A)

Application of a bio-energetic growth model to larvae of the pearl oyster (Pinctada margaritifera L.)

Dynamic energy budget (DEB) theory has formed the basis for a generic model that describes energy fluxes in an organism, from energy acquisition to its uses in growth, maintenance, development and reproduction, according to two forcing variables: temperature and food concentration. We applied this model to the larval phase in the pearl oyster Pinctada margaritifera var. cumingii (Linné 1758) to evaluate the impact of spatiotemporal variation in the lagoon environment on its capacity for development. The specific parameters of the model, which represent ingestion, temperature effect and the allometric relationship between length and biovolume of the larvae, were determined from experiments or taken the literature. The modification of these parameters allowed us to identify the underlying adaptive character trait: P. margaritifera larvae have a good capacity to exploit low food concentrations and a narrow range of thermal tolerance restricted to hydrobiological conditions found in the tropical oligotrophic waters of its distribution zone. Growth simulations show a good fit with the observations made on reared larvae under different conditions, fed on either cultured algae or natural plankton, and with growth data from a natural cohort.

Finally, a first application of the model to a pearl-culture lagoon reveals the predominant effect of the vertical structure of trophic resources in determining spatial variation in larval growth.

8. THOMAS et al. (B)

Modelling the growth of Mytilus edulis (L.) by coupling a dynamic energy budget model with satellite-derived environmental data

Bivalves cultivation plays a crucial role in coastal ecosystems, not only from the direct socio-economical activity generated but also from ecological interactions between cultivated stocks and their environment. Bivalve production is usually vulnerable to environmental and natural food variability. For management purposes; it is therefore important to be able to define criteria for shellfish farming potential in order to select new sites or estimate the carrying capacity of existing ones. That requires to clarify the response of bivalves to environmental variations with a non specific approach (valid at any site, age or season) on the basis of "generic" models and proxies of environmental factors easy to measure on a temporal and spatial basis. We propose to simulate the response of mussel (Mytilus edulis) to the spatio-temporal fluctuations of its environment (i.e. trophic resource, temperature) by using a generic growth model coupled to satellite-derived chlorophyll and temperature data. Mont-Saint-Michel bay is proposed as a pilot site to develop and test this methodology.

9. SARAIVA et al.

From individuals to ecology in mussel energetics

Content: 1) estimation of DEB parameters for *Mytilus edulis*, including filtering module; 2) field observations in the harbour of NIOZ; 3) comparisons with simulations; 4) possibly: recontronstruction of food trajectories from observations on mussels.

10. ALUNNO-BRUSCIA et al.

Multi-site comparison of the growth of cultured blue mussels (Mytilus edulis) by using Dynamic Energy Budget theory

The mussel (*Mytilus edulis*) culture occurs in temperate waters around the world under a wide range of environmental conditions, *e.g.* at phytoplankton concentrations below as 1-2 $\mu g\ L^{-1}$ (in Norwegian fjords) up to 9-10 $\mu g\ L^{-1}$ (in French Atlantic coastal sites). Under such contrasted food resources, the aim of our study is to develop a generic bio-energetic model for *M. edulis*, *i.e.* than can be applied in various contrasted environments with a constant set of parameters, to simulate the mussel growth and reproduction. Such a model will allow us to assess directly the links between mussel growth performances and environmental parameters in different culture sites. We used the Dynamic Energy Budget (DEB) theory to relate mussel growth variability to environmental conditions (temperature, trophic resources) among different sites. Mussel growth was simulated in several contrasted ecosystems in France (Mont Saint Michel and Aiguillon Bays), in Norway (Flødevigen, Austevoll, Toskasundet fjords), in the Netherlands (Oosterschelde estuary) and in Canada (Tracadie Bay). One DEB parameter, *i.e.* the half-saturation coefficient *Xk* depends on food quality and therefore on ecosystems, was calibrated for each site in order to evaluate the generality and the limits of the model. Both chlorophyll *a* and phytoplankton enumeration were tested as food quantifiers to identify the most suitable one to quantify mussel growth. Applying DEB model in contrasted ecosystems allowed us to explain mussel growth variability among culture sites according to food quantity (*e.g.* chlorophyll *a*, phytoplankton abundances and size classes) and quality (phytoplankton species), as well as seawater temperature. Based on our results, we discuss the ways to improve the parametrization of the functional response of the mussel to food availability.

11. HANDA et al.

Growth of mussels (M. edulis) in a Norwegian coastal area; comparison of food proxies by DEB modeling
Seston variables and growth of the sea mussel _Mytilus edulis_ were measured in two separate field experiments during the growth season (March-October) in a Norwegian coastal area. Five seston variables were used as alternative input values in a dynamic energy budget (DEB) model to compare their suitability as proxies for predicting mussel growth: 1; suspended particulate matter (SPM). 2; particulate organic matter (POM), 3; organic content of seston (OC), 4; particulate organic carbon (POC), and 5; chlorophyll _a_ (chl _a_). Mean SPM and POM measured 5.8-10.5 mg L-1 and 1.8-6.2 mg L-1 , respectively, while mean POC and Chl_ a_ measured 210-275 µg L-1 and 1.3-3.1 µg L-1 , respectively. OC varied between 25 and 65%. Average growth in length at 2 m depth constituted 0.20% day-1 in medium size mussels (24-36 mm, field experiment 1) and 0.08% day-1 in large mussels (40-55 mm, field experiment 2). Standardized dryweight increased by 50-90% at peak levels and was neither correlated to food nor environmental variables. Growth in dry weight showed a seasonal pattern independent of growth in length, with occasionally spawnings from late April until August. The model test showed the best match in length growth when using POC as food proxy in field study 1. Observed growth rate decreased strongly at the end of the sampling period and the decrease was partly reproduced by the model when using POC. With chl _a_, SPM, POM or OC as proxy, the model showed very little corresponding decrease in growth rate. For field experiment 2, the model fit the observed growth fairly well for POM and OC, whereas SPM and chl _a_ gave the poorest fit.

12. SARA et al.
Using DEB to assess the effectiveness of integrated multi-trophic aquaculture in the Mediterranean Sea: evidence from* Crassostrea gigas *and* Mytilus galloprovincialis *models

13. HOEFNAGEL & MARTINS
A Dynamic Energy Budget model of Hydrobia ulvae: parameter estimation and model development
Energy allocation of organisms to maintenance, growth and reproduction can be described using the Dynamic Energy Budget (DEB) model. This model relates costs for process rates to two state variables that describe the organism: Structural body volume and Reserves. The environment is described in terms of food availability and temperature. The present study focuses on energy ingestion and assimilation in Laver spire shell (*Hydrobia ulvae*) and allocation to maintenance and growth. Furthermore estimates of the two state variables for the organism were made. Three experiments were conducted for this purpose. It was found that consumption of adult snails (>3 mm TSL) follows Consumption = 0.0316 * L2 + 3.0231 (r2 = 0.66) and that *H. ulvae* spends approximately 0.78 J per day on maintenance when length is 5 mm. An energy budget model is presented for the mudsnail that describes energy allocation in the snail throughout its life.

14. VAN DER MEER et al.
A dynamic energy budget model for the shore crab
The second is on the shorecrab Carcinus maenas. Recently, two students of me, worked on the physiological ecology of the shore crab, and estimated food intake (functional response parameters) in relation to size and satiation, digestion rate, mass loss during starvation and growth rate in relation to size and food intake. These data, and additional data from the literature (Klein-Breteler) and the grey literature (Afman), must enable a more thorough estimation of DEB parameters than have been obtained so far.

15. CAMPEAS et al.

Bio-energetic modelling of growth of the European sea bass in aquaculture, based on Dynamic Energy Budget theory

The optimization of *Dicentrarchus labrax* aquaculture involves various criteria including selecting traits of commercial interest for e.g. growth, fish welfare or waste management, which would benefit from a better understanding of the fish energetic budget. In this context, we applied the Dynamic Energy Budget (DEB) theory to sea bass and estimated a set of DEB parameters for this species by using 5 different data sets of on growing sea bass in very different rearing conditions (indoor and outdoor, different temperatures, feeding conditions and initial size) to calibrate the model. We developed a methodological approach to calibrate the parameters using the Least Square Error minimization, with a focus on parameter variation with the proper methodology. We used two strategies to calibrate the model: in the "single calibration" strategy, the model was calibrated on one data set at a time (which produced the most fitted simulation) while in the "joint calibration" approach, the calibration was performed on all data together (which produced the most robust set of parameters). The quality of the adjustment is discussed and we compared our results compared to others to underline that the DEB parameters of various species of fish are all within a close range.

16. PECQUERIE et al. (A)

Understanding growth patterns of fish larvae in the context of the Dynamic Energy Budget theory

We aim to test some assumptions for the growth of fish larvae that are in agreement with embryonic and juvenile growth in a DEB context. The objective is to obtain continuity between stages without introducing a lot of details for larval growth, i.e. limiting the number of new parameters. We apply the theory to anchovy, salmon, tuna and zebrafish data. We will test the following assumptions: V1 morphy, food-size limitation, and learning (i.e. vision development or behaviour).

17. PECQUERIE et al. (B)

Variability of salmon life histories in the context of Dynamic Energy Budget theory

Salmon species undergo major life-history events of migration from freshwater to the sea and returning from seawater to freshwater. And individuals vary in age, size and condition at the timing of migration. Here, we address the following question: Can we capture this variability of life histories in Pacific salmon within the DEB framework with a short set of simple rules for developmental decisions that depends on the time of the season and the maturity state?

18. FREITAS & VAN DER VEER

Interspecies differences in DEB parameters among flatfish species

Content: a paper dealing with difference in DEB parameters between North Atlantic flatfish species

19. FREITAS et al.

Growth and development of herring and sprat as revealed with the DEB approach

Content: a paper dealing with DEB and pelagic species including larval stages (herring, sprat)

20. VAN DER MEER

The disappearance of the eel from the western Wadden Sea

Short description: this ms concerns the eel *Anguilla anguilla* and is based on (1) data at the individual level from the literature; (2) data on changes in abundance and size-structure of the eel in the western Wadden Sea, from 1960 to the present day. By combining these data I will estimate DEB parameters, arrive at a growth model and use this growth model in combination with the size-structured data to arrive at the changes over time in recruitment and survival. For this, I have to make assumptions on food conditions, unless the size-structured data allow cohorts to be recognized. I have to do more work to see whether that is possible.

21. JUSUP et al.

Applicability of Dynamic Energy Budget approach to cultivation of bluefin tuna (Thunnus thynnus)

Short description: Using literature data on bluefin tuna (Thunnus thynnus), we calibrated a Dynamic Energy Budget model primarily to be used in aquaculture setting. The model shows good agreement with the available data on wild fish. The next step is to validate the model and assess the predictive capability in relation with the fattening process in the Mediterranean sea. Results may affirm the DEB approach as valuable tool for prediction of growth of cultured bluefin tuna.

22. MAURY et al.

What the DEB theory tells us about the physiology and ecology of tropical tunas?

Parameters of the DEB model are estimated for yellowfin, bigeye and skipjack tunas using a new statistical methodology applied to tag-recapture data and auxiliary information. The model allows to derive important features of growth and maturity of those different species. Assumptions regarding the ecology of those species and their potential trophic interactions are tested quantitatively.

23. ANANTHASUBRAMANIAM et al.

Synchronous cell division in marine phytoplankton

Many marine phytoplankton species complete their cell cycle just before or after dawn. Cell division in these species is a highly synchronous phenomenon driven by periodic environmental forcing, such as the diurnal changes in light and nitrogen availability. At least in part, we expect current DEB theory to be able to explain this synchrony, as a periodic energy and nutrient supply will lead to a periodic pattern in the growth rate of individual cells and in the investment of energy in maturation. Moreover, in DEB theory, the process of cell division initiates when a certain amount of energy has been invested in maturation. This "integrate and fire" mechanism has the potential to induce synchronicity in cell division. We will investigate to what extent current DEB rules are sufficient to describe synchronous patterns in cell division and, if necessary, develop new theory to account for these patterns.

24. LIKA et al.

Marine species diversity as reflected by the DEB parameters

The purpose of the study is to initiate the development of a DEB parameter database for a variety of species. Data for representative marine species will be collected from the literature and parameter estimation will be performed based on the simultaneous minimization of a weighted sum of squared deviations between a number of (real and pseudo) data sets and model predictions as a single-step procedure (“add_my_pet”-procedure). The robustness of this parameter estimation approach will be examined. This study introduces a framework for studies of species diversity by means of Dynamic Energy Budgets.

25. LIKA & KOOIJMAN

The topology of energy allocation in dynamic energy budgets

Dynamic energy budget (DEB) models describe the rates at which an individual organism acquires energy and utilizes it for physiological process related to maintenance, growth and reproduction. A key assumption of DEB models is the way assimilated energy is allocated to the various energetic processes. Different assumptions concerning energy allocation may result in different behavior at the population level. The standard energy allocation rule (κ-rule) in DEB theory says that assimilated energy first enters the reserves, from which a fixed fraction κ of the mobilized flux is allocated to maintenance and growth and the remaining to maturity maintenance and reproduction. The purpose of this paper is to study the topology of energy allocation. Based on the standard κ- rule model, different energy allocation schemes (e.g., i) maintenance is paid from mobilized flux and has priority over both growth and reproduction, ii) maintenance is paid from assimilated energy, iii) SDA paid from the mobilized flux of reserves) will be considered. The resulting models will be examined for obeying the first principles and properties of DEB theory. Models will be compared in terms of body size scaling relationships and life history parameters.

26. KOOIJMAN

DEB-based body mass spectra for planktontic consumers

The body mass spectrum of consumers follows from the Dynamic Energy Budget (DEB) theory using complementary assumptions of steady state in homogeneous environments, prey size selection that is linked to the body size of the predator and an exponential relative frequency distribution of maximum body sizes. The intra- and inter-specific scaling relationships of the DEB theory convert this relative frequency distribution into a body-mass-specific abundance via a structure-specific abundance. I evaluate the age-dependent growth, reproduction and survival patterns, and the number of trophic levels as functions of nutrient recycling and nutrient load.

27. MATEUS et al.

Can we reach consensus between marine ecological models and metabolic theories in ecology? A look at primary producers

Provisional abstract: A general agreement is expected between ecosystem models and metabolic theories, and one should be able to use ideas and principles from both views. Nevertheless, there are marked differences that can vary from differences in formulation of processes to baseline assumptions. So far, efforts to reconcile both types of models of natural systems have been limited. Here we critically compare both models, highlighting similarities and showing where the approaches differ.

28. KLANJSCEK et al.

Modeling ocean environments using matrix population models derived from a DEB model

Short description: a short communication on how to create DEB-determined matrix population models with explicit energy and size dimensions. This approach is suited for grids with a large number of nodes with different environmental conditions such as large spatial systems over large time scales. Needless to say, such an approach is particularly interesting for ocean environments, especially since there are many existing matrix meta-population models (describing movement) which can easily be integrated with the DEB-based matrix population growth model.

29. JAGER & SELCK
Stress responses in the marine polychaete Capitella
In the paper, we analyse one or several data sets with stressors and *Capitella* species within the context of DEB3. A particularly interesting aspect of this species is that the size at first reproduction is not fixed, but affected by toxicants and density. This suggests that the maturity and somatic maintenance rate coefficients are not equal. Analysis of such data can shed more light on the DEB concepts of maturation and maturity maintenance, and the effects of stressors on these concepts.

30. KLOK et al.
Analyzing the impact of toxicants in the food chain C. volutator shorebirds using Dynamic Energy Budget- and population models
Abstract: The tube-dwelling amphipod *Corophium volutator* (Pallas, 1766) is an ecologically important representative of the in fauna of marine sediments and is widely distributed along the north-eastern American and western European coasts. Living in the intertidal marine sediments were toxicants tend to accumulate the species is expected to suffer population level impacts. Since *C. volutator* is an important prey species for several migratory shorebirds changes in the abundance and quality (internal toxicant concentration) of *C. volutator* may have negative effects on these predators. *C. volutator* is relatively easy to keep in laboratory and therefore has been the subject of many toxicological studies. Despite this relatively few toxicological studies on *C. volutator* have tried to interpret effects measured at the individual level on the population dynamics of the species. We will use the Dynamic Energy model concept to extract mechanistic information from published toxicological studies on sub-lethal effects in *C. volutator*. We further extrapolate this mechanistic information to the population level and assess the potential impact of changes in *C. volutator* abundance and toxicity load on its predators. We discuss how toxicological experiments should be extended to facilitate a DEB wise interpretation of the data.

31. WIJSMAN & SMAAL
Growth of cockles (Cerastoderma edule) described by a Dynamic Energy Budget model