Status report for Month 6 (June 2009):

WP3: Impact on the food-web (DTU, BNI, IOW, TMBL, IOPAS)

Task 3.1: Process validation of food-web models (1-24)

<u>Deliverables:</u> Food-web model and BEM simulation results 1961-2004 (24), unified validation data sets (6), detailed assessment of model skills (24), analysis of regime-shifts in the food-web (24) <u>Milestones and expected results:</u> Validated models for climate and nutrient load change scenarios; delineation of the impact of historically changing drivers on <u>dynamics (life-histories, distributions and phenologies) of key species (e. g., cod).</u>

Activities in months 1-6:

Work in first 6 months has primarily focussed on developing a common set of variables that will be used as input to the foodweb models for forcings.

Several email correspondances and phone discussions with partners in wp3 and other wps have been held, and a dedicated meeting was arranged to identify variables and datasets required for validation and forcings. The meeting was held in collaboration with the ICES – Helcom Working Group on Integrated Ecosystem Assessment of the Baltic Sea in March 2009, Rostock, Germany. Details of how the reproductive volume data are calculated and scaled (spatial, temporal) were discussed during a phone conference with wp2 colleagues and some general aspects related to its influence on cod biology.

A comprehensive data table has been prepared and circulated to other wp leaders. The variables included are those which have been used in earlier studies to explain significant variability in cod and sprat recruitment, growth and condition, and in production and abundance of selected species of zooplankton and total zooplankton biomass. The variables are depth-specific and spatially-resolved.

Some validation datasets based on field observations have been delivered to project partners. The datasets include time series of sea surface temperature, and deep (halocline) temperature from the Bornholm Basin. An updated time series of cod reproductive volumes for model validation purposes is being prepared together with Latvian colleagues and is expected to be available in the next quarter.

New studies are being initiated regarding consequences of acidification on Baltic biota. Results will be used later in project to help develop bio-climatic envelope models of how acidification might affect Baltic biota. UG has begun literature search to establish relevant background for Bioclimate Envelope Modelling (plan to begin with *Mytilus edulis* - although this species is not a major component of the EwE models to be used in Ecosupport, *Mytilus* is a major component in benthic-pelagic coupling in the Baltic, and [more importantly] there's a wealth of literature available for it. We also have unpublished data on acidification impacts of key life-cycle components in *Mytilus*, and therefore figure we can use this as a model organism to develop the relevant methodologies before transferring these to key species in the EwE models.

We have begun literature / ocean acidification network search to summarise impacts of acidification on key species in EwE models (*Acartia*, sprat, herring, cod). Preliminary experiments have begun on effects of acidification on highly susceptible species in Kattegat.

Task 3.2: Scenario simulations of the food-web (1-33)

<u>Deliverables</u>: Food-web and fish population model simulations for 1960-2100 (33), calculated envelopes for resilience of species in future climate (33), cause-and-effect studies of simulated changes and analysis of various scenarios (33)

<u>Milestones and expected results</u>: To discover changes in the food-web due to future climatic changes and address questions such as whether cod or blue mussels can survive in the future BS

Activities in months 1-6:

Preparatory work is scheduled for months 1-17.

Full activity not scheduled to start until month 18. However, a large amount of preparatory work has been conducted in this sub-task, mainly in relation to other projects and activities.

Most wp3 partners are involved with the ICES – Helcom Working Group on Integrated Ecosystem Assessment of the Baltic Sea. This WG met in March 2009, in Rostock, Germany. Eco-support partners BNI and DTU-Aqua participated; an associated partner of Eco-support (SBF) participated and is co-chair of the WG. BNI and DTU-Aqua presented results of ongoing work related to environmentally-driven foodweb and fish population modelling and which will be developed further within Eco-support.

With respect to Ecopath-Ecosim, BNI and DTU-Aqua colleagues have started to re-structure the Ecopath food web model and have provided a revised sketch of the model structure. They have also started the calibration of this food web model and presented results at the ICES-Helcom WG meeting in Rostock.

Colleagues at DTU-Aqua and partners outside Eco-support have developed two fish projection models under future cliamte change and presented the results at the ICES-Helcom Working Group on Integrated Ecosystem Assessment of the Baltic Sea in March 2009, Rostock, Germany. One model uses temperature and salinity to estimate future cod and sprat recruitment in a stochastic model of predator-prey interactions between cod, herring and sprat. Another model makes projections for cod, sprat and herring biomass for the 21st century based on historic (1970s-2005) abundance and hydrographic data, and including predation-competition among fish and zooplankton species.

All results must be considered as very preliminary. Nevertheless the attempts have been very successful in identifying and developing the links between various models.

The results are documented and available in the report from the working group (available at <u>http://www.ices.dk/reports/BCC/2009/WGIAB09.pdf</u>).

Task 3.3: Quantification of uncertainty of future food-web projections (1-36)

<u>Deliverable</u>: Probabilistic uncertainty assessments of biological responses (e. g., populations, food web structure) to model structure and forcing scenarios (33) <u>Milestones and expected results</u>: Estimates of future development of populations and food webs in response to future scenarios of eutrophication, climate change and exploitation

Activities in months 1-6:

The sub-task is not scheduled to start until month 25. However, a large amount of preparatory work has been conducted in this sub-task, mainly in relation to other projects and activities.

The food web projections will be sensitive to both the climate development (including the CO2 emission scenario used), the eutrophication development and fishery developments.

Some preliminary analyses of uncertainty of the foodweb projections have been conducted by 2 Eco-support partners in the ICES – Helcom Working Group on Integrated Ecosystem Assessment of the Baltic Sea, which met in March 2009, in Rostock, Germany. During the WG, several different models of fish stock development were used with a common climate projection in an assemble-averaging approach to estimate in a preliminary way how the fish populations might react under different assumptions about climate effects on population dynamics and interactions among fish species and with zooplankton.

All results must be considered as very preliminary. Nevertheless the attempts have been very successful in identifying and developing the links between various models.

The results are documented and available in the report from the working group (available at <u>http://www.ices.dk/reports/BCC/2009/WGIAB09.pdf</u>).

Gantt chart or similar to show the timing of different Work packages and Tasks

Light grey: preparatory phase (some forcing data are still missing)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35 36
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