Integrating spatial processes into ecosystem models for sustainable utilization of fish resources

INSPIRE

Deliverable No: 7.3	Workpackage number and leader: WP 7, UT-EMI		
Period covered:	1.February 2014 – 31.January 2015		
Date:	31.03.2015	Contract delivery due date	March 2015
Title:	Periodic progress report (incl. kick-off meeting report)		
Lead Partner for Deliverable:	UT-EMI		
Author(s):	Henn Ojaveer, Pettai, M-L. Neuenfeldt, S., Casini, M., Möllmann, C., M., Blenckner, T., Horbovy, J., Kallasvuo, M., Kornilovs, G., Lehmann, A., Nilsson, A., Nissling, A., Polte, P.		
Dissemination level (PU=public, PP=Restricted to other programme participants, including the BONUS Secretariat, CO=confidential)			PU
Nature of the Deliverable (RE, RE/SP, RE/PP, RE/PR, RE/FR, SP, PP, ER, MO, PT, DE, TE, OT)			RE
Report Status (DR = Draft, FI = FINAL)			FI

Acknowledgements

The research leading to these results has received funding from BONUS, the joint Baltic Sea research and development programme (Art 185), funded jointly from the European Union's Seventh Programme for research, technological development and demonstration and from national funding institutions

INSPIRE Overview

Process-based understanding of changes in commercial fish spatial distributions, and to disentangle the role of natural drivers and various anthropogenic impacts, is a challenging research topic with high relevance to resource management. The very recently started four-years BONUS INSPIRE project will fill in the most persistent gaps in knowledge of the spatial ecology of the major commercial fish and thereby support the effectiveness of the relevant policies and ecosystem-based management of the Baltic Sea. The project would serve as a *„framework axis project*" which other Baltic Sea research could be related to.

INSPIRE is designed to substantially advance our knowledge on the major commercial fish species – cod, herring, sprat and flounder, which represent key elements of the Baltic Sea ecosystems. The specific objectives of INSPIRE are to:

i. Quantify processes generating heterogeneity in spatial distributions of fish;
ii. Quantify and map potential hazards to the connectivity between identified key habitats, and assess the impact of anthropogenic and climatic environmental changes on habitat connectivity;
iii. Quantify the population dynamics and interactions of the fish species in a spatially explicit context;
iv. Develop spatially explicit advice for ecosystem-based fisheries management.

INSPIRE proposes pilot ecosystem integrated surveys to resolve the habitat requirements of different life-stages of fish species by combined use of traditional methods and application of modern advanced analysis techniques. The surveys are conducted in close collaboration with local fishermen.

www.bonus-inspire.org

Project partners:

No.	Legal name	Abbreviation	Country	PI in charge
1	University of Tartu	UT-EMI	Estonia	Henn Ojaveer
2	Danmarks Tekniske Universitet	DTU-Aqua	Denmark	Stefan Neuenfeldt
3	Morski Instytut Rybacki - Państwowy Instytut Badawczy	MIR-PIB	Poland	Jan Horbowy
4	Stockholm University	SU	Sweden	Thorsten Blenckner
5	Swedish University of Agricultural Sciences	SLU	Sweden	Michele Casini
6	Institute of Food Safety, Animal Health and Environment	BIOR	Latvia	Georgs Kornilovs
7	Thünen Institute of Baltic Sea Fisheries, Federal Research Institute for Rural Areas, Forestry and Fisheries	TI-OF	Germany	Patrick Polte
8	University of Hamburg	UHAM	Germany	Christian Möllmann
9	Natural Resources Institute Finland	LUKE	Finland	Meri Kallasvuo
10	Helmholtz Centre for Ocean Research Kiel	GEOMAR	Germany	Andreas Lehmann
11	Lund University	LU	Sweden	Anders Nilsson
12	Uppsala University	UU	Sweden	Anders Nissling

1. Executive summary

The key activity during the first year of the project was collecting new evidences from the field as well as assembling historical data for not only estimating spatial distributions of fish (WP1), assessing their migrations (WP2) and establishing causal links between different scales (WP3), but also feed into stock assessments (WP4) and form the ultimate basis for ecosystem based management (WP5). All deliverables and milestones related to these tasks, as well as communication (WP6) and coordination (WP7) were accomplished in a full accordance to INSPIRE workplan.

Important roles to play for ensuring within-project integration and linkage between various workpackages, and species-specific activities are integrating workshops and four fish champions. These 'strategic lines' have proven efficient and crucial for organising and coordinating the project work.

Two-directional communication with stakeholders was achieved through involvement of the representative of the Baltic Sea RAC into scientific discussions in the project as well as communication of INSPIRE plans and initial findings to BSRAC, ICES and HELCOM. In total, INSPIRE scientists have 80 memberships in international stakeholder committees. In addition, several scientists are performing advisory roles at national and international levels (incl. in relation to EU Common Fisheries Policy, Marine Strategy Framework Directive and Multiannual management of Baltic fish stocks).

Cooperation with BONUS BIO-C3 and BAMBI projects include, amongst others, Summer school "The Baltic Sea: a model for the global future ocean?", joint theme session at ICES ASC 2015 on "From genes to ecosystems: spatial heterogeneity and temporal dynamics of the Baltic Sea". In addition, joint activities with BIO-C3 involve "Baltic zooplankton study" and planning the invasive non-indigenous round goby *Neogobius melanostomus* investigations. Cooperation with BALTCOAST was also initiated.

The current report provides overview on the progress of the project during the first year by summarising research activities and first results by workpackages, followed by extensive list on performance statistics by partner institutes. The annexes include report of the project kick-off meeting and information on participation of INSPIRE scientists in stakeholder committees

2. Scientific and/or technological results achieved

WP 1 Spatial Distributions

Lead: Michele Casini, SLU

1. Scientific highlights

The egg (specific gravity) and spermatozoa (mobility at different salinities) characteristics analyses showed that both flounder ecotypes (coastal- and deep-sea spawners) occurred in SDs 25 and 28. In SD 28 spawning individuals of the coastal spawning ecotype occurred also at 70-80 m depth suggesting that population mixing with hybridisation may occur (Fig. 1).

The ichthyoplankton surveys showed that the southern part (SD 26N and SD 28) of the investigation area was more important for the reproduction of sprat (higher egg densities) in May, while a more uniform distribution of eggs was found in June. However, both in May and June sprat larvae were concentrated in the southern part of the survey area (Fig. 2). It will be important to clarify whether this happened due to low survival of sprat eggs and larvae in the northern area or due to passive migration from north to the south. The mapping of distribution of sprat eggs and larvae in several previous years showed a similar distribution pattern.

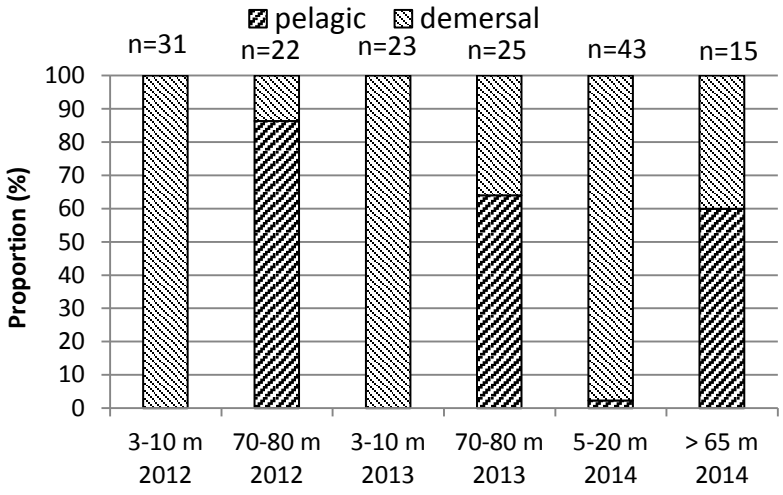
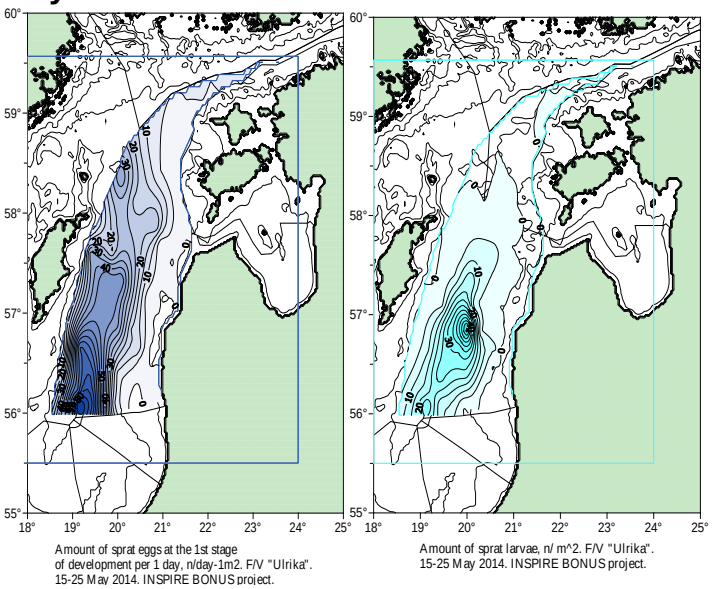


Figure 1. Proportion of spawning individuals of the respective flounder ecotype at different depth off Gotland SD 28 in 2012, 2013 (Nissling and Florin, unpublished) and 2014 (the latter as INSPIRE sampling).

May 2014



June 2014

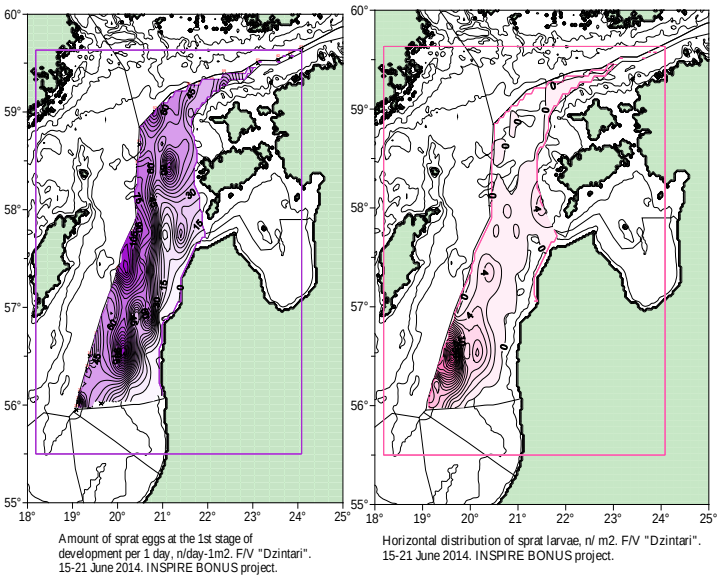


Figure 2. Distribution of sprat eggs-1st stage (left panels) and larvae (right panels) in May and June 2014.

2. Summary

Task 1.1. Data collection and assembly in common databases

Gilllnet fish survey are used to monitor the distribution of the main life stages of cod and flounder during autumn and spring on selected transects covering all possible habitat types and supposed nursery areas at pan-Baltic scale. Collection of relevant habitat data are also undertaken along the same transects. Inventory of settling flounder (0-group) and 1-group flounder using beach seine is performed in several locations around the Baltic to detect the timing and frequency of larvae arrival and abundance of 1-group.

Hydro-acoustic and experimental trawling surveys are used to achieve additional information on distribution and abundance of herring and sprat and their feeding habits. The survey data will be collected in a common database and made available to ICES.

Some dedicated acoustic surveys activity focus on improving the survey performance methodology (comparison of day and night records and trawls). Sprat 0-group data from national surveys are in-depth analysed to be potentially used for the prediction of recruitment, for modification of surveys to obtain more reliable estimates of 0-group, and for identification of the main nursery grounds through ichtyoplankton surveys and application of molecular/biochemical analysis methods.

Gillnets and beach seines surveys

1.1.1. Fishing with multimesh gillnet was made during autumn and spring on 11 selected transects covering all possible habitat types. Apart from standard environmental variables, such as depth, secchi depth, temperature & salinity, also video films were recorded. In total 37 fish species were recorded. The total catch of the target species were 2564 flounders and 74 small cod (≤20cm) in the spring and 764 flounders and small cod (≤20cm) in the autumn.

A total of 2077 otoliths and 1378 genetic samples of flounder were taken, and otoliths, genetics and stomachs were sampled from all juvenile cod. In addition some samples were also taken for priority 2 species, i.e. adult cod and other flatfishes.

During the gillnet surveys, samples were taken at transects 8 and 10 (ICES SDs 25 and 28, see Fig. 3), to study egg (specific gravity) and spermatozoa (mobility at different salinities) characteristics. More samples were taken during a survey with R/V Alkor (GEOMAR) in April 2014 (SDs 22, 24-26 and 28).

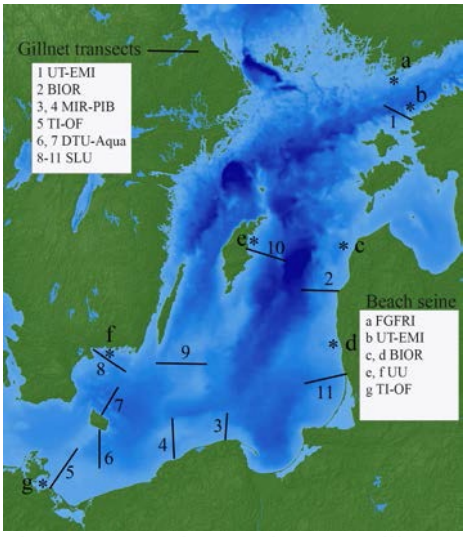


Figure 3. Schematic map illustrating approximate locations of gillnet transects and beach seining to collect data for habitat mapping and modeling of juvenile flounder and cod.

1.1.2. An inventory of settling (0-group) and 1-group flounder using beach seine was performed at three times during the summer in 10 locations around the Baltic to detect the timing and frequency of larvae arrival and abundance of 1-group. Time of sampling was set from July to middle of September. Flounders were extremely sparse in the locations B & F (see Fig. 1 in the Project Working Plan) which might be due to the decided sampling dates missing the settling of flounder in these areas being too early in location B and too late in location F. Additionally the number of individuals of other species (e.g. sticklebacks, gobies etc) was noted per haul and the following environmental parameters assessed at each site and occasion: water temperature, salinity and turbidity, wind speed and direction and at the first occasion type of substrate and coverage of vegetation. Water samples were taken per site and date.

Flounder ecotypes and timing of 0-group arrival at the coast

1.1.3. In total 162 individuals were analysed to distinguish between the two flounder ecotypes ("pelagic" and "demersal" spawners). Genetic samples (for analysis of population structure), otoliths (age reading and trace element composition) and data on ecotype have been forwarded within the project to Task 4.2 in WP4.

Females of the respective flounder-ecotype was distinguished by egg specific gravity measurements using a density gradient column and compared with glass bulbs of known specific gravity, i.e. in SDs 24-28 individuals with eggs displaying high neutral buoyancy (at ca 11-14 psu) were judged pelagic spawners and those with low neutral buoyancy (at ca 18-23 psu) demersal spawners. For males, spermatozoa mobility at different salinities was used to discriminate between the ecotypes. Spermatozoa mobility was assessed under a microscope at 250X magnification. Fish displaying swimming spermatozoa at <10 psu and higher were judged demersal spawners and fish with swimming spermatozoa at >10 psu pelagic spawners.
Assessment of egg and spermatozoa characteristics revealed that both flounder-ecotypes were present in SD 28 and SD 25. In SD 28 off Gotland spawning individuals of the demersal ecotype, spawning in coastal areas and at offshore banks (at ca 3-25 m depth), were found also at ca 70-80 m depth and a few individuals characterized as the pelagic ecotype (spawning in the deep basins) occurred close to the shore at 5-20 m depth, indicating that population mixing with hybridisation may occur in areas where both ecotypes are present.

1.1.4. Beach-seine samples for 0-group (1-gr) flounder has been analysed for locations H (Gotland, SD 28; two sites) and G (Hanö Bight, SD 25; two sites) at three occasions during July-August. Data on size frequency distribution (0-gr and 1-gr flounder) and density per sampling site and date have been forwarded within the project (Task 1.2). Fish were preserved in ethanol for genetic analysis and analysis of otolith chemistry. Water samples have been forwarded for trace element analysis for comparison with otolith chemistry (Task 4.2, in WP4).
Samplings of juvenile flounder revealed that 0-gr fish arrive to nursery areas in cohorts, at a size of 15-25 mm, from early-mid July and onwards until late August-early September. A strong cohort occurred in late August. Thus,

occurrence of both early and late arriving cohorts in a nursery area suggests that 0-gr fish may origin from different spawning areas. Growth of 0-gr flatfish amount to ca 0.9 mm/day. Hence, flounder seem to utilize these areas for only a short time as only few individuals >50 mm are present after arrival of the first cohort. In accordance with previous observations, most 0-gr fish occurred at 0.2 and 0.6 m depth.

Ichthyoplankton and acoustic surveys

1.1.5. Ichthyoplankton survey were performed in May 2014 (performed in the frames of ongoing international hydro-acoustic survey) and in June 2014 in SDs 26N, 28, 29, 32W. Ichthyoplankton samples were collected with IKS-80 ichthyoplankton net. The samples were collected by vertical trawling from the depth of 100 m or bottom till the surface and by horizontal trawling in the upper water layer. The samples were preserved in formaldehyde solution and treated in laboratory. All sprat eggs were measured and the development stage was determined. The collected sprat larvae was deep-freezed immediately on-board of the vessel and then transported to EMI-UT lab in -86 degrees. To perform spatial analyses on larvae condition, RNA/DNA and protein samples were delivered with courier in dry-ice to University of Hamburg where individual length and weight were recorded, and protein and R/D analyses were run. R/D analyses were done according to protocol prepared by Caldarone (2001).

1.1.6. Experimental hydro-acoustic survey in June in SD 28 was performed to improve the methodology of processing of the acoustic data and conduction of the trawling. During the survey, one daily station was carried out on the same fish concentrations. Several hauls were performed in different layers both in day and night time.

1.1.7. Studies of the spatial aspects of feeding conditions and feeding of sprat and herring.
The study was conducted during the BIAS (Baltic International Acoustic Survey) on board of the R/V Baltica in the ICES SDs 29 and 32 in October 2014. The zooplankton samples were collected in 13 control haul stations with Juday net accompanied by the hydrography profile by the CTD probe. In addition to the standard sampling from control hauls, feeding samples were taken (5 fish per 0.5 cm length group per SD were collected both for herring and sprat). The total number of feeding samples will be app. 170 for sprat and 270 for herring. For feeding investigations the stomachs of herring and sprat were collected and preserved in 4% formaldehyde solution for further analysis. Besides stomachs collection, the total length and average size group weight will be recorded and the otoliths taken. The stomachs analysis is ongoing in EMI-UT.

Relation to Deliverables and Milestones

No Deliverables for the Task 1.1 were due during the 1st Project Year. Half of the Milestone no. 1 was fulfilled (2 sampling campaigns for cod and flatfish performed, M3 and M10), while the rest of Milestone no. 1 will be fulfilled during the 2nd Project Year (M15 and M22) as planned.

Task 1.2. Mapping the spatial distribution of fish: linking existing data, new sampling and statistical analyses

Annual and seasonal maps of fish distribution in demersal and pelagic habitats from 1978 onwards are produced using advanced spatial statistics, using the data from existing international monitoring programs. Maps of the spatial distribution of sprat eggs and larvae, and their condition, are also produced using the INSPIRE pelagic field surveys. Indices of spatial overlap between predator/prey and competing species are produced to evaluate the potential predator-prey and competitive relationships in the Baltic Sea. The importance of distribution and overlapping for the diet composition of cod are examined as well as dietary habits of herring and sprat will be investigated.
Statistical habitat modeling is employed to relate the spatial distribution of different life stages of the target fish species to biotic (predators, preys, competitors) and abiotic (temperature, salinity, oxygen) factors, using both existing surveys (BITS, BIAS, BASS databases and newly compiled historical data) and the data from the INSPIRE field surveys (gillnets and ichtyoplankton/acoustic surveys) collected under Task 1.1.
The abundance indices from the gilnest samplings are used to design a reliable recruitment index for cod (integrating BITS data) and flounder, applicable in stock assessment. Otoliths of the captured cod juveniles are used for studies on growth and survival in particular habitats. Habitat characterization of nursery areas is done for settling flounder using the data gathered during the beach seine sampling under Task 1.1.

Maps of sprat egg and larvae abundances, and larvae condition

1.2.1. Maps of sprat larvae and eggs using data from May and June 2014 surveys were produced. The main results showed that in May the main sprat egg distribution area was the southern part of the survey area, namely SDs 26N and 28. In the northern part the abundance of sprat eggs was substantially lower. Sprat larvae were met only in the southern part of the area. The distribution of adult sprat and percentage of the spawning sprat females in the survey area was rather even and did not correspond to the pattern in the distribution of sprat eggs and larvae.
In June 2014, on the other hand, sprat eggs distribution was more even in all survey area in comparison with May. However, sprat larvae occurred only in the southern part of the area.
Because of low number of sprat larvae and their very low weight (mostly Dw<130µg) the number of individuals analysed for condition using RNA/DNA and protein samples was not sufficient yet to draw conclusions on spatial variation on their condition.

Compilation of historic databases from research surveys which are not in ICES databases

1.2.2. A data base on Latvian bottom trawl surveys will be developed by BIOR for years 1976-1990. In that period the bottom trawl surveys were performed more often and the area coverage was larger than in the later period. At

present, the data have been prepared for 17 surveys carried out in 1988-1990 with the information on 419 hauls. For other years the biological information of the hauls has been partly compiled and it will be combined with the trawl information. The development of the database will be completed in 2015.

1.2.3. A data base on Latvian hydro-acoustic surveys is developed by BIOR for years 1981-1991. At present the data have been prepared for 9 surveys carried out in 1981-1991 including all acoustic, biological and hydrological information. The total number of hauls during surveys was 367. In total, 14 more surveys of this period will be included in the data base in 2015.

1.2.4. A data base on Latvian commercial fishery on sprat and herring has been prepared by BIOR for 1983-1987. In this data base individual vessel information will be available. The data base will be extended for years 1996-2014 and will be completed in 2015.

1.2.5. Data on cod catches from the BIAS and BASS acoustic surveys started to be compiled from different countries and will be finalized under 2015. The data will provide information on the overall spatio-temporal changes in cod distribution in the pelagic water, which can then be combined with the data from bottom trawl surveys.

1.2.6. A data base on Estonian herring larvae spatio-temporal distribution has been developed by UT-EMI in the NE of the Gulf of Riga for 1957 – 2013. Weekly high resolution samples were collected and individuals measured from nine stationary stations from May to July (larval herring distribution period). Data for 2004-2013 are available in ICES ichtyoplankton database.

1.2.7. Baltic Sea zooplankton dataset (http://www.sea.ee/huvitavat/balticzooplankton/) has been compiled by a joint effort of number of researchers from institutes that conduct or have conducted long-term monitoring of the Baltic Sea. The primary goal of the initiative is to assemble a pan-Baltic raw zooplankton time series data in an effort to look at all-Baltic patterns and ecosystem dynamics at multiple spatial and cross-disciplinary scales. The dataset contains currently species counts and biovolume estimates from 23000 samples and ca 15 000 profiles provided by 7 institutes: Estonian Marine Institute, Tartu University (UT-EMI), Marine Research Centre, Finnish Environment Institute (SYKE), Institute of Food Safety, Animal Health and Environment (BIOR), Latvian Institute of Aquatic Ecology (LHEI), National Marine Fisheries Research Institute (NMFRI), Atlantic Research Institute of Marine Fisheries & Oceanography (AtlantNIRO) and Swedish Meteorological and Hydrological Institute (SMHI). For INSPIRE purpose, the database will be used to characterise prey field availability and variability of clupeids at various spatial scales and habitats (e.g., coastal areas, large gulfs, open sea), as well as serve as an ultimate data source for interannual comparisons. By this way, it will feed into vitally all science-based WP's (WP2-5).

Habitat utilization of herring larvae

1.2.8. Habitat utilization of Wester Baltic herring larvae. The TI-OF sampled pelagic and littoral sites in a major spawning ground of Western Baltic spring spawning herring in 2014 as part of the INSPIRE project.
In 2014 TI-OF fished seven stations weekly in Strelasund, Greifswald Bay and Pommeranian Bay with a CALCOFI trawl (1500 µm mesh/ 1m net diameter) to investigate habitat utilization of older (post flexion) herring larvae, hypothesizing that Western Baltic spring spawning herring conclude most of their early life history in the inshore waters associated with Greifswald bay and the Island of Ruegen (Germany). Accordingly the Bay is assumed not only a major spawning ground but also a significant retention area and nursery for larval herring contributing by a set of diverse habitats to rearing of juvenile stages. Additionally the vertical distribution of larval stages was investigated based on the hypotheses that in the shallow, hydrologically well mixed waters of the lagoon early larval herring would be rather homogenously distributed and not stratified as regularly observed in the open ocean.

Despite escalating temperature increases in the littoral zone, the preliminary results of this study revealed considerably high larval abundance in near shore habitats. Site specific topography however was found to structure larval abundance along the littoral depth gradient from the zone shallower than 1 m to that shallower 3 m. In the pelagic outer bay, vertical distribution of larval herring was surprisingly distinct, however varying with extension of the water column and larval body length. In general our results demonstrate a quite patterned habitat utilization of early herring life stages in inshore systems. Data processing will continue in INSPIRE during 2015.

Hydrodynamic modelling

1.2.9. One of the central tasks for the hydrodynamic modeling of the Baltic Sea was the switch from SMHI atmospheric forcing to ERA-Interim atmospheric forcing provided by ECMWF. ERA-Interim is updated regularly, so that model simulations can be used as supplement to hydrographic measurements. A reconstruction of spatially highly resolved 4-dimensional hydrodynamic conditions, including the oxygen distribution, for the entire Baltic Sea was done over the period 1970-2014. Daily averaged hydrodynamic fields were stored in a model data base and can be used as input for the Lagrangian particle tracking sub-model. Additionally, hydrodynamic and habitat changes due to climate variability can be investigated in detail. Furthermore, simulated hydrodynamic fields can be associated with spatial distribution of fish.

Relation to Deliverables and Milestones

No Deliverables or Milestones for the Task 1.2 were due during the 1st Project Year.

Task 1.3. Population dynamic consequences of spatio-temporal shifts in predator-prey interactions and implementation into stock assessment

INSPIRE applies and further developed the spatial SMS (stochastic multispecies model) using the information gained under Tasks 1.1 and 1.2. SMS describes stock dynamics of interacting stocks linked together by predation. An extended SMS model with area-dependent predation mortality for cod, herring and sprat has been developed and is applied in INSPIRE. ICES Sub-division based values for predation mortalities of herring and sprat were derived in the hindcast SMS by accounting for the distributions of cod, herring and sprat when estimating the prey-specific consumption rates of cod. The consequences of recently limited spatial overlap between cod, herring and sprat populations are evaluated and incorporated into current population models (e.g. SMS) for later use in stock assessment (WP4).
Furthermore, a historical reconstruction of the food-web is performed to understand spatial distributions in response to factors different from those observed during the past few decades. Especially, cod-flatfishes interaction is reconstructed back in time under oligotrophic conditions and low fishing pressure.

Relation to Deliverables and Milestones

Task 1.3 was planned to start during the 2nd Project Year, and therefore no activities and results are reported here.

3. Deviations from the work plan

No deviations in the workplan which could affect achieving of project aims. A few minor deviations in data colletion include: i) one transect (transect I) in the gillnet survey could not be fished in autumn 2014 due to bad weather conditions; ii) oxygen measurements and habitat video recording are missing from 3 transects in the spring 2014 and 2 respectively 1 transect in the autumn 2014 due to delayed delivery or malfunction of equipment.

WP 2 Passive movements, active migrations, and habitat connectivity

Lead: Christian Möllmann, UHAM

1. Scientific highlights

The spatial distribution patterns of eastern Baltic cod early life stages as well as strong variations of the circulation patterns provide an excellent opportunity to distinguish between self-sustaining components of the different cod stocks and regions of their mixed populations. A hydrodynamic model combined with a Lagrangian particle tracking technique was utilized to provide long-term knowledge on environmentally-related survival probability and drift of eastern Baltic cod eggs and yolk-sac larvae. Simulations were performed to quantify processes generating heterogeneity in spatial distribution of Baltic cod early life

stages. We tested the environmental conditions in the different spawning grounds for suitability of spawning, egg survival probability and estimated the population connectivity of eastern Baltic cod eggs and yolk-sac larvae between the different spawning grounds. On general, the extent of cod eggs in the Baltic Sea represented as virtual drifters is determined by the level of oxygen conditions, which define a major habitat requirement to which species' physiology is suited. Secondly, eggs initially released as drifters in the most western spawning grounds were strongly affected by sedimentation, while for the whole spawning environment temperature dependent mortality was only evident after severe winters. The combination of topographic features and egg buoyancy appears as a barrier for the transport of Baltic cod eggs and could potentially limit the connectivity of Baltic cod early life stages between the different basins in the central and eastern Baltic Sea.

In the Baltic Sea, two genetically distinct cod populations occur, the "Eastern" Baltic cod in ICES SDs 25-32 and the "Western" Baltic cod in SDs 22-24. Since 2006, cod abundance has increased 5 fold in the Arkona Basin in the eastern part of the "Western" cod's management unit (SD 24), but remained constant in SD 22, presumably due to mixing of the two stocks. The spatio-temporal dynamics of stock mixing were analysed using shape analysis of archived otolith, and the impact of "Eastern" cod's immigration on recruitment by hydrographic drift modelling. The percentage of "Eastern" Baltic cod in the Arkona Basin increased from ca. 20 % before 2005 to > 60 % in recent years. The spatial resolution of stock mixing suggests immigration occurring north of Bornholm, but propagating throughout the Arkona Basin. An age-related trend in immigration was evident, which started with age 4 year cod followed by progressively older individuals. The immigration cannot be attributed to spawning migration, as no seasonal trend in stock mixing was observed. Only between 20-50% of the available habitat was suitable for successful spawning of "Eastern" cod, limited by primarily low salinity. Best conditions occurred irregularly in May-end June, interspersed with years where successful spawning was virtually impossible. On average, only 19 % of the eggs survive to the end of the yolk-sac, with mortality primarily after bottom contact due to low salinity. The general drift direction of the surviving larvae was towards the east. Albeit considerable, the immigration of "Eastern" cod does therefore not seem to contribute significantly to "Western" Baltic cod's recruitment.

2. Summary

Work-package 2 contains statistical and process-based analyses of movements of the focal species at different temporal and spatial scales and in different life-stages. Besides quantifying these movements, emphasis is put on the characterization of obstacles for the transport or movement between nursery and feeding habitats, between feeding and spawning habitat, and (closing the life cycle) between early life stages habitats and nursery grounds. This includes the assessment-relevant movements between ICES sub-divisions.

Task 2.1 Transport of early life stages from spawning area to nursery grounds In this task an existing hydrodynamic model (BSIOM) and a Lagrangian particle-tracking technique are used to evaluate drift patterns of cod

and flounder eggs and larvae. Using this model suite long-term knowledge on environmentally-related survival probability and drift of Eastern Baltic cod eggs and yolk-sac larvae were provided. Simulations were performed to quantify processes generating heterogeneity in spatial distribution of cod early life stages. The environmental conditions were tested in the different spawning grounds for suitability of spawning and egg survival probability. Further, the population connectivity of eastern Baltic cod eggs and yolk-sac larvae was estimated. The development of the tracking model and according model simualtions are underway for flounder.

Two manuscripts are in the final stage for submission, hence Deliverable D2.2 [Manuscripts (2) on tracking eggs and larvae M18] will be achieved as planned. Similarly, Milestone M8 [Larval early life-history stages tracking model development: Model completed M24] will be achieved as planned.

Task 2.2 Migrations of adult individuals In this task net-migrations rates between adjacent sub-divisions will be estimated using existing tagging and acoustic survey data from the partner institutes. As a baseline for this study a database on traditional tagging data and a respective research plan for their analyses has been created and submitted as scheduled in Deliverable D2.1 [Database on traditional tagging data ;12]. Accordingly Milestone M7 [Fish tagging database: Database completed M12] has been achieved as planned.

Additional work has been conducted on a compilation and analyses of data on herring infestation with *Anisakis simplex* larvae. Parasitic infection rates will be used as biological tags indicating herring migration rates. Eventually a review of historical literature on Baltic herring population dynamics has been initiated with the aims to collect major findings on herring ecology from non-English literature and to synthesize findings according to the driving factors of spatial distribution and survival dynamics. A database for historic and current literature on herring ecology was established. Collection of historic data sets and literature from all parts of the Baltic Sea will be continued during 2015. The review (among others) will deliver additional information on herring migration changes.

Future WP2 deliverables D2.3 [Manuscripts (2) on migrations of adult individuals M24] and D2.4 [Report on migration estimates M24] are expected to be delivered as scheduled.

Task 2.3 Small scale movements relevant for species interactions In this task small-scale movements of cod, herring and sprat, such as school formation, evasive reaction, distance between schools, reactions to the presence of predators (including fishers) will be analysed using existing acoustic and data storage tag data. The small scale movements knowledge will be used (i) to test hypotheses on density dependent emigration on a sub-basin scale and (ii) to understand if the exchange between ICES sub-divisions has other reasons than reproductive success or fishery, that is availability of prey or predation risk, or a combination of different factors. Drivers of species distribution will be also investigated at the small temporal and spatial scale using high resolving acoustic, video and plankton net (prey field) data, generated in a dedicated survey activity (pilot study).

Presently data for this task a gathered inlcuding historical hydroacoustic recordings and a dedicates survey in March/April 2015 that will investigated small-scale predator prey distribution using modern ocean observation techniques such as the Video-Plankton-Recorder (VPR) and the Laser Optical Plankton Recorder (LOPC). Furthermore a Baltic Sea zooplankton dataset has been compiled by a joint effort of number of researchers from institutes that conduct or have conducted long-term monitoring of the Baltic Sea under WP1 (under Task 1.1). The primary goal of the initiative is to assemble a pan-Baltic raw zooplankton time series data in an effort to look at all-Baltic patterns and ecosystem dynamics at multiple spatial and cross-disciplinary scales. Historical and contemporary zooplankton monitoring data collected by six institutions in Finland, Estonia, Latvia, Russia and Poland between 1957 and 2012 were harmonized for the structural organization of data and species taxonomy, yielding a coherent dataset of ca 23000 zooplankton samplings representing nearly 15000 vertical profiles.

The work in this Task will result in Deliverable D2.5 [Database on small scale distribution of cod, herring and sprat M30] and D2.6 [Manuscript on small scale movements M36], which are both expected to be delivered as scheduled.

3. Deviations from the workplan

There are no deviations from the workplan.

WP 3 Scaling from individuals to populations

Lead: Patrick Polte, TI-OF

1. Scientific highlights

The simulated spatial distribution patterns of eastern Baltic cod and flounder eggs (WP2) could serve as release locations for the drifting larvae of both species. In cooperation with colleagues from the EU-BONUS project “BIO-C3” we have used the hydrodynamic model of the Baltic Sea in combination with a Lagrangian particle tracking method to provide distribution probability maps of juvenile cod and flounder. Model runs have been performed for the time period 1979 to 2013. Further model runs for 2014/2015 and subsequent Lagrangian drift tracking model runs will be done if the corresponding atmospheric forcing will be available. Settlement probability maps of juveniles will be estimated in relation to bottom depths as well as to the oxygen concentrations at the bottom.

2. Summary

This WP aims at quantifying the impact of individual scale movements on population scale spatial distributions. Besides the scaling from individuals’ movement to populations’ dispersion in space, focus in WP3 is on local scale mortality, for example hazards due to hot spot fisheries, predation on aggregations of juveniles, or climatic extremes such as severe winter storms. The question to be addressed is whether such local events shape larger,

regional scale population abundance and recruitment strength and thus spatial distribution patterns.

The WP has two major objectives:
1. Develop methods to scale individual movements of cod, herring, sprat and flounder (early life stages) to population distributions
2. Perform process-studies collecting basic knowledge on regional hazards for population dynamics of Baltic herring and cod

Task 3.1 Scaling individual movements to populations' spatial distributions

Available observed distribution patterns of cod, herring, sprat and flounder early life stages will be put in relation to individual movements and migrations analysis (WP2). So far the hydrodynamic model (BSIOM) and a Lagrangian particle-tracking technique have been used to evaluate drift patterns of cod and flounder eggs and larvae. Simulations were performed to quantify processes generating heterogeneity in spatial distribution of cod early life stages. The environmental conditions were tested in the different spawning grounds for suitability of spawning and egg survival probability. Further, the population connectivity of eastern Baltic cod eggs and yolk-sac larvae was estimated. The development of the tracking model and according model simulations are underway for flounder. The aim is to provide temporally and spatially resolved distribution and settlement probability maps focusing on relative densities of juveniles within the different nursery areas.

Future WP3 deliverable D3.1 [Manuscripts on distribution probability maps for juvenile cod and flounder M36] is expected to be delivered as scheduled.

Task 3.2 Quantifying effects of regional hazards on larger scale productivity and spatial distributions

Activities of this Task will start in M15.

3. Deviations from the worklan

There are no deviations from the workplan.

WP 4 Stock Assessments

Lead: Jan Horbovy, MIR-PIB

1. Scientific highlights

The activities undertaken so far include development of spreadsheet versions of specific stock-production models and preparation to separate assessment of herring and sprat from northern areas. As serious problems in analytical assessment of eastern Baltic cod were discovered and ICES was unable to provide analytical assessment and advice for 2015, it was suggested to put more emphasis, than originally planned, on cod issues in the project. Besides

achieving higher impact of the project results, the scientific argumentation is that without realistic cod assessment it is difficult to correctly determine the dynamics of clupeids stocks.

2. Summary

The WP4 has two major objectives:

a. to include and quantify the effects of migrations and spatial and temporal changes in exploited fish distribution (cod, herring, and sprat) on stock assessment,
b. to provide assessment of the status of flatfish in the Baltic, as a basis for quantitative management of these stocks.

Assessment part of the project started towards the end of 2014, and as the WP4 depends very much on the new data and compiled historical data, no assessments were performed yet, which is according to the work plan.

Significant progress has been achieved in Task 4.2 in which reference data for spawning types characteristic (egg and spermatozoa characteristics) has been collected. Genetic analyses were performed and data were obtained for statistical analyses of genetic differentiation between sampled sites. Data for other methods to evaluate stock differentiation have been prepared (morphometric and advanced otolith micro-chemistry). Evaluation of egg specific gravity measurements on flounder indicate that sub-populations may exist within the deep sea spawning (with pelagic eggs) flounder ecotype. Normal development of hybrid (cross fertilisation experiment) eggs/larvae indicates that hybrid flounder individuals may occur. This work will continue in 2015.

Work plan for WP4 presented in DoW was based on status of assessment work as known in 2013. However, in 2014 serious problems in analytical assessment of eastern Baltic cod were discovered and ICES was unable to provide analytical assessment and advice for 2015. Discovered problems in cod assessment and cod ecology may be summarised as:

a. very bad retrospective pattern of eastern cod assessments,
b. inconsistencies between fisheries and survey information – unstable catchability,
c. serious problems with age reading – no consistency even within a country,
d. strongly declining condition of cod and probably growth,
e. strongly increasing infection of cod with nematodes, with some indications of having impact on cod's natural mortality,
f. decreasing overlap of cod and clupeids,
g. enlarging hypoxic/anoxic areas affecting cod distribution.

In the light of above findings it is suggested to put more emphasis than it was planned on cod issues in the project, as without realistic cod assessment it may be difficult to correctly determine the dynamics of clupeids stocks. Related efforts will be directly channelled to ICES - the main stakeholder of INSPIRE -

through attending expert group, Advice Drafting Group, Advisory Committee and Science Committee meetings. Therefore, there will be no additional deliverables foreseen at this stage.

Task 4.1 Assessment of fish stocks with inclusion of migration, spatial and temporal effects and taking into account impact of cod predation Standard stock assessment approaches used by ICES do not take into account differences in spatial distribution of fish within assessment units/stocks, while decreasing overlap between cod and clupeids has been observed for several years. The aim of this task is to include differences in spatial distribution of fish stocks and fish migrations in the assessment models. Several approaches will be tested and applied, including spatially disaggregated age-structured methods, models which account for migration, multispecies models. In multispecies models change in predator-prey overlap will be addressed. Assessment of sprat and herring in the present assessment units (sprat in the whole Baltic and Central Baltic herring (sub-div. 25-29,32) will be verified by applying assessment models to stocks identified earlier on biological grounds in these units.

Preparation to separate assessment of herring and sprat from northern areas has started. EMI-UT contributed to the task with revision of available historical data for the separate assessments of herring according to the assessment units used by ICES prior to 1990. The work was focused on the Gulf of Finland herring and on the combined stock of Sub-divisions 28.2, 29 and 32. This activity will be continued in coming years.

Based on the analysis of weekly resolved surveys on herring larvae during May-July in 2004-2013, significant relationship between the abundance of large larvae (17-20 mm) and herring recruitment was established in the Gulf of Riga. This input information will be considered during the forthcoming session of the ICES WGBFAS with an ultimate aim to involve fisheries independent ecosystem data into the Gulf of Riga herring assessment. That may be useful in future assessment of herring stocks.

Task 4.2 Stock identification of flounder in the Baltic Sea The aim of this task is to develop tools to be used for estimation on allocation of catch to different spawning types of flounder in different fisheries in the Baltic Sea. In order to create a reference material of flounders of known spawning type 162 flounders were sampled in WP1 and differentiated by egg and spermatozoa characteristics. The reference material has also been photographed for later morphometric analysis. In 2015 the reference material will be added to with the second year gillnet survey (WP1).

Protocol for a new combination of 16 genetic microsatellites has been developed and genotyping have been made of 496 flounders sampled during gill survey including the reference collection. In 2015 this will be analysed and further genotyping of juvenile flounder from the beach seine surveys in WP1 will be undertaken.

Additionally, otoliths were sampled according to the plan in the WP1 surveys. The advanced otolith micro-chemistry will be used to differentiate between pelagic and demersal spawning flounder, to give information on the connectivity between deeper and shallow waters, and to show how much the different depth strata are utilized by the different flounder types.

Task 4.3. Data analysis and analytical assessment or evaluation of flatfish stocks So far there is no accepted analytical assessment of flatfish stocks in the Baltic and ICES provides management advice on the basis of survey indices of stock size. Such advice is only approximate. The aim of this task is to provide analytical assessment or evaluation of the Baltic flatfish stocks, taking into account differentiation into populations (e.g. demersal and pelagic flounder) determined within Task 4.2. Depending on availability of data different approaches will be attempted for different stocks (e.g. catch curve analysis, stock-production models, length based models, age-structured models, random effect or Bayesian approaches).

Development of spreadsheet versions of specific stock-production models has started. In addition, some standard approaches like ASPIC and/or Collie & Sissenwine (1983) will be tested.

First Deliverable is scheduled for month 36 (D4.2. Database for flounder assessment or stock evaluation by stock).

3. Deviations from the worklan

There are no deviations from the workplan.

WP 5 Ecosystem based management

Lead: Eero Aro (until 31.12.2014) and Meri Kallasvuo (since 01.01.2015), LUKE

As activities in this WP start only in Month 13, there are no progress nor research results to report, except attendance in project kick-off meeting and First Integrating Workshop to ensure that WP5 requrements are met when planning activities in other WP's in INSPIRE

WP 6 Dissemination

Lead: Stefan Neuenfeldt, DTU-Aqua

1. Highlights

By the close contact to various ICES expert groups and Baltic Sea RAC, INSPIRE results have been made available to the stakeholders and interested public almost in real time.

2. Summary

The WP aims to engage key target audiences downstream of the RTD core of the project, using a broad variety of engagement approaches:

1. Policy makers, by putting the latest research in policy-relevant context;
2. Non-specialist audiences, through effective use of press and medias;
3. Society at large, by providing full Open Access to projects research publications.

Scientists are criticized for poor communication of research to a non-scientific audience. The formats for communication that are respected in the scientific community (peer-reviewed publications and conference talks), are not appropriate to disseminate research to policy and decision makers. WP 6 will use a variety of proven non-technical communication means and methods to adapt the project's knowledge output to the evolving needs of the high-level end users through regular interaction with decision makers and to connect with the public through media, open access to research. This multi-faceted approach allows each target audience to be addressed in the most effective manner in order to best engage, exchange and inform.

Task 6.1 Participation at expert groups coordinates the consortium capacity to transfer the latest research into the "policy informing" domain, via consortium partners' participation in the relevant ICES expert groups, consultations via HELCOM and interaction with the relevant environmental stakeholders for the Baltic Region.

During the first year of INSPIRE, there has been a lot of attention to Eastern Baltic cod, because despite positive predictions, the analytical assessment was showing so large inconsistencies, that it could not be used or advice giving. This resulted in one of the most data dense stocks in the world has currently be treated as being 'data-poor'.

First INSPIRE results were presented at the *ICES Workshop on Scoping for Integrated Baltic Cod Assessment* held in Gdynia, Poland, 1-3 October 2014.

In INSPIRE, we used newly available data from an EU financed stomach sampling scheme to investigate, if cod between 30 cm and 40 cm total length are consuming less food nowadays, and if yes, if the difference is a possible cause for stunted growth. We found indications that average meal intensity (number of meal per day if searching for food) increased, but that average daily food consumption decreased by about 35%. Accounting for the food conversion, and cost of activity, the resulting excess energy was only about 20%. This energy excess has to be distributed over somatic growth, and maturation, and is possibly compromised by the increasing degree of infection with parasites.

The results have been further investigated, including all available data and interpreting them spatially explicit, as is the core idea of INSPIRE, within the frame of *ICES Study Group on Spatial Processes in the Baltic*. A possible inclusion of these findings on a more general level into multispecies stock assessment has been discussed at the *ICES Working Group on Multispecies Assessment Methods*.

By the close contact to ICES advisory groups, INSPIRE results can be made available to the stakeholders and interested public almost in real time. The INSPIRE web site has been installed (Del. 6.1) and is updated regularly.

Task 6.2 Public awareness collaborates with the project research authors and ensure that 100% of the postprint versions of the projects` peer-reviewed manuscripts are accessible free of charge via EC FP7 Infrastructures OpenAIRE research repository (www.openaire.eu), boosting access to policy-relevant research, and increasing the visibility of the project and its publications authors. The benefits of Open Access are particularly important to PhD students, early career researchers, members of the interested public and scientists in developing countries. So far, INSPIRE manuscripts have not reached that far, in accordance with the work plan. Also work on the scheduled public science book, due in month 48, has not been stared, yet.

Task 6.3 Training school and concluding symposium conducts a summer school and a concluding symposium together with other, close related BONUS projects.

Under the overarching theme “The Baltic Sea: a model for the global future ocean?”, and using an integrative approach, the BIO-C3/BAMBI/INSPIRE summer school, to be held at GEOMAR in Kiel July 5 to July 11 2015, will address:

- Past, current & future environmental conditions in the marginal habitats of the Baltic Sea.
- Baltic biota under stress by exploitation, environmental fluctuations and global change
- Temporal and spatial trends in species invasions, community structure, biodiversity, and Baltic fish stocks.
- Stress physiology and the potential for evolutionary adaptation.
- The link from new fundamental science to informed resource management promoting sustainability.

In addition to these scheduled activities, INSPIRE is contributing to a theme session at the ICES Annual Science Conference 2015 in Copenhagen (http://www.ices.dk/news-and-events/asc/ASC2015/Pages/Theme-Sessions.aspx).
Together with scientists from the other Bonus projects BIO-C3 and BAMBI, in the theme session wewill consider new knowledge obtained on (1) biodiversity on all levels (e.g. genetic, species, community, habitat and functional), and its links to ecosystem features such as stability and functioning and (2) the spatial and temporal dynamics of species and communities. Although the Baltic Sea is the focal region, we invite contributions from other areas and comparisons between systems, in order to generate a comprehensive overview on existing regulations, knowledge and methodology primarily on the following subject areas:

- patterns of biodiversity at different levels of organisation

- habitat requirements of different life-stages of commercially and ecologically important species and populations.
- coupling between biodiversity, ecosystem functions and ecosystem services,
- evaluation frameworks for assessing and testing indicators for biodiversity (also in a socio-economic context)

3. Deviations from the worklan

There are no deviations from the workplan.

WP7 Management

Lead: Henn Ojaveer, UT-EMI

1. Highlight

Efficient internal communication, systematic contacts with the BONUS Secretariat and continuous monitoring of the progress by the project coordination unit have ensured timely science delivery according to the project workplan.

2. Summary

This WP has five generic objectives:

1. Ensuring that project objectives are achieved on time and within the costs estimated;
2. Co-ordinating all work conducted in the project,
3. Overseeing the task and work-packages,
4. Ensuring the development and production of deliverables, as well as reporting.
5. Ensuring that appropriate levels of communications are maintained among partners in order to achieve expected levels of scientific outputs.

The coordinator will carry out the day to day monitoring and management of the project, ensure co-ordination between the project partners and the circulation of project documents and data, and organize meetings and discussions. Work package leaders will keep the coordinator informed of the ongoing status of work packages. The co-ordinator will be responsible for communications with BONUS. The co-ordinator will organize the kick-off meeting, annual project meetings (incl., and invite and nominate scientists and stakeholder representatives to the advisory board. The co-ordinator will administer a budget for travel and subsistence costs for members of the Advisory Board to attend the project meetings and participate in the project. The co-ordinator will be responsible for financial and management reporting, as required by BONUS and defined in the workplan. The co-ordinator is also responsible for finalising

all the reports, with input from work-package leaders. The final report will have broader dissemination and will circulate among partners prior to dissemination outside the consortium. The co-ordinator will make sure that the final report reflects a consensus of all partners. The co-ordinator will also take responsibility for ensuring that the project results are appropriately disseminated. The co-ordinator will be responsible for the organisation of a concluding symposium.

Task 7.1 Monitoring the project progress
This is a routine activity and achieved through contacts between the project coordinator and manager from one side and partner institute PI's, workpackage leads, fish champions and individual scientists from the other side.

Task 7.2 Internal communication
Project coordination unit (coordinator and manager) has been in a continous contact with partner institute PI's and individual scientists to ensure achieving project aims. This includes, amongst others, contacts with BONUS secretariat to enquire the relevant information needed for partner institutes on rules of operation, internal contacts within the project consortium to identify news items for the BONUS projects central webpage and distribution of funds to partner institutes. Communication has been achieved via various means (physical meetings, e-mailing, Skype conferences, phone calls).

Task 7.3 Financial and management reporting
Multiple communication between the project coordination unit (coordinator and manager) and BONUS Secretariat has occurred to obtain information and become familiar with the reporting requirements and associated formats. The obtained information was synthesised and transferred to INSPIRE partner institute PI's and administrative contacts to ensure meeting BONUS needs for reporting.

Task 7.4 Project meetings
Organising project kick-off meeting with database management workshop (please see the meeting report in Annex 1), the First Integrating Workshop (M8) and two steering commitee meetings (M1, M8).

Task 7.5 Administration of the Advisory Board

Project Advisory Board was established (M2) and also invited to INSPIRE First Integrating workshop (at own cost).

3. Deviations from the worklan

There are no deviations from the workplan.

3. Promoting an effective science-policy interface to ensure optimal take up of research results

INSPIRE strategy is to ensure efficient and timely two-directional communication with stakeholders. In this regard, communication and cooperation with Baltic Sea RAC and ICES is our priority. Baltic Sea RAC representative (Pehr Eriksson) is involved in scientific discussions in INSPIRE and is regularly attending project meetings. In total, INSPIRE scientists have 80 memberships in international stakeholder committees (Annex 2) with the dominating role in fisheries and ecosystem-oriented groups in ICES. In addition, several scientists are performing advisory role at national and international levels (incl. in relation to EU Common Fisheries Policy, Marine Strategy Framework Directive and Multiannual management of Baltic fish stocks). Information on the project aims has been communicated to ICES, BSRAC executive committee and HELCOM ENV-FISH.

4. Collaboration with relevant research programmes and the science communities in the other European sea basins and on international level

Several project partners are involved in international collaboration beyond the Baltic Sea. The nature and framework of the collaboration is varying and spanning from formal long-standing global international reserach networks (such as ‘Oceans Past Initiative’ and ’Indicators for the Seas’) to more regional activities (US LENFEST Fishery Ecosystem Task Force) and attendances of workshops focussing on modeling of ecological systems and ecosystem assessments. In addition, two activities are in the planning/early phase: coopeation with the Ocean Health Index team for producing the Baltic Health Index and cooperation with a pan-European project focusing on flounder (further information is given under 7.5 below).

5. Progress in comparison with the original research and financial plan, and the schedule of deliverables

The project is progressing according to the research plan without any deviations affecting achieving its aims and goals. Three deliverables sceduled to year #1 (D2.1; D6.1 and D7.1) were submitted according to SoD. A few small modifications in the original financial plan have occurred in some partner institutes without implications to the workplan and science delivery.

Underuse of the budget by SU has been caused by a slight delay in activities by this project partner. However the project has picked up momentum in SU and the spending will be increased. LU will submit a revised budget, showing the new activity level for the remaining years of the project.

6. Amendments to the description of work and schedule of deliverables

No changes to the description of work has neither occurred nor expected in coming years. However, there are two slight changes (please see details below) in milestone/deliverables, one already approved/occurred and the other one requested and not yet approved by BONUS secretariat. Both changes, driven from the motivation to increase efficiency of the science in the project in altered external conditions, will not affect planned science delivery, but will increase visibility and impact of the project results essentially in one of the major INSPIRE stakeholders - ICES.

i) Arrange the 2nd Integrating workshop (originally scheduled to M12) and Project annual meeting (originally scheduled to M15) back to back in M13 (i.e., February 2015). Request was approved by the BONUS Secretariat;

ii) Shift timing of the 3rd Integrating workshop (originally scheduled to M18) to M20 (i.e., September 2015), essentially due to acceptance of BONUS Theme Session at ICES ASC and changed situation with the eastern Baltic cod assessment). Request accepted by the BONUS Secretariat on March, 18th.

7. Performance statistics

The information below is given by project partners by using institional short names as indicated on page 4 above.

7.1. Number of times the project has contributed significantly to the development and implementation of 'fit-to-purpose' regulations, policies and management practices on international, European, the Baltic Sea region or national level aimed at safeguarding the sustainable use of ecosystem's goods and services

UT-EMI

Review of the ICES management options on Baltic Sea fish stocks for 2015 in order to advice the European Commission implementing the EU Common Fisheries Policy – 1 (2014-06_STECF 14-10 - BALTIC ADVICE for 2015_JRC90504.pdf)

Analysis of effort allocation in European fisheries in the Baltic Sea in order to advice the European Commission implementing the EU Common Fisheries Policy – 1 (STECF 2014-12 Evaluation of Fishing Effort Regimes - p2_JRC93183.pdf)

Advisory servicies for the Estonian Ministry of Environment on fisheries management options in the Baltic Sea (EU Common Fisheries Policy).

Contribution to the national process of MSFD to propose monitoring scheme and start to develop program of measures.

MIR-PIB

Attendance of the meeting at EC discussing the Multiannual plan for the Baltic Sea fisheries (by Jan Horbowy)

BIOR

Participation in national and international (BaltFish) meetings on fishing possibilities in the Baltic Sea. Important component of these meeting have been proposing management options of fishing effort distribution in the Baltic Sea in pelagic fisheries that is closely connected with the INSPIRE objective to elaborate a spatially explicit advice for ecosystem-based fisheries management.

7.2. Number of suggestions for designing, implementing and evaluating the efficacy of relevant public policies and governance on international, European, the Baltic Sea region or national level originating from the work of the project.

BIOR

National discussion on the fishing possibilities in 2015, distribution of the fishing effort in pelagic fisheries

7.3. Number of times the scientists working in the project have served as members or observers in stakeholder committees, e.g. EC, HELCOM, VASAB, ICES etc.

The relevant detailed information on all partners is summarised in Annex 2.

7.4. Number of international, national and regional stakeholder events organised by the project

None

7.5. Number of joint events/co-operation activities/partnerships of the project with non-Baltic research actors and other European marine basins

UT-EMI

Partnership within the global research network ‘Oceans Past Initiative’ (OPI, www.oceanspast.net) and the EU COST Action ‘Oceans Past Platform’ (OPP).

Participation in the global science initiative 'Indicators for the Seas, (IndiSeas)

DTU-AQUA

Participation in the the 3rd NMFS National Ecosystem Modeling Workshop helt by NOAA in Seattle, WA, USA. The workshop was focused on ensemble modelling of ecological systems, and Stefan Neuenfeldt was invited to present some of the INSPIRE concepts to NOAA scientists.

Particiaption in Knowledge Based Bio-Economy (KBBE) workshop on MICE models, multispecies models, and harvest strategies for lowinformation stocks in Wellington, NZ. The workshop was focused on Models of Intermediate Complexity for Ecosystem assessments, and Stefan Neuenfeldt was invited to present the modelling strategy in INSPIRE in relation to identification of potential target levels for Central Baltic Sea fishing mortalities taking species interactions and spatial overlap into account.

SU

Pan-Baltic regional study on the Baltic Health Index (BHI), scientifically led by Thorsten Blenckner was initiated, where INSPIRE is also expected to contribute. It involves also cooperation from outside the Baltic Sea - Ben Halpern and the Ocean Helth Index team.

UHAM

Christian Möllmann is member of and has participated in **2 meetings** of the LENFEST Fishery Ecosystem Task Force lead by Tim Essington and Phil Levin. The Task Force develops Ecosystem Management Plans for the US. Christian Möllmann is the selected European expert.

UU

Co-operation with Pedro Morais, Portugal in a planned pan-European project „Causes and mechanisms explaining fish life history plasticity" focusing on flounder. Otoliths (for trace element analysis) and tissue samples (genetical analysis) from flounder from the Baltic will be included in the comparison.

7.6. Number of persons and working days spent by foreign scientists on research vessels participating in the cruises arranged by the project

None

7.7. Number of persons and working days spent by foreign scientists using other major research

None

7.8. Number of peer-reviewed publications arising from the project research with authors from, at least, two different participating states

None

7.9. Number of entries to existing openly accessible common databases, storing original data from the entire Baltic Sea system or larger geographical area

UT-EMI

Entry of the Gulf of Riga larval herring data (2004-2013) into ICES ichtyoplankton database

UT-EMI, DTU-AQUA and BIOR

Assembling pan-Baltic zooplantkon database (joint activity with BIO-C3; see http://kodu.ut.ee/~riina82/index.html). The metadatabase is under preparation abd will be uploaded to the website as soon as ready.

MIR-PIB

Entry of data (2) to the Baltic International Trawl Survey (BITS) database

LUKE

Entry of data into Baltic International fish Survey (BIFS) and BITS databases

7.10. Number of popular science papers produced by the project

None

7.11. Number of interviews to media given by the members of the project's consortium

MIR-PIB

Interview to Polish TV by Jan Horbovy (September 2014)

SLU

Michele Casini, phone interview, 16-09-2014. Radio Germany: Current Research, “Fishery-induced changes in fish population structure, with Baltic Sea focus”.

Ann-Britt Florin, 10-05-2014, Gotlands Allehanda – local Swedish newspaper, ”Fiskar efter svar om östersjöns arter” (Fishing after answers about Baltic species).

UU

Anders Nissling, local radio (Radio Gotland), Sweden, January 2015 (topic: saline water inflow & potential effects on fish stocks)

7.12. Number of multi-media products and TV episodes produced by the project with dissemination purpose

None

7.13. Number of other international, national and regional communication, dissemination and public outreach initiatives to disseminate the project's research results

UT-EMI

Ojaveer, H. 2014. BONUS INSPIRE: Integrating spatial processes into ecosystem models for sustainable utilization of fish resources. Written communication to HELCOM FISH-ENV 10-2014.

Ojaveer, H. et al. 2014. Integrating spatial processes into ecosystem models for sustainable utilization of fish resources. Poster presentation at ICES ASC.

Ojaveer, H. 2014. Integrating spatial processes into ecosystem models for sustainable utilisation of fish resources. Baltic Maritime Spatial Planning Forum. 17-18. June 2014, Riga, Latvia.

Arula, T., Ojaveer, H. 2014. Can we predict Baltic spring spawning herring *Clupea harengus membras* recruitment form larval abundance? EU FP7 project VECTORS Final Meeting in La Grande Motte (France) in 17-21 November 2014. Poster presentation.

7.14. Number of post graduate courses organised by the project and persons participating

None

7.15. Number of mobility activities (persons, visit days) from the project to the other BONUS projects

UT-EMI

Participation in BONUS BIO-C3 work: meetings and initiation of joint activities: Baltic Sea zooplankton study (http://kodu.ut.ee/~riina82/) and BONUS Theme Session at ICES ASC 2015 (http://www.ices.dk/news-and-events/asc/ASC2015/Pages/Theme-Sessions.aspx).

MIR-PIB

Participation (A. Luzeńczyk) at BIO-C3 kick-off meeting.

UU

Anders Nissling participated on a survey with R/V Alkor & provided Jan Dierking (BIO-C3) with flounder samples for isotope analysis.

7.16. Number of PhD students and the number of post-docs funded by the project as well as the number of doctoral thesis defended

SU

One post doc (Susa Niiranen) started in SU in 2014

SLU

One PhD student (Alessandro Orio) started in SLU in 2014

BIOR

One PhD student (Ivars Putnis) is a part-time participant and one Post doc (Didzis Ustups) started in INSPIRE project

TI-OF

One PhD student (Dorothee Moll) started in TI-OF in 2014

UHAM

One Post doc (Klas Ove Möller) and one PhD student (Muriel Kroll) started in UHAM in 2014

GEOMAR

One PhD student (Katharina Höflich) started in GEOMAR in 2014

8. Distribution of the project 's research staff and research organisations involved by age class, seniority and gender

Research staff	PhD students		Post-docs		Assisstants		Associate proffessors and equivalent		Full profes-sors	
Age	Men	Female	Men	Female	Men	Female	Men	Female	Men	Female
≤24	0	0	0	0	1	0	0	0	0	0
25-49	5	3	1	5	7	7	6	9	1	3
50-64	0	0	0	1	2	4	3	7	0	4
≥65	0	0	0	0	0	2	0	0	0	0

Annex 1 to the project annual report

Integrating spatial processes into ecosystem models for sustainable utilization of fish resources (INSPIRE)

Kick-off meeting report

25-28 February 2014

Tallinn , Estonia

Agenda item #1: Arrival and registration

Kick-off meeting of the BONUS INSPIRE project was held in Tallinn, Estonia during 25-28. February 2015. The meeting was hosted by the Ministry of Environment. The meeting agenda can be found in Annex 1. The meeting was physically attended by 25 participants from all but one project partners (Annex 2). In addition, Karin Limburg participated over Skype.

Agenda item #2: Welcome and housekeeping

The project coordinator (Henn Ojaveer) welcomed meeting participants. Project manager (Marge Simo) introduced houskeeping rules.

Agenda item #3: General presentation of INSPIRE

The project coordinator gave presentation on the project, by introducing objectives, structure and general workplan.

Agenda item #4: Planning of Deliverables and Milestones

Discussion of work distribution by project partners per deliverable was one the most important agenda items of the meeting. The created table reflects the distribution of work per deliverable on partner/personal level. The information is used to map the responsibilities within the project.

Agenda item #5: Welcome by the Ministry of Environment

The vice-chancellor of the Ministry of Environment of Estonia, Mr. Marku Lamp, wished every success to the project. He explicitly indicated interest of the Ministry of Environment for the project results for consideration of further applications to improve management practices of the Baltic commercial fish stocks.

Agenda item #6: Database workshop

The workshop was led by Neil Holdsworth, the head of the ICES Data Center and data adviser to the INSPIRE project. Neil gave introductory presentation related to ICES Data Center and INSPIRE and led discussion on data collection, transformation and management. The following provides decisions made on the activities and

timescales. The information provided below will serve as a background information with an ultimate aim to deliver INSPIRE data into ICES database.

Data collection

1. What data types are you expecting to collect within the INSPIRE project?

✓ Trawl survey (INSPIRE 2 specific survey dataset, different gears, locations) – DATRAS database

✓ Historical trawl surveys, also in DATRAS format but additional survey datasets

✓ Fish stomachs, Egg/Larvae – (ICES data formats probably OK)

✓ CTD's (Hydrographic) , profiles? Oceanographic database? Or just use standard trawl survey fields

✓ Additional environmental variables (% coverage, substrate type, *seal damage on fish*?)

✓ Historical commercial datasets (RDB or InterCatch format??)

✓ Biological tagging – new dataset type (No established format, would need to look at this)

✓ *Genetic material/otolith chemistry?*

2. Do you expect to collect new datatypes i.e. data that there are no established methodologies/formats for?

✓ All datatypes are 'established' in some form or another, not necessarily at ICES though

3. Will the data be collected from existing platforms/vessels etc?

✓ Yes – all known

4. Will the data be collected as part of existing data collections/surveys/programmes?

✓ Partly, for trawl surveys it is largely based on existing methods etc. But not part of DCF, or RSC programmes

5. Will the data also be hosted at the institutes collecting the data?

✓ Yes, will be part of national/institute data systems

Data transformation

1. What data product types will be generated from the data (maps, time series, indicators etc)?

✓ Catch effort in spatial dimension, over time (as maps and time series)

✓ Hydrographic/Environment used in model simulation + other hydrographic data from existing sources

2. Where would the data products reside/be available?

✓ Published as paper reports, add products to ICES Geonetwork

3. Will methodologies be available/published that allow recreation of the products from the dataset collections?

✓ Published as part of INSPIRE reports

Data management: general

1. Will INSPIRE adopt existing codings/vocabularies to describe the datatypes? If yes, will these need to be expanded/adapted?

✓ Largely agree to use existing i.e vocab.ices.dk, DATRAS lists etc. and extend with additional values

2. Is there a clear understanding in the project contract about the ownership/rights of new data collected?

✓ In consortium agreement (partner institutes are data owners)

3. Is there a restriction on public access i.e. moratorium, primary data vs products?

✓ Working database will contain all data
✓ What is available to the ICES datasets will be the 'public' data, according to ICES data policy
✓ *BONUS citation of data collected under this project*

Data management: timings

Jan 2015

✓ *Biological tagging – new dataset type (No established format, would need to look at this)*

Mar 2015

✓ *Trawl survey (INSPIRE 2 specific survey dataset, different gears, locations) – DATRAS database*
✓ *CTD's (Hydrographic) , profiles? Oceanographic database? Or just use standard trawl survey fields*

Jan 2016

✓ Historical trawl surveys, also in DATRAS format but additional survey datasets
✓ *Historical commercial datasets (RDB or InterCatch format??)*

Late 2015

✓ *Fish stomachs, Egg/Larvae – (ICES data formats probably ok)*
✓ *Additional environmental variables (% coverage, substrate type, seal damage on fish?)*

Genetic material/otolith chemistry – to be discussed further and greed.

Agenda item 7: Planning field surveys and other M1-M12 joint activities

To facilitate some of the interdisciplinary work in the project, Karin Limburg joined the meeting over Skype and gave a presentation on *'How can otolith chemistry bring INSPIR(e)ATION to our project?'*.

Further work was arranged in five sub-groups as agreed during the meeting. The sub-group short reports/summaries are found below.

1. Sub-group on 'Survey Data'

Participants: **Ann-Britt Florin**, Karin Hüssy, Didzis Ustups, Anders Lehmann, Patrick Polte, Michele Casini, Dorothee Moll, Anna Luzenczyk, Redik Eschbaum, Ulf Bergström

The group focussed on the upcoming gillnet survey for cod & flounder and started to remind itself what is the purpose of the survey (Why?), in order to best identify what should be sampled and how. The main objectives for the surveys was identified as: 1) Habitat modelling of cod and flounder; 2) stock identification of flounder, 3) recruitment index for cod and 4) growth and nursery habitat quality (prey selection) of cod.

The second discussion point was what should be sampled and it was divded in two categories: Habitat variables and Fish data. The habitat variabkes was identified to be: depth, temperature, salinity, oxygen, secchi depth and substrate&vegetation. It was decided that the last items should be collected by video footage only.

For sampling of fishdata there was a discussion on what to do with non-target species.I it was deemed desirable to get information from all species caught (total number caught, weigth caught, lengthdistribution) for habitat modelling purposes but also future use. However this desire could not be allowed to risk the overall goal of the survey to get data on adult flounder and juvenile cod. Therefore it was decided to adopt a subsample proceedure for non-target species to ensure that not too much time would be spent measuring non-target species while still gathering as much data as possible.

There was also concerns raised regarding collecting of individual fish data such as otoliths. Adopting a sampling strategy of 10 indivulas/cm group per fishing station could, assuming 25 lengthgroups , result in 6 250 flounder otoilths per transect. It was decided that the subsampling needed to be looked over to get a managable number of otoliths.

The antipaticipating of long travelling time between fishingstations togehter with the intense sampling scheme made the group to decide to adjust the previously suggsted HELCOM standard for setting and lifting nets to allow for longer working days.

2. Sub-group on 'Tagging database'

Participants: **Christian Möllmann**, Eero Aro, Stefan Neuenfeldt, Georgs Kornilovs

Purpose: Produce net migration estimates be contrasted with modelling e.g. from BALMAR model

Treat the historical data quantitatively (Diffusion process) → paper

Identify as special case emigration from the Bornholm Basin to the Arkona Basin (DST) and historical data combined, indentify candidate conditions→ paper.

Remember to record length and weight data for release-recaptures for growth modelling.

Tagging database:

Historical data from Eero, only those which already are computerized? No! So use the opportunity to computerize written data, but for the deliverbale use existing computerized data only.

➔ Produce overview, period, area, species, number of tags, number of recaptures, specify data format
➔ (C. Möllmann and S. Neuenfeldt to discuss)
➔ Check Ole Bagges tagging journals
➔ Make an overview, mail to the institutes (G. Kornilovs data on cod and flounder; E. Aro cod 74-84, Bagge's journals, check with Jan and Kris if there are data in Gdynia, E. Aro: flounder 1975 to 1988)

NB: consider call for tender for new tagging programme.

Data storage tags:

➔ Same overview as above
➔ Raw data
➔ Geolocations incl. uncertainty

3. Sub-group on 'Tracking eggs and larvae'

Participants: **Hans-Harald Hinrichsen**, Andreas Lehmann, Karin Hüssy, Anders Nissling, Didzis Ustups, Ulf Bergström

Objective: Analyses of connectivity patterns of fish early life stages spawned in offshore habitats in relation to natural drivers

General work description: Connectivity patterns and processes will be analysed using a variety of methodologies including coupled biophysical modelling and field studies, focusing on Eastern Baltic cod and flounder. Connectivity will be evaluated for present and scenario conditions of different drivers. GEOMAR will perform long-term drift model runs to investigate the connectivity patterns of the above mentioned species in relation to oceanographic circulation, to different spatially resolved initial spawning and hatching grounds as well as related to specific biological traits.

Basis: 44-years (1970-2013) model run of **BSIOM** (Kiel Baltic Sea Ice Ocean Model), horizontal resolution 2.5 km, 60 vertical levels, entire Baltic Sea including Kattegat and Skagerrak

Variables: 3d-temperatur, 3d-salinity, 3d-oxygen, 3d-current field, daily averages

Lagrangian particle tracking model: Drifters will be launched at positions representing spawning and/or hatching areas of cod and flounder within the model domain, drifters experience the model environment at any time and position. Drifters can be flagged to stop drifting or to be removed, or any other action can be specified.

Cod drifting experiments:

information already available:

areas: SD 24, SD 25, SD 26, SD 28
spawning time: all year (March-September)
egg habitat suitability: > 11 PSU, > 1.5°C, >2ml/l
egg drift duration: dependent on temperature-related development
vertical distribution: buoyancy level for eggs (> 11 PSU)

Larval drift duration: about 90 days, last xx days of larvae drift will be checked for suitable oxygen conditons for settlement
Vertical larval distribution: discrete depth levels for larvae and juveniles

Flounder drifting experiments:

necessary information will be provided mainly by Anders Nissling and Disdiz Ustups

areas: SD 24, SD 25, SD 26, SD 28
spawning time: March/April-July (earlier to the west and south)
egg habitat suitability: > 10.6 PSU, > 1 ml/l
vertical distribution: buoyancy level for eggs (> 10.6 PSU)
drift duration eggs: about 7 days

vertical distribution larvae: discrete depth levels for larvae and juveniles
Larval drift duration: 120 days, until metamorphosis
Settlement (survival) probability in shallow waters (< 10m)

Additionally experiments:
Drift experiment for coastal spawners: Coastal release locations will be provided from Anders Nissling

4. Sub-group on 'Herring recruitment'

Participants: **Patrick Polte**, Christian Möllmann, Tiit Raid, Dorothee Moll, Georgs Kornilovs, Timo Arula, Michele Casini, Henn Ojaveer, Ulf Bergström

Based on results of the workshop on herring spawning ground distributions held 2008 in Öregrund and a couple of recent publications on the spawning ecology of Baltic herring. The group decided to revisit historical knowledge and review papers (e.g. Parmanne et al. 1994).

There was great enthusiasm amog participants to collect knowledge (also from Russian literature) and incorporate it into a new review paper on herring early life stage ecology. It was agreed to initiate efforst and create a list of contents based on a work in progress by the group of Michele Casini at SLU. A major aim of this effort is to identify crucial knowledge gaps that then could be addressed by joined experiments (field/lab) and result in a complementary list of environmental drivers and stressors for herring reproduction success which could then be implemented into hierachical models including habitat characteristics and anthropogenic impacts. In this context some specific questions did arise that could be focused on in further efforts. On a spatial level it was considered unclear why larval indices derived from some Baltic Sea areas are useful as stock assessment instruments whereas they fail in this respect in other areas (for other stocks). Another question focused on discrepancies to affiliate autumn and spring spawning herring to certain populations. Does autumn spawning just represent an individual delay of the spawning season or are autumn spawners genetically distinct? Concerning spawning strategies of Baltic Sea herring: How do they it differ from e.g. North Sea stocks and do different strategies imply an entirely different suite of environmental variables affecting reproduction success?

5. Sub-group on 'Small scale work'

Participants: **Stefan Neuenfeldt**, Anders Nilsson, Michele Casini, Georgs Kornilovs, Karin Hüssy

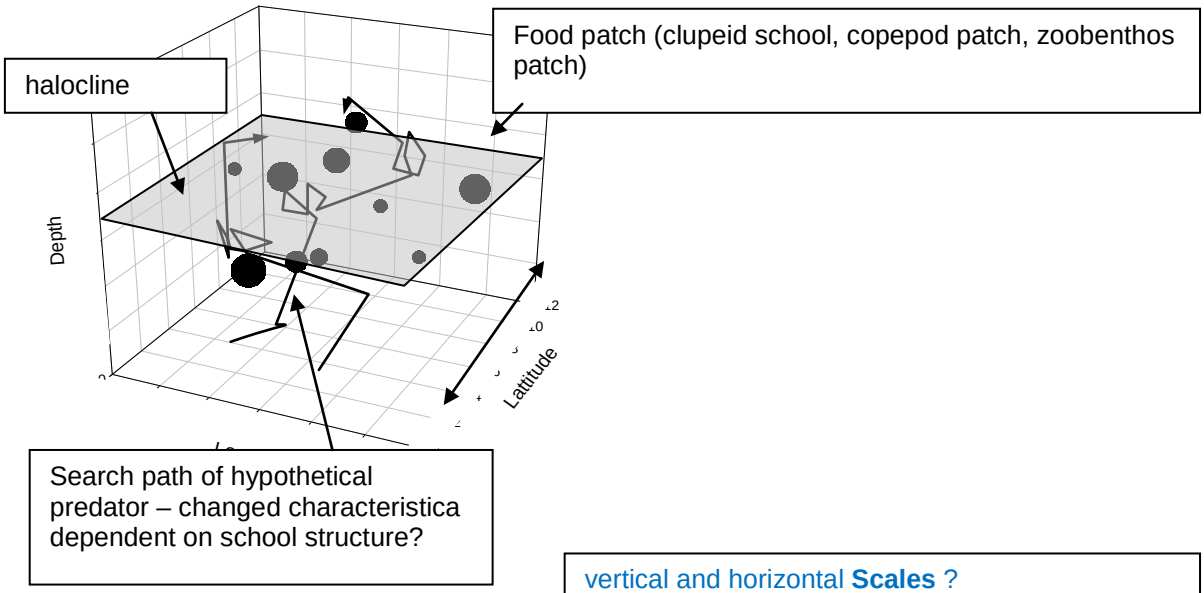
None of the presently applied ecosystem and multispecies models in the Baltic is presently able to convincingly predict stomach content data. In SMS, the stomach data are so much down-weighted in estimated log-likelihood, that they de facto are not used to predict abundances and biomasses. The ultimate goal of this part of INSPIRE is, to develop a new foraging/preference model that can predict the predator diet composition, and can be integrated into existing multispecies and ecosystem models.

Purpose:

In INSPIRE, data on predator (cod) and prey (herring, sprat, zoobenthos, zooplankton) are collected, and we will try to get with the stomach modelling as far as we can. This includes:

- Produce database on small scale distributions, with focus on cod and sprat, but as far as possible also for herring, zoobenthos and zooplankton. → database
- Modelling different foraging strategies using realistic prey distributions→ paper
- Modelling stomach content data (prey field) →paper
- Scaling functional responses of individuals on the population level →paper

Small-scale distributions database:



Schmematic drawing of a possible small scale setup. Vertical and horizontal scales are in meters. The small scale sampling has as purpose to quantify distributions (probability densities) of school size (diameter or height), horizontal distance between schools [m]. The sampling at different locations has as a purpose to measure, if the pdf's depend on regional biomasses and hydrography (especially oxygen stratification). The same (or similar) parameters describing patch dimensions and distribution in space (and time) will, if possible, be collected for zoobenthos and zooplankton.

The data will be collected on a dedicated cruise with RV Alkor in 2015, but also all available historical (acoustic) raw data, stomach data and data storage date will be assembled.

Modelling:

1. The stomach data will as a starting point be used to investigate, if there are periods during the data which serve as predation time windows, especially the periods of schools formation and dissolution. This will be done before the 2015 cruise in order to focus the sampling.

2. Subsequently, data from 12 000 individually sampled stomachs and additional from the new stomach tender will be used to analyse feeding frequency and stochastic characteristics of meals for comparison with the observed prey distributional parameters, that is modelled encounter probabilities, given known movement parameters of cod and activity from data storage tags together with the observed prey distributions. The results will be a stochastically formulated individual-based functional response.

3. The, we will use scale transition theory to scale the individual-based functional response to regional or population level.

4. Finally, the resulting population level feeding model/functional reponse will be integrated into the current Eastern Baltic multi-species model.

In INSPIRE, focus will be on the database and bullet points 1 to 3.

Agenda item #8: Information from BONUS EEIG

BONUS EEIG project manager Andris Andrushaitis gave presentation on BONUS programme and described some specific issues of project management and reporting. He also answered to several questions from the meeting participants.

Agenda item #9: Planning the first Milestones and Deliverables

The core of the discussion was devoted to project integrating workshops, as it was thought that these are key elements securing success of the project. The discussion/decisions summary can be found below.

Workshop	Actions
WS1 (M8)	• Database issues (Deliverables 1.1 and 2.1); • Cod and flatfish fieldworks review (what did or did not function); • Links to stock assessment work (WP4); • Transport of eggs and larvae (Deliverable 2.2) • How to model maps and simulating spatial distributions; • Involve Neil Holdsworth for database issues and Mark Dickey-Collas for general discussion; • Potential meeting with the advisory board members; **Suggested leads Michele Casini and Christian Möllmann** To have the at the ICES ASC meeting in La Coruna and present INSPIRE project as poster
WS2 (M12) M13?	• Update on surveys, now with second survey concluded; • Discuss usage of survey data to model distributions and overlaps; • Initiate analyses on migrations (link to WP2); • Planning for WP3 **Suggested leads Christian Möllmann and Patrick Polte** Hamburg is offered as meeting location or with WGIAB?
WS3 (M17) M30	• Focus on making assessments which are due in M36; **Suggested lead Jan Horbovy**
WS4 (M39)	• Synthesis (big papers) **Suggested leads Stefan Neuenfeldt and Henn Ojaveer**

Agenda item #10: Wrap up and adjourn

The project coordinator thanked the meeting participants for their active contribution during the meeting and wished safe travels to home

List of Annexes:

Annex 1. Meeting agenda

Annex 2. List of participants

Annex 1

Agenda of the kick-off meeting of BONUS INSPIRE

Venue: Ministry of Environment, Narva Rd. 7a, Tallinn

Tuesday, 25. February

12:00-13:00	**Agenda item #1**: Arrival and registration (with coffee and tea)
13:00-13:30	**Agenda item #2:** Welcome and housekeeping
13:30-14:00	**Agenda item #3:** General presentation of INSPIRE (Henn Ojaveer)
14:00-17:00	**Agenda item #4:** Planning of Deliverables and Milestones (Stefan Neuenfeldt)

Wednesday, 26. February

09:00-09:10	**Agenda item #5:** Welcome by the Ministry of Environment
09:10-12:00	**Agenda item #4 cont.-d**
12:00-13:00	*Lunch*
13:00-16:00	**Agenda item #4 cont.-d**
16:00-18:00	*INSPIRE SC meeting*
19:00-21:00	*Joint dinner*

Thursday, 27. February

09:00-12:00	**Agenda item #6:** Database workshop (Neil Holdsworth)
12:00-13:00	*Lunch*
13:00-17:00	**Agenda item #7:** Planning field surveys and other M1-M12 joint activities. Work in sub-groups, if needed.

Friday, 28. February

09:00-10:00	**Agenda item #8:** Information from BONUS EEIG (Andris Andrushaitis)
10:00-11:30	**Agenda item #9:** Planning the first Milestones and Deliverables (M1-M12; Henn)
11:30-12:00	**Agenda item #10:** Wrap up and adjourn

Annex 2

List of meeting participants

No	**Name**	**Organisation**	**e-mail**
1	Henn Ojaveer	UT-EMI	henn.ojaveer@ut.ee
2	Marge Simo	UT-EMI	marge.simo@ut.ee
3	Redik Eschbaum	UT-EMI	redik.eschbaum@ut.ee
4	Tiit Raid	UT-EMI	tiit.raid@ut.ee
5	Timo Arula	UT-EMI	timo.arula@ut.ee
6	Stefan Neuenfeldt	DTU-AQUA	stn@aqua.dtu.dk
7	Christian Möllmann	UHAM	christian.moellmann@uni-hamburg.de
8	Pehr Eriksson	Baltic Sea RAC	pehr.e.eriksson@telia.com
9	Andris Andrusaitis	BONUS	andris.andrusaitis@bonuseeig.fi
10	Neil Holdsworth	ICES	NeilH@ices.dk
11	Michelle Casini	SLU	michele.casini@slu.se
12	Ulf Bergström	SLU	ulf.bergstrom@slu.se
13	Ann-Britt Florin	SLU	ann-britt.florin@slu.se
14	Eero Aro	FGFRI	Eero.Aro@rktl.fi
15	Hans-Harald Hinrichsen	GEOMAR	hhinrichsen@geomar.de
16	Andreas Lehmann	GEOMAR	alehmann@geomar.de
17	Karin Hüssy	DTU-AQUA	kh@aqua.dtu.dk
18	Anders Nilsson	LU	anders.nilsson@biol.lu.se
19	Georgs Kornilovs	BIOR	Georgs.Kornilovs@bior.gov.lv
20	Didzis Ustups	BIOR	dizdis.ustups@bior.gov.lv
21	Anders Nissling	UU	anders.nissling@hgo.se
22	Jan Horbowy	MIR-PIB	jhorbowy@mir.gdynia.pl
23	Anna Luzenczyk	MIR-PIB	aluzenczyk@mir.gdynia.pl
24	Patrick Polte	TI-OF	patrick.polte@ti.bund.de
25	Dorothee Moll	TI-OF	dorothee.moll@ti.bund.de

Annex 2 to the project annual report

Information on participation of INSPIRE scientists in stakeholder committees

No	Last name	First name	Affiliation short	Committee
1	Arula	Timo	UT-EMI	ICES WGBFAS
2	Arula	Timo	UT-EMI	ICES WGALES
3	Eschbaum	Redik	UT-EMI	ICES/OSPAR WG on seabirds
4	Raid	Tiit	UT-EMI	ICES WGBFAS
5	Raid	Tiit	UT-EMI	ICESWGBIFS
6	Ojaveer	Henn	UT-EMI	ICES SCICOM
7	Ojaveer	Henn	UT-EMI	ICES WGBIODIV
8	Ojaveer	Henn	UT-EMI	ICES WGIAB
9	Ojaveer	Henn	UT-EMI	ICES WGCOMEDA
10	Ojaveer	Henn	UT-EMI	ICES WGHIST
11	Neuenfeldt	Stefan	DTU Aqua	ICES WGIAB
12	Neuenfeldt	Stefan	DTU Aqua	ICES WKSIBCA
13	Neuenfeldt	Stefan	DTU Aqua	ICES SGSPATIAL
14	Neuenfeldt	Stefan	DTU Aqua	ICES WGSAM
15	Hüssy	Karin	DTU Aqua	ICES WKSIBCA
16	Eero	Margit	DTU Aqua	ICES WKSIBCA
17	Eero	Margit	DTU Aqua	ICES WGIAB
18	Eero	Margit	DTU Aqua	ICES WGBFAS
19	Horbowy	Jan	MIR-PIB	ICES WGBFAS
20	Horbowy	Jan	MIR-PIB	ICES ACOM
21	Luzeńczyk	Anna	MIR-PIB	ICES WGBFAS
22	Radtke	Krzysztof	MIR-PIB	ICES WGBFAS
23	Radtke	Krzysztof	MIR-PIB	ICES WGBIFS
24	Podolska	Magdalena	MIR-PIB	ICES WGPDMO
25	Blenckner	Thorsten	SU	ICES WGIAB
26	Kinninmouth	Stuart	SU	ICES WGSPATIAL
27	Niiranen	Susa	SU	ICES WGSPATIAL
28	Casini	Michele	SLU	ICES SGSPATIAL
29	Casini	Michele	SLU	ICES WGBFAS
30	Casini	Michele	SLU	ICES ADGBS
31	Casini	Michele	SLU	HELCOM CORESET II
32	Casini	Michele	SLU	ICES WKSIBCA
33	Florin	Ann-Britt	SLU	ICES WGBFAS
34	Florin	Ann-Britt	SLU	ICES SIMWG
35	Florin	Ann-Britt	SLU	ICES WGITMO
36	Florin	Ann-Britt	SLU	HELCOM CORESET II
37	Florin	Ann-Britt	SLU	OSPAR COBAM
38	Bergström	Ulf	SLU	ICES WGVHES
39	Bergström	Ulf	SLU	ICES SGSPATIAL
40	Bartolino	Valerio	SLU	ICES SGSPATIAL

41	Kornilovs	Georgs	BIOR	ICES WKBALCOD
42	Kornilovs	Georgs	BIOR	ICES WGBFAS
43	Ustups	Didzis	BIOR	ICES WGBFAS
44	Ustups	Didzis	BIOR	ICES WGIAB
45	Putnis	Ivars	BIOR	ICES WGIAB
46	Makarcuks	Andrejs	BIOR	ICES WGALES
47	Svecovs	Fausts	BIOR	ICES WGBIFS
48	Strods	Guntars	BIOR	ICES WGBIFS
49	Polte	Patrick	TI-OF	ICES WGALES
50	Polte	Patrick	TI-OF	ICES WGIPS
51	Möllmann	Christian	UHAM	ICES/HELCOM WGIAB
52	Möllmann	Christian	UHAM	ICES WGCOMEDA
53	Möllmann	Christian	UHAM	Lenfest Ecosystem Fishery Task Force
54	Möllmann	Christian	UHAM	Uni Stockholm DEMO
55	Peck	Myron	UHAM	WGIPEM
56	Möller	Klas	UHAM	WGZE
57	Aro	Eero	Luke	ICES Finnish delegate
58	Aro	Eero	Luke	ICES ACOM
59	Aro	Eero	Luke	ICES WGBFAS
60	Aro	Eero	Luke	ICES WGBIFS
61	Aro	Eero	Luke	ICES WGIAB
62	Aro	Eero	Luke	ICES WGSAM
63	Aro	Eero	Luke	ICES SGSPATIAL
64	Aro	Eero	Luke	NMR AG-Fisk
65	Aro	Eero	Luke	NMR EK-FJLS
66	Kallasvuo	Meri	Luke	ICES SGSPATIAL
67	Pönni	Jukka	Luke	ICES WGBFAS
68	Pönni	Jukka	Luke	ICES WGBIFS
69	Pönni	Jukka	Luke	ICES PGCCDBS
70	Pönni	Jukka	Luke	ICES WKPELA
71	Raitaniemi	Jari	Luke	ICES ADGBS
72	Raitaniemi	Jari	Luke	ICES ADGHERMA
73	Raitaniemi	Jari	Luke	ICES WGBFAS
74	Raitaniemi	Jari	Luke	ICES WGECO
75	Raitaniemi	Jari	Luke	ICES PGCCDBS
76	Raitaniemi	Jari	Luke	ICES WKNARC
77	Raitaniemi	Jari	Luke	ICES WKNARC
78	Raitaniemi	Jari	Luke	ICES WKGMSFDD3-II
79	Raitaniemi	Jari	Luke	ASCOBANS Bycatch WG
80	Nilsson	Anders	LU	ICES Resource Manager