

# ICES SGCBNS REPORT 2012

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## Report of the Study Group Climate related Benthic Processes in the North Sea (SGCBNS)

26–29 October 2012

Plymouth, UK



**ICES**

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## Executive summary

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The Study Group on Climate related Benthic processes in the North Sea (SGCBNS) was initiated by the ICES Benthos Ecology Working Group (BEWG) as a follow up initiative of the former North Sea Benthos Surveys (NSBS 1986; NSBP 2000). The aim was to facilitate future research activities concerning benthic ecosystem processes related to climate change and to establish a network of benthic long-term series. This year the chairs of the SG organized the annual meeting in November at Plymouth Marine Laboratory, UK.

The main objectives of the SG were to study benthic ecosystem processes and to facilitate future research on this topic. These objectives were addressed by initiating two case studies on spatio-temporal patterns of bioturbation, representing a key ecosystem process in benthic environments, and to establish and further develop the Benthic long-term series network (BELTS net) in collaboration with the Benthos Ecology Working Group (BEWG). Three papers were initiated (one paper submitted) during the course of the SG and an extensive compilation of bioturbation trait metrics of 1 042 benthic species was conducted, which will be available for the scientific community.

During this year's SG meeting, the establishment and promotion of BELTSnet was discussed (Tor a). BELTS net is a platform to allow joint analyses of marine benthic long-term series by collaborative work of scientists. Johan Craeymeersch is the chair of BELTS net initiative. A draft presentation provided by Hans Hillewaert (ILVO) containing the lay-out of the website was presented and a discussion for the dissemination of the network was also covered during the meeting.

During the SG meeting also the production of a methods paper to report on the current metric used to enable the calculation of benthic bioturbation (e.g. bioturbation potential- BPC) was compiled (Paper: *Bioturbation classification of European marine infaunal invertebrates*; submitted to *Ecology and Evolution*).

The second aim of the meeting was to continue with final analysis of the work initiated in 2011 for case study 1 (Paper: *Assessment of the fine scale temporal variability in coastal sediment bioturbation*; Tor b). The preliminary results showed a high seasonal variability of bioturbation potential with maxima in the summer month in most study areas. All of the outstanding analyses were conducted at the meeting and a final draft is in preparation at present. The group agreed to submit this work to *Global Ecology and Biogeography* in the second half of 2013.

The third aim was to progress work for case study 2 (Paper: *Spatial variation in BPC and vulnerability of ecosystem functioning in the North Sea*; Tor c). The dataset of the ICES North Sea Benthos Project 2000 (NSBP 2000) will be used for this purpose. These datasets were extracted during the meeting and a compilation of additional information needed for the analyses was initiated, i.e. the update of the master species list with bioturbation categories and the compilation of macrofauna data to calculate the mean individual weights of species. First analyses and drafting of a CS2 manuscript will be continued intersessionally and reported at the ICES BEWG in April 2013 at La Coruña.

## **1 Opening of the meeting**

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The chairs of the workshop, Silvana Birchenough and Henning Reiss, opened the session (26 October at 12.30) and welcomed all the participants. A total of 7 participants from 3 countries, Belgium, UK and Norway were present (see details provided in Annex 1). The group members Julie Bremner, Jasmin Godbold, Alicia Romero Ramirez and Martin Solan contributed remotely.

Silvana Birchenough and Henning Reiss were appointed as rapporteurs for the meeting on a daily basis.

Adoption of the agenda

## **2 Adoption of the agenda**

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The group unanimously adopted the agenda (Annex 2) without any changes.

### 3 BELTS net (Tor a)

The Benthic Ecology Long Term Series network (BELTS net) was initiated by the BEWG and further developed by the SGCBS to facilitate joint analyses of marine benthic long-term series by collaborative work of scientists (Annex 5). During this meeting the following issues were discussed within Tor a:

- Demonstration of final text and lay out for the BELTS net website (Figure 1)
- Information on the website and maintenance
- General approaches to disseminate information about BELTS
- Discuss the possibilities how to interact within the network and how this can be facilitated with a website
- Discussions on how to add additional benthic long-term series metadata available (e.g. US initiatives)



Figure 1: Example of website lay out for [www.beltsnet.info](http://www.beltsnet.info)

Discussions on the lay out for the BELTS net website and also in relation to the best possible opportunities for further dissemination of this initiative were covered by the group. A final revision of the website was done and suggestions for further improvement were sent to the administrator Hans Hillewaert. The text is available and the only outstanding action is to make the site live. Dr Johan Craeymeersch is the chair of the network.

The website will be either hosted by the Institute for Agricultural and Fisheries Research (ILVO) in Oostende (Belgium) or by IMARES Wageningen UR (The Netherlands). Hans Hillewaert (member of the BEWG) has agreed to support the technical development of the website. The group decided to purchase the domain name 'beltsnet.info' for the BELTS net website and J. Craeymeersch and H. Hillewaert will persist with the required next steps.

The dissemination approaches outlined in Table 1 as well as the strategies for collaboration and project management (see ICES 2011) will be followed up as soon as the BELTS net have established its website. Possible approaches to disseminate the cur-



rent BELTS net initiative, already outlined in 2011, its remit and aims were discussed by the group. The agreed dissemination strategies are outlined below:

**Table 1: Approaches for dissemination of BELTS net.**

	<b>Dissemination approach</b>	<b>Target Audience</b>	<b>Notes</b>	<b>Required effort/ input</b>
1	Advertising Paper / Flyer	Scientists / Contributors	Distribution among institutions (Universities, Research institutes). Could be extracted from website or poster.	Medium
2	Poster (e.g. ASC 2014)	(ICES) scientists	Also for other conferences with a suitable scope.	Low-medium
3	Proposal theme session ASC 2014	(ICES) scientists	Proposing theme session on long-term changes of benthos in cooperation with BEWG. BELTS net could be implemented and presented (e.g. first paper or other products of the network)	High
4	Proposal of sessions at other conferences	Scientists	Contacting organizers of conferences and propose theme sessions on long-term changes and climate change, where BELTS net could play an important role (e.g. EMBS)	High
5	Linkages with other networks /initiatives	Scientists and public	To widen the scope of the network. (e.g. Euro Marine)	Medium - high
6	ICES Insign publication	Scientists and public		High
7	ICES Bulletin Board	Scientists and public	First announcement of the network and/or products of the network.	Low
8	Signature in e-mails	Colleagues	Added information to e-mail signature of network members	Low

In addition, scientists with a known interest in long-term series studies should be contacted directly by the chair of BELTS net to stimulate the collaborative work within the network.

#### 4 **Paper: Bioturbation classification of European marine infaunal invertebrates**

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The group agreed the production of a methods paper to allow calculations of bioturbation. In the course of the Study Group the members have compiled information on bioturbation traits of 1 042 macrofauna species and prepared a table containing the functional classification scores for each species. The main objective of this paper is to make the information on bioturbation traits publicly available and to discuss the main assumptions for the BPc calculations. The paper was drafted during the meeting and communicated to all co-authors. The abstract of this work is provided below:

#### **Bioturbation classification of European marine infaunal invertebrates**

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**Ana M. Queirós<sup>1</sup>, Silvana Birchenough<sup>2</sup>, Julie Bremner<sup>2</sup>, Jasmin Godbold<sup>3</sup>, Ruth Parker<sup>2</sup>, Alicia Romero Ramirez<sup>4</sup>, Henning Reiss<sup>5,6</sup>, Martin Solan<sup>3</sup>, Paul Somerfield<sup>1</sup>, Carl Van Colen<sup>7</sup>, Gert Van Hoey<sup>8</sup> and Stephen Widdicombe<sup>1</sup>**

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#### **Abstract**

- 1) Bioturbation is a key biological modulator of geochemical processes in marine systems. In-situ quantification can be achieved in a myriad of ways, but requires expert knowledge and technology. Alternatively, a trait-based index of bioturbation exists that is easily calculated based on community abundance and biomass data (commonly available), and the functional classification of organisms by traits associated with sediment mixing (less available). This metric can therefore be used to generate information about bioturbation where dedicated research programmes do not exist.
- 2) The current work provides a table containing the functional classification scores for 1042 marine benthic species, including the NW European continental shelf, as a tool from which community bioturbation potential - "BPc", a trait-based index - can be calculated. Uses and future extensions of this table could increase the availability of information about bioturbation,

by allowing the calculation of  $BP_c$  in a standardized manner. Such estimates would increase the comparability of studies concerned with large-scale assessments of ecosystem processes and functioning influenced by bioturbation. Future uses of this table could thus help European Member States to meet their responsibilities under European marine management legislation, supporting the calculation of an “indicator of function” for European waters ( $BP_c$ ) that can be widely applied, building on data that is already regularly monitored.

- 3) The key strengths, assumptions and limitations of  $BP_c$  calculation are reviewed, offering guidelines about the use of the table provided.

### **Way forward**

The manuscript was completed intersessionally and submission to *Ecology and Evolution* was done in March 2013.

## 5 Paper: Assessment of the fine scale temporal variability in coastal sediment bioturbation (Case study 1; Tor b)

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This paper aims to determine the extent to which a key ecosystem function (bioturbation) varies within and between years (Study sites and datasets provided in Annex 3). To achieve this we have used a number of temporal reference datasets using macrofauna abundance and biomass, to answer the following four questions:

- Does the potential for community level bioturbation vary over the course of a year?
- If so, which species or **traits** are most responsible for this observed variation?
- Does the strength and nature of any variation observed in an area depend on the geological location or the sediment characteristics or disturbance events?
- Are observed patterns of intra-annual variation significant and are they conserved from year to year?
- Are there any observed changes in the overall diversity of these datasets?

### Assessment of the fine scale temporal variability in coastal sediment bioturbation

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### Background

The aim of this work was to determine the extent to which a key ecosystem function (bioturbation) varies within and between years. We have collated a number of tem-

poral reference datasets using macrofauna abundance and biomass (see summary table and Figure 1 in Annex 3) to answer the specific questions.

Currently, there is limited understanding on benthic function in marine benthic systems over fine temporal scales. Current marine policies (e.g. EU Marine Strategy Framework Directive), aiming to protect and promote sustainable use of the marine environment, demonstrated that this level of understanding is currently missing in benthic systems. Therefore there is a pressing need to provide evidence based science on the status and benthic responses in relation to structure and function of these systems. The ICES Study Group of Climate related Benthic Processes in the North Sea (SGCBNS), has produced an assessment in relation to fine-scale bioturbation activity over a wide range of areas and datasets. This manuscript presents current knowledge in relation bioturbation calculations over many benthic systems. This information is deemed to be highly valuable for ecologists, conservation and regulators working and making decisions on the sustainable use and future state of marine benthic ecosystems.

## Approach

A total of 15 datasets were used in this assessment (Annex 3). Each dataset contains estimates of macrofauna abundance and biomass. For each species in each replicate sample an index of bioturbation was calculated based on the metric developed by Solan et al. (2004).

Extensive data preparation was prior to calculating BPc's. A master species list was generated containing all the different datasets available for this work. A standardised table with values for movement and reworking was assigned to individual taxa. The ecological information assigned to the traits for movement and reworking was based on published material and expert judgment (consensus of 12 ecologists). A final list of species containing all datasets was produced (n=1 042 taxa). A final standardized scoring system for reworking and movement was QA by the ecologists and adopted by all the members of the group to calculate the individual bioturbation potential (BPc's).

During this year's meeting additional statistical analyses were carried out in several group-work sessions, focusing on identifying similarities and dissimilarities in the seasonal patterns of BPc between the different study regions. These analyses were finalized during the meeting.

## Way forward

The group discussed the analysis and questions agreed during the previous meeting. All of the analyses were done and a manuscript is being developed from this work. There is a first draft manuscript with text for methods, results and introduction of this work. The SG agreed to submit this work to the *Journal of Global Ecology and Biogeography* (IF=5.2). Intersessional work will be conducted during 2013 to input comments to the draft. The draft is planned for mid 2013.

## 6 **Paper: Spatial variation in BPc and vulnerability of ecosystem functioning in the North Sea (Case study 2; Tor c)**

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This paper aims to determine the spatial patterns of bioturbation as a key ecosystem function on a North Sea wide scale and to assess the vulnerability of ecosystem functioning in different North Sea habitats to climatic change. Therefore, the group agreed to use the macrofauna dataset of the NSBP 2000 project. The following objectives and research questions will be addressed in this case study:

### **Main objectives:**

- To assess spatial patterns in bioturbation across the North Sea in relation to habitat variability and environmental forcing
- To investigate potential vulnerability of benthic bioturbation potential to climate change across the North Sea

### **Research questions:**

- How does bioturbation vary over the North Sea as a whole?
- How does bioturbation vary between and within North Sea habitats?
- How does bioturbation relate to environmental forcing factors across the North Sea (e.g. temperature)?
- How do the relative proportions of species with specific (bioturbation) traits relate to community-level bioturbation across the area?
- How much within-(bioturbation) trait diversity is there in different communities?
- How does within-(bioturbation) trait diversity relate to habitat/environment variability?

## **Spatial variation in BPc and vulnerability of ecosystem functioning in the North Sea**

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**Gert Van Hoey, Silvana Birchenough, Julie Bremner, Johan Craeymeersch, Jasmin Godbold, Ruth Parker, Ana M. Queirós, Alicia Romero Ramirez, Henning Reiss, Martin Solan, Paul Somerfield, Carl Van Colen, Steve Widdicombe**

### **Background**

Bioturbation, the biologically mediated regulation of biogeochemical processes, is one of the most important aspects of ecosystem function in marine soft sediments. The bioturbation potential of individual communities can be estimated using the BPc index developed by Solan et al (2004). Case study 1 is aimed to assess short-term temporal variability of bioturbation at a selection of sites. Case study 2 will expand on this rationale, to examine spatial patterns in bioturbation over the North Sea and assess how these patterns relate to habitat type and environmental forcing.

As BPc is an estimate of overall community bioturbation, it does not provide information on the relative contributions of different bioturbating species. However, the number and range of species contributing to overall bioturbation is important when

considering the vulnerability of the function to external forcing (e.g. climate change). Assemblages with a higher diversity of bioturbation types (traits) and those with higher richness within each bioturbation trait, might be expected to be less vulnerable to climate change effects than those with few bioturbation types and low within-trait diversity, because they will have increased capacity to 'compensate' for the loss of any particular species.

## Approach

The SG will use the NSBP 2000 data, which provides the most extensive macrofauna dataset on a North Sea wide scale. The bioturbation potential will be calculated based on the same methods as used for CS1. The master list with bioturbation categories of 1 042 species, which was compiled during the interims workshop on CS1 and thereafter (see section 4), will be used as a basis for the analyses. Information on bioturbation categories was lacking for 240 out of the 532 macrofauna species from the NSBP 2000 data and was updated during last year's SG meeting (ICES 2011).

Since the NSBP 2000 dataset only provides abundance data, the bioturbation potential for CS2 will be calculated based on mean individual weights of the North Sea macrofauna species. Thus, available abundance and biomass data, provided by the members of the SG, will be used to calculate the mean individual weights (MIW). Following a group discussion during the meeting in 2011, the abundance and biomass data were compiled on a seasonal scale to account for seasonal differences in bioturbation potential (see section 5).

During this year's meeting the abundance and biomass data were compiled in a database. The calculation of MIW was carried out preferably based on abundance and biomass data available for the season's spring and summer, because most of the NSBP 2000 sampling was done during this period of the year. For 452 of the 532 species used for the analyses, MIW could be calculated based on spring/summer data. In some cases the MIW was taken as an average of species of the same genus or determined on genus or family level. If biomass data were only available in AFDW (74 species), values were converted to wet weight by using appropriate conversion factors (Brey 2001). Only for 40 species the MIW was calculated based on abundance and biomass data from autumn or winter. No data were available for 29 species. These species were found on less than 2% of the sampling stations, except of *Chaetoderma nitidulum* (4%) and *Arcturella* (2.42%), and were omitted from the preliminary analyses. However, the group will explore additional data to complete the MIW data prior to the final analyses. So far, 26 266 of the 26 866 records of the NSBP2000 dataset were retained for the preliminary analyses.

## Way forward

The group agreed to start the analysis with the data available and report the initial analysis at the BEWG meeting (April 2013). The main data analyses and the outline of the manuscript will be carried out intersessionally and with the agreement to provide a draft manuscript in September 2013 for comments.

## **7 References**

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- Brey T (2001) Population dynamics in benthic invertebrates. A virtual handbook. Version 01.2.
- ICES (2011) Report of the Study Group on Climate related Benthic processes in the North Sea (SGCBNS). ICES CM 2011/SSGEF:12, by correspondence.
- Solan M, Cardinale BJ, Downing AL, Engelhardt KAM, Ruesink JL, Srivastava DS (2004a) Extinction and ecosystem function in the marine benthos. *Science* 306: 1177-1180



## Annex 1: List of Participants

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## **Annex 2: Agenda**

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Study Group on Climate related Benthic Processes in the North Sea (SGCBNS)

(Plymouth, 26 - 28 November 2012)

### **Proposed time table and ToRs**

ToR a) Review progress under BELTS net

ToR b) To continue and agree final milestones for Case study 1 (CS1)

ToR c) Preparation of a publication based on the results and outline of a time table for finalizing CS1

ToR d) To develop the work for Case study 2 (CS2)

### **Monday (26 November)**

11: 00-12.00 Arrival and set-up

12:00-17:00

- Opening and introduction (all)
- Internal information (S.Widdicombe/ Ana Queiros, PML)
- Adoption of agenda
- Appointment of rapporteur
- Introduction to the meeting (S. Birchenough/H. Reiss)
- Outdates on the BELTS net

### **Tuesday (27 November)**

9:00 - 11:00 Plenary discussion and review of progress made on CS1 and bioturbation trait scores.

11:30 - 13:00 Continue with CS1 data analysis and agree on subgroups (text production)

13:30 - 16:00 Subgroup work on CS1 analysis and methods paper outline

16:00 - 17:00 Plenary discussion and outline of progress and milestones for completion of the methods paper manuscript

### **Wednesday (28 November)**

9:00 - 12:00 Subgroup work on CS1 and the final bioturbation trait table (merging CS1 and CS2 data)

13.00 - 13:30 Update on previous work on CS2 (Gert van Hoey)

13:30 - 16:00 Continue with data analysis and subgroup work on CS1 (paper layout and text production) and CS2 (data preparation)

16:00 - 17:00 Outline of progress and milestones for completion of the manuscript

**Thursday (29 November)**

9:00 - 14:00 Review actions/agree milestones and deliverables for CS1, CS2 and the methods paper

14:00 Close of meeting

### Annex 3: Case study 1 – Study sites and datasets

#### Assessment of the fine scale temporal variability in coastal sediment bioturbation

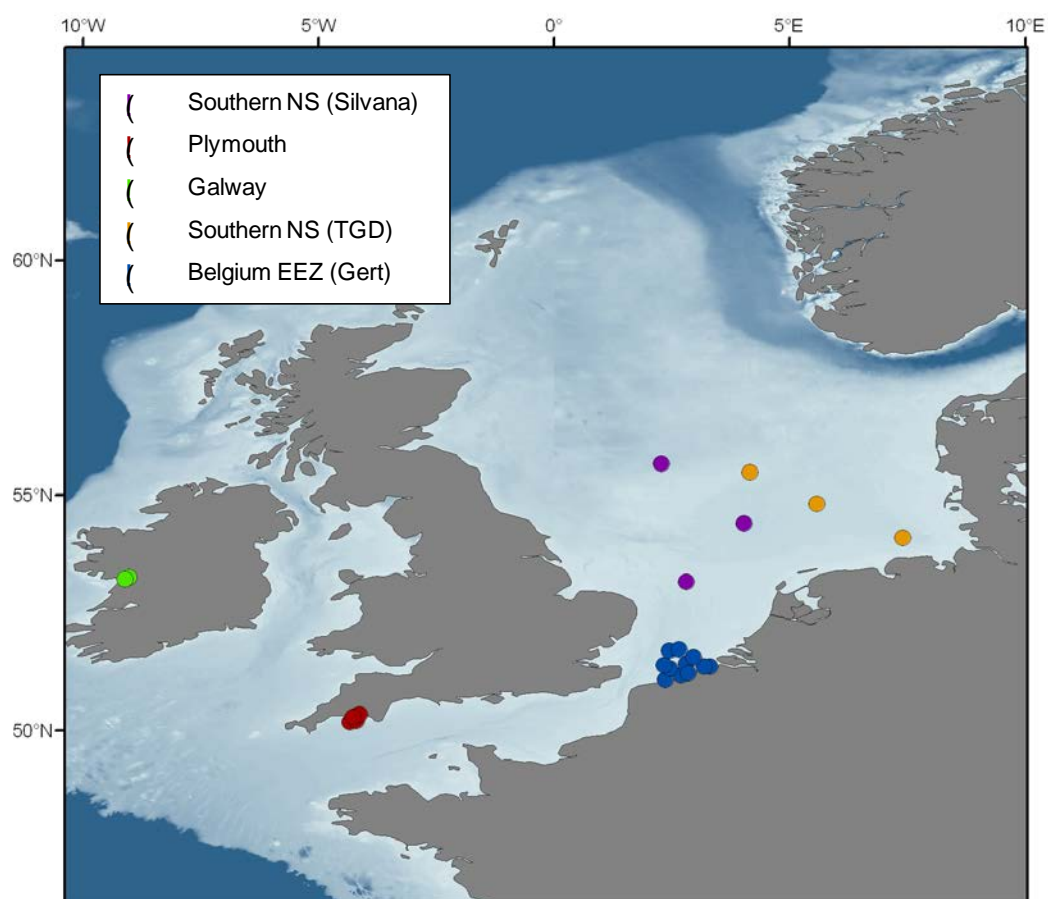


Figure 2: Overview of the study sites.

Table 2: Datasets for Case study 1

#	Geographical location	Station	Habitat	Depth	Length of time-series	Sampling frequency	Reps per sampling date	Data Holder(s)
1	Plymouth	Jennycliff	Sandy mud	10m	July 2008 – May 2010	Every 2 months	5	PML (Somerfield / Widdicombe)
2	Plymouth	Cawsand	Fine sand	10m	July 2008 – May 2010	Every 2 months	5	PML (Somerfield / Widdicombe)
3	Plymouth	Rame Mud	Mud	50m	July 2008 – May 2010	Every 2 months	5	PML (Somerfield / Widdicombe)
4	Plymouth	L4	Muddy sand	50m	July 2008 – May 2010	Every 2 months	5	PML (Somerfield / Widdicombe)
6	North Sea	Dogger Bank	Coarse sandy mixed	50	2007	Feb, Apr, May, Sept, Oct	4	Cefas (Birchenough)
7	North Sea	Oyster ground	Muddy sands	50	2007	Feb, Apr, May, Sept, Oct	4	Cefas (Birchenough)
8	North Sea	Sean gas field	Muddy sands	50	2007	Feb, Apr, May, Sept, Oct	4	Cefas (Birchenough)
9	North Sea	German Bight	Muddy sand	37m	2000 – 2002	Monthly	5	Senckenberg (Reiss)
10	North Sea	Oyster Ground	Muddy sand	41m	2000 – 2002	Monthly	5	Senckenberg (Reiss)
11	North Sea	Dogger Bank	Fine sand	30m	2000 – 2002	Monthly	5	Senckenberg (Reiss)
12	German Bight	H1	Mud	23	1969 - 1985	nearly Monthly	5	AWI (Schroeder)
13	German Bight	P12	Muddy sand	36	1969 - 1984	Every 1-2 Months	5	AWI (Schroeder)
14	German Bight	FSd	Fine sand	26	1969 - 1984	Every 1-2 Months	5	AWI (Schroeder)
15	Galway Bay	Leverets (polluted)	TBC	9m	Dec 1996 – Nov 1997	Monthly	TBC	Aberdeen (Solan)
16	Galway Bay	Margaretta (clean)	TBC	22m	Dec 1996 – Nov 1997	Monthly	TBC	Aberdeen (Solan)

## **Annex 4: BELTS net**

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### **Aims - targets**

The intention of the BELTS net network is to facilitate joint analyses of marine benthic long-term series by collaborative work of scientists and by making existing information (e.g. publications, reports) widely available. Unlike other initiatives, the aim of BELTS net is NOT to collect data. Instead it is meant to bring scientists together to jointly analyse long-term dataserie s to further the understanding of temporal changes in marine ecosystems over larger scales and the effects of climate change. These approaches will facilitate studies of climatic effects on benthic systems over larger scales. Results from single dataserie s will support wider assessments on benthic changes over wider North Sea regions.

### **Development**

The BELTS net started as an initiative developed by the ICES BEWG and was further developed by the SGCBNS. However it is open to all scientists willing to participate.

### **General idea - concept**

Instead of collating data, results will be produced by the data owner, keeping the datasets separate, but joining the overall assessments. This way, also inconsistencies between datasets can be overcome as long as they are considered in the separate analyses and results are formulated accordingly. The point of BELTS net is to circumvent data problems by working together without sharing raw data.

The BELTS net will be able to produce results that can only be achieved by complementary analyses – not by repeating work, but by generating overarching insights based on group contributions. Clear and identifiable end products shall be joint publications and workshops. This should be an interesting forum that will provide wider opportunities to work and collaborate among scientists.

### **Procedures**

Communication will be facilitated by a BELTS net website and associated mailing lists. There will be a main list advertising general news and new studies and specific lists for each study.

Every member can put questions (objectives) forward and suggest required analyses, ask for necessary contributions (data, results and expertise), which then are open for discussion.

The initiative shall tackle specific questions by asking for contributions of specific results from the partners. All contributors will have access to existing contributions when they submit their results. They will then be added to a distribution list to receive all future contributions. Contributions can be data or expertise, offering the opportunity for contributors to justify their inclusion – like a research consortium: What can people bring to this collaborative project?

To allow a productive outcome within adequate time, each study should fix appropriate deadlines for

- discussions of questions, analytic methods and type of output and
- delivery of contributions.

With the specific objective, well defined tasks will be distributed to construct a joint manuscript. All contributors will be co-authors.

After some initial joint analyses an informal meeting may be organized to develop the final publication.

This procedure needs a general element of trust from the collaborators and for each study a specific agreement about the handling of contributions shall be defined by the respective groups.

This website will provide a short outline of the goals of the BELTS net and participants. Over time, it is hoped that the website will expand and be used as a communication tool for the benthic community. It will list people and institutes involved, and also metadata descriptions of the datasets they have available. Additionally, a discussion forum will be set up on the site and a general e-mail address will be created. A scientific coordinator will run the general organization for defined periods, as a general contact person for questions regarding the network. The discussion forum will be monitored and followed up by the scientific coordinator and members of the BELTS net, as will all the e-mails sent to the Network through the info mailing address. VLIZ will assist in compiling a data agreement or “declaration of mutual understanding on data sharing”. This document will describe the possible data use and availability of contributing datasets within the BELTS net and between the network and third parties. Additional information on the website can contain links to other relevant initiatives or explain how one can become part of this network.

### **Status quo**

Participants of the BEWG meeting 2009 agreed on developing the collaborative work, which will involve further analyses/results (on published or unpublished records), using standardized analyses. Intercessional work will continue by means of interrogating the long-term datasets with an agreed set of parameters to enable further comparisons. One initiative has been started for joint analyses of long-term data, which will be further discussed during the BEWG meeting 2013:

- Regime shifts in benthic communities across the North Sea (lead by Silvana Birchenough and Carl Van Colen)

The development of the BELTS net was further discussed during several SGCBNS meetings and at the BEWG meetings in Fort Pierce and Reykjavik in 2011 and 2012, respectively. The BELTS net website layout and content is finished and further activities of joint papers are already planned. The final step of publishing the website is now of primary importance and needs to be followed up during the BEWG meeting in La Coruna in 2013.



## Annex 5: Recommendations

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Recommendation	Adressed to
1. The SGCBNS has completed their final meeting in November 2012. The group still has manuscripts being prepared intersessionally with agreed delivery times. Most of the future work and activities from this work will be fed to BEWG as part of the long-term initiatives. The following recommendations illustrates the specific initiatives which should be further developed within the BEWG:	Benthos Ecology Working Group (BEWG)
2. To launch the website of BELTSnet and proceed with the next steps for promoting the network	BEWG
3. To finalize the work on case study 2 aiming for submission of a paper in 2014	BEWG
4. To explore possibilities of a joint theme session on climate change effects (Paul Montagna, Henning Reiss and Silvana Birchenough) during the ASC 2015.	BEWG