ICES SGCBNS REPORT 2011

SCICOM STEERING GROUP ON ECOSYSTEM FUNCTIONS

ICES CM 2011/SSGEF:12

REF. SCICOM, BEWG, ACOM

Report of the Study Group on Climate related Benthic processes in the North Sea (SGCBNS)

24–27 October 2011

by correspondence

ICES International Council for the Exploration of the Sea
CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2011. Report of the Study Group on Climate related Benthic processes in the North Sea (SGCBNS), 24–27 October 2011, by correspondence. ICES CM 2011/SSGEF:12. 24 pp. https://doi.org/10.17895/ices.pub.8812

For permission to reproduce material from this publication, please apply to the General Secretary.

The document is a report of an Expert Group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

© 2011 International Council for the Exploration of the Sea

Contents

Executive summary **1**

1 Opening of the meeting **2**

2 Adoption of the agenda **2**

3 BELTS net (ToR a) **2**

4 Case study 1 (ToR b) **4**

5 Case study 2 (ToR c) **5**

6 Minutes of the interims workshop on CS1 in Plymouth 2011 ..... **7**

7 Other business (ToR d) **8**

8 References **9**

Annex 1: List of participants **10**

Annex 2: List of Participants (Plymouth meeting, February 2011) **12**

Annex 3: Agenda **14**

Annex 4: Case Study 1 – Summary and data sets **16**

Annex 5: BELTS net **19**

Annex 6: Recommendations **22**

Annex 7: SGCBNS draft terms of reference for the next meeting **23**

Executive summary

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 discuss and 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 SG organised a workshop in February at the Plymouth Marine Laboratory, UK. The aim of this workshop was to initiate work on the proposed case study 1 (Assessing fine-scale bioturbation). Subsequently, the SG also conducted their annual meeting as a WebEx conference on 24–27 October 2011 to facilitate the participation of members unable to travel.

The establishment of the Benthic long-term series network (BELTS net) was continued during the SG meeting (ToR a). BELTS net is a platform to facilitate joint analyses of marine benthic long term series by collaborative work of scientists. Johan Craeymeersch was appointed as the new chair of BELTS net. First steps for setting up and hosting the network website were taken and different possibilities for the dissemination of the network and the internal working platforms were discussed and adopted.

One major aim of the annual SG meeting was to further develop case study 1 (CS1) focusing on the seasonal variation of the potential for community level and species level bioturbation (ToR b). Based on the results of an interim workshop in Plymouth in February 2011, which was organised by the SG and hosted by PML, a first manuscript draft was discussed within the group. The preliminary results showed a high seasonal variability of bioturbation potential with maxima in the summer month in most study areas. After a few additional analyses, a final draft will be developed by spring 2012 for submission to Global Ecology and Biogeography in the second half of 2012.

The second case study (CS2) the bioturbation potential was considered as a key ecosystem function over a large spatial scale (ToR c). The dataset of the ICES North Sea Benthos Project 2000 (NSBP 2000) will be used for this purpose. These data were extracted during the meeting and a compilation of additional information needed for the analyses were 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 will be carried out prior the next annual meeting of the SG in October. Further analyses and drafting of a CS2 manuscript will be conducted at the annual meeting scheduled in October 2012

1 Opening of the meeting

The chairs of the workshop, Silvana Birchenough and Henning Reiss, opened the session (24 October 2011 at 09:30) and welcomed all the participants. A total of 11 participants from 6 countries, Belgium, France, UK, the Netherlands, Norway and Germany, were present (see details provided in Annex 1).

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

2 Adoption of the agenda

The group unanimously adopted the agenda (Annex 3) 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 SGCBNS to facilitate joint analyses of marine benthic long term series by collaborative work of scientists. During this meeting the following issues were discussed within ToR a:

- Preparation of final draft of text for the BELTS net website
- Where to host the website and how to maintain it?
- General approaches to disseminate information about BELTS
- Update on current/first initiative of BELTS (work in progress by Silvana Birchenough-Cefas and Carl Van Colen-University of Ghent)
- Discuss the possibilities how to interact within the network and how this can be facilitated with a website
- Alexander Schröder has resigned as the chair of the network. Suggestions were canvassed between participants for a follow-up candidate

The text for the BELTS net web site was distributed among the group members via a working document (provided in Annex 5).The final text will be available at the end of 2011. Dr Johan Craeymeersch was appointed as a new chair of the network followed by group discussions. This new appointee was supported by the chairs of SGCBNS. Johan first action as chair was to provide the final web-site text.

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

Possible approaches to disseminate the current BELTS net initiative, its remit and aims were discussed by the group. The agreed disseminations strategies are outlined below.

Table 1. Approaches for dissemination of BELTS net.

	Dissemination approach	Target Audience	Notes	Required effort/ input
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 2012)	(ICES) scientists	Also for other conferences with a suitable scope.	Low-medium
3.	Proposal theme session ASC 2013	(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.	Linkages with other networks /initiatives	Scientists and public	To widen the scope of the network. (e.g. Euro Marine)	Medium - high
5.	ICES Insigth publication	Scientists and public		High
6.	ICES Bulletin Board	Scientists and public	First announcement of the network and/or products of the network.	Low
7.	Signature in e-mails	Colleagues	Added information to e-mail signature of network members	Low

In order to facilitate the communication and scientific exchange between network members, different strategies were also discussed by the group. The requirements of BELTS net for a project management or communication platform will be:

1) Exchange of documents and data
2) Joint preparation of documents online
3) Mailing lists
4) Forum for discussion
5) Different "rooms" for different member groups/projects
6) Restricted access to the entire platform and the single "rooms"

There was no consensus on how to meet these requirements with minimal financial effort. Nevertheless, the following list of potential online collaboration and project management tools for BELTS net was compiled mainly based on recommendations by Mike Gormley (IT developer, PML, Plymouth), with the main recommendation of Base Camp HQ or PHProjekt (as a free tool).

Externally hosted platforms (most have a fee)

Central Desktop

- http://www.centraldesktop.com/
- Very good product, many customisation options
- Free edition very restrictive, and expensive at $99/month per package
- Enterprise edition may be cheaper

Project2Manage

- http://www.project2manage.com/
- Video demo looks good but no free trial available
- Price plans available, and cheaper at $9.95–14.95/month per package

Base Camp HQ

- http://basecamphq.com/?referrer=YT30B7
- Video demo looks good, free trial restrictive (but good feedback from users within FP7)
- Good plans at $24–49/month per package

Ace Project

- http://www.aceproject.com/
- Free but externally hosted
- Seemed complicated

Internally hosted platforms (by BELTS net server; free)

(General review by Mike Gormley was that they all failed somewhere)

ProjectPier

- http://www.projectpier.org/
- Works well but peculiar

dotProject

- http://www.dotproject.net
- Not intuitive
- Poor profile manager

PHProjekt

- http://www.phprojekt.com/
- Good – facilitates projects with a work package structure
- Sector activities but different components link well together

Atlassian Confluence, WiKi (added by J. Dannheim)

- http://www.atlassian.com/software/confluence/

  Free for non-profit institutions (but expenses for academic institutions?)

The dissemination approaches outlined in Table 1 as well as the strategies for collaboration and project management will be followed up as soon as the BELTS net have established its website.

4 Case study 1 (ToR b)

This case study aims to determine the extent to which a key ecosystem function (bioturbation) varies within and between years (summary provided in Annex 4). To achieve this we have used a number of temporal reference datasets using macrofauna abundance and biomass, to answer the following four questions, these are outlined below:

- 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 data sets?

Approach

A total of 15 data sets were used in this assessment (Annex 4). Each data set 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 data sets 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 10 ecologists). A final list of species containing all data sets was produced (n=1186 taxa). A final standardised 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).

Way forward

The group agreed to concentrate on the final analysis and manuscript production for this work. There is a first draft manuscript with text for methods, results and introduction of this work. There was a clear need to augment the current analysis; discussions on several tests were suggested for this work. There are also some outstanding calculations pending on available biomass values for BPc calculations for some data sets.

The SG also discussed the potential journal opportunities and it was decided that the Journal of Global Ecology and Biogeography (IF=5.2) will be consider for submitting this work. Intercessional work will be conducted during 2011 and 2012 to provide a draft ready for circulation (spring 2012) and comments once the analyses have been finalized.

5 Case study 2 (ToR c)

This case study 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, we will 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?

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 in bioturbation at a selection of sites. Case study 2 will expand on this rationale, to ex-amine 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 1186 species, which was compiled during the interims workshop on CS1 (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 20000 data. Therefore, the list was updated during this SG meeting.

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 this meeting, the MIW data will be compiled on a seasonal scale to account for seasonal differences in bioturbation potential (see CS1). The MIW of 532 species needs to be compiled. These species represent the most abundant species in the NSBP 2000 dataset. The final compilation of the MIW data will be carried out by J. Craeymeersch. These data will be circulated to all CS2 contributors and provided to SG members via the SG share point.

Way forward

The group agreed to start the analysis with the data available prior the next annual meeting of the SG in October 2012. As soon as the data preparation is completed (February 2012), individual bioturbation potential (BPi) will be calculated for all North Sea species. The resulting community BPc will be mapped with GIS tools to enable the analyses of the spatial patterns in bioturbation. The preliminary results and the compiled data will be circulated among the contributors for further analyses.

The main data analyses and the outline of the manuscript will be carried out during the next annual meeting of the SG.

The declaration of mutual understanding for data sharing within this case study was uploaded to the SG share point and was accepted by the participating contributors.

Issues raised and discussed during the SG meeting:

1) Preparation of NSBP 2000 data for first analyses
2) Comparing BP trait list with NSBP species list (do we have traits for all species?)
3) Highlight (data) gaps which need to be filled
4) Discussion of using mean individual weights for BPc calculation (Biomass data are only partly available from NSBP 2000)
5) Can we tackle all research questions with the available data set?
6) Decide on way forward and intersectional work on analyses until next year's SG meeting

6 Minutes of the interims workshop on CS1 in Plymouth 2011

Plymouth, 16–18 February 2011

The meeting opened on 16 February at 10:00 at the Plymouth Marine Laboratory (PML, UK) with 10 participants from 3 countries (UK, France, Germany; see Annex 2). The group unanimously adopted the agenda without any changes. Two contributors, Gert van Hoey and Alexander Schröder, contributed remotely with data for CS1.

The aim of this interims workshop was to discuss and initiate data compilation and first analyses of the seasonal variability of bioturbation potential for case study 1 (CS1). The following Terms of References were addressed during the meeting:

ToR a) Agreement about data policy for the CS1

ToR b) Compile and analysed the processed data for CS1/ICES support share point

ToR c) Preparation of a manuscript and outline time table for publication for CS1

ToR a)

All participants agreed on the "Declaration of Mutual Understanding" for data sharing within the SGCBNS case study. The DMU was uploaded to the SG share point.

ToR b)

All data contributors gave on overview presentation about their specific study sites from the west coast of Ireland to the southeastern North Sea.

The data preparation was carried out by compiling the species lists of the different data sets and by generating a master species list containing the bioturbation categories for all species based on the following criteria for mobility (Mi) and reworking mode (Ri):

Mobility Mi

1 = in a fixed tube

2 = limited movement, sessile, but not in tube

3 = slow movement through sediment

4 = free movement via burrow system

Reworking mode Ri

1 = epifauna that bioturbate at the sediment-water interface

2 = surficial modifiers, whose activities are restricted to <1-2 cm of the sediment profile

3 = head-down/head-up feeders that actively transport sediment to/from the sediment surface

4 = biodiffusers whose activities result in a constant and random diffusive transport of particles over short distances

5 = regenerators that excavate holes, transferring sediment at depth to the surface

Bioturbation categories were assigned to 1186 macrofauna species. The master list was uploaded on the share-point and was used by all present data providers for calculating the bioturbation potential. The master list will be further distributed among the other CS1 contributors and will be made public at the end of the Study Group activities.

ToR c)

The first outline of a publication on temporal variation in bioturbation was prepared. The results section of this draft will be completed until the annual meeting of the SGCBNS in October 2011, where the work will be continued and responsibilities for further contributions will be appointed.

7 Other business (ToR d)

Collaborative opportunities for linking the SG activities with other initiatives and ICES expert groups were discussed during the meeting. The main conclusion was that the group should initiate cooperation with the expert groups on long-term changes in planktonic systems. Particularly, the future work within the BELTS net can be used to facilitate collaboration between the groups on long-term dynamics of marine systems. The linkages between long-term changes in the plankton and the benthos are not well understood, although there is a tight bentho-pelagic coupling in many marine shelf regions. Johan Craeymeersch raised the ongoing research on this topic in Dutch waters. Phytoplankton trends and patterns in space and time in

(Dutch) coastal waters for the period 1991–2005 suggests that mean annual total phytoplankton biomass remained essentially constant, but its composition changed considerably. Dinoflagellates and diatoms increased but flagellates and Phaeocystis both declined (Baretta-Bekker *et al*., 2009). Small diatoms seem to increase up to about 2001 (Zuur *et al.*, 2009). Changes in the qualitative composition of the algal food have strong consequences for growth of filter feeders (Soudant *et al.*, 2000). The changed nutrient ratios and the changed qualitative composition of the phytoplankton might result in niche expansion for certain suspension-feeding species or a niche shrinkage for others.

The bentho-pelagic coupling processes should be more intensively studied within interdisciplinary frameworks. The group suggested two approaches:

1) To compare long-term trends of benthos and plankton communities across different marine ecosystems;

2) To use small scale information on benthos and plankton communities and dynamics to test ecosystem modelling approaches (see ICES 2009).

8 References

Baretta-Bekker J.G., Baretta J.W., Latuhihin M.J., Desmit X., Prins T.C. 2009. Description of the long-term (1991-2005) temporal and spatial distribution of phytoplankton carbon biomass in the Dutch North Sea. Journal of Sea Research 61: 50-59.

ICES. 2009. Report of the Workshop on Climate related Benthos Processes in the North Sea (WKCBNS), 8–11 December 2008, Wilhelmshaven, Germany. CM 2009/2/MHC01. 43 pp.

Solan, M., B.J. Cardinale, A.L. Downing, K.A.M. Engelhardt, J.L. Ruesink, D.S. Srivastava. 2004. Extinction and Ecosystem Function in the Marine Benthos. Science 306: 1177-1180.

Soudant P., Sanles M.V., Quere C., Le Coz J.R., Marty Y., Moal J., Samain J.F., Sorgeloos P. 2000. The use of lipid emulsions for sterol supplementation of spat of the Pacific oyster, Crassostrea gigas. Aquaculture 184: 315-326.

Zuur, A.F., Latuhihin, M.J., leno, EN, Baretta-Bekker, JG, Smith, GM, Walker, NJ(2009)Additive Mixed Modelling Applied on Phytoplankton Time Series Data. Mixed effects models and extensions in ecology with R Statistics for Biology and Health: 423-446.

Annex 1: List of participants

Name	Address	Phone/Fax	Email
Silvana Birchenough	The Centre for Environment, Fisheries & Aquaculture Science Pakefield Road Lowestoft, Suffolk NR33 0HT UK	Phone: +44 1502527786 Fax: + 441502-513865	silvana.birchenough@cefas.co.uk
Lene Buhl-Mortensen	Institute of Marine Research P.O. Box 1870 Nordnes N-5817 Bergen Norway	Phone: +47 55 236936 Fax: +47 55 238531	lenebu@imr.no
Johan Craeymeersch	Wageningen IMARES Korringaweg 5 NL-4401 NT Yerseke The Netherlands	Phone: +31 317 487075 Fax: +31 317 487359	johan.craeymeersch@wur.nl
Jennifer Dannheim	Alfred Wegener Institute for Polar and Marine Research P.O. Box 120161 27570 Bremerhaven Germany	Phone: +49 471 4831 1734 Fax: +49 471 4831 1425	jennifer.dannheim@awi.de
Steven Degraer	RBINS-MUMM Gulledelle 100 B-1200 Brussels Belgium	Phone: +32 (0)2 773 2103 Fax:	S.Degraer@mumm.ac.be
Jasmin Godbold	Oceanlab, University of Aberdeen Main Street Newburgh, ELLON AB41 8LQ United Kingdom	Phone: +44(0) 1224 274416 Fax: +44(0) 1224 274402	j.a.godbold@abdn.ac.uk
Aurélie Foveau	CRESCO - IFREMER Station de Dinard 38 Rue du Port Blanc 35801 Dinard France Tél :	Phone: +33(0) 223185886 Fax: +33(0) 223185850	Aurelie.Foveau@ifremer.fr
Ana M. Queirós	Plymouth Marine Laboratory Prospect Place The Hoe Plymouth PL1 3DH United Kingdom	Phone: +44(0)1752633476 Fax : +44(0)1752633101	anqu@pml.ac.uk
Henning Reiss	University of Nordland Faculty of Aquaculture and Biosciences	Phone: +47 7551 7576 Fax:	henning.reiss@uin.no

	PO box 1490 8049 Bodø Norway		
Martin Solan	Oceanlab, University of Aberdeen Main Street Newburgh, ELLON AB41 8LQ United Kingdom	Phone: +44(0) 1224 274409 Fax: +44(0) 1224 274402	m.solan@abdn.ac.uk

Annex 2: List of Participants (Plymouth meeting, February 2011)

Name	Address	Phone/Fax	Email
Silvana Birchenough	The Centre for Environment, Fisheries & Aquaculture Science Pakefield Road Lowestoft, Suffolk NR33 0HT UK	Phone: +44 1502527786 Fax: + 441502-513865	silvana.birchenough@cefas.co.uk
Julie Bremner	The Centre for Environment, Fisheries & Aquaculture Science Pakefield Road Lowestoft, Suffolk NR33 0HT UK	Phone: +44 1502524546 Fax: + 441502-513865	julie.bremner@cefas.co.uk
Jasmin Godbold	Oceanlab, University of Aberdeen Main Street Newburgh, ELLON AB41 8LQ United Kingdom	Phone: +44(0) 1224 274416 Fax: +44(0) 1224 274402	j.a.godbold@abdn.ac.uk
Ruth Parker	The Centre for Environment, Fisheries & Aquaculture Science Pakefield Road Lowestoft, Suffolk NR33 0HT UK	Phone: +44 1502524393 Fax: + 441502-513865	ruth.parker@cefas.co.uk
Ana M. Queirós	Plymouth Marine Laboratory Prospect Place The Hoe Plymouth PL1 3DH United Kingdom	Phone: +44(0)1752633476 Fax : +44(0)1752633101	anqu@pml.ac.uk

Alicia Romero Ramirez	UMR CNRS 5805 EPOC - OASU Station Marine d'Arcachon Université Bordeaux 1 2 Rue du Professeur Jolyet 33120 ARCACHON CEDEX FRANCE	Phone : +33556228500 Fax : +33556835104	a.romero-ramirez@epoc.u-bordeaux1.fr alicia.romero-ramirez@u-bordeaux1.fr
Henning Reiss	Senckenberg Institute Department for Marine Research Südstrand 40 26382 Wilhelmshaven Germany	Phone: +49 4421 9475 266 Fax: +49 4421 9475 222	h.reiss@senckenberg.de
Martin Solan	Oceanlab, University of Aberdeen Main Street Newburgh, ELLON AB41 8LQ United Kingdom	Phone: +44(0) 1224 274409 Fax: +44(0) 1224 274402	m.solan@abdn.ac.uk
Paul Somerfield	Plymouth Marine Laboratory Prospect Place The Hoe Plymouth PL1 3DH United Kingdom	Phone: +44(0)1752633449 Fax : +44(0)1752633101	pjso@pml.ac.uk
Steve Widdicombe	Plymouth Marine Laboratory Prospect Place West Hoe Plymouth PL1 3DH UK	Phone: +44 1752 633411 Fax: +44 1752 633101	swi@pml.ac.uk

Annex 3: Agenda

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

(24–27 October 2011, WebEx meeting)

Monday, 24 October 2011

09:30 Meeting start (Web ex connection 15 minutes before to test and activate equipment)

- Opening and introduction (all)
- Internal information (Maria-ICES)
- Adoption of agenda
- Appointment of rapporteur (actions only)
- Introduction to the meeting (S. Birchenough/H. Reiss)
- Up-date on work conducted for production of manuscript for CS1
- Plan the work needed for CS1 manuscript

Activities:

- Current status of Belts and strategy to be decided to work the text/web layout and maintenance
- Data available and examples of case studies being developed at present
- Short overview presentation about the available data and the objectives of CS1
- Discussions on work conducted and outstanding issues
- Text preparation and integration of results

15.30-16.30 Review daily progress (via WebEx)

Tuesday, 25 October 2011

9:30 – 10:30 Meeting start (Web ex connection 15 minutes before to test and activate equipment) Plenary discussion/review progress made on Belts

Activities:

- Continue with work/discussions for manuscript production for CS1

- Agree on way ahead for manuscript production for CS1
- Wrap-up final issues/concerns/ for manuscript CS1
- Setting the time table and responsibilities for manuscript production

15.30-16.30 Review daily progress (via WebEx)

Wednesday, 26 October 2011

09:30 Meeting start (Web ex connection 15 minutes before to test and activate equipment)

- Discussions of aims/ participants and data available for CS2
- Review information available
- Start with data coding and divide the work for analysis (e.g. areas, data sets, Additional information)
- Develop a manuscript structure with available information

15.30-16.30 Review daily progress (via WebEx)

Thursday, 27 October 2011

9:30 – 10:30 Meeting start (Web ex connection 15 minutes before to test and activate equipment)

- Plenary discussion/review progress made on Belts
- To review progress with CS2
- Setting the time table and responsibilities for manuscript production
- Discuss new opportunities for collaboration with other ICES Expert groups
- Time and venue for next year's meeting

10.30 Close of meeting

SGCBNS terms of reference 2010:

a) Finalising the available text and web site opportunities for Belts (Benthic Ecology long-term series);

b) Continuing with work/text for manuscript production for case study 1(CS1);

c) Compiling and starting analysis of data for case study 2 (CS2)/ICES support with share point and WebEx facilities;

d) Discussing new opportunities for collaboration with other ICES expert groups.

Annex 4: Case Study 1 – Summary and data sets

Assessment of the fine scale temporal variability in coastal sediment bioturbation

Contributors/Co-authors (alphabetical)

Silvana Birchenough[1], Julie Bremner[1], Jasmin Godbold[2], Ruth Parker[1], Ana M. Queirós[3], Alicia Romero Ramirez[4], Henning Reiss[5], Alexander Schröder[6], Martin Solan[2], Paul Somerfield[3], Gert van Hoey[7], Steve Widdicombe[3]

[1] The Centre for Environment, Fisheries and Aquaculture Science, Pakefield Road, Lowestoft, NR33 OHT, UK.

[2] Oceanlab, University of Aberdeen New Street Newburgh ELLON, AB41, 8LQ, UK.

[3] Plymouth Marine Laboratory, Prospect Place, The Hoe, Plymouth, PL1 3DH, U.K

[4] UMR CNRS 5805 EPOC OASU Station Marine d'Arcachon, Université Bordeaux 12 Rue du Professeur Jolyet, 33120 ARCACHON CDEX France.

[5] Faculty of Biosciences and Aquaculture, University of Nordland, Postboks 1490, 8049 Bodø, Norway.

[6] NLWKN Lower Saxony Water Management Agency, Dep. Bra-Ol, Ratsherr-Schulze-Str. 10, 26122 Oldenburg, Germany.

[7] Institute for Agriculture and Fisheries Research (ILVO-Fisheries), Bio-environmental Research Group, Ankerstraat 1, 8400 Ostend, Belgium.

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 temporal reference datasets using macrofauna abundance and biomass (see summary table and Figure 1) to answer 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 for benthic systems. Therefore there is a pressing need to provide evidenced 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 data sets. 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.

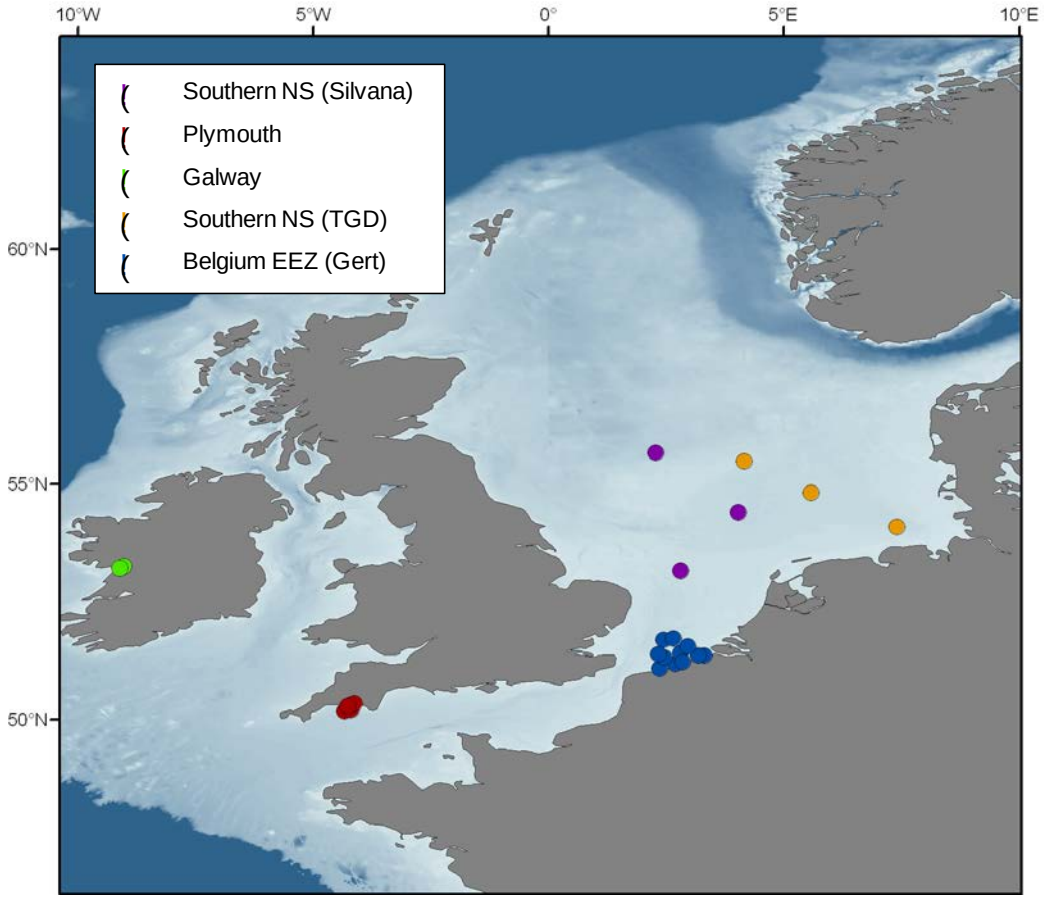


Figure 1. Overview of the study sites.

	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 5: BELTS net

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 data series 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 data series 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 data sets separate, but joining the overall assessments. This way, also inconsistencies between data sets 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.

Comparison and relations to other projects

Large scale projects that intend to collect, harmonise and manage actual data already exist (e.g. EMODNET, see information in Annex 4) and the BELTS net initiative presented here does NOT intend to duplicate these efforts.

Large collections of data are valuable tools for the future, but are notoriously difficult to manage. First, the ownership and intellectual rights of the data supplier need to be assured and procedures are needed to avoid unauthorised use of the data. Second, an extensive harmonisation of these data sets is necessary to ensure comparability and data quality before any analyses can begin. Third, the producers of the respective data sets know best the potentials and restrictions of the data as well as any interesting observations.

Although the technical problems can be overcome with some effort - as has been successfully demonstrated in some projects (e.g. MARBEF, NSBP 2000) there is still considerable reluctance from many scientists to give away valuable long term series data. This is an understandable issue since collection, analysis and interpretation of time-series data sets requires time and effort over prior to publish these outcomes in the peer review literature.

Procedures

Communication will be facilitated by a BELTS net web site 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 & 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 & 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 organised 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 email address will be created. A scientific coordinator will run the general organisation for defined time 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 emails 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 standardised 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 2012:

- 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 the SGCBNS meeting in Lowestoft in March 2010 and at the BEWG meeting in Fort Pierce during May 2011. The results of this discussion are summarised in this text. A draft with action will be further distributed to all participants for comments.

Annex 6: Recommendations

RECOMMENDATION	ADRESSED TO
1. To develop further the existing text, website and facilitate analyses in connection with Benthic long-term series network (BELTS net).	SGCBNS and Benthos Ecology Working Group (BEWG)
2. To discuss further analysis for CS1 and agree on next steps for manuscript preparation and submission.	SGCBNS
3. To prepare data and initial analyses for CS2.	SGCBNS
4. To explore possibilities of a joint theme session on long-term changes of benthos and climate change effects during the ASC 2013.	SGCBNS and Benthos Ecology Working Group (BEWG)
5. To explore further opportunities for collaboration with other SG's and WG's focused on joint analyses (e.g. bentho-pelagic coupling)	WGBIODIV (Biodiversity) Plankton SG (Priscilla Licandro-Maria should advise)

Annex 7: SGCBNS draft terms of reference for the next meeting

The **Study Group on Climate Related Benthic Processes in the North Sea** (SGCBNS), chaired by Silvana Birchenough, UK, and Henning Reiss, Germany, will meet in Plymouth, UK, 1–4 October 2012 to:

a) Update on current developments and future requirements in cooperation with other expert groups to support more advanced understanding of the climate related benthic processes in the North Sea;

b) Finalise Case Study 1 on the seasonal variability of bioturbation potential;

c) Continue analyses and manuscript preparation on Case Study 2 on large scale patterns of bioturbation potential as an important ecosystem function in the North Sea;

d) Discuss additional research opportunities in relation to climate change based on the findings of the first two case studies ;

e) Review progress and discuss possible contributions to BELTS net (the benthic long-term series network).

SGCBNS will report by 1 December 2012 (via SSGEF) for the attention of BEWG, SCICOM and ACOM.

Supporting Information

Priority	The work of this Study Group (SG hereafter) will be in accordance to the recent ICES Science Plan in support of an Ecosystem Approach. Evidence-based science to advance our current knowledge with the facilitation of interdisciplinary research for assessing climate change processes for marine benthos and the integration of surveys to harmonise practices will be a valuable strategy to develop this work.
Scientific justification	Current public and scientific concerns on the climate-driven changes within marine ecosystems has stimulated much interest in how climate change might affect benthic organisms. Currently there is a lack of understanding in how benthic communities respond to climatic variation. The fact that marine benthic ecosystems are relatively complex and ecological processes, such as trophic and non-trophic interactions, benthic-pelagic coupling and species interaction, are only partly understood, emphasizes the need for enhanced research of climate influences on benthic communities and processes. Based on the work done in the BEWG and the SGNSBP on the assessment of effects of changes in hydrodynamics and sea temperature and changes of the distribution of benthic communities, respectively, this SG will address relevant open questions of climate related processes in benthic systems. The Study Group "Climate related Benthic processes in the North Sea" [CBNS] will outline and inititate relevant interdisciplinary research and strategies by using case studies to address hypotheses relevant for climate effects on benthic systems. Furthermore, the SG aims to use benthic data for improving the performance of ecosystem models and therefore, their ability to predict changes in the benthos due to climate effect.
Resource requirements	ICES support and facilitation of vneues for hosting the meeting in October 2012. Specific resource requirements are for members to prepare for and participate during the meetings.
Participants	These would include a wide range of scientists, whose disciplines could contribute to the topics developed in this SG (e.g. benthic ecology, fish ecology and ecological modelling). Additional participation will be sought from ICES countries and by scientists both from disciplines and scientific circles not normally represented at ICES when necessary. It has to be clear that - because of its high data availability - the North Sea is

	here selected as a case-study area, rather than the research focus, which is the impact of climate change to the benthos. Hence, any expert in this field of research – also from non-North Sea bordering countries might contribute to the SG.
Secretariat facilities	This group is likely to have demand on the computing resources of the Secretariat, but no additional software/hardware is anticipated beyond that which is currently available (i.e. sharepoint, ICES data base information).
Financial	In principle it will be useful to explore within ICES financial support for this group (i.e. database usage and funds to support collaborative work). Additional, 'in kind' contribution will be provided by individual organisations covering travel and subsistence and time for the participants.
Linkages to advisory committees:	ACOM
Linkages to other committees or groups	A close working link with e.g. Benthos Ecology Working Group (BEWG), ICES-PICES Strategic Initiative on Climate Change Impacts on Marine Ecosystems (SSICCME),, Working Group on Integrative, Physical-biological and Ecosystem (WGIPEM), ICES Regional Ecosystem Group for the North Sea (REGNS) and ICES Working Group on Zooplankton Ecology (WGZE).
Linkages to other organizations	ICES will seek wider participation for this group including contact with relevant academic and intergovernmental organisations for this SG.