

# **Benthic Dynamics: *in situ* surveillance of the sediment-water interface**

25<sup>th</sup> – 29<sup>th</sup> March, 2002  
University of Aberdeen, Aberdeen, Scotland

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<http://www.abdn.ac.uk/ecosystem/conference/>

## **GOALS AND OBJECTIVES**

The aim of the conference was to bring together scientists with a proven capability in design, construction and implementation of appropriate remotely operated and autonomous technology used in shallow and deep-sea benthic research. A main objective of the meeting was to include as many different technologies from as wide a range of research foci as possible to encourage the generation of ideas and facilitate inter-disciplinary collaborations. The meeting was also designed to bring together international researchers who are known to have considerable experience in the design and use of benthic technology but who have not had a forum in a conference setting to share these ideas with colleagues from other disciplines. In addition to presenting scientific data, the participants were able to share information on technological matters, especially solutions to common design and implementation problems through active participation in several small workshops. The conference organizers intended for the participants in these workshops to consider current specifications and design issues, synthesise and evaluate current knowledge, and be inspired to engage in future research and inter-disciplinary collaborations that involve the synergy of two or more technologies. It was important that these discussions placed less emphasis on future technologies and instead concentrated on solutions using existing or present day emerging technology; the hope was to encourage new developments and collaborations between members of the meeting that could be implemented in the short-term. A number of informal sessions and a trip to Oceanlab (the new UK deep sea research and lander design, testing and fabrication facility) were also timetabled to facilitate this process.

Our final goal is to publish any findings, conclusions and/or recommendations as scientific papers within the context of appropriate and contemporary applications in a highly regarded and independently peer reviewed journal that is widely cited and internationally available.

## EXECUTIVE SUMMARY OF SCIENTIFIC / TECHNICAL RESULTS

It was clear from the outset that this meeting was the first time in many years (>10) that international engineers, scientists and other users (commercial and government) of benthic technology had been brought together to share experiences and present data in an ecological context. It was generally agreed that the technology focus of the meeting was badly needed and long overdue. A total of 59 oral presentations and 18 posters reflecting the use of technology in a variety of benthic habitats (freshwater rivers and lakes, intertidal, estuarine, coastal and deep sea up to 6000m depth) were presented at the conference. These included the use of technology for obtaining data on sediment biogeochemistry, organism-sediment relations, hydrodynamics at the sediment-water interface, in situ monitoring of small- and large-scale benthic phenomena and in situ 2-D and 3-D imaging techniques. Most of the presentations dealt with ways of recording and quantifying both the input to and release of living and non-living materials from the sediment-water interface. However, the spatial scales at which those processes and patterns could be captured were, to a large extent, extremely local. The participants recognized that coupling of materials between the sea/lake bed and the water column can occur over much greater spatial scales, with water column processes (also affected by the benthos) occurring way beyond the reach of present surveillance techniques. In particular, there were few obvious techniques for quantifying the fluxes of living particles at the benthic interface, and there is a clear need that such techniques be developed. There is a great deal of discussion in the literature surrounding scale issues in the benthos, and the conference participants were keenly aware that these need to be carefully considered before experiments could be designed or definitive statements could be made. However, one overwhelming consensus was that in situ techniques clearly had great potential for exploring dynamics of benthic community functioning.

The wide variety of research foci and expertise allowed many cross-discipline issues to be raised, discussed and, in many instances, solutions to common design and implementation problems were offered. Experiences from alternative habitats were of particular interest and raised questions about some ecological models and paradigms that otherwise had been generally accepted. The concentration of specialized engineers had a similar positive effect and was instrumental in starting a network of communication. The inclusion of five workshops (biogeochemistry, imagery, artifacts and interpretation, hydrodynamics and organism-sediment relations) proved to be a valuable addition to the meeting and provided an opportunity to produce a series of interdisciplinary scholarly review articles. In the case of the imagery workshop, it was the first time in a decade that all the active users of sediment profile imaging technology had been brought together. Discussion of artifacts caused by instrumentation design and the interpretation of results was a necessary and valuable exercise, an otherwise infrequently visited area of benthic ecology. The use of an informal ‘any other business’ session provided an opportunity to show data and in situ footage of several design/sampling artifacts, information that is not always accessible or quantified.

The conference also provided a ‘spring-board’ for the generation of several collaborations, outlines for future proposals and ‘networks of excellence’ on both a national and an international level. These included informal e-mail based discussion networks (derived from the workshop participant lists), direct collaborations with existing funds, and the generation of new formal proposals. There was also keen interest in repeating the meeting in the near future, and plans have already been initiated to secure breakaway scientific papers, meetings and workshops. The proceedings of the meeting will form a special issue of the *Journal of Experimental Marine Biology and Ecology*.

## ONRIFO SPONSORED PARTICIPANTS

### Summary of participants funded by ONRIFO.

Title / Name	Institution / Agency	Country
All participants were partially supported	See address listing	15 countries

## SCIENTIFIC / STEERING AND ORGANIZING COMMITTEES

### Steering Committee Members.

Title / Name	Institution / Agency	Country
Dr. Martin Solan	University of Aberdeen	United Kingdom
Prof. Monty Priede	University of Aberdeen	United Kingdom
Prof. David Raffaelli	University of York	United Kingdom
Dr. Joseph Germano	Germano and Associates Inc.	United States
Prof. Graham Shimmield	Dunstaffnage Marine Laboratory and Scottish Association of Marine Sciences	United Kingdom
Prof. Rutger Rosenberg	University of Gothenburg	Sweden
Prof. John Gray	University of Oslo	Norway
Prof. Richard Warwick	Plymouth Marine Laboratory	United Kingdom
Prof. Michael Simmons	University of Aberdeen	United Kingdom

### Organizing Committee Members.

Title / Name	Institution / Agency	Country
Dr. Martin Solan	University of Aberdeen	United Kingdom
Prof. David Raffaelli	University of York	United Kingdom
Prof. Monty Priede	University of Aberdeen	United Kingdom
Dr. Joseph Germano	Germano and Associates Inc.	United States

## SPONSOR INFORMATION

### List of all conference sponsors.

Agency	Country
British Ecological Society	United Kingdom
Challenger Society	United Kingdom
Marine Biological Association	United Kingdom
Germano and Associates Inc.	United States
U.S. Army Engineer Research and Development Center, Dredging Operations Technical Support Program	United States
NOAA Coastal Services Center	United States
Office of Naval Research International Field Office	United States

## PROCEEDINGS

The proceedings will form a special issue of the *Journal of Experimental Marine Biology and Ecology*, an independently peer reviewed and internationally available scientific journal. Expected publication is early 2003. Three copies will be sent to ONRIFO on completion. Additional copies can be purchased direct from the publisher (Elsevier). Any questions relating to the volume should be directed to Dr. Martin Solan.

## SCIENTIFIC PROGRAM

### Monday 25<sup>th</sup> March, 2002 (morning session)

	<b>Breakfast</b> <i>Crombie Diner (Kings Hall residents) or Johnston Diner (Crombie Hall residents).</i> <b>Please note that Zoology is approx. 15-20 mins walk (see map for route)</b>
08:00 - 08:40	
09:00	Assembly of delegates and collection of conference packs. <i>Foyer of Zoology building</i>
09:20	Welcome and Introduction <i>Main lecture theatre, Zoology building</i>
<b>Session A:</b>	<b>Porewater biogeochemistry and diagenesis</b>
09:45	<i>Oxygen demand in coastal marine environments: comparing in situ microelectrodes and laboratory core incubations</i> <b>Rabouille, C.</b> , Denis, L., Lansard, B. and Grenz, C.
10:05	<i>Comparison of sediment oxygen uptake rates determined by in-situ microprofiling and shipboard/laboratory incubations</i> <b>Breuer, E.R.</b> , Harvey, S.M., Peppe, O.C., Overnell, J., Hughes, D.J., Black, K.D., Nickell, L.A. and Jones, K.J.
10:25	<i>Short- and medium-term fate of fresh organic carbon in deep-sea sediments</i> <b>Witte, U.</b> , Aberle, N., Sand, M., Wenzhofer, F., Boetius, A., Pfannkuche, O., Sommer, S. and Cremer, A.
10:45	<b>Tea/coffee break, Zoology foyer</b>
11:15	<i>Benthic fluxes of trace metals in contaminated U.S. harbours</i> Chadwick, D.B., Hampton, T., Rivera-Duarte, I., Davidson, B., Guerrero, J. and Crecelius, E. This communication will be presented by <b>Sabine Apitz</b> .
11:35	<i>Early diagenesis processes in turbiditic sequences of the Bay of Biscay</i> <b>Chaillou, G.</b> , Anschutz, P., Jouanneau, J-M. and Mulder, T.
11:55	<i>In situ sediment oxygen microprofiles and associated trace metal geochemistry from two sites, west coast of Scotland</i> <b>Shimmield, T.</b> , Breuer, E.R. Duncan, J.L., Mercer, D.J.L. Black, K. and Shimmield, G.
12:15	<i>Speciation, redox states and reactivity of particular manganese in marine sediments</i> <b>Dedieu, K.</b> , Anschutz, P., Desmazes, F. and Chaillou, G.
12:35	<i>Resuspension and its effect on eutrophication and carbon recycling: In situ measurements using new sensor technology</i> <b>Tengberg, A.</b> , Almroth, E., Hall, P. and Hovdenes, J.
12:55 – 14:00	<b>Buffet luncheon, Zoology foyer</b>

## Monday 25<sup>th</sup> March, 2002 (afternoon session)

14:00	<i>Potential benthic microbial recruitment in an extremely acidic mining lake</i> <b>Bell, E.</b> and Weithoff, G.
14:20	<i>Advective porewater exchange in subtidal sands: Does it really enhance the degradation of organic matter?</i> <b>Janssen, F.</b> and Witte, U.
14:40	<i>Seasonal and 3-dimensional distribution of redox species in salt marsh sediments by in situ voltammetry</i> <b>Taillefert, M</b> and Bull, D.C.
15:00	<i>Spatial variability in sediment oxygen consumption in a lagoonal system in New Caledonia, South Pacific</i> <b>Grenz, C.</b> , Denis, L., Boucher, G., Chauvaud, L., Clavier, J., Fichez, R. and Pringault, O.
15:20	<b>Tea/coffee break</b> <i>Zoology foyer</i>
15:50	<i>Factors influencing organic carbon recycling and burial in Skagerrak sediments</i> <b>Hall, P.</b> , Stahl, H., Tengberg, A. and Brunnegard, J.
<b>Session B: Organism sediment relations</b>	
16:10	<i>Targeted sediment sampling to assess the bacterial response to organism generated habitat heterogeneity using a ROV</i> <b>Soltwedel, T.</b> and Vopel, K.
16:30	<i>In situ estimations of motility of juvenile polychaetes in tidal flats</i> Hernandez-Guevara, N.A. and <b>Rodriguez-Valencia, J.A.</b>
16:50	<i>Predicting post disturbance recovery of soft sediment communities</i> <b>Dernie, K.M.</b> , Kaiser, M.J. and Warwick, R.M.
17:10	<i>Assessment of abundance and biomass of macrofauna in Bahor-Kalat estuary in south east Iran (NE of Oman Sea)</i> <b>Attaran Fariman, G.</b>
17:30	<b>End of proceedings</b>
18:00	<b>Evening meal</b> <i>Johnston dining room</i>

## Tuesday 26<sup>th</sup> March, 2002 (morning session)

	<b>Breakfast</b> <i>Crombie Diner (Kings Hall residents) or Johnston Diner (Crombie Hall residents)</i>
08:00 - 08:40	
09:30	<i>Two-dimensional optical quantification of high speed sediment bio-reworking by Amphiura filiformis</i> <b>Gilbert, F.</b> , Hulth, S., Strömberg, N., Ringdahl, K. and Poggiale, J-C.
09:50	<i>Segmentation of multibeam sonar bathymetry data and video mosaics using local Fourier transformations at varying spatial scales</i> <b>Cutter Jr., G.R.</b> , Rzhanov, Y. and Mayer, L.A.
10:10	<i>Spatio-temporal attraction of deep sea scavengers by food falls</i> <b>Klages, M.</b> , Muyakschin, S., Premke, K., Trenkel, V. and Wegner, J.
10:30	<i>Search paths, topography and patchiness of impacts by fishes and mobile macrocrustacea on mud</i> <b>Burrows, M.</b> , Robb, L., Nickell, L.A. and Hughes, D.J.
10:50	<b>Tea/coffee break</b> <i>Zoology foyer</i>
11:20	<i>Spatial variation of soft bottom benthic assemblages associated with intertidal boulder fields</i> <b>Cruz-Motta, J.J.</b>
<b>Session C:</b>	<b>Hydrodynamics at the sediment-water interface</b>
11:40	<i>Acoustic instrumentation for measuring benthic sediment processes</i> <b>Betteridge, K.F.E.</b> , Thorne, P.D. and Bell, P.S.
12:00	<i>Time series observations and the assessment of sediment erosion and transport</i> <b>Bohlen, W.F.</b>
12:20	<i>Flow and benthic variability in the Colorado River through Grand Canyon, Arizona, USA</i> <b>Haden, G.A.</b> , Shannon, J.P., Benenati, E.P., Straka, K. and Blinn, D.W.
12:40	<i>Resuspension potential of pelagic carbonate ooze</i> <b>Black, K.S.</b> , Peppe, O.C. and Gust, G.
13:00-14:00	<b>Buffet luncheon</b> <i>Zoology foyer</i>

## Tuesday 26<sup>th</sup> March, 2002 (afternoon session)

14:00	<i>An experimental system to explore processes along particle paths on continental margins under increasing pressure</i> <b>Holscher, B.</b> , Gust, G. and Thomsen, L.
14:20	<i>A new generation of seabed landers for measuring resuspension mechanisms</i> <b>Rees, J.</b> and Bunt, J.
14:40	<i>Bottom stress and sediment dynamics</i> <b>Howarth, M.J.</b>
15:00	<i>Flow increases ecosystem functioning in diverse systems: an in situ study of estuarine sediments</i> <b>Biles, C.</b> , Solan, M., Isaksson, I., Paterson, D.M. and Raffaelli, D.
15:20	<b>Tea/coffee break</b> Zoology foyer
15:50	<i>A new autonomous time series in situ benthic invertebrate recruitment sampler</i> <b>Whitlach, R.B.</b> , Cummings, V.J., Hamilton, J. and Osman, R.W.
16:10	<b>Workshop Session</b> (see workshop section for breakout room allocations)
17:30	<b>End of proceedings</b>
18:00	<b>Evening meal</b> Johnston dining room

## Wednesday 27<sup>th</sup> March, 2002

	<b>Breakfast</b> <i>Crombie Diner (Kings Hall residents) or Johnston Diner (Crombie Hall residents)</i> <b>**Collect packed lunch***</b>
08:00 - 08:40	
09:00	Workshop Session (see workshop section for breakout room allocations)
09:50	Transfer to coaches outside Zoology building
10:00	Depart by coach from Zoology building for visit to <i>Oceanlab</i> , Newburgh
10:45	Welcome and Introduction to <i>Oceanlab</i> , <b>Prof. Monty Priede and Dr. Phil Bagley</b>
11:15	Tour of <i>Oceanlab</i> and time to see design and testing facilities, landers and meet <i>Oceanlab</i> staff <b>Tea/coffee will be served</b>
12:00	Depart <i>Oceanlab</i> for mixer at <i>StrathIsla Highland Whisky Distillery</i> (Group A) or <i>Glenfiddich Whisky Distillery</i> (Group B). Consume packed lunch <i>en route</i> .
13:30	Arrive at distillery for tour and shop visit.
16:00	Return to Aberdeen
17:30	Arrive Zoology building, <b>End of proceedings</b>
18:00	<b>Evening meal</b> <i>Johnston dining room</i>

## Thursday 28<sup>th</sup> March, 2002 (morning session)

08:00 - 08:40	<b>Breakfast</b> <i>Crombie Diner (Kings Hall residents) or Johnston Diner (Crombie Hall residents)</i>
<b>Session D:</b>	<b>In situ benthic monitoring</b>
09:30	<i>Polyacrylamide gel probes for redox sensitive trace metal pore water sampling</i> <b>Morford, J.</b> , Kalnejais, L., Martin, W., Francois, R. and Karle, I-M.
09:50	<i>Biogeochemistry of the sediment-water interface of an acidic mining lake studied with microsensors and gel-probes</i> <b>Koschorreck, M.</b> , Bauer, I. and Matthias, A.
10:10	<i>Experimental disturbance of foraminiferal-bacterial interactions</i> <b>Langezaal, S.</b> , van Bergen, P.F. and van der Zwaan, G.J.
10:30	<i>Long term in situ experiment on deep-sea macrobenthos response to drilling fluid contamination and organic matter enrichments</i> <b>Menot, L.</b> , Crassous, P., Khripounoff, A., Caprais, J-C., Desbruyere, D. and Sibuet, M.
10:50	<b>Tea/coffee break</b> <i>Zoology foyer</i>
11:20	<i>Use of acoustic seabed classification to identify fish habitats</i> <b>Freeman, S.M.</b> , <b>Bergmann, M.</b> , Hinz, H. and Kaiser, M.J.
11:40	<i>In situ studies of metabolism, muscle physiology and behaviour in deep-sea fish</i> <b>Bailey, D.</b> , Bagley, P.M., Jamieson, A.J., Collins, M.A. and Priede, I.G.
12:00	<i>Benthic interface studies with landers: new designs and implications</i> <b>Parker, W.R.</b> , Lomas, P., Malcolm, S., Pearce, D. and Parker, E.R.
12:20	<i>The GEOMAR modular lander system: a platform for deep-sea observations and experiments</i> <b>Pfannkuche, O.</b> , Sommer, S., Boetius, A. and Witte, U.
12:40	<i>A tool for interactive analysis of simultaneous biological and environmental data on the deep seabed</i> <b>Vangriesheim, A.</b> , Mansouri, T., Galeron, J., Merlin, A. and Sibuet, M.
13:00-14:00	<b>Buffet luncheon</b> <i>Zoology foyer</i>

## Thursday 28<sup>th</sup> March, 2002 (afternoon session)

<b>Session E:</b>	<b><i>In situ benthic imagery</i></b>
14:00	<i>Benthic fluxes and bioturbation on an organic enrichment gradient in Loch Creran, Scotland</i> Black, K., <b>Nickell, L.</b> , Hughes, D., Overnell, J., Harvey, M., Jones, K., Breuer, E., Cromey, C. and Shimmield, T.
14:20	<i>Effects of trawling on the sediment surface in Mediterranean and Swedish waters observed in sediment profile images</i> <b>Rosenberg, R.</b> , Nilsson, H.C., Gremare, A. and Amouroux, J-M.
14:40	<i>Use of axial tomography to follow the temporal changes of benthic communities in an unstable sedimentary environment</i> <b>Michaud, E.</b> , Desrosiers, G., Long, B., de Montety, L., Cremer, J.F., Pelletier, E., Locat, J., Gilbert, F. and Stora, G.
15:00	<i>Identification of patch structure within marine benthic landscapes using a Remotely Operated Vehicle (ROV)</i> <b>Parry, D.M.</b> , Kendall, M.A., Pilgrim, D.A., Jones, M.B.
15:20	<b>Tea/coffee break</b> <i>Zoology foyer</i>
15:50	<i>Assessment of benthic habitat quality in the lower Chesapeake Bay, USA using multiple methods and metrics</i> <b>Diaz, R.J.</b> and Dauer, D.M.
16:10	<i>Video-guided deployment of benthic observatories</i> <b>Linke, P.</b> and Pfannkuche, O.
16:30	<b>Workshop Session</b> (see workshop section for breakout room allocations)
17:30	<b>End of proceedings</b>
18:00-00:00	<b>Conference dinner and bar</b> <i>Crombie dining room</i>

## Friday 29<sup>th</sup> March, 2002 (morning session)

08:00 - 08:40	<b>Breakfast</b> <i>Crombie Diner (Kings Hall residents) or Johnston Diner (Crombie Hall residents)</i>
09:30	<i>Spatial and temporal changes in the benthic oxygen dynamic: Insights from in situ 2-dimensional images and total oxygen uptake measurements</i> <b>Wenzhoefer, F.</b> and Glud, R.N.
09:50	<i>In situ observation of organism-sediment interactions in intertidal sediments</i> <b>Kennedy, R.</b> , O'Reilly, R., Patterson, A. and Keegan, B.F.
10:10	<i>Holographic recording of plankton and other particles in Loch Etive, Scotland</i> <b>Watson, J.</b> , Alexander, S., Craig, G., Hendry, D.C., Hobson, P.R., Lampitt, R.S., Nareid, H., Nebrensky, J.J., Player, M.A., Saw, K. and Tipping, K.
10:30	<i>Detection of organic enrichment near finfish net-pens by sediment profile imaging at SCUBA-accessible depths</i> Wildish, D., Hargrave, B.T., Crawford, C. and <b>Macleod, C.</b>
10:50	<b>Tea/coffee break</b> <i>Zoology foyer</i>
11:20	<i>Benthic spatial and temporal variation analysed by using the Benthic Habitat Quality (BHQ) index</i> <b>Nilsson, H.</b> , Rosenberg, R. and Diaz, R.J.
11:40	<i>An objective method for assigning successional stages to sediment profile imagery data</i> <b>O'Connor, B.</b> , Costelloe, J. and Costelloe, M.
12:00	<i>Analysing the impact of bottom trawls on sedimentary seabeds with sediment profile imagery</i> <b>Smith, C.</b> , Rumohr, H., Karakassis, I. and Papadopoulou, K-N.
12:20	<i>Sediment profile imagery (SPI) versus Hydraulic modelling: a reality check in the Magic Kingdom</i> <b>Reid, C.</b> , Germano, J.D. and Kennish, R.
12:40	<i>Sediment anoxia and bottom water ammonia and sulphide as potential factors in lobster mortality in long Island Sound, USA</i> <b>Valente, R.</b> and Cuomo, C.
13:00-14:00	<b>Buffet luncheon</b> <i>Zoology foyer</i>

## **Friday 29<sup>th</sup> March, 2002 (afternoon session)**

14:00	<i>Application of sediment profile imaging in monitoring the disposal of dredged material in the deep sea</i> <b>Williams, I.</b> , Blake, J.A., Diaz, R.J. and Rhoads, D.
14:20	<i>Benthic biotopes remote sensing using acoustics</i> Freitas, R., Rodrigues, A-M. and <b>Quintino, V.</b>
14:40	<i>Use of Laser Line Scan for assessment of response of benthic habitats and demersal fish to seafloor disturbance</i> <b>Carey, D.</b> , Rhoads, D.C. and Hecker, B.
15:00	<i>Relations between marine benthic biodiversity and ecosystem functioning: a remote assessment using sediment profile imagery</i> <b>Solan, M.</b> , Kennedy, R., Raffaelli, D. and Keegan, B.F.
15:20	<b>Tea/coffee break</b> <i>Zoology foyer</i>
15:50	<b>Informal workshop progress reports</b>
16:15	<b>Closing remarks, any other business and conclusions</b>
17:00	<b>End of proceedings</b>
18:00	<b>Evening meal</b> <i>Johnston dining room</i>

## **Saturday 30<sup>th</sup> March, 2002**

Breakfast will be served as for previous days.

**All rooms should be vacated by 10:00hrs.** For those with a late departure, luggage may be left securely at the porter's desk for pick up later in the day.

## COUNTRIES REPRESENTED AND NUMBER OF PARTICIPANTS

### List of countries participating.

Country (total)	Number of Participants (total)
Australia	3
China	1
Denmark	1
France	12
Germany	14
Greece	1
Republic of Ireland	4
Japan	1
The Netherlands	4
Portugal	1
Sweden	6
United Kingdom (Scotland, England and Wales)	34 (= 21, 11 and 2)
United States	19
<b>15 countries</b>	<b>101</b>

## LIST OF PARTICIPANTS AND CONTACT INFORMATION

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<p><b>Dr. Phil Bagley</b>  Oceanlab  University of Aberdeen  Newburgh, Aberdeenshire  AB41 6AA  UK</p> <p>Tel: + 44 1224 274411  Fax: + 44 1224 274402  Email: <a href="mailto:p.bagley@abdn.ac.uk">p.bagley@abdn.ac.uk</a></p>	<p><b>Dr. David Bailey</b>  Oceanlab  University of Aberdeen  Newburgh, Aberdeenshire  AB41 6AA  UK</p> <p>Tel: + 44 1224 274413  Fax: + 44 1224 274402  Email: <a href="mailto:d.bailey@abdn.ac.uk">d.bailey@abdn.ac.uk</a></p>
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