

The importance of sediment for biodiversity

Special Session at 7th International SedNet Event, 6-9 April 2011, Venice

Date: Thursday, 7 April 2011, 09.00 – 12.30 h

Moderator: Adriaan Slob, TNO, Delft, the Netherlands

Reporter: Jos Brils, SedNet steering group member, Deltares, Utrecht, the Netherlands

The abstracts of the invited key-notes are attached as appendix I. The brief biopics of the key-note speakers, of the moderator and of the session reporter are attached as appendix II.

Session rationale:

“Sediment forms a variety of habitats. Many aquatic species live in the sediment. Microbial processes cause regeneration of nutrients and important functioning of nutrient cycles for the whole water body. Sediment dynamics and gradients (wet-dry and fresh-salt) form favorable conditions for a large biodiversity.” This was already stated in 2004 in the SedNet booklet¹. Thus for SedNet it is already clear from its origin that sediment is of crucial importance for biodiversity. However, so far SedNet did not yet attempt to further underpin this statement with ‘facts & figures’. Such underpinning of the importance of sediment for biodiversity may enable more and better attention to sediment management by policymaking and management. Hereby we also realize that halting of biodiversity loss, and thus the degradation of ecosystem services, has moved to the core of EU environmental policy making.² It is against this background that this special session is organized.

Session outline:

09.00 Opening, welcome, outline and objective of this session
Adriaan Slob, TNO, Delft, the Netherlands (session moderator)

The scientific evidence base:

3 invited scientific keynote talks (25 minutes talk, 5 minutes for clarifying questions) each addressing scientific state-of-the-art facts & figures on the importance of sediment for biodiversity. Talks covering the entire river basin, via estuaries/tidal zone all the way up the coastal/marine system.

09.10 Fresh water sediments and biodiversity
Alan Covich, INTECOL President, University of Georgia, Athens, GA, USA

09.40 Biodiversity and sedimentary habitats in critical transitional zones: the Venice lagoon as example
Stefano Guerzoni & Davide Tagliapietra, both ISMAR-CNR, Venice, Italy

10.10 **Coffee break**

10.30 Physical and biogeochemical processes as building blocks for maintaining sediment biodiversity in coastal environments
Kate Spencer, Queen Mary University of London, United Kingdom

¹ See: www.sednet.org

² See: http://ec.europa.eu/environment/nature/index_en.htm

11.00 **Audience discussion:**

The moderator asks the audience to reflect on the following three key-questions, question by question:

- Is sediment indeed of crucial importance for biodiversity?
- Can a 'white paper' help to increase awareness to this issue?
- Suggestions for the white paper:
 - producers,
 - outline,
 - proposed role of SedNet?

12.15 **Wrap-up/synthesis:** anticipated outcome:

- Further underpinned statement on the importance of sediment for biodiversity
- First outline for a 'white paper' on the importance (facts & figures) of sediment for biodiversity and suggestions on whom (volunteers?) and how to produce that 'white paper' (including the role of SedNet)
- Session report in the SedNet associated Journal of Soils and Sediments (JSS)³
- Key-messages in the SedNet e-newsletter and overall conference report
- One slide, summarizing the key-findings of this session (i.e. answers to key-questions posed above)

This slide will be presented by the session reporter (Jos Brils) plenary to the Conference participants in the opening session, i.e. somewhere in the afternoon time slot from 13.40 – 14.00 h.

12.30 **End of session / Lunch**

³ For JSS see: <http://www.springer.com/environment/soil+science/journal/11368>

Appendix I – Key-note abstracts

Fresh water sediments and biodiversity

Alan Covich,
INTECOL President, University of Georgia, Athens, GA, USA
E-mail: alanc@uga.edu

The role of benthic species diversity in sustaining freshwater ecosystem processes and natural ecosystem services is well understood but not widely appreciated. Examples of the critical services performed by filter-feeding and burrowing benthic invertebrates in providing clean drinking water are illustrated by comparative, long-term studies of freshwater biodiversity at widely distributed sites in temperate to tropical ecosystems. Native species provide important degrees of insurance in sustaining natural processes, such as organic-matter breakdown and nutrient cycling, essential to provisioning of clean water. Defining the roles of these key native species and their resiliency is essential to determine which species interact positively, negatively or independently as food-web complexity is altered. These studies help to provide new insights regarding how to sustain freshwater biodiversity in a rapidly changing world where climatic changes are altering the frequency and intensity of disturbances that directly and indirectly affect freshwater ecosystem processes. Floods, droughts, and hurricanes are predicted to increase in frequency and intensity and sea level is already rising in many coastal zones. Cumulative effects of these changes will add new challenges in sustaining ecosystem services provided by rivers, lakes and wetlands.

Biodiversity and sedimentary habitats in critical transitional zones: the Venice lagoon as example

Stefano Guerzoni & Davide Tagliapietra
National Research Council, Institute of Marine Sciences (CNR-ISMAR), Venice, Italy
E-mail: s.guerzoni@ismar.cnr.it & d.tagliapietra@ismar.cnr.it

Lagoons and estuaries are characterised by progressive composite gradients that involve salinity, sediment structure, water renewal, nutrients, etc. The contribution of different components of the gradient depends on the main hydrodynamic energy sources of the system. The key effect of the transitional gradient on macroscopic biocoenosis is that the number of species that can cope with it decrease progressively, leading to a physiological reduction of biodiversity. The decline in species number and diversity along the gradient has been the subject of different conceptualisations, each one putting emphasis on different aspects of the gradient, depending on the type of Coastal Transitional Ecosystem investigated: sediment type and structure, salinity, seawater renewal, sediment organic content and saprobic processes. Physical disturbance of sediment, both natural and anthropogenic, and sediment pollution are additional causes for biodiversity changes or loss. A prominent part of biodiversity is therefore explained by structural characteristic of the transitional system, whilst the rest is due to biological interactions, anthropogenic disturbance and pollution.

Physical and biogeochemical processes as building blocks for sediment biodiversity in coastal environments

Kate L. Spencer
School of Geography, Queen Mary University of London, Mile End Road, E1 4NS, United Kingdom
E-mail: k.spencer@qmul.ac.uk

Coastal sediments are highly biologically productive and perform a range of important functions that are well-recognised including nutrient cycling and wave attenuation. These environments are currently facing significant challenges associated with climate change, development and water quality deterioration leading to loss of wetland habitat and biodiversity. Increasingly, we are seeking to manage, rehabilitate and recreate these environments using soft engineering techniques, for example Managed Realignment (MR) and in Europe, this has predominantly been driven by the need for habitat (re)creation under the EU Habitats Directive. Although habitat creation and environmental enhancements have been delivered by many restoration schemes, there is an increasing need to demonstrate that these schemes maximise the full range of ecosystem services that they can provide, including biodiversity. The development of vegetation for example, is nested within the wider hydrogeomorphic and biogeochemical salt marsh system and will be controlled by tidal inundation (hydroperiod), rates and patterns of surface flow, the delivery of suspended material and the development of marsh surface morphology. Detailed, high resolution measurements of hydrogeomorphic and hydrodynamic processes are rarely considered within restoration schemes. Yet, improving our understanding of the complex linkages between ecological, physical and biogeochemical processes in both natural and restored sediments is necessary for maintaining and restoring biodiversity in coastal sediments and wetlands.

Appendix II – Biopics of session speakers & organizers

In alphabetical order (family name):

Family name
First name
Organisation
Website
Role in session
E-mail

Brils

Jos
Deltares
www.deltares.nl
Reporter
jos.brils@deltares.nl



Jos Brils is working as a senior adviser at Deltares. He is originally trained as biologist/ecotoxicologist. His current area of interest is ecosystem services, international networking and science-policy-interfacing, specifically in the field of (risk-based) river-basin management. Mr. Brils was the initiator and coordinator of the EC FP6 Coordination Action (CA) project RISKBASE: Integrated Risk-Based Management of the water/sediment/soil system at River Basin scale (www.riskbase.info). He was the initiator and coordinator and to date steer group member of the FP5 funded European Sediment Network SEDNET, that since 2005 continued as fully self-supporting network (www.sednet.org). Furthermore, he was the coordinator of the 'sediment risk field' in the EC FP6 CA project RISKBRIDGE (www.riskbridge.eu). Mr. Brils is/has been participant of several scientific advisory committees of studies and issues on sediment quality and quantity monitoring and assessment (a.o. steering committee member of UNESCO's International Sediment Initiative, <http://www.irtces.org/isi/>) and is/ has been member of several scientific advisory boards of international conferences. Mr. Brils has given numerous (invited) keynote lectures on risk-based management in general and ecotoxicological and sediment management issues specifically at national and international workshops, conferences and symposia and chaired sessions at several of these events.

Family name
First name
Organisation
Website
Role in session
E-mail

Covich

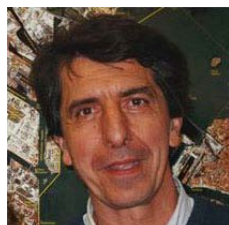
Alan
University of Georgia, Athens, GA, USA
<http://www.ecology.uga.edu/facultyMember.php?Covich-20/>
Speaker
alanc@uga.edu



Alan P. Covich joined the University of Georgia as Director (2003-2006) and is a professor in the Odum School of Ecology. Covich's research interests include effects of extreme climate-driven variability of flows on the assembly and function of aquatic food webs and ecosystem services. His research examines predator-prey chemosensory communication, species-specific roles in detrital processing chains, and species redundancy in functioning of aquatic ecosystems. Covich is a North American representative to the International Association of Limnology and is currently president of the International Association for Ecology (INTECOL). He was elected president of the Ecological Society of America in 2006-2007, and president of the American Institute of Biological Sciences (AIBS) in 2000, and president of the North American Benthological Society in 1996. He was awarded the Icko Iben Award for Excellence (in interdisciplinary work) by the American Water Resources Association in 1997 and elected a Fellow of the American Association for the Advancement of Science in 1999. Covich serves as reviewer of climate change impacts on water quality for the US Environmental Protection Agency, and the US National Science Foundation, and as a consultant to Resources For the Future (RFF) in Washington, D.C. in aquatic ecology. (www.rff.org/Publications/Pages/PublicationsList.aspx?Subtopic=Fresh%20water).

Family name
First name
Organisation
Website
Role in session
E-mail

Guerzoni
Stefano
National Research Council, Institute of Marine Sciences (CNR-ISMAR)
<http://www.ismar.cnr.it/>
Speaker
s.guerzoni@ismar.cnr.it



Stefano Guerzoni was born in Bologna in 1951, he obtained a *Laurea cum laude* in Biology in 1974 at the University of Bologna and a PhD in geochemistry (1978) at Scripps Institute of Oceanography (La Jolla, USA) with Edward Goldberg.
Research scientist at the National Research Council since 1976, now senior scientist at the Institute of Marine Sciences in Venice. He has done research work for more than 20 years in geochemistry and sedimentology of coastal, riverine and lagoon environments. His research interests currently are the morpho-bathymetric variations of transitional environments due to both historical and climatic reasons and the application of environmental indicators and indices for the integrated management of the coastal zone. He is co-editor of the "Atlas of the Lagoon of Venice" (2006), see also: http://atlante.silvenezia.it/en/index_ns.html

Family name
First name
Organisation
Website
Role in session
E-mail

Slob
Adriaan
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www.tno.nl
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adriaan.slob@tno.nl



Adriaan Slob is senior researcher and was manager of the team Regional Development and Policy Processes. His studies concern governance of social-ecological systems, the role of knowledge in policy processes and the involvement of stakeholders. He is a skilled facilitator of (policy) processes. He is leader of the EC FP7 funded PSI-connect project (www.psiconnect.eu) and was involved in SEDNET (www.sednet.org), AQUATERRA (www.eu-aquaterra.de), RISKBRIDGE (<http://www.irgc.org/Risk-Bridge.html>) and RiskBase (www.riskbase.info), where his role was to organise workshops and discussions between scientists from different disciplines and between scientists and policy makers.

Family name
First name
Organisation
Website
Role in session
E-mail

Spencer
Kate
School of Geography Queen Mary University of London
<http://www.geog.qmul.ac.uk/staff/spencerk.html>
Speaker
k.spencer@qmul.ac.uk



Kate Spencer is a Senior Lecturer in Physical Geography in the School of Geography, Queen Mary University of London. She has 16 years research and consultancy experience working in aquatic, and more specifically estuarine and near coastal, environments. Her work focuses on the biogeochemical behaviour of inorganic and organic contaminants and the management of fine and cohesive sediments. This work has improved our understanding of (i) how sediment and water chemistry (e.g. contaminant cycling, partitioning, mobility and bioavailability) responds to changing physical and chemical conditions during e.g. dredging, flooding, natural erosion and early diagenesis and, (ii) how contaminant partitioning can be used as a tool to identify contaminant sources and to validate sediment dating techniques. Through the development and application of novel sediment tracers, this work also integrates this geochemical knowledge with the need to understand the physical processes of sediment transport and flocculation and inform sediment management and remediation strategies. She has provided expert advice and technical support to a range of stake-holders and end-users including; the Environment Agency of England and Wales, the Irish Environment Protection Agency, Environment Canada and a range of port authorities examining urban sediment quality and sediment management activities.

Family name **Tagliapietra**
 First name Davide
 Organisation National Research Council, Institute of Marine Sciences (CNR-ISMAR)
 Website <http://www.ismar.cnr.it/>
 Role in session Speaker
 E-mail d.tagliapietra@ismar.cnr.it



Davide Tagliapietra was born in Venice, Italy in 1960. He graduated in Biological Sciences at the University of Padua, in 1984. At present he is researcher at the National Research Council, after a long experience as freelance field biologist. His research is focussed on the benthic ecology of coastal transitional ecosystems (lagoons and estuaries) including: (i) benthic macrofaunal population and community dynamics; (ii) bioindication; (iii) relationships between benthic ecology and hydrogeology (iv) habitat typology and classification. He is co-author (2004) of the "Italian manual of methods for the study of the marine benthos" for soft bottom macrobenthos and co-editor (2006) of the "Atlas of the Lagoon of Venice", see also: http://atlante.silvenezia.it/en/index_ns.html