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Facing Present and Future Coast Challenges

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Local organising committee:

Viktorija Vaitkevičienė, Marine Science and Technology Centre of Klaipėda University
Ilona Minevičiūtė, Association „Baltic valley“, Klaipėda
Rosita Milerienė, Marine Science and Technology Centre of Klaipėda University

Contacts:
H. Manto 84, LT-92294
Klaipėda, Lithuania
http://balticlagoons.net/littoral2014/
e-mail: littoral2014@balticlagoons.net
phone: +370 46 398844
fax: +370 46 398845.

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PREFACE

Littoral 2014 “Facing Present and Future Coast Challenges”, the 12th conference of this series, is the traditional bi-annual international event of the Coastal & Marine Union (EUCC), an association with 2700 members and member organisations in 40 countries. Founded in 1989 with the aim of promoting coastal conservation by bridging the gap between scientists, environmentalists, site managers, planners and policy makers, it has grown into the largest network of coastal practitioners and experts in Europe, with 15 National Branches and offices in seven countries.

Littoral 2014 is especially dedicated to the 20th aniversary of the EUCC Baltic States Office. After Gdansk in 2006, the conference for the second time takes place in the Baltic, in Klaipėda, Lithuania. Lithuania has one of the shortest coastal zones in Europe but shares the largest European lagoon with Russia. Therefore, coastal and especially lagoon issues have a long tradition in Lithuania and local scientists and practitioners are intensively involved in a broad spectrum of local, regional and international activities.

We hope that Littoral 2014 will further strengthen the interaction between scientists and practitioners from different countries around Europe and beyond, will strengthen the existing coastal networks and will help to provide new perspectives and adequate solutions to present and future coast challenges.

Gerald Schernewski, Ramūnas Povilanskas,
Arturas Razinkovas-Baziukas and Saulius Gulbinskas

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SUPPORTED BY: DENOFLIT

Marine nature conservation in Lithuania - Inventory of marine species and habitats for development of Natura 2000 network in the offshore waters of Lithuania (DENOFLIT)

DENOFLIT is five years (2010-2015) project financed by EU LIFE+ programme, and co-financed by Lithuanian Ministry of Environment and six project partners. The project is aimed at field inventories of marine species and habitats, evaluation of pre-selected sites and designation of marine protected areas in the Lithuanian offshore waters of the Baltic Sea.

The project field surveys were performed in three large offshore areas (1630 km^2, approx. one third of the total Lithuanian EEZ) targeting reefs and sandbanks, two fish species of Twait Shad (*Alosa fallax*) and Common whitefish (*Coregonus lavaretus*), and seven bird species including Divers (*Gavia stellata, Gavia arctica*), Velvet Scoters (*Melanitta fusca*), Razorbills (*Alca torda*), Guillemots (*Uria aalge*), Black guillemot (*Cepphus grille*) and Long-tailed Duck (*Clangula hyemalis*). The best available acoustic and underwater video techniques were used for mapping seabed habitats, satellite telemetry and ship surveys were employed for marine bird observations, whereas combined acoustic and gillnet surveys were performed during fish inventories. Based on collected field data and site evaluation results, designation procedure of two large NATURA2000 sites was initiated and will be completed by March 2015. Due to seabed geomorphology and other environmental constraints both sites are bordering Latvian and Russian offshore waters.

During the conference LITTORAL 2014 project results will be presented in the session “Coastal and marine conservation”. Other results will be disseminated to the public through interactive exposition in the Lithuanian marine museum and Handbook on marine nature values.

Visit project website for more information: http://corpi.ku.lt/denoflit

EXHIBITOR: INTERNATIONAL EMECS CENTER

The International EMECS Centre is an organization established for promoting international exchanges on not only coastal but also catchment areas of the enclosed coastal seas in a wide range of fields such as research, policy, civic action, education and industrial activities and so forth to solve the problem on the environmental conservation of enclosed coastal seas in the world such as the Seto Inland Sea (Japan), Chesapeak Bay (USA), the Baltic Sea (Northern Europe) and the Mediterranean Sea (Southern Europe).

The name of the centre is an acronym for Environmental Management of Enclosed Coastal Seas. The organization was established in Kobe city, Japan in 1994 after the success of the first and second international conferences on the environmental management of enclosed coastal seas, and was certified as a Public Interest Incorporated Foundation by the Cabinet Office of Japan.

EMECS

Website: http://www.emecs.or.jp/index-e.html
E-mail: secret@emecs.or.jp

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INVITED KEYNOTE SPEAKERS

TOWARDS SUSTAINABLE COEXISTENCE OF AQUACULTURE AND FISHERIES

Øivind Bergh

Institute of Marine Research, Bergen, Norway
oivind.bergh@imr.no

Keywords: coexist project, aquaculture, fisheries, marine spatial planning, integrated coastal zone management

Globally, coastal areas are subject to an increase in competing activities. Coastal fisheries and aquaculture are highly dependent on availability and accessibility of appropriate sites. Aquaculture production is increasing, whereas fisheries are at best stagnant. Coastal activities also include activities such as recreation, tourism, facilities for renewable energy production, and Marine Protected Areas (MPAs). Competition for available sites will probably increase, emphasizing the need for Marine Spatial Planning (MSP) and improved management tools supporting policies for space allocation along the entire European coastline.

Successful Marine Spatial Planning (MSP) is not likely to be achieved without a certain level of conflict, and without iterative adaptations in management actions. MSP is viewed an essential part of advancing ecosystem-based management as demanded by the Marine Strategy Directive. The biological interconnectedness of fisheries and aquaculture is strong, with factors such as competition for space, disease transmission, genetic impact from escapees, availability of food for cultured finfish, and organic and inorganic waste management.

In an ecosystem-based management context, both industries are human activities strongly influencing, and influenced by, the environment. Management of aquaculture and fisheries, as well as other uses of the coastal zone, should be considered parts of integrated coastal zone management (ICZM) with local variations in their respective importance.

POTENTIALS AND CONSTRAINTS OF AQUACULTURE IN THE ANTHROPOCENE

Bela H. Buck

Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research (AWI), Germany
bela.h.buck@awi.de

Global food security and human well-being are in serious jeopardy as the production of living marine resources for sustaining human livelihoods cannot be met by natural fisheries production. This is event the case if these resources are sufficiently managed at levels of optimum sustainable yields. Thus, governments and international organizations (e.g. FAO, EU) worldwide are responding to the *blue revolution* by becoming increasingly interested in expanding aquaculture to foster food security, nutrition and income generation. Scientific and technological advances have underpinned the onset of this blue revolution and are increasingly informing aquaculture development policies (e.g. SCAR-Fish, 2013). Indeed, the gap between seafood supply and demand is increasing at an alarming rate as these are nutrient-dense foods considered extremely important for human health and welfare.

None withstanding, the development of aquaculture has been remarkable. Seafood and seafood products are the most traded global food commodities (FAO, 2012). Within these, aquaculture products provide more than half of all fish destined for human consumption. As land-based and inshore aquaculture will continue to grow, thereby underpinning its future role in quality food supply, this much needed development will however only delay the widening of the gap in seafood supply by and large. Hence, unconventionally new and modern technologies such as RAS and offshore farming systems are required to significantly assisting in closing this gap.

New concepts are needed to develop a diverse marine food sector within EU member states that will meet the increasing demand for seafood and biotech-products while providing jobs, goods and services in harmony with healthy, productive, and resilient marine ecosystems operations. Those concepts must coincide with a better economically reliable concept for EU states for RAS devices, especially when combining aquaculture with other energy resources (wind energy, biogas, geothermal sources) as well as moving to use new sites, such as the move off the coast in hostile near- or offshore environments.

SAND DUNE CONSERVATION, THE ANSWER IS BLOWING IN THE WIND

J. Patrick Doody

National Coastal Consultants, United Kingdom
pat.doody@ntlworld.com

Sand dune species, habitats and ecosystems adapt to changes in wind and wave action and tides, especially during storms. Human activity has restricted the movement associated with this natural change. In many areas this has been to protect assets established along the coastal margin from erosion and/or blowing sand; physically intervening to prevent the movement of sand. In other areas, neglect caused by cessation of grazing or invasion by alien species has had a similar effect.

Hemmed in by human assets such as housing, roads or other infrastructure and truncated by agriculture or forestry mobile sand dunes represent a depleted resource. Rising sea levels combine with developments on land to 'squeeze' those that remain. Together these factors deplete the natural assets and services provided by the sand dunes, particularly from a nature conservation perspective. This paper will explore the way in which the approach to sand dune management has changed over the last 25 years. In particular, it will look at the role that sand dune dynamics will play over the next 25 years in reversing some of the more damaging trends in dune development.

PERSPECTIVES ON MANAGEMENT OF COASTAL FLOODING AND COASTAL EROSION

Jacobus Hofstede

Ministry of Energy, Agriculture, Environment and Rural Areas Schleswig-Holstein, Germany
jacobus.hofstede@melur.landsh.de

Keywords: coastal risk management, climate change adaptation

Humans love coasts. The transition between land and sea is a perfect place to live, work and recreate. It is, therefore, no surprise that coasts are intensively utilized and, as a consequence, natural structures and functions are impaired. At the same time, many coasts face the possibility of flooding and erosion during storm surges. Protection or, rather, risk management of vulnerable people and assets becomes expedient. Traditionally, coastal risk management (CRM) focus on technical measures like sea dikes, groins, revetments and beach replenishments.

Accelerated sea-level rise is one of the main consequences of anthropogenic climate change. The probability of coastal flooding and erosion will increase accordingly and sustainable CRM has to consider climate change adaptation. In this keynote, it is argued that a sustainable adaptation strategy implies a holistic CRM consisting of the elements prevention, protection, preparedness, emergency response, recovery and review. These integral components are described as parts of a control loop.

It is, further, argued that, due to high and increasing vulnerabilities (damage expectations), maintaining and adapting the technical defences will remain a corner stone of CRM. In order to increase the natural resilience of coasts to climate change, however, it certainly is beneficial to duely consider natural structures and functions or, in other words, to work with nature.

PREVENTION, MITIGATION AND COMPENSATION – THE RELEVANCE OF EFFICIENT BIOLOGICAL MONITORING DURING THE CONSTRUCTION OF THE NORD STREAM PIPELINES UNDER CONSIDERATION OF LEGAL CONSTRAINTS

Jan Kube

Nord Stream AG, Switzerland
jan.kube@nord-stream.com

Keywords: Baltic Sea, offshore gas pipeline, environmental monitoring

"Nord Stream" is the name for two parallel offshore pipelines of a length 1,224 km, transporting up to 55 bcm natural gas per year from Russia to Germany through the Baltic Sea. Both pipelines were laid between 2010 and 2012. The complex evaluation of various alternatives during the planning phase for this project between 1998-2008 revealed finally a route which crosses five NATURA 2000 (MPA`s) sites in its German section. According to the provisions of the EU Habitat Directive (Art. 6), the permit for construction and operation of the pipelines included the obligation to ensure that the project does not adversely affect the integrity of any of the sites concerned. The implementation of certain unique and complex measures for avoidance, mitigation and reinstatement during construction required also the establishment of an extensive environmental monitoring program covering baseline investigations & EIA, threshold control for certain emissions, ecological supervision and auditing, biological effect monitoring, and the control of the recovery process after construction. The Nord Stream environmental monitoring program for Germany covered a period of nine years: 2006-2014. Additional monitoring programs were established for project related compensation measures.

THE INTEGRATION OF NATURE CONSERVATION INTO THE MARINE SPATIAL PLANNING PROCESS

Frank Maes

Ghent University, Faculty of Law – Maritime Institute, Belgium
frank.maes@ugent.be

Keywords: marine spatial planning, nature conservation

Nature conservation at sea is not a new policy. Its drivers can be found in international (CBD, 1992) and regional law (Helsinki Convention, 1992; OSPAR, 1992, NATURA 2000 EU). Part of nature conservation at sea, in particular habitat protection, can be achieved by designating marine protected areas (MPAs). MPA initiatives are mostly perceived as potentially limiting other users and give rise to resistance from them. Precisely this resistance by a coalition of other users resulted in the designation of MPAs without additional measures of protection and often a lack of a broadly balanced stakeholder participation and public support. As a compromise most of those MPAs are not well managed or have no management plan at all, or they are too small in scale or lack interconnectivity with other MPAs, resulting in an inadequate habitat protection. At least that was the case in Belgium in the past.

Marine spatial planning (MSP), in terms of zoning and as a process, can help to reduce this conflict model and provide new opportunities to improve nature conservation. In fact nature conservation objectives and offshore renewable energy projects have been the drivers for the initial marine spatial planning (MSP) initiatives in northern Europe. They are both new entrants at sea that are supposed to come in conflict with traditional users for reducing their traditional use of space, such as for fisheries and shipping. The fact that nature conservation is not the only one claiming relative large areas at sea has shifted the focus of resistance, increased other stakeholder interests and in particular increased public interest for a broader support of the integration of all activities at sea. Precisely this broader support by other stakeholders and the public is an important element of the MSP process, together with a better transparency, the integration of scientific data, the development of a long term vision, increased attention to monitoring and a correct implementation and enforcement of the marine spatial plan. MSP requires forward looking, a better balancing of interests and long term decisions with the potential to adapt to new situations by a transparent process. One can argue that MSP has the potential to contribute to the extension of MPAs, their transboundary interconnectivity and an increased attention for developing MPA management initiatives (such as restrictions to certain fisheries techniques, the exclusion of fixed activities or activities detrimental for habitats). Under certain conditions, offshore wind farm projects can enhance nature protection, even better than existing MPAs that lack management plans or user restrictions. Ten years of Belgian MSP will be presented as an example of these new developments and its contribution to nature conservation.

SAND DUNE NETWORKS: OPPORTUNITIES AND CHALLENGES FOR EUROPEAN COASTAL DUNE CONSERVATION MANAGEMENT

Paul Rooney

UK Sand Dune and Shingle Network, Liverpool Hope University, United Kingdom
rooneyp@hope.ac.uk

Keywords: coastal sand dunes, networks, conservation management

Coastal dunes are a multi-valued habitat required to fulfil many functions. This creates competing demands that are difficult to reconcile. Dunes throughout Europe have suffered significant losses in terms of their extent and quality. The international situation shows us that, despite conservation efforts, dune habitats are declining. This is discussed using the results of Article 17 reporting under the EU Habitats Directive for coastal dunes.

A European Dune Network (EDN) was proposed in 1987, leading to the launch of the European Union for Dune Conservation and Coastal Management (EUDC) and the development of an informal network. In 1993 the EUDC was broadened to be based on Integrated Coastal Zone Management (ICZM) meaning that there was no longer a dedicated European resource for sand dunes. The UK Sand Dune and Shingle Network was established in 2006 with the aim of conserving sand dunes and shingle as dynamic landscapes. Formal support for an EDN was given in 2010 by EUCC Council. The EDN aims and objectives are presented and recent developments are outlined. There is a need for urgent action to conserve dunes, including the sharing of knowledge and experience.

The paper identifies examples of recent good practice in dune conservation, including projects to rejuvenate dune dynamics. A set of actions for the conservation European dunes is proposed. The paper concludes with a call for a strong EDN and the conservation of dunes as dynamic landscapes.

SUSTAINABLE TOURISM: QUALITYCOAST AND THE GREEN DESTINATIONS INITIATIVE

Albert Salman

Coastal & Marine Union (EUCC) Leiden, the Netherlands
a.salman@eucc.net

Tourism has become one of the main sectors influencing land-use and local economy, especially in coastal zones. The Baltic region has so far escaped some of the more dramatic impacts of tourism, but some important trends can change this. Climate change could make the Baltic region more attractive. And consumers increasingly expect destinations not only to be affordable, sexy and sunny, but also green, clean and social. The tourism destinations of the future will be more sustainable and green than today.

This keynote presentation will address some important issues and trends in "green tourism". Two issues will be clarified: First, what is “sustainable tourism”? How can it be measured and credibly demonstrated, in order to build consumer confidence, promote business prosperity, foster community benefits, and avoid “green washing”? Second, what should destinations do to become more attractive, and sustainable? The main international programs and tools will be reviewed, relevant for coastal and non-coastal destinations.

The presentation will also clarify what conference participants can do to contribute to destination sustainability in their own region. A brief introduction will be given to upcoming Green Destinations seminars and workshops that are organised for experts, consultants, and destination managers and researchers, with special workshop sessions at Littoral 2014.

ORAL PRESENTATIONS

COASTAL DUNE LANDSCAPE - FACING CHALLENGES (STUDY FROM ESTONIA)

Agnes Anderson*, Urve Ratas , Are Kont

Tallinn University Institute of Ecology, Estonia
agnes.anderson@tlu.ee

Keywords: sandy beaches, grey dunes, Estonia

An increasing anthropogenic pressure and ongoing global and regional changes may harm valuable coastal landscapes, which are used for recreation. Conflicts of interests may change these dynamic and fragile ecosystems (including the habitats of Natura 2000), even though the active use period is very short (May-September in Estonia). It is evident that the recovery processes take long time.

The study was carried out due to the fact that the increase in both human influence and activity of coastal processes is evident in several coastal areas in Estonia. We selected two study sites with characteristic ecosystems and vegetation, different land use in various parts of Estonia (Keibu – on the western coast of mainland and Ruhnu Island –100 km from mainland). In each site, we compiled a landscape profile to visualize the topography, vegetation and soil cover. Both areas have sandy beaches, sandy beach ridges and grey dunes.

The primary results show that changes in the dune landscapes can be rapid, especially on sandy beaches due to storm surges. The inland areas are more affected by human activity and changes in vegetation cover are well visible as a result.

This study has proved that the coastal environment needs permanent observation to assess the level of changes and has also shown that it is important to improve integrated management approaches to sustain the use of these areas.

CLIMATE VARIABILITY AND COASTAL MANAGEMENT. STUDY CASE BASED ON AGRICULTURAL PRODUCTION IN MEXICAN COASTAL STATES

Isaac Azuz-Adeath

Centre for Design and Innovation in Engineering, CETYS University, Mexico
isaac.azuz@cetys.mx

Keywords: climate variability, coastal management, agricultural production, Mexico

This paper shows the impact of decadal climate variability on agricultural production in the 17 Mexico´s coastal states. The index of four global climate signals: North Atlantic Oscillation, Atlantic Multidecadal Oscillation, Pacific Decadal Oscillation and El Niño-Southern Oscillation, in combination with the maximum and minimum surface atmospheric temperatures were analysed and correlated with the principal agricultural products during the period 1980-2010. Significant correlations were observed between the global signals and the agricultural products selected. The influence of these global signals constrain the long-term behaviour of the agricultural production and could affect the alimentary security. Coastal managers and policy-makers need to take into account the decadal climate variability impacts in the coastal zone, prior to develop strategies oriented to deal with climate change adaptation and/or mitigation.

INTEGRATION OF MSP PRINCIPLES INTO EXTENSION OF GENERAL PLAN OF LITHUANIA WITH SOLUTIONS FOR DEVELOPMENT OF MARITIME BUSINESS

Nerijus Blažauskas*, Rosita Milerienė, Saulius Gulbinskas

Marine Science and Technology Centre of Klaipėda University
nerijus.blazauskas@jmtc.ku.lt

Keywords: maritime spatial planning, Baltic Sea, marine activities development

Along with the European level initiatives to foster maritime spatial planning, the demand for maritime space allocation for specific uses is continuously increasing due to the additional sea space demanded by wind energy developers, oil companies seeking for prospecting and exploitation of new oil deposits at the sea. At the same time quite a number of marine related projects have been planned and currently being implemented. Those are – offshore LNG terminal development, reconstruction of Šventoji sea port, NORDBALT offshore high voltage (HVDC) energy link between Sweden and Lithuania, deepening of the Klaipėda port. New maritime related initiatives are influencing the shipping traffic pattern, reshaping roadsteads and relocating anchorage sites. In addition there are new projects/initiatives related to expansion of marine Natura 2000 sites. Along with rapid growth of the maritime activities on a national scale, the fragile Baltic Sea ecosystem needs to be regarded and managed as single entity. The ecosystem approach integrating the existing scientific knowledge is recognized as a common framework for doing so. At the same time, many sea uses transcend national borders. In order to harmonize interests of different existing and also new marine users emerging spatial planning of the marine space of Lithuania had to be implemented. The study presents the first attempt to integrate the environmental, economic and social needs into one comprehensive plan. Prepared spatial solutions create the pre-conditions for future developments at the sea and at the same time require new quality of the scientific research while investigating the marine resources and evaluating the economic effect as well as environmental consequences.

COASTAL LAGOON RECOVERY BY SEAGRASS RESTORATION. A NEW STRATEGIC APPROACH TO MEET HD & WFD OBJECTIVES

Andrea Bonometto*[1], Adriano Sfriso[2], Massimo Parravicini[3], Valerio Volpe[4], Rossella Boscolo[1], Chiara Facca[2]

[1]*Italian National Institute for Environmental Protection and Research - ISPRA, Italy,* [2]*Department of Environmental Sciences, Informatics & Statistics, University of Venice, Italy,* [3]*Laguna Venexiana Onlus, Italy,* [4]*Venice Water Authority - Ministry of Infrastructure and Transport, Italy*
andrea.bonometto@isprambiente.it

Keywords: seagrass restoration, coastal lagoons, habitat 1150*, Habitat Directive, Water Framework Directive

The seagrass meadows have a structural role for the ecology of transitional waters, providing several ecosystem functions, goods and services. Seagrass loss by natural and human-induced disturbance has been recorded frequently throughout the word and their decline is now a worldwide problem.

The main objective of the recently co-funded SeResto project (LIFE12 NAT/IT/000331) is to restore the seagrass meadows on a large scale in the Northern Venice Lagoon, in order to improve the Habitat 1150* (Coastal lagoon) conservation. The project is expected to contribute to the achievement of the "Good" ecological status, demonstrating the effectiveness of the proposed actions to meet also the WFD 2000/60/EC objectives.

Our technical strategy intends to support the self-rehabilitation capacity of aquatic seagrasses, where environmental conditions are going back to be suitable for *Nanozostera noltii* and/or *Zostera marina* colonization. It is based on the transplantation of 9 small sods (30 cm diameter) in 35 sites, to trigger the natural development of seagrass meadows. Moreover fishers' direct intervention will foster the seed and rhizome dispersion.

An intensive monitoring activity is planned and recently started to investigate the effectiveness of this measure in improving the ecological status of the area, including Biological Quality Elements (BQEs) required by WFD 2000/60/CE (seagrasses, macroalgae, macrobenthos and fish fauna) and supporting abiotic elements in water and sediments.

COSTAL CLIMATE CHANGE ADAPTATION IN EXISTING URBAN AREAS, LESSONS LEARNED FROM DUTCH AND NORWEGIAN PILOTS

Floris Boogaard[*1,2,3], Hans de Beer[4], Johannes Revier[1], Eric de Boer[1]

[1]Hanze University of Applied Sciences, the Netherlands, [2] TAUW, the Netherlands, [3]Delft University of Technology, Department of Water Management, Faculty of Civil Engineering and Geosciences, the Netherlands, [4]Geological Survey of Norway, Norway
f.c.boogaard@pl.hanze.nl

Keywords: climate change, coastal cities, sustainable urban drainage systems, stormwater management

Climate change is expected to have a large impact on coastal cities all around the world. Due to the expected sea level rise for coastal regions new flood defence policies are developed, with emphasis on risk assessment and a multifunctional approach to strengthening existing coastal defences. Most climate adaptation programs in cities focus on technical measures with little international knowledge exchange of the best management practices and governance. In this article the best management practices of two coastal cities both named 'Bergen' is discussed.

The Dutch pilot 'Bergen' shows that implementing the right combination of sustainable urban drainage systems in a densely built area, is really complex. It seems impossible to make a plan with full support from all stakeholders at once. The whole process has to be organised in an adaptive way, as a learning process. The proposed strategy, that reflects a process of learning by doing, offers good possibilities for other coastal cities. The Norwegian pilot 'Bergen' is a UNESCO World heritage site. Human activities result in lower groundwater levels which are a danger for the preservation of cultural deposits. Higher temperature and longer dry periods due to climate change will require a revisited sustainable water management of the whole area. A selection of sustainable urban drainage systems (SUDS) is made to preserve this unique cultural heritage.

General lessons from both climate adaptation programs can be learned to benefit climate adaptation programs for coastal cities all around in the world.

INTEGRATED COASTAL AND MARINE MANAGEMENT: LESSONS FROM THE CELTIC SEAS PARTNERSHIP

Natasha Barker Bradshaw[*1], Lyndsey Dodds[1], Lynne McGowan[2], Sue Kidd[2], Caroline Salthouse[3]

[1]WWF- United Kingdom, [2]University of Liverpool, United Kingdom, [3]North West Coastal Forum, United Kingdom
nbarkerbradshaw@wwf.org.uk

Keywords: good environmental status, marine strategy framework directive, marine spatial planning, integrated coastal management, Celtic seas partnership

By 2020 European seas must achieve 'Good Environmental Status' (GES) under the Marine Strategy Framework Directive (MSFD). Member States will need to collaborate across regional seas such as the NE Atlantic, Baltic, North and Mediterranean seas in order to achieve compliance with the Directive. Many of the targets and indicators set to monitor 11 descriptors of the state of the environment will require co-ordination and co-operation across Member State borders to find new measures to maintain or achieve GES.

Many of the marine activities that will influence Member States' ability to achieve GES are located at, near or depend upon coastal infrastructure or coastal space. Recent workshops bringing together stakeholders across the Celtic Seas have highlighted the high degree of inter-linkage between the MSFD descriptors and coastal resources/activities. Lessons learnt from engaging stakeholders through voluntary ICM policy and practice needs to be utilized, to facilitate MSFD implementation and to counteract the policy vacuum for ICM implementation.

This paper sets out the policy context for the MSFD and ICM in Europe and how important ICM is to achieving GES. It elaborates on practical results and examples being illustrated through the LIFE+ funded Celtic Seas Partnership Project (2013-2016). It will raise questions and provide some answers to how implementation of the MSFD could be strengthened through the use of ICM policy and practice.

FUNCTIONAL COMPOSITION OF BENTHIC COMMUNITIES ACROSS HABITAT VARIETY IN MESSOLONGHI LAGOON, GREECE

David Cabana*[1], Kalliopi Sigala[1], Artemis Nicolaidou[2], Sofia Reizopoulou[1]

[1]*Hellenic Centre for Marine Research, Greece,* [2]*University of Athens, Greece*
davidcabana@outlook.com

Keywords: macroinvertebrates, biological traits, habitat complexity, fractal dimension, seasonality

The structural composition of macroinvertebrates assemblages has been classically reported in terms of biodiversity and abundance in order to investigate community composition and productivity aspects. Under this perspective, studies are aiming to explain the effects of key environmental features and pressures that drive the variation in species and functional composition of benthic communities. This study examines how functional composition varies across habitat complexity within an open coastal lagoon. Body size, mobility, habitat location, feeding mode and apparatus, food type, habitat modification and bioturbation were selected as macroinvertebrate biological traits, whereas as proxies for habitat complexity were considered the phytal biomass, volume and fractal dimension. Results show a positive correlation of the habitat complexity proxies with the distribution of feeding mode, mobility and habitat location. A less strong correlation over body size and food type was observed. In terms of traits resilience the bare sediment habitat denoted a higher seasonal variation with a drop during summer. This study shows the role of the habitat complexity in structuring the distribution of the studied biological traits on macroinvertebrate communities at Messolonghi lagoon and how the seasonal resilience of certain traits appears to be governed by the habitat complexity.

CROSS-COMMUNITY SCALING OF BENTHIC MACROINVERTEBRATE ASSEMBLAGES: A FUNCTIONAL APPROACH TO COMMUNITY ORGANISATION IN MEDITERRANEAN INLAND WATERS

Francesco Cozzoli*, Vojsava Gjoni, Gabriele Marini, Luca Mazzotta, Maurizio Pinna, Alberto Basset

Department of Biological and Environmental Sciences and Technologies, University of the Salento, Italy
francesco.cozzoli@unisalento.it

Littoral and transitional macrozoobenthic communities are characterized by a broad diversity in size and behaviour. The search for simple and effective descriptors of biological ecosystem components is a major challenge of monitoring aquatic ecosystem health. Because metabolic and geometric constraints underpin body-size scaling relationships, metabolic theory offers a useful framework to predict the numeric abundances of macrozoobenthic species.

Cross Community Scaling Relationships (CCSR) express the relationship between the average size of an individual in an assemblage and the total number of individuals in that assemblage. Where resource availability or space is constant across sites or through time, the average amount of resource (or space) used per individual directly determines the number of individuals that can be supported. However, subsidiary factors can modulate the realized expression of metabolic/geometric scaling rules by modifying the resources accessibility/availability across the individual body size spectra. The mechanistic relevance of individual body-size on coexistence relationships still requires field and laboratory tests and community level scaling-up.

Here, the influence of different physical constrains on CCSR descriptors is investigated through the (statistical) analysis of a large transitional water macrozoobenthic dataset. Results show that, while the pro capite individual body size (thus the individual energetic) has a major role in determining the realized individual density, subsidiary physical factors can remarkably increase the accuracy of our predictions. We discuss and interpret the implications of our observations for applied (monitoring) and theoretical (energetic) ecology.

IMPACT OF CLIMATE CHANGE ON THE HYDROLOGY OF DRAINAGE BASIN OF THE CURONIAN LAGOON

Natalja Čerkasova[*1], Vitalijus Denisovas[1], Ali Ertürk[2], Petras Zemlys[1], Georg Umgiesser[3,1]

[1]Klaipėda University, Lithuania, [2]Istanbul Technical University, Turkey, [3]ISMAR-CNR, Italy
natalja.cerkasova@gmail.com

Keywords: Soil and Water Assessment Tool (SWAT), hydrology modelling, calibration, Curonian Lagoon watershed

Soil and Water Assessment Tool (SWAT) was used to assess the potential impact of climate change scenarios on discharge from the Nemunas and Minija Rivers, which are located in the Curonian lagoon drainage basin. The SWAT model was implemented for the study area. Calibration and validation of the model were performed using monthly stream flows for 2000-2007 and 2008-2010, respectively. The R^2 and Nash-Sutcliffe model efficiency values computed for the monthly comparisons with measured historical data from Nemunas and Minija River stations were 0.81 and 0.79 for the calibration period and 0.62 and 0.60 for the validation period. Information on calibration, validation and sensitivity analysis of SWAT model has been provided to assist future advances of watershed models in the study area.

In developing climate change scenarios within the general patterns defined by the Intergovernmental Panel on Climate Change (IPCC), predicted inter-seasonal local increases in temperature, precipitation and decrease in relative humidity were implemented by adjusting daily baseline parameter values in a seasonally specific manner. Two main scenarios were addressed: pessimistic (high increase in temperature and precipitation) and optimistic (low increases in temperature and precipitation). The SWAT predictions provide an important insight into the magnitude of stream flow changes that might occur in the Nemunas and Minija River in Lithuania as a result of future climatic change.

NIGER DELTA COASTLINE CHANGE: RESULTS OF CONFLICT BETWEEN THE FORCES OF NATURE AND MAN

Olusegun A. Dada[*1,2], Guang Xue Li[1], Lulu Qiao[1]

[1]College of Marine Geosciences, Ocean University of China, China, [2]Deptartment of Marine Science & Technology, Federal University of Technology, Akure, Nigeria
oadada@futa.edu.ng

Keywords: Delta evolution, Niger Delta, coastline retreat, climate change, ocean remote sensing, anthropogenic activities

The trend in the Niger Delta (ND) shoreline change, in the last century has been studied; using multi-temporal remote sensing data, of Land Sat ETM plus and topographic maps of 1923 and 1950, to examine the changing pattern of accretion and erosion of the ND shoreline, with GIS tools. The Niger Delta, in the Gulf of Guinea, Northern Atlantic Ocean, which is one of the world's largest arcuate fan-shaped river deltas with 21 estuaries, accounts for about two-thirds of the entire coastline of Nigeria. It is the economic hub of Nigeria, with more than 600 oilfields and a proven oil reserve of over 35 billion barrels at the production rate of 2.5 million barrels a day. River Niger, the 3rd largest river in Africa and 9th in the world, drains a large part of West Africa, and discharges its waters, sediments and other loads, into the ND; before it finally enter into the Atlantic Ocean. The results of the analysis reveal prevailing erosion in the ND during the long-term (1923-2013) and medium-term (1950-2013); while short-term (1987-2013) analysis shows moderate accretion. This paper unravels the relationship between shoreline configuration in the ND, river discharge and climatic variability. Findings from this study show that there is a strong coherence in the timing of both ND shoreline recession and rainfall variability in Nigeria. The years of low rainfall, were also times when discharges on the Niger River system were either very low, or nonexistent. In conclusion, the intensive monsoon rainfall and sediment supply from the hinterland influence the configuration and position of the shoreline in the Niger Delta.

INTEGRATED APPROACH TO IDENTIFICATION OF SPA'S FOR WATERBIRDS IN THE LITHUANIAN EEZ

Mindaugas Dagys[*1], Ramūnas Žydelis[2], Julius Morkūnas[3], Liutauras Raudonikis[4]

[1]Nature Research Centre, Lithuania, [2]Ecology and Environment Department, DHI, Denmark, [3]Marine Science and Technology Centre of Klaipėda university, Lithuania, [4]Lithuanian Ornithological Society, Lithuania
dagys@ekoi.lt

Keywords: waterbirds, Lithuanian EEZ, telemetry, ship-based survey, SPA identification

Identification of new sites, important for waterbirds in the Lithuanian EEZ of the Baltic Sea was undertaken under the project "Inventory of marine species and habitats for development of Natura 2000 network in the offshore waters of Lithuania – DENOFLIT". An integrated approach was adopted by combining traditional waterbird investigation methods, namely ship-based surveys, with novel telemetry tools – tracking birds by using implantable satellite transmitters and ARGOS locating and data management service. Combination of these two approaches allowed not only to evaluate abundance and distribution of different target waterbird species in the Lithuanian EEZ, but also to get an insight into the movements of birds throughout the seasons and into the connectivity of different wintering sites, utilised by marked birds, across the entire Baltic Sea and beyond. The presence probability of birds in waters of different countries was estimated for the entire annual cycle, stressing the importance of concerted international efforts in the area of waterbird conservation. Several areas of waterbird aggregation in the Lithuanian EEZ were identified during the project, with one of them being proposed for the designation as an SPA for the protection of wintering waterbirds.

DEVELOPMENT OF WADDEN SEA SHELLFISH BEDS AFTER MANAGEMENT ADJUSTMENTS

Norbert Dankers[*1,2], Erik van Dijk[2]

[1]IMARES, the Netherlands, [2]EUCC, the Netherlands
norbert.dankers@wur.nl

Keywords: Wadden Sea, coastal management, coastal conservation, shellfish beds, Mytilus edulis

Around 1990 all dense shellfish beds had disappeared from the Dutch Wadden Sea because of intensive fishery. Both, beds composed of high densities of individual organisms (Cockle), as biogenic structures (*Mytilus edulis*) disappeared. Oyster beds (*Crassostrea gigas*) had not invaded yet.

The Wadden Sea had already been declared a conservation area under several schemes (RAMSAR, MAB, Trilateral Agreements, National Conservation Laws and later EU-habitat and -bird directives.

These schemes made it possible to develop management approaches, among others:

1. Stop or reduce cockle fishery both for stimulation of cockle beds, provide bird food and provide substrate for mussel bed development
2. Reduce mussel (seed) fishery and change fishery practice
3. Develop knowledge for stimulating, protection and possibly construction of shellfish beds

We analysed the results of the management- and fishery practice changes over the period since the implementation in the early 1990ties. They have proven to be very successful.

1. Cockle stocks have developed to levels not measured before.
2. Intertidal mussel beds show recovery due to strict conservation measures, although not in all subregions to the same extent. Subtidal populations suffer much less fishery stress due to management procedures introduced by the fishery community.
3. Large monitoring and research projects were stimulated and these result in knowledge on factors causing survival and disappearance of shellfish beds.

Results of these monitoring and research projects are demonstrated, trends in developments of target organisms and dependent species are shown and implications for management discussed.

SIX YEARS AFTER APPROVAL – THE ROLE OF MPAS IN MONITORING BENTHIC HABITATS IN THE GERMAN EEZ

Alexander Darr[*1], Michael L. Zettler[1], Kerstin Schiele[1], Roland Pesch[2], Dieter Boedeker[3]

[1]Leibniz Institute for Baltic Sea Research Warnemünde, Germany, [2]Bioconsult Schuchardt & Scholle Gbr, Germany, [3]Federal Agency for Nature Conservation, Germany
alexander.darr@io-warnemuende.de

Keywords: MPA, German EEZ, SCI, habitat mapping, assessment, monitoring

The nomination of five areas as Sites of Community Importance (SCI) in the German EEZ with respect to the Habitats Directive was approved by the European Commission in 2008. Although the selection and the description of the areas were based on the best available data, knowledge on the habitat characteristics and the communities of these areas are still fragmentary. Therefore, intensive research including habitat mapping, the adjustment of the monitoring program and the assessment criteria is still ongoing. Additionally, the SCI are foreseen to play a prominent role in the implementation of the Marine Strategy Framework Directive (MSFD). It is crucial that the assessment of the benthic habitats is consistent across the directives and conventions. While they all share the same goal to achieve good environmental conditions, the approaches to meet this goal vary. The main aim of the ongoing activities is therefore the development of consistent assessment methods and a synergistic monitoring programme that meet the requirements of all legal frameworks including the HELCOM Baltic Sea Action Plan. The presentation gives an overview over the recent corresponding activities in the German EEZ.

EVALUATION OF BENTHIC HABITATS: CASE STUDY ON BOULDER REEFS IN THE SOUTH-EASTERN BALTIC SEA

Darius Daunys[*], Andrius Šiaulys, Aleksej Šaškov, Ingrida Bagdanavičiūtė

Marine Science and Technology Centre of Klaipėda University, Lithuania
darius.daunys@jmtc.ku.lt

Keywords: MPA, habitat mapping, integrated assessment

This study is based on results of habitat mapping carried out in the framework of large national project „Inventory of marine species and habitats for development of Natura 2000 network in the offshore waters of Lithuania (DENOFLIT)“. Different techniques have been applied to collect basic environmental and biological information on benthic habitats in depths between 25 and 70 meters: underwater acoustics (side scan sonars and multibeam), drop video and remotely operated vehicles, grabs and dredges. This led to a large dataset of highly diverse information on seabed types, substrate heterogeneity, diversity and structure of benthic communities in studied sites. Although classification of sites using multivariate statistics and identification of benthic habitats was relatively straightforward, delineation of boulder reefs and interpretation of the habitat value and quality was a complex task. It involved both, regional and local scale criteria as well as statistically derived and expert judgment based quantitative or qualitative estimates. This presentation demonstrates an example of an integrated evaluation of boulder reefs in two areas from the south-eastern Baltic Sea with the overall aim to identify and delineate MPA sites for development of NATURA 2000 network in the eastern Baltic.

DEVELOPMENT AND MANAGEMENT OF THE LAST MIGRATING INLAND SAND DUNES ON THE ISLAND OF SYLT (SE COASTAL NORTH SEA)

Tobias Dolch*, Karsten Reise

Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research - Wadden Sea Station Sylt, Germany
tobias.dolch@awi.de

Keywords: migrating dunes, long-term development, GIS, aerial photographs, dune management

Dune migration was prevalent on the island of Sylt. Formed at the western beach, the dunes used to migrate eastwards over the entire island driven by prevailing westerly winds. However, towns and roads were built which today interrupt their migration path. As the dunes were approaching infrastructure, they were planted successfully with beach grass to achieve stabilisation. Today, only in the northern part of Sylt, a complex of three inland dunes is still migrating.

A series of high-resolution aerial photographs (1936 – 2012) was visually analysed, and migrating dunes were recorded and quantified with a geographical information system (GIS). This set of long-term records was completed by elevation data from 2007 and 2013. The analysis revealed how the dunes migrate as well as their average annual migration rate of 2.9 m and that they have decreased considerably in size since 1936. A forecast of the moving direction and the estimated time of dunes` arrival at infrastructure was conducted in order to identify hot spots.

Instead of stabilising the dunes we recommend to remain these unique landscape features and their ecological value and consider alternative management strategies. Concurrently, it could be taken advantage of their scenic attraction and their high touristic potential by implementing sustainable low-impact tourism in the form of public pathways through the dunes, viewpoints and an information centre.

DO WE HAVE THE DATA AND CRITERIA WE NEED FOR INFORMED MANAGEMENT OF MPAS IN FINLAND?

Jan Ekebom*[1], Lasse Kurvinen[1], Djurdjica Ivkovic[1], Michael Haldin[2], Ulrika Björkman[2], Annica Långnabba[2], Pekka Lehtonen[2], Matti Sahla[2], Essi Keskinen[3], Johanna Kantanen[3], Mats Westerbom[1], Anu Riihimäki[1], Anna Arnkil[1], Aija Nieminen[1], Heidi Arponen[4], Kevin O'Brien[4], Maiju Lanki[5], Ari Laine[5]

[1]Metsähallitus Natural Heritage Services, Finland, [2]Metsähallitus Natural Heritage Services, Finland, [3]Metsähallitus Natural Heritage Services, Finland, [4]Metsähallitus Natural Heritage Services, Finland, [5]Metsähallitus Natural Heritage Services, Finland
jan.ekebom@metsa.fi

Keywords: MPAs, management, knowledge basis, site evaluation, criteria

Metsähallitus NHS manages all state owned marine areas in Finland, including MPAs. The NHS is working hard to fulfil a multitude of international and national obligations regarding MPAs that stem from International Conventions (CBD, HELCOM, Ramsar) and EU Directives, in particular the Marine Strategy Framework Directive, Habitats and Birds Directives and, soon also the new Maritime Spatial Planning Directive. In 2014 NHS started a new project called Meri-HOTT in order to achieve a good coordination, avoid double work, secure synergy benefits and, ensure an adequate knowledge basis for informed decisions, when fulfilling these obligations. The national underwater biodiversity inventory programme VELMU provides a good knowledge basis for this work and it should be sufficient for assessing the status of marine habitats and species as well as MPA site and network evaluations. The Meri-HOTT project will provide answers to the three principal questions: do we have a sufficient knowledge basis for fulfilling all obligations, can we manage our MPAs well and what can we do about identified knowledge gaps? The MSFD changed the way by which we can assess the status and change of our marine nature. Unless we check the adequacy of our knowledge basis and fill possible data gaps, we cannot manage our MPAs properly.

ANNUAL SUCCESSION IN THE PEBBLE-SAND LITTORAL OF BRACKISH WATER TEMPERATE LAGOON - VISTULA LAGOON AS EXAMPLE

Elena E. Ezhova*, Elena E. Esiukova, Natalia V. Rodionova, Evgeniia K. Lange, Zhanna I. Stont, Alexandra A. Volodina, Maria M. Smirnova

Atlantic Branch of P.P.Shirshov Institute of Oceanology RAS, Russia
igelinez@gmail.com

Keywords: epibenthic diatom bloom, filamentous algae, *Rangia cuneata*, *Nodularia spumigena*, Vistula Lagoon

An annual course of littoral biota development at the pebble-sand beds in the north-east of Vistula Lagoon, is considered on data 2011-2014. Zooplankton, temperature, salinity, water level and nutrients concentrations were sampled weekly; benthic animals monthly, benthic algae - when present, cyanotoxine content - when „hyperbloom“ or fish kills were marked. Several phenomena were considered as typical for the habitat. Close after ice-mealting when temperature exceeds 6ºC, diatom bloom starts. Epibenthic diatom macrocolonies defind productivity of upper littoral stripe during 1-1.5 month and provide specific habitat for meiobenthic-sized animal community (oligochaetes, nematodes, rotatorians, ostracods, protozoans). Then, June-May, mass development of filamentous algae *Cladophora glomerata, Ulva intestinalis, Ulva prolifera* occurs. Microalgae become dominant primary producers since end of May and reach “hyperbloom” level several time per year, last time in the middle of October, when *Nodularia spumigena* was marked. Spring and summer-autumn events of fish kill marked annually. Microcystins and nodularin in water samples were recorded in October. Dominant benthic species in the area are alien clams *Dreissena polymorpha* and *Rangia cuneata,* it spawn in July when mean daily temperature ca. 20ºC, salinity above 3 PSU. Polychaete *Marenzelleria neglecta* larvae appear in October, when average temperature is 10-5ºC and salinity reach annual maximum, till 7 PSU.

HUMAN USES AND THEIR POTENTIAL INFLUENCE ON THE SUCCESSFUL SPAWNING OF HERRING IN THE VISTULA LAGOON (SOUTHERN BALTIC SEA)

Dariusz P. Fey*, Lena Szymanek, Iwona Psuty, Adam Lejk, Piotr Margoński

National Marine Fisheries Research Institute, Poland
dfey@mir.gdynia.pl

Keywords: herring spawning, human uses, management, Vistula Lagoon

The entire Polish coastal zone is an important Baltic herring (*Clupea harengus* L., 1761) spawning area. There are, however, some regions of particular importance, and the Vistula Lagoon is one of them.

It is a widely-held opinion that herring spawning grounds in the Vistula Lagoon do not require any special protection. Consequently, only pikeperch and bream protected areas have been designated in it. Even though it seems there is little need to implement special protection for herring spawning grounds at present, such a cavalier approach could lead to overlooking potential risks to both effective spawning and egg and larva survival in the future. Thus, we evaluated the current character and intensity of human uses in the Vistula Lagoon area and their possible changes in the future. Furthermore, we discussed how the human activities may affect herring spawning grounds, now and in the future. It can be concluded that most of the human activities that could be responsible for unfavourable for herring changes in the Vistula Lagoon area are currently practiced at either very low levels of intensity (e.g. fisheries, tourism, passenger and cargo transport, dredging, industry, urbanization) or are non-existent in this region (e.g., mining, energy extraction). There is, however, high probability that the intensity of some of the activities will increase in the future considerably, especially if channel through the Vistula Spit is executed.

BUILDING COMMON ICZM VISION THROUGH "IMAGINE" PROCESS IN ULCINJ, MONTENEGRO

Pedro Fernández[*1], Anton Stanovic[2], Elvir Zecevic[3]

[1]*ECNC Group - EUCC Medtierranean Centre, Spain,* [2]*GreenStep, Montenegro,* [3]*Ulcinj Business Association (UBA), Montenegro*
[*]***p.fernandez@eucc.net***

Bojanatour project uses ICZM as a general framework and approach towards sustainable development in Ulcinj and Bojana delta (Montenegro). A series of ICZM workshops are bringing together local authorities, civil society and private sector representatives. Participatory meetings assist to build and agree on a Common ICZM Vision for Ulcinj and Bojana Delta, assuring coherence with other national policies and initiatives and their downscaling to the local level.

A specific methodology is used to conduct this process through participatory workshops: "IMAGINE" – The Systemic and Prospective Sustainability Analysis. This process is adapted to the project scope and local conditions.

After a first workshop where participants analysed the main coastal issues, project team has worked out different scenarios focusing on tourism development. The masterplan for this area, which was approved but not implemented yet, is being revised in order to find alternatives that support better nature conservation, namely in Bojana delta. From this participatory revision, a common ICZM vision is to be agreed by local stakeholders. This process is being enhanced by pilot projects funded by Bojanatour project, aiming at proving synergies between tourism offer, nature and environment. By the end, a communication strategy and tools will push forward all project outputs to promote Ulcinj as a sustainable tourism-nature destination.

THE GOOD ECOLOGICAL STATE OF THE BALTIC LAGOONS – DEFINED BY USING THE HISTORICAL NUTRIENT LOADS AND ACHIEVED WITH THE NEW BSAP?

René Friedland[*1], Gerald Schernewski[1,2], Thomas Neumann[1,2]

[1]*Leibniz Institute for Baltic Sea Research Warnemuende (IOW), Germany,* [2]*Marine Science and Technology Centre of Klaipėda University, Lithuania*
[*]***rene.friedland@io-warnemuende.de***

Keywords: water quality indicators, Water Framework Directive, Baltic Sea Action Plan, integrated modeling

The Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) aim both on achieving a good ecological status. For the MSFD ecological targets have been set for the Baltic subbasins within TARGREV and revised nutrient load reductions of the HELCOM parties have been adopted in the Baltic Sea Action Plan (BSAP).

To define the targets for the German WFD waterbodies we transferred today measured concentrations of Chlorophyll, Total Nitrogen and Phosphorus to the state of 1880, which serves as reference for an ecological status only minor disturbed by human activities. For that purpose we run two simulations with the Baltic Sea ecosystem model ERGOM-MOM, one with the present nutrient loads and one with the reconstructed loads for the historical state. For the German loads and the Oder we used the results of the catchment model MONERIS. From these two simulations we computed the relative change between the historical and the present loads and multiplied the median of the measured concentrations with the transfer factors from the simulations. Thereby step gradients within the factors occurred from the nutrient sources to the open sea, showing the different reactions of the coastal waters and the open sea to the changed nutrient loads. Further first results will be presented, if the nutrient reductions of the BSAP from 2013 are ambiguous enough to reach the WFD goals in the three major southern lagoons.

TO THE EFFECTIVENESS OF COASTAL AND FLOOD PROTECTION STRUCTURES UNDER TERMS OF CHANGING CLIMATE CONDITIONS

Peter Fröhle

Institute of River and Coastal Engineering, Hamburg University of Technology, Germany
froehle@tuhh.de

Keywords: climate change, coastal protection, sandy coasts

Climate Change related questions are presumably under the most important challenges of mankind for the future. The consequences for the very often densely populated low-lying coastal areas are on one hand obvious in general, but, on the other hand still uncertain in detail, since the bandwidth of scenario model results of future climate is still comparatively high. Nevertheless, actions of mitigation of and adaptation to Climate Change have to be initiated as soon as possible in order to be implemented in due time.

Based on a detailed analysis of the consequences of climate change for the hydrodynamic conditions, i.e. water levels, waves and currents, in the Baltic Sea, the consequences for Coastal Flood and Erosion Protection Measures are analysed with the result that without additional protective measures i) severe erosion of sandy coasts has to be expected and ii) most of the flood protection measures will be unsafe in the future.

In addition, sustainable and future viable strategies and measures have been developed and assessed, e.g. for

- sea dikes,
- flood protection dunes,
- flood protection walls,
- revetments,
- (submerged) breakwaters and
- groins.

The investigation are performed for areas in the Baltic Sea, but the results are in general transferable to other areas world-wide.

CAN MARITIME SPATIAL PLANNING PROVIDE THE MECHANISM TO REALISE THE DESIRED ECONOMIC POTENTIAL OF OUR OCEANS

Jeremy Gault[*1], Anne Marie O'Hagan[2], Cathal O'Mahony[1]

[1]*Coastal and Marine Research Centre(CMRC) – University College Cork, Ireland,*
[2]*Hydraulics and Maritime Research Centre (HMRC) – University College Cork, Ireland*
[*]***j.gault@ucc.ie***

Keywords: maritime spatial planning, Integrated Coastal Zone Management, economic growth, participatory processes

Findings from the COEXIST (EU–7th Framework) project, unsurprisingly, revealed that the aquaculture sector was concerned about the potential level of conflict with existing industries such as fisheries and tourism and expansion of new industries (energy). This is indicative of the current levels of spatial pressure on our coastal and marine environment and the potential for conflict - both of which will only be exacerbated by current economic policies to derive higher returns from the marine domain and the societal need to meet increasing food and energy demands. Early stakeholder engagement is viewed as critical to successful policy implementation as evidenced by parallel initiatives such as Transboundary Planning in the European Atlantic (TPEA-DG MARE), PISCES and the Celtic Seas Partnership (both EU Life+).

The European Parliament's recent adoption of the Directive on Maritime Spatial Planning (MSP) suggests that it is perceived as the approach that will reduce conflict and deliver the full economic potential of our Oceans. However, historical attempts at integrated management for maritime sectors have had limited success and operational examples of MSP are still in their infancy. This paper will contrast the experience of attempting to implement Integrated Coastal Zone Management (ICZM) with the new MSP Directive, involvement of stakeholders in both approaches and critically assess whether MSP can deliver the economic future as outlined in current national and EU policies.

IS TIME A LIMITING FACTOR IN COASTAL LAGOONS: THE ROLE OF TIME SCALES IN THE CONNECTIVITY AND COLONIZATION PROCESS OF COASTAL LAGOONS

Michol Ghezzo[1], Francesca De Pascalis[1], Concepción Marcos[2], Georg Umgiesser*[1,3], Petras Zemlys [3], Angel Pérez-Ruzafa[2]

[1]Institute of Marine Science - National Research Council (ISMAR-CNR), Italy, [2]Department of Ecology and Hydrology, University of Murcia, Spain, [3]Marine Science and Technology Centre of Klaipėda University, Lithuania
georg.umgiesser@gmail.com

Keywords: Mar Menor, hydrodynamics, numerical modeling, connectivity

In coastal lagoons, the colonization process represents the possibility to maintain the genetic flow in a population and is probably the main mechanism structuring the communities. Therefore, the connectivity between areas is the key to understand the ecological patterns of the biological communities in these environments. Time scales, that can play an important role in the results of colonization process as pelagic phase duration, must be in the range determined by the minimum arrival time required to reach a locality and the permanence time in it, otherwise the larvae of a given species could not arrive or be expelled from the system before the settlement can be performed.

In this work we analyse the limits imposed to connectivity by time scales determined by the first arrival age, retention probability and hydrodynamic mortality in three different coastal lagoons (Curonian in the Baltic, Venice in northern Adriatic and Mar Menor in the Southwestern Mediterranean).

We have defined first arrival age as the minimum pelagic larval duration useful to connect two locations, hydrodynamic mortality as the maximum time spendable from a particle inside the basin, due to only hydrodynamic and morphological conditions and retention probability as an index on the possibility of the larvae to remain in a particular place the time sufficient to perform the settlement.

A ROLE FOR ECOSYSTEM SERVICE ASSESSMENT IN EUROPEAN MARINE SPATIAL PLANNING?

Gillian Glegg*, Wendy Dodds, Steve Fletcher, Angela Carpenter, Rebecca Shellock, Laura Friedrich

Plymouth University, United Kingdom
gillian.glegg@plymouth.ac.uk

Keywords: marine spatial planning, governance, ecosystem services

With the introduction of European legislation for Marine Spatial Planning (MSP), there is real opportunity to consider innovative approaches to governance. Due to the interconnected nature of ecosystems, ecosystem-based management is a prescription within MSP. The English Channel, for example, supports an array of marine ecosystem services which exist within a complex web of use patterns. Despite this, it is not treated as a single entity; instead, it is governed through a mosaic of sector-specific, national and international arrangements.

To deliver the new MSP Directive, cross-border co-operation will be vital. Mapping and quantifying ecosystem services, thus integrating ecology with economics, is necessary to understand the impacts of marine policy. This knowledge has traditionally been absent from the marine management evidence base, which has a history of not taking the true values of ecosystems into consideration. To date, Ecosystem Service Assessment (ESA) has been widely promoted on land with less application in marine environments. There is significant potential for this shortcoming to be addressed via MSP.

The 'Promoting effective governance of the Channel ecosystem' is a capitalisation project conducted under the INTERREG IVA Channel Programme. This presentation will draw on a number of PEGASEAS findings, including the challenges associated with marine ESA and application. In doing so, it will outline the debate concerning the role for ESA to support MSP efforts.

HUMAN IMPACT ASSESSMENT OF TRANS-BORDER COASTAL LOCAL MUNICIPALITIES IN THE EASTERN GULF OF FINLAND

George Gogoberidze[*1], Julia Lednova[1], Kirsi Kostamo[2], Marco Nurmi[2], Miina Karjalainen[3]

[1]*Arctic and Subarctic Institute, Russian State Hydrometeorological University, Russia,* [2]*Finnish Environment Institute (SYKE), Finland,* [3]*Kotka Maritime Research Association (KMRA), Finland*
[*]***ggg_iczm@rshu.ru***

Keywords: coastal zone, human impact assessment, trans-border local municipalities, Eastern Gulf of Finland

The existing methods for assess the impacts of human activities on the marine nature need to improve. The use of the Human Impact Assessment (HIA) value estimation method for trans-border coastal local municipalities in the Eastern Gulf of Finland (EGoF) allowed us to estimate the nature-ecological state of the local municipality as well as vulnerability and the opportunities for further ecosystem based development. This complex methodology, based on the set of the official statistical data, was used for the economic-environmental assessment for each coastal municipality.

In frame of the work the indicator method of HIA value estimation for trans-border coastal local municipalities are formulated. The integrative indicator (HIA value) was calculated for each coastal local municipality in the EGoF region both in Russia and in Finland, based on various statistics that are describe the local and regional human activities. The HIA method is representative, nonmetric, independent to the geographic region and it is possible to map in GIS for comparison the coastal municipalities between each other with continuous comparison by the all parameters.

Based on the indicators and HIA values, recommendations to reduce human impacts on the environment are developed for coastal local municipalities.

The work is done in the framework of the SOUTH-EAST FINLAND – RUSSIA ENPI CBC PROGRAMME Project "TOPCONS – Transboundary tool for spatial planning and conservation of the Gulf of Finland".

DATA COLLECTION AND HABITAT MAPPING IN SHALLOW AREAS BY LIDAR, VIDEO AND DIVING – THE CROSS BOARDER PROJECT SUPERB

Michael Haldin[1], Ulrika Björkman[*1], Johnny Berglund[2], Michael Tulldahl[3], Kristin Dahlgren[2], Carlos Paz von Friesen[2], Matti Sahla[1], Annica Långnabba[1], Anette Bäck[1]

[1] *Natural Heritage Services, Finland,* [2]*County Administrative Board of Västerbotten, Sweden,* [3]*Swedish Defence Agency Research Unit, Sweden*
[*]***ulrika.bjorkman@metsa.fi***

Keywords: data collection, habitat mapping, shallow areas, LiDAR, drop-video, cross border cooperation

There is an increasing need for detailed information on underwater habitats in shallow coastal areas. These areas contribute with some of the oceans widest array of species and habitats. They are also under an ever-growing pressure from human activities. Hence a method for gathering high quality data for large scale areas effectively is a pressing need. Furthermore, to manage our marine areas whit confidence and as promised (e.g. Helsinki Convention, Natura 2000) we need to produce reliable biological and geological maps.

The international SUPERB project has connected people and knowledge from many areas of science (e.g. technical and biological) to develop new data collection methods and improve old techniques. The goal has been to make data collection less time consuming and more cost-effective. SUPERB has successfully tested LiDAR an airborne laser mapping technique generally used for gathering topographic and bathymetric data, as tool for collecting biological underwater data. Combining LiDAR data with information from video and diving yielded a dataset that when processed in a GIS program resulted in extraordinary maps.

The project has also been involved in developing a dropdown HD-video camera and assessing whether coastal lagoon inventories could be carried out by the means of an UAV-helicopter. The focus has also been on bringing together decision makers and scientists so we all can learn about the whole process from the seafloor to the decision maker's desk.

COASTAL VEGETATION DATABASES AS TOOL FOR DUNE MANAGEMENT?

Maike Isermann

Bremen University, Germany
maike.isermann@uni-bremen.de

Keywords: vegetation databases, vegetation changes, conservation, management, European coastal vegetation

A worldwide trend exists to make vegetation relevés internationally available. Assumption for this is the digitization and storage in databases that enable complex vegetation analyses, general ecological issues as well as trends due to changes in environment and land use.

The database currently has 9000 relevés; considers all vegetation types in coastal regions e.g., drift line, mud vegetation, heather and woodland. Data are recorded in the program TurboVeg, a comprehensive database management system for vegetation data that allows including of various header data. Metadata are set out in the Global Index of Vegetation-Plot Databases, a global overview of existing plot-based vegetation data (http://www.botanik.uni-greifswald.de/world_index_vegdb0.html). The relevés will be available for other initiatives, e.g., the European Vegetation Archive (http://euroveg.org/eva-database). Applications are the description of drift line and yellow dune vegetation, and changes in coastal vegetation in relation to environment. Other studies describe the invasion of plant communities by Rosa rugosa; establish a red-list of plant communities or show biogeographical differences of Eryngium maritimum regarding its occurrence in dune communities.

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TSUNAMI-PROOF TREES: CHARACTERIZING EFFECTIVE TSUNAMI AND WIND PROTECTION FORESTS AS COASTAL DEFENSES AGAINST TSUNAMI INUNDATION

Masahiro Ito

Meijo University, Japan
maito@meijo-u.ac.jp

Keywords: tsunami-proof trees, tsunami and wind protection forest, tsunami inundation

On 11 March 2011, a mega-tsunami caused by the 2011 off the Pacific coast of Tohoku Earthquake destroyed most of the coastal levees along the Pacific coast of northeastern Japan. In this tsunami, the maximum run-up height reached 29.6 m at Ofunato City, Iwate Prefecture and destroyed or severely damaged numerous breakwaters, tidal embankments, coastal levees, and coastal towns in Iwate, Miyagi, and Fukushima Prefectures. Countermeasures to prevent the destruction of coastal levees have been considered as part of the restoration process. In light of this, the effect of a tsunami defence that combines costal levees with a tsunami and wind protection forest was studied. The following characteristics were surveyed: the ground height from the sea surface; the right angle width of the tsunami and wind protection forest to the shoreline; the tsunami depth based on the tsunami trace; the trunk diameter of the trees; and the growth conditions (standing tree or fallen tree) of the tsunami-stricken trees in a tsunami-inundated forest in Miyagi Prefecture. The measured data are arranged with the shoreline distribution of the tsunami-trace height, the tree growth conditions after the tsunami, the tsunami height, and so on. Results show that the tsunami inundation height in the area surveyed fluctuated from 7 to 13 m. The trunk diameter of forest trees (pines) ranged from 15 to 75 cm. Notably, trees with trunk diameters greater than 35 cm were not felled by the tsunami.

BALTIC SEA COASTAL MANAGEMENT AS AN ACADEMIC CHALLENGE

Risto Kalliola*, Harri Tolvanen

Department of Geography and Geology, University of Turku, Finland
risto.kalliola@utu.fi

Keywords: coastal management, education, academia, university

The implementation of integrated coastal management poses challenges to coastal scientists and educators. This reality is strongly met also in the Baltic Sea which is one of the world's most human-influenced marine areas with intensive seashore uses all over. It is also a characteristically coastal sea as some 80% of the sea is less than 50 km from the shoreline. Shallow nearshore waters tend to show diffuse transitions from land to sea, or from terrestrial to marine environments. This implies directional changes in species composition and ecosystem processes. Terrestrial and marine characteristics co-occur in different intensities along this gradient, but there are also genuinely coastal phenomena and ecosystem services which need to be properly described and understood. All these complexities must be attended in coastal management but there is often insufficient knowledge-base and poorly available spatial data to perform this task. Our presentation reports both theoretical and practical aspects about these questions covering the fields of scientific research, monitoring and education. We identify gaps in understanding of the coastal realm, and put special emphasis on our experiences from using geographical approach to the coast, including the spatial and temporal dimensions of these unique environs.

ENVIRONMENTAL IMPACTS OF IRRIGATION MANAGEMENT ON PROTECTED MEDITERRANEAN LAGOON - THE KOTYCHI LAGOON CASE IN NW PELOPONNESE / GREECE

George A. Karantounias*, Nick S. Spyropoulos, Sophie Reizopoulou

Agricultural University of Athens Greece
george.karantounias@gmail.com

The Kotychi biotope in NW Peloponnese, Greece, is an important lagunal system, protected by the Ramsar International Convention, which nowadays receives the waters from the hydrographic and drainage networks of the area.

Around the lagoon cultivated lands are irrigated since the early 70s from the Pinios river reservoir. However existing irrigation management techniques lead to irrigation water overconsumption resulting in increased volumes of drainage waters, which flow into the lagoon and through the lagoon mouth to the sea. Irrigation water overconsumtion changed the lagoon water quality leading to water salinity decrease, nutrients concentration increase, eutrophication, ecosystem alteration, reeds and peat increase, increase of trapping of suspended solids and decrease of the active water volume of the lagoon. These conditions were unfavourable and in some cases, they became asphyxiating for the fish fauna and decreasing the fish production of the lagoon.

In the late 80s the lagunal ecological situation was close to total collapse. Responses included works of environmental and ecological upgrading carried out in the early 90s. The influence of the rehabilitation works was very positive to the ecosystem and the environment. The impacts were studied using GIS; entering data from aerial photographs, satellite imagery and maps.

The Kotychi sea lagoon case could serve as a pilot project for similar applications all over the world with view to environmental conservation combined with moderate man made interventions financed by private and international funds.

PHOSPHORUS STORAGE AND MOBILIZATION IN COASTAL REED BEDS - THE ROLE OF IRREGULAR ANOXIC EVENTS

Svenja Karstens[*1], Uwe Buczko[2], Stephan Glatzel[3]

[1]Landscape Ecology and Site Evaluation, University of Rostock, Germany, [2]Landscape Ecology and Site Evaluation, University of Rostock, Germany, [3]Geoecology, University of Vienna, Austria
svenja.karstens@uni-rostock.de

Keywords: phosphorus, phragmites australis, coastal wetlands, sorption isotherms

The capacity of coastal wetlands to act as a source or sink for phosphorus is of paramount importance. Phosphorus is a key nutrient for plant growth, but when it exceeds a natural level, eutrophication of the water body results. Coastal wetlands with common reed (*Phragmites australis*) can be found along all basins of the Darß-Zingster-Boddenkette, a chain of four inner coastal water bodies connected to the southern Baltic Sea.

To gain insights into the processes of phosphorus mobilization and immobilization, we combined laboratory experiments and field work. Redox potential, pH, oxygen saturation, conductivity, suspended sediment concentrations and water level were measured in situ on a monthly basis. Soluble reactive phosphate concentrations in the water and total phosphorus contents (after peroxidsulfate digestion) in sediment, plants and water were determined by the molybdenum blue method. In addition to field sampling, sorption experiments were conducted.

Langmuir and *Freundlich* sorption isotherms reveal large differences in the sorption capacity for different parts of the heterogeneous reed bed. Since small-scale lagoons within the dense reed stands are sheltered from turbulent water flows, dead biomass, partially decomposed litter and fine mineral particles settle on the sediment surface and create an organic-rich, fine-grained sediment which is capable of storing large amounts of phosphorus. On the other hand, phosphorus can be released under anoxic conditions from the sediments into the overlying water column. Our research elucidates the role of anoxic events and the complex interplay between wetland plants, sediment and water.

PATTERNS OF SEDIMENTATION AND EROSION IN COASTAL REED BEDS INFLUENCE OF HETEROGENEITY OF PLANT MORPHOLOGY AND LOCAL-SCALE TOPOGRAPHY

Svenja Karstens[*1], Uwe Buczko[2], Franziska Schwark[3], Stephan Glatzel[4]

[1]Landscape Ecology and Site Evaluation, University of Rostock, Germany, [2]Landscape Ecology and Site Evaluation, University of Rostock, Germany, [3]Landscape Ecology and Site Evaluation, University of Rostock, Germany, [4]Geoecology, University of Vienna, Austria
svenja.karstens@uni-rostock.de

Keywords: sedimentation, erosion, coastal wetlands, phragmites australis, luminophore tracer test

Common reed (*Phragmites australis*) is an engineer of its own environment. Seawards, reed beds act as a buffer by dissipating wave energy, reducing turbulence and thus sediment suspension. They enhance particle trapping and organic matter accumulation. On the other hand, these wetlands serve as a buffer by trapping wind-eroded particles from the landward side. The objective of this study was to elucidate the interplay of erosion and sedimentation processes in a coastal reed belt at the Darß-Zingster-Boddenkette, a chain of four inner coastal water bodies connected to the southern Baltic Sea. Several different methods to monitor sediment transport mechanisms were used: Tracer tests with luminophores to visualize sediment pathways, different sediment traps within and outside the reed stands to quantify sediment deposition, and rod surface elevation tables to measure vertical sediment accretion. Additionally, total suspended sediment concentrations and root-mean-square velocities were obtained at various locations between the open water and the dense reed stands. Sedimentation and erosion in reed beds are discontinuous, event-based processes. Whereas most of the time, the dense reed beds reduce wind speed and decrease turbidity, large amounts of sediment can be abruptly eroded and transported into the adjacent coastal waters during short episodes of geomorphic instability triggered by human activity, extreme weather events or ice drift during harsh winters. The in situ measurements showed that both plant morphology and local-scale topography have an impact on sediment erosion, transport and deposition patterns.

MEASURING SUSTAINABILITY OF COASTAL AREAS: GERMAN-LITHUANIAN EXPERIENCE

Marija Kataržytė[*1,2], Gerald Schernewski[1,3], Silke Schönwald[3]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Ecology Department, Faculty of Natural Science and Mathematics, Klaipėda University, Lithuania, [3]Leibniz-Institute for Baltic Sea Research, Coastal Research and Management Group, Germany
marija.katarzyte@jmtc.ku.lt

Keywords: sustainability indicators, SUSTAIN, QualityCoast

The evaluation of sustainable development is one of the core challenges in the coastal zone management. Within the project SUSTAIN a universal tool to help deliver sustainability on Europe's coasts has been developed with the involvement of 12 EU countries. This new tool is based on easily measurable indicators and can be applied to different European coastal regions for sustainability evaluation. Together with a weighting and preference system it allows coastal municipalities not only to measure the present state of sustainability but also to develop a future sustainability vision as well as a development strategy. After an application exercises in Germany and Lithuania the weaknesses and benefits were evaluated and the new approach linking this system with the QualityCoast certification programme was developed. This approach evaluated during application exercise in two Lithuanian Baltic seaside resorts Palanga and Šventoji, with the exemplary involvement of stakeholder groups.

COMPARISON OF WIND WAVE FIELDS IN THE SOUTHEASTERN BALTIC LAGOONS

Dmitry Kurennoy[*1], Loreta Kelpšaitė[2], Boris Chubarenko[3]

[1]Ballast Ham Dredging, Russia, [2]Marine Science and Technology Centre of Klaipėda University, Lithuania, [3]Atlantic Branch of the Shirshov Institute of Oceanology, Russian Academy of Sciences, Russia
d.kurennoy@gmail.com

Keywords: wave modeling, wind waves, Baltic Sea, Vistula lagoon, Curonian lagoon, Neva Bay

Properties of wind generated waves under typical (long-term) and extreme meteorological conditions were studied for 3 different size and shape shallow lagoons of the southeastern Baltic: Curonian and Vistula lagoons are natural basins and Neva Bay bordered by dam. All lagoons are intensively developing with regards to transport and recreation infrastructure. The shores of all these lagoons continuously suffer from erosion processes.

Due to lack of proper measurements wave properties were derived by means of the SWAN model. The calculations were performed for the long-term wind parameters. Results show that significant wave height for typical winds (7 m/s) doesn't exceed 0.5 m and has similar patterns in all water areas. Moderate winds (11 m/s) develop waves up to 0.7-0.9 m. Herewith, a distinct fetch dependence takes place for allocation of the highest waves. The stormy winds (>19 m/s) produce waves up to 1.2 in Neva Bay, 1.3 in Vistula and ~1.5 m in Curonian Lagoon at the longest fetch locations. Difference was seen for storms – morphometry and shape play the major role for generation of the highest waves, especially in the Curonian Lagoon.

Most of the storms come from W-SW directions and as usually accompanied by substantial surge (in extreme cases >2 m). Such severe storm conditions (>26 m/s) generate waves in Curonian Lagoon ~2.5 m and around 2 m in Vistula lagoon and Neva Bay. In general, impact caused by surge leads the highest waves approach much closer to the coast.

THE NATURAL VALUES OF POLISH COASTAL DUNES – HABITATS WORTH TO PROTECT. FoMoBi PROJECT CONCLUSIONS

Tomasz A. Łabuz

Institute of Marine and Coastal Sciences, University of Szczecin, Poland
labuztom@univ.szczecin.pl

Keywords: coastal dunes, biodiversity, geodiversity, Polish coast

The project FoMoBi is aimed at understanding the contemporary foredunes relief, their dynamics, vegetation patterns and emerging threats to that habitat - as a part of accumulative coast. The second research objective reflects the need of education and future use of these valuable areas. The detailed aims of this project research on foredune habitats, in particular: 1. Alignment - the ranges of the foredunes along the Polish coast through their inventory in space. 2. Determination their variability in time, under the influence of natural and anthropogenic factors (stressors) - volatility surface dynamics and distribution of species. 3. Estimation of state / condition according to the guidelines for the conduct of monitoring Nature 2000 sites. 4.Determination of threshold conditions causing their variability. 5. Determination of temporary and seasonal variability of vegetation. 6. Determination of substratum differentiation. 7. Dissemination of knowledge about the dynamics, the dangers and consequences of changes in this environment. 8. Preparation of guidelines for action and protection or restoration of habitats in areas without them (as far as real possibilities). 9. Wide promotion and knowledge increase about environment. The concept for the works is to conduct research along the entire Polish coastline (consisting of 464 km of open Baltic Sea coast) simultaneously, which is a pioneering operation in Poland. The results will give a detailed description of habitats, risks they face and their variability, and indicate the possibility of human use in a way that would maintain the qualities of this environment. Research is carried out with financial support from the National Centre for Research and Development. The data are collected since 2010 along whole Polish coast, where there are sections of accumulation on coastal dunes. Research is focused on relief measurement of dune dynamics caused by natural and human induced factors. Part of work is related on natural values as plant habitats and animals existence. The bio and geodiversity of dunes is value for local society also in light of biodiversity documents established in EU. The dune coasts in Poland cover 85%. Only 15% of it is in permanent accumulative state, where whole habitats can be observed. In few places this type of coast is under proper nature protection. Among them, new habitats in the Natura 2000 network since 2004.

The project described present habitats of dune coasts, pointed problems in management and showed natural values, where environment is main treasure of local societies.

INSTITUTIONAL FRAMEWORK AND ORGANISATIONAL SETTINGS AS A TOOL IN PRACTICAL FISHERIES MANAGEMENT IN COASTAL AREAS OF POLISH PART OF THE VISTULA LAGOON (SOUTHERN BALTIC SEA)

Adam M. Lejk*, Iwona Psuty, Dariusz P. Fey, Lena Szymanek, Piotr Margoński

National Marine Fisheries Research Institute, Poland
****adam.lejk@mir.gdynia.pl***

Keywords: multi-level governmental structure, stakeholders, social network, protected areas

The coastal zone of the Baltic Sea with its bays and lagoons is an important breeding and nursery area for many fish species. The task for the Baltic countries is to provide legal and active protection of these areas. Suitable and efficient coastal water management system is important in terms of ensuring sustainable fisheries and the protection of species of high ecological importance. It should be an effective system that provides the exchange of information between different stakeholders and supports the development of the area at the same time guaranteeing the maintenance of good environmental status.

The analysis of Vistula Lagoon coastal case study for potential designation of protected areas relevant to herring reproduction has been conducted. First we identified stakeholders and institutions comprising the hierarchical management structure on different political levels and responsible for sustainable exploitation and conservation of the Vistula Lagoon coastal areas. Additionally, we analysed existing official documents and law in relation to fishery, nature conservation, spatial planning, shipping, and resource extraction. In the second step, interview method was used to verify multi-level management system for the designation of relevant administrative bodies which play important role in decision making process. This knowledge is essential to develop new and improved forms of natural resource governance, especially if protected spawning areas are to be considered.

EVALUATION OF GOVERNANCE STRUCTURES REGARDING HERRING SPAWNING GROUNDS. A SOCIAL NETWORK ANALYSIS

Friederike Lempe*, Harry V. Strehlow

Thuenen Institute of Baltic Sea Fisheries, Germany
friederike.lempe@ti.bund.de

Keywords: coastal zone management, fishery, sustainable resource governance, social network analysis, qualitative research

The diversity of interests regarding the use and the protection of coastal resources and the further degradation of aquatic habitats in the estuaries and lagoons of the Southern Baltic require an evaluation of current management practices. A total of 35 semi-structured expert interviews with state and non-state actors coming from fishery, nature conservation, agriculture, science and spatial planning were realized to identify central actors within the coastal governance network. Respondents were asked to evaluate their own bargaining position in the network. Under discourse analytical considerations, we analysed individual perceived power asymmetries between different stakeholder groups. These results were compared with social network data. Results indicate that there are partially huge discrepancies between the self- and outside perception of different stakeholders concerning their influence. Additionally, network maps visualize central actors and reveal "bottlenecks" and "supporters" of a sustainable coastal zone management. The discourse seems to be highly polemic and characterized by irreconcilable interest antagonisms. Several stakeholders feel disadvantaged and marginalized preventing meaningful cooperation. The paper increases the understanding of the factors that impede or facilitate sustainable coastal resource governance and provides an insight into the engagement and importance of stakeholders in the policy-making process.

INVENTORY OF OFFSHORE WATERS IN LITHUANIA FOR DEVELOPMENT OF NATURA 2000 NETWORK (DENOFLIT): DIVERSITY AND DISTRIBUTION OF DEMERSAL FISH

Linas Ložys*[1], Justas Dainys[1], Romas Statkus[2], Jelena Fedotova[2], Nerijus Nika[3], Žilvinas Pūtys[1]

[1]Nature Research Centre, Lithuania, [2]The Fisheries Service under the Ministry of Agriculture of the Republic of Lithuania, Lithuania, [3]Marine Science and Technology Centre of Klaipėda University, Lithuania
lozys@ekoi.lt

Keywords: Baltic Sea, fish, demersal fish

Inventory was aimed to (1) survey presence and distribution of Twaite shad and Common whitefish, (2) to evaluate impact of environmental parameters on abundance of fish at offshore banks and surrounding areas in the Lithuanian EEZ. The study was implemented as a part of the project „Inventory of marine species and habitats for development of Natura 2000 network in the offshore waters of Lithuania (DENOFLIT)". Such comprehensive survey has been conducted on offshore ichthyofauna using bottom gillnets of different selectivity for the first time in Lithuania. The analysis of historical research and fishery statistics data was done aiming to understand better trends in abundance of Twaite shad and Common whitefish. The survey data and the analysis revealed alarming decline of the stocks; the main harm is presumably done at freshwater spawning sites. Evaluation of impact of some environmental parameters, such as depth, sediments, features of bottom habitats and etc., on abundance and distribution of demersal fish revealed the importance of offshore banks as habitats for various fish species during warm-water periods, influence of bottom sediments size on distribution of Cod during cold-water periods and negative effect of depth on distribution of Flounder. The study data suggests importance of offshore banks as habitats for different fish species and reveal key environmental parameters determining importance of the particular habitats for fish at Lithuania's territorial waters.

SINK-SOURCE ROLE OF A FRESHWATER HYPERTROPHIC ESTUARY FOR N, SI AND P: MASS BALANCES COUPLED WITH FLUX MEASUREMENTS

Irma Lubienė[*1], Mindaugas Žilius[1], Jolita Petkuvienė[1], Tomas Ruginis[1], Diana Vaičiūtė[1], Artūras Razinkovas-Baziukas[1], Gianmarco Giordani[2], Marco Bartoli[2]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Department of Life Sciences, Parma University, Italy
irma.lubiene@jmtc.ku.lt

Keywords: nutrients, mass budget, Curonian lagoon

Extreme eutrophication can menace the one-way sink function of estuaries for nutrients (N, Si and P) and in general their ecosystem services. Considering the unpredictable and poorly studied effects of climate change, that will alter temperatures, the timing of water and nutrient transport to the coastal zone and their stoichiometry. In this contribution, a nutrient annual budget for the Curonian Lagoon is presented, with the overall aim to investigate whether they are net retained, released or unaffected. The proposed mass budget is oversimplified but robust: it integrates monthly loads of N, Si and P. Moreover, available seasonal measurements of benthic fluxes in intact sediment cores were upscaled and compared to mass budgets. Three main outcomes are apparent: 1) There is a strong seasonal variation in the Nemunas River discharge, its associated N, Si and P loads and the stoichiometry of nutrients; 2) The lagoon exports large amounts of particulate matter, mostly as phytoplankton, to the Baltic Sea, and removes, transforms or retains relevant fractions of inflowing inorganic N, Si and P; 3) There are evidences that internal load nutrient regeneration from surface organic sediments sustains a relevant fraction of primary production, in particular during summer, when allochtonous nutrient loads decrease.

DEVELOPMENT THE STRATEGY FOR ENVIRONMENTALLY FRIENDLY PORT

Maria A. Mamaeva[1], Marina R. Kononenko[*1], Natalia S. Pisarevskaia[1], Mihail B. Shilin[1], Riitta Kajatkari[2], Oli-Pekka Brunilla[3], Esa Hamalainen[3], Anni Anttila[4]

[1]Russian State Hydrometeorological University, Russia, [2]Port of Hamina-Kotka, Finland, [3]Centre for Marine Studies of University of Turku, Finland, [4]Kymenlaakso University of Applies Science, Finland
ko_mar@europe.com

Keywords: environmentally friendly port, sustainable development, environmental legislation, monitoring of environmental impacts

Key elements in the co-operation / competition between the Baltic Sea ports now and in the future will be their environmental status. The objective of the co-operation project „Environmentally Friendly Port“ is to improve the environmental state of two ports, Hamina-Kotka (Finland) and Ust-Luga (Russia). The project involves parties such as the Russian State Hydrometeorological University, Ust-Luga Company JSC (Russia), Kymenlaakso University of Applied sciences, and Port of Hanona-Kotka Ltd. (Finland). It focuses on four main areas: present state of environmental impact management, development of replacing procedures, environmental legislation, and monitoring of environmental impacts.

One of the project outcomes is the elaboration of an environmental strategy for the port Ust-Luga with using European experience. The main recognized goal of the strategy is preservation of marine environment and guaranteeing of ecological safety during construction and functioning of the port, which are based on close cooperation between the port representatives, state structures and local population, with a focus on sustainable development.

POTENTIAL ENVIRONMENTAL AND CLIMATIC DRIVERS INFLUENCING THE SUCCESSFUL SPAWNING OF HERRING IN THE VISTULA LAGOON (SOUTHERN BALTIC SEA)

Piotr Margoński*, Dariusz P. Fey

National Marine Fisheries Research Institute, Poland
pmargon@mir.gdynia.pl

Keywords: herring spawning, environmental drivers, climate change, Vistula Lagoon

Baltic herring (*Clupea harengus* L., 1761) is one of the key elements of the pelagic and coastal ecosystems of the Baltic Sea. Due to its ability to adapt to a wide range of water salinity, it inhabits and successfully reproduces in shallow waters of nearly the entire Baltic Sea. In the Polish part of the Baltic Sea herring spawns mainly in the Gdańsk and Pomeranian bays and in the Vistula Lagoon. Spawning occurs in shallow waters most frequently on bottom substrate as rocks, gravel and submerged vegetation. Early herring developmental stages remains in shallow waters and lagoons until they attain a length of approximately 30 mm. More or less at this time, the herring undergo their metamorphosis and it is ready to leave the lagoon.

We will discuss the most important environmental factors potentially influencing the successful spawning of herring in the Vistula Lagoon as temperature, salinity, oxygen content, ice cover duration, turbidity, type and location of bottom sediments, trophic state of the lagoon, and food availability.

We will also present how future changes in meteorological and hydrological conditions as a consequence of the expected climate scenarios may have an impact on timing, duration and intensity of herring spawning in the Vistula lagoon and further, on the level of recruitment success.

SEASONAL SEA ICE INFLUENCE ON THE PHYSICS OF THE WATER BODY – GULF OF FINLAND

Ioanna Merkouriadi, Matti Leppäranta

University of Helsinki, Finland
ioanna.merkouriadi@helsinki.fi

Keywords: sea ice, climate change, circulation, heat budget

Long-term hydrographic and sea ice data have been examined in order to study the inter-annual variability and trends of the hydrographic characteristics, heat content, freezing and break-up days and ice thickness during the last century in the coastal zone of the Gulf of Finland. Moreover, we examine the influence of the seasonal sea ice on the physics of the water body; hydrography, circulation, atmosphere ocean interaction. The results showed significant decrease of the ice season length by almost 30 days in the last century. The maximum annual sea ice thickness decreased by 8 cm in the last 40 years. In the last 85 years, surface water temperature increased by 1 ºC and surface salinity decreased by 0.5 psu. The circulation under ice became weaker by almost 1 cm s-1. The ice cover was a good control measure of the net surface heat exchange. Solar radiation had a strong seasonal cycle with monthly maximum at 160 W m-2 and minimum below 10 W m-2. Terrestrial radiation was mostly between -40 and -60 W m-2. Latent heat exchange was much more important than sensible heat exchange, similar to the net terrestrial radiation values in summer and autumn.

EUROPE'S FIRST MARINE RESERVE: WAS IT A GOOD IDEA?

Dan Minchin

Marine Organism Investigations, Ballina, Killaloe, Co Clare, Ireland, Marine Science and Technology Centre of Klaipėda University, Lithuania
moiireland@yahoo.ie

Keywords: reserve, UNESCO, management, tourism

Lough Hyne Marine Reserve is a tidal sea-lough of 450 hectares with depths to 47m on the south-west coast of Ireland. It is connected to the sea by a small narrow passage to a sea inlet and is surrounded by high ground and so has little freshwater input. The Lough develops an anoxic hypolimnion in late summer and has a warmer epilimnion on account of its high water retention that accommodates isolated populations of species generally found in more southern latitudes, including the Mediterranean Sea. The Lough will have been studied from 1886 and more extensively since 1923 on account of the wide range of habitats and high species diversity. The knowledge gained and the unique assemblages led to becoming a marine reserve in 1981. Meetings with stakeholders took place and some compromises were necessary to include within the management plan. Following the formation as a reserve there were a series of challenges in its management as its status will have attracted tourism. Research continues at the Lough under licence with now more than 250 accounts having been published. The paper presents a view of a marine biologist who studied the area since 1964, was involved in the establishment of the marine reserve and followed developments till recently.

BETWEEN SCYLLA AND CHARYBDIS: NON-INDIGENOUS SPECIES IN COASTAL FISHERY AND AQUACULTURE

Dan Minchin*[1,2], Sergej Olenin[1]

[1]*Marine Science and Technology Centre of Klaipėda University, Lithuania,* [2]*Marine Organism Investigations, Marina Village, Ballina, Killaloe, Co Clare, Ireland*
moiireland@yahoo.ie

Keywords: biological invasions, nature conservation, naturalness, fishery and aquaculture, management

One of the core principles of the coastal and marine nature conservation is the maintaining of naturalness, i.e. keeping coastal marine habitats, as far as possible, free of any human induced perturbations including introduction of non-indigenous species (NIS). NIS may cause serious changes in native biodiversity, habitats and ecosystem functioning and also provoke economic losses and human health problems. In recent decades, more and more NIS are expanding their range because of climate alteration and/or are spreading due to globalization of World trade. By far, not all NIS are accepted as being of commercial value. Yet, some are abundant and cause harmful effects. One option for such species is to develop a fishery for them and thereby mitigate their overall negative environmental and/or economic impacts. NIS with high acceptability might be cultured, however, a balanced and practical approach is needed that provide for societal needs as such species may also have undesired impacts. In European seas there are several examples of species that have become introduced deliberately, or inadvertently, that might be utilized. The dilemma for managers in the utilization and management of NIS is usually determined by legislation and public opinion. In this account we provide an overview of NIS that are of commercial importance in fisheries and culture activities in European seas.

A GIS TOOL TO EVALUATE MARINE TRAFFIC SPATIO-TEMPORAL EVOLUTION USING SÉMAPHORE DATA. AN APPLICATION ON FRENCH COASTAL ZONES

Annalisa Minelli*, Iwan Le Berre, Ingrid Peuziat

Institut Universitaire Européen De La Mer - Geomer, LETG-Brest GEOMER, France
annalisa.minelli@univ-brest.fr

Keywords: GIS, Sémaphores, Marine Traffic

In a context of unprecedented development of marine activities, their monitoring and integrated management becomes a priority for marine spatial planning. Data about marine activities exist but they describe only a specific part of the traffic (e.g. commercial one with AIS data), or are not available for public uses (fishing data) or remains sparse or unstructured (boating). In France, one precious source of information are the Sémaphores, which are located along the coasts and register continuously the marine traffic, noting down each boat observed. Currently, the use of this data remains dedicated to marine traffic security topics, but could be very useful for public management of coastal zone.

This note presents an Open Source GIS tool which quantifies the marine traffic on specific routes using sémaphore data. First of all, raw data are standardised, then an automatical procedure recognizes the specific route crossed by the single boat and traces (following the shortest path rule) a synthetical path along a geometrical network. These paths share segments along the network and this allows to group traffic fluxes in order to calculate the most frequented zones. Moreover, is under implementation an additional function to simultaneously analyse data from different sémaphores and different years of recordings. In this way, the tool presented can provide a useful base to evaluate spatial and temporal evolution of pressures due to the traffic on marine areas and activities.

DPSIR APPROACH APPLIED TO MARINE BIOLOGICAL INVASIONS: A FRAMEWORK FOR ENVIRONMENTAL QUALITY ASSESSMENTS

Sergej Olenin*[1], Dan Minchin[1,2]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Marine Organism Investigations, Ballina, Killaloe, Co Clare, Ireland
sergej.olenin@jmtc.ku.lt

Keywords: non-indigenous species, ecological quality indicators, good environmental status descriptors, MSFD, WFD

The paper considers DPSIR (Driver-Pressure-State-Impact-Pressure) approach in relation to marine biological invasions and the concepts of ecological quality indicators (EU Water Framework Directive, WFD) and good environmental status descriptors (EU Marine Strategy Framework Directive, MSFD). The analysis shows that not only biological, but also physico-chemical and hydro-morphological parameters may be, in greater or lesser extent, modified by invasive alien species (IAS) increasing or decreasing trends. A paper presents a framework to involve changes produced by IAS into environmental quality assessments under WFD and MSFD. This study is supported by the EU FW7 Project DEVOTES "DEVelopment Of innovative Tools for understanding marine biodiversity and assessing good Environmental Status".

MARINE SPATIAL PLANNING: FISHERIES MEASURES IN A N2000 AREA IN THE BELGIAN PART OF THE NORTH SEA

Ellen Pecceu*, Bart Vanelslander, Sofie Vandendriessche, Gert Van Hoey, Els Torreele, Hans Polet, Kris Hostens

Institute for Agricultural and Fisheries Research (ILVO), Belgium
ellen.pecceu@ilvo.vlaanderen.be

Keywords: marine spatial planning, VMS, fisheries management measures

The Belgian Part of the North Sea (BPNS) is a relatively small (3454 km²) and shallow area. Nevertheless, the area is intensively used by a dozen of activities, including aggregate extraction, fisheries, wind energy development, shipping and dredging. In March 2014, Belgium approved a legally binding marine spatial plan. This plan provides a long term vision for the BPNS, translated into concrete objectives for the period 2014-2020. Within this plan, zones are delineated in which specific rules apply with respect to various human activities. For commercial fisheries, 4 areas are delineated within the protected area "Vlaamse Banken" in which a number of restrictions will be in force. To access the possible consequences of such measures on existing habitats (restoration) and on the fisheries sector (loss of fishing grounds), a detailed overview of fishing activities in the area is required, including fleet dispersion (per state, fishing gear and species), as well as information about the target species over the past 3 years. This information was collected based on VMS & logbook data over the period 2010-2012. The analyses highlighted which métiers will be impacted most by these fisheries measures. Possible conflicts might arise in zone 1 and 2 for the Belgian shrimp fishery, zone 1 for the Dutch shrimp fishery, and zones 2, 3 and 4 for the Dutch beam trawl fishery, Fisheries measures might have an influence on the catches of shrimp, sole, plaice and flounder in the BPNS.

DEFINING A ROADMAP TO EUROPEAN CLEANSEAS

Carolina Pérez Valverde*, Pedro Fernández

Centro Mediterráneo EUCC, Spain
c.perez@eucc.net

Keywords: marine strategy framework directive MSFD, good environmental status GES, marine litter, micro-plastics

Marine litter is a threat to Europe's marine ecosystems. It is a major societal challenge because it impacts the vast natural marine capital that supports economies, societies and individual well being. Marine litter, of which plastic is a main component, is explicitly identified as a descriptor for determining Good Environmental Status (GES) under the Marine Strategy Framework Directive (MSFD). Europe aims to achieve GES by 2020 and CleanSea is providing key scientific knowledge and tools for marine litter monitoring and action plans. The project operates in the four marine regions on Europe's coasts coordinating with and making use of the existing institutional structures established by the UNEP Regional Seas Programme.

CleanSea is a multidisciplinary and collaborative research project addressing marine litter from different perspectives. It aims at providing European Member States and other stakeholders with improved knowledge, methods and tools to be able to better define, monitor and achieve a marine environment free of harmful litter levels. In doing so, it will deliver a transparent and useful guidance to policy makers and stakeholders to deal with marine litter mitigation.

The result will be a Roadmap to Good Environmental Status for ML derived from a transparent, coherent synthesis of natural and social science research outcomes and stakeholder input.

The paper aims to present the results of findings of the first implementation phase of the project.

CONSERVATION OF COASTAL SHIFTING DUNE RIDGES AS LINEAR LITTORAL HABITATS

Ramūnas Povilanskas

Klaipėda University, Lithuania
ramunas.povilanskas@gmail.com

Keywords: dune ridge, linear littoral habitat, Baltic Sea, Curonian Spit

The presentation addresses the main principles of the conservation of coastal shifting dune ridges based on the concept of linear littoral habitats. The main conclusion of the presentation is that in order to ensure the long-term dune management sustainability, the longitudinal functional zoning must replace the current perpendicular one in the management of the entire Curonian Spit on both sides of the border, i.e., both, in Lithuania and in the Russian Federation. The dune management should be based on the interpretation of the shifting barchans with the adjacent windward strips of *kupstynė* and *palvė* as an interrelated system of linear littoral habitats and, thence, on facilitating the dynamism of palvė as the main dune management priority.

DEVELOPMENT OF RIVER BASIN MODELING SYSTEM FOR A WATER MANAGEMENT INSTITUTION

Svajūnas Plungė

Environmental Protection Agency, Lithuania
s.plunge@aaa.am.lt

Keywords: Lithuania, SWAT model, modeling system, water management

Lithuanian Environmental Protection Agency in 2009 started the development of Soil and Water Assessment Tool (SWAT) based water modeling system, which would be capable of answering multiple questions related to water management. Questions connected to non-point source water pollution or the application of best management practices or the drawing future forecast of water quality were among those, which required application of such system. In 2009 and 2010 SWAT model has been tested for small catchment applications in Lithuania. This knowledge was used for the preparation of initial project for model application for the whole of Lithuania, which took place in 2011 and 2012. After that major project for preparation of model for the whole of Lithuania was commenced in the end on 2013 and is still ongoing. Presentation is intended to communicate initial results from this latest project. Project's aims are preparation of SWAT model for all Lithuania with the latest data, use of modeling system for the renewal of River Basin Management Plans and Programmes of Measures, evaluating impacts of those programmes for the load reduction towards the Baltic Sea, the use of modeling system for evaluating different agricultural and optimizations scenarios, etc.

AN EXAMPLE OF ENVIRONMENTAL RISK ASSESSMENT FOR AN OFFSHORE DUMPING IN A MEDITERRANEAN AREA ALONG ITALIAN COASTS

Marina Pulcini*, Francesca Giaime

ISPRA, Italy
marina.pulcini@isprambiente.it

Keywords: sediment management, harbour dredging, risk assessment

Sediment management is complex and multivariate issue, involving a careful balance of science, politics and economics. However, because the choices made have far-reaching implications, it is useful for countries to develop standard approaches for sediment assessment and management to meet agreed-upon goals.

In Italy, dredging activities produce huge quantities of sediment to be managed, with different characteristics in terms of grain size and contamination. So managing of dredged material is a very complex problem to be solved.

Historically, sediment quality has been assessed by making comparisons between concentrations of contaminants with (numerical) sediment quality guidelines (SQGs). Based on such a comparison, the potential chemical risks, or hazard of (groups of) sediment-bound contaminants can be estimated. A recent overview of SQGs in Italy design an integrated approach framework to evaluate the risks of possible disposal options for dredged sediment derived from a harbour.

Moreover sea disposal "licences" are only issued after detailed scientific assessment of the potential environmental impact, with particular regard to the need to safeguard coastal and marine conservation sites, fisheries and other uses of the sea

In this paper we describe this approach in a region of Mediterranean sea (Tyrrhenian sea) where, on the basis of the requirement to dredge a harbour, a new disposal area was identified and was to investigate through specific environmental Plan.

ASSESSING THE FISH MIGRATIONS IN THE CURONIAN LAGOON - LITHUANIAN COASTAL ZONE SYSTEM: ECOPATH APPROACH

Artūras Razinkovas-Baziukas*[1], Rasa Morkūnė[1], Egidijus Bacevičius[1,2]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Lithuanian Ministry of Agriculture, Department for Fishery Research and Science, Lithuania
*** arturas.razinkovas-baziukas@jmtc.ku.lt***

Keywords: ECOPATH model, food web, fishery, coastal fisheries management

Lithuanian coastal zone is a transitory basin strongly influenced in the northern part by the organic enriched waters from the Curonian lagoon while fish communities are dominated by fish species migrating between the coastal habitats and the Baltic proper (herring, sprat), the Curonian lagoon (perch, pikeperch, ruffe) or performing migrations between the Baltic and inland waters (smelt, salmon). The ECOPATH model comprising 43 living compartments in the Lithuanian coastal zone (<20 m isobate) was constructed. The model setup was mostly based on the original monitoring and trophology data providing comparatively high for ECOPATH models pedigree index. Model was balanced taking into account the different time spent by the migratory fish species in the coastal zone and evaluating massive organic material exports from the adjacent Curonian lagoon. After the balancing the system was found to be heterotrophic and providing a sink for most of migratory fish populations. The balancing of the model also revealed the inconsistency in the biomass evaluation methods for some sessile fish species as a common goby. These findings are contradicting the general paradigm of coastal zone as an autotrophic and productive ecosystem and, probably could be extrapolated to other exposed sandy coasts of the South-eastern Baltic.

EVIDENCE FOR SENSITIVITY OF DUNE WETLANDS TO GROUNDWATER NUTRIENTS

Jennifer Rhymes[*1], Laurence Jones[2], Nathalie Fenner[1], Hilary Wallace[3]

[1]Bangor University, United Kingdom, [2]Centre for Ecology and Hydrology, United Kingdom, [3]Ecological Surveys (Bangor), United Kingdom
jenrhymes@ceh.ac.uk

Keywords: dune slacks, nitrogen, groundwater, contamination, sand dunes, ecohydrology

Dune slacks are seasonal wetlands, high in biodiversity, which experience within-year and between-year variations in water-table. They are subject to pressures such as climate change, land use change and eutrophication. Despite their biological importance and the threats facing them, the hydrological and nutrient parameters that influence their soil properties and biodiversity are poorly understood. In this study we examined the impact of groundwater nutrients on water chemistry, soil chemistry and vegetation composition of dune slacks at three distance classes (0-–150 m, 150–300 m, 300–450 m) away from nutrient sources at Aberffraw dunes in North Wales, whilst accounting for differences in water-table regime. Groundwater nitrate and dissolved inorganic nitrogen (DIN) and soil nitrate and nitrite all had significantly higher concentrations closest to the nutrient source. Multivariate analysis showed that although plant species composition within this site was primarily controlled by water table depth and water table fluctuation, nitrogen from groundwater also influenced species composition, independently of water table and soil development. Areas exposed to low groundwater nutrient concentrations (mean 0.204 mg/L +/- 0.091 of DIN) had greater abundance of nitrophilous species and fewer basipholous species than in areas with lower concentrations. This shows that clear biological impact occurs below previously suggested DIN thresholds of 0.20 – 0.40 (mg/L).

SCENIC VALUATION OF COASTAL DUNE LANDSCAPES ON THE CURONIAN SPIT

Ramūnas Povilanskas[*], Egidijus Jurkus, Dalia Baziukė

Klaipėda University, Lithuania
ramunas.povilanskas@gmail.com

Keywords: coastal dunes, scenic valuation, Baltic Sea, Curonian Spit

The presentation addresses the main principles of the scenic valuation of coastal dune habitats based on the concept of the subjectivist (psychological) valuation. The landscape of the Curonian Spit is symbolically significant for Lithuanians – for locals and for tourists as well. The specific semi-natural landscape with shifting dunes, untouched coastline and traditional cottages communicates the image archetypal to the Lithuanian Baltic coast. At the same time, the spit with its distinct nature and the sense of the tamed wilderness is a favourite international tourist destination. The key pre-conditions to ensure a truly integrated management and in a long-term sustainable maintenance of amenities and values of the Curonian Spit include balancing of different interests in the utilisation of its unique natural resources (first of all, forests and dunes). Hence, the need for scenic valuation of coastal dunes, which is the process of assessing their aesthetic appeal to visitors. The first results of the survey show, that visitors of the Curonian Spit clearly distinguish shifting dunes from other habitats visually, but have difficulties in segregating various types of dunes and forests on the spit.

MODELLING FINE-SCALE HELCOM HUB BIOTOPES FOR THE FINNISH NATIONAL ASSESSMENT OF THREATENED MARINE HABITAT TYPES

Matti Sahla[*1,2], Annica Långnabba[1]

[1]*Natural Heritage Services (Metsähallitus), Finland,* [2]*University of Turku, Department of Geography and Geology, Finland*
[*]***matti.sahla@metsa.fi***

Keywords: HELCOM HUB, GIS modelling, inventory data, national assessment, habitat types

The HELCOM Underwater Biotope and habitat classification (HUB) was published in 2013, whereafter Metsähallitus Natural Heritage Services set out to explore the applicability of HUB to a set of national inventories data, consisting of 12 000 analysed drop-video recordings. The chosen area for the study, the Kvarken Archipelago, is a UNESCO World Natural Heritage Site, and is characterised by shallow moraine landscapes and isostatic land uplift.

The data-driven, hierarchical HUB system allows classification to 6 different levels. Clear split-rules have been defined between and within levels, delineating 328 biotopes covering all benthic and pelagic environments. We classified our data points in accordance with the HUB system regarding substrate and species assemblages, using MS Excel. Based on the classification results, we produced a HUB biotope map through predictive GIS modelling. With spatial data coverage of the classification results ranging from good to sparse, the process underlined the need for area-specific environmental predictor variables, in order to later attain nationwide whole-coverage marine biotope maps.

Our study shows that HELCOM HUB works when using numerical inventory data. HUB biotope maps may aid both local and regional marine spatial planning and monitoring, and Finland will shortly implement HELCOM HUB nationally as a basis for assessment of marine red-listed habitat types, thereby also ensuring contributions to further development of the HUB classification system.

CLIMATE CHANGE, COASTAL RE-ALIGNMENT AND PUBLIC PARTICIPATION: A BALTIC CASE STUDY

Gerald Schernewski[*1,2], Eva Weisner[1]

[1]*Leibniz-Institute for Baltic Sea Research, Germany,* [2]*Marine Science and Technology Centre of Klaipėda University, Lithuania*
[*]***gerald.schernewski@io-warnemuende.de***

Keywords: sea-level rise, public participation, coastal protection

Sandy coasts along the German Baltic are subject to ongoing erosion and are highly vulnerability to climate change induced sea-level rise. Existing soft (e.g. beach nourishment) and hard (e.g. dikes, groynes) defences are costly and these costs will fast increase in future. Therefore, in less densely populated regions, alterative strategies have recently been implemented like a combination of holding the line of current defences to protect villages and a coastal realignment.

The most prominent case study is situated near Rostock and includes the town Markgrafenheide and the coastal wetland nature reserve Hütelmoor (490 ha). Markgrafenheide received a comprehensive flood protection system (a ring-dyke). As an environmental compensation measure, the nearby Hütelmoor has been restored. Only a narrow dune belt separates the moor from the sea. The coastline has been left up to its natural dynamics and erosion will in future allow a flooding of the moor during storm surges. In surveys we studied the perception and attitude of local residents and visitors towards this measure, analysed the public participation process before, during and after the implementation and evaluated the role of media. In our presentation we describe the process and address the question, whether public participation is really the key to acceptance of future large scale coastal protection measures. For several reasons, we have serious doubts.

MEASURING SUSTAINABILITY AND CLIMATE CHANGE ADAPTATION IN COASTAL COMMUNITIES: A CASE STUDY

Johanna Schumacher*[1], Gerald Schernewski[1,2], Silke Schönwald[1]

[1]*Leibniz-Institute for Baltic Sea Research, Germany,* [2]*Marine Science and Technology Centre of Klaipėda University, Lithuania*
johanna.schumacher@io-warnemuende.de*

Keywords: coastal sustainability, indicators, self-assessment methodology, climate change adaptation, ICZM, quality coast

In the context of Integrated Coastal Zone Management (ICZM) and Sustainable Development, the use of indicators to measure sustainability in coastal communities has garnered increasing interest. Within the project SUSTAIN a universal indicator-based assessment methodology tailored for European coastal municipalities, was developed. Yet, on a local level indicator use is often restricted to one-time applications or project duration, and they are rarely used by coastal municipalities.

Linking the assessment method with a certification scheme, such as the QualityCoast Award, is hoped to add value and increase incentives for coastal communities. A combined tool in which the QualityCoast indicators are merged into the SUSTAIN assessment methodology was developed. Its potential to measure sustainability and climate change adaptation was assessed on the basis of the German seaside resort Markgrafenheide in which a comprehensive coastal protection and realignment scheme was implemented. The indicators were applied to the current state and the state before the scheme's implementation. Thereby it was analysed in which way major changes are reflected in the results and to what extent coastal communities can improve their sustainability scores through appropriate measures. It was found that the scheme was reflected only limitedly in the indicator scores. The findings are critically discussed and suggestions for improvements given.

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BEACHES UNDER PRESSURE – AN INTEGRATING ANALYSIS ON NATURE CONSERVATION AND TOURISM AT THE BALTIC SEA BEACHES

Franziska K. Seer*, Ulrich Irmler, Joachim Schrautzer

Institute for Ecosystem Research, Applied Ecology, Christian-Albrechts-University of Kiel, Germany
fseer@ecology.uni-kiel.de*

Keywords: species protection, human trampling, tourism, stakeholder, Baltic Sea beach

The Baltic Sea beaches are highly attractive to tourists. In order to find new ways for sustainable nature conservation at intensively used beaches, our research group is developing a concept to reconcile habitat and species preservation with tourism. Thus, several studies on biodiversity and habitat requirements were conducted.

The vegetation assemblages at differently used beaches and the trampling tolerance of typical beach plants were analysed. Results revealed varying effects on plants for different socio-ecological groups. Furthermore, the home range, the movement behaviour and the population of coastal wolf spiders (Lycosidae) were investigated. Both ecological studies underline the high vulnerability of the upper shore area.

At three coastal municipalities stakeholders from tourism, politics, administration and nature conservation were interviewed to analyse their interest in conservational measures at the Baltic Sea beaches. More than 70% of the stakeholders agree to the need for more preservation, but more than 70% expect also disadvantages from beach protection areas.

In summary, nature conservation measures should aim at the sensitive upper shore area, which would be a compromise between ecological and touristic needs. Nevertheless, results also underline the need for an intercommunal concept, which should be developed with a high participation of stakeholders to minimize distrust and support acceptance.

DECADAL CHANGES IN THE BOUNDARIES OF CONCENTRATIONS OF MARINE BIRDS – CONSEQUENCES FOR MARINE PROTECTED AREAS

Henrik Skov

DHI, Denmark
hsk@dhigroup.com

Keywords: marine protected areas, temporal change, waterbirds, climate change, eutrophication

A total of 45 % of marine protected areas in the Baltic Sea have been designated on the basis of concentrations of waterbirds. Designations have occurred over a 23-year period stretching from the mid 1980'es to present. Widespread changes in the distribution ranges of waterbirds have been described over this period, as well as significant reductions in the total populations. Regional analyses of distribution patterns demonstrate to what extent the higher end of distributions of waterbirds has changed during this period. The analyses compared densities of Long-tailed Ducks Clangula hyemalis between the Baltic - wide surveys in 1992-1993 and 2007-2009. Despite big changes in absolute densities between the two periods the area of high habitat suitability marked by the 75 percentile has displayed a high degree of spatial stability between the two surveys. The results indicate that large-scale northward range extension and reduction in population sizes of wintering waterbirds in the Baltic Sea which are linked primarily to large scale processes like climate change and eutrophication have had limited effect on the location of main concentrations. The stability in the distributional patterns at the regional scale also indicates that the effects of human activities such as habitat displacement linked to marine wind farms, infrastructure and other physical disturbances have played a minor role as compared to effects from eutrophication and climate change.

HERRING – SUSTAINABLE MANAGEMENT OF A NATURAL RESOURCE IN THE SOUTHERN BALTIC SEA

Nardine Stybel[*1], Dariusz Fey[2], Henrik Nilsson[3], Harry Strehlow[4]

[1]EUCC – The Coastal Union Germany, Germany, [2]National Marine Fisheries Research Institute, Poland, [3]World Maritime University, Sweden, [4]Institute of Baltic Sea Fisheries, Germany
[*]stybel@eucc-d.de

Keywords: herring, spawning grounds, coastal management

Even though the ICES advice and stricter adherence of the approved total allowable catches have resulted in a more sustainable fisheries management, important herring stocks of the Baltic Sea have declined substantially. Next to fisheries management measures, coastal spawning and nursery grounds play a vital role in the recovery of the herring stocks. Until now, monitoring of the quality and importance of coastal spawning areas in the riparian member states has not been holistically taken into account. Moreover, fragmented and partly conflicting competencies often impede sustainable coastal management.

The project HERRING, funded by the South Baltic Cross-Border Co-Operation Programme, seeks to improve this situation. It addresses questions such as: What are the main stressors in coastal habitats? What are the strengths and weaknesses of present marine ecosystem management in order to develop management strategies for spawning and nursery areas? Which stakeholders should work together to develop sustainable solutions for protecting herring spawning and nursery areas?

The project focuses on three case study areas that are important spawning and nursery grounds in the southern Baltic Sea – the German Greifswalder Bodden, the Polish Vistula Lagoon and the Swedish Blekinge archipelago.

As project results, HERRING aims at competence building and awareness rising within coastal management structures and strives for the inclusion of the condition and the monitoring of coastal spawning grounds into overall Baltic Sea (herring) fisheries management (www.baltic-herring.eu).

ACCEPTANCE OF MUSSEL CULTIVATION IN THE SZCZECIN LAGOON, BALTIC SEA

Nardine Stybel[*1], Sven Dahlke[2], Gerald Schernewski[3]

[1]*EUCC – The Coastal Union Germany, Germany,* [2]*University of Greifswald, Germany,* [3]*Leibniz-Institute for Baltic Sea Research, Germany*
[*]***stybel@eucc-d.de***

Keywords: water transparency, zebra mussel, coastal management

The EU Water Framework Directive requires EU waters to achieve good status by 2015. Various internal nutrient-retention and nutrient-removal measures focusing on coastal waters have been discussed which may fulfil European water quality targets when combined with solutions in the river basins. In the Baltic Sea, mussel cultivation is a promising solution, especially in estuaries and lagoons, which play a key role as retention reservoirs for nutrients. Mussels act as filters and clean water, reduce turbidity, and sequester nutrients, removing them from the nutrient cycle when harvested. While small-scale blue mussel farms were implemented in the central Baltic Sea area, experience with mussel farming in inner coastal and transitional areas with low salinities remains rare.

In 2011 a small-scale pilot farm was installed in Lake Usedom, closely connected to the German part of the Szczecin Lagoon, to investigate the cultivation of zebra mussels (*Dreissena polymorpha*) for water quality improvement. Based on the first harvesting and modelling results, regional stakeholders have been involved in a first round of cross-border discussions. While tourists and tourism professionals support the idea of zebra mussel farms for an improved water transparency, fishermen are doubtful, fearing spatial conflict and negative effects on fish composition. This presentation will give an overview on the results of our interview campaigns.

IMPACTS OF CLIMATE CHANGE ON HABITAT-FORMING MACROALGAE OF THE BALTIC SEA

Antti Takolander[*1], Mar Cabeza[1], Elina Leskinen[2]

[1]*Department of Biosciences, Metapopulation Research Group, University of Helsinki, Finland,* [2]*Department of Environmental Sciences, University of Helsinki, Finland*
[*]***antti.takolander@helsinki.fi***

Keywords: macroalgae, climate change, biodiversity, Baltic Sea

Coastal macroalgae provide important habitat for biodiversity. In the Baltic Sea, the number of species declines with salinity gradient towards north. Climate change has been projected to cause elevated temperatures, declining salinity and increased amounts of dissolved inorganic carbon (DIC) coupled with lowered pH. We provide a synthesis of the effects of different drivers on macroalgal species of the Baltic Sea. Declining salinity will affect adversely species with marine origin, especially in the northern shores already characterized by low salinity, which contain majority of suitable substrate. Perennial, habitat-forming species, e.g. *Fucus vesiculosus*, are generally more sensitive to declining salinities than opportunistic, filamentous species, which will have implications for future community composition. Increasing temperatures can cause increased thermal stress, while declining ice cover means longer growing season, which may intensify eutrophication combined with increased riverine nutrient input. Facultative bicarbonate-using species may benefit from increased dissolved CO_2. We conclude that climate change may cause severe declines in habitat-forming species during the 21st century, especially in low salinity areas such as Gulf of Finland and Gulf of Bothnia. The combined effects of the drivers are, however, unknown. We identify major questions for research on impacts of climate change on the Baltic Sea coastal biodiversity.

MARINE IMPORTANT BIRD & BIODIVERSITY AREAS (MIBAS) IN EUROPE AND IMPLICATIONS FOR MANAGEMENT

Marguerite Tarzia*[1], Ivan Ramirez[1], Rory Crawford[2]

[1]BirdLife International, United Kingdom, [2]Royal Society for the Protection of Birds, United Kingdom
marguerite.tarzia@birdlife.org*

Keywords: seabirds, marine important bird areas, IBAs, Natura 2000, MPAs, by-catch, Baltic Sea, Lithuania

BirdLife International maintains a database of more than 12,000 Important Bird and Biodiversity areas (IBAs) globally. Within Europe, there are 3607 IBAs, of which 659 are considered marine within European Union member states.

In Europe, the IBA criteria take into account the requirements of regional conservation treaties, such as the EU Birds Directive, the Bern Convention, and the Helsinki Convention. IBAs are therefore priority sites for conservation that should be protected by governments under their legal obligations. Despite being determined using scientifically rigorous criteria, not all European mIBAs are currently protected. BirdLife's top priority is to achieve full protection of these sites and to use mIBAs as a shadow list for the designation of Special Protection Areas (SPAs) - forming a key component of the Natura 2000 Network.

The Baltic provides an excellent case study of the need for seabird site identification, protection and management. Several threatened seabird species including the Long-tailed duck (Vulnerable) and the Velvet Scoter (Endangered) face a diverse number of direct and indirect threats that need to be addressed, such as by-catch in fisheries.

We will focus on the progress achieved in Lithuania in comparison to the rest of the EU. We will also address the problem of seabird by-catch within and outside marine IBAs and how our local partner is working to minimize this threat, hopefully serving as a model for neighbouring countries.

EXTREME COASTAL EROSION CASES ALONG THE PORTUGUESE WEST COAST

Francisco Taveira Pinto

Faculty of Engineering, University of Porto, Portugal
fpinto@fe.up.pt

Keywords: Portugal, erosion, sediments, coastal structures

Coastal erosion is a common problem along sandy shores in Europe, a result of the dynamic nature of its coastal zones, of anthropogenic influences and of the effects of climate change.

A possible increase of extreme events, the weakening of river sediment supplies due to dams and embankments, and the expected acceleration of sea level rise tend to aggravate coastal erosion on decadal time scales.

To minimize negative effects it is necessary to understand the various processes causing erosion so as to assess possible prediction scenarios for coastal evolution on the medium to long terms.

This paper deals with the erosion situation to which the Portuguese west coast has been subjected, in relation to known sedimentary changes and to potential impacts of climate change on coastal areas.

The possibility of re-using sediments from Portuguese reservoirs to nourish eroded beaches is pointed out. Also, coastal response to climate change driven variations in the longshore sediment transport regime is considered. Several examples will be presented.

MSP INFORMATION FROM SPATIAL DATA – CROSS-BORDER CASE FROM GULF OF FINLAND

Harri Tolvanen*, Hanna Luhtala, Risto Kalliola

Department of Geography and Geology, University of Turku, Finland
harri.tolvanen@utu.fi

Keywords: spatial data, marine spatial planning, Gulf of Finland, Baltic Sea

One of the main challenges in the use of GIS in marine spatial planning (MSP) and integrated coastal zone management (ICZM) is to gather sufficient spatial information to make assessments and decisions about the use of the sea and coasts. We discuss what the expression "sufficient spatial data" actually means in this context, and how diverse source data are best applied in MSP. It should be acknowledged that the spatial data compilation is only the basis for marine spatial planning, which itself is a process where the environmental and socio-economical factors are considered geographically, and common agreements are made to use the marine space efficiently and sustainably. We discuss the spatial and temporal comprehensiveness of marine and coastal data, and the amount of useful and dependable information that can be derived from them for the spatial planning process. Special emphasis is put on understanding the four-dimensionality of the marine environment, sensing geographical scales and their effect upon information accuracy, and appreciating the importance of thorough metadata review when obtaining datasets. Experiences are drawn from an effort to collect geographical data into a knowledge base for a tri-lateral marine spatial plan in the Gulf of Finland, Baltic Sea. We identify gaps in knowledge (thematically and geographically), examine data availability, and assess the technical and semantic interoperability internationally (especially across the EU-Russia border).

CISOCUR – HYDRODYNAMIC CIRCULATION AND RESIDENCE TIMES IN THE CURONIAN LAGOON: COMBINING STABLE ISOTOPE MEASUREMENTS AND NUMERICAL MODELLING

Georg Umgiesser*[1,2], Artūras Razinkovas-Baziukas[2], Petras Zemlys[2], Ali Ertürk[3,2], Jovita Mėžinė[2]

[1]ISMAR-CNR, Italy, [2]Marine Science and Technology Centre of Klaipėda University, Lithuania, [3]Istanbul Technical University, Turkey
georg.umgiesser@ismar.cnr.it

Keywords: Curonian Lagoon, numerical modeling, stable carbon isotopes, circulation

The spatial pattern of the hydrodynamic circulation of the Curonian lagoon, the largest European coastal lagoon, is still little understood. In absence of automatic current registration data all the existing models relied mostly on such data as water levels leaving high level of uncertainty.

Here we present CISOCUR, a new project financed by European Social Fund under the Global Grant measure. The project applies a new methodology that uses the carbon stable isotope (SI) ratio of C_{12} and C_{13} that characterize different water sources entering the lagoon and may be altered by internal kinetic processes. Through the tracing of these isotope ratios different water masses can be identified. This gives the possibility to validate several hypotheses of water circulation and validate hydrodynamic models.

So the main research goal is to apply the stable isotope tracers and a finite element model to determine the circulation patterns in the Curonian lagoon.

Here we show how the SI analysis was used to validate the hydrodynamic model on the basis of residence time. The average residence time of the Nemunas waters is estimated through SI data and is then compared with the model data computed through standard algorithms. Seasonal changes of carbon content are taken care of through a preliminary application of a carbon kinetic model. The results are compared to literature data.

SPATIAL AND TEMPORAL VARIATIONS OF COLOURED DISSOLVED ORGANIC MATTER IN THE SHALLOW EUTROPHIC LAGOON

Diana Vaičiūtė*[1], Mariano Bresciani[2], Marco Bartoli[3], Claudia Giardino[2], Martynas Bučas[1]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Optical Remote Sensing Group, CNR-IREA, Italy, [3]Parma University, Italy
diana.vaiciute@jmtc.ku.lt

Keywords: organic matter, cyanobacteria bloom, remote sensing, MERIS, .river discharge

In this study spatial and temporal distribution of coloured dissolved organic matter (CDOM) was studied in the shallow eutrophic Curonian Lagoon in spring and summer from 2005 to 2011. CDOM is one of the main components that contributes to water colour and have different origins: terrestrial and autochthonous. Due to ongoing eutrophication increased CDOM concentration can affect primary production and ecosystem structure by reducing the amount and quality of photosynthetically active radiation to phytoplankton and macrovegetation.

MERIS/Envisat (satellite of European Space Agency) were used and CDOM was derived after application of Boreal Processor. Two-band semi-empirical algorithm that uses the reflectance peak in the red and near-infrared (NIR) spectral regions was applied in order to get chlorophyll *a* (chl *a*).

We obtained that 1) there was high seasonal pattern in CDOM concentration, its higher values appeared in spring as an outcome of high river loads after ice melting and rain; 2) during summer CDOM concentration differed spatially: higher CDOM values occurred close to the mouths of Rivers and in the south-western part of the lagoon, which is often affected by intensive primary producers bloom, and possibly high phytoplankton degradation could increase CDOM concentration there. Environmental conditions (wind speed and direction, river discharge, temperature, precipitation and chl *a*) were important for the explanation of spatial and temporal distribution patterns.

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STAKEHOLDER ENGAGAMENT AND PARTICIPATORY MAPPING FOR INTEGRATED COASTAL ZONE MANAGEMENT IN ROMANIA

Nataşa Văidianu*[1], Florin Tătui[2]

[1]University of Bucharest, Interdisciplinary Centre for Advanced Research on Territorial Dynamics, Romania, [2]University of Bucharest, Faculty of Geography, Romania
marianatasa.vaidianu@g.unibuc.ro

Keywords: public participation, perception, fuzzy cognitive mapping, legislation

Stakeholder engagement represents an important component in integrated coastal zone management implementation. A proper evaluation and understanding of stakeholders‘ interests lead to consensus and resource conflict decrease. We investigated stakeholders’ perceptions through fuzzy cognitive mapping approach. Interviews were made with authorities and economic sectors representatives: tourism, fisheries, industry, agriculture. Results indicate a large number of factors perceived as affecting the current issues of the Romanian Black Sea Coast. Expectations and management objectives were exposed. The results shall serve as strategic planning tool and improve the management of coastal zones. It is also highlighted that little attention is given to the connectivity of land-sea environments. There are still no clear regulations on community participation and on the rights of people to voice their concerns. This top-down approach to resource governance causes delays and conflicts, and means that the flexibility required to respond to problems at the local level is lacking. Overall, the potential of fuzzy cognitive mapping approach as a tool for support coastal zone management is essential in depicting stakeholders knowledge and makes the implementation process easier. This is the first study in Romania to investigate stakeholders’ participation in coastal zone management. This work was supported by European Social Funds through the POSDRU project under contract 159/1.5/S/133391.

WHAT DO BIRDS TELL US ABOUT 30 YEARS OF COASTAL DUNE MANAGEMENT?

Vincent van der Spek[*1], Antje Ehrenburg[2,3], Luc H.W.T. Geelen[1]

[1]Waternet, the Netherlands, [2]Antje Ehrenburg Ecologisch Onderzoek, the Netherlands, [3]Vogelwerkgroep Zuid-Kennemerland, the Netherlands
[*]vincent.van.der.spek@waternet.nl

Keywords: birds, breeding bird survey, coastal dune management

An analysis of the breeding bird population of the Amsterdam Water Supply Dunes (3400 ha) between 1985 and 2012 shows that, like elsewhere along the Dutch coast, species related to forests and shrubs increased and those associated with open habitats decreased. This reflects the changes in habitat over the past decades. The once dynamic and diverse mosaic landscape changed dramatically and turned into a static one. Rough vegetation with tall grasses increased, dune slacks and grasslands rich in wildflowers decreased. Habitat restoration was successful for characteristic flora and some fauna, but critical bird species did not return. Especially ground breeders decreased or disappeared altogether. In general, species of the red list decreased, while common species increased, though there are exceptions, like the nationally threatened but still common Nightingale (*Luscinia mecharhynchos*). Declining species include both long and short distance migrants and non-migratory species, so the causes are not (entirely) related to their fly-ways. The sad exception is the overhunted Turtle Dove (*Streptopelia turtur*). Other causes for decline include a decrease in available prey items, competition from and predation by newcomers (birds and mammals) and toxics (dioxins possibly effects reproduction of ground breeders). Some results are already used to increase bird numbers. Last spring Waternet worked on an analysis to improve the habitat for marsh birds in our water supply area.

RESPONSIBILITIES AND CHALLENGES OF STAKEHOLDER INVOLVEMENT IN COASTAL RISK MANAGEMENT

Manfred Vollmer

Wadden Sea Forum e.V., Germany
vollmer@waddensea-forum.org

Keywords: coastal risk management, multi-stakeholder partnership, responsibilities

Many coastal zones and the adjacent low-lying hinterlands are facing increasing impacts on natural and socio-economic resources due to economic developments as well as the effects of climate change. Recent economic developments in the Wadden Sea region such as port expansion, energy transition and tourism, as well as effects of climate change such as increasing temperatures, variations of precipitation, rising sea and fresh water levels, demand enhanced management in order to achieve and maintain a sustainable society with healthy ecosystems and economies.

In addition to sound ICZM policies, a comprehensive risk management is necessary to cope with the variety of emerging risks within the coming decades. Risks are understood differently by people, institutions and sectors. Therefore, dealing with risks demands a process of collective action, where actors are linked to one another and are coordinated in their actions. Managing increased risks requires the integration of stakeholders from different sectors in reframed coastal zone management strategies.

The roles and responsibilities of stakeholder involvement will be analysed due to coastal risk management structures and practices. With the example of the Wadden Sea Forum, a multi-stakeholder partnership in the field of regional development, the challenges of implementing an enhanced stakeholder-science-policy interface will be highlighted.

CONTRIBUTION OF ANTHROPOGENIC ACTIVITY AND CLIMATE CHANGE TO THE SALINITY VARIATION: INSIGHTS FROM THE CURONIAN LAGOON

Petras Zemlys[*1], Christian Ferrarin[2], Georg Umgiesser[1,2], Inga Dailidienė[1], Jovita Mėžinė[1]

[1]*Klaipėda University, Lithuania,* [2]*ISMAR-CNR, Italy*
[*]***petras.zemlys@jmtc.ku.lt***

Keywords: salinity change, anthropogenic impact, climate change impact, coastal lagoons, Curonian lagoon, numerical modelling

The purpose of this study was to evaluate the salinity variation, and to indicate natural and anthropogenic factors having influence on the salinity change in the Curonian Lagoon. During the last decades the annual average of the salinity in the northern part of the Lagoon increased. Many factors, like Klaipėda Strait deepening, westerly winds intensification, decrease of fresh water input and increase of the water level in the Baltic Sea may have had an impact on the salinity of the Curonian Lagoon. The investigation was carried out by analysing long-term salinity data and using a model system based on the finite element programme package SHYFEM. Analysis of salinity data and simulations results revealed that the decrease of rivers discharge into the Curonian Lagoon due to climate change was the main factor determining the salinity change of the Curonian Lagoon in the last three decades, while deepening of the Klaipėda Strait together with sea gates narrowing contrasted intrusion of salty water. However, deepening alone during the period 1925−1987 leads to a significant salinity increase.

POSTER PRESENTATIONS

ECOSYSTEM MONITORING OF THE RUSSIAN PART OF THE CURONIAN AND VISTULA LAGOONS

Sergey Aleksandrov[*1,2], Andrey Gusev[1], Anna Semenova[1]

[1]*Atlantic Research Institute of Marine Fisheries and Oceanography, Russia,* [2]*Immanuel Kant Baltic Federal University, Russia*
[*]***hydrobio@mail.ru***

Keywords: ecological monitoring, eutrophication, water quality, Curonian and Vistula Lagoons

As an example of ecosystem monitoring in Russia it is possible to review the regular complex ecosystem monitoring which is carried out by "AtlantNIRO" in the Curonian and Vistula Lagoons. Monitoring has been carried out monthly (March-November) since 1991 and includes a lot of physical, chemical (nutrients, oil, BOD_5, detergents, etc.), radioecological, biological (chlorophyll, primary production, phytoplankton, zooplankton, benthos) indicators. Monitoring allowed to estimate the current level and to identify long-term trends in reducing pollution and increasing eutrophication of the lagoons. Also, these studies have greatly advanced the knowledge of the structure and functioning of the lagoon ecosystems. E.g., the effects of climate change to increase of algae hyperblooms in the lagoons and shift of water quality after the invasion bivalve in the Vistula Lagoon. The climate warming was cause ongoing eutrophication of the lagoons despite of significant reduction of nutrients loading in 1990-2000s. Hyperblooming of Cyanobacteria affects seriously on the Curonian Lagoon leading to the deterioration of the water chemical parameters and pollution with Cyanobacteria toxins. This lagoon may be characterized as hypertrophic with "poor" water quality. In the Vistula Lagoon after the invasion of the filter-feeding bivalve *Rangia cuneata* water quality is significantly improved to "satisfactory" level, e.g., transparency increased by 2 times, but lagoon ecosystem remained at hypertrophic level.

LINKING SOCIO-ECONOMIC WASTE MANAGEMENT DRIVERS WITH MARINE LITTER IN THE LITHUANIAN COASTAL ZONE

Arūnas Balčiūnas

Marine Science and Technology Centre of Klaipėda University, Lithuania
arunas.balciunas@jmtc.ku.lt

Keywords: marine litter, waste management, waste composition

Improper waste management is a growing problem in modern society and an obvious example of this – litter in marine environment. A comparison of marine litter, at four Lithuanian beaches, within different categories of coastal zone urbanization and functional use, characteristics with local waste management system indexes was done. Statistical analysis of collected data was used to identify possible spatial and temporal tendencies. The study links marine litter, tourist flows, local waste generation and composition for evaluation of anthropogenic pressures on Lithuanian coastal zone. Research aiming at understanding the dependencies between marine litter and waste management system is of great importance for filling knowledge gaps in marine environment pollution and future discussions.

OCCURRENCE AND REMOVAL POSSIBILITIES OF DICLOFENAC, 17-β-ESTRADIOL AND 17-α-ETHINYLESTRADIOL IN WASTEWATER OF LITHUANIAN URBAN AREAS

Inga Baranauskaitė*, Jolanta Dvarionienė

Institute of Environmental Engineering, Lithuania
inga.baranauskaite@ktu.lt

Keywords: pharmaceuticals, diclofenac, estradiol, ethinylestradiol, environmental systems, wastewater treatment management

Surface water chemical pollution poses a threat to the aquatic environment. Effects of it can be acute and enduring toxicity in aquatic organisms, accumulation of pollutants in the ecosystems and decline of the biodiversity, as well as risk to human health. In 2013 by the Directive 2013/39/EU of the European Parliament and of the Council three pharmaceuticals were added to the monitoring list of priority hazardous substances in order to collect all the monitoring data.

Previous research papers revealed that pharmaceuticals consumption and its distribution after utilization might cause a risk to the environment. Moreover, no investigations have been carried out assessing diclofenac, 17-beta-estradiol and 17-alpha-ethinylestradiol in wastewater in Lithuania. This paper aims at filling this gap. For this purpose samples from Kaunas and Marijampolė wastewater treatment plants were taken. Concentrations of pharmaceutical substances showed high levels in wastewater that confirmed the need of analysis. By the done research the database of hazardous medical substances concentrations in wastewater treatment plants of Lithuanian urban areas was collected and when the assessment of different technical and managerially removal approaches was accomplished the model of diclofenac, 17-beta-estradiol and 17-alpha-ethinylestradiol management in wastewater based on the framework of environmental systems theory was represented.

EVALUATION OF POLLUTION EFFECTS AND COASTAL ZONE MANAGEMENT ALONG THE TURKISH BLACK SEA COAST

Levent Bat[1*], Murat Sezgin[1], Oylum Gökkurt Baki[2], Ümit Aydin[3]

[1]Sinop University, Fisheries Faculty, Department of Hydrobiology, Turkey, [2]Sinop University, Vocational School of Environmental Health Program, Turkey, [3]Sinop Special Provincial Administration, Turkey
leventbat@gmail.com

Keywords: Black Sea, land-based sources of pollution, coastal zone management, sustainable development

The coastal zone is an area where great numbers of human activities demand use of the coastal area and therefore it has an important role in protecting the sea. The coastal zone is particularly vulnerable to pollution and damage, both direct and indirect, from human activity and the destruction or pollution of habitats in the Black Sea and also it can destroy dependent species. In the Black Sea, some cities use the sewage system directly.

Environmental problems in the Black Sea are critical to address. The Black Sea has historically been one of the most biologically productive regions in the world. According to investigations, these important regions are suffering from a loss of biodiversity because of the effects of pollution in the Black Sea.

The Black Sea receives large quantities of unregulated and uncontrolled fresh water runoff from irrigation, hydro and thermal power generation and from the coastal area's permanent human settlements.

Sustainable development of the Black Sea requires continued international co-operation and coordination. Solutions to the Black Sea's environmental problems demand that uniform and strict rules be adopted by each country. Regulations should also cover those countries which influence the Black Sea's environment through the rivers and other land based pollution sources. The resolution of the problems in the coastal zones is through coordinating accurate integrated coastal zone management.

PROBABLE RESPONSE OF THE SAMBIAN PENINSULA SHORE TO CHANGES OF COAST-FORMING FACTORS DURING 2002-2012

Valentina Bobykina*, Konstantine Karmanov, Boris Chubarenko

Atlantic Branch of P.P. Shirshov Institute of Oceanology, Russian Federation
bobyval@mail.ru

Keywords: coastal dynamics, monitoring, climate change

Sambian Peninsula shore consists from the weakly cemented glacial deposits which are easy eroding. Therefore any changes of the coast-forming factors is reflecting in shore dynamics and rate of erosion.

Monitoring data obtained during 2002-2012 (10 years) show that erosion rate for the main part of the shore increased for last 5 years. For example, annual erosion rate for the western part of the northern shore of the Sambian Peninsula (Primorye Village) have increased up to 0.78 meters per year (2007-2012) in comparison to 0.4 meters per year (average for 2002-2007). The same situation is observed in Lesnoe Village, located to east of Primorye Viladge - the average annual rate of erosion is increased from 0.25 meters per year for 2002-2007 to 0.46 meters per year for 2007-2012.

For the most locations at the central part of northern shore of the Sambian Peninsula (Otradnoe, Svelogorsk, Pionerrsk) is not possible to track this tendency as coastal protection constrictions were built there. The one exception is the segment of the shore to the east from cape Gvardeyskiy. Here a similar (as for Primorye and Lesnoe villages) increase of erosion rate was observed for the last 5 years - the average annual rate increased from 0.1 to 0.15 meters per year. Maximum erosion rate was observed near Kulikovo Vilalge: the average rate was of 4.6 meters per year for period 2003-2009, but it became of 5.7 meters per year for 2011-2012. The increase of storminess activity is suggested to be a main reason of erosion intensification, especially the storm in January 2012, - an increase both of numbers of northern winds and their strength in the South-Eastern Baltic for last years.

LANDSCAPE MAPPING AS A TOOL FOR DETERMINING OF TERRESTRIAL VERTEBRATES COASTAL HABITATS

Julia Bublichenko[1*], Andrew Bublichenko[1], Gregory Isachenko[2]

[1]Zoological institute RAS, Russia, [2]StPetersburg State University, Russia
julandb@mail.ru

Keywords: coastal habitats, terrestrial vertebrates, landscape type

Berezoviye islands (The Gulf of Finland) includes more than 50 islands and islets. 28 types of natural landscape sites have been described. Each type is characterized by its peculiar relief, pedogenic bedrock composition and moistening regime. 78 species of terrestrial vertebrates inhabit the shore line. 5 main habitats were revealed: 1. Reed thicketes; 2. Bulrush thickets; 3. Coastal meadows; 4. Boulder ridges and stony placers; 5. Sandy, sand-and-stone beaches and dunes.

The correlation between habitats and landscape site types within the coastal zone has been established. The landscape site “low overgrowing coasts and shallow waters with periodic changes of water level and organic silt accumulation” corresponds to: 1, 2. “Actual terraces with forming soils on marine sand” and “actual marine terraces on sand-boulder deposits, and stone-bars, permanently subjected to the impact of sea waves” correspond to 3. “Abraded low boulder ridges with the dominance of boulders uncovered by vegetation” correspond to 4. “Sandy beaches”, “sandy-shingle beaches” and “actual dunes” are united as 5. Coastal meadows are the most inhabited (both by number of species and their abundance).

This study was conducted under financial support from SPbSC RAS and TOPCONS international project (№ 2011-022-SE511).

DISTRIBUTION OF CHAROPHYTA IN THE CURONIAN LAGOON AND IMPACT OF ENVIRONMENTAL FACTORS (PROJECT MAURAKUMA)

Martynas Bučas*[1], Marija Kataržytė[1], Zofija Sinkevičienė[2], Diana Vaičiūtė[1], Jolita Petkuvienė[1], Raimonda Kybrancienė[1], Greta Gyraitė[1], Šarūnas Navickas[1]

[1]*Marine Science and Technology Centre of Klaipėda University, Lithuania,* [2]*Nature Research Centre, Institute of Botany, Laboratory of Flora and Geobotany, Lithuania*
martynas.bucas@jmtc.ku.lt

Keywords: oospores, salinity gradient, euphotic zone, habitats of European importance

Most of charophyte species are good environment quality indicators maintaining water transparency and good ecological status of a water body. Due to lack of data and knowledge on charophytes species composition and their distribution and changes, controlling environmental factors it is impossible to determine status and improve highly eutrophic of Curonian lagoon. Therefore the aim of the project – to assess charophytes recent distribution and oospores bank in the sediments as possible tool for the restoration of underwater vegetation in the Curonian lagoon. In this project application of available water acoustic technique for charophyte distribution mapping will be tested and recommendations on the development of this method and its applicability for charophytes monitoring will be provided. The obtained data about bank of charophytes oospores will give understanding on charophytes distribution patterns and changes and potential of restoration under increasing salinity in the Curonian lagoon. Changes of water salinity and turbidity in the lagoon strongly depends on Klaipėda strait, where channel of harbour is constantly being modified, most likely impact charophytes habitats. This is going to be assessed in this project. For the first time biological factors affecting charophytes and impact of associated epibenthic organism will be analysed by classical and molecular methods in such type of lagoon.

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LAC MODEL IMPLEMENTATION IN THE EVALUATION OF BEACH CARRYING CAPACITY: A CASE OF BEACH KONYAALTI, ANTALYA

Uğur Burhan Yildirim, Gönül Tuğrul Icemer*

Akdeniz University, Environmental Engineering, Antalya Turkey
gicemer@akdeniz.edu.tr

Keywords: beach management, coastal tourism, beach carrying capacity, LAC model, Konyaaltı Beach, Antalya

In the last 40 years, the rapid growth of coastal tourism has created a remarkable pressure on beaches and also as responsible for many current coastal problems. Over the years many studies have been completed on he carrying capacity of specific recreational activities. For the purpose of this study the definition of Beach Carrying Capacity is the perceived number of people that can fit comfortably on a beach, including the swimming zone, before adversely affecting an individual person's beach recreation experience and/or the surrounding environment. For this purpose, physical and social carrying capacity evaluated and compared with LAC model. LAC (Limit of Acceptable Change) to implement the model, beach users were interviewed and the LAC model taking into account the users' satisfaction level standards have been established. Results showed that needs area a comfortable recreation experience for the user's is 10 m^2/user in urban beach.

SUITABLE AREAS FOR EFFECTIVE USE OF ARTIFICIAL OYSTER REEFS (CRASSOSTREA GIGAS) IN EROSION CONTROL IN THE EASTERN SCHELDT BASIN

João Salvador de Paiva*, Tjark van Heuvel, Mindert de Vries, Carla Pesch

Delta applied research centre, HZ university of applied sciences, the Netherlands
j.n.salvadordepaiva@hz.nl

Keywords: ecosystem engineer, coastal protection, erosion, sedimentation, Crassostrea gigas, GIS

The realization of the storm surge barrier and secondary dams not only changed the hydrodynamics, but also the geomorphological characteristics of the Eastern Scheldt basin (Netherlands) creating a disequilibrium between erosion and sedimentation. Over the past 25 years, this has led to a sand deficit resulting in the erosion of the intertidal flats. The habitat for intertidal soft-bottom benthic fauna is slowly disappearing, and with it food sources for estuarine birds. Also dikes will become more exposed to wave action, which increase the risk of dike failures during storms.

The Pacific Oyster (*Crassostrea gigas*) is an ecosystem engineer and forms large and dense reefs in sub- and intertidal areas in the Eastern Scheldt. These reefs can be used as breakwaters for sediment stabilization and wave attenuation, with the advantage of adaptability to changing climate conditions. The efficiency of their use, however, will depend on correct placement.

Based on field observations of natural oyster reefs and their sediment stabilizing effect, it has been found that an exposure time of 33% is the upper limit for oyster reefs use, a Building with Living Nature solution, in coastal protection. In our GIS analysis the most suitable locations were determined for artificial oyster reefs and evaluated with the existing oyster reefs. The results can help correct placing of new artificial oyster reefs for mitigation of the sand deficit and safety purposes in the Eastern Scheldt.

ASSESSMENT OF BIOGEOCHEMICAL CHANGES AT THE SEDIMENT-WATER INTERFACE DUE TO LARGE SCALE *MARENZELLERIA SPP.* INVASION IN THE EASTERN PART OF THE GULF OF FINLAND

Tatjana Eremina*[1], Ekaterina Voloshchuk*[1], Alexey Maximov*[2]

[1]Russian State Hydrometeorological University, Russia, [2]Zoological Institute of RAS, Russian Federation
tanya.er@gmail.com

Keywords: invasive species, biogeochemical processes, benthos layer, reactive-transport model

North American polychaete species of the genus *Marenzelleria spp*. is one of the most successful invaders in the Baltic sea. In the Eastern Part of the Gulf of Finland *Marenzelleria spp*. had become the dominant benthos species that led to significant changes in biogeochemical processes at the sediment-water interface as well as ecosystem reconstruction.

These polychaetes can significantly influence biogeochemistry of sediments, preventing hypoxic events. Due to bioirrigation activity deeper sediment layers are saturated with oxygen. Active oxygen and iron coupling promote bounding of phosphorus which prevents its biological consumption and contribution to eutrophication processes.

For quantitative assessment of worm's activity contribution to sediment changes, reactive-transport model is used. The model simulates the diagenesis of nutrients (NO_3^-, PO_4^{3-}, NH_4^+), oxidants (NO_3^-, SO_4^{2-}) and some other characters (total Mn and Fe). Those assessments of *Marenzelleria spp*. invasion impact will be taken into account in benthos layer submodel in high-resolution eco-hydrodinamic model of the Baltic Sea which is constructed for ecosystem changing investigation with consideration of joint effect of climate change and biological communitys in this region.

For model validation hydrochemical data from near bottom layer, pore water and sediments were collected in September 2013 in the Eastern Part of the Gulf of Finland. Preliminary results of these simulations will be discussed.

DEVELOPMENT OF A CARBON AND NUTRIENT CYCLE MODEL FOR AQUATIC ECOSYSTEMS

Ali Ertürk[*1,2], Georg Umgiesser[3,2], Petras Zemlys[2], Mindaugas Žilius[2]

[1]Istanbul Technical University, Turkey, [2]Klaipėda University, Lithuania, [3]ISMAR-CNR, Venice, Italy
erturkal@gmail.com

Keywords: aquatic ecology, carbon cycles, carbon isotopes

The aim or the problem orientation of most of aquatic models developed in the last three decades are water pollution control, water quality management or planning issues such as the total daily maximum load analysis.

Aquatic ecosystem models can also be used for identification of different components of an ecosystem including the significance of different processes in biogeochemical cycles, the material and energy tranSasfers in a food web or the two-directional coupling between the organisms and environmental conditions.

This study presents a box modelling framework, which has following features: Nitrogen, phosphorus and silicon cycles; different autotrophic plankton groups including cyanobacteria; zooplankton; a multi-layer sediment diagenesis model; different forms of dissolved and particulate organic carbon that can be tract among allochthonous and autochthonous organic carbon, inorganic carbon cycle together with alkalinity and pH simulation, carbon isotope simulation to compare the model results with stable isotope analysis for trophic level determination. The model has additional features including hydrodynamic linkage with the hydrodynamic model SHYFEM.

ESTAS-II-AQUABC model was applied to the Curonian Lagoon (Lithuania), where data from a period of several years extending from 2012 to 2014 (winter) were used for validation. Model results and their interpretation will be presented at the conference.

OIL SPILL, DAMPING AND DREDGING SENSITIVITY MAPPING IN THE RUSSIAN PART OF SOUTH-EASTERN BALTIC

Elena E. Ezhova[*1], Evgeniia K. Lange[1], Olga V. Kocheshkova[1], Marina V. Lyatun[1], Alexey V. Goustchin[1], Julia J. Polunina[1], Marika A. Gerb[1], Alexandra A. Volodina[1], Dmitriy V. Dorokhov[1], Mihail B. Shilin[2]

[1]Atlantic Branch of P.P.Shirshov Institute of Oceanology RAS, Russia, [2]Russian State Hydrometeorological University, Russia
igelinez@gmail.com

Keywords: sensitivity mapping, South Eastern Baltic

Economic Strategy of Kaliningrad region till 2020 includes an intensive development of port-harbour areas, off-shore oil and sand extraction and other industrial activity in the territorial sea and coastal lagoons, connected with dumping, dredging and potential risks of oil spills. Because on it, sensitivity mapping for Russian zone of the South Eastern Baltic (SEB), Curonian and Vistula Lagoons was done within the Federal program “World Ocean” 2011-2013. Method of Integral Ecological Vulnerability (IEV), accepted in Russia for oil spill sensitivity mapping was applied. It based on environmental sensitivity index (ESI) for shoreline and uses spatial distribution of quantitative/qualitative parameters of biotic components and their sensitivity coefficients to different impacts for open marine areas. IEV has been calculated in ArcGIS 9.2. Highest ranks of vulnerability were detected for Baltic herring breeding grounds, areas of eggs/larvae distribution of bank cod; macroalgae beds; seasonal bird aggregation areas. In Curonian Lagoon most vulnerable were eastern, southern and partially western coasts, where breeding areas of several commercial fish species and areas of rich aquatic vegetation and birds accumulations are disposed. In Vistula Lagoon highest vulnerability, defined by location of breeding grounds of several commercial fish species and birds accumulations, was estimated at the eastern coastal zone. For all areas IEV decreased in a line: spring-summer-autumn-winter.

MARINE LITTER: SOCIAL AWARENESS AND CO-RESPONSIBILITY

Maria Ferreira*, Joana Mira Veiga

Coastal & Marine Union (EUCC), Leiden, the Netherlands
m.ferreira@eucc.net

Keywords: MARLISCO, marine litter, waste management, awareness raising, stakeholder engagement

Marine litter is a complex and multi-dimensional problem, where responsibilities are often unclear and the burden of costs unequally divided within society and although it has major economic and environmental impacts there is no simple solution in sight. In the last few years, the topic has gained major attention and momentum at European level. MARLISCO - Marine Litter in Europe's Seas: Social Awareness and Co-responsibility (FP7 – Science in Society, 2012-2015), which involves a diverse consortium across 15 EU countries. It seeks to raise societal awareness, trigger co-responsibility across the different sectors and facilitate dialogue between the different actors on both the problems and the potential solutions regarding marine litter. The project developed and put in place a series of tools and mechanisms to support and address some of the barriers that seem to be hindering a more effective response from society. These include an assessment of the prevailing perceptions and attitudes of different stakeholders regarding marine litter with over 3,500 respondents; a data-base of 72 examples of practices and initiatives; national forums in 12 partner countries, involving representatives from key sectors and the wider public; a European video contest targeting school students, which engaged directly over 2,000 European youngsters; a series of awareness raising activities and innovative educational in several European languages, implemented and disseminated in 15 countries.

THE EFFECT OF TWO BIVALVE SPECIES IN BENTHIC FLUXES OF NITROGEN IN LAGOON SEDIMENTS: A MICROCOSM EXPERIMENT

Ilias Foskolos[1], Elizabeth Arevalo*[1], Juan S. P. Ibanhez[1,3], Sokratis Papaspyrou[2], Artemis Nicolaidou[1]

[1]National and Kapodistrian University of Athens, Department of Zoology - Marine Biology, Greece, [2]University of Cadiz, Department of Biology, Spain, [3]IRD, CEERMA, Federal University of Pernambuco, Brazil
eli.arevaloc@gmail.com

Benthic metabolism is directly related to benthic macrofauna since their sediment reworking and bioirrigation activities affect biological, physical and chemical fluxes across the sediment-water interface. The aim of this study was to assess the effect of two bivalves, the filter-feeder *Cerastoderma glaucum* (Bruguière, 1789) and the deposit-feeder *Abra segmentum* (Récluz, 1843), on the benthic metabolism of lagoonal sediments impacted by a waste water treatment plant. Long-term whole-core experiments were performed in a controlled temperature room, with sediment, water and bivalves collected in the vicinity of the water treatment plant of Aetoliko in Messolonghi lagoon (Greece). Twelve undisturbed sediment cores, were brought to the laboratory. In three of the cores, *C. glaucum* (3 cm average length) were added at a density of 500 ind m-2, in other three *A. segmentum* (1.5 cm average length) were added at a density of 1600 ind m-2 and in the last three both species were placed at a density of 660 ind m-2. Three cores were left as controls. Oxygen consumption and Dissolved Inorganic Nitrogen (NH_4^+, NO_3^-, NO_2^-) fluxes were measured once a week for three weeks under dark conditions, starting 7 days after adding the bivalves. During the course of the experiments, fluxes from the water to the sediment were found in all the cores. The fluxes were higher in the cores with animals, suggesting that the animal activities contributed to the consumption of oxygen and the removal of nutrients from the water column. *A. segmentum* had the strongest impact on benthic metabolism, more than two times the control, which may be caused by its deeper burrowing and its deposit feeding activity. The high negative fluxes in the presence of the bivalves, suggest that they may be key species regarding the functioning of lagoonal habitats. Furthermore, when present in high densities, they may play an important role in mitigating the impact of anthropogenic inputs of nutrients in these ecosystems.

COMPLEX FIELD WORK ON NATURE OBSERVATION OF THE COASTAL ZONE AND OCEANOGRAPHIC SURVEYS IN THE EASTERN GULF OF FINLAND

George Gogoberidze*, Julia Lednova, Valery Abramov, Lev Karlin

Arctic and Subarctic Institute, Russian State Hydrometeorological University, Russia
ggg_iczm@rshu.ru

Keywords: coastal zone, field work, environmental monitoring, hydrological and hydrochemical observations, Russian Eastern Gulf of Finland

Authors present the main results of complex field works that included two parts:

- field works in the coastal zone of the Russian Eastern Gulf of Finland;
- summer cruise oceanographic surveys in the Russian Eastern Gulf of Finland.

Coastal field studies in the coastal zone were performed on June, 2013, in the key research areas: Bolshaya Izhora of Leningrad Oblast and Zelenogorsk - Sestroretsk as a part of the Kurortny District, St. Petersburg. The observations included:

- express-analysis of the ecological quality of water;
- recreational activity impacts on the sanitary of the beach;
- description of the coastal area.

Summer cruise oceanographic survey was conducted in two stages on June-July, 2013, in the Russian Eastern Gulf of Finland by sailing-motor catamaran "Centaurus II". Full complex of hydrological and hydrochemical observations has included measurement of salinity and water temperature, flow parameters in the bottom layer at the 4 stations within the specified polygon, sample collection and their quantitative chemical analysis.

The complex of the field work is done in the framework of the SOUTH-EAST FINLAND – RUSSIA ENPI CBC PROGRAMME 2007–2013 Project "TOPCONS – Transboundary tool for spatial planning and conservation of the Gulf of Finland", Grant Contract 2011-022-SE511. The advanced analysing made with financial support of the Ministry of education and science of within the state order 2014/166 and state contract 14.515.11.0002.

INVASION OF *ROSA RUGOSA* AND *HIPPOPHAË RHAMNOIDES* IN PLANT COMMUNITIES OF THE RUSSIAN BALTIC SEA COASTS

Valentin Golub*, Viktoria Bondareva

Institute of Ecology of the Volga River Basin of Russian Academy of Sciences, Russia
vbgolub2000@mail.ru

Keywords: *Rosa rugosa*, *Hippophaë rhamnoides*, Russian Baltic Sea coasts, Ellenberg's values, anthropogenic factors

Nowadays, *Rosa rugosa* and *Hippophaë rhamnoides* are inculcated into plant communities on the Russian Baltic Sea coasts. These adventitious species form dense thickets.

R. rugosa dominates in derived plant communities over the coast of the Baltic in Leningrad region, actively replacing grasslands of alliance *Lathyro-Elymion arenarii*. The sea coast of Kaliningrad region in western part is overgrown by communities in which *H. rhamnoides* is dominates.

DIVERSITY OF HARD BOTTOM HABITATS ALONG THE COAST OF BALTIC PROPER OF LATVIA

Vadim Yermakov*, Sveta Romanovich

Latvian Institute of Aquatic Ecology, Latvia
**vadim.yermakov@lhei.lv*

Keywords: Baltic Proper, marine protected area, biodiversity, hard bottom habitats

The coastal ecosystems of the northeastern Baltic Sea are very dynamic and characterized by high variety of bottom types. Locations with the highest biodiversity and productivity of benthic vegetation and zoobenthos strongly depends on a distribution of hard bottoms. Three separate sites with hard bottom in the southern, central and north parts of the Baltic Sea coast of Latvia are investigated and compared in the present study with an aim to estimate the general distribution of habitats and habitat-forming species. Study area in the southern part from the Lithuania border to Jūrmalciems is a Natura 2000 area and also designated as Marine Protected Area (MPA) up to depth of 20m. Study site Šķēde – Pāvilosta in the central part of the coast is also assigned as Natura 2000 area and is allocated as MPA up to depth of 25 m. Area from Oviši shoal till the border of Estonia and several offshore shoals up to depth of 30m are investigated at northern part of the coast. Irbene strait and offshore shoals are under the protection of Natura 2000 and are proposed to be included in MPA list.

Results of our study indicate that the southern site is rich in diversity of hard bottom habitats and has a good coverage of habitat forming species (Mytilus and Furcellaria). In central site, unfortunately, the coverage of Furcellaria is worse as it was supposed. The northern site has the good coverage of Mytilus and dominance of annual species in vegetation. The reasons of observed differences between sites will be discussed.

SUSTAINABLE COASTAL DEVELOPMENT ASSESSMESNT AND GOVENANCE: FROM COASTAL SCIENCE TO MUNICIPAL MONITORING AND SUSTAINABAILITY INDICATORS

Jānis Kauliņš[1], Raimonds Ernšteins[1], Jānis Lapinskis[1], Anita Lontone[1], Ilga Zīlniece[*1], Martiņš Grels[2], Andris Ķepals[1]

[1]Universiy of Latvia, Faculty of Geography and Earth Sciences, Latvia, [2]Ministry of Environmental Protection and Regional Development, Latvia
** ilga.zilniece@email.com*

Keywords: coastal science and governance, local municipal monitoring, indicator systems

General problem for the development of coastal governance practice is to be seen at both ends of governance cycle – science and policy. This is particularly relevant at the local municipal level. The lack of locally based coastal research knowledge and its introduction into municipal safety and socio-economic development planning is clearly recognized in Latvia with well expressed land based and sectorial s governance practice. Overall objective is to create, apply/test and use applicable system for integrated coastal science transfer into integrated coastal management (ICM) policy, esp. at the local municipal level, but also other vertical governance levels within country. Principal integration approach is necessary at any step of the process to be realized - from coastal science to municipal monitoring and sustainability indicators into ICM. This is being tested (step-wise) via realization of various research and development projects. Those attempts are: to translate and integrate academic coastal science based results into to be designed an applied municipal land-water boundary monitoring and indicator system; to integrate this auditing knowledge into the whole municipal coastal governance cycle process/products with innovating and facilitating ICM decision-making and policy renewal, complementary instruments based planning and implementation; to design an integrated coastal science and governance communication content/products and to prepare stakeholders participated communication process with integrated instruments development.

MARINE LITTER - STATE OF THE ART IN GERMANY

Kristina Klesse[*1,2], Gerald Schernewski[1,3], Matthias Mossbauer[2], Anke Vorlauf[2], Sylvie Wesnigk[1]

[1]Leibniz-Institute for Baltic Sea Research (IOW), Germany, [2]EUCC – Die Küsten Union Deutschland e.V., Germany, [3]Marine Science and Technology Centre of Klaipėda University, Lithuania
*[*]**kristina.klesse@io-warnemuende.de***

Keywords: marine litter, Baltic Sea, monitoring, awareness raising, MARLISCO

Marine litter has severely increased on a global scale. It is recognised as an emerging threat to the marine environment as well as to human health, safety and livelihoods. The overall objective regarding marine litter pollution is a measurable and significant decrease in the total amount by 2020, which is set within the Marine Strategy Framework Directive. A 'good environmental status' has not yet been achieved for the Baltic Sea. In Germany, a national board of experts has been established to compile existing knowledge and to develop and refine monitoring methods and programmes on marine litter in order to evaluate the condition as well as to set up efficient action plans for the reduction of litter pollution in the sea. Additionally, a national project is funded to test these methods and to create a first complete dataset for further analysis. We will give an up-to-date insight into most recent research developments on marine litter in Germany and present first results of macro-litter beach surveys and micro-litter monitoring. The problem of accuracy, reliability as well spatial and temporal representativity of the methods will be discussed. Furthermore, the European MARLISCO project will briefly be presented. It is an example of public awareness, dialogues and co-responsibility among different actors towards a sustainable management of marine litter across all European seas.

COAST EXPOSITION AND BEACH HEIGHT AS A FACTOR OF DUNE LAND EROSION CAUSED BY STORM SURGES

Tomasz A. Łabuz

Institute of Marine and Coastal Sciences, University of Szczecin, Poland
labuztom@univ.szczecin.pl

Keywords: coast exposition, coast erosion, Polish coast

The coast erosion is one of the main problem of management on Polish coast. Recent years show that prediction of storm surges is not enough. This presentation explains relation of coast exposition on recent storm surges that affected Polish coast. During last 15 years Polish coast have been affected by storm surges from NE and NW directions. The analises of land, dune erosion during that storms show, that coast exposition with beach height is main factor of erosion rate. It was stated several times that those conditions may be key to understand coast erosion. The data collected since 1997 in project Anthropogenic-Natural Dune Dynamics (ANDDY) and in last ongoing Foredune Morphodynamics and Biodiversity (FoMoBi) present relation of coast exposition and its changes to direction of storm surges development. The important factor is storm surge length and water height. However the coast exposition and beach height are the main factors of erosion. The main conclusion is that without beaches higher than storm surges inflow, coast protection is useless. The only solution is beach nourishment, each year after heavy surge.

THE MANAGEMENT METHODS OF POLISH COASTAL DUNES SINCE 2004

Tomasz A. Łabuz

Institute of Marine and Coastal Sciences, University of Szczecin, Poland
labuztom@univ.szczecin.pl

Keywords: Polish coastal dunes, dune management

The Polish coast is 500 km long and mainly exposited on N direction. Almost 85% is built by sandy aeolian deposits and covered by different dune types. The management methods of dunes in Poland have changed during last ten years. The point of view concerned on heavy measured have been changed. It was caused by lack of money for heavy structures. Between 2006-2012 strong storm surges occurred. Those caused heavier erosion than in previously years. Due to that, and possibility of European funding new heavy coastal measures appeared. Almost 6% of dune coast have been "covered" by concrete and rock bands since 2009. Of course during that time many coastal areas have been nourished. Those efforts were without success due to storm erosion. During last 10 years the average erosion of coastal dunes exceeded 2 m. Only 15% of coastal dunes are in accumulative phase. The 35% is permanently eroded. The data collected by project FoMoBi stated that coastal protection used in Poland is dangerous for natural habitats and is a threat to foreseeable changes of coastal areas. The other, soft management methods of coastal dunes include dunes stabilisation by planting Ammophila arenaria and fashine fences. This can be considered as successful, if not reduce biodiversity dune habitats. No method take into account the protection of habitats, wildlife and landscape. They are aimed only at protecting land and human settlements, especially developing due to tourism increase.

MACRO-COLONIES FORMED BY EPIBIOTIC DIATOMS IN LITTORAL OF THE VISTULA LAGOON

Evgeniia K. Lange*, Elena E. Ezhova, Maria M. Smirnova

Atlantic Branch of P.P.Shirshov Institute of Oceanology RAS, Russia
****evlange@gmail.com***

Keywords: epibenthic diatoms, multi-species colonies, Vistula Lagoon

In 2012-2014 the phenomenon of epibenthic diatom macro-colonies mass development in the pebble littoral of the Vistula Lagoon was studied. Unusual content and structure of this colonial multi-species aggregation and a rather wide scale of spatial distribution were the reasons for special attention. Such a community was never described in the Vistula Lagoon. These macro-colonies were marked in the early-spring photodocuments of coastline monitoring in 2011 for the first time and recognized as macroalgae. Later annual observation of the phenomenon from start to disappearance (14.04.-06.06.2012, 02.04-24.05.2013 and 27.03-23.05.2014) let to define it as epibenthic diatom bloom with formation of macroscopic colonies (0.5-3.0 cm). The colonies have a specific shape, a mucous matrix and consist of several fresh-brackish water diatom species: *Gomphonema olivaceum* most abundant and forming of colony structure, and *Surirella ovata, Cymbella affinis, Cymbella* cf. *lanceolata* var. notata, *Fragilaria ulna, Fragilaria* cf. *pinnata, Fragilaria spp., Diatoma tenuis, Achnanthes spp.* Macro-colonies form 60-100% coverage of pebble stripe of 3-10 m in width and 15 km along the shore at 0-0.3 m depth and present in the littoral since early April to the end of May annually. The diatom multi-species colonies occur when the mean daily temperature is 6-15ºC, salinity 2.3-4.9 PSU, content of Si in water 4542-1054 µg/l. Si content 298-358 µg/l coincides with the end of diatom bloom.

MUNICIPAL COASTAL GOVERNANCE IN LATVIA: COLLABORATION GOVENANCE INTEGRATION INTO LOCAL MANAGEMENT AND COMMUNICATION

Anita Lontone*, Līga Zvirbule, Sintija Graudiņa, Raimonds Ernšteins

University of Latvia, Faculty of Geography and Earth Sciences, Latvia
anita.lontone@lu.lv

Keywords: collaboration governance, governance environment, societal representation, mutual integration, collaboration communication, local municipalities pledging and practice

Municipal coastal governance (MCG) developments in Latvia have been studied and recommendations prepared during various university-municipality collaboration R&D projects applied/tested. Those were based on collaboration governance principle and system integration into local top-down and bottom-up management and communication implementation cases. There are number of municipal environmental and coastal governance development approaches known and relatedly studied to be recognized and later pro-actively introduced into ongoing municipal development planning process. Those are: Collaboration governance concept at all governance levels (incl. household level) and cross-sector integration – as coherent frame for MCG; Governance environment – municipal institutional collaborative management itself and necessity to facilitate top-down governance component; Social/NGO mediated coastal governance – further development of societal collaborative representation and necessity to facilitate horizontal and bottom-up components, incl. collaborating with and complementing to also other main mediators (formal/nonformal educators, media, science/technologies) involvement/contribution; Household environmental/coastal governance – inhabitants environmental/coastal friendly behaviour actions facilitation and full scale bottom-up integration; Disciplinary and integrated MCG approaches developed and applied complementary. There are various success cases studied and general conclusions and recommendations designed in order to facilitate successful preparation and implementation of coastal collaboration and adaptive governance at local municipalities Those suppose to be mutually complementing and facilitating traditional top-down, bottom-up approaches according to local conditions and practice traditions.

COMPOSITION AND DISTRIBUTION OF SPECIES OF THE GENUS CHIRONOMUS (DIPTERA, CHIRONOMIDAE) IN THE VISTULA LAGOON OF THE BALTIC SEA

Marina Markiianova

Atlantic Branch of P.P. Shirshov Institute of Oceanology of Russian Academy of Sciences, Russia
markiyanovamarina@gmail.com

Keywords: occurrence, sibling species, Chironomus

Species of the genus *Chironomus* determined karyosystematic method. Karyotypes were analysed at polytene chromosomes from salivary glands by a standard ethyl-orcein method, with use of standard specific cytophotomaps. 328 karyotypes were studied. Studies conducted since 2004 by 2009.

In the Vistula Lagoon two chironomid sibling species of *plumosus* group were recorded: *Chironomus plumosus* and *Chironomus balatonicus*. *C. balatonicus* found in the eastern, central and southern parts. In the southern area both *C. plumosus* and *C. balatonicus* were recorded. Close to both species are marked of near the mouth river Cieplicovka, of near the mouth river Nogat *C. plumosus* only.

Frequency of occurrence of *C. plumosus* was 12.5%, *C. balatonicus* - 87.5%.

The Vistula Lagoon is a semi-enclosed water with the expressed smooth salinity gradient (from 0.1 to 4.5 PSU with higher values in the eastern part). Salinity is usually one of the main factor, defining species distribution at such ecosystems and the borders of species ecological distribution are close to physiological limits in regard of salinity. We assume, the revealed type of sibling species occurrence is defined by salinity gradient.

IMPACT OF THE INVADER *CERCOPAGIS PENGOI* (Ostroumov, 1891) ON ZOOPLANKTON IN THE VISTULA LAGOON OF THE BALTIC SEA

Elena Naumenko

FSUE "Atlantic Scientific Research Institute of Marine Fisheries and Oceanography", Kaliningrad, Russia
naumenko@atlant.baltnet.ru

Keywords: *Cercopagis pengoi*, impact on zooplankton, Vistula lagoon

About 15 years have passed since the invasion of *C. pengoi* into the Vistula Lagoon. This species was first recorded in the Gulf in August 1999, where it was brought with the piled-up currents of the Baltic Sea. The species successfully naturalized and became a permanent mark in the zooplankton samples from May to July-August.

Impact magnitude of *C. pengoi* on the zooplankton community in the Lagoon has increased steadily. Magnitude of the impact on zooplankton is closely connected with the press of the Baltic herring juvenile *Clupea harengus membras*, which spawns in the Vistula Lagoon.

The invasion of the large predatory crustacean led to the restructuring of the zooplankton community. In the spring period the following small species in the rotifers community got a competitive advantage: *Keratella cochlearis*, *Filinia longiseta*. New predator in the plankton promoted increase of zooplankton specific production rate, increase of the zooplankton community stability to external influences, the food chain elongation and increase of structuredness community.

STOCKS AND DISTRIBUTION OF PELAGIC FISH IN THE SHALLOW OFFSHORE AREAS OF THE LITHUANIAN EEZ OF THE BALTIC SEA

Nerijus Nika[*1], Faust Shvetsov[2], Jelena Fedotova[3], Justas Dainys[4], Linas Ložys [4]

[1]Marine Science and Technology Centre of Klaipėda University, Lithuania, [2]Institute of Food Safety, Animal Health and Environment BIOR, Latvia, [3]Fisheries Service Division of Fishery Research and Science, Lithuania, [4]Nature Research Center Institute of Ecology, Lithuania
[*]nerijus.nika@jmtc.ku.lt

Keywords: fisheries acoustics, fish stocks, spatial distribution, nursery habitat

In 2011-2013 under LIFE project "Inventory of marine species and habitats for development of Natura 2000 network in the offshore waters of Lithuania (DENOFLIT)" hydroacoustic pelagic fish surveys were performed in three shallow areas of Lithuanian EEZ of the Baltic Sea: Klaipėda-Ventspils and Sambian plateaus and Klaipėda bank. Night surveys followed standard ICES pelagic fish survey protocol, using hydroacoustic method (Simrad EK60 multi-frequency acoustic system) in combination with pelagic trawling while specifically targeting on protected species – twaite shad. No target species have been caught, despite trawling hauls were done adjacent to historical twaite shad catch sites. Meantime, catches absolutely dominated by other two clupeid species: Baltic herring and sprat, which together constituted on average up to 95 % of the catch. Within Lithuanian EEZ, its eastern part and two eastern project areas (Sambian and Klaipėda-Ventspils plateaus) are characterized as productive areas for economically important clupeid fishes, especially sprat. Sprat constituted on average 75% of mixed clupeid stock in survey areas and juvenile stages predominated in trawl samples from Sambian and Klaipėda-Ventspils plateaus, which should be treated as important nursery habitats for sprat (and potentially for herring) recruitment. Within survey areas pelagic fish distribution had specific patterns related to bottom slope; and vertical distribution followed seasonal thermal stratification.

HERRING. SWEDEN CASE STUDY AREA – HANÖ BIGHT AND BLEKINGE ARCHIPELAGO

Henrik Nilsson*, Lilitha Pongolini

World Maritime University, Sweden
hn@wmu.se

Keywords: herring, spawning ground, stressors, laws and regulation, stakeholders

Hanö Bight and Blekinge archipelago constitutes of a combined coastline that streches over 200 km, from the south east of the county of Skåne to the north east of the county of Blekinge. The seabed in the Swedish case study area is varied with substrate consisting of rocks and stones as well as sand, clay and organic silt. The vegetation on the hard substrate consists mainly of red and brown macroalgae while the vegetation dominating the soft seabed are various angiosperms like eelgrass. Due to the lack of knowledge concerning herring spawning grounds it is a challenge to assess the impact of various human induced stressors that may have a negative impact on the success of spawning. There are several laws and regulations on EU level and national level with the aim to conserve natural habitats for the sake of preserving biological diversity. The Marine Strategy Framework Directive and the Swedish Environmental Code respectively are stated as the most influential. In current practices regarding coastal zone management and particular spawning area management there are problems pointed out. Lack of agreement between involved stakeholders, lack of knowledge about spawning grounds and a slow decision making processes. Still no particular mandate is given to any of the stakeholders when it comes to spatial management of spawning grounds.

COMPARING ECOSYSTEM PROCESSES AMONG RIVERS, LAGOONS AND SEA: AN EXPERIMENT IN AQUATIC ECOSYSTEMS OF CORFÙ ISLAND (GREECE)

Maurizio Pinna*[1], Vojsava Gjoni[1], Gabriele Marini[1], Luca Mazzotta[1], Alberto Basset[1], Irene Vasiliou[2], Elena Papadopouluo[2], Elenh Galavou[2], Angelos Lomis[2], Evangelia Chatzicharistou[2], Elena Kavvadia[2], Marialena Metallinou[2], Effrosini Pagkrati[2], Stamatis Ghinis[2]

[1]Department of Biological and Environmental Sciences and Technologies, University of the Salento, Italy, [2]Region of Ionian Islands, Theotokou Ioanni, Corfù, Greece
maurizio.pinna@unisalento.it

Keywords: ecosystem process, detritus decomposition, rivers, lagoons, sea, *Phragmites australis*, Corfù island

In aquatic ecosystems, the decomposition of organic detritus represents one of the most important ecosystem functions, which support the detritus-based food webs. The rate of decomposition is usually calculated to recognized the process, being a synthetic measure that take in to account both abiotic and biotic factors. Decomposition rates have been also applied to evaluate the ecological status in terms of ecological functionality. Even if the researches on detritus decomposition have been carried out in all aquatic ecosystems including rivers, transitional waters and sea, no comparative study regarding the variation of decomposition rates among these ecosystems is available, to date. Here, we compare decomposition rates from rivers, lagoons and sea. Five sampling sites were fixed in each of the 3 of the most important rivers and in lagoons of Corfù island (Greece); other 5 sampling sites were fixed in the sea around the island. Twelve leaf packs containing 3 g of dried Phragmites australis leaves were submerged in April 2014 and retrieved after 30 days. Abiotic parameters were recorded in both sampling dates. Macroinvertebrates were removed from the retrieved leaf packs, counted, identified at lower taxonomic level and weighted. Leaf pack decomposition rates were calculated, and their variability was compared within each aquatic ecosystem, within each ecosystem typology (river, lagoon, sea) and among ecosystem typology. The results are going to be presented on the poster.

UNCERTAINTY OF MACROINVERTEBRATE BODY-SIZES DERIVED BY LENGTH PER WEIGHT RELATIONSHIPS, TAXONOMIC SUFFICIENCY AND INFLUENCE ON THE ISS ECOLOGICAL INDICATOR: A STUDY CASE IN LESINA LAGOON (MEDITERRANEAN ECOREGION, ITALY)

Maurizio Pinna*, Daniela Santagata, Ilaria Rosati, Alberto Basset

Department of Biological and Environmental Sciences and Technologies, University of the Salento, Italy
maurizio.pinna@unisalento.it

Keywords: rapid biomonitoring, benthic macroinvertebrate body-size, length per weight relationships, Index of Size Spectra, Mediterranean lagoons

Indicators based on body-size metrics have been recently developed and applied. Despite of the implication of body-size in ecological status assessment, the determination individual biomass of benthic macroinvertebrates (BM) is a complicate, time-consuming, time-lag, and expensive procedure. They are the greater limitation in the application of body-size based indicators, specifically for the new multi-metric Index of Size Spectra (ISS). The aim of the research was to test simplifying procedures for a more user-friendly application of body-size based indicators in transitional waters. The research was performed in the Lesina lagoon (Mediterranean ecoregion, Italy). We evaluated the uncertainty of estimating the individual biomass (IB) of BM applying the length per weight relationships (LWRs), obtained at species and order level. Than we compared the ISS using: 1. direct measures of IB of site/sampled BM; 2. indirect measures of IB obtained by LWRs at species and order taxonomic levels; 3. indirect measures of IB obtained by LWRs of a previous dataset realized in Lesina; 4. indirect measures of IB obtained by LWRs at species and order levels of a previous dataset realized in different sites. The accuracy of body-size spectra and ISS achieved with the different direct and indirect measures of individual biomass will be described and compared in the light of developing simple, rapid and accurate biomonitoring tools for the ecological assessment of transitional waters.

DISTRIBUTION AND ORIGIN OF ORGANIC MATTER IN THE BALTIC SEA AND THE CURONIAN LAGOON SEDIMENTS

Nijolė Remeikaitė-Nikienė*[1,2], Galina Lujanienė[2], Rūta Barisevičiūtė[2], Vitalijus Malejevas[1,2], Galina Garnaga-Budrė[1,3], Algirdas Stankevičius[1,2]

[1]Environmental Protection Agency, Department of Marine Research, Lithuania, [2]Center for Physical Sciences and Technology, Lithuania, [3]Klaipėda University, Lithuania
n.remeikaite@aaa.am.lt

Keywords: sedimentary organic matter, stable carbon isotopes, Baltic Sea, Curonian Lagoon

The most important sources of organic matter in the Baltic Sea are: primary production, river discharge and inflow from the North Sea. A large part of the of both autochthonous and allochthonous organic matter is incorporated in the bottom sediments. The understanding of the origin and fate of organic matter can provide an information about occurrence of the natural processes and anthropogenic pressures in both the water bodies themselves and drainage basin.

The aims of the present study were to characterize the carbon isotopic ($^{13}C/^{12}C$ or $\delta^{13}C$) composition of sedimentary organic matter and to assess relative contribution of autochthonous and allochthonous organic carbon sources in the Lithuanian part of the Baltic Sea and the Curonian Lagoon. Studies were conducted in spring, summer and autumn in 2012 and 2013 in frame of the National monitoring and the EU part-financed project „Chemical Munitions Search & Assessment - CHEMSEA". Sediment samples were collected using the Van Veen grab sampler; sediment from the top ~1-3 cm was sub-sampled for analysis.

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EUROPEAN DUNE NETWORK: SHARING ACROSS BORDERS

Paul Rooney

UK Sand Dune an Shingle Network, Liverpool Hope University, United Kingdom
rooneyp@hope.ac.uk

Formal support for the establishment of the 'European Dune Network' was given by the EUCC Council at its meeting of 13th April 2010. The 'European Dune Network' will bring structure to the loose association of national contact points, to further the aims of networking and cooperation. The network will focus on conservation of the EU habitats and species which underpin the Natura 2000 network specific to dunes, and will seek to support and develop funding bids to EU programmes through its national contact points to initiate sand dune based projects.

Aims. The agreed aims are:

- to promote the sustainable use and management of coastal dunes,
- to support policies and actions that conserve the intrinsic natural values of coastal dunes,
- to develop a vibrant European network of communities concerned with coastal dune use and management,
- to support the advancement of knowledge and understanding of coastal dunes, and
- to provide an international platform dedicated to coastal dunes.

Objectives. The agreed objectives are to:

- encourage and support the international exchange of knowledge and understanding between those concerned with coastal dunes,
- encourage and facilitate communication that develops international relationships, understanding and cooperation between those concerned with coastal dunes,
- secure resources that service and develop the aims of the European Dune Network,
- support initiatives which are aligned to the aims of the European Dune Network,
- support and promote the development and operation of national and regional dune networks.

The UK Sand Dune and Shingle Network, based in the Department of Geography & Environmental Science, Liverpool Hope University, UK, have offered to act as an initial contact point for the European Dune Network.

THE IMPACT OF RECENT LARGE-SCALE INVASIONS ON STRUCTURE OF THE BENTHIC COMMUNITY IN THE OPEN PART OF THE VISTULA LAGOON IN 1985-2013

Liliya V. Rudinskaya[1], Andrey A. Gusev[*1], Sergey V. Aleksandrov[1,2], Anna S. Semenova[1]

[1]Atlantic Scientific Research Institute of Marine Fisheries and Oceanography, Russian Federation, [2]Immanuel Kant Baltic Federal University, Russia
[*]***andgus@rambler.ru***

Keywords: invasive species, *Marenzelleria neglecta*, *Rangia cuneata*, Vistula Lagoon

North American polychaete *Marenzelleria neglecta* is the first major invader in the Vistula Lagoon in 1988. Until 1988 *Chironomus balatonicus* (56%) and oligochaetes (16%) dominated the benthic biomass. Invasion of *M. neglecta* caused change of the dominants. Proportion of biomass of *M. neglecta* during its maximum development reached 58%. Since 2003, dominant group was again Chironomidae. Proportion of biomass of *M. neglecta* stabilized at 5-11%. Registered restructuring in benthic community, which had a temporary character in 1989-2002, resulted to a narrowing food base of the fish benthophagans.

The second invasive species was North American bivalve *Rangia cuneata*. It was first discovered in September 2010. Clams spread throughout in the Vistula Lagoon, including the most freshwater areas. In autumn 2010 biomass averaged about 10 g/m^2, 2011-2012 increased to 850-900 g/m^2 and 2013 decreased to 350 g/m^2. At the first invasion stage of *R. cuneata*, biomass of the main benthic groups (chironomids, oligochaetes and polychaetes) increased, and biomass in small gastropods (Hydrobiidae) decreased. As an active suspension feeder, *R. cuneata* has a significant impact on the plankton community and play a significant role in water self-purification and clarification. Since 2010, there has been an increase in benthic biomass, which should have a positive impact on food base of the fish benthophagans and its accessibility.

NATURAL SALT MARSH VEGETATION IN MECKLENBURG-WESTERN POMERANIA, GERMANY

Björn-Christian Russow

Institute for Applied Ecology, Neu Broderstorf, Germany
russow@ifaoe.de

Keywords: coastal management, nature conservation, salt marsh vegetation

The salinity conditions in the transition between the mesohaline zone and the oligohaline zone of the southern parts of the Baltic Sea do allow the growth of salt meadows almost only by agricultural use (such as grazing) in Mecklenburg-Western Pomerania.

However, in small areas the development of stable salt marsh vegetation can be possible medium- to long term. This can be realized under special conditions, which allow a steady flow and at the same time an accumulation of salt in the sediment. These areas are "natural salt marsh vegetation areas".

Special conditions as described above do exist at recently built areas of sand hooks and berms as well as in areas of boulder- strewn beaches.

Therefore natural salt marsh vegetation areas in Mecklenburg-Western Pomerania can be found in areas of the "Wismarbucht", at extended wadden areas, temporarily dried out because of wind, e.g. Pramort, Bock and Hiddensee. Furthermore they can be found at boulder- strewn beaches of the peninsulas Wittow and Jasmund. The total of these areas are being estimated with 60 to 100 hectares.

In contrast to anthropo- zoogenic salt marsh areas the natural salt marsh areas do not have tide ways and also do not have any zonation of vegetation. Furthermore natural salt marsh vegetation develop on sand, pebbles and gravel and contain a higher rate of species intolerant to grazing.

The highly important development of the natural salt marsh vegetation areas conflicts with its treatment. The natural areas have been grazed – even under nature conservation issues. Furthermore the impact of tourists, walking across these natural areas, have lead to disturbance and damaging of this unique vegetation, so that the plant species there are classified as critically endangered at present.

The following report presents the results of a three year lasting recording of natural development of salt marsh vegetation in Mecklenburg-Western Pomerania. It also makes recommendations on a better protection of these areas with its unique vegetation.

BEACH PLANTS UNDER PRESSURE – AN INTEGRATING ANALYSIS ON EFFECTS OF TOURISM

Franziska K. Seer*, Ulrich Irmler, Joachim Schrautzer

Institute for Ecosystem Research, Applied Ecology, Christian-Albrechts-University of Kiel, Germany
****fseer@ecology.uni-kiel.de***

Keywords: beach ecosystems, species protection, plant growth, driftline plants, human trampling, tourists, Baltic Sea beach

The impacts of touristic use on beach plants were investigated at the Baltic Sea beaches in northern Germany. The findings are fundamental for the development of concepts which should agree habitat and species conservation with tourism.

First, vegetation relevés were conducted to analyse the touristic impact on plant diversity on 23 differently used Baltic Sea beaches. Results showed that upper beach areas can significantly promote the typical beach plants of the strandline communities (Cakiletea-maritimae, Honckenyo-Elymetea).

In a second step, the effects of trampling were determined to investigate the performance of *Atriplex prostrata, Crambe maritima* and *Honckenya peploides*. In total 108 individuals of each species were planted on three Baltic Sea beaches and treated with 0, 1 and 2 steps d^{-1} m^{-2}. Responses to trampling impact were measured for plant growth, plant fitness, reproduction and survival. Additionally, habitat dynamics such as sand burial and flooding events were documented. Generalized Linear Mixed Models were applied to analyse the effects of site and treatment. Results revealed that differences of the site conditions dominated plant growth and fitness. Nevertheless, trampling caused a significant reduction of canopy height, leave length, chlorophyll content of leaves and fitness of photosystemII of *C. maritima*.

Based upon these results, further ideas are discussed for a future spatial planning at Baltic Sea beaches in order to avoid touristic use of sensitive areas.

CHANGING IN PLANKTON COMMUNITY OF THE VISTULA LAGOON (BALTIC SEA) AFTER *RANGIA CUNEATA* (SOWERBY I, 1832) INVASION

Anna Semenova[*1], Olga Dmitrieva[1], Andrey Gusev[1], Sergey V. Aleksandrov[1,2]

[1]*Atlantic Research Institute of Fisheries and Oceanography, Russia,* [2]*Immanuel Kant Baltic Federal University, Russia*
[*]***a.s.semenowa@gmail.com***

Keywords: Vistula Lagoon, invasion, *Rangia cuneata*, plankton community

North American brackish-water bivalve *Rangia cuneata* was first recorded in the Vistula Lagoon in 2010. Now *R. cuneata* already colonized and populated the widespread areas. Top-down effect of the mollusk with the filtering type of food on the plankton community of the Lagoon is still unclear. The aim of this study was to investigate the changes in communities of phyto-and zooplankton occurred after invasion *Rangia cuneata*. Communities of phytoplankton and zooplankton were investigated during the vegetation season from April to November in 2008-2013 at 5-9 stations on Russian part of the Vistula Lagoon. In the phytoplankton community after invasion of *Rangia cuneata* there was a sharp decline in the proportion of green algae and diatoms and dramatically increased the proportion of blue-green algae. The impact of the invader on the zooplankton community was reflected in the change of its structure, so in the summer in zooplankton larvae *Rangia cuneata* appeared. In the summer period 2010-2013 increased share of rotifers and reduced the proportion of cladocerans and copepods. Thus the influence was reflected in the change in the ratio of taxonomic groups of phyto-and zooplankton and the appearance in the plankton community larvae *Rangia cuneata*, which can complicate the competitive relationship. According to the ratio of taxonomic groups of phyto- and zooplankton Vistula Lagoon in 2011-2013 can be attributed to a reservoir at a higher trophic status, compared with 2008-2010 years.

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POTENTIAL IMPACT OF MUSSEL FARMING ON THE ECOLOGY AND BIOLOGY OF MARINE-COASTAL AREAS

Antonietta Specchiulli, Sergio Pelosi, Maddalena Maselli, Tommaso Scirocco, Primiano Schiavone, Adele Fabbrocini, Raffaele D'Adamo[*]

National Research Council – Institute of Marine Science, Unit of Lesina, Italy
[*]***raffaele.dadamo@fg.ismar.cnr.it***

Keywords: phytoplankton, chlorophyll *a*, nutrients, physico-chemical factors, Mediterranean area

The seasonal variability of physico-chemical and biological parameters was observed from October 2012 to October 2013 inside and outside a farming area in the Southern Adriatic sea (Italy), to assess the impact of the mussel farming on ecology and biology of the area. Temperature showed a typical seasonal trend from 7°C to 27°C, while the salinity range was 34-39 psu. Oxygen saturation was close to 100% at the surface layers and decreased up to 60% near the bottom during the spring, suggesting its consumption by organic matter mineralization processes, which affected ammonia and phosphorous, with the highest concentrations measured outside area (4.73 μM and 2.12 μM, respectively). Increased values of oxidative nitrogen in winter (12.01 ± 3.67 μM) were highlighted. A typical seasonal trend was observed for silicates from 5.59 ± 2.36 μM in winter to 0.45 ± 0.28 μM in spring. Chlorophyll *a* values reflected mixing and upwelling processes, with a peak of 6.70 $\mu g.l^{-1}$ in March, characteristic of the maximum phytoplankton production (1.53 x 10^6 $cell.l^{-1}$). Diatoms represented the predominant taxonomic group (52%) in abundance and number of species for all the period, suggesting constant eutrophic conditions in both sites. The temporal trend of diatoms is roughly similar for both the sites, except for the spring-summer period, when a decrease of 50% of diatoms abundance was observed outside and a greater deviation of 80% was found inside the farming area.

AN EXPERIMENT OF MORAINE DEPOSITS DUMPING AT THE NEARSHORE SAND DUMPING SITE, LITHUANIA

Sergej Suzdalev*, Saulius Gulbinskas, Nerijus Blažauskas

Marine Science and Technology Centre of Klaipėda University, Lithuania
sergej.suzdalev@jmtc.ku.lt

Keywords: dumping, sediment dredging, marine environment

Removal and offshore disposal of dredged sediments may cause harm to the marine environment. Dumping of dredged soils have a significant physical impact at the point of disposal, including covering of the seabed and local increase of suspended solids levels.

Capital and maintenance dredging of the Klaipėda state seaport in Lithuania has always resulted in dumping of large amounts of sediments at the offshore dumping sites, operating in Lithuanian territorial waters. One of the site was approved in 1996 and so far was used only for the disposal of sandy sediments (fine sand and silty sand) at the depths of 28-34 m. Since the beginning of its operation 1,5 mln. m^3 of sand was dumped here. Due to existing limitations regarding sediment types and isolation of the area from the nearshore sand migration zone the proposal of dumping area extension and recommendation to dump moraine deposits, dredged from Klaipėda port during the capital dredging works, were elaborated.

In order to evaluate possible impact to the marine environment an experiment of moraine/sand mixture dumping was carried out in 2012, followed by the 3 stages of environmental monitoring. Current study presents some of the results from scientific investigations carried out before the dumping start (background conditions), during the dumping works and after half of the year since the end of the dumping works.

COMBINING MULTIPLE APROACHES TO ASSESS CLIMATE CHANGE IMPACTS ON MACROALGAL COMMUNITIES

Antti Takolander*[1], Mar Cabeza[1], Elina Leskinen[2]

[1]Department of Biosciences, Metapopulation Research Group, University of Helsinki, Finland, [2]Department of Environmental Sciences, University of Helsinki, Finland
antti.takolander@helsinki.fi

Keywords: macroalgae, climate change, species distribution models

Species distribution models (SDMs) are powerful tools often used in assessing climate change impacts on terrestrial biodiversity. However, in marine biology, they are rarely utilized. Marine species distributions are often controlled by abiotic gradients, e.g. temperature and salinity, and less influenced by physical obstacles to dispersal compared to terrestrial ecosystems. However, there is substantial uncertainty related to extrapolating SDMs outside the calibration data used to build the models. This uncertainty can be reduced by coupling the model outputs with data from laboratory experiments, where species-specific tolerances to changed conditions can be assessed. We present a framework using the two approaches to investigate climate change impacts on habitat-forming macroalgal species of northern Baltic Sea. Macroalgae are important species group accounting for major fraction of coastal photosynthesis and providing important structural habitat for invertebrates and fish. Combining experimental work with SDMs allows studying interactions of different drivers, e.g. altered salinity and temperature effects, and assess drivers which do not have a clear spatial distribution, such as increasing levels of atmospheric and dissolved CO_2 coupled with declining pH.

WORKSHOPS

PREPARING TO ADAPT WITH YOUNG PROFESSIONALS

Robbert Misdorp[1], Maria Ferreira[1], Joop Marquenie[2], Albert Salman[1], Tjark van Heuvel[3]

[1]Coastal & Marine Union (EUCC), the Netherlands, [2]Natuur Centrum Ameland, the Netherlands, [3]HZ University of Applied Sciences, the Netherlands
**climecoast@gmail.com*

Keywords: Greenland ice sheet instability, SLR, Ameland subsidence, ICM, young professionals' coastal community

Three global changes incite ICM: growing coastal population, economic development and impacts of climate change. Man-induced processes are reaching a critical level: e.g. the exponential increase of atmospheric CO2 concentration and the melting of Greenland Ice Sheet–GIS. Whether the GIS will melt abruptly is of utmost importance for densely populated coastal areas. Acceleration in Sea Level Rise-SLR has not yet been monitored. However gas production on the Wadden island of Ameland caused the eastern part to subside at rates between initially 1.8 m/century and now 1.2 m/c during the last 25 years. Timely execution of balanced adaptive measures, directed at sustainable development, reduces the numbers of flood victims and damages of resources. The combination of risk assessment, the results of the subsidence monitoring and the practical experience laid down in the 'Climate of Coastal Cooperation' book triggered the involvement of young professionals. Students are challenged to use their talents to conceptualise resilient, no-regret adaptive response options accommodating the global changes for 'their' coastal stretch. During the YPCC session, students of some Universities (of Applied Sciences) will present the results of their fieldwork and their cases and participants are kindly invited to join and to learn about the engagement of students through the Young Professionals' Coastal Community-YPCC programme is taking shape, as a follow up of the YPCC Littoral 2012.

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