

MaPSIS 2017

Maritime Spatial Planning, Ecosystem Approach & Supporting Information Systems

24-28 April 2017, Las Palmas de Gran Canaria, Spain

BOOK OF ABSTRACTS

Maritime spatial planning is now.

ORGANIZED BY ECOAQUA
&
UNIVERSITY OF LAS PALMAS DE GRAN CANARIA



Welcome from the MAPSIS Organizing Committee

Dear Participants,

On behalf of the whole EcoAqua team, I would like to extend you all a very warm welcome to Las Palmas de Gran Canaria, the city of the venue of the MaPSIS 2017, an International Conference dealing with “*Maritime Spatial Planning, Ecosystem approach and Supporting Information Systems*”. The biogeographical setting, the social and economic characteristics of the Outermost Regions of Europe are very much linked with various maritime economic sectors such as tourism, artisanal fisheries, maritime traffic, marine conservation and aquaculture. When it comes to Marine or Maritime spatial planning, a number of issues and questions arise, given that the potential stakeholders directly involved, or at least concerned, are numerous and often with apparently conflicting interests.

The Conference venue is extremely pleasant with much to offer in the neighbourhood in terms of cultural and leisure activities. The team has put up a rather complete programme with sessions dealing with all aspects of science and practice behind maritime activities, each session highlighted by a special lecture. As it stands, the number of participants is impressive, more than hundred attendants coming from different countries within and beyond the European continent. There are more than 50 oral communications and quite a good number of poster presentations, covering the different themes of the conference. Something original is the possibility for the participants to take part in one or more workshops on specific aspects of the overall maritime issues. Take advantage of the occasion and enrol yourself in the ones interesting to you!! We thank the keynote speakers for providing us with their insight and impart knowledge to all. There will be plenty of occasions to interact with renowned scientists and relevant actors involved in “blue growth”.

Thanks to all of the ECOAQUA University Research Institute who have contributed towards putting forth this event and charted out the nice scientific programme. Thanks to you all for joining us and sharing your experience and expertise with all interested parties in Maritime spatial planning from different angles. Due acknowledgment is also made to the University of Las Palmas de Gran Canaria (ULPGC) rectorate for their

continuous support to make this conference a successful event. And last, but not least, our acknowledgements go to the ERA-Chair Programme of the European Commission for underpinning excellence research on the marine realm in the Outermost Regions.

¡Bienvenidos a Gran Canaria!

Sachi Kaushik

Ricardo Haroun



The ECOAQUA team, from left to right: Andrej Abramic, Hyun Suk, Gercende Courtois, Francisco Otero, Pedro Borges

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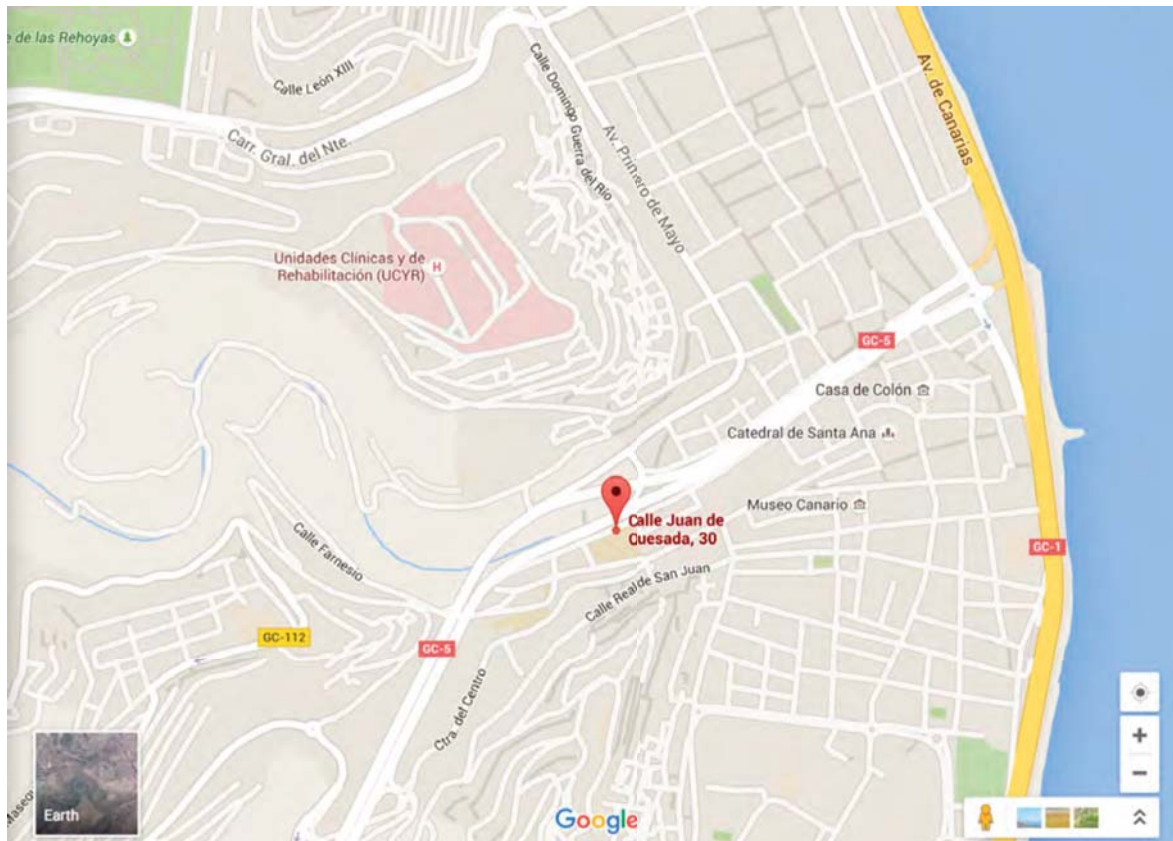
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LOCATION:

From the 24th to the 28th of April, MaPSIS 2017 will take place at the University rectorate in Las Palmas de Gran Canaria, located in the centre of the city and only 5 minutes walk from Las Palmas Central station and close to all of the selected conference hotels. The city of Las Palmas is easily accessible via the international airport of Las Palmas de Gran Canaria (20 minutes by bus or taxi).



Direction: ULPGC Rectorado - Calle Juan de Quesada, 30, 35001, Las Palmas

Programme MaPSIS 24-28th April 2017

Maritime Spatial Planning, Ecosystem Approach and Supporting Information Systems

Monday 24 April 2017

09:00 – 11:00	PLASMAR Project - partners meeting
11:00 – 11:30	Coffee Break
11:30 – 13:30	PLASMAR Project - partners meeting
13:30 – 15:00	Lunch
15:00 - 17:00	PLASMAR Project - partners meeting
18:00 - 19:30	Registration of participants
18:30 - 19:00	Project PLASMAR public presentation – MSP in Macaronesia
19:00 – 20:00	MaPSIS inauguration
20:00 – 21:00	Icebreaker

Tuesday 25 April 2017

09:00 –11:00	1st Session:Maritime Spatial Planning & Blue Growth Chairman: Prof. Dr. Ronan Long, World Maritime University, Sweden
09:00 –09:20	Plenary speaker– Dr. Helena Calado, University of the Azores, Portugal “Current and Future Challenges on MSP”
09:20 – 09:35	MASPAWIO: Combining marine spatial planning and model-based evaluation of reefs connectivity and habitat degradation scenarios: example from the Western Indian Ocean. Crochelet E. <i>et al.</i> Presented by Martinez C.
09:35 – 09:50	Maritime spatial planning: the need for a Land-Sea interface scope and an integrated approach Lobo A.
09:50 – 10:05	The situation PLAN: a decisive STEP ENGAGING stakeholders in Marine Spatial PlanNING from madeira autonomous region (Portugal) Andrade C. <i>et al.</i> ; Presented by Oliveira M.
10:05 – 10:20	Analysis between two policies of marine spatial planning and conservation in São Paulo State – Brazil Terra F. <i>et al.</i>
10:20 – 10:35	Marine infrastructure enclosures for enhancing marine conservation Shabtay A. <i>et al.</i>
10:35 – 10:50	International vulnerable areas and law: spatial approach Bonnin, M. <i>et al.</i>
10:50 – 11:00	Discussion
11:00 – 11:30	Coffee Break & Poster session
11:30-13:30	1st Session:Marine strategies & Environmental Planning Chairman: Dr. Helena Calado, University of the Azores, Portugal
11:30 – 11:50	Plenary speaker– Prof. Dr. Victor N. de Jong, Institute of Estuarine and

Coastal Studies, University of Hull, UK. “Assessing ‘ecological status’ by linking ecological network ‘structure’ and network ‘functioning’ in accordance with the spirit of the EU Directives”

11:50 – 12:05	Ecosystem-based management, marine restoration and a new biodiversity instrument for areas beyond national jurisdiction: Reflections from the European Union MERCES and ATLAS Projects Long, R., Grehan, A.
12:05 – 12:20	The challenge of dynamic ocean management in transboundary scenarios: The western Mediterranean sea as a case study Fabbri, F. <i>et al.</i>
12:20 – 12:35	Adapting to climate change on the European coast Chica, J.A. <i>et al.</i>
12:35 – 12:50	Criteria system for complex assessment of the Russian coastal geosystems Krylenko, V.V. <i>et al.</i>
12:50 – 13:05	Marine protected areas: monitoring plan of the national park of Cabrera and Atlantic Islands of Galicia national park (Spain) Amengual, P. <i>et al.</i> presented by Rey, C.
13:05 – 13:20	Potential contribution of the first sale system of fresh fish in the Canary Islands to the compliance of the marine strategy framework directive (MSFD): An example of Gran Canaria (Canary Islands, Spain). Pérez, Y. <i>et al.</i>
13:20 – 13:30	Discussion
13:30 – 15:00	Lunch

15:00 – 16:30	1st Session: Biodiversity Conservation within Blue Growth Chairman: Dr. Fernando Tuya Cortés, IU-ECOQUA, ULPGC, Spain
15:00 – 15:20	Plenary speaker– Prof. Dr. Ricardo Haroun, IU-ECOQUA, ULPGC, Spain. “Marine expedition BIO-Príncipe 2016: marine biological assessment and sub-tidal habitats characterization”
15:20 – 15:35	Bioengineering marine ecosystems with floating seaweed prairies Radulovich, R.
15:35 – 15:50	Spatial management of marine and coastal protected species. The case of <i>Cystoseira</i> spp. in Canary Islands (Spain) Martin, L. <i>et al.</i>
15:50 – 16:05	Seasonal and spatial factors as drivers of marine biodiversity on rhodolith seabeds Cosme, M. <i>et al.</i>
16:05 – 16:20	Launch of an action plan to ensure angelshark in the Canary islands are abundant and protected in their unique stronghold Jiménez, D. <i>et al.</i>
16:20 – 16:30	Discussion
16:30 – 16:45	Coffee Break & Poster session
16:45 – 18:30	Workshop - Blue growth VS Good Environmental Status - PLASMAR open workshop by Yaiza Fernández-Palacios IU-ECOQUA, ULPGC, Spain

Wednesday 26 April 2017

**09:00 – 11:00 1st Session: Marine/Maritime Information Systems & Data Management
Chairman: Dr. Andrej Abramic, IU-ECOQUA, ULPGC, Spain**

09:00 – 09:20 Plenary speaker– Dr. Hugo De Grof, European Commission, Directorate-General Environment, Unit E.4. “INSPIRE for responding to Marine Pollution”

09:20 – 09:35 The role of Emodnet (European marine observation and data network) to support MSP: Emodnet thematic portals and Emodnet sea-basin checkpoints
Martín, B. *et al.*

09:35 – 09:50 Emodnet chemistry results in support to EU marine policies: use cases
Giorgetti, A. *et al.* presented by Partescano, E.

09:50 – 10:05 The AIS, a relevant data for Maritime Spatial Planning?
Le Tixerant, M. *et al.*

10:05 – 10:20 Sis- increasing amount of data for marine spatial data infrastructure with marine observation sensors
Tavra, M. *et al.*

10:20 – 10:35 Dewetra Data Server, an open-source engine to interoperate with Geo-Spatial Dynamic Data
Campanella, P. *et al.*

10:35 – 10:50 Application of the Operational Oceanography System Ocean UCA-Maps to coastal planning, management, and monitoring: the case of bacterial contamination in the Bay of Cadiz
Gonzalez, C. *et al.*

10:50 – 11:00 Discussion

11:00 – 11:30 Coffee Break & Poster session

**11:30-13:30 2nd Session: Maritime Spatial Planning & Blue Growth
Chairman: Dr. Victor N. de Jong, Institute of Estuarine and Coastal Studies, University of Hull, UK and Editor-in-Chief of the Elsevier journal “Ocean & Coastal Management”**

**11:30 – 11:50 Plenary speaker– Dr. Angel Borja, AZTI Tecnalia, Spain.
“Is it possible to conciliate the objectives of the Marine Strategy Framework Directive and the Marine Spatial Planning Directive?”**

11:50 – 12:05 The European Maritime Spatial Planning: between maritime activities, conservation and coastal uses
Maccarrone, V., Sprovieri, M.

12:05 – 12:20 Land and sea use interaction in Heraklion coast
Rempis, N. *et al.*

12:20 – 12:35 Zoning and management system in the south Sumatera province: implications of Indonesia's legal regime on Marine Spatial Planning
Fery, K. *et al.* presented by A. Afandy

12:35 – 12:50 Can Romania achieve its 2021 MSP target? a scenario based on modeling and input from stakeholders
Văidianu, N., Ristea M.

12:50 – 13:05	Marine spatial planning for enhanced fisheries and aquaculture sustainability Aguilar-Manjarrez, J.
13:05 – 13:20	Sustainability in coastal areas: proposal of an integrated system of indicators for its analysis and communication Fernández-Palacios, Y. <i>et al.</i>
13:20 – 13:35	Marine spatial conflict resolution based on cooperative game theoretic decision rules. The what, the why and the how. Kyriazi, Z. <i>et al.</i>
13:35- 13:45	Discussion
13:45 – 15:00	Lunch
15:00 – 16:30	1st session: Maritime sector’s needs, opportunities & challenges Chairman: Dr. Conor Norton, Dublin Institute of Technology, Ireland
15:00 – 15:20	Plenary speaker– Dr. Sadasivam Kaushik, IU-ECOQUA, ULPGC, Spain
	“Food from the oceans: A critical appraisal of opportunities & challenges.”
15:20 – 15:35	Implementing marine aquaculture zoning within marine spatial planning: A case study for madeira archipelago (Portugal) Andrade, C., Nogueira, N.
15:35 – 15:50	Strategic environmental study for offshore wind farms installation in Spain Ayuso, J.R. <i>et al.</i> presented by Palacios, M.V.
15:50 – 16:05	Site selection methodology for renewable energies and aquaculture facilities in the Canary Archipelago Weiss, C.V.C. <i>et al.</i>
16:05 – 16:20	Temporary and Spatial predictions to simulate the impacts of alternative fishery policies on the Gran Canaria marine ecosystem Couce-Montero, L. <i>et al.</i>
16:20 - 16:35	Integrated zoning for aquaculture and biodiversity-using a spatial decision- support tool Venier, C. <i>et al.</i> presented by Zanella, A.
16:35 – 16:45	Discussion
16:45 – 17:00	Coffee Break & Poster session
17:00 – 18:45	Workshop – Co-allocation of Maritime Uses - Eastern Atlantic Sea Basin (MUSES project) by Dr. Helena Calado, University of the Azores
21:00 – 23:30	Social Dinner (optional)

Thursday 27 April 2017

09:00 – 11:00 **2nd Session: Environmental Planning, Biodiversity Conservation within Blue Growth**
Chairman: Dr. Angel Borja, AZTI Tecnalia, Spain

09:00 – 09:20 **Plenary speaker - Dr. Irene del Barrio, European Environment Agency, Denmark. “Spatial components of the marine environmental planning within the European legislation”**

09:20 – 09:35 Aquaculture and Marine Protected Areas: Exploring Potential Opportunities and Synergies
Simard F. *et al.*

09:35 – 09:50 Ocean metabolism, heterotrophic energy production, vertical particle flux, nutrient retention efficiency, and benthic respiration
Packard, T.T. *et al.*

09:50 – 10:05 Seawetra, a MSP tool to support the conservation of the marine mammals in the Pelagos Sanctuary
Moulins, A. *et al.*

10:05 – 10:20 Microplastics: a global problem that needs global cooperation
Herrera, A. *et al.*

10:20 – 10:35 Jellyfish blooms around the world: The roles of climate and humans
Purcell, J.E.

10:35 – 10:50 The eNGO experience of marine spatial planning: WWF’s reflections in Europe to date
Taylor, A.R. *et al.*

10:50 – 11:00 Discussion

11:00 – 11:30 **Coffee Break & Poster session**

11:30 – 13:45 **2nd Session: Marine/Maritime Information Systems & Data Management; Chairman: Dr. Hugo De Grof, European Commission, Directorate-General Environment, Unit E.4 – Compliance and Better Regulation**

11:30 – 11:50 **Plenary speaker- Ms.c Manuel Frias HELCOM Secretariat, Finland. “HELCOM work on a Marine Spatial Data Infrastructure for the Baltic Sea”**

11:50 – 12:05 The European Atlas of the Seas
Barale, V.

12:05 – 12:20 The Italian impulsive noise registry
Fossati, C. *et al.*

12:20 – 12:35 Land tenure registration on the marine areas in Croatia
Flego, V., Roić, M.

12:35 – 12:50 GeoCMS HotSpot: Data evaluation and preparation
Aden, C., Kirchner, A.C.

12:50 – 13:05 SIMBIO: Computer system for strengthening decision-making in biodiversity and marine coastal protected areas in Guatemala
García, S. *et al.* presented by Bergasa, O.

13:05 – 13:20	Decision support concept to design of Maritime Spatial Plans related to development of anchoring capacities – Case study Croatia Jajac, A. <i>et al.</i> presented by Jelena Kilić
13:20 – 13:30	Discussion
13:30 – 15:00	Lunch

15:00 – 16:30 **3rd Session: Maritime Spatial Planning & Blue Growth**
Chairman: Dr. José Aguillar Manjarrez, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.

15:00 – 15:20	Plenary speaker- MSc. Lodewijk Abspoe, Directorate-General for Spatial Development and Water Affairs, The Netherlands. “MSP as pathway to blue growth in the Netherlands”
15:20 – 15:35	Marine Spatial Planning in regional, insular territories. The role of regions as crucial stakeholders and policy making authorities Hatziyanni, E., Arvanitidis, C.
15:35 – 15:50	Symphony-a Swedish tool for cumulative impact assessment in Marine Spatial Planning Hammar, L. <i>et al.</i> presented by Mattson, D.
15:50 – 16:05	SIMCELT: Supporting Implementation of Maritime Spatial Planning in the Celtic Seas O’Higgins, L. <i>et al.</i> presented by Onwona, J.
16:05 – 16:20	Integration of shipping component into Marine Spatial Planning process in Estonia K. Kasepõld <i>et al.</i>
16:20 – 16:30	Discussion
16:30 – 16:45	Coffee Break & Poster session
16:45 – 18:30	Paralell Workshop – Reference list on marine habitats in Spain: Classification and relation to the other lists by Concepcion Rey & Victoria Palacios - TRAGSATEC
16:45 - 18:30	Paralell Workshop: Maritime Spatial Planning Challenge - MSP ROLE GAME by Lodewijk Abspoel, Directorate-General for Spatial Development and Water Affairs, The Netherlands
18:30 - 19:00	Poster Award & Conference closure
21:00 – 23:30	Night out in Vegeta

Friday 28 April 2017

09:00 – 11:00	Workshop: Maritime Spatial Planning Challenge - MSP ROLE GAME by Lodewijk Abspoel, Directorate-General for Spatial Development and Water Affairs, The Netherlands
11:00 – 11:30	Coffee Break
11:30 – 13:00	Thematic event: The Atlantic Action Plan: Funding opportunities for MSP in the Atlantic Area - by Federico Cardona Pons, Support Team for the EU Atlantic Action Plan

LIST OF ABSTRACTS

Tuesday 24 April 2017

Session 1 - Maritime Spatial Planning & Blue Growth

Chairman

Prof. Dr. Ronan Long, World Maritime University, Sweden

Plenary speaker – Dr. Helena Calado, University of the Azores, Portugal

MASPAWIO: COMBINING MARINE SPATIAL PLANNING AND MODEL-BASED EVALUATION OF REEFS CONNECTIVITY AND HABITAT DEGRADATION SCENARIOS: EXAMPLE FROM THE WESTERN INDIAN OCEAN

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In June 2017, the United Nation will hold a dedicated conference on the Sustainable Development Goal 14 (Life below water) acknowledging the key importance of the Ocean for supporting humankind development. The preparatory work and discussions of this conference highlight already how integrated and indivisible are all the Sustainable Development Goals but as well the reality of threats and pressures on marine and costal ecosystems. Allowing to have a wider picture of all the interest at stake and thus to support a critical integrated approach of activities at sea, marine spatial planning however is still not largely implemented in all seas. In the Indian Ocean one project funded by the French Aid Agency (AFD), MASPAWIO, is aiming at supporting and fostering the implementation of marine spatial planning in one hotspot of the world. The Western Indian Ocean region is indeed acknowledged for its high biodiversity, both in terms of species and ecosystems and represents at the same time a notable shipping area, an important international fisheries resource area, an increasingly popular tourism destination and at last but not the least a future major producer of natural gas. In this region a large fraction of the population is dependent on coastal and marine resources and ecosystem services. The Regional State of the Coast Report (2015) indicates that over the past 50 years a rapid population growth and global economic expansion have exponentially increased the pressure on coastal resources, and overfishing and coastal developments have put pressure on the abundance of stocks and the biological diversity. In order to support both the national efforts but as well the Nairobi Regional Seas Convention, the MASPAWIO project has first set up an atlas and listed accessible data set and is entering now in a second phase in order to showcase how marine spatial planning can be a dynamic tool and help to develop scenario and critical insights for marine spatial planning.

As the effectiveness of marine conservation efforts and marine resources management has to take into account the connectivity of ecosystems linked over large areas by ecological processes, such as larval dispersal, this connectivity and the evolution of pressures on marine ecosystems trough time are key information to take into account into marine spatial planning. The MASPAWIO project will thus apply a biophysical model driven by ocean currents to evaluate connectivity between Western Indian Ocean reefs and will further work on the high interconnectivity within several regions and lower connectivity across the Western Indian Ocean region and compare the results with the current MPA network. Sites/reefs that should be considered as priority sites for MPA implementation and environmental scenarios to study habitat degradation consequences on coral reef ecosystems connectivity patterns will be produced and the results will be discussed in terms of implications for transboundary marine policies and regional cooperation in the Western Indian Ocean.

Keywords: MSP, Connectivity, Scenarios, Indian Ocean, Regional MPA Network

MARITIME SPATIAL PLANNING: THE NEED FOR A LAND-SEA INTERFACE SCOPE AND AN INTEGRATED APPROACH

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Maritime Spatial Planning (MSP) is a place-based or area-based regulatory instrument that has emerged after decades of debate, theory and practice on the integration of marine governance particularly around the context of integrated coastal zone management (ICZM). ICZM has traditionally been focused on achieving integration across management of different levels of Administrations and coastal stakeholders, while MSP focuses on efficient allocation of marine space for different marine sectors and activities, including nature conservation. The coastal zone is an interface of maritime and terrestrial spaces which are absolutely interdependent. As a result, linking ICZM and MSP is not only logic but necessary, as MSP does have a potential influence on shore vicinity, which is one of ICZM's major concerns and ICZM could benefit from the MSP seaward perspective on integrated coastal and marine management. MSP's power for the allocation of industrial activities in the sea might have a major influence inland, for instance on rural or structurally weak areas of coast. MSP can also be the reason behind future urban regeneration in former port areas, marine related industries and shipyards. Therefore one can say that MSP may help the implementation of ICZM by representing diverse uses and occupations in the ocean spatially and temporally for a given planning area and ICZM may play a crucial role in completing the Plan's area by including the shoreline waters and studying the influence on coastal vicinity. The reality is that, at least in most countries in Europe, ICZM has failed to integrate the management of the sea and land parts of the coastal zone due to a wrong competence distribution among the local and state administrations. On the other hand although the MSP Directive proposal was set up as applying to coastal zones as well as marine waters, the final document only contemplates the latter ones, so the desirable link and coordination between ICZM and MSP is not going to be possible on a short term basis.

MSP also needs to enjoy an integrated approach. The use of marine space has been planned on a single-sector basis, especially among the traditional uses of the sea, such as fisheries and navigation, and marine environmental protection. Within sector-based approaches, activities generally remain managed by their existing mechanisms and overlapping of uses and conflicts between them may occur. Besides, the integrated approach creates a more economically efficient environment for the different sectors and also a more equitable one. This integrated approach also affects the different levels of government and should translate into coordination and cooperation between the various levels of decision-making (international, national, regional and local).

Keywords: Integrated coastal zone management, marine spatial planning, integrated approach

THE SITUATION PLAN: A DECISIVE STEP ENGAGING STAKEHOLDERS IN MARINE SPATIAL PLANNING FROM MADEIRA AUTONOMOUS REGION (PORTUGAL)

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In the footsteps of EU major guidelines of the Road map on development of maritime spatial planning by Member States (COM(2008) 791, 25.11.2008), Portugal implemented legislation regarding maritime spatial planning and management (Decree Law nº 17/2014, from the 10th of April). Following an ecosystem approach and principles of adaptive and integrated management this regulation aims *“to promote the exploitation of sustainable economic, rational and efficient marine ecosystems and ecosystem services, ensuring compatibility and sustainability of the various uses and the activities developed therein, taking into account the inter and intra-generational use of space at national level and aiming at job creation”*.

The planning of the maritime space is carried out through two major tools:

1. Situation Plans, SP (or plans of reference) defining spatial and temporal characteristics of current and potential uses and activities of maritime area and/or volumes;
2. Plans of affectation of areas or volumes to different uses and activities, compatible to the Situation Plan.

This presentation illustrates the establishment of the SP for Madeira Autonomous Region, in a top-down approach, to better understand the role of the different stakeholders addressing a challenge at local/regional scale, an insular environment that can be applied to similar contexts. Stakeholders involved from the start in the process of establishment of the SP are more likely to keep involved in further developments and management of Marine Spatial Plans.

Key words: Marine Spatial Planning, Situation Plan, ecosystem approach, adaptive and integrated management, maritime stakeholders

ANALYSIS BETWEEN TWO POLICIES OF MARINE SPATIAL PLANNING AND CONSERVATION IN SÃO PAULO STATE - BRAZIL

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Worldwide, there is an increasing recognition of the importance of conservation and planning policies for coastal and marine ecosystems. Participatory or co-management processes have been implemented globally through Integrated Coastal Zone Management (ICZM), Marine Spatial Planning (MSP) and the creation of Marine Protected Areas (MPAs). In Brazil, the policies of coastal management and the creating protected areas are often used for coastal marine planning, however, these policies are rarely integrated to the marine zone itself, causing conflicts and reducing their potential for effective management.

This abstract presents the historical analysis of two policies that guide marine spatial planning in Brazil, focusing on São Paulo State (SP) and analyses their implementation. Maps were done using official data (*shape files*) to identify overlaps of these policies. A comparative table of permitted uses and practices for each area set by the Ecological-Economic Marine Zoning (EEMZ) of the Northern and Central Coasts of São Paulo State was also prepared.

Despite the 28 years of the National Coastal Zone Management Plan and the 18 years of the São Paulo State Coastal Zone Management Plan, these policies are in the early stages of the ICZM process, passing through a review phase without the effective implementation of actions. The creation of the three MPAs of the coast of São Paulo has eight years and although all together correspond to the largest marine protected area of sustainable use in Brazil, their management plans have not been developed yet, which imposes limits to their effectiveness. Nevertheless, the public participation through management councils and sectorial groups increased the transparency in the management of these areas and are contributing to the legitimacy of their process. Overlaps between both policies in much of the maritime range of SP were observed, these were areas to establish uses and practices but that are poorly integrated within management process. Even the State Coastal Zone Management Plan itself fails to incur the overlaps between the Sectors Northern Coast and Central Coast. This can cause legal uncertainties for the users of the resources (mostly fishermen) once these policies overlap different rules.

We conclude that such public policies do not dialogue with each other and remain in the early stages of implementation. For the formulation of these policies only few criteria derived from scientific and ethno-ecological knowledge, highlighting the economic interests in political decisions. Policies of marine planning should be integrated and formulated based on criteria and attributes to promote the resilience of social-ecological systems and the sustainability of ecosystem goods and services. They also should adopt a co-management process of natural resources, adaptive and participatory.

Keywords: Marine Spatial Planning; Integrated Coastal Zone Management; Marine Protected Areas; Social-ecological Resilience for Ecosystems Goods and Services.

MARINE INFRASTRUCTURE ENCLOSURES FOR ENHANCING MARINE CONSERVATION

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The growing human population increasingly requires resources from the marine environment, such as energy, food and space. As a result, conservation of the marine environment faces many challenges from coastal infrastructures, which greatly affect the marine environment, particularly by bring about the loss of biodiversity and habitat. The goal of this study is to integrate marine conservation in areas where the coastal environment is dedicated to infrastructures, and thus provide support for marine ecosystems rather than degradation.

We examined enclosed areas along Israel's Mediterranean coastline surrounding infrastructure facilities, where public access is either limited or prohibited and which are typically viewed as threats to the marine environment. We assessed species diversity and distribution through field surveys and used the Ecopath with Ecosim (EwE) program to construct an ecosystem model. The model is used to examine various infrastructure management scenarios and their potential contribution to marine conservation thus highlighting infrastructure management's effect on the surrounding ecosystem. Based on the results, we developed marine spatial planning approach which aims to find ways to meet development needs while enhancing marine conservation through improved policy and best practices.

Field surveys revealed high species diversity in addition to higher numbers of rare and vulnerable species in enclosed infrastructure areas compared to control sites. Management scenarios examination with EwE suggests that enforcement of existing access prohibition regulations will maintain the abundance of vulnerable species and therefore may contribute to increase connectivity within a network of existing and proposed marine protected areas along the coast. The results of this study is a unique contribution to the sustainable development and ecosystem-based management, both important to the field of marine spatial planning, as they demonstrate a unique approach to operationalize marine conservation beyond that provided by marine protected areas. Establishing conditions for coastal infrastructure enclosures to support marine ecosystems will enhance possibilities for marine conservation along the sensitive and highly impacted marine areas.

INTERNATIONAL VULNERABLES AREAS AND LAW: SPATIAL APPROACH

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Ecologically Important Spaces have first be underlined by international law of nature conservation. Meanwhile, the law of the sea identified jurisdictional zones and organized distribution of competences under oceans. Today, various international organisations from various fields of competences identify vulnerable spaces (Vulnerable marine ecosystems, Particularly Sensitive Sea Areas, etc.). Determining the characteristics of those vulnerabilities is an important issue at stake. Those organisations are involved in sectorial fields such as transport of fisheries and identify vulnerable zones taking into account the economic sector on which they are involved.

By mapping these zones, we will show how they have to be transposed into national laws and or into marine spatial plans. In order to better understand legal obligations of these zones we will first analyse the methodology and criteria of their designation. By the end, we will imagine a universal designation of those zones.

Tuesday 25 April 2017

1st Session: Marine strategies & Environmental Planning

Chairman

Dr. Helena Calado, University of the Azores, Portugal

Plenary speaker – Prof. Dr. Victor N. de Jong, Institute of Estuarine and Coastal Studies,
University of Hull, UK

ASSESSING ECOLOGICAL STATUS BY LINKING ECOLOGICAL NETWORK STRUCTURE AND NETWORK FUNCTIONING IN ACCORDANCE WITH THE SPIRIT OF THE EU DIRECTIVES

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Our ecosystems are responding to continuously varying boundary conditions due to external natural pressures in combination with anthropogenic pressures.

Since the management of our waters is largely budget driven, methods to judge the status or the condition of the ‘structure’ and ‘functioning’ (see the requirements in the Water Framework Directive and the Marine Strategy Framework Directive) of our coastal ecosystems is mainly based on only some and too narrow ‘indicators’. These are usually represented by investigating certain habitats or ‘fragmented food webs’ such as benthic macrofauna, fishes, birds and/or toxic algae and/or results from insufficient dynamic simulation models. There is, however, a lot of doubt whether this sort of indicators can indeed be used as reliable proxies for entire systems that consist of a waterbody, a sediment bed and in the coastal zones also extensive intertidal areas. A comparable description can be presented for socio-economic systems where we also have indicators in use to measure the status or the condition of only a part of our social system (employment, stock market indices).

There is a need to assess both, the ecological and the social-economic system, and in an integrated way. However, before we can make that step we need to find the best possible integrated ecosystem indicator(s) and the best suited spatial level so that we can link that effectively to the socio-economic system.

Based on the application of Ecological Network Analysis, as run under R (enaR), five different food web types for three different parts of the Ems estuary (Lower Reaches, Middle Reaches and Dollard) and representing different abiotic conditions and even different pressures but covering exactly the same period in time, are compared with each other. The results are used to connect biodiversity representing ‘system structure’ to indicators representing the ‘system functioning’ so that this can effectively be used for policy making and management at the national as well as the EU level.

ECOSYSTEM-BASED MANAGEMENT, MARINE RESTORATION AND A NEW BIODIVERSITY INSTRUMENT FOR AREAS BEYOND NATIONAL JURISDICTION: REFLECTIONS FROM THE EUROPEAN UNION MERCES AND ATLAS PROJECTS

Prof Ronán Long (World Maritime University), Dr. Anthony Grehan (National University of Ireland Galway), Prof David Johnson (Seascope Consultants Ltd)

The paper reviews progress in the negotiation of a new international instrument on the protection of biodiversity in areas beyond national jurisdiction in the context of marine ecological restoration, the ecosystem approach and maritime spatial planning. In order to give additional context, the paper provides a brief overview of two European Union interdisciplinary projects that are currently underway, namely: (i) the MERCES project, which is examining the scientific and legal basis to restore degraded and/or damaged marine ecosystems and habitats and the services they provide in European regional seas; and (ii) the ATLAS project, which creates a dynamic new research partnership between academic institutions and industry with a view to preparing a trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe taking into account the exploration and commercial exploitation of deep-sea ecosystems and marine genetic resources balanced with the need for conservation of biodiversity in a changing ocean.

The paper advances two arguments: firstly that in addition to the conservation and sustainable use of biodiversity, the architecture of the implementation agreement on biodiversity should be designed with a view to preventing, protecting and restoring marine ecosystems and the productivity of the ocean in the interest of the common good. Secondly, the negotiations should also take into consideration how best to incorporate into the biodiversity instrument new spatial management tools to protect deep-ocean ecosystems with the ultimate aim of improving ocean governance in the Atlantic and elsewhere.

THE CHALLENGE OF DYNAMIC OCEAN MANAGEMENT IN TRANSBOUNDARY SCENARIOS: THE WESTERN MEDITERRANEAN SEA AS A CASE STUDY

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Dynamic Ocean Management (DOM) is addressed as a new frontier in the field of operational ecology for marine resource management able to conform to the mutating nature of marine species and ecosystems. The establishment of stationary boundaries represents so far the most spread approach to zonation for the purpose of marine resource management (e.g. marine protected areas). Instead DOM refines boundaries depending on species distribution changes in space and time, representing an effective approach in terms of economic efficiency and conservation of natural resources (Maxwell et al., 2015). It is imperative for any DOM project to be implemented within an efficient coordinative framework. A switch from national to more complex transboundary scenarios inevitably requires greater effort for effective coordination of DOM. Most DOM projects imply the management by a single country of the marine area under its national jurisdiction, in few cases DOM is coordinated within an international framework. In this study we want to investigate over the potential of DOM in the context of transboundary scenarios. As a case study we collect and analyze information on the complex sociopolitical framework of the Western Mediterranean Sea where both European and African countries share marine boundaries, and we focus on the potential of DOM to reduce the impact of fisheries and marine traffic on population of sea turtle (*Caretta caretta*) in this marine area.

We review the legal and management frameworks of each coastal country in the Western Mediterranean Sea, focusing on the sectors of fishery, marine traffic and conservation, and we research on the spatial organization of these frameworks in relation to jurisdictional waters delimitations. We combine publicly available information on management institutions with geo-referenced data on jurisdictional waters. Through this approach we identify the spatial connection between management institutions and marine areas under different jurisdictions. In addition, we obtain spatial information on the distribution of shipping activity per sector (e.g. fishery) using AIS data.

Finally we develop an information system to conduct a spatially-explicit identification of human activities, legal instruments, research institutions, organizations of marine managers and users, existing policy measures, and environmental information. The practical nature of these interactive tools provides direct support to the development of DOM, still they can have relevant impact on other planning approaches such as maritime spatial planning.

References: Maxwell et al., 2015, Marine Policy, 58, 42–50.

Keywords: Dynamic ocean management; Mediterranean Sea; Information system; *Caretta caretta*, GIS

ADAPTING TO CLIMATE CHANGE ON THE EUROPEAN COAST

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The threat posed by climate change could produce a substantial increase in damage related to coastal erosion and flooding in coastal areas worldwide over the next decades. So, this direct driver of change is considered as one of the frames of reference that any initiative of Integrated Coastal Zone Management must have.

That is why it is necessary to seek adaptation strategies that help to reduce these impacts as much as possible in coastal areas. In this sense, for the European Union, adaptation is a priority and it has urged member countries to implement specific policies.

Assuming that not all countries are responding to the effects of change as expected, the aim of this study is to analyze the national adaptation strategies that are developed in Europe as a response to the problem in coastal zones. National strategies and plans for adaptation to climate change in different European coastal countries have been dissected. Scientific papers written in recent years on the theme of adaptation proposals in European coastal areas have also been reviewed. The analysis has considered different types of measures, both structural and non-structural.

The results corroborate the hypotheses and allow to differentiate between two types of countries. On the one hand, there are countries that already develop specific measures and have a well defined coastal policy. And on the other hand, there are also countries where coastal areas are not a priority in their public policy.

Keywords: Coastal zone; climate change; European Union; adaptation strategies.

CRITERIA SYSTEM FOR COMPLEX ASSESSMENT OF THE RUSSIAN COASTAL GEOSYSTEMS

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Economic development planning and seacoasts protection is impossible without understanding of how natural conditions and anthropogenic transformations influence coastal geosystems. The main issues of management decision making are as follows: whether anthropogenic coast change is permissible; whether there is a need of coastal protection; whether adaptation of economic activities to possible seacoast changes is required. Accordingly, it is necessary to develop a system of criteria for seacoast classification and assessment.

Scientific literature provides different classifications of seacoast types, which reflect their diversity to a greater or lesser extent. These classifications usually reflect the "static" state of coasts, without taking into account their previous evolution, present dynamics and further transformation. For successful coastal zone management it is necessary to have a system of criteria for the assessment of coastal geosystems dynamics caused by natural and anthropogenic factors. At the same time, it is necessary to have criteria that assess the risks of economic activity on a seacoast. It also important to has a set of criteria that characterize the environmental value of seacoasts and the necessity of their protection. Thus, the criteria characterizing economic conditions and opportunities include the criteria for the assessment of seacoast dynamics, natural risks, environmental restrictions, the results of the previous economic activity.

The present work offers basic principles of the system of complex assessment of any stretch of the seacoast of Russia. Taking into account the great length of Russian seacoasts, it is impossible to get complete information on each of the stretches. In addition, the classification was simplified to a great extent in order to make its use convenient in the system of managerial decision-making. Therefore, the developed criteria have the evaluative nature giving qualitative characteristics of the present coast state and of the processes that determine its preceding and subsequent evolution. This characteristic is the primary basis for taking managerial decisions on economic development of a coast stretch.

The developed complex system of criteria was used for the assessment of coastal geosystems of the Azov and Black Seas Russian coasts. This region is characterized by a high degree of economic use and, at the same time, by high level of environmental significance. It was discovered that accumulative coasts are the most dynamic and the most prone to natural threats. The sea level rise and the increase of wave effect present the greatest natural threat. Most often, the dangerous anthropogenic impact can be seen in the reduction of the volume of sediments that is received by the accumulative form. The recreational value of coasts is equally dependent on both physiographic and socio-economic factors.

Thus, the proposed system of criteria allows qualitative assessment of dynamic and consumer properties of any seacoast segment of various types. After some improvements made, it is planned to apply these criteria for the development of the inventory of sea coasts of Russia.

The investigations were supported by the Russian Science Foundation (project 14-50-00095).

MARINE PROTECTED AREAS: MONITORING PLAN OF THE NATIONAL PARK OF CABRERA AND ATLANTIC ISLANDS OF GALICIA NATIONAL PARK (SPAIN)

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A marine ecological monitoring plan is essential to assess the representativeness and conservation status of each marine National Park in the context of the Spanish National Parks Network. The National Parks Autonomous Agency (OAPN-MAPAMA) addressed the immediate need required by Spanish National Parks Network and developed in 2011 an initial proposal for a monitoring plan and assessment. This proposal was implemented through the collaboration of Tragsa group during 2011 and also 2015-2016. A service project was conducted at the Cabrera Archipelago in the Mediterranean Sea, involving an extensive ecological monitoring and also an intensive ecological assessment. Moreover, the Atlantic Islands of Galicia National Park in the Atlantic Ocean has now a bathymetric and physical cartography and faunistic and botanic characterization that allow identifying the marine systems. As a result of these studies carried out, these two National Parks, Cabrera Archipelago and the Atlantic Islands of Galicia, have now a proper tool to be continuously evaluated through a set of marine indicators and tracking protocols which are suitable for every marine National park, which will let the OAPN to manage the environmental conservation and to apply sustainable measurements on maritime activities of each marine National Park, according to their respective conservation objectives.

Keywords: marine protected areas; conservation; biodiversity management; marine protection; national parks

POTENTIAL CONTRIBUTION OF THE FIRST SALE SYSTEM OF FRESH FISH IN THE CANARY ISLANDS TO THE COMPLIANCE OF THE MARINE STRATEGY FRAMEWORK DIRECTIVE (MSFD): AN EXAMPLE OF GRAN CANARIA (CANARY ISLANDS, SPAIN).

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The initial assessment document of the environmental goodness status of the Canary Islands Region in the Marine Strategy (DMEM, 2012) remarks, in relation to the 3rd descriptor (D3), entitled “Commercially exploited fish and shellfish”, that is necessary the analysis of catch and fishing effort data series. The DMEM (2012), through the D3, tries to build indicators about the conservation status of 15 fish stocks, but it describes gaps of information of these stocks, and highlight the necessity of alternative indicators in a scientific context. On the other hand, the first sale system of fresh fish (FSS) is the principal source of capture data in Canary Islands. However, DMEM (2012) pointed out some problems in FSS, as incorrect identification of species, uncertainty in the accuracy of weight records, it doesn't take into account the discards, and there are no records of fishing effort and the gear used. However, as it is shown below, the information recorded by the FSS could be helpful in decision process, and the system of data recording could be potentially improved in the medium and long term.

In this context, our approach to the problems describe in DMEM (2012) is the characterisation of 6 point of data reporting in the FSSS of Gran Canaria, through the most representative fish species (in frequency and weight). For this, data from 2006/2008 to 2014 from Agaete, Arguineguín, Castillo del Romeral, Mogán, San Cristóbal and Taliarte were analysed. In each FSS point, the contribution of each specie (in incidence and weight) was used to identify the more representative ones. From the 15 fish stocks propose in DMEM, 9 species are coincident with the results obtained in this analysis. Moreover, the species differences between FSS points are showed.

The FSS was not designed as a fishing data recording system, but as fish product traceability system. Nowadays, the net of FSS is composed by 29 points distributed along the Archipelago, where daily capture by species, boat and by fishing ground is recorded. In order to optimize the FSS, and due to its original design, it is important to make a diagnosis about their way to work and, at the same time, to promote measures to improve the information recording system as a keystones of fisheries policy of Canary Islands.

Keywords: artisanal fishery; MSFD; capture; representative species

Tuesday 25 April 2017

1st Session: Biodiversity Conservation within Blue Growth

Chairman

Dr. Fernando Tuya Cortés, IU-ECOQUA, ULPGC, Spain

Plenary speaker - Prof. Dr. Ricardo Haroun, IU-ECOQUA, ULPGC, Spain:

THE MARINE EXPEDITION BIO-PRÍNCIPE 2016: BIOLOGICAL ASSESSMENT AND SUBTIDAL HABITATS CHARACTERIZATION OF THE PRÍNCIPE ISLAND

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The island of Príncipe is located in the Gulf of Guinea and constitutes a tropical terrestrial biodiversity hotspot, whereas its marine life and the conservation of its biological resources are still mostly unknown. In a joint research effort developed between the Príncipe Island UNESCO Biosphere Reserve and the Research Institute for Sustainable Aquaculture and Marine Ecosystems (IU-ECOQUA), a scientific marine expedition was carried out during 2 weeks in November 2016, with sampling and surveys in intertidal and subtidal habitats. The main objectives of BIO-Príncipe 2016 were to start cataloguing benthic marine taxonomic groups, to characterize subtidal marine habitats, and to evaluate the conservation status of coastal fish populations.

Aside from underwater census techniques used to assess diverse ecological parameters of major benthic groups (macroalgae, invertebrates and fishes), IU-ECOQUA scientists have put in place new sampling techniques, both for the mapping of the main underwater habitats as well as for the evaluation of microplastics along its coastline.

In this contribution, we will present the results gathered during this first marine expedition, where macroalgal composition is dominated by fleshy red algae as well as cenocytic green algae, invertebrates such as “opisthobranchs” gastropods (sea slugs), echinoderms and corals seems to be rather common in shallow subtidal rocky bottoms, and large predatory fishes were almost absent. Regarding the marine habitat survey, calcareous red algal beds (rhodoliths or locally called “gla gla”) are the most conspicuous and extensive marine habitat in the western part of the island.

Based on the main results obtained in BIO-Príncipe 2016, it is planned to organize other marine research expeditions to this equatorial African region, fostering a solid knowledge of the rich tropical marine life present at Príncipe Island and promoting a responsible use of its valuable marine resources.

BIOENGINEERING MARINE ECOSYSTEMS WITH FLOATING SEAWEED PRAIRIES

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Shallow marine spaces where light reaches the sea floor tend to have a larger biodiversity and productivity due to growth of benthic primary producers. These are mainly seaweeds, seagrasses and diatoms that grow additionally to phytoplankton suspended in the water column. This is particularly true for coastal areas that moreover receive abundant nutrients from land, and over seamounts. Otherwise, the majority of the ocean tends to be sparsely and migratory populated.

The only documented and highly significant natural exception to the above is the Sargasso Sea, where *Sargassum* seaweeds live floating permanently. The other and growing exception, of anthropogenic origin, is the cultivation of seaweeds in floatation. These two cases, both overriding the benthic nature of seaweeds, broadly affect biological and environmental aspects, besides biomass production from seaweed farming (1).

Floating seaweeds, naturally occurring or cultivated, provide substrate for growth of epiphytes and smaller animals, feed to herbivores and a trophic chain thereafter, and shelter. They essentially act as large fish aggregating devices, enriching biodiversity and enhancing fisheries (2). Also, seaweed masses bioremediate waters overloaded with nutrients and provide other environmental services that are only recently being considered. Among these, of particular relevance are those related to mitigating climate change, including radiation-balance relations that we are exploring and describe here, which may significantly contribute to decreasing ocean warming while increasing albedo.

By combining these and other characteristics of areas cultivated to floating seaweeds, we propose here an approach to bioengineer sizable ocean surfaces that considers the addition of other aquaculture activities and interaction with fisheries, including restocking. Essentially, what is proposed is, in a manner, to mimic the Sargasso Sea yet emphasizing biomass production and use as well as specific ecosystem services, including recovery and prevention of hypoxic and dead zones.

These changes and more detailed applications, which are described here, constitute a challenge to marine spatial planning particularly as they may introduce new ecosystem definitions, site selection criteria and management requirements. The overall goal is to increase productivity and capacity to provide services in a manner that can significantly alter the seascape and the way the ocean is managed and viewed. This may sustainably increase planetary carrying capacity and constitute a powerful tool for development in the context of climate change and dwindling resources.

Key words: biodiversity enrichment, fisheries enhancement, primary productivity, Sargasso Sea, seaweed cultivation.

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SPATIAL MANAGEMENT OF MARINE AND COASTAL PROTECTED SPECIES. THE CASE OF *CYSTOSEIRA* SPP. IN CANARY ISLANDS (SPAIN)

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The protection of threatened species requires verified and updated information on their situation in the environment, especially about their abundance, distribution and conservation status. This information is essential for adopting management and recovery plans that allow survival and conservation of species in the environment. In the Canary Islands, the brown algae of the genus *Cystoseira* are representative canopy-forming species in the rocky and exposed shores and have a high ecological value in the marine and coastal ecosystems of the Canary Islands. *Cystoseira abies-marina*, *C. tamariscifolia* and *C. mauritanica* are included in the Canarian catalogue of protected species (Law 4/2010). However, in recent years there has been a significant regression of their populations in the Canarian coasts, and in some areas *Cystoseira* canopies have disappeared completely. The objective of the study that end in December 2017 is to establish and show the current spatial distribution of the *Cystoseira* canopies in the western Canary Islands and then propose appropriate management measures for their protection. The study presents preliminary results regarding the present spatial distribution, the distribution of the species in the past according to references, the phenological changes of the species in some locations, the potential distribution of the species according to the environmental characteristics, and the analysis of their evolution over time. Results are used to establish the current conservation status and the corresponding conservation measures.

Keywords: endangered species; *Cystoseira*; Canary Islands; spatial distribution; coastal management.

SEASONAL AND SPATIAL FACTORS AS DRIVERS OF MARINE BIODIVERSITY ON RHODOLITH SEABEDS

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The rhodolith seabeds constitute marine sedimentary bottoms mainly built by free calcareous red algae, forming unattached nodules of irregular rocky aspect in the photic zone. These habitats, being worldwide distributed, host a high biodiversity and provides diverse ecosystem services and products for human beings. Factors such as hydrodynamic conditions, sediment characteristics, and the type of algal species that make up the nodule, can influence the rhodolith morphology and its three - dimensional structure. Rhodoliths have a large diversity of interstitial spaces, offering a range of ecological niches for numerous species, either epifauna, infauna, as well as various epiphytes. The main objectives of this study was to investigate the variation in rhodolith's morphology and the role of seasonal, spatial variables in the distribution of epifaunal communities associated with those rhodolith seabeds.

The study was performed sampling rhodoliths fields at two different seasons along a depth gradient (20/25/40m) in Gran Canaria Island (Spain) using the methodology proposed by Nelson *et al.* (2009) and Sciberras *et al.* (2012) studies. Samples were collected by SCUBA and in the laboratory biometrical parameters related to rhodolith morphology, such as size and sphericity, were measured. At the same time, taxonomic identification of major epifaunal species' associated were done.

Rhodoliths morphology showed a dominance of spherical structures in all samples, regardless of depth. The spherical shape of the rhodoliths is related to the high hydrodynamism in the sampling areas. The analysis of the associated epifauna revealed up to 29 different taxa identified till suborder level. In addition, the composition of this epifauna varied significantly according to the seasons and inside them, also with depth. Thus, a higher number of taxa were observed in March compared to December, and in particular at the deepest depth: 40 m. This study reflected for the first time, the great faunal biodiversity of this marine habitat in the Canary Islands, despite the low taxonomic level resolution. Further research should be developed to understand the correlation between this habitat and associated epifauna communities in order to evaluate the ecosystem services provided by rhodolith's seabeds and to implement future conservation policies for this keystone habitat.

Keywords: Epifauna, marine habitats, red calcareous algae, Macaronesia

References:

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LAUNCH OF AN ACTION PLAN TO ENSURE ANGELSHARK IN THE CANARY ISLANDS ARE ABUNDANT AND PROTECTED IN THEIR UNIQUE STRONGHOLD

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The protection of the Angelshark (*Squatina squatina*) in its last remaining stronghold is of utmost importance. This unique species has been eliminated throughout much of its historical range over the past century and is listed as Critically Endangered on the IUCN Red List (Ferretti et al. 2015). However, the Angelshark is still frequently encountered in the Canary Island archipelago, giving hope that this species can be saved from extinction.

In June 2016, a workshop was organised by the Angel Shark Project, IUCN Shark Specialist Group and Shark Trust to bring a multi-disciplinary group of divers, scientists, conservation organisations, local and international shark experts alongside the Canary Island Government and Spanish Government to develop the Angelshark Action Plan for the Canary Islands. The highest priority threats to Angelshark populations were identified and key steps to address these threats were discussed to build a comprehensive Action Plan. Our joint Vision for the Action Plan is that Angelsharks in the Canary Islands are abundant and protected in their unique stronghold

The Action Plan will be launched this month and focuses around six main goals: Fisheries, Habitat & Pollution, Human Interaction, Legislation, Research and Community Engagement. All interested parties are invited to participate in the Actions and become part of the newly formed Angel Shark Conservation Network. We would like to thank all the workshop participants for their detailed discussion, enthusiasm and expertise in developing the Action Plan.

Keywords: Angelshark, Conservation, Action Plan, Critically Endangered.

Wednesday 26 April 2017

1st Session: Marine/Maritime Information Systems & Data Management

Chairman

Dr. Andrej Abramic, IU-ECOQUA, ULPGC, Spain

Plenary speaker - Dr. Hugo De Grof, European Commission, Directorate-General
Environment, Unit E.4

INSPIRE FOR RESPONDING TO MARINE POLLUTION

Hugo De Groof

European Commission, DG Environment, Unit E.4 – Compliance and Better Regulation

Most marine pollution begins on land (about 50-80%, varying from region to region and depending on the study). Land-based economic activities such as those by industries, transport, waste management and energy production discharge to streams and/or emit to the atmosphere. Marine based economic activities like fish farming, gas and oil extraction, shipping, dredging, mineral extraction, fishing etc. add to these pressures. To assess their impact and to tackle (respond) the sources of such pressures a wide range of land, atmosphere and marine geophysical and state-of-the-environment monitoring data must be available. The 'INfrastructure for SPatial Information in the EU' Directive, INSPIRE was adopted a decade ago to install the necessary data governance and legal as well as technical interoperability to bring this wide variety of spatial data on driving forces, pressures, state and impacts together.

This presentation will be tale of achievements, policy developments and outstanding challenges.

THE ROLE OF EMODNET (EUROPEAN MARINE OBSERVATION AND DATA NETWORK) TO SUPPORT MSP: EMODNET THEMATIC PORTALS AND EMODNET SEA-BASIN CHECKPOINTS

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The European Marine Observation and Data Network (EMODnet) is a long term initiative launched by the European Commission's Directorate-General for Maritime and Fisheries (DG MARE) in 2009 and a key implementation mechanism of its Marine Knowledge 2020 strategy (2010).

In this communication we will provide an overview on EMODnet and we will explain how this initiative can contribute to the Maritime Spatial Planning (MSP) process by (1) facilitating access to European marine data (2) evaluating current marine observation systems at the sea-basin level.

(1) EMODnet Thematic Lots

Currently there are approximately 160 organisations involved in EMODnet who are working together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products. EMODnet has become the centralized gateway to European marine data across seven thematic areas: Bathymetry; Geology; Seabed habitats; Chemistry; Biology; Physics; Human activities. For each of these thematic areas, there is a EMODnet thematic lot subproject and corresponding data portal. Whilst distinct in scope, the data and information made available by each of these thematic lots portals can be potentially relevant for MSP. EMODnet's infrastructure has been developed through a stepwise approach and is now entering its third and final development phase. In this phase EMODnet will evolve to further support stakeholders requirements for the implementation of the Maritime Spatial Planning Directive.

(2) EMODnet Sea-basin Checkpoints

EMODnet Sea-basin Checkpoints are assessing the status of marine observations at a sea-basin level by facing a number of challenges such as wind farm siting, marine protected areas, oil platform leak, climate and coastal protection, fisheries management, marine environmental management and river inputs. Stress-tests of marine observation systems are being carried out in the Atlantic, Arctic, Baltic, Black Sea, Mediterranean and North Sea to evaluate the adequacy of data to solve these challenges, that is, how well the available data meet the needs of users, including scientists, civil society, private companies and public bodies. Many of these challenges are relevant for MSP purposes and these tests can help to identify bottlenecks for planning in terms of data availability and appropriateness.

Keywords: EMODnet; marine observations; thematic lots; sea-basin checkpoints.

EMODNET CHEMISTRY RESULTS IN SUPPORT TO EU MARINE POLICIES: USE CASES

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Scientific research as well as management of the marine environment and sustainable blue growth rely on the availability of quality-assured data, reliable information and solid scientific-based knowledge. During the implementation of several EU marine directives (eg. WFD, MSFD, MSP,...) lack of data, need of harmonization and of coherence among EU Member States have been identified as key issues limiting the assessment of Good Environmental Status required to promote a sustainable use of maritime space and of its resources. The long-term EU initiative EMODnet (European Marine Observation and Data network) is one of the key infrastructures engaged in collecting, facilitating access and promoting use and re-use of data for both scientific research and marine environmental management. It started in 2009 with pilot components for limited sea basins, was extended to all European seas in 2013 and it is facing now the high-resolution phase. EMODnet spans over seven disciplinary themes: bathymetry, Geology, seabed habitats, chemistry, biology, physics, human activities, coastal mapping, providing information to several indicators of the 11 GES descriptors. In order to facilitate a harmonized approach to environmental status assessment in EU sea basins, EMODnet Chemistry has focused on the collection, harmonization and Quality Control of data related to eutrophication and marine contaminants. Furthermore, in order to implement aggregated visualization products specifically aimed to the needs of marine directives, guidelines developed by Regional Sea Conventions (eg. OSPAR, HELCOM, UNEP/MAP-MEDPOL), the main directives on eutrophication and contaminants, INSPIRE implementing rules as well as best practices of aggregated information have been taken into account. Dedicated OGC standard services for browsing, viewing and downloading chemistry source data sets and data products for the European waters are developed, maintained and monitored. Recent efforts have been also dedicated to the needs of the Directive on Maritime Spatial Planning (MSP, 2014), which requires the integration of multidisciplinary data and information on maritime activities, on the state of the marine environment and on its vulnerability to human activities.

Keywords: EMODnet; MSFD; MSP; eutrophication; contaminants

AIS, A RELEVANT DATA FOR MARITIME SPATIAL PLANNING?

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Maritime spatial planning (MSP) concept is now accepted and the legislative framework in the UE established. However its operational implementation remains sometimes difficult. As stated in the Directive (MSP 2014/89/UE), one of the key to success is to have reliable data, interoperable and exploitable in an operational context. In particular, relevant information on spatio-temporal distribution of human marine activities and on their interactions with other sea uses (potentials conflicts or synergies) is essential (Ehler & Douvere 2009). This exercise is particularly difficult to achieve in the marine environment where the spatio-temporal distribution of human marine activities is hard to describe. No fixed physical limits can be established to assign a space to an activity, and various activities can coexist in a same zone at the same time. As a result this type of information often remains the weak link of information systems developed by marine stakeholders. Since 2002, the Automatic Identification System (AIS) which has been made mandatory by the International Maritime Organisation (IMO) in the objective of safety of marine navigation is currently seeing a major development. Allowing a real time geo-tracking and identification for equipped vessels, AIS data are promising to describe certain marine activities and are more and more exploited for different issues (risks, impact assessment and assistance in management and planning) (McCauley *et al* 2016). After a short presentation of mains features of AIS data, this paper offers:

- To establish an overview of current uses of AIS data in a MSP context based on several current projects in Europe and in the world;
 - To present the current juridical context that remains vague for the use of this kind of data;
 - To present some results as part of several research and development projects. In a multi-scales context, the objective is to illustrate how the AIS data processing and analysis can produce adequate and tailored information for a MSP program: ship route, maritime traffic density, maritime traffic channels (shipping lane), hierarchical maritime transportation network, navigation flow, estimation of the spatial distribution and intensity of fishing activities, spatio- temporal interactions between activities (potential conflicting uses of the sea or synergies). In conclusion, a discussion about the benefits and the limits of using AIS data in a MSP process is initiated and emerging research and development opportunities are identified.

Keywords: AIS data– marine GIS – sea uses - spatio-temporal human marine activities distribution and interaction – Maritime Spatial Planning (MSP)

References: Ehler C. and Fanny D. Marine Spatial Planning: a step-by-step approach toward ecosystem-based management. 2009. IOC Manual and Guides No. 53, Paris: UNESCO McCauley *et al*, 2016, Ending hide and seek at sea. Science 351(6278)

INCREASING AMOUNT OF DATA FOR MARINE SPATIAL DATA INFRASTRUCTURE WITH MARINE OBSERVATION SENSORS

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The development of technology reduces the costs of collecting data with sensors. Sensor integration becomes an integral part of spatial data infrastructures (SDIs). Data model of marine and coastal spatial data organised and distributed through Marine SDI (MSDI) is especially wide and needs appropriate integration of sensor data. Integration of data obtained by the sensor is leading to richer data volume, but also big data issues. Planned integration of sensors in the MSDI provides greater interoperability.

In this work, we present a method of including observation sensors via OGC Sensor Observation Service (SOS). It is tested in Croatian MSDI case, from the organizational and information point of view. Croatian MSDI is also taking into account INSPIRE directive, so we reflect on Guidance for INSPIRE download services and Observations & Measurements & SWE Guidelines.

Future research needs to take into account seamless data migration through World Wide Web (WWW) with familiar tools for future solutions and applications. We are opening a discussion for sensor data quality assurance and assessment.

Keywords: Sensors; Marine Spatial Data Infrastructure (MSDI); Sensor Observation Service (SOS); INSPIRE

DEWETRA DATA SERVER, AN OPEN-SOURCE ENGINE TO INTEROPERATE WITH GEO-SPATIAL DYNAMIC DATA

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Data availability and interoperability are key concept in the modern web Information Systems. Environmental monitoring, environmental management and decision support systems are strongly supported by web GIS functionalities. As the same time, they need to integrate heterogeneous sets of data in order to provide useful information for end-users. In the world of the Web GIS technologies, the OGC standards are a spread-used pillar to exchange data in thought different systems; WMS, WCS and WFS are well-defined http interfaces to exchange map information and representation via web. Many open source software, both on client and server side, supports these standards. One of most used of this software is GeoServer, an open-source server written in Java that allows users to share, process and edit geospatial data. One of the issues working with geospatial data is the distinction between the static and dynamic data. Static data (as administrative boundaries or DEM) normally does not change in time while dynamic data (as observations or models of oceanographic variables, or marine traffic data) changes. They can have many different input raw format but they are all related to a reference timestamp. Dewetra Data Server (DDS) is a plugin of GeoServer software that extends the standard GeoServer API to let the clients to be able to handle dynamic data with the same OGC WxS standards that are common for static data. DDS can handle a huge set of different input data, stored in native format, in a dedicated archive. When the client needs to add a dynamic information in a web map, he asks to DDS the availability of this information in a specified time frame period. If the data is available, the system publishes it on the fly and gives back the layer id to the client. This data is thus available in order to be added as new layer to the Map using WMS, WCS or WFS. DDS has been developed by CIMA Foundation for the Italian Civil Protection Department and has been used in many national and international projects of environmental monitoring. It has also been used in the Seawetra platform to integrate in a unique client web application all information needed for environmental management, impact assessment and conservation for protected area. An example of high dynamic marine data that can be handled by the system is information collected by the Automatic Information System's antennas (AIS). AIS data are parsed, stored and analysed using DDS in a space-time referenced context. For instance, DDS can return last position or polyline of the track of each MMSI in the time frame. Moreover, DDS can also calculate marine traffic intensity maps. AIS information can be compared with other dynamic information like radar images, meteorological models, temperature fields using DDS. The purpose of this talk is to introduce the concept of Dewetra Data Server explaining the architecture of the system, the public API and some sample of real-world applications.

Keywords: Interoperability, OGC, WxS, OpenSource, Data Management

APPLICATION OF THE OPERATIONAL OCEANOGRAPHY SYSTEM OCEANUCA-MAPS TO COASTAL PLANNING, MANAGEMENT, AND MONITORING: THE CASE OF BACTERIAL CONTAMINATION IN THE BAY OF CADIZ

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The Operational Oceanography System (OOS) OceanUCA-Maps was developed by the Department of Applied Physics of the University of Cadiz to provide observational and model-based information and forecasts of met-ocean and marine data for the Andalusian waters. Its friendly, web-based GIS environment makes it suitable for authorities, decision-makers, and general public use. This work shows the application of the meteorological, hydrodynamic, and Lagrangian transport-dispersion numerical models included in the OOS to the management and monitoring of bacterial contamination due to domestic/industrial waste waters in the proximities of bivalve mollusc harvesting area in the Bay of Cadiz (Andalusia). Modelled current fields for different type-case scenarios as a function of wind and tidal conditions were implemented into a Lagrangian particle-tracking model, specially designed for the simulation of transport- dispersion processes of potential bacterial content from waste waters into the Bay, from the spill points identified by AGAPA. Risk indexes elaborated from numerical results may be applied for planning the use of coastal and marine areas, by identifying the zones more affected by this kind of contamination, while considering the peculiarities of each modelled scenario.

Wednesday 26 April 2017

2nd Session: Maritime Spatial Planning & Blue Growth

Chairman

Prof. Dr. Victor N. de Jong, Institute of Estuarine and Coastal Studies, University of Hull,
UK

Plenary speaker - Dr. Angel Borja, AZTI Tecnalia, Spain

IS IT POSSIBLE TO RECONCILE THE OBJECTIVES OF THE MARINE STRATEGY FRAMEWORK DIRECTIVE AND THE MARINE SPATIAL PLANNING DIRECTIVE?

Angel Borja Yerro

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The EU Marine Strategy Framework Directive (MSFD) requires Member States to achieve Good Environmental Status in their waters out to the 200 nm, based upon 11 Descriptors and many criteria. This requires harmonising the assessments across international borders and in line with international regional seas conventions (i.e. OSPAR, HELCOM, Barcelona, Bucharest). In contrast, the recent EU Maritime Spatial Planning Directive (MSPD) aims for Member States to maximise the Blue Economy and Blue Growth in their waters by harmonising the many conflicting and competing uses and users but without compromising the natural system. This includes the means of designating Marine Protected Areas. This presentation discusses the means of reconciling both of these directives as well as incorporating the implementation of all other relevant estuarine, coastal and marine directives such as the Habitats Directive or the Water Framework Directive. It presents the paradoxes of assessment, stakeholder engagements and competing status assessments. It assesses the means and challenges of co-location of activities and designations and focuses on the management of endogenic managed pressures and unmanaged exogenic pressures, including the relevance of climate change in implementing the directives.

THE EUROPEAN MARITIME SPATIAL PLANNING: BETWEEN MARITIME ACTIVITIES, CONSERVATION AND COASTAL USES

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The sea and the coasts are drivers of the economy. In Europe the Blue Growth is the long term strategy to support sustainable growth in the marine and maritime sectors. European marine waters are under increasing anthropogenic pressure, responding to concerns about the capacity of specific sectorial policies to manage such pressures. European Union (EU) adopted two initiatives: Marine Strategy Framework Directive (2008) to place the legislative requirement to maintain Good Environmental Status (GES), and Maritime Spatial Planning Directive (2014) to promote the sustainable development and use of marine and maritime resources and linked economies. Coastal development can support or, even, increase industrial activities such as building of offshore infrastructure, shipping, fishing and coastal urbanization. These activities increase the pressure on marine ecosystem and on marine protected areas. In particular, marine protected areas play key roles in buffering biodiversity from a wide range of anthropogenic pressures.

Data from open databases as a Corine Land Cover (CLC) map of European Environmental Agency, Emodnet on Human Activities (Hydrocarbon Extraction), the full World Database on Protected Areas (WDPA) (IUCN & UNEP 2014), the Global Map of Cumulative Human Impact referred to maritime commercial activity (Shipping) of the National Centre for Ecological Analysis and Synthesis (Halpern et al., 2008), and the distribution of artificial light in 2013 from NASA DMSP-OLS stable nighttime lights images, were used to characterize the maritime spaces and Marine Protected Areas of European members states ((Davies et al., 2015). All data handling and extracted were performed in R-CRAN, and ArcGIS 10.2. The main results of the study underline that data extracted from CLC European coastal zones map (in a 500 mt buffer from coastline to inland) are characterized by a strong heterogeneity between the several member states, in general the artificial surfaces represent a third of total CLC element counted. Analysis of distances from the marine WPDA sites to the coastal elements of CLC, highlight that most of the land covers is represented by artificial surfaces (level I CLC). Another investigated element was the artificial light (Butt 2012) both in marine WAPDA and in a buffer of 1 km in the coastal CLC elements selected. The results show that the values of artificial light measured on sea surface are very similar to the values measured in CLC elements near to protected areas. The data of traffic density show that the main vessel routes are far way from the territorial waters, but in some cases high traffic density has been highlighted near the area of WPDA. From the other hand, the data from Emodnet DB on hydrocarbon extraction show that it is possible to find platforms both in proximity of important vessel routs and in the nearest of important coastal protected areas.

In conclusion, this study show that the member states studied are characterized by a strong variability of the uses of coastal and marine spaces. This should be reflected in the future approaches to the implementation of MSP at local scale. In some particular cases the conflicts between the conservation policies, i.e. MSFD, and the maritime activities, as shown in this study, should be taken into account in order to guarantee a real blue growth for the future of European Seas

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Pages 164–171

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LAND AND SEA USE INTERACTION IN HERAKLION COAST

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According to the Directive 2014/89/EU «*Establishing a framework for Maritime Spatial Planning (MSP)*» each Member State is obliged to enact and implement MSP at the latest by 31 March 2021. MSPs should take into account the particularities of maritime areas, existing and future activities and uses and their environmental impacts and also Land-Sea interactions. A key principle of MSP is to ensure coherence between terrestrial and maritime planning. Land-Sea interactions, which are increasing over the years, have a direct impact on the coastal and marine space. A variety of activities and uses, (e.g. tourism, recreation and research, maritime and manufacturing activities) are present and are further developing in the coastal and marine area. The growing competition of the coastal uses, combined with the effects of climate change and the risk of natural disasters, exert strong pressures on coastal and marine resources, endangering their viability and their conservation. This study aims to investigate the issues raised by the interaction of uses and identify the existing and future pressures land and sea uses in the wider Heraklion, Crete coastal area, with a total coastline length of 145 km.

To achieve this goal a decision analytic approach was used, based on the need of stakeholders, that include three neighboring Municipalities (Heraklion, Malevizion, Hersonissos), for further tourism development of coastal area. In this direction, local authorities have proposed the realization of several, disjointed, development interventions which include establishing a diving park in two potential locations, new marinas, expansion of bathing beaches and coastal regeneration projects in a large beach. More specifically a holistic approach of the whole coastal area and the overall interactions between land and sea, was made.

Base on the results, the realization of any tourist development intervention, also increases the negative effects that are related to the land-sea interaction. The development of marinas in the selected locations, increases the pressure on the sea area as the navigation will increase, but also increases the pressure on land space, as traffic flows will change, creating new pressures in urban areas. The extension of bathing beaches implies larger number of bathers, thus creating greater needs for infrastructures in land area for their service. The location of the diving park is crucial, since it will upgrade the nearby coastal area, but will apply more pressure in an already saturated area and also change tourist flows in the study area. The coastal regeneration project, as planned, will upgrade the inland section of the beach but in some areas it is expected to cause a reduction of the beach area either due to the coverage by man-made structures either by increased erosion. Increased erosion, will lead to need of new coastal protection projects in maritime area. The holistic approach results show that each development intervention, except of the local impacts, causes also positive and negative effects in neighboring municipalities, like changes in tourist flows between antagonizing areas.

During project planning and interventions in the coastal area, it is a necessity to take into account the impact of the land – sea interactions, both at local and regional level. The implementation of the decision analytic approach can identify future pressures and indicate the interactions of land and uses in local level and in regional level. A holistic approach of the coastal area would have contributed to reduction of negative interactions for the study area, both between land and sea and between the development projects. All of the above highlight even more the need for an integrated view of terrestrial and maritime space, as well as to ensure the participation of a large number of experts and stakeholders from all scientific and administrative fields, during the implementation of maritime spatial plans.

Keywords: Coastal land uses; maritime uses; interaction; Crete Island; Greece

ZONING AND MANAGEMENT SYSTEM IN THE SOUTH SUMATRA PROVINCE: IMPLICATIONS OF INDONESIA'S LEGAL REGIME ON MARINE SPATIAL PLANNING

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The paper examines the extent to which the paradigm of marine planning policies and practices can be implemented. In Indonesia, marine spatial planning (MSP) and management efforts with the zoning system has begun in the past decade with the legal regime of the Law no. 27/2007 Jo. no. 1/2014. Previously, the zoning system has been implemented at the district level, however, but since the enactment of the Law no. 23/2014, zoning should be made at the provincial level. The consequences are the map scale to be small and should involve many stakeholders, and became a great political consensus. As the case in the waters of South Sumatra Province, the coastal community involvements are still lacking in the planning of the coastal and small islands management. Accordingly, the interests and aspirations of the community were not accommodated during the public consultation process and build mutual agreement. In fact, currently, the provincial government is promoting the maritime industrialization attempts; with relatively small water area is expected to have an impact on the reduction of space for the livelihood of the fishermen. Therefore, the implementation of the new regime should consider the concept of shared management between the government and the autonomous regions, both the district to the village level. On the other hand, participatory approach should be increased.

Keywords: marine spatial planning; zoning system; coastal and small islands management; South Sumatra; Indonesia.

CAN ROMANIA ACHIEVE ITS 2021 MSP TARGET? A SCENARIO BASED ON MODELING AND INPUT FROM STAKEHOLDERS

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Ocean governance is an emerging challenge. Increasing demands on marine resources and activities taking place in the marine area are compromising the future use and viability of the marine environment. The social-ecological interactions in the marine areas are complex (natural and human), volatile and uncertain (e.g. tidal), intensified by external issues and vulnerabilities like climate change. Marine spatial planning is a useful and cost-effective tool for the regulation and protection of the marine environment. But the main challenge is how to design proper governance mechanisms that can foster these interactions. Our main aim is to determine the requirements for sectoral and integrated maritime governance in the Black Sea as well as the cross-scale effects, with a focus on consensus building and legitimacy in sectoral policies: fishing, ports and shipping, tourism, offshore energy, and integrated policies: Maritime Spatial Planning (MSP), ICZM, Integrated Maritime Policy (IMP). A special attention is paying to compare natural and historical (geo-political) characteristics to understand the activities, policies, and governance regimes, including cross-boundaries cooperation. In this context, our project covers highly actual aspects concerning the way the marine spatial planning process evolves. The need to pursue new approaches and commitments for a sustainable utilization of marine resources has become very clear. We aim at an integrated approach of the social, economic, and ecological factors affecting the Romanian Black Sea coast via implementation of the ecosystem approach to marine management. During the ongoing national project MARSEA (www.geo.unibuc.ro/marsea), conducted by our team, the activities are structured on three directions: (1) Setting up the scene for MSP in Romania, (2) Mapping and demonstrating MSP using MARXAN (wildlife distribution and human uses, current and future), (3) Create an enabling environment for participatory marine and coastal resource management and capacity building. Analysis revealed that science has sometimes developed separately from society and societal needs and not fully understood by ordinary people. Our findings suggest that more must be done not only to raise public awareness of critical issues, but also to find ways of actively engaging with civil society, stakeholder groups, and the public at large in the preparation and execution of marine spatial plans. Lack of coordination and effective policies between the governmental institutions and the different sectors of activities were also identified as common problems for both environmental and socio-economic aspects. However, best practices as well as bad examples will provide support in governance and adaptive management and should be addressed for knowledge improvement and science-policy transfer. We will also provide guidelines on how to join and use spatial information in all steps of marine spatial planning. Effective and integrated marine spatial planning will contribute to deliver a coherent spatial plan that reduce conflicts of the Romanian marine environment, as well as minimising the pressure and impact on the marine environment.

Keywords: governance; legislation; public participation; spatial planning; Black Sea.

MARINE SPATIAL PLANNING FOR ENHANCED FISHERIES AND AQUACULTURE SUSTAINABILITY

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The outcomes of two recent FAO projects are used in the presentation to highlight policy-level guidance on marine spatial planning for enhanced fisheries and aquaculture sustainability. Drawing from the publication, “*Marine spatial planning for enhanced fisheries and aquaculture sustainability – its application in the Near East*”, a clear and comprehensive account for the application of marine spatial planning (MSP) within the Regional Commission for Fisheries (RECOFI) region is made. The work builds on regional technical workshops, held under the auspices of the FAO, aimed principally at improving the prospects for fisheries and aquaculture in the Gulf and beyond. Following a case study on Saudi Arabia the potential steps and considerations in adopting a marine spatial planning approach are identified.

The Horizon2020 project “*Marine Investment for the Blue economy (or MARIBE)*” is used to investigate the potential of multi-use of marine space to support sustainable growth in the marine and maritime sectors as a whole. These evaluations can form the basis of the logic, fairness and acceptability of the zoning, which in turn should lead to the marine spatial plan approval. The opportunities for companies to cooperate within the four key Blue Growth sectors (marine renewable energy, mariculture, marine biotechnology and seabed mining) to promote the multi-use of space are discussed through the lense of pilot projects from four maritime basins: Baltic basin, Atlantic basin, Mediterranean and Black sea Basin, and Caribbean Basin.

Meaden, G.J., Aguilar-Manjarrez, J., Corner, R.A., O’Hagan, A.M. & Cardia, F. 2016. Marine spatial planning for enhanced fisheries and aquaculture sustainability – its application in the Near East. FAO Fisheries and Aquaculture Technical Paper No. 604. Rome, FAO. (also available at www.fao.org/3/a-i6043e.pdf).

Marine Investment for the Blue economy: <https://maribe.eu/>

Keywords: aquaculture; fisheries; marine spatial planning; sustainability.

SUSTAINABILITY IN COASTAL AREAS: PROPOSAL OF AN INTEGRATED SYSTEM OF INDICATORS FOR ITS ANALYSIS AND COMMUNICATION

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Although Sustainable Development stands as the paradigm to follow in order to transform our social and productive model as well as our relationship with the environment, its implementation remains without success or the expected results are not fully evaluated. In particular, the international community has repeatedly emphasized the importance of coastal areas and levels of unsustainability they suffer. Currently, there is a large number and variety of information and data useful for the assessment of Sustainability in coastal areas. However, these resources are scattered and not organized in a way that allows an integrated analysis of Sustainability and that could guide its progress.

The research presented responds to the need to have a defined and accepted methodology that measures the trends (increasing or decreasing) of Sustainability issues in coastal areas. The methodological approach proposed for the assessment of Sustainability in coastal areas is based on a system of indicators to guide management decisions.

First, there is a critical analysis of the experiences available in the assessment of Sustainability. In this analysis, different issues were examined, such as: the geographic scope of the analysis, the identification of sustainability priorities, the identification of limits and trends, the conceptual frameworks used, the social agents involved, the system for selecting indicators, the real calculation (or not) of indicators, the definition of calculation methodologies, the elaboration and / or communication of conclusions, and the continuity of the calculation over time. The result of this analysis allowed assessing the achievements made so far and identifying constraints to overcome, guiding the progress of research in the field.

Taking into consideration the results obtained in the previous analysis and after reviewing diverse data providers and related bibliography, a novel methodological proposal is presented. It defines precisely the elements and necessary contents, as well as the order of the methodological stages, which are:

1. Delimitation of the coastal area.
2. Selection of Priorities for Sustainability.
3. Compilation of Indicators and Measures by Priority.
4. Pre-selection of Priorities, Indicators and Measures, through a Delphi participatory process.
5. Selection of Priorities, Indicators and Measures for calculation.
6. Integrated analysis and communication, through a graphic representation scheme.

As a result, an innovative methodology for Sustainability Assessment in Coastal Areas, dynamic and iterative, has been defined based on indicators. The proposal is complemented with a Coastal Sustainability Communication Scheme, with the aim of contributing to increase social awareness about responsible use of the coast and its natural, cultural and economic values.

MARINE SPATIAL CONFLICT RESOLUTION BASED ON COOPERATIVE GAME THEORETIC DECISION RULES. THE WHAT, THE WHY AND THE HOW.

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Conflicts related to the use of marine space can emerge either prior to, or after the adoption of a marine plan. Various decision support tools and processes that have been tested so far for addressing conflicts, although successful in providing identification and visualization of spatial conflicts and compatibilities and their relevant trade-offs, they fail to provide one single solution (i.e. allocation of space) acceptable from all parties involved, that resolves those conflicts. This happens because the spatial allocation rules that these processes adopt, usually focus only on the efficiency criterion that does not guarantee a single mutually acceptable solution. We propose that spatial allocation solutions should fulfill criteria such as efficiency, fairness, equity and transparency, while considering the formation of coalitions between interested parties, that may emerge. Based on this, we present the application of cooperative game theoretic decision rules that provide such solutions using two examples, one falling at the planning stage of MSP and one at the implementation stage. Finally, we further elaborate on the integration of such rules in already existing decision support tools and processes.

Keywords: Marine Spatial Planning, Conflict Resolution, Cooperative Game Theoretic Decision Rules

Wednesday 26 April 2017

1st session: Maritime sector's needs, opportunities & challenges

Chairman

Dr. Conor Norton, Dublin Institute of Technology, Ireland

Plenary speaker - Dr. Sadasivam Kaushik, IU-ECOQUA, ULPGC, Spain

FOOD FROM THE OCEANS: A CRITICAL APPRAISAL OF OPPORTUNITIES & CHALLENGES

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The increasing human population and the demand for food Is exerting pressure on land and freshwater resources. As regards “Seafood”, capture fisheries is at best stagnant, while “Aquaculture” still continues to show some growth, although it is not clear for how long this can and will continue. Anyway, seafood accounts for little (< 2%) of human food consumption in terms of energy and less than 16% in terms of animal protein and much less so if we take in terms of overall protein supply. To meet the putative increase in demand for seafood, currently we do not have many options: fishing down or at the top of the trophic level, expanding extractive aquaculture, reduce our reliance on marine ingredients in intensive fish / shrimp farming or go towards marine agronomy in a concerted manner. Given the inevitable impacts of terrestrial human activities on almost all the different components of the coastal and even off-shore ecosystems, efforts need to be initiated at the terrestrial level in order to limit the impacts at the land-water interface. An ecosystem-based management is needed to encompass all the economic and social activities to address the judicious exploitation of our ocean as a sustainable food source for humans over the long term. Besides being a source of food, ocean is also a source of other benefits to our day to day life: provision of energy (fuel), leisure (fun) without forgetting the conservation of biodiversity for the generations to come (future).

Keywords: seafood; fisheries; aquaculture; sustainability; human nutrition

IMPLEMENTING MARINE AQUACULTURE ZONING WITHIN MARINE SPATIAL PLANNING: A CASE STUDY FOR MADEIRA ARCHIPELAGO (PORTUGAL)

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Aquaculture zoning is an important step towards the economic, social and environment sustainable development of this sector.

This article presents a case study of establishing the first aquaculture zoning programme at the initial steps of Marine Spatial Planning in Madeira archipelago (Portugal).

Several areas were selected as suitable for offshore fish farming, the most promising and tested aquaculture system in the local environment and less conflicting with other maritime stakeholders, either space/water users (leisure, bird and cetacean spotting business), or involving resource exploitation (fisheries, sand abstraction).

The lack of history of large scale aquaculture operations, with implications for area/water users and corresponding environmental data, motivated a precautionary approach with environmental impact assessment procedures according national legislation, restrictions on the production volume (the output production capacity limited to 1200 metric tons of fish per licensed area), distance limitations between stock holding facilities (>500m) and maritime access corridors in between areas for the use of other maritime stakeholders.

The effective implementation of Marine Aquaculture Zoning within Marine Spatial Planning in Madeira will require: long-term commitment; recognizing rights to other stakeholders within managed areas; collaborative networking between space users; involvement of space users in monitoring and control programmes; coordination between environment, fisheries and aquaculture government agencies; effective management and enforcement.

Keywords: marine aquaculture, fish farming, aquaculture zoning, aquaculture development, precautionary approach

STRATEGIC ENVIRONMENTAL STUDY FOR OFFSHORE WIND FARMS INSTALLATION IN SPAIN

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The Renewable Energy National Plan 2005-2010 envisaged the establishment by 2010 of Pilot Marine Wind Farms and the possibility of installing nearly 1,000 MW in the Territorial Sea. In this context, and according to the third additional resolution in the Royal Decree 1028/2007, a Strategic Environmental Assessment (SEA) of the Spanish Coast was required. The SEA was jointly conducted by Ministry of Industry, Tourism and Trade, Ministry of Environment and Ministry of Agriculture, Fisheries and Food, through the collaboration of TRAGSA group during 2007-2008. A Preliminary Assessment of the Wind Farms potential effects on the marine environment was carried out in order to identify maritime-terrestrial public domain areas that fulfil the environmental conditions required for the installation of Marine Wind Farms, under the Act 9/2006 procedure, on the Assessment of the Effects of certain Plans and Programmes on Environment. The SEA, together with the subsequent characterizations of Marine Wind Areas (MWAs), should assist promoters in choosing the most suitable areas, and facilitates the design of installation projects submitted. Marine zoning was established through a graphical representation of the criteria defined in the document and those areas (72) were classified as follows with a simple colour code: Suitable zones (green); Exclusion zones (red); Areas with environmental determining conditions (yellow). The criteria for the establishment of “exclusion zones” and “areas with environmental determining conditions” were based on fishing activities and resources, maritime-terrestrial public domain, biodiversity and protected areas, environmental security, cultural heritage and landscape protection.

Keywords: offshore; wind farms; strategic environmental assessment; Marine Wind Areas; marine renewables energies

SITE SELECTION METHODOLOGY FOR RENEWABLE ENERGIES AND AQUACULTURE FACILITIES IN THE CANARY ARCHIPELAGO

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Integrated Offshore Management seems to be the next challenge in the future development of sustainable growth of maritime economies. The progressive increase in worldwide demands for marine-based renewable energies together with higher market demands for aquaculture-based food require a better knowledge on maritime spatial planning tools that allow optimizing the utilization of this space for different uses. That is the case of the foundation of energy production and the marine aquaculture installations where synergistic or competitive interactions must be thoroughly analyzed at the appropriate scale. The present work proposes a specific methodology that integrates several selection criteria responding simultaneously to the needs and limitations of the maritime aquaculture and renewable energy production, aiming to identify the most suitable marine areas to locate fish farming cages and wind and wave energy farms. This methodology was implemented in the 25 km coastal fringe off the five islands of the Canary Archipelago, taking advantage of a multicriteria approach based on independent probabilistic suitability analysis (time series of 20-30 years) for: (i) the structural requirements for aquaculture cages and energy systems; (ii) the operational limits for operation and maintenance activities (O&M); (iii) the wind and wave energy production potential; (iv) the feasibility to transport the energy to the grid; (v) and the biological requirements for eight selected fish species. A stepwise procedure was carried out, including: 1) suitability maps for aquaculture, wind and wave energy, with a spatial resolution of 0.01° and expressed in probability terms (0-1 scale), were generated by integration of some of the five previously established criteria; 2) an integrated co-location map, considering suitability thresholds for each activity, demonstrating the possibilities of coexistence of different uses. The results obtained show that potential zones for marine fish farming are concentrated southeast of the islands. For wave energy, areas located in the north and northwest of the islands stand out, due to the incidence of the waves, while for wind power, the potential areas are distributed heterogeneously, predominating areas in the south and southeast of the islands. From the spatial zoning created, potential co-location areas for wind power and aquaculture are identified in the southeast of the islands (e.g. Tenerife, 54 km^2 and Gran Canaria, 155 km^2), while 204 km^2 in Fuerteventura and Lanzarote are identified for the co-location of wind and wave energy systems. No significant areas are identified for the co-location of all the activities together. Thus, in this case study the opportunities for marine aquaculture and renewable energy systems are highlighted through the preliminary assessment of the potential exploitation of such resources in the study area. However, further developments in the maritime spatial planning framework should be implemented for the conflict analysis between marine uses and activities.

Keywords: Marine spatial zoning; co-location; marine renewable energies; marine aquaculture; multicriteria analysis.

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TEMPORARY AND SPATIAL PREDICTIONS TO SIMULATE THE IMPACTS OF ALTERNATIVE FISHERY POLICIES ON THE GRAN CANARIA MARINE ECOSYSTEM

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The inadequate fishery management policies carried out in the Canary Islands and the poor regulation of recreational fishing appear to be responsible of overfishing and fish resources depletion. Using the Ecopath with Ecosim software, we model five fishing scenarios and only those that reduce significantly the fishing effort of the recreational fishery would allow for recovery of the marine ecosystem in the short- and medium-term, including the most exploited stocks. The best results, in terms of abundance, were obtained when a geographical partition of rights of exploitation between artisanal and recreational fishermen was considered. This last scenario provides an adequate volume of catches for artisanal fishermen, thereby ensuring their livelihood. This work is a first approach in the use of spatial and temporal models to assess the effectiveness of alternative fishery policies at the Canary Islands.

Keywords: Ecopath with Ecosim; Canary Islands; Fishery Management; Overfishing

INTEGRATED ZONING FOR AQUACULTURE AND BIODIVERSITY - USING A SPATIAL DECISION-SUPPORT TOOL

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Spatial decision-support tools can guide decision-makers towards knowledge-based spatial planning. Their application for multiple-objective zoning is beneficial for supporting the on-going Maritime Spatial Planning (MSP) process, in particular in areas of high density of uses like the Adriatic-Ionian region (AIR).

In this work, we give contribution to the sustainable development of the aquaculture, as one of the main maritime activities for sustainable Blue Growth in the AIR. Aquaculture expansion should occur alongside the protection of biodiversity and the conservation of sites where aquaculture and its synergic uses can coexist. Planning for these objectives independently from one another has been shown to produce inefficiencies in costs, area, and conflicts across sectors. The objective of this research is to operationalize multi-objective zoning for aquaculture expansion and biodiversity protection (seabed habitats, marine mammals, seabirds and turtles species distribution, nursery and spawning areas of commercially important fish species). The area of analysis is the coastal area of the Emilia Romagna Region (Italian Northern Adriatic Sea). This area is the main producer of mussels in Italy and it is currently intensively crowded by several maritime uses, which are expected to grow over next years resulting in increase of conflicts and pressures on sensitive environments (Natura 2000 sites; Biological Protection zone).

The decision support tool Marxan and its advanced version Marxan with Zones are applied to develop planning scenarios. Firstly, we prioritise biodiversity conservation, through Marxan, while minimizing conflicts with other anthropic uses. Secondly, we carry out an aquaculture suitability analysis using a multicriteria evaluation approach based on environmental, biological and socio-economic conditions. Next, we simultaneously prioritize both aquaculture and biodiversity, through Marxan with Zones, while minimizing impacts on seven other industries operating in the Emilia Romagna Region.

We discuss an integrated zoning plan that meets targets for multiple objectives, and which adheres to several constraints regarding the location of aquaculture farms offshore in order to both allow the use of bigger technologies for mussel catch and minimize the impacts on coastal environments (pollution impact, visual impact).

Our analysis can guide multiple stakeholders and decision-makers towards cost-efficient solutions that are scientifically based, thus contributing to the marine spatial planning process and sustainable growth in the Adriatic-Ionian region.

keywords: Sustainable aquaculture development, Biodiversity conservation, Maritime Spatial Planning; Decision support tool; Marxan

Thursday 27 April 2017

2nd Session: Environmental Planning, Biodiversity Conservation within Blue Growth

Chairman

Dr. Angel Borja, AZTI Tecnalia, Spain

Plenary speaker - Dr. Irene del Barrio, European Environment Agency, Denmark

SPATIAL COMPONENTS OF THE MARINE ENVIRONMENTAL PLANNING WITHIN THE EUROPEAN LEGISLATION

Irene del Barrio

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The marine environment in Europe is protected by a number of Directives that apply to different features and have diverse spatial components. These Directives frequently define frameworks for the establishment of environmental objectives and the implementation of plans to help achieving them. It is the case of the Nature Directives (Habitats and Birds), the Water Framework Directive or the Marine Strategy Framework Directive (MSFD). In all of them, the features to be protected have to be delimited (e.g. species, habitats, water bodies), and the human activities affecting them have to be identified and addressed by programmes of measures. All this information has to be reported to the European Commission, generally in formats agreed with all Member States. Then, the Commission makes use of it to assess the policy effectiveness and to check that Member States are implementing the normative adequately (compliance check). The reporting is done through a web-based infrastructure of the Eionet (European Information and Observation Network), maintained by the European Environment Agency (EEA). It allows free access to all information submitted by Member States, except cases where a Member State has restricted it. The EEA, which main mandate is to assess the state of the European environment, also uses the information submitted via the European reporting obligations. However, in order to complement these assessments, it receives more data via the Eionet. All the information used for EEA's assessments is published and accessible via EEA's website, where a Spatial Data Infrastructure is held for the spatial datasets. However, the marine environment will have soon a thematic website to access mainly the information produced and submitted under the MSFD, namely WISE-marine. Among this, a metadata catalogue will allow the discovery of the spatial datasets resulting from the monitoring programmes and used in the assessments of the Good Environmental Status (GES), in which pressures produced by human activities are included. The Maritime Spatial Planning Directive also requires the collection of the information on human activities, as well as taking into account all the marine environmental planning set up within the implementation of the above mentioned Directives. Therefore, the Community environmental legislation becomes a consistent base for the marine spatial planning in Europe, providing a lot of information on what to protect and how.

AQUACULTURE AND MARINE PROTECTED AREAS: EXPLORING POTENTIAL OPPORTUNITIES AND SYNERGIES

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To meet Aichi Target 11 on marine biodiversity protection and Aichi Target 6 on sustainable fisheries by 2020, as well as the Sustainable Development Goal (SDG) 2 on food security and SDG 14 on conservation and sustainable use of the oceans, seas and marine resources by 2030, there is an urgent need to rethink how best to reconcile nature conservation and sustainable development. Therefore it is important to put in place effective governance to support processes that apply principles of sustainable development and an ecosystem approach to decide about economic activities at sea such as aquaculture.

There are opportunities, benefits and synergies between aquaculture and MPAs. There is not yet a comprehensive analysis of aquaculture and MPAs but there are some examples of positive interactions between aquaculture activities and MPAs such as fisheries enhancement, services to the ecosystems or economic resilience of MPA local communities. There are also unintended negative consequences to be discussed to present balanced arguments.

It is recognised that aquaculture is an important activity in terms of sustainable development. It can play a role for food security, poverty alleviation and economic resilience, in particular for MPA local communities and contribute to wild stock enhancement, as an alternative to overfishing and for providing services to the ecosystem.

There is a need on both aquaculture and MPA sides for clarity of objectives and willingness for open and extensive dialogue from the outset. Clear procedures for site selection and MPA designation are important in order to avoid conflict and favour synergies.

There are a number of available tools and methods for supporting greater synergies between aquaculture and MPAs, such as the ecosystem approach, and carrying capacity, ecosystem impact assessment and certification processes.

The results from this work have already helped to build a common understanding between conservation and aquaculture and initiate a rapprochement for increasing synergies. It is also hoped they will act as further stimulus to develop new areas of research and, together with that, to move forward with the development of new strategic guidance on optional conditions for coexistence of MPAs with aquaculture.

OCEAN METABOLISM, HETEROTROPHIC ENERGY PRODUCTION, VERTICAL PARTICLE FLUX, NUTRIENT RETENTION EFFICIENCY, AND BENTHIC RESPIRATION

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Before nitrification, before photosynthesis, respiration defined life. In marine plankton is cold fire, oxidizing organic compounds to CO₂, returning organically bound elements to their elemental constituents, reducing inorganic electron-acceptors, and producing energy-currency molecules to drive all their life processes. In biological oceanography, we measure respiration only to calculate net primary productivity or the nutritional transfers for key zooplankton species. But, respiration is much more. In ocean water-columns it defines the biological pump, heterotrophic energy production, nutrient retention efficiency, carbon flux transfer efficiency, benthic metabolism, carbon sequestration, and carbon burial. Conceptual advances in these ocean processes by the EOMAR team at the University of Las Palmas, Gran Canaria are presented here. We explain the new concept of Nutrient Retention Efficiency, how to calculate vertical elemental flux from plankton respiration, the importance of the curvature in the plankton respiration-depth profile, the calculation of energy production, calculations of zooplankton respiration profiles from Longhurst-Hardy Plankton Recorder samples, the real meaning behind Kleiber's Law, corroboration of the enzyme kinetic model of respiration, the calculation of seafloor respiration and benthic carbon burial from respiration-depth profiles.

Keywords: Ocean metabolism, Respiration, Carbon Flux, ETS, ATP, zooplankton

SEAWETRA, A MSP TOOL TO SUPPORT THE CONSERVATION OF THE MARINE MAMMALS IN THE PELAGOS SANCTUARY

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The art. 8 of the Marine Spatial Planning Directive 2014/89/EU indicates that "*Member States shall set up maritime spatial plans which identify the spatial and temporal distribution of relevant existing and future activities and uses in their marine waters, in order to contribute to the objectives set out in Article 5*". The Directive lists a series of activities including fishing areas, maritime transport routes and traffic flows, nature and species conservation sites and protected areas, scientific research and tourism. To gather such geographical information inside a unique platform is a great challenge for environmental protection. However, nowadays, environmental stakeholders suffer the lack of such multi-disciplinary platforms. Moreover, the INSPIRE Directive 2007/2/EC clearly states how geographic information should be organized in order to be easily understood, visualized and be interoperable. In this context, SEAWETRA have been developed as a WebGIS platform dedicated to gather information useful for the conservation of the cetaceans protected by the Pelagos Sanctuary and by the ACCOBAMS. Moreover, cetaceans are bio-indicators of the marine ecosystem as umbrella species and are listed as bio-descriptor 1 and 4 for the Marine Strategy Framework Directive 2008/56/EC. SEAWETRA's concept is organized in two main objectives: 1) to collect, archive and visualize geographical information coming from a large spectrum of datasets in an interoperable format; 2) to support decision making through an Ecosystem-Based Approach. The presentation will present the types of data that has been selected to feed SEAWETRA, some being static other being dynamic. The presentation will also show practical information to support the governance of the Member States. As dynamic data, SEAWETRA maps earth observation parameters and oceanographic models from the open-data service Copernicus (in particular SST, chlorophyll concentration, MFS forecast model). For this purpose, the dynamic legend tool has been developed in order to allow the user to adapt the scale color in function of the plot data. SEAWETRA also maps data collected *in situ* by CIMA Research Foundation in collaboration with i) tourism operators as whale-watching operators; ii) along the ferry lines and iii) during dedicated surveys to study cetaceans. In this case, the system allow the user to choose to plot specific species or type of vessels. Overlapping species distributions with the oceanographic parameters, it is possible to build some cetacean habitat models as for instance the model produced by the JRC Fin Whale Habitat (another dynamic data of SEAWETRA). Other cetaceans data are pooled in the platform using the crowd-sourcing data collected by Ushahidi platform (an application for Smartphone and web). In this case, this service was implemented to map in a dynamical way the strandings and to help stakeholders to identify the early signs of an epidemic. Maps of the spatial and temporal distributions of fishing vessels or maritime transport routes and traffic flows are also available in the platform. Indeed the platform allows to visualize the Automatic Identification System data (AIS) provided by AISHub. Raw data (positions of vessels) can be displayed and used to draw the polylines of the tracks of the vessels. From 18months of ferries polylines, it is been possible to determine the width of the main ferry corridors. The position of the corridors and the density of the traffic over the corridor can be used to access the associated level of impact risk on cetaceans. The platform also includes some administrative areas (Regions, cities, MPAs) as static layers related to cetacean conservation. When it is possible the data comes from an existing WMS, WFS service provided by territorial authorities (for instance the Natura2000 protected sites of Liguria Region Italy). When the data is produced by CIMA Foundation, the data is presented in the INSPIRE standard accordingly to the related Data Specification (Protected Sites, Habitats and Biotopes, Species distribution).

MICROPLASTICS: A GLOBAL PROBLEM THAT NEEDS GLOBAL COOPERATION

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As a result of different processes of degradation and fragmentation, plastics smaller than 5 mm, called microplastics, are accumulating in the oceans. In recent decades the size of these particles is getting smaller, their abundance is increasing, and their distribution is becoming more and more global. The European Union (EU) has identified the environmental effects of microplastic as one of the main issues of concern within the framework for the conservation of marine ecosystems (MSFD: 2008/56/EC).

Microplastics, due to their size, can be ingested by zooplankton and transferred up the food chain. There are physical hazards associated with this ingestion, but in addition it poses a biohazard because microplastics adsorb persistent organic pollutants (POP's), including polychlorinated biphenyls (PCBs). Because of this biohazard, it is necessary to quantify the ingestion rate, the PCB adsorption by microplastics, and how it affects the organisms. In addition to estimating the microplastic ingestion rates in zooplankton, it is also imperative to estimate their egestion rates. In this way the rate of incorporation and eventual transfer to zooplankton predators can be determined.

Microplastic contamination has been found everywhere in the world even in remote areas, and microplastic ingestion has been reported in many marine species. However, in order to integrate and compare data from different areas and from different species, standard techniques, methods and measurements of microplastics from land, sea and biota are needed. In addition, a global database to share data and improve communication between researchers and policy makers needs to be created.

In 2015 the University of Las Palmas de Gran Canaria (ULPGC) launched the Microtrophic Project within the research group, EOMAR from IU-ECOQUA, to study the impact of microplastics on the marine food web. It was the first step in finding solutions to this serious microplastics-environmental problem. It started as a one year study of temporal variability of microplastic pollution in three islands. Here, we present the preliminary results of the Microtrophic Project highlighting the PCB content of microplastics collected in the three islands and the first report of microplastic ingestion by planktivorous fish in the Canary Current.

Keywords: marine litter, plastic pollution, microplastic, PCBs, environmental conservation

JELLYFISH BLOOMS AROUND THE WORLD: THE ROLES OF CLIMATE AND HUMANS

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Jellyfish are known mostly for the problems they cause humans, which include stinging, clogging fishing nets, killing fish in aquaculture pens, clogging seawater intakes from power and desalination plants and ships. Ironically, blooms jellyfish occur where the environment is most deteriorated by human activities around the world. Environmental deterioration is accelerating and jellyfish may benefit. Introductions of non-indigenous species (NIS) also have increased and probably will accelerate from increased shipping and widening of canals. Although blooms may have increased, causes of blooms are unknown for almost all species. Many basic life-history characteristics are inadequately studied, including reproduction, growth, and mortality rates that contribute to the dynamics of jelly populations. Those data are essential to understand their importance. Although of great potential significance for fisheries and aquaculture, the trophic interactions between jellyfish and fish are inadequately studied. New indirect trophic techniques have become popular to provide insight into food web relationships, but past methods should not be abandoned. Instead of laborious feeding rates, ingestion calculated from metabolic data can be combined with biomass data for use in ecosystem models. Jellyfish should be included in fishery studies, ecosystem studies, and fishery management plans. Improved and miniaturized technology has provided new techniques for studies on jellyfish. New uses for jellyfish are being developed, with many potential benefits in medicine and as food.

Keywords: aquaculture, fisheries, coastal development, shipping, medicine

THE ENGO EXPERIENCE OF MARINE SPATIAL PLANNING: WWF'S REFLECTIONS IN EUROPE TO DATE.

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Aim

This research seeks to bring together WWF's views and experiences from engaging in national and regional marine spatial planning (MSP) processes in Europe, in order to develop common themes and recommendations for future MSP development.

Background

WWF is a major stakeholder in the development of MSP across Europe and has been a leading advocate of MSP as a tool to help restore ecosystems and achieve Good Environmental Status. The Maritime Spatial Planning Directive requires EU Member States to implement an ecosystem approach to MSP. Some countries have already completed at least one full cycle of planning, while others are at a very early stage. At this important time, WWF's shared reflections on the early development of MSP will be of great value to decision makers and other stakeholders to help assess the effective implementation of an ecosystem approach and highlight examples of best practice.

Methods

Semi-structured interviews lasting at least an hour were held between WWF staff working in the Baltic, Mediterranean, North and Celtic Seas, during which staff were asked about their experiences of MSP to date and of examples of good or bad practice in aspects such as stakeholder engagement, support for marine protected areas, transboundary coordination and taking a forward-looking approach.

Findings and conclusions

Overall, WWF considers that much progress has been made in several countries to date on the delivery of MSP as a process, with early adopters making improvements over time. However, countries and regions display significant variations in stakeholder engagement and implementation of forward-looking approaches to MSP. Although intra-regional variations also occur, in general, Baltic Sea countries were considered to be the most developed in delivering an ecosystem based approach, based on effective cooperation, while countries in the North and Celtic Seas were most advanced in engaging stakeholders. In the Mediterranean, MSP is less well developed but early stages raise concerns about the degree of coordination and stakeholder engagement. We consider that the sharing of experiences and information is crucial to improve the implementation of MSP in a way that effectively embeds the principles of ecosystem approach.

Thursday 27 April 2017

2nd Session: Marine/Maritime Information Systems & Data Management

Chairman

Dr. Hugo De Grof, European Commission, Directorate-General Environment, Unit E.4

Plenary speaker - Ms.c Manuel Frias, HELCOM Secretariat, Finland

HELCOM WORK ON A MARINE SPATIAL DATA INFRASTRUCTURE FOR THE BALTIC SEA

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HELCOM Secretariat, Finland

In this presentation we will describe the background, status and challenges of the HELCOM work toward a Baltic Sea Marine Spatial Data Infrastructure (MSDI) based on decentralized regional data exchange of geographical data.

The governance of marine space requires nearly always transboundary datasets as maritime activities are commonly international. This is true for dedicated intergovernmental organizations like the Helsinki Commission, or HELCOM, in the Baltic Sea region. It is also true for national actors including marine spatial planners, who frequently need updated information beyond the borders of their country.

As the remit of HELCOM covers the effects of all human activities to the Baltic Sea marine environment (including at sea e.g. shipping, fisheries, oil and gas and renewables) its four decades of marine governance work has generated large amounts of data, as well as data products like maps.

The needed data has been generated either by dedicated regular HELCOM monitoring /data collection activities (e.g. measurements of pollution loads, environmental parameters or species populations), or by ad hoc activities where existing national datasets have been merged to harmonized regional datasets (e.g. national borders, protected areas, location of windfarms or aquaculture facilities).

The recent HELCOM and national activities in the field of Maritime Spatial Planning (MSP), as well as the overall trend in marine governance favoring the use of maps, has especially increased interest harmonized regional datasets. As updating such datasets requires commonly similar efforts as the original compilation, and thus considerable resources not commonly accessible in regional work, automatized approaches have to be used if one wants to ensure regularly updated datasets.

To address the challenges related to updating of regional geodata of this type one obvious solution is follow the European (e.g. INSPIRE Directive) and global trend toward decentralised databases. In the regional context of the Baltic Sea this requires the creation of a regional network of national data portals enabling automatic, or semi-automatic, generation of harmonized regional datasets via a joint nomenclature. As data in national databases is usually generated by national agencies to fulfill the obligations of national regulations they have good potential to be reasonably updated.

HELCOM led activities within the ongoing Baltic LINes project is to build a prototype of such a regional MSDI (Marine Spatial Data Infrastructure) to access harmonized cross-border transnational Baltic Sea geodata. The focus in this pilot project is shipping corridors and linear infrastructure (wind farms, cables and pipelines) but the aim is that the prototype will be developed to cover other data types in the future.

THE EUROPEAN ATLAS OF THE SEAS

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The European Atlas of the Seas is a web-based coastal and marine information system, originally aimed at the general public, but capable also of supporting non-specialist professionals in addressing environmental matters, human activities and management policies related to the sea. It is based on a combination of data (and metadata), originating primarily from the European Commission (EC) and its Agencies, which present a snapshot of both natural and socio-economic elements of coastal and marine regions in the European Union (EU) and its Outermost Regions. Further, it offers basic instruments to derive *ad hoc* indicators for a range of maritime issues, as well as map services and data analysis tools, such as product-to-product correlations, or time series visualization, to provide a quick, but detailed and reliable, reference source of maps, facts and figures.

The first idea of a European Atlas of the Seas was set forward already in 2007 by the EC “Blue Paper” that launched the Integrated Maritime Policy (IMP) of the EU. Early work on the Atlas was originally conducted by the EC Directorate General (DG) for Maritime Affairs (MARE), while the actual development of system architecture and infrastructure, data collection, map services and descriptive text, was assigned in 2013 to the EC Joint Research Centre (JRC), with the aim to facilitate access to new services and features, as well as the interaction with other available information tools.

The present European Atlas of the Seas consists of background layers designed to give basic information and to be displayed as map backdrop, as well as a number of geographical layers, classified under eight main categories: geography, nature, tourism, security and safety, people and employment, transport and energy, governance and European policies, fisheries and aquaculture. These thematic layers can be used to compose users’ customized maps.

The Atlas of the Seas’ capabilities for map exploration and combination can be used to extract *ad hoc* indications on various maritime themes from each data layer, or to combine together more layers for a comparative look at the same themes. The basic idea behind this characteristic of the Atlas is that of providing non-specialist, but professional users with analysis and interpretation capabilities, to couple data into ecological and socio-economic indicators. The Atlas’ EU-wide thematic map collection delivers a common baseline that can help EU Member States getting started with the Maritime Spatial Planning (MSP) Directive requirements. As this is widely seen as a pre-requisite for Blue Growth, future research extending current projects results and facilitating MSP applications will help combine protection and sustainable use of the European Seas’ ecosystem resources. Currently the Atlas, Version 4, accessible at the address http://ec.europa.eu/maritimeaffairs/atlas/maritime_atlas/, receives about 6000 to 8000 visits per month, with an average in excess of 200 visits per day.

Keywords: map; atlas; coastal/marine information system; European Seas; Maritime Spatial Planning.

THE ITALIAN IMPULSIVE NOISE REGISTRY

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The implementation of the Marine Strategy Framework Directive requires the establishment of a register of impulsive noise sources in order to implement both the Descriptor 11 of MSFD of the European Union and the Ecological Objective 11 of the Ecosystem Approach Process (EcAP) of the Barcelona Convention. The Interdisciplinary Centre for Bioacoustics and Environmental Research of the University of Pavia (CIBRA) currently participates to the development of a demonstrator of an impulsive noise register, managed by ACCOBAMS (Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contiguous Atlantic Area), for the Mediterranean and Black Sea that is compatible with the noise register developed by ICES (International Council for the Exploration of the Sea) for the OSPAR (Oslo and Paris Conventions) region. The primary aim of this international database is to assess the distribution in time and space of impulsive noise sources over the Agreement area. At the Italian national level, adaptations are underway to meet specific requirements for the Italian region. In this regard, the ACCOBAMS registry model, that is still in a demonstration phase, will be tuned up to host additional data about geographical features, Marine Protected Areas, impulsive sound sources details, measures of low frequency underwater noise and, in our intentions, will be linked to noise propagation modelling to evaluate the noise footprint of each sound source recorded/expected. It should also be linked to the Italian Stranding database to alert on and detect eventual overlapping of noise and cetacean stranding events. Data will be presented on a map system with selectable options to fit customers' specific interest. All such new features take forward the initial scope of the MSFD impulsive noise register and will open interesting opportunities for better understanding the relationship between underwater noise and cetaceans.

Keywords: Noise, Underwater acoustics, Marine Mammals, Seismic Surveys, Sonar

LAND TENURE REGISTRATION ON THE MARINE AREAS IN CROATIA

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Marine spatial data infrastructures and marine cadasters are mainly focused on sea and ocean related themes, like hydrography, topography, bathymetry, navigation, geology and marine biology. Onshore land administration is mostly parcel based and relies on strictly regulated official registers. Most of the registers are designed according to the needs of onshore land registration and do not meet the specific requirements of registration on marine areas, such as their three-dimensional extent, spatial and temporal variability, area overlapping, and they lack the appropriate registration of the boundaries and limits of land tenure on maritime areas. An efficient management and planning of activities on the sea and in coastal zone require a prompt and accurate information about existing tenure, i.e. information about the rights, restrictions and responsibilities in effect on a particular area, either marine, onshore, or covering both. The most common solution to the growing need of registration of tenure on marine areas is extending the competence of onshore land registers over the coast, to marine areas, adding a complex mesh of institutions to already complex mesh of relations and interests.

In this paper the existing registers, required and regulated by law, which may include interests on marine areas in Republic of Croatia are reviewed. The review includes the Register of concessions on maritime domain (ports and harbors, leisure facilities, amusement parks, mariculture, cables, pipelines etc.), Register of cultural property (underwater archaeological sites), Register of protected areas (various levels of protection according to the Law on nature protection), Register of approved mineral resources exploration areas and Register of established exploitation fields of mineral resources (hydrocarbons and salt), Register of issued licenses for fish and other marine organisms farming, as well the two key registers of real estate in Croatia, Cadastre and Land book (parts of marine domain defined as land parcels).

All of these registers were designed and function as „stand alone“ registers, so the consequence is that the cross-connections between different registers, spatial extents of registered objects, users and tenure and relevant data are weak or nonexistent. The compliance to existing international standards and directives, such as INSPIRE, Land administration domain model (ISO 19152 standard) and the emerging hydrographic IHO S-121 standard is an important step towards the interoperability of registers facilitating the use of tenure information in marine and coastal management systems.

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Keywords: marine areas, Croatia; LADM; land tenure, IHO

GEOCMS HOTSPOT: DATA EVALUATION AND PREPARATION

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Nowadays many actors in the field of environmental monitoring are producing spatial data about species occurrences and environmental status. In the context of national and EU reporting requirements (e.g. birds directive, habitats directive), public authorities often make use of data collected by nature conservation associations. To enable such work to be done using modern media, apps and web portals are offered to young and technology-affine people for mapping and reporting. The applications have been developed for citizen science (CS) projects using well known frameworks used for volunteer geography. The required open source software of the geospatial web (e.g. spatial DBMS, map clients, mapserver, statistical and GIS libraries, social media applications) can be linked with one another through their open source code and known interfaces. The exchange of data is still a challenge because of a lack in the use of standards regarding data specifications and data models as well as specific attribute information. NGOs are not obligated to comply with standards. This challenge can only be addressed with specific knowledge, techniques and financial expense. Public authorities have a focus on the performance of web-based spatial data infrastructures with regard on a standardized syntax of spatial datasets and semantics (e.g. INSPIRE data specifications). They have to follow legal obligations on national (e.g. spatial data access act, environmental information act) and EU-level with a focus on the „*Infrastructure for Spatial Information in the European Community*“ (INSPIRE, EC/2/2007). This allows to overcome data incompatibility and enables the usage of data within the EU. At the same time, only few cooperation agreements provide a timely transfer of species data to authorities. Many authorities still offer analogue report sheets which can be sent back by postal services instead of web-based interfaces.

To cope with those barriers we developed the *Geospatial Content Management System HotSpot* for NGOs based on a requirements engineering, UML documentation and modelling and scheme mappings. The system built on a modularized architecture is fully built up out of open source software on top of the CMS *CMSmade simple*. Modules programmed with PHP, JavaScript, Python and HTML/5 support the implementation and management of web-based questionnaires and mobile web apps including quality controls (*HotSpot Survey*), geostatistical and GIS analysis in the form of OGC web processing services (*HotSpot Analyzer*), a management (*HotSpot DataManager*) and the OGC- and INSPIRE-compliant publication (transformation, view and download) of species distribution datasets on the web (*HotSpot GoINSPIRED*). To provide citizen science data to officials, it is crucial to previously evaluate those. In our system we unite five different evaluation methods, that will be used depending on the data source (CS light vs. CS proper). We distinguish manual and automated evaluation methods. Manual evaluation of data can either be executed by an expert (expert evaluation) or by the crowd of users (crowd evaluation). Those methods will be only applied for CS light data. Automated data control can be either carried out using a temporal or spatial distribution of pre-existing data. Furthermore, with the *HotSpotSDM* web processing service, we implemented a method for automated data evaluation based on species distribution models (SDM). Here we are using the OGC WPS standard, as implemented in PyWPS along with R Statistics, to predict the ranges of terrestrial as well as marine species based on open databases. Binary species distributions (true/false) are calculated on 10×10 km species distribution units (SDU) using existing records of the Global Biodiversity Information Facility (GBIF) and sets of predictor variables of the two open databases BioClim (terrestrial) and Bio-Oracle (marine). As a result, the process returns GIS conform datasets consisting of the SDM, a representation on INSPIRE SDU grid as well as a statistical evaluation which also can be accessed using the INSPIRE download service provided automatically by the GeoCMS.

Keywords: INSPIRE; Spatial Data Infrastructure; GeoCMS; Species distribution; data evaluation

SIMBIO: COMPUTER SYSTEM FOR STRENGTHENING DECISION-MAKING IN BIODIVERSITY AND MARINE COASTAL PROTECTED AREAS IN GUATEMALA

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Guatemala is located north of the Central American isthmus, between the meridians 88 ° 00 'and 92 ° 30' W and the parallels 13 ° 30 'and 18 ° 00' N, occupying an area of 108,889 km². The National Council for Protected Areas (CONAP), responsible by law for the administration of the Guatemalan Protected Areas System (SIGAP), has different functions, such as, the administration, protection and conservation of Protected Areas and the Biological Diversity of the country, managing 309 protected areas with more than 34,000 km², equivalent to 30% of the national land and 15% of the national land and sea area.

Guatemala is implementing a grant from the World Environment Facility (Global Environmental Fund) for the execution of the Project “*Conservation and Sustainable Use of Biodiversity in Coastal Marine Protected Areas*” (APMs), whose implementing agency is the United Nations Development Program (UNDP). Within the framework of this Project, the Coastal Marine Information System for Biodiversity (SIMBio) is being developed. Its purpose is to store, manage and analyze technical and scientific data related to coastal marine topics and biological diversity, as well as their relationship in management of protected areas. SIMBIO, once fully deployed, will offer a management facility, based on quality geographically geo- referenced, standardized, and immediate information for marine-coastal and biodiversity, in order to make possible fast management decisions in the Guatemalan Pacific Coast.

The SIMBio System, on the one hand, ensures the scientific and technical quality of the evaluation process of the information collected through this technology, as well as the definition of the results to be presented to facilitate decision-making. On the other hand, the system also ensures the accurate incorporation of the technical conditions in the validation process, favouring the use of this tool through different types of technology that allows the users a diversity of elements in their work.

For UNDP and CONAP, it is important to implement this type of initiatives and projects, as a contribution to better decision-making and for a proper management of biological diversity.

DECISION SUPPORT CONCEPT TO DESIGN OF MARITIME SPATIAL PLANS RELATED TO DEVELOPMENT OF ANCHORING CAPACITIES – CASE STUDY CROATIA

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Planning of nautical tourism development and especially planning of its supporting infrastructure (such as ports, marinas, anchorages) development are important topics when maritime spatial planning is conducted. Focus of research presented in this paper is in modelling of concept that will provide support to spatial planning specialists in design of maritime spatial plans (MSP) related to development of anchoring capacities for small vessels as a suitable framework for sustainable development of that nautical tourism branch. Even more precisely, research is focused in modelling of the decision support concept (DSC) to design of MPS meaning support to processes of identification, validation, comparison and selection of locations for construction of anchorages that will be included in MSP. It is complex and ill-defined problem because of several reasons such as involvement of multiple stakeholders having diverse interests, multi-disciplinarity, huge quantity of information and data (especially of spatial data), limited resources, numerous conflicting goals and criteria. Therefore proposed DSC is designed to enable inclusion of multiple stakeholders in all previously mentioned processes as well as to enable mitigation of the conflicts between stakeholders, making easier design and implementation of MSP. Furthermore, it supports design of MPS that define usage of maritime space in a way that enables maximization of positive social and techno-economic impacts of anchoring branch on local community while ensuring the highest possible protection of natural and cultural heritage. In order to cope with such complexity it is proposed a generic DSC to design of MSP for construction of anchorages based on Geographic Information Systems (GIS is used as a database and for provision of spatial analysis), multicriteria methods (PROMETHEE methods are used for comparison of locations, AHP method is used for determination of criteria weights), goal analysis (used for identification of significant goal, objectives and criteria in a form of a goal three) and logic of decision support systems (DSS). The concept is tested on design of MSP for the island of Solta in Croatia and it was proved as applicable, consistent, efficient and effective methodology for design of MSP.

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Keywords: decision support concept; maritime spatial planning; multiple stakeholders; AHP; PROMETHEE; GIS

Thursday 27 April 2017

3rd Session: Maritime Spatial Planning & Blue Growth

Chairman

Dr. José Aguillar Manjarrez, Food and Agriculture Organization of the United Nations
(FAO), Rome, Italy.

Plenary speaker - MSc. Lodewijk Abspoe, Directorate-General for Spatial Development
and Water Affairs, The Netherlands

MSP AS PATHWAY TO BLUE GROWTH IN THE NETHERLANDS

Abspoel, L.

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Hence we took the Blue Growth agenda from Limassol and checked against what our part of the North Sea could contribute to societal needs and tap into the potential, particularly looking into marine energy, aqua- and mariculture, tourism, blue biotech and deep sea mining. Not forgetting the existing sectors of course, for those are our cash cows at the present.

We've gone back and forth to sea space and innovation, bearing in mind the agreements of restoring the eco system as to have clean, healthy and productive seas and coastal areas.

Our view was a long term one: 2050. Allowing us to look at a fossil free and circular economy and giving us perspective on future generations.

A challenge not only in terms of managing marine space, but also of keeping perspective for all stakeholders in making the transition to a green-blue economy.

MARINE SPATIAL PLANNING IN REGIONAL, INSULAR TERRITORIES. THE ROLE OF REGIONS AS CRUCIAL STAKEHOLDERS AND POLICY MAKING AUTHORITIES

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Maritime activity in the Eastern Mediterranean such as maritime shipping, fishing, aquaculture and tourism, have a huge economic impact to the coastal areas, and involve various end-users, stakeholders and economic operators. Increased demand for maritime space over the last decades and future activities such as oil exploitation, ocean energy and raw materials' extraction, indicate the involvement of different levels of authorities at a regional, macroregional and transnational scales. Furthermore, Integrated Maritime Policy and 2014/89/EU Directive, have established a definite framework for EU Members for an integrated approach of coastal zone management, and for the implementation of an ecosystem approach through the marine spatial planning. Land-sea interactions along with the economic and social aspects must be taken into account, for the coordination of activities and maritime space uses, through an environmentally benign approach for the sustainable development and protection of the biodiversity. In a such perspective, management of coastal and marine areas has been turned out into complex and sensitive procedure, by involving different levels of authorities and various stakeholders and end users, including the public.

In Crete, an island of 8336 Km² land area and 1050 Km coast line, fast growing of numerous activities at the coastal zone, such as tourism, fishing, shipping, ports, constructions, indicate the necessity of a multi-sectoral management with an holistic, integrated approach for implementing sustainable marine policies. Taking into account the growing vulnerability of the marine environment and the need for a sustainable use of ecosystem services, economic development does not have to conflict with the continuous delivery of the ecosystem services perpetuity. That kind of approach could regulate human uses of marine space, by protecting marine environment and delivering the marine ecosystem services and societal benefit. Thus, highly variable marine environment at the Eastern Mediterranean, together with the variable MSP approach regarding to the sea basin geographic limits must is taken into account.

As MSFD follows an adaptive management approach while at the same time MSP and ICZM procedures must be kept up to date and reviewed every six years, that brings to attention that relative national and regional ongoing frameworks and funding opportunities with local peculiarities must be counted on for the better implementation of the Directives. Public consultation focusing on users and entrepreneurs at the coastal zone must be seriously taken into account, and citizens participation must be enhanced, through specific tools and processes.

The role of a Regional Authority should be dynamically and crucially active, by adaptating specific tools for raising environmental awareness on the uses of the coastal zone combining vertical scientific knowledge deriving from the research sector with an horizontal integradtion of regional and local peculiarities in the coastal-marine zone and by boosting the societal and political engagement of people to the environmental and planning issues at the territory. For that purpose, the integrated geographical systems applications (Crete's Regional GIS) and Cloud ICT platform (developed in terms of «STEP» H2020 Undergoing Project) are being used by the Crete's Regional relevant authorities.

Keywords: Marine Spatial Planning; Eastern Mediterranean; Regional stakeholders; Crete

SYMPHONY-A SWEDISH TOOL FOR CUMULATIVE IMPACT ASSESSMENT IN MARINE SPATIAL PLANNING

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Sweden has started its national marine spatial planning process that will lead to three marine spatial plan proposals delivered to government in 2019. The plans will together cover all Swedish territorial sea and the EEZ, excluding the coastal waters, which are covered by municipal spatial planning. One of the major ambitions is to implement the ecosystem approach in Swedish MSP. The possibility to integrate assessments of cumulative environmental impact in the planning process has been identified as crucial for implementation of the ecosystem approach.

Sweden has hence developed a tool, Symphony, in which assessment of ecosystem values, in terms of ecosystem components, and pressures from human activities is carried out in a spatial GIS-like context. Symphony is a tool developed at SwAM under the lead of Ph.D Linus Hammar. It is based on scientific methods for large-scale cumulative impact assessment but stands out with the practical link to Marine Spatial Planning. The aim is to use Symphony to evaluate different planning alternatives in search for sustainable planning solutions and as part of the environmental impact assessment.

Input-data and preliminary results, all based on existing data, include:

- About 30 maps of ecosystem components (benthic habitats, fish, porpoises, seals, seabirds, reefs, seagrass and plankton)
- Aggregated maps indicating biodiversity hotspots and sensitive areas
- About 30 maps of human pressures (shipping noise, oil spill, fishing, military activities, wind farm bird avoidance, pollution, eutrophication, coastal exploitation and more)
- Sensitivity scores weighting the effects of pressures on ecosystem components
- Impact maps representing the total cumulative impact in the planning areas and beyond

The applied method is transparent and can be used in any country and as a basis for transboundary consultations. HELCOM is using a similar method for assessment of the ecosystem status and pressures (HOLAS II). Sweden has a bilateral collaboration with NOAA in the US regarding the development of Symphony, and support from Chalmers University of Technology and NIVA Denmark Water Research.

At MaPSIS 2017 Jan Schmidtbauer Crona, Daniel Mattsson or a representative from the Swedish Geological Survey will hold a presentation of the current status of Symphony, including baseline results.

SIMCELT: SUPPORTING IMPLEMENTATION OF MARITIME SPATIAL PLANNING IN THE CELTIC SEAS

O’Higgins, L., Onwona Ansong, J. and O’Hagan, A.M.

Maritime Spatial Planning; good environmental status; ecosystems based approach; transboundary cooperation; Celtic Seas.

The regulation of maritime activity in Europe’s regional seas is governed by two overarching policy initiatives; the Integrated Maritime Policy (IMP; EU 2007) and the Marine Strategy Framework Directive (MSFD; 2008/56/EC). Achieving a sustainable balance between national economic ambitions for blue growth and the achievement of Good Environmental Status (GES) however is a complex challenge. In response to this, the European Council have adopted the Maritime Spatial Planning (MSP) Directive (2014/89/EU) placing a statutory obligation on coastal Member States (MS) to develop cross-sectoral and spatially specific maritime spatial plans by March 2021. Advocating a holistic Ecosystems Based Approach (EBA), Dir. 2014/89/EU also requires Member States sharing a maritime border to coordinate planning efforts across boundaries and to ensure the collective pressure of maritime activity stays within levels compatible with the achievement of GES. Transboundary plans must therefore take account of potential cumulative and/or downstream effects and where necessary, include the development of sea-basin or macro-regional strategies.

One of a series of similar regional seas initiatives co-financed by DG-MARE, the SIMCelt project therefore focusses on promoting the development of transnational cooperation to support EB planning across transboundary zones of the Celtic Seas. Led by University College Cork, SIMCelt comprises a dynamic consortium of maritime spatial planners and researchers from seven partners representing a mix of governmental authorities and academic institutes from Ireland, France and the UK. Taking a practitioner-led focus and drawing on existing institutional cooperation structures, SIMCelt partners are working together to share best practices, enhance regional cooperation and support greater regional coherence to national planning efforts across the Celtic Seas. In doing so SIMCelt builds on the outputs of previous EU-funded projects such as the Celtic Seas Partnership and Transboundary Planning in the European Atlantic and contributes to the broader policy goals of the Maritime Strategy for Atlantic Ocean Area and the associated Action Plan for the Atlantic Area.

INTEGRATION OF SHIPPING COMPONENT INTO MARINE SPATIAL PLANNING PROCESS IN ESTONIA

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Marine Spatial Planning is a long-term process oriented on the future development of marine areas. Originally focus on ecological and environmental protection of sea areas included in marine spatial planning process nowadays encloses also economical and navigational safety components. Due to a rapid increase of cargo transit by sea and active use of marine areas for offshore developments it is extremely important to consider marine traffic routing and navigational safety during the marine spatial planning process. Since marine spatial planning is not yet implemented in Estonia it is important to estimate possible changes and risks in the development of shipping routes for the adequate integration of the navigation safety component into the marine area planning process.

The paper presents the overview of possible scenarios on the development of shipping in Estonia and estimates of existing shipping routes' efficiency due to future perspectives. The analysis is largely based on work done as part of the BalticScope project, where shipping traffic estimates are based on AIS (automatic identification system) data and consider international regulation of shipping (*e.g.* COLREG, UNCLOS, IALA, IMO). The contribution is focused on how shipping is spatially relevant to sea area use in Estonia and why the safety of navigation should be efficiently integrated into the marine spatial planning process. Recent studies revealed the increase of marine traffic in Estonia which will lead to changes of existing shipping routes. Shipping development estimation is based on analysis of (a) shipping intensity in Estonian EEZ (exclusive economic zone), (b) hydro-meteorological conditions in the area, (c) different types and functions of a vessel. The potential changes of these parameters should be considered when planning marine areas. Additionally, the needs of shipping industry should be balanced on national and international levels taking into account safety requirements, environmental issues, and resource availability. The study shows that integrating shipping component into the maritime spatial planning process in Estonia is efficient and need to be included as an important rapidly developed sector of sea area use.

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Kopti, M. *et al.*, 2016, Baltic Scope topic paper - Central Baltic, 47.

Keywords: maritime spatial planning; the Baltic Sea; safety of navigation; shipping routes; Estonia.

Poster session

P1 - AN APPROACH TO ECOSYSTEM-BASED MANAGEMENT IN MARITIME SPATIAL PLANNING PROCESS

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¹Maritime Spatial Planning; good environmental status; ecosystems based approach; transboundary cooperation; Celtic Seas.

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Sustainable development is the framing concept assuring that resources are exploited while maintaining the ability of these natural resources to provide for future generations. With human dependence on marine resources increasing, Ecosystem-Based Management (EBM) has been identified as a suitable approach to ensure sustainable development. In order to achieve this, the core principles and elements of EBM should be operational in the maritime/marine spatial planning (MSP) process to ensure that human activities in marine space are ordered to attain ecological, economic and social objectives. However, policies from various states and organizations sometimes do not set a clear precedence for translating principles of EBM and present different and complex approaches to an ecosystem-based marine spatial planning (EB-MSP). Again, a feasible methodology for EBM to be operational in MSP is still vague. This paper therefore presents results from a survey and review of 39 MSP initiatives in Europe, Asia and the Americas. Results showed that essential MSP steps and elements such as adaptive management, setting of planning boundaries, understanding and analysing the ecosystem and future conditions are not fully operational. A methodology and recommendations for EB-MSP to ensure that EBM is operational at each stage of an MSP process is proposed. It stresses the importance of setting planning boundaries beyond jurisdictional borders to consider bio/eco-regions and cover near-shore waters, the need to have a cross-sector integration, understanding the ecosystem through having an ecosystem service perspective and having a legal framework to ensure that results from monitoring and evaluating of plans are adapted through review and revision.

P2 - CHARACTERISTICS OF FISHING IN THE CANARY ISLANDS RELATED TO MARINE SPATIAL PLANNING

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At present, the transposition of the “DIRECTIVE 2014/89/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 July 2014 establishing a framework for maritime spatial planning” into Spanish law is on its way. One of the initial requirements of this process is to collect and analyze spatial information to establish the distribution and timing of current activities and uses in the corresponding sectors. The aim of this work is to contribute to the development of the cartographic information baseline of the Canary Islands by (mainly) using the fishing legislation. In the first place, this analysis emphasizes the dual competence of the sea fishing between external waters (EW) of State competence and internal waters (IW) of Autonomous competence (Law 20/1967, Royal Decree 2510/1977) - although shellfishing and aquaculture are exclusive competence of the autonomous communities (Royal Decree 1938/1985). There are curious circumstances such as that the island of La Gomera because of its geographical configuration does not present IW, or that the islands of Fuerteventura and Lanzarote "share" IW. There are 25 Guilds of Fishermen (in Spanish, “Cofradías de Pescadores”) non-profit associations (CAGPyA, 2017) that have generic zones assigned although this allocation does not imply any rights over the fishes, but rather the possibility of being considered stakeholders when conducting consultations or projects. There are also Cooperatives of Fishermen - for profit - but these do not have assigned zones. As for the spatial restrictions on fishing activity, there are 3 Marine Reserves of Fishing Interest, with different use regimes and with no-take zones. In addition, there are 6 locations containing artificial reefs, with certain restrictions on fishing activity, and 18 aquaculture concessions in operation (CAGPyA, 2014) where fishing is not permitted. There are other types of locations, such as port areas, beaches, etc., where fishing is also restricted. It is remarkable that Special Areas of Conservation (SAC) do not include any measures on fishing quantities, species or effort. With regard to the development of professional fishing, it is notable the high detail in which regulations describe the modalities or fishing gear allowed (about 20 types) with respect to each specific island, areas, depths, timing (including weekends and festive) and even differences in the light-mesh characteristics of some gears targeting species at specific timing (in some cases). It is also important to consider that there are specific fishery management plans (ex. El Hierro and Fuerteventura islands) which require modifications of the current regulations. On the other hand, recreational fishermen do not present spatial restrictions, with the exceptions described above, except for underwater fishing that are restricted to its own specific zones (although commons to all other disciplines). As for shellfishing, there are areas with temporal and spatial closures which include several species and even, in some cases, the conditions are modified when specific plans are developed. In short, to create useful spatial (and temporal) fishery information in the Canaries is a challenge in the framework of the DIRECTIVE 2014/89/EU due to the heterogeneity above exposed. All the information presented in this work is accompanied by maps developed with GIS tools. Preparatory work carried out within the framework of the PLASMAR Project (MAC/1.1a/030), with the support of the European Union (EU) and co-funded by European Regional Development Fund (ERDF) and “INTERREG V-A España-Portugal MAC (Madeira-Azores-Canarias)” Cooperation Programme.

Keywords: fishing; marine spatial planning

P3 - SPATIAL COMPETENCES OF FISHERY IN CANARY ISLANDS AND THE ANGEL SHARK (*SQUATINA SQUATINA*)

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In order to comply with the “DIRECTIVE 2014/89/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 July 2014 establishing a framework for maritime spatial planning”, and its transposition into Spanish law, the administrations with competences in the planning of the maritime space will begin a process of definition, analysis and organization of the activities and uses. Fishing in the Canaries has divided its spatial competences in external waters (EW) which belong to the State (Law 3/2001) and internal waters (IW) that are Autonomic (Law 17/2003). Fishing can be developed by professional and recreational fishermen, but professionals can sell their catches and recreational cannot. On the other hand, sharks and rays constitute a group of organisms with a fundamental ecological role. The populations of the angel shark are in regression and in a very delicate situation worldwide, nevertheless, in the Canaries this scenario is not being followed yet (Ferretti et al., 2015). The purpose of this communication is to show, by the analysis of the regulations, the difficulty for a non-expert reader to know if he is committing an illegality if he catches this species. We have analyzed the current laws regarding to the capture of this species by professional and recreational fishermen in EW and IW. A non-expert reader can verify that for this species 3 up to regulations are applied (1 European and 2 national ones). The European Council Regulation (EU) 2017/127, among other things, prohibits the capture of this species to professional fishermen in Union waters. For recreational EW, this species is not on the list of species that are allowed to be fished by Royal Decree 347/2011 (and it also applies the European regulation as is specified in articles belonging to the national norms, Law 3/2001 and Royal Decree 347/2011). On the other hand, for the recreational fishing in IW it could be considered the application of what is known as "supplementary clause" (in Spanish, “cláusula supletoria”) in the state law (article 149.3 of the Spanish Constitution) which comes to indicate the validity of the state law due to a regulatory gap of the autonomic regulations (Garrido Mayol, 2003). However, this clause has been interpreted with limitations by the Constitutional (spanish) Court. Thus, not always is possible to consider the intervention of a state law towards an area of autonomous competency when it is not legislated by the Autonomous Community in the use of its competency (Requejo Rodríguez, 1996). In similar situation there are several species of sharks and rays in the Canary Islands (in prep.). In short, the understanding of the regulations is fundamental for a correct application by the administered. Situations like the one described can cause a serious impact by not being categorically clear in the regulations. Finally, the forthcoming transposition of the DIRECTIVE 2014/89/EU may be an opportunity to complement the existing harmonization between state and regional regulations on fisheries.

Preparatory work carried out within the framework of the PLASMAR Project (MAC/1.1a/030), with the support of the European Union (EU) and co-funded by European Regional Development Fund (ERDF) and “INTERREG V-A España-Portugal MAC (Madeira-Azores-Canarias)” Cooperation Programme.

Keywords: spatial law competences; professional and recreational fisheries; angel shark

P4 - ENZYME TOOLS TO DETERMINE THE WELL-BEING OF BIOLOGICAL COMMUNITIES

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The marine environment is subject to numerous human activities, with significant pressures and impacts from fishing, alterations derived from climate change, and discharges (urban and/or industrial), among others, with consequent loss of environmental quality, and the elimination or alteration of habitat and species populations. Because of this, we have been able to align our research with the objectives of environmental management. Using enzymes as biomarkers helps us understand and correct the effects of anthropogenic stresses on marine ecosystems. The possible alterations of biological communities can cause changes in physiological states, species diversity, abundance and biomass. These are areas of our expertise, so, we can apply our knowledge of metabolic enzymes and develop enzyme activities as bioindicators. The main analyses that we offer are: (1) the activity of the electron transport system (ETS), the potential respiration (Φ), (2) the activity of isocitrate dehydrogenase (IDH), a CO₂ producing enzyme, and (3) the activity of Glutamate dehydrogenase (GDH), an ammonium producing enzyme. The ETS activity is both an energy production indicator and a biomass consumption indicator. IDH and GDH are enzymes of the intermediary metabolism, indicating both energy demand as well as biomass consumption. On other hand, by also measuring protein content, we can determine energy reserves available. Measuring all these parameters together, we can analyze energy metabolism, a key goal in defining metabolic stress in marine organisms.

Keywords: Electron transport system; Isocitrate dehydrogenase; Glutamate dehydrogenase; biomarkers; enzyme; ETS

P5- INFLUENCE OF REDUCING THE OIL FISH CONTENT OF THE FEED FOR AQUACULTURE SEA BASS ON THE LEVELS OF PERSISTENT ORGANIC POLLUTANTS (POPS)

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Objective. Levels of some persistent organochlorine pollutants (POPs) are higher in aquaculture-associated fish than in wild-caught. The content of animal fats in feed for aquaculture has been proposed as an explanation. The objective of this study was to analyze the differences in the level of contamination by POPs of edible muscle of sea bass based on the different diets.

Methods. 6 groups of aquaculture-associated sea bass (n = 10, each) were fed with diets enriched with different percentages of fish oil (3 and 6%) and fish flour (20, 10, and 5%). A total of 22 organochlorine pesticides (OCPs) and 18 polychlorobiphenyls (PCB) congeners were determined by gas chromatography-mass spectrometry.

Results. 5 congeners of PCBs showed a percentage of detection higher than 95%. Fish fed with diets enriched in fish oils (6%) had higher levels of PCBs than fish fed with diets prepared with low fish oils (3%). Regarding to OCPs, 3 substances were detected in 100% of the series. We observed that fish fed with diets enriched with fish oils (6%) had higher levels of OCPs than fish fed on diets with low fish fats.

Major conclusions. Feed composition has an influence, not only in the nutritional quality of the products, but also on their toxicological quality. Therefore, fish fed with diets with low percentage of fish oil may be considered safer for the consumer.

Keywords: Aquaculture; Persistent organic pollutants; Polychlorobiphenyls; Diet; Fish oil.

P6 - SPATIAL AND VERTICAL DISTRIBUTION OF THE DEEP SCATTERING LAYER IN THE CANARY ISLANDS WATERS.

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The Deep Scattering layer (DSL) around The Canary Islands (Central-east Atlantic) waters is of great ecological importance due to the abundance of mesopelagic species. During oceanographic surveys carried out by the O/V *La Bocaina* between 1997 and 2002, the DSL was assessed using acoustic and fishing techniques (pelagic trawls). The abundance registered was higher than obtained in previous surveys, as well as the number of species identified. In the present work, the spatial and vertical distribution of these species is presented. The aim of this work is to describe the functionality of the DSL biological community.

Keywords: Deep Scattering Layer; Mesopelagic species; Vertical distribution; Spatial distribution; Canary Islands

P7 - ANTHROPOGENIC PRESSURES OVER JUVENILE GREEN SEA TURTLES IN COASTAL WATERS OF THE CANARY ISLANDS

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A significant challenge to wildlife managers in tourism settings is to regulate the activities regarding the observation of endangered wildlife to protect them from deleterious impacts. Green sea turtle (*Chelonia mydas*) is an iconic species, globally endangered according to IUCN Red List and included in several international and national legislations. The Canarian waters may represent the northern most location of regular occurrence of this species in the north-eastern Atlantic. During the last fifteen years, some locations with the presence of green turtles have been touristically exploited for turtle sighting with an increasing interest in close interactions that include a very close approach, feeding, touching and swimming in the company of such species. Here, we present the results of a multidisciplinary study (genetic, stable isotopes, biochemical and toxicological analyses, together with satellite tracking), carried on the green turtles from the Canary Islands, that identified the pressures that affect the species and determined the impact of supplemental feeding on the diet and health of the turtles. Our results highlight the necessity of intensifying environmental education and modifying the current regulation of several activities, including turtle sighting, recreational fishing and maritime traffic.

Keywords: biodiversity conservation, sea turtles, feeding, anthropogenic pressure.

P8 - CHONDRICHTHYES AND OSTEICHTHYES FROM THE EARLY PLIOCENE OF THE EASTERN CANARIES, SPAIN.

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In the marine deposits dated at ca 4.8 Ma found on the Eastern Canary Islands, Gran Canaria, Fuerteventura and Lanzarote, several remains of marine vertebrate remains have been found, mainly corresponding to fossil fish teeth. 8 species of Chondrichthyes (*Carcharocles megalodon*, *Parotodus benedeni*, *Cosmopolitodus hastalis*, *Isurus oxyrinchus*, *Carcharias cf. acutissima*, *Carcharhinus cf. leucas*, *Carcharhinus cf. priscus*, *Galeocerdo cf. aduncus*) and 3 species of Osteichthyes (*Archosargus cinctus*, *Labrodon pavementatum*, and *Diodon scillae*). Some of those extinct fishes are cited for the first time on the Early Pliocene sea levels of the Canary Islands and establish ecological coincidences between the Mediterranean Sea, the Pacific coast of America and the Atlantic island (Azores and Canary Islands) during the Pliocene.

References:

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Keywords: Pliocene, migrant, Chondrichthyes, Osteichthyes, Eastern Canaries,

P9 - DEVELOPMENT OF ENZYMOLOGICAL METHODS TO STUDY METABOLISM AND ENVIRONMENTAL SIGNIFICANCE IN SCYPHOZOAN JELLYFISH

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Studying the metabolism of jellyfish is necessary to calculate, understand, and predict the flow of oxygen, carbon and ammonia in marine ecosystems and aquaculture. Jellyfish are omnipresent zooplankton and are also food for sea turtles, zooplankton, fish and birds. In aquaculture, oxygen consumption and ammonia excretion data can help to determine the requirement of water, food and oxygen, as well as the dimensions of the hatcheries. Accordingly, knowing jellyfish metabolic requirements throughout the life cycle of jellyfish is vital to develop optimum aquaculture infrastructures and conditions. Furthermore, measuring metabolism reveals the physiological state of these organisms. This helps define their health and helps understanding how their physiology adapts to environmental changes.

In the following study we optimize enzymatic techniques to measure respiration and ammonia excretion of jellyfish in different life stages. We measure respiration through the enzymatic activities from the respiratory electron transport system (ETS) and isocitrate dehydrogenase (IDH). IDH and ETS activities are two of the biochemical processes that largely control the respiratory CO₂ (RCO₂) production (through the Krebs Cycle) and respiratory O₂ (RO₂) consumption, respectively. Ammonia excretion was measured through the activity of the glutamate dehydrogenase (GDH) which is an important component of the ammonia excreting process. Nevertheless, these enzymes have only rarely been studied in jellyfish. Here, we adapted the methodology described for IDH (Tames-Espinosa et al., 2015), ETS (Gómez et al., 1996) and GDH (Fernandez-Urruzola et al., 2011) to work with the scyphozoan *Aurelia labiata*. Precisely, the methods were modified to work with the different life stages of this species. In this way, we aim to further understanding of jellyfish life cycles and jellyfish roles in ecosystem studies.

References:

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- Gómez, M., *et al.*, 1996, *South African Journal of Marine Science*, 17(1), 15-20.
- Fernández-Urruzola, I., *et al.*, 2011, *Journal of Experimental Marine Biology and Ecology*, 409(1), 21-29.

Keywords: Jellyfish; metabolism; ETS; IDH; GDH

P10 - DEVELOPMENT PROSPECTS OF NATURAL-TERRITORIAL COMPLEX OF THE DOLGAYA SPIT

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The Dolgaya spit is one of the largest accumulative bodies on the Russian coast of the Sea of Azov. Plots of natural forest-steppe and wetland landscapes with unique flora and fauna were preserved there. A part of the Dolgaya spit is a natural landmark of regional significance. Sand and shell beaches of the Dolgaya spit are actively used for recreational purposes being the basis of social and economic development of the Dolzhanskaya resort. Swimming season lasts from May to September. The unique combination of the two coasts wind regime is favourable for outdoor activities that have features of extreme sports – for windsurfing and kitesurfing. The presence of anthropogenic and natural threats impedes sustainable development of the Dolgaya spit geographical complex. Our study is aimed at search of a solution to this issue.

Field studies that include the analysis of natural features and antropogenic changes were carried out in the course of the work. In addition, the conducted studies were based on the analysis of the remote sensing data. An important part of the research were opinion polls and the analysis of urban planning and statistical information.

As the results of the social researches show, the most attractive natural factors in the choice of the Dolzhanskaya resort as the place of vacation are the sea, the beaches, clean dry air, steppe vegetation and spaciousness. Negative factors are predominantly social and economic ones: low level of recreational infrastructure and service, poor transport accessibility.

The lack of a balanced strategy impedes the development of the Dolzhanskaya resort. Uncontrolled development resulted in excessive traffic and recreational load, spontaneous development, lack of transport and recreational infrastructure and destruction of natural landscapes. The situation is aggravated by serious natural threats. The distal part of the northeast coast of the spit erodes and draws back. During severe storms, some areas of the spit are underflooded.

On the basis of the received information, it was possible to develop recommendations on economic use and conservation of the Dolgaya spit. The resort development should be based on the organization of recreation in the natural environment that underwent few changes and has good climate and air quality. The prospective activities are swimming, balneological and spa treatment, ecotourism, and hunting and fishing tourism, active types of sea recreation. The landscape approach in the scientifically grounded organization of the functional and morphological structure of the resort and reservation within the Dolgaya spit will help to maintain and develop its economic and environmental potential.

Acknowledgements:

The researchers were supported by the Russian Foundation for Basic Research (№ 16-45-230321).

Keywords: Sea of Azov; Dolgaya spit; resort development; environment; natural-territorial complex

P11 - ENVIRONMENTAL MONITORING PLAN FOR A BIG INFRASTRUCTURE: PORT OF GRANADILLA

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The last block of the big arm of the Granadilla harbour was set in place on 22th November 2016 in Granadilla, Tenerife, Canary Islands. Once the port is finished, so is the Environmental Monitoring Plan (EMP) at Construction Phase. On January 2017 the new EMP at Operation Phase is scheduled to begin.

The European Commission created on 6th of November 2016 the “Fundación Pública Observatorio Ambiental Granadilla” to monitoring the build-up of this construction as a primary objective.

This presentation shows our study about some of the EMP monitoring results at construction phase (February, 2009 to December, 2016) while others (*Cymodosea nodosa* seagrass and its ecosystem, on one hand, and sea urchin *Diadema africanum* tissues' heavy metals accumulation) will be communicated separately.

The EMP encompasses terrestrial and marine monitoring, although, all the terrestrial results are omitted in order to accommodate our presentation in this workshop's marine scope. Particularly, coastal dynamics (streamflow, average sea level and waves, turbidity plume, sedimentation at sea floor level, bathymetric alterations and beach tipping), sea water quality (oceanographic parameters, chlorophyll concentration, chemical parameters, organic and microbiological pollution), sediment quality (granulometry, chemical parameters, heavy metals), marine biodiversity (supralittoral, intertidal communities, coastal fishes communities, benthic fishes, infauna, bionomic transects bionomic cartography). Along with the results, we also discuss our methodology

In a form-like sheets format, for each monitored parameter we expose the methodology, results, short discussion and conclusions. Furthermore, the last part of this paper holds a general discussion in reference to the EMP itself, excepting, again, the aforementioned seagrass and sea urchins studies.

Keywords: Environmental Monitoring Plan, Port of Granadilla; Observatorio Ambiental Granadilla; environmental parameters; Environmental Impact Assessment .

P12 - HEAVY METALS CONCENTRATION IN *DIADEMA AFRICANUM* AT GRANADILLA COAST. IS THERE A CAUSE-EFFECT RELATIONSHIP WITH GRANADILLA PORT?

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Heavy metals -Cadmium (Cd), Cupper (Cu), Chrome (Cr), Mercury (Hg), Nickel (Ni), Lead (Pb) and Zinc (Zn)- concentrations in *Diadema africanum* Rodríguez, Hernández, Clemente & Coppard, 2013 at Granadilla coast (Tenerife, Canary Islands, Spain) from 2011 to 2016 are analyzed in this paper.

A Beyond-BACI method (Before After Control Impact) is used to study 8 stations in order to differentiate between the natural and impact variability in different temporal scales (Aguado *et al.*, 2012). At each station 12-16 sea urchins have been manually collected by scuba diving. Afterwards, 8 sea urchins are selected on-board and preserved in a freezing container until getting them frozen in the laboratory. Gonads are extracted with no-metal utensils (plastic or wood surgical materials are used) and frozen too until being subjected to heavy metals determination.

Four multivariate, no parametric, independent analysis are conducted by means of the software package PRIMER & PERMANOVA v.7. On the one hand we considered time series on each station, having the data normalized and log-transformed, to obtain the euclidean distance relationships, Principal Components Analysis (PCA) and the correspondent eigenvectors in order to determine which elements are the ones that define the station distribution the best, in the two chosen principal components. Along with the former, a similarity SIMPER analysis is performed to know how much it contributes to separation.

On the other hand, a second, complementary study, based on the same hypothesis and statistical transformations, analyzes every heavy metal of interest over the whole time series for each station. Moreover, a third analysis takes base on the same assumptions and requirements, and studies the response of the whole set of stations against heavy metals concentration through the whole time interval, and finally we conduct a PERMANOVA (non parametric multivariate) analysis to check for significant differences between sampling time and impacted, non impacted and control zones.

References:

Aguado *et al.*, 2012, Marine Pollution Bulletin 64. 729-738.

Keywords: Heavy metals; *Diadema africanum*; Granadilla port; Observatorio Ambiental Granadilla; Environmental Impact Assessment.

P13 - IMPACT OF A PORT CONSTRUCTION (PORT OF GRANADILLA) ON A SEAGRASS BED AT GRANADILLA, TENERIFE (CANARY ISLANDS)

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Interannual changes in the shoot and leaves density, leaf length, peciolus length, leaves area and biomass of the seagrass *Cymodocea nodosa* (Ucria) Asecherson, 1870 were evaluated at Granadilla (Tenerife, Canary Islands) from 2011 to 2016 to provide more insight on the for responses to the impact of a port construction (port of Granadilla).

A Beyond-BACI method (Before After Control Impact) is used to study 9 stations at Granadilla coast. This method can differentiate between the natural and impact-originated in different temporal scales (Aguado *et al.*, 2012). In each station 3 squared samples of seagrass were manually collected by scuba diving, cold-preserved on board and processed later, at laboratory they processed. Since 2016, heavy metals are studied in leaves, roots and stems. Likewise, from the same year the biomass was separated in total, leaves, roots and stems biomass.

To detect significant “Time of sampling x control vs Impact” interactions for all parameters a PERMANOVA design test was made. Relationships with environmental conditions (oceanographic parameters -salinity, temperature, chlorophyll, turbidity, pH and oxygen concentration-, water nutrients and water pollutants along with sediment pollutants and heavy metals in sediments are subject to a Principal Component Analysis (PCA) to reduce variables and identify the most importants.

References:

Aguado *et al.*, 2012, Marine Pollution Bulletin 64. 729-738.

Keywords: *Cymodocea nodosa*; seagrass; Observatorio Ambiental Granadilla; Granadilla port; Enviromental Impact Assessment

P14 - INFLUENCE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATION IN THE DEVELOPMENT OF OFFSHORE WIND FARMS IN SPAIN:

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It is true that renewable energies, and concretely offshore wind power, constitute an opportunity to meet the International and National commitments and targets for the reduction of Greenhouse gas emissions established by United Nations Framework Convention on Climate Change, the Kyoto Protocol, and the Paris Agreement, and therefore they are a successful tool to stop the Progress of Climate Change. However, this energy sources are not completely harmless, since their installation, operation and decommissioning may cause potential damages and threats in the marine environment.

It is therefore important to achieve a balance between the environmental benefits and the use of the oceans and the protection of the environment.

The main objective of this research is to analyze the influence of the current international and Spanish regulations on environmental impact assessment on the life of the offshore wind farms.

From the perspective of EU law, the Directive 2014/52 / EU will be compared with the Directive 2011/92 / EC, and its effects on the development of offshore wind energy will be analyzed. Then, it will be studied its connections with the protection of the Natura 2000 sites created by the Habitats Directive 92/43 / EEC.

Regarding Spanish domestic law, the 21/2013 Environmental Assessment Law will be analyzed in relation to the authorization procedure for the implementation of marine wind farms in Spain, regulated by Royal Decree 1028/2007.

Keywords: offshore wind; environmental impact; EU law; Spanish regulation; authorization procedure.

P15 - PROFILE OF SEMI-PERSISTENT AND EMERGING POLLUTANTS IN AQUACULTURE-ASSOCIATED AND WILD-CAUGHT FISH: BOOPS BOOPS AS A SENTINEL SPECIES

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Objective. The marine environment serves as a sink for pollutants, although the environmental contamination may be non-uniform. A great debate exists about the differential level of pollutant of wild and aquaculture-associated species. We designed a study aimed to evaluate the level of contamination of persistent pollutants in a sentinel species (*Boops boops*) caught in two different scenarios: caged from aquaculture-associated production and wild-caught.

Methods. A total of 82 chemical substances were determined by gas chromatography-mass spectrometry, including persistent (polychlorobiphenyls (PCBs) and organochlorine pesticides (OCPs)), semi-persistent (bromodiphenyl ethers (BDEs) and polycyclic aromatic hydrocarbons (PAHs)), and emerging (organophosphate flame retardants (OPFRs) and UV-filters) pollutants. Three different groups of boggles were analyzed: caged from aquaculture-associated production, wild-caught, and a group of boggles caught near emissaries.

Results. Aquaculture-associated fish showed lower levels of selected semi-persistent and emerging pollutants than wild-caught fish. Thus, sum of BDEs was significantly lower in the aquaculture group ($p = 0.01$). A similar trend was also observed for benzo(a)anthracene, the UV-filter 2-ethylhexyl-p-methoxycinnamate and some OPFRs. In the other hand, sum of dioxin-like PCBs and sum of DDTs were lower in the group of wild-caught boggles ($p = 0.034$ and $p = 0.003$, respectively). Fish feed appear as an important factor in the uptake of such substances suggesting a diet intervention to control the levels of this substances in the aquaculture (a suggestion highly recommended to reduce the levels of PCBs and OCPs in aquaculture).

Major conclusions. The type of production is a factor conditioning the level of contamination of fishes. As in other animal, diet would be the main source of contamination. However, further research is needed in specific aquaculture-associated fishes instead of a sentinel species such as *Bopus bopus*.

Reference

1. Henríquez-Hernández L.A. et al., 2016, Science of the Total Environment, pii: S0048-9697(16)32795-4. [Epub ahead of print]

Keywords: Aquaculture; Emerging pollutants; Organophosphorus flame retardants; Persistent organic pollutants; Sunscreen

P16 - ENVIRONMENTAL SPATIAL PLANNING IN ENCLOSED COASTAL SEAS: NEW METHODOLOGIES FROM AN INTEGRATED MANAGEMENT APPROACH

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The planning and management of marine environments is particularly complex in the case of enclosed coastal seas. These natural environments, usually endowed with a high environmental value due to their geographical uniqueness, are in the case of developed countries often subject to important anthropic pressures derived from the attraction that they offer to human activity. This difficult coexistence on many occasions conditions the sustainability and survival of these marine environments, whose balance requires addressing their planning and management from a comprehensive and multidisciplinary approach. The present work details the case of the Mar Menor, an inland sea of only 170 km² located in the southeast of Spain and communicated with the Mediterranean Sea through five channels. Its high environmental value due to its rich and unique biodiversity, is affected by a varied catalogue of impacts. Despite being protected by various environmental figures, including the European Nature 2000 Network, the situation in the Mar Menor has in recent months caused a significant increase in the turbidity of its waters that has generated a major social alarm in the region.

This context is motivated by a number of different causes (dumping / supply of nitrates, urbanization of natural environments, alteration of coastal sedimentary dynamics, etc.) whose origins and impacts are sometimes difficult to identify and prioritize in their importance. The poster presents an innovative methodology for multidisciplinary diagnosis of impacts by using tools based on GIS systems. Through the implementation of indicators, an assessment is made of the current impacts of the Mar Menor from an integrated perspective. This methodology will allow to address the current issues of the Mar Menor from a holistic approach, since many of the impacts generated by the increase in turbidity of the water will be shown to be caused by elements whose origin is sometimes miles away from its waters. The GIS indicators will allow a measurable and objective quantitative distribution of the responsibility of the different anthropic activities (agriculture, mass tourism, mining, etc.) existing around the global territory. Thanks to this comprehensive diagnosis we will be able to implement management measures that make it possible to reconcile the natural values of the Mar Menor with the existing activities in a sustainable way. These proposals will be based on a 360° analysis in which all public and private stakeholders must be involved in the development of a framework of governance which is not only conjunctural to solve the current problems, but is balanced and sustainable in the long term.

Keywords: Mar Menor; Environmental spatial planning; GIS indicators; integrated management; impact assessment

P17 - STAKEHOLDERS' PERSPECTIVE ON SPATIAL CONFLICTS AND CROSS-SECTORAL TENSIONS IN THE CONTEXT OF MARINE SPATIAL PLANNING (MSP) IN THE POLISH MARINE AREAS: CAUSES OF CONFLICTS, AND MECHANISMS UNDERLYING THE PLANNING PROCESSES

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Marine Spatial Planning (MSP) is a process of negotiating and allocating marine space to various uses and users engaging a range of societal stakeholders. MSP usually combines top-down and bottom-up approaches, where different conflicts of interests and conflicts of values become apparent, and where the ultimate planners need to make decisions on functions of marine areas. In-depth understanding of existing and potential conflicts as well as causes of these conflicts underlie planning process and allow achieving more satisfying solution.

In our study, we present the preliminary analysis based on semi-structured interviews, of the Polish marine stakeholders' perspective on conflicts and tensions in the Polish Marine Areas (PMA) in the context of on-going MSP processes. Further, we present marine stakeholders' opinions on possible roots of these conflicts and on tools and mechanisms which may, in their opinion, prove important in reducing these conflicts.

Our study reveals that conflicts between fisheries and nature conservation as well as between fisheries and off-shore energy developments are perceived as the most significant by representatives of all sectors. Internal conflicts within the fishery sector itself and between tourism and nature conservation came second. Individual groups of stakeholders identified different causes of these conflicts. Fishers perceived EU regulations followed by national managerial strategies (concerning both fisheries and nature conservation) as the major factor that empowers tensions around fisheries. Representatives of public administration considered lack of trust and lack of proper communication between all parties of the MSP process to be the major obstacle in effective planning, while environmental sector underlined reluctance to change prevailing among all parties, especially the fishers. Off-shore energy sector blamed poor knowledge on MSP and on renewables in general. Drawbacks in environmental legislation and limited consultations processes were commonly mentioned as additional issues that hamper MPA processes.

Majority of interviewed stakeholders were not able to suggest any short-term and easy to implement solutions that could possibly reduce the identified conflicts and improve MSP processes. Our respondents called for more inclusive public consultations, more personalized approach towards marginalized groups of stakeholders (such as coastal fisheries), educational campaigns or long-term compensations for economic losses suffered by the fisheries sector.

P18 - THE EUROPEAN REGULATION ON THE MANAGEMENT OF THE COAST AND MARITIME SPACE

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One of the last initiatives of the European Union on the coast and maritime space is the European Parliament and Council Directive 2014/89 / EU of 23 July 2014, establishing a framework for maritime spatial planning. This last regulation is incorporated into a long series of provisions on the protection of the coast and the marine environment. Therefore, it is necessary to review the different initiatives, programs, and legislation affecting the coast and the marine environment.

In particular, in this contribution it will be sought to highlight the relationship of this Directive to the Marine Strategy Framework Directive 2008/56/EC of 17 June 2008 establishing a framework for Community action in the field of marine environmental policy.

All this in the framework of a complex general and special legislation of protection of the environment that makes precise, at least, to make an exposition of the interactions with the above mentioned regulation.

P19 - USING SEABIRD REMOTE TRACKING AS A TOOL FOR ADAPTIVE MANAGEMENT IN COASTAL AND MARINE PROTECTED AREAS

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Establishing coastal and marine protected areas has been traditionally based on identifying relevant biodiversity hotspots. But defining their borders and extension has usually been a poorly informed process due to a clear lack of data, despite being crucial for ecosystem functioning, management and policy-making inside a protected area. As a result, legal boundaries of many coastal and marine protected areas do not reflect natural processes nor account for dynamism in space and time of marine ecosystems. Since many of these protected areas were established years or decades ago, place-based management strategies should move towards an adaptive management framework, especially for its convenience when dealing with complex, heterogeneous, and dynamic systems.

In many countries, Environmental and Wildlife Conservation Agencies and Governments have implemented Long Term Ecological Research (LTER) programmes, aiming to hold enough high-quality data to inform proper management actions over time. These programmes usually include protocols for monitoring sessile and mobile organisms as indicators, primarily to track the effects of global change on protected areas. However, the spatial and temporal dynamism of productive areas, frequently targeted by top-predators often in precarious conservation status, is rarely considered. Indeed, in marine ecosystems some top-predators have been shown to track spatial and temporal shifts of trophic networks. In the case of seabirds, their movements and behaviour are easy to track at high spatial and temporal resolution, and can provide valuable information regarding marine habitat dynamism, thus making them an ideal sentinel species for LTER programmes.

In this regard, we performed a pilot study tracking Cory's Shearwater (*Calonectris diomedea*) in three protected areas of the Spanish National Park Network with important marine or coastal domain. We chose this medium size pelagic seabird because individuals can be easily caught, present high nest-fidelity, and are sensitive to environmental changes at short and long temporal scales. We gathered more than 500 trajectories from 136 individuals breeding at Cabrera (Balearic Is.), Timanfaya (Canary Is.) and Islas Atlánticas (NW coast of Spain). Tracking programme was carried out in summer 2015 and 2016 at Cabrera and Timanfaya, and in summer 2015 at Islas Atlánticas.

We present here an analytical procedure based on state-of-the-art algorithms to analyze seabird movement data, with the aim of evaluating spatial and temporal patterns of behaviour displayed in the National Parks and surrounding waters. Combining home-range analysis with inferred behaviour can inform about spatial consistency in the foraging areas of seabirds and their relation with primary productivity. Results can also point out relative abundance of key prey species, potential sites where human-induced disturbances are more likely, or the need to displace boundaries of the marine domain of the protected areas, thus supplying valuable information for the adaptive management process.

Because of the role of seabirds as sentinel species and the increasing accuracy and feasibility of tracking studies, we recommend Environmental and Wildlife Conservation Agencies to incorporate seabird tracking as a major tool in LTER programmes for a properly informed adaptive management of marine and coastal protected areas.

Keywords: seabird tracking; behavioural annotation; sentinel species; consistency; Marine Protected Areas

P20 - MARINE PROTECTED AREAS: PROPOSAL OF A NATIONAL MARINE PARK IN EL HIERRO ISLAND (SPAIN)

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A detail analysis of the Spanish National Parks Network shows that there are some deficiencies in the representativeness of Spanish natural systems, and especially on marine environment, according to the Spanish Law 30/2014 on National Parks. The National Parks Autonomous Agency (OAPN-MAPAMA) addressed the immediate need identified and developed a prospective study in order to get possible scenarios to create 100% Marine National Parks. El Hierro Island, located in the Canary Islands of Spain, was the most suitable candidate to become the first 100% marine National Park in Spain and then a technical proposal was developed. This initiative was implemented through the collaboration of Tragsa group during 2013 -2014. A service project was conducted at El Hierro Island, involving a public consultation of stakeholders, scientific sector and non-governmental organizations. Moreover, a public survey was developed in order to estimate the degree of acceptance of the proposal by the population. The waters around the island of El Hierro are a unique location in terms of their oceanographic characteristics and the levels of biodiversity found there, so it is expected that El Hierro became the first 100% marine National Park in Spain.

Keywords: marine protected areas; conservation; biodiversity management; marine protection; national parks

P21 - OCURRENCE OF UV-FILTERS IN SEAWATER SAMPLES FROM GRAN CANARIA ISLAND BEACHES

Montesdeoca-Esponda S.¹, García-Guerra R.B.¹, Guedes-Alonso R.¹, Sosa-Ferrera Z.¹, Kabir A.², Kenneth G.F.², Santana-Rodríguez J.J.¹

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Benzotriazole UV stabilizers (BUVSs) are a group of emerging compounds added in sunscreens and other personal care products whose use has increased in the last decades due to the growing concern about the link between sunlight exposure and skin cancer. BUVSs can present negative effects over aquatic systems. They are mutagenic in bacterial systems and toxic in plants and can exert adverse effects on the fecundity and reproduction of fish (Montesdeoca-Esponda, *et al.*, 2013). After be used, BUVSs can reach the environment through recreational activities such as swimming and bathing in oceans, lakes or rivers or after passing throughout wastewater treatment plants without be removed.

We have developed a procedure based on Fabric phase sorptive extraction (FPSE) followed by ultra-high performance liquid chromatography with mass spectrometry detection for the determination of seven benzotriazole BUVSs compounds in seawater samples from different beaches of Gran Canaria island. FPSE is a novel miniaturized sample preparation technique developed by Kabir and Furton (Kabir and Furton, 2014), which is a highly sensitive, fast, efficient and solvent minimized sample preparation approach (Kumar R *et al.*, 2014). FPSE integrates the advantages of sol-gel derived hybrid inorganic-organic sorbents and the flexible, permeable and rich surface chemistry of cellulose fabric, containing approximately 400 times higher sorbent loading than SPME fibers and providing better extraction efficiencies. Moreover it is a cheap device that can be reused and do not suffer from coating damage, unlike to SPME fibers or stir bars.

The methodology allowed enrichment factors of 25 times with limits of detection (LODs) from 1.06 to 8.96 pg·mL⁻¹, recoveries in the range 9.30-51.4% and intra and inter-day RSDs between 3.97 and 20.8% for all compounds. The application of the proposed procedure to thirty-six seawater samples from different beaches of the island allowed detecting and quantifying one of the target compounds in the range from 41.12 to 544.9 pg·mL⁻¹.

References:

Kabir A. & Furton K.G. (2014). Fabric phase sorptive extractors (FPSE), US Patent Application: 14,216,121,

Kumar R *et al.*, (2014). Journal of Chromatography A, 1359, 16.

Montesdeoca-Esponda S., *et al.* (2013). Trends in Analytical Chemistry, 51, 23.

Keywords: UV filters; seawater: miniaturised extraction; ultra-high liquid chromatography; mass spectrometry detection

P22 - PHYSIOLOGICAL AND POTENTIAL RESPIRATION OF DIFFERENT LIFE STAGES OF SCYPHOZOAN *AURELIA LABIATA* .

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In the following study we used O_2 optodes to measure the physiological respiration (R) in each life-stage of the scyphozoan jellyfish *Aurelia labiata*. *A. labiata* goes through a sessile polyp stage, a planktonic larvae stage, called ephyra, and a planktonic medusa stage. We examined the metabolism of this species in the literature and compared their respiratory demands throughout their different life-cycles. We also measured their potential respiration (Φ) using the electron transport system (ETS) analysis. The R and the Φ results were used to determine the percentage of the maximum respiration (R: Φ ratio) they used and the physiological state they occupied in each life-stage. With this information, which is rarely measured due to the organisms' fragility, we are testing the use of enzymological techniques to determine respiration. These serve as adequate alternatives that could minimize some laboratory logistic challenges associated with scyphozoan jellyfish (Purcell et al. 2010) and improve the data acquisition rate of ocean metabolism measurements. Also, our contributions here could be used in rearing *A. labiata* and other jellyfish, since it provides better understanding on the physiological changes throughout their life transformations. These contributions could also enhance the inclusion of scyphozoans in ecosystem models and address their impact on pelagic and coastal dynamics (Purcell et al. 2010).

References:

Purcell et al., 2010. *Hydrobiologia*, 645(1), 135-152.

Keywords: Respiration; ETS; Scyphozoa; jellyfish; *A. labiate*

P23 - SCIENTIFIC GROUND OF STABLE ENVIRONMENTAL MANAGEMENT OF THE ANAPA BAY-BAR

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The Anapa resort is the leader of the seaside health resort and children recreation market in Russia. The main value of the resort is vast sandy beaches and the dune landscape of the Anapskaya bay-bar. The adjacent Kiziltash lagoons belong to the Ramsar lands. The main inter-industrial controversy of the territory use is the conflict between the recreational use of the Anapa bay-bar and the shores of the lagoons, and the protection of unique natural landscapes. Therefore, the study of the Anapa bay-bar geosystem is interesting from the scientific point of view as well as from the point of economic use optimization and conservation of the unique natural site.

These observations are of importance for the study of the basic aspects of the lithodynamic processes in the coastal zone and the development of models for predicting the further evolution of the geosystem of the bay-bar in order to solve practical social-economic tasks.

The Anapa bay-bar is an accumulative body in the northwestern part of the Caucasian Black Sea coast, extending for approximately 47 km and largely composed of quartz sand with an admixture of shells and their detritus. The bay-bar is a polygenetic accumulative coastal morphostructure, formed by sediment migrating in transverse and longitudinal directions. The width of the Anapa bay-bar varies from 80 m to 1.5 km in its northern and southern parts, respectively. Unlike most other similar accumulative structures on nontidal coasts in the Black and Baltic seas, this bay-bar is subjected to intense economic (recreation) development. At the same time, its lithodynamic system has avoided substantial technogenic transformations and thus represents a favorable object for the investigation of natural processes and their regularities.

The data obtained during the research allowed typification of some parts of the bay-bar according to the combination of the morphological structure, relief dynamics, and the composition of the existing factors. It was established that modern development of the bay-bar geosystem depends on a number of natural and anthropogenic factors. The research showed that during the last decades, at some places of the bay-bar the width of the accumulative body above-water part has been decreasing. Nevertheless, the overall stability of the bay-bar is maintained due to the alongshore reverse sediment movement. In case of abrupt reduction in the volume of sediments in the tectonic system of the bay-bar or in case of termination of their alongshore migration, the above-water part of the bay-bar may be destroyed.

On the basis of the received information it became possible to develop recommendations on the economic use and conservation of the unique Anapa bay-bar geosystem. In particular, it is recommended to completely refrain from sediments removal, to reduce the change of the natural relief and the dunes vegetation. Taking into account the nature of lithodynamic processes, it is recommended not to construct any hydrotechnical and other facilities that can hamper the alongshore sediment movement. It is suggested that a nature conservation area is created in the territory of the adjacent Ramsar land and the Anapa bay-bar. Diverse regimes of conservation that take into account natural, historical and cultural, economic and other features should be introduced in the territory of the reservation. The presented functional areas should contribute to the effective economic use and be beneficial for the region economy and at the same time, they should adequately protect the unique natural complex of the Anapa bay-bar and the Kiziltash lagoons.

Acknowledgements:

The researchers were supported by the Russian Foundation for Basic Research (№ 15-05-02654).

Keywords: Anapa bay-bar; environmental management; resort; beach; Black Sea

P24 - AQUACULTURE WEB VIEWER

Subdirección General Caladero Nacional, Aguas comunitarias y Acuicultura

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In compliance with the Common Fisheries Policy (CFP) objectives to contribute to the sustainable development of the aquaculture sector from an economic and social point of view, Member States have to define a medium-term strategy to development and growth of aquaculture through coordinated spatial planning. The GIS tools applied in aquaculture allow a proper spatial analysis and help the decision-making by the competent Authorities. In this context, Tragsa Group has developed a Web viewer for the Spanish Aquaculture in 2016 including the following works: analysis of spatial planning of aquaculture in Spain and regulatory issues; collection of background data and human uses of marine environment; standardization of data; and design of dynamic queries and spatial analysis. As a result of these works, there is a GIS tool that allows access to spatial data services and geographic information layers regarding aquaculture, marine and continental facilities and selection of proper areas for aquaculture facilities.

Keywords: aquaculture; CFP; GIS tool; spatial planning; standardization of data

P25 - PROJECT PAMEV. A NEW TOOL FOR THE STUDY AND DISSEMINATION OF NATURAL HERITAGE

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The Project "Paleontología de la Macaronesia. Espacio Virtual (PAMEV) " is based on the virtual musealization and digitization of the paleontological and paleoecological collections of the archipelagos of the Azores, Madeira , Canary Islands and Cape Verde. The objective of this tool is to initiate a space for the dissemination of ULPGC's own collections, both for specialists for researchers and for the general public, in the fields of zoology, botany, ecology, biodiversity, paleontology, oceanography and Global climate changes detected in the Canaries and in the other archipelagos of the subtropical North Atlantic. This tool will allow the consultation and participation, in order to allow communication between managers, curators and scholars, of different collections of specimens and data to establish a permanent flow of communication. Initially, it is intended to include in this virtual museum, digital models with 3D reconstruction and infographic lighting of the important fossil collection.

The fossil collections and remains belong to the Laboratory of Paleontology and the Laboratory of Vertebrates of the ULPGC, group BIOCON, under the direction of Dr. Joaquín Meco Cabrera and Dr Luis Felipe López Jurado .

Keywords: Paleontology, paleoecology, virtual museum, North Atlantic, Canary Islands

P26 - SPANISH INVENTORY OF MARINE HABITATS AND SPECIES

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In compliance with obligations and commitments under Law 42/2007 of Natural Heritage and Biodiversity, both, the Species and Habitats Marine Inventories were needed to be developed. The Spanish Inventory of Marine Habitats and Species has been carried out by the Ministry of Agriculture and Fisheries, Food and Environment through the collaboration of Tragsa group and the Scientific Community. Significant efforts were carried out in order to compile existing and scattered information on marine biodiversity, with particular attention placed on harmonizing available data. Participants met several times in different Working Groups, with the aim of completing References Lists for marine Habitats and Species. As a result, it was developed a query tool for understanding, planning and management of natural heritage, regarding to the requirements of European Directives on Conservation of Nature and the International Conventions ratified by Spain. The List of Marine Habitats in Spain, that is classified hierarchically, was completed and published in March 2013; a big effort was made to get gateways from this List to another classifications: EUNIS, OSPAR Convention and Barcelona Convention, among others. The Spanish list of Marine Species was completed in February 2016, and there is also a correspondence between the Spanish list and WoRMS (the world register of Marine Species) in order to harmonize available data. It is expected to periodically up to date both Reference Lists.

References:

Templado J., Ballesteros E., Galparsoro, I., Borja, A., Serrano A., Martín, L., Brito, A. 2012. *Guía Interpretativa: Inventario Español de Hábitats y Especies Marinos*. Ministerio de Agricultura, Alimentación y Medio Ambiente, Madrid.

Keywords: marine species; marine habitats; inventory; biodiversity; marine protection

P27 - STUDY OF THE PRESENCE OF STEROID SEX HORMONES AND GLUCOCORTICOID RESIDUES IN FISH TISSUES FROM GRAN CANARIA (SPAIN)

Guedes-Alonso, R., Montesdeoca-Esponda, S., Sosa-Ferrera, Z., Santana-Rodríguez, J.J.

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Every day tons of organic pollutants are discharged in water bodies and specifically oceans because of their great regeneration ability [1]. In fact, the 2030 Agenda for Sustainable Development of the UN have a key topic named “life below water” [2], and one aspect of this topic could be the study of how and how much compounds affect aquatic organisms.

From all types of organic pollutants presented in water bodies, steroid hormones are a worrisome group of compounds because of their toxic effects over aquatic biota. As a matter of fact, these compounds are also considered as endocrine disrupting compounds because they can produce important changes not only in sexual systems of aquatic organisms but also in other biological systems [3]. These changes could be produced at very low concentrations, sometimes in the range of $\text{ng}\cdot\text{L}^{-1}$, so it is necessary the development of analytical methods which allow the sensitive determination of steroid hormones in organisms tissues.

In light of the above, this work presents an analytical method based in microwave-assisted extraction coupled to ultra-high performance liquid chromatography and mass spectrometry detection which constitutes a powerful procedure for the analysis of steroid hormones in solid and biological samples [4, 5]. All the parameters involved in the extraction and detection procedures have been optimised in order to get the best efficiency. The method shows appropriate detection and quantification limits, that range from 0.14 to 49.0 $\text{ng}\cdot\text{g}^{-1}$, as well as good linearity and repeatability.

After the development of this method, it was applied to three different types of tissue samples (muscle, skin and viscera) of two fishes of the coast of the Canary Islands (*Boops boops* and *Sphoeroides marmoratus*) exposed to the outfall of the Las Palmas de Gran Canaria city wastewater treatment plant. The results showed that higher concentrations of detected compounds were in viscera and skin while the concentrations in muscle tissue were lower. The concentrations of detected compounds ranged from below quantification limits to 3.95 $\mu\text{g}\cdot\text{g}^{-1}$ for both species.

References:

1. Bertinelli L, *et al.*, 2008, Ecological Economics, 66, 371–378.
2. United Nations General Assembly, 2015, Resolution adopted by the General Assembly on 25 September 2015, 35.
3. Svensson J, *et al.*, 2014, Aquatic Toxicology, 147, 84–91.
4. Guedes-Alonso R, *et al.*, 2014, Environmental Analytical Chemistry, 3–4, 14–27.
5. Guedes-Alonso R, *et al.*, 2016, Analytical and Bioanalytical Chemistry, 408, 6833–6844.

Keywords: steroid hormones; microwave-assisted extraction; ultra-high performance liquid chromatography; mass spectrometry; fish tissue.

P28 - THE MARINE CARTOGRAPHY PROJECT

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In compliance with obligations and commitments under Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fisheries resources in the Mediterranean Sea, the marine information should be provided by Member States in order to protect marine habitats. A better knowledge of the characteristics of the seabed is essential for the rational and sustainable management of the coast and to take the necessary measures for its protection. In this sense, the Marine Cartography Project aims to carry out a systematic investigation of the characteristics of the seabed, through high resolution geophysical technology and sampling of the seabed, in order to obtain a high precision bathymetry, as well as knowledge of the background qualities and their distribution. Tragsa Group has been involved in these activities since 1997. As a result, there is now a proper tool for the Administration regarding marine information that contributes to decision-making in, among others: Fisheries agreements promoted by the UE; selection of proper areas for aquaculture facilities, closure of fishing zones for vulnerable species, selection of marine protected areas, proper identification of marine habitats, identification of geological hazards, formation and regeneration of beaches based on the knowledge of sedimentary dynamics and civil use of geomorphology for engineering works.

Keywords: offshore; marine cartography; SPACE; habitats; knowledge; marine monitoring

P29 - THE MARITIME SPATIAL PLANNING DIRECTIVE AND ITS STIMULATING EFFECTS ON THE DEVELOPMENT OF OFFSHORE WIND ENERGY IN SPAIN

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Due to the increase in demand for marine spaces for different purposes, and in line with the Integrated Marine Policy and the so-called Blue Growth, the Maritime Spatial Planning Directive-2014/89/EU Directive- was adopted, which obliges EU Member States to develop maritime spatial plans where they establish the present and future spatial-temporal distribution of the different relevant activities and uses in their marine waters before 31 March 2021 in order to achieve, among other objectives, sustainable development.

The Spanish Government has recently drawn up a Draft Royal Decree, which transposes the Directive establishing the steps to be followed for the preparation of plans for the management of the Spanish marine space.

The objective of this research is to analyze from a legal point of view the impact that the Maritime Spatial Planning Directive may have on the development of offshore wind energy in Spain, where, to date, opposition from other users of the sea, such as fishermen and aquaculturists, has been a major obstacle to the development of these types of marine renewable energies, as well as concerns about the potential negative environmental effects of their installation and operation.

The Directive opens the way for an appropriate maritime management aimed at eliminating conflicts between the various activities carried out at sea and finding the balance between the sustainable development of economic sectors at sea and the protection of the marine environment.

The Maritime Planning Directive will be studied linking it to the Directive 2008/56/EC -Marine Strategy Framework Directive- and the projections of both in Spanish domestic law, through a comparative study of the Draft Royal Decree with the Law 41/2010 -Law on the protection of the marine environment-. It will also be linked to the specific national regulation regulating the authorization procedure necessary for the installation of offshore wind farms in Spain.

Keywords: offshore wind; Maritime spatial planning Directive; sustainable development; environmental effects; Spanish law.

Workshop sessions

BLUE GROWTH VS GOOD ENVIRONMENTAL STATUS - PLASMAR OPEN WORKSHOP

by Dr.Yaiza Fernández-Palacios

Workshop Length: 2 hours

WORKSHOP FACILITATOR DETAILS

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WORKSHOP DESCRIPTION INCLUDING LEARNING OBJECTIVES

Blue growth is the maritime contribution to achieving the goals of the Europe 2020 strategy for smart, sustainable and inclusive growth. Its development must go hand in hand with the implementation of the Marine Strategy Framework Directive (MSFD) (Directive 2008/56/EC), which is the environmental pillar of the EU Integrated Maritime Policy.

PLASMAR Project “Bases for the Sustainable Planning of Marine Areas in Macaronesia” will be running until end of 2019 and is funded by Interreg under the MAC 2014-2020 Programme. One of its main activities includes the establishment of methodologies that allow the development of maritime sectors with criteria of sustainability and in balance with the ecosystems approach.

The objective of the workshop is to analyse the relationship between specific maritime sectors and the application of the 11 qualitative descriptors that determine the good environmental status (GES) according to the MSFD. The work will be done in groups, in such a way that a number of maritime activities (or even coastal activities that affect the marine space) will be chosen.

The information provided to participants will include general information on the MSFD and details of the qualitative descriptors and related monitoring parameters that describe what the environment will look like when GES has been achieved.

In the last part of the workshop each group will present their results and general conclusions will be drawn to identify the synergies and barriers of the maritime sectors from an ecosystem approach in relation to the application of common environmental legislation.

Learning objectives will include the analyses of sectors key to Blue Growth, the implementation of MSFD and practical application of the 11 qualitative descriptors with regards to specific maritime activities for the achievement of GES, and the identification of barriers and synergies between marine and coastal activities.

DESCRIPTION OF TARGET WORKSHOP AUDIENCE

Individuals belonging to all coastal and marine stakeholders are welcome to participate. Thus, workshop participants can be individuals belonging to:

- marine/maritime research community;

- public bodies (governmental agencies at any level - local to global);
- private maritime sectors (private economic interests of any kind),
- and civil society (all organizations that aren't governmental bodies or private economic interests).

Their activities areas or areas of interest can be any related to the marine or coastal areas, such as transport, fisheries, aquaculture, conservation, tourism, or research, among others.

WORKSHOP REQUIREMENTS

Pre-inscription for the workshop is required.

AV requirements: laptop and projector for initial Powerpoint presentation.

Room setup: Tables to work in small groups. Post-its, big format paper and markers might also be required.

Instructions for participants: Pre-workshop material will be delivered to participants with the conference material.

DETAILED WORKSHOP AGENDA

Oral presentation (15')- Introduction and explanation of workshop dynamic.

Practical development of workshop (1h 15'): Start with a quick classification of participants according to their stakeholder group and divide participants in groups to analyse and work in specific maritime sectors in relation to MSFD descriptors.

Presentation of group results and conclusions of workshop (30')

CO ALLOCATION OF MARITIME USES - EASTERN ATLANTIC SEA BASIN (MUSES PROJECT)

by Dr. Helena Calado, University of the Azores

Workshop Length: 2 hours

WORKSHOP FACILITATOR DETAILS

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WORKSHOP DESCRIPTION INCLUDING LEARNING OBJECTIVES

MUSES project (<https://muses-project.eu/>), funded by the European Union's Horizon 2020 research and innovation programme (Grant Agreement No. 727451), will review existing processes, used across the EU, for marine and coastal development to ensure they are sufficient for the sustainable multi-use of the marine environment. The project will build knowledge of the appropriate techniques to minimize barriers, impacts and risks, whilst maximizing local benefits and reducing gaps in knowledge to deliver efficiencies through integrated planning, consenting processes and other techniques.

MUSES project will analyse five European sea basins (Baltic Sea, North Sea, Eastern Atlantic, Mediterranean Sea and Black Sea), however the workshop will be focused on the Eastern Atlantic.

Regarding the Eastern Atlantic sea basin, **the objectives of the MAPSIS workshop are**

- (i) the identification and validation of current and potential multi-uses and
- (ii) the identification/validation of drivers, barriers, added values and impacts for each multi-use identified.

The Workshop will present an introduction to MUSES project by Prof^a Helena Calado (Multi-uses, definitions and concepts) followed by round tables and discussion groups, participants debate around (i) main challenges and (ii) potentialities for Multi-uses in the Eastern Atlantic maritime space.

Learning objectives: Improve understanding on maritime multi-uses.

DESCRIPTION OF TARGET WORKSHOP AUDIENCE

Practitioners on maritime uses knowledgeable on allocation, co allocation and multi-uses on maritime space or resources. Researchers and MSP Scholars with knowledge on maritime multi-uses.

WORKSHOP REQUIREMENTS

Room setup: 40 chairs and 5 round tables, white board and paper big format

Instructions for participants:

Inscriptions until one week previous to the MAPSIS Conference, 17 April, max 35 participants.

Pre-workshop instructions delivered by e-mail one week previous to event.

DETAILED WORKSHOP AGENDA

- 20' - Introduction to project and themes by Prof^a Helena Calado
- 15' – Organization and instructions to the participants on tables
- 10' – Discussion on maritime multi-uses in the Eastern Atlantic
- 15' – Discussion on drivers for each multi-use
- 15' – Discussion on barriers for each multi-use
- 15' – Discussion on added values for each multi-use
- 15' – Discussion on impacts for each multi-use
- 10' – Results presentation

REFERENCE LIST ON MARINE HABITATS IN SPAIN: CLASIFICACION AND RELATION TO OTHER LISTS

By Dr. Concepcion Rey and Dr. Victoria Palacios

Workshop Length: 2 h 30`

WORKSHOP FACILITATOR DETAILS

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WORKSHOP DESCRIPTION INCLUDING LEARNING OBJECTIVES

At present, the Spanish Inventory of Marine Habitats (IEHM) has focused on the elaboration of the Reference List of Marine Habitat in Spain -involving the participation of Scientific Experts-, and their hierarchical classification and the establishment of relationship with other existing habitats classifications.

This Reference List was developed with the intention of defining a common framework of understanding between experts, regardless of spatial scope, in order to establish a common management tool for habitats management.

As expected, this List will make possible to know if habitats of the Reference List equivalent to others contained are protected under different regulations, are prioritized for their conservation, are the basis for the declaration of MPAs, and it can be proposed a common denomination for cartography works.

Regarding this List, the identification of some existing habitats at Spanish marine waters could be used to propose in the future to the European Environment Agency proposals for inclusion in the EUNIS classification.

At this Workshop, background and methodology information should be provided to the working group when dealing with the relationships between the Habitats of the Reference List and the other classifications, and the steps required for their subsequent scientific validation.

DESCRIPTION OF TARGET WORKSHOP AUDIENCE

- Scientific Experts on Marine Habitats
- Public Administration
- National and International Organisations
- NGOs
- Students
- Stakeholders related to marine activities

WORKSHOP REQUIREMENTS

AV requirements: pre-inscription for the workshop required.

Room setup: a room with projector, laptop and small tables to work in small groups after the oral presentation of workshop aim should be provided.

Instructions for participants: a dossier with the Reference List on Marine Habitats in Spain will be sent to the participants in advance, so they can be familiarised with it before the Workshop, in order to a practical development of it.

DETAILED WORKSHOP AGENDA

Oral presentation (45`)- Introduction and general context:

- About the Spanish Inventory of Marine Habitats (IEHM)
- Current status of the component: Reference List on Marine Habitats in Spain
- The INSPIRE data model for Habitats and Biotopes
- EUNIS Classification
- Relationship with other habitat classifications: OSPAR, Barcelona Convention, Act 30/2014 on National Parks in Spain, etc.

Practical development of workshop (1h 30`)

- Approach to the use of relations among the Reference List on Marine Habitats in Spain and other classifications
- Conclusions

MARITIME SPATIAL PLANNING CHALLENGE

By Dr. Lodewijk Abspoel

Workshop Length: 1,5 - 2h

WORKSHOP FACILITATOR DETAILS

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WORKSHOP DESCRIPTION INCLUDING LEARNING OBJECTIVES

The workshop participants are invited to join in a near real exercise on Maritime Spatial Planning”: The ‘Maritime Spatial Planning Challenge – Short Sea Shipping & Blue Growth Edition’

It is a table top strategy game designed for those with an interest in ecosystem based Maritime Spatial Planning (MSP), Short Sea Shipping and sustainable Blue Growth (BG).

It is a metaphor for Maritime Spatial Planning with a fictional narrative, stylized maps, colorful tokens and a minimum number of game rules.

The goal of the game is to experience some of the dynamic and complex interactions between marine related activities and maritime planning.

It allows the players to experience and discuss the meaning and implications of different maritime strategic objectives such as Blue Growth (BG), the blue economy, land-sea interactions, short sea shipping, clean & healthy seas and Good Environmental Status (GES).



DESCRIPTION OF TARGET WORKSHOP AUDIENCE

The workshop is to introduce maritime planning to students, stakeholders and the wider public; and to shape a strategic dialogue among professionals. will be tailored to the scientific community. So it is to public and private organisations, research institutions and universities as well as institutional and private organisations willing to learn more on MSP.

WORKSHOP REQUIREMENTS

AV requirements: n/a

Room setup:

- Set of tables put together to lay out the board game: 1,60 x 2,40 meters
- 3 side tables for game materials & water
- No chairs
- Daylight preferred

Instructions for participants: n/a



DETAILED WORKSHOP AGENDA

Introduction (10')

The facilitator will present the outline and goals for the workshop.

Into the action (10')

The participants will be divided in 3 groups of 8-10 individuals, will asked to pick a role they will play in the game (planner, business, ngo), and have a bit of time to familiarize themselves with the game materials and country information.

1-2-3 go (60')

Series of rounds of 5-10 minutes to start developing, planning and coordinating activities in the countries that border the Rica Sea.

Wrap up (10')

Stepping out of the game and evaluate lessons learned.

THE ATLANTIC ACTION PLAN: FUNDING OPPORTUNITIES FOR MSP IN THE ATLANTIC AREA

By Dr. Federico Cardona Pons

Workshop Length: 2h

WORKSHOP FACILITATOR DETAILS

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Phone: 944 014 690

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WORKSHOP DESCRIPTION INCLUDING LEARNING OBJECTIVES

The EC adopted the Atlantic Action Plan (AAP) in March 2013 to revitalize the marine and maritime economy of the Atlantic regions in France, Ireland, Portugal, Spain and the UK. The AAP objectives are in line with EU's "Blue Growth" initiative which is the maritime contribution to achieving the goals of Europe 2020 strategy for smart, sustainable and inclusive growth.

The second priority of the AAP explicitly mentions as one of the specific objectives of the plan "to contribute to Member States maritime spatial planning and integrated coastal management processes" by sharing best practice and facilitating cross-border coordination. The workshop aims to provide guidance and proactive support for public and private organisations willing to engage with the implementation of the European Strategy and the Atlantic Action Plan. The learning objectives of the workshop are:

- Identification of funding instruments relevant for the development of MSP related projects.
- Guidelines about how to create a successful application to fund a MSP related project

DESCRIPTION OF TARGET WORKSHOP AUDIENCE

The workshop will be tailored to the scientific community, however it will be open to public and private organisations, research institutions and universities as well as institutional and private organisations willing to implement a project in the Atlantic regions of EU.

WORKSHOP REQUIREMENTS

AV requirements: One laptop and one projector

Room setup: There will be a plenary session followed by working groups.

Instructions for participants: participants must send beforehand their expertise and the main areas of interest.

DETAILED WORKSHOP AGENDA

Plenary session (35'). The facilitator will present the AAP and the most relevant funding opportunities to implement projects in the Atlantic Area.

Working groups (35'). The participants will be divided in groups of 6-8 individuals and will be asked to carry out a SWOT analysis of different topics chosen based on the prior feedback the attendants are asked to provide.

Coffee break (20'). The Assistance Mechanism Team will provide a coffee break.

Main conclusions (15')

Q&A session (15')