

March 4th - 6th 2024
Al Hoceima, Morocco & online

SMART MARINE CONSERVATION FORUM

Book of abstracts



Disclaimer

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Specially Protected Areas Regional Activity Centre (SPA/RAC), United Nations Environment Programme/Mediterranean Action Plan (UNEP/MAP) or the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Copyright

All property rights of texts and content of different types of this publication belong to SPA/RAC. Reproduction of these texts and contents, in whole or in part, and in any form, is prohibited without prior written permission from SPA/RAC, except for educational and other non-commercial purposes, provided that the source is fully acknowledged.

© 2024

United Nations Environment Programme Mediterranean Action Plan
Specially Protected Areas Regional Activity Centre Boulevard du Leader Yasser Arafat
B.P.337 - 1080 Tunis Cedex - TUNISIA
car-asp@spa-rac.org

For bibliographic purposes, this document may be cited as: UNEP/MAP – SPA/RAC, 2024. Book of abstract of Smart Marine Conservation Forum (Al Hoceima, Morocco, 4-6 March 2024), SPA/RAC publi., Tunis, 48 p.

For more information: <http://smart-marine-conservation-forum.spa-rac.org>

FOREWORD

The world is facing a triple planetary crisis of climate change, biodiversity loss, and pollution. Innovative and smart solutions are imperative to protect our oceans and ensure their sustainable management. The International Forum on Database Management and Digital Transformation for Marine Conservation will convene experts, researchers, professionals, and institutional representatives from the Mediterranean region and beyond, to explore the latest advancements in database management and digital solutions for marine conservation, while fostering international collaboration.

The Forum objectives are the following:

- Showcase the latest advancements in data collection, processing, numerical modeling, and Information and Communication Technologies (ICT) for marine conservation.
- Address challenges, share best practices, and explore opportunities in the field.
- Provide an international platform for cross-sectoral exchange, networking, and collaboration.

The Smart Marine Conservation FORUM is organized by SPA/RAC, in collaboration with AGIR, and in coordination with the National Agency of Water and Forests (ANEF). Funding for the event is provided by the Italian Ministry for the Environment and Energy Security (MASE), under the bilateral cooperation agreement between UNEP/MAP and MASE, with a contribution from the European Union through the EU-funded ILIAD project.

It is scheduled to take place in Al Hoceima, Morocco, from 4 to 6 March 2024 and online.

TABLE OF CONTENTS

FOREWORD	3
SCIENTIFIC COMMITTEE	7
ORGANISING COMMITTEE	7
PROGRAMME	8
ORAL PRESENTATIONS	14

SCIENTIFIC COMMITTEE

Specially Protected Areas Regional Activity Centre (SPA/RAC)

- **Anis Zarrouk**
- **Asma Kheriji**
- **Emna Derouiche**
- **Issam Achour**
- **Lobna Ben Nakhla**
- **Yassine Ramzi Sghaier**

ORGANISING COMMITTEE

Specially Protected Areas Regional Activity Centre (SPA/RAC)

- **Anis Zarrouk**
- **Dhia Guezguez**
- **Dorra Maaoui**
- **Emna Derouiche**
- **Imtinen Kefi**
- **Issam Achour**
- **Naziha Ben Moussa**

AGIR

- **Houssine Nibani**
- **Samira Rahmouni**

PROGRAMME

Day 1 : March 4, 2024	
9 h 00 – 9 h 30	Registration
9 h30 – 10 h 30	Opening ceremony Elyes Hamza – SPA/RAC Director Farchi Cristina – Italian Ministry of Environment and Energy Security (MASE) representative Zouhair Amhaouch - Head of the Parks and Nature Reserves Division at ANEF Oussama Qostal - Fisheries Division (DPM) representative Houssine Nibani –AGIR President
10 h 30 – 10 h 45	Presentation of the forum's objectives and schedule Anis Zarrouk (SPA/RAC)
10 h 45 – 11h 00	Coffee break
Session 1 : Keynote Speeches	
11 h 00 – 12 h 30	<u>Lobna Ben Nakhla</u> (SPA/RAC): Enabling tools for data collection for the assessment and update of the Mediterranean Regional Action Plans for the conservation of threatened species and vulnerable habitats: The Role of UNEP/MAP Barcelona convention. <u>Paolo Carpentieri</u> (GFCM): Recent improvements in data acquisition, processing and management for marine conservation: the role of GFCM. <u>Andrej A. Gajić</u> (Sharklab ADRIA): Elasmobranchs in Focus: Understanding Population Dynamics, Habitats, and Threats for Effective Regional Conservation Actions.
12 h 30 – 14 h 00	Group photo Lunch
Session 2 : Marine Biodiversity monitoring, observation and conservation and related Databases	
Moderator : Emna Derouiche (SPA/RAC)	
Rapporteur : Asma Damghi (AGIR)	
14 h 00 - 15 h 40	<u>Dhia Guezguez:</u> The Mediterranean Biodiversity Platform: The Mediterranean SDI at the service of Biodiversity Conservation. <u>Reda Neveu,</u> Asma Kheriji, Dhia Guezguez & Susan Gallon: MAPAMED, the database of MARine Protected Areas in the MEDiterranean.

	<p><u>Aurora Nastasi</u>: The GFCM Database on Sensitive Benthic Habitats and Species.</p> <p><u>Giordano Giorgi</u>: The Italian Marine Ecosystem Restoration Information Platform.</p> <p><u>Ivana Mitrovic</u>: Montenegro Marine ecosystem database.</p>
15 h 40 - 16 h 10	Coffee break
16 h 10 - 17 h 30	<p><u>Dori Edelist</u>, Emily Roberstson & Dror Angel: Digital transformation in Citizen Science based Jellyfish Observation Initiatives in Southern European Seas.</p> <p><u>Andrea Picciolo</u>, Antonio Terlizzi, Houssine Nibani & Paolo D'Ambrosio: Empowering Marine Conservation: Collaborative Monitoring Initiatives between Porto Cesareo MPA and Al Hoceima National Park under SPAMI Twinning Programme.</p> <p><u>Almokhtar Saed</u> & Issam Achour: Results of Midterm Sea Turtle Nesting Monitoring in Libya and their Integration into MBP & IMAP Information System.</p> <p>Wassim Amdrous, <u>Imed Charkaoui</u>, Mehdi Aissi & Ibrahem Benamer: Bridging NASTNet and Adopt-a-Beach Databases for North African Sea Turtle Conservation.</p>
Day 2 : March 5, 2024	
Session 3 : Fisheries and Aquaculture Data Management	
Moderator : Anis Zarrouk (SPA/RAC)	
Rapporteur : Hasna Bouazzati (AGIR)	
9 h 00 - 10 h 40	<p><u>Federico De Rossi</u>: Fisheries and aquaculture data in support of the GFCM decision-making mechanism.</p> <p><u>Antonio Terlizzi</u>: Increasing trammel mesh size, reduces biomass removal, mitigates discards and increases economic revenue in artisanal fisheries: An example from the Porto Cesareo MPA, Ionian Sea, Italy.</p> <p><u>Lancelot Blondeel</u>, Clyde Blanco, Femke Aers, Pedro Rappé, Anthony Van De Sompele, Brahim Al Farisi, Wim Allegaert, Els Vanderperren & Hans Polet: VISTools: transforming fishing vessels from automatic data-gathering platforms to a Digital Twin of the Ocean.</p> <p><u>Alessandro Lucchetti</u>, Rocco De Marco, Francesco Di Nardo, Laura Screpanti, Daniele Costa, Benedetta Castagna, Daniel Li Veli, Jure Miočić Stošić & David Scaradozzi: Leveraging Digital Tools for Dolphin Conservation.</p>

10 h 40 - 11 h 00	Coffee break
11 h 00 - 12 h 00	<p>Yann Laurent: FAO Calipseo platform: An innovative modular approach to manage fisheries data flow and statistics at national level.</p> <p>Bechir Saidi, Samira Enajjar, Anis Zarrouk & Mohamed Nejmeddine Bradai: Importance of database in conservations strategies of vulnerable marine megafauna in the Gulf of Gabès, Tunisia.</p> <p>Bente Lilja Bye, Christopher Genillard, Magdalena Schmid & Arne-Jørgen Berre: Aquaculture risk metrics - serving multiple stakeholders with digital twins of the ocean.</p>
12 h 00 - 13 h 30	Lunch
Session 4 : Oceanographic Data and Digital Twin of the Ocean Moderator : Issam Achour (SPA/RAC) Rapporteur : El Haimour Fatima Zahra (AGIR)	
13 h 30 - 15 h 10	<p>Rafael Company Peris, Aida Mora Ayuso, Anis Zarrouk, Issam Achour & Valentijn Venus: Ballast Water Monitoring strategy at the Port of Valencia: A Comprehensive Study on Invasive Species.</p> <p>Harald Warmelink, Magali Gonçalves & Igor Mayer : Maritime Spatial Planning (MSP) Challenge Simulation Platform: seven years of design, development and application.</p> <p>Talen Rimmer, Cora Hoerstmann, Jay Pearlman & Frank Muller-Karger: Towards best practices for global interoperable ocean observing and monitoring for ecosystem-based management including conservation planning.</p> <p>Marco Amaro Oliveira, José Pinto, Pedro Gonçalves, Miguel Cândido & Rune Oyerhamn: Littoral in situ data collection using drifting platforms.</p> <p>Houssine Nibani: Interoperability and MSP: Enhancing Marine Conservation through Digital Transformation at Al Hoceima Marine Observatory.</p>
15h 10 - 15 h 30	Coffee break
15 h 30 - 17 h 30	<p>Felix Dols, Lornic Meszaros & Ghada El Serafy : EDITO Model Lab: a demonstration of an integrated application of the Digital Twin Ocean.</p> <p>Piotr Zaborowski, Rob Atkinson, Alejandro Villar & Raul Palma: Interoperability and Standards trends and challenges.</p> <p>Simone Libralato: Toward Oceans' twin: modelling approaches from physics to fish and fisheries.</p>

	<p><u>Razvan Mateescu, Dragos Niculescu, Elena Vlasceanu, Liliana Rusu & Luc Valdenbulche:</u> Downstream operational services supported by the Copernicus marine environment service for black sea coastal and marine areas protection.</p> <p><u>Mouna Ketata:</u> The Tunisian Coastal Observatory: Integrating Centralized GIS, Real-time Monitoring, and Satellite Observations for Coastal Management.</p> <p><u>Mohamed Abbas Tahoon:</u> Using the IMAP Info System to collect, manage and share data from monitoring programs along the northern coast of Egypt.</p>
19 h 30 - 21 h 30	Social dinner (offered by AGIR)
Day 3 : March 6, 2024	
Session 4 : Oceanographic Data and DTO Applications (continuation)	
Moderator : Dhia Guezguez (SPA/RAC)	
Rapporteur : Ben Aidine Bouchra (AGIR)	
8 h 30 – 10 h 30	<p><u>Valentijn Venus,</u> Firman Wahyudi, P. Muchada, F. Kurniawan : SemFlow - an online tool for cross-domain knowledge management for Maritime innovation.</p> <p><u>Marina Markovic:</u> MSP Workspace for the Mediterranean. Lorenza Babbini, <u>Annalisa Minelli,</u> Alessandro Lotti, Arthur Pasquale, Alessandro Oggioni, Paolo Tagliolato & Gloria Bordogna: The key for UNEP-MAP Knowledge Heritage: KMaP prototype.</p> <p><u>Fernando Cassola,</u> Alexandre Carvalho, Demetrius Lacet & Marco Amaro Oliveira: A 3D Immersive novel tool for digital twins using virtual choreographies: the oil spill use case.</p> <p><u>Garabet Kazanjian:</u> Digital Twins of the Ocean for multi-sectoral governance and policy-making.</p> <p><u>Valentijn Venus,</u> Firman Wahyudi & P. Muchada: Building interoperable Citizen Sciences Smartphone applications for Maritime information needs.</p>
11 h 00 – 11 h 30	Coffee break
11 h 30 – 13 h 00	Field Trip: Visit Al Hoceima MPA and Sea Exploration
13 h 00 – 15 h 00	Lunch

Session 5 : Poster Session at Al Hoceima MPA Observatory with focus on the importance of data in marine and coastal biodiversity conservation in Al Hoceima National Marine Park.

15 h 00 – 16 h 30

El Mghouchi Karim, Malouli Idrissi Mohamed, Ouamari Najib & Hassani Zerrouk Mohammed: The First Photo-Identification Study on Bottlenose Dolphins (*Tursiops truncatus*) in the waters off Al Hoceima, Western Mediterranean.

Atman Ait Lamqadem, Felix Dols, Viggo T. Wivestad, Jarl Gunnar T. Flaten, Signe A. Sønvisen, Erling Devold, Grethe Lilleng & Bård Johan Hanssen: Sustainable Interoperable Aquaculture Development (SI-AD) for the protection to the aquaculture farms.

Badria Bouchmal & Mohamed Amine Abarkan: Modeling octopus behaviour using conservation standards methodology.

Fatima Akkouh & Najwa Lamkaddem: Importance of *Cystoseira elegans* biomass in the ecological balance of the ZMPNAH.

Safae Amlou: The red kite, representing the terrestrial part of the PNAH.

Mariam Aznag & Amina Serma: The loggerhead sea turtle, a species of passage within the PNAH

Iman Balharbi & Amine Chakhte: The imperilled monk seal: challenges and strategies.

El Mehdi Bouchich: The role of the great horned owl, *Bubo bubo*, in the ecological balance of the PNAH.

Bilal Charki & Tarik Kaikai: Analysis of osprey conservation status at PNAH according to conservation standards.

Driss Derraji & Mohamed Oulad Hammou: Conservation of benthic species in the PNAH

Khawla Haimami & Siham Sabbani: Dolphins in Al Hoceima National Park

Zakaria Id El Hamed: Conservation of the Northern Bald Ibis in the Souss Massa Marine Park

Ibrahim Ziani: Study of seagrass meadows replacing Posidonia in Al Hoceima

Charif Bririch: *Patella ferruginea* population in the ZMPNAH

Bouchra Ben Aidine: Importance of ecosystem services provided by shellfish farming in restoring the PNAH ecosystem

Razvan Mateescu, Liliana Rusu, Elena Vlasceanu, Dragos Niculescu: Coastal waves' gauge stations network extension in the Romanian coastal areas, Its support of the fisheries and experimental aquaculture farms management

ORAL PRESENTATIONS

S2A1

The Mediterranean Biodiversity Platform: The Mediterranean SDI at the service of Biodiversity Conservation

Dhia Guezguez

Regional Activity Center for Specially Protected Areas (SPA/RAC): Boulevard du Leader Yasser Arafat B.P. 337
- 1080 Tunis Cedex – Tunisia

E-mail : dhia.guezguez@spa-rac.org

Abstract: Spatial data plays a fundamental role in informing evidence-based decision-making processes and implementing effective biodiversity conservation strategies in the Mediterranean region. The Mediterranean Biodiversity Platform (MBP), developed by the Specially Protected Areas Regional Activity Centre (SPA/RAC), serves as a Spatial Data Infrastructure (SDI) to support the implementation of the Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (Post-2020 SAPBIO).

To achieve this, the platform follows interoperability standards and data principles to promote a unified understanding of Mediterranean biodiversity. Additionally, data access and dissemination provide open and user-friendly access to a diverse array of biodiversity data, empowering stakeholders to make informed decisions based on evidence.

In addition, the MBP provides essential functionalities, including data discovery and access. The platform features a thorough catalog of biodiversity data, encompassing species and habitats distribution, threats, physical-chemical features and responses. Additionally, the MBP offers interactive visualization, facilitating the exploration of spatial data patterns, trends, and correlations. Moreover, users have the capability to download specific data subsets for in-depth analysis, integration with other platforms and visualization purposes.

By aligning with the post-2020 SAPBIO, promoting data sharing, access, and with capacity building, the MBP empowers stakeholders to work collectively towards post-2020 SAPBIO vision “By 2030 start to reverse the loss of biodiversity and put the Mediterranean marine and coastal biodiversity on the path to recovery for the benefit of nature and people”.

Keywords: Mediterranean Sea, biodiversity, conservation, SDI, Interoperability, data sharing & access, decision-making, Post-2020 SAPBIO.

S2A2

MAPAMED, the database of MARine Protected Areas in the MEDiterranean

Reda Neveu¹, Asma Kheriji², Dhia Guezguez² & Susan Gallon¹

¹ Mediterranean Network of Marine Protected Areas Managers (MedPAN): 58 quai du port 13002 Marseille 2 - France

² Regional Activity Center for Specially Protected Areas (SPA/RAC): Boulevard du Leader Yasser Arafat B.P. 337 - 1080 Tunis Cedex – Tunisia

E-mail: reda.neveu@medpan.org

Abstract: The Parties to the Convention on Biological Diversity (CBD) adopted in 2004 the objective to establish, by 2012 for marine environments, a comprehensive, well-managed, and ecologically representative national and regional systems of protected areas. This commitment falls under the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD) of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention). The Regional Activity Centre for Specially Protected Areas (SPA/RAC) coordinates the implementation of this protocol.

Within this framework, Mediterranean countries contribute to achieving the stated objective through the Regional Work Programme for Marine and Coastal Protected Areas in the Mediterranean, including the high seas. This program was adopted in 2009 by the Contracting Parties to the Barcelona Convention. The initial step in implementing this work program involves assessing the representativeness and effectiveness of the network of marine and coastal protected areas in the Mediterranean.

In 2010, at the initiative of the Mediterranean Network of Marine Protected Areas Managers (MedPAN) and in close collaboration of the SPA/RAC a unique partnership approach was launched at the Mediterranean level aiming to develop in 2011 a common database of Marine Protected Areas (MPAs) in the Mediterranean by 2011, titled MAPAMED (MARine Protected Areas in the MEDiterranean). This database includes spatial data along with corresponding attribute data.

This presentation provides an overview of the MAPAMED database and its website (mapamed.org), jointly owned, managed and regularly updated by both MedPAN and SPA/RAC. MAPAMED is interoperable with the World Database on Protected Areas (WDPA), the European Environment Agency's Nationally Designated Areas (CDDA) and Natura 2000 data, and the Ramsar Sites Information Service (RSIS). This collaborative initiative highlights the importance of facilitating the availability of robust, standardized, and validated data for marine biodiversity conservation.

Keywords: public database, interoperability, MPA, conservation, Mediterranean.

S2A3

The GFCM Database on Sensitive Benthic Habitats and Species

Aurora Nastasi

General Fisheries Commission for the Mediterranean (GFCM): Via Vittoria Colonna, 1, 00193 Roma RM, Italy

E-mail : Aurora.Nastasi@fao.org

Abstract: The [GFCM Database on sensitive benthic habitats and species](#) holds information on the distribution and abundance of habitats and species considered to be indicators of vulnerable marine ecosystems (VMEs) in the GFCM area of application. The database aims to store data and facilitate the analysis of all known VME indicator records (including absence data) in the Mediterranean and the Black Sea, covering deep water areas inside and outside national jurisdiction, for use by the GFCM Scientific Advisory Committee on Fisheries (SAC) and the Working Group on the Black Sea (WGBS) as well as the wider scientific community. The database contributes to the provision of scientifically robust advice to the GFCM on the distribution of potential VMEs in its area of application and supports the adoption of relevant management measures by decision makers. Analysis tools are integrated within the database (e.g. through RStudio online) and sample analytical scripts (in both R and Python languages) are put at disposal through dedicated repositories to users.

Keywords: GFCM Database, Sensitive Benthic Habitats, VME Indicator Records, Scientific Advisory Committee on Fisheries (SAC), Analytical Tools and Scripts.

S2A4

The Italian Marine Ecosystem Restoration Information Platform

Giordano Giorgi

Istituto superiore per la protezione e la ricerca ambientale (ISPRA): Via Vitaliano Brancati, 60- 00144 Roma, Italy

[E-mail: giordano.giorgi@isprambiente.it](mailto:giordano.giorgi@isprambiente.it)

Abstract: Italy's Recovery and Resilience Plan (PNRR) for Marine Ecosystem Restoration Project aims to implement active restoration plans for oysters, Posidonia meadows, coralligenous and cystoseira habitats in Italian Marine waters. It will significantly be enhancing, at the same time, the observation system with mapping the entire Italian coastal habitats (LIDAR) and seamounts, installing new buoys (coastal and offshore), AUV, work class ROV and a new Oceanographic research vessel.

All marine data will be gathered in a new developed Italian Marine Ecosystem Restoration (MER) Information Platform where modelling tools (physico-chemical and ecological) and digital twins instruments will be implemented for the first time on a national scale. The MER Information Platform will also include the Centralized Information System (SIC) that collects all data related to Marine Strategy Framework Directive monitoring, to Habitats Directive and survey data foreseen by the PNRR Digitalization of Marine Protected Areas Project (DigitAp), beyond other legacy databases on Environmental Impact Assessment Monitoring Programmes, coastal erosion and other relevant marine projects developed by ISPRA.

All data included in the Italian Marine Ecosystem Restoration Information Platform will be freely available for everyone, granting access to environmental information in full compliancy with Aarhus Convention data policy.

Keywords: Marine Ecosystem Restoration, oysters, Posidonia meadows, seamounts, LIDAR.

S2A5

Montenegro Marine ecosystem database

Ivana Mitrovic

Agencija Za Zaštitu Zivotne Sredine: IV Proleterske 19-81000 Podgorica, Crna Gora, Montenegro

[E-mail: ivana.mitrovic@epa.org.me](mailto:ivana.mitrovic@epa.org.me)

Abstract: Since 2008, Montenegro has been a Contracting Party to the Barcelona Convention and its protocols and therefore has an obligation, among other, to report on the parameters of the marine ecosystem. In 2008, Contracting Parties decided through their COP 15 Decision IG.17/6 to progressively apply the Ecosystem Approach (EcAp) to the management of human activities that may affect the Mediterranean marine and coastal environment for the promotion of sustainable development. A major component of the EcAp implementation is related to the monitoring and assessment of the status of the marine and coastal environment. In view of establishing a coherent region-wide framework, the Contracting Parties adopted in 2016 the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) (COP 19 Decision IG.22/7), based on eleven environmental objectives (Decision IG.22/7), on the basis of which the countries of the Adriatic region should adapt their national monitoring programs. However, it should be noted that the current IMAP contains elaborated and agreed harmonized indicators and environmental objectives relating to biodiversity, non-indigenous species, eutrophication, hydrography, coastline, contaminants and marine litter.

Based on IMAP and the Marine Strategy Directive (MSFD), which was transposed through the Law on Marine Environment Protection, a comprehensive Monitoring Program for the monitoring of the state of the marine ecosystem in Montenegro has been developed, which should gradually be fully implemented in the upcoming period.

It includes a set of parameters related to biodiversity, non-indigenous species, eutrophication, hydrography, coast, contaminants and marine waste and for which there is a defined reporting obligation under the Barcelona Convention and the European Environment Agency (EEA).

Therefore, the existing platform for storing data created aims to enable adequate storage and availability of information on the state of the marine ecosystem as well as automated and simple reporting that is fully compliant with the requirements of the Barcelona Convention (IMAP Info Standards) and the European Environment Agency.

The platform is designed for the Ministry of Ecology, Spatial Planning, and Urban Planning, along with professional institutions involved in monitoring the marine ecosystem. Its purpose includes data entry, analysis, and validation for the monitoring program. Additionally, it serves the Environmental Protection Agency for national and international reporting and informs both professionals and the general public in Montenegro who are interested in environmental matters.

Keywords: EcAp, IMAP, MSFD, Platform, Montenegro.

S2A6

Digital transformation in Citizen Science based Jellyfish Observation Initiatives in Southern European Seas

Dori Edelist, Emily Roberstson & Dror Angel

University of Haifa: Abba Khoushy Ave 199, Haifa, 3498838, Israël

[E-mail: blackreefs@gmail.com](mailto:blackreefs@gmail.com)

Abstract: Jellyfish are ancient, abundant, mesmerizing creatures, that are an important part of the marine ecosystem, but also create a nuisance to coastal economies and affect health of millions worldwide. Spatial and temporal patterns of their arrival are therefore key to managing the challenges jellyfish pose. In Southern European Seas, which are major tourism hotspots, there are a multitude of local organizations striving to monitor, map and study the spatial and temporal distribution patterns of relevant species as they drift across the shores. These initiatives mostly do so with the help of Citizen Scientists – either the wider public, or individuals trained by scientists to identify and report the presence of gelatinous creatures online according to locally set standards. Supported by the EU ILIAD project, 12 CS JOIs from 8 countries in Southern European Seas partnered to share their methodologies for jellyfish data collection, validation and verification.

This regional networking allows:

- 1) the development of a shared methodological metadata schema, 2) an expert questionnaire for data standardization and harmonization,
- 2) discussions of additional best practices, such as examination of data resolution, storage and management options,
- 3) exchange and prioritization of shared challenges and identification of opportunities for future collaboration.

Keywords: Jellyfish, Citizen Science, Data Standardization, Mediterranean Sea, Digital Twins.

S2A7

Empowering Marine Conservation: Collaborative Monitoring Initiatives between Porto Cesareo MPA and Al Hoceima National Park under SPAMI Twinning Programme

Andrea Picciolo^{1,2}, Antonio Terlizzi², Houssine Nibani³ & Paolo D'Ambrosio^{1,2}

¹ Porto Cesareo MPA: Via Cosimo Albano, SNC, 73010 Porto Cesareo – Lecce, Italy

² Stazione Zoologica Anton Dohrn: Via Francesco Caracciolo, 80122 Napoli, Italy

³ AGIR: 188 Rue Mbarek Al Bekkay/ Quartier Al Menzah, 32000 Al Hoceima, Morocco

E-mail: picciolo.a@gmail.com

Abstract: Marine Protected Areas (MPAs) play a crucial role in the protection and conservation of marine biodiversity and ecosystems. These zones provide a safe haven for a wide range of marine species, facilitating their growth, reproduction, and survival. The management and protection activities within MPAs are essential for preserving ecologically significant habitats which offer vital ecosystem services and, also serve as nursery habitats for numerous commercially important fish species and attract sustainable and conscious tourism. The importance of monitoring activities within MPAs is evident and fundamental in achieving various conservation goals outlined in major international directives on species and ecosystem conservation and restoration. Monitoring provides crucial data on ecosystem health, species abundance and distribution, and key environmental variables relevant to conservation. This information is critical for evaluating the effectiveness of management measures and making necessary adjustments in the face of deviations or unforeseen threats.

The Porto Cesareo MPA employs specific knowledge and technologically advanced tools for the surveillance of key species, control and management of anthropogenic activities, morpho-bathymetric and ecological studies on coastal and offshore habitats (Side Scan Sonar, Multibeam, ROVs, Drones), and remote analysis of physical variables (Temperature, Chlorophyll and Total Suspended Matter concentrations) both on a large scale (Satellites) and local scale (Temperature Data Loggers, CTD). Recent focus has been on coastal habitats, subject to stressors typical of the transitional environments, including investigations on the conservation status of dune habitats and the study of the *Gongolaria barbata* macroalgal forests in the very shallow water of “La Strea” inlet, following extreme events such as the November 2019 Medicane and heatwave phenomena. Moreover, active involvement of local communities, academia researchers, and non-governmental organizations in monitoring MPAs promotes participatory and sustainable management. This engagement fosters environmental awareness and a wider sense of responsibility towards marine resources.

In the framework of the SPAMI Twinning Programme led by SPA/RAC, a collaboration between the Porto Cesareo MPA and Al Hoceima National Park has evolved, from the recent exchanges concentrated in the observation of management activities, monitoring techniques, and discussions on sustainability projects, to a collaboration led to the production of an exchange agreement, emphasizing strategic monitoring actions and environmental assessments using validated EU protocols.

The Al Hoceima National Park, equipped with a management plan, acknowledges the need for advanced technical knowledge and effective and advanced instrumentation. The collaboration aims to fill these gaps, providing the park with the necessary expertise and tools to enhance its monitoring capabilities and implement effective management actions.

Keywords: Marine Protected Areas, Twinning Programme, Collaborative Monitoring, Biodiversity Conservation, Environmental Assessment.

S2A8

Results of midterm sea turtle nesting monitoring in Libya and their integration into MBP & IMAP info System

Almokhtar Saied & Issam Achour

Nature Conservation Department, Ministry of Environment: Janzoor Road Alghiran- Tripoli, Libya
Regional Activity Center for Specially Protected Areas (SPA/RAC): Boulevard du Leader Yasser Arafat B.P. 337
- 1080 Tunis Cedex – Tunisia

E-mail: mok405@yahoo.com

Abstract: Effective conservation and management of marine biodiversity, including endangered species such as sea turtles, relies on robust monitoring programs and integrated data management systems. This study focuses on the integration of midterm sea turtle nesting monitoring results from Libya into the Mediterranean Biodiversity Platform (MBP) and the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria Information System (IMAP info System). The midterm monitoring efforts, conducted along the Libyan coast in the framework on the EU IMAP/MPA project and MAVA sea Turtle project, encompassed key nesting beaches and the use of standardized protocols for data collection.

The collected data includes nesting activity such as nesting density, nest counts, and nesting success rates, alongside environmental parameters like beach erosion, temperature, and human disturbances. Through systematic data integration, these midterm monitoring results provide valuable insights into the population trends, distribution patterns, and nesting habitat preferences of sea turtles in Libyan beaches.

The Integration of the collected data into the MBP & IMAP Info System facilitates accessibility, visualization, and analysis of the collected data, enabling stakeholders to make decisions for the effective conservation and management of sea turtle populations and their habitats.

This presentation highlights the importance of midterm monitoring and its integration into spatial data infrastructure such MBP for better marine biodiversity protection and management planning.

Keywords: Sea turtles, nesting monitoring, Mediterranean Biodiversity Platform (MBP), IMAP Info System, Libya.

S2A9

Bridging NASTNet and Adopt-a-Beach Databases for North African Sea Turtle Conservation

Wassim Amdrous, Imed Charkaoui, Mehdi Aissi & Ibrahem Benamer

WWF North Africa: 3, Bis rue El Moez -E Menzah 1- 1004 Tunis, Tunisia.

E-mail: wamdrous@wwfna.org

Abstract: The Mediterranean Sea, with its 20+ coasting countries and approximately 160 million inhabitants, is one of the most crowded and impacted marine bodies by human activities in the world. Maritime traffic (15% of global shipping), Overfishing (62% of fish stocks are at serious and real risk of being depleted), oil and gas extraction (7-9% of the world reserve), and climate change (one of the top seas responsive to climate change) are some of the main impacts threatening the Mediterranean biodiversity of roughly 12,000 marine species in which 20 -30% are endemic. Most of these species and their habitats extend beyond national borders. In this regard, further regional collaboration is essential for effective conservation, especially given the disparities between Northern and Southern shores in conservation efforts.

The North African Sea Turtles Network (NASTNet) is one of the examples of a successful network: (Combination of experts and NGOs representing the five North African countries) in the North African coastline. The Network aims at strengthening the coordination of sea turtle conservation efforts among North African countries develop a network strategy to exchange experiences, support and strengthen the capabilities of national/ local partners in the fields of protection and scientific research. Through financial support, technical expertise, and network facilitation, WWF North Africa has been instrumental in nurturing the growth of NASTNet. The organization's dedication extends beyond mere sponsorship, actively participating in the development of standardized protocols (Protocols on: Stranding, Nesting, studying interaction with fisheries (Bycatch Protocol), Sea turtle Blood and Tissue sampling + Epibionts, Treatment of animals in difficulties alive or in a coma) ensuring the quality and reliability of the collected data.

Another database of interest is provided by the Adopt a Beach initiative. Since its initiation in 2022 the project has yielded a provisional, yet very important data on plastic pollution's composition, distribution and characteristics. The aim of WWF-NA is to link the two databases in the future to correlate the presence, distribution and stranded sea turtles with the identified hotspots of plastic pollution which will lead to recommendations and actions of conservation for the species. (for example: NASTNet has developed a book containing the situation, data and statistics for the five North African countries).

Keywords: WWF-NA, North Africa, Sea Turtles, NASTNET.

S3A1

Fisheries and aquaculture data in support of the GFCM decision-making mechanism

Federico De Rossi

General Fisheries Commission for the Mediterranean (GFCM): Via Vittoria Colonna, 1, 00193 Roma RM, Italy

E-mail: Federico.DeRossi@fao.org

Abstract: The decision-making process of the GFCM is supported by the scientific advice produced by the GFCM subsidiary bodies that review the outcomes of existing GFCM technical working groups which regularly compile and analyse available scientific evidence. Based on the proposals advanced by Member states (Contracting Parties), the Commission adopts either binding recommendations or non-binding resolutions. Most of these decisions set reporting obligations for Contracting Parties and Cooperating non-contracting Parties (CPCs), with the transmitted fisheries and aquaculture data playing a key role in the mechanism.

With respect to fisheries data quality towards the consolidation of the data used for scientific advice of CPCs, two different mechanisms are currently in place at the GFCM level according to the data. Information transmitted by both CPCs and national experts through the Stock Assessment Forms (SAFs) input data calls is regularly evaluated by existing GFCM stock assessment working groups and benchmark sessions held during the year and, at least, for the species identified as priority by the Scientific Advisory Committee for Fisheries (SAC) and the Working Group on the Black Sea (WGBS). On the other hand, the quality of the fisheries data received through the fisheries Data Collection Reference Framework (DCRF) online platform from CPCs in response to existing GFCM Recommendations is ensured thanks to the regular application of fisheries quality indicators on the DCRF database: the results are put back at disposal of concerned CPCs via online dashboards under the DCRF online platform. In the context of aquaculture data, and within the umbrella of the Scientific Advisory Committee for Aquaculture (CAQ), there are ongoing activities towards the quality assessment of the information (production statistics, centers, and market) officially transmitted by CPCs through the appointed National Focal Points via the Information System for the Promotion of Aquaculture in the Mediterranean (SIPAM) online platform. Both fisheries and aquaculture reporting obligations of CPCs as well as the implementation of GFCM decisions at national level are then assessed by the GFCM Compliance Committee (CoC) annually.

Keywords: Mediterranean Sea, Black Sea, fisheries, aquaculture, decision-making process, scientific advice.

S3A2

**Increasing trammel mesh size reduces biomass removal, mitigates discards and increases economic revenue in artisanal fisheries:
An example from the Porto Cesareo MPA, Ionian Sea, Italy**

Antonio Terlizzi

Stazione Zoologica Anton Dohrn, Via Francesco Caracciolo, 80122 Napoli NA, Italy

E-mail: antonio.terlizzi@szn.it

Abstract: Small-scale fishing plays a major role in regional economies worldwide and, with a large number of small vessels involved, it provides employment and livelihood to coastal communities. Generally recognized as more selective than other fishing practices, small-scale fishery can nevertheless be subjected to high rates of discards of both non-target species and small-sized individuals, which in turn could lead to both decreased incomes for fishers and increased depletion of fish stocks. However, if the relationship between fish size and price has long been assessed, the effect of enhanced size-selectivity of fishing gears and consequent economic gains has been little investigated. This study, set in the Porto Cesareo Marine Protected Area (Italy, Ionian Sea), aimed at testing effective strategies to improve trammel net selectivity, reducing discards and maximizing the income for fishers. Different mesh sizes (20, 22 and 24mm) trammel nets were employed.

The study consisted in 72 fishing days from July 2012 to September 2013 and each day involved experimental fishing with the three mesh sizes. A total of 16008 specimens (103 species) were collected but the analysis focused on the 18 most common species in the area for a total of 12782 individuals. Mesh size trammel nets of 20mm and 22mm yielded most of the biomass, 324.8 and 321.5 kg respectively, while the 24 mm mesh yielded 280.7 kg. The 24 mm mesh, even if accounted for lower income compared to the 22 mm mesh (2383.9 € vs 2590.5 €, respectively), provided a significant 50% reduction of discards compared to the 20 mm and 22 mm mesh. The use of 24mm mesh size was found to be an effective strategy to reduce the number of discarded organisms and, consequently, the pressure exerted on local fish stocks with associated higher revenue for fishers. The results of this study demonstrated that trammel net selectivity can improve and support conservation measures and concurrently increase profitability of local fishery.

Keywords: small-scale fisheries, gear selectivity, trammel net, sustainability, selective fishing.

S3A3

VISTools: transforming fishing vessels from automatic data-gathering platforms to a Digital Twin of the Ocean

Lancelot Blondeel, Clyde Blanco, Femke Aers, Pedro Rappé, Anthony Van De Sompele, Brahim Al Farisi, Wim Allegaert, Els Vanderperren & Hans Polet

Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Fisheries and Aquatic Production, Ankerstraat 1, 8400 Oostende, Belgium

E-mail: lancelot.blondeel@ilvo.vlaanderen.be

Abstract: Sensors on-board of Belgian fishing vessels measure essential data on several aspects of the fishing activity. These measurements include vessel position, towing force and rope length of the net, fuel consumption, and catches per haul. However, there are new and valuable information that can be extracted if all these data are integrated and coupled with each other. The VISTools system automatically harmonizes all the data coming from the sensors and analyzes them without an extra burden to the crew on-board.

These coupled data are then interactively visualized into significant business insights either as a live feed view to the skipper on-board or near-real time information to the vessel owner on land. This system opened to new opportunities of installing additional sensors that gather data that directly benefits science and indirectly the fishing sector. These hitchhiking sensors at the net are measuring temperature, salinity, and turbidity at different depths. By further coupling this information with other data from other databases such as CMEMS and EMODnet, Digital Twins of the Ocean predictive models can be trained and be used as additional decision support tools to the sector. Currently there are two models being developed, (a) catch prediction model that forecasts the suitable areas to catch common sole and European plaice and (b) ship routing model that simulates the steaming route that consumes fuel efficiently.

Keywords: VISTools System, Sensor Integration, Hitchhiking Sensors, Digital Twins of the Ocean, Predictive Models.

S3A4

Leveraging Digital Tools for Dolphin Conservation

**Alessandro Lucchetti^{1,2,3}, Rocco De Marco¹, Francesco Di Nardo⁴, Laura Screpanti⁴, Daniele Costa^{4,5},
Benedetta Castagna^{2,4}, Daniel Li Veli¹, Jure Miočić Stošić⁶ & David Scaradozzi^{2,4}**

¹Institute for Biological Resources and Marine Biotechnologies (IRBIM), Ancona, Italy,

²National Biodiversity Future Center, 90133 Palermo, Italy

³Coordinator LIFE DELFI project (LIFE18 NAT/IT/000942)

⁴Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche, Ancona, Italy

⁵Ancybernetics, Via Brece Bianche, 12, 60131 Ancona AN

⁶Blue World Institute of Marine Research and Conservation, Kaštel 24, HR-51551 Veli Lošinj, Croatia

E-mail: alessandro.lucchetti@cnr.it

Abstract: Dolphin conservation faces numerous challenges, from habitat degradation to human activities impacting marine ecosystems, firstly fishing. However, advancements in digital technologies offer promising solutions to address these challenges. This presentation explores the integration of artificial intelligence (AI), photo identification techniques, and mobile applications in dolphin conservation efforts.

Artificial intelligence, particularly machine learning algorithms, has emerged as a powerful tool for detecting and monitoring marine mammals. By analyzing acoustic signals and underwater imagery, AI systems can identify dolphin presence, track their movements with unprecedented accuracy and efficiency. This digital approach not only streamlines data collection but also provides valuable insights into the behavior and distribution of dolphin populations.

Photo identification remains a cornerstone of marine mammal research, allowing scientists to recognize individual dolphins based on unique markings and features. Digital platforms enhance this process by automating the cataloguing and comparison of dorsal fin patterns, facilitating large-scale studies of dolphin populations across different regions and timeframes. However, the lack of coordination and numerous data sources make the system inefficient, with a loss of potentially useful information.

Moreover, the development of mobile applications has revolutionized citizen science participation in dolphin conservation. These apps enable users to report dolphin sightings, record behavioral observations, and contribute valuable data to scientific databases. By engaging the public in monitoring efforts, these digital platforms foster community awareness and support for marine conservation initiatives.

By leveraging AI-powered detection, photo identification techniques, and citizen science apps, researchers and conservationists can enhance our understanding of dolphin ecology, implement evidence-based conservation strategies, and inspire collective action towards the protection of these iconic marine species.

Keywords: Artificial Intelligence, Photo identification, Mobile app, automatic detection.

S3A5

FAO Calipseo platform: An innovative modular approach to manage fisheries data flow and statistics at national level

Yann Laurent

Food and Agriculture Organization of the United Nations (FAO): FAO headquarters Viale delle Terme di Caracalla, 00153 Roma RM, Italy.

E-mail : Yann.Laurent@fao.org

Abstract: Calipseo is a tool to support FAO Members to reinforce their capacity to produce fisheries statistics for evidence-based policies making, as well as for fulfilling reporting obligations to national institutions, regional fisheries bodies or management organizations and to FAO. This web-based application manages administrative data such as registries and licenses for fishers and fishing vessels, and fishery dependent data collected in the field by enumerators (Sample based survey for small-scale fisheries) or reported by fishers themselves (logbook for large-scale fisheries). It includes reporting modules and associated monitoring dashboards for the key indicators needed to manage fisheries, such as catch, effort, catch per unit. of. effort, economic values. It can be installed as a full application or only with few modules (just a vessel registry or just a catch and effort database). It is currently deployed in 8 countries.

Keywords: Calipseo platform, Fisheries Statistics, Web-Based Application, Data Management, Monitoring Dashboards

S3A6

Importance of database in conservation strategies of vulnerable marine megafauna in the Gulf of Gabès, Tunisia

Bechir Saidi^{1,2}, Samira Enajjar², Anis Zarrouk³ & Mohamed Nejmeddine Bradai⁴

¹Faculty of Science and Technology of Sidi Bouzid, University Campus Agricultural city - Sidi Bouzid.

²National Institute of Marine Science and Technology (Sfax center) BP. 1035–3018 Sfax.

³Regional Activity Center for Specially Protected Areas (SPA/RAC): Boulevard du Leader Yasser Arafat B.P. 337 - 1080 Tunis Cedex – Tunisia

⁴ASCOB-Syrtis, Faculté des sciences de Sfax, 1171 Sfax Tunisie

E-mail : bechirinstm@yahoo.fr

Abstract: Vulnerable marine megafauna such as elasmobranchs and sea turtles are particularly vulnerable to fisheries bycatch due to their life history characteristics. Fisheries represent one of the main threats to marine megafauna in the Gulf of Gabès, but the level of their interaction with fisheries remains poorly assessed.

Data collection is a key component in vulnerable marine megafauna conservation. Data collected through ongoing monitoring provides essential information to understand fishery operations, evaluate fishery impacts on the vulnerable marine megafauna, and develop appropriate conservation strategies. A well-designed data collection and monitoring program is crucial to achieve objectives.

This study aims to show the importance of database to elucidate the impact of fisheries on vulnerable marine megafauna and the proposition of conservation strategies in the Gulf of Gabès, Tunisia. The study was carried out in the framework of MedBycatch Project which aims to reduce the impact of bycatch in targeted fleet segments on vulnerable marine species in the Mediterranean.

Based on data collected during 2019, 2020 and 2021 via 1678 at port questionnaires to fishers and 739 fishing days on board observation of fishing vessels including bottom trawlers, small-scales fisheries (bottom longlines and set nets) and purse seine the multi-gear fisheries impacts on vulnerable marine megafauna is assessed. Analyze showed that elasmobranchs and marine turtles are the most groups affected by all gears. However, the trawlers, bottom longline, and gillnets were the most impacting.

The results allowed to propose some mitigation measures on trawlers, demersal longline and gillnets targeting elasmobranchs to reduce their impact on elasmobranch species and sea turtles. Investigation showed that spatiotemporal measures could be the best solution to reduce the rates of bycatch. Furthermore, a low mortality of bycaught sea turtles and elasmobranch constitutes an opportunity to release alive specimens caught accidentally.

Keywords: Bycatch, Database, elasmobranch, Gulf of Gabès, Sea turtles, conservation.

S3A7

Aquaculture risk metrics - serving multiple stakeholders with digital twins of the ocean

Bente Lilja Bye¹, Christopher Genillard², Magdalena Schmid² & Arne-Jørgen Berre³

¹BLB : Tjyruhjellveien 17, 3512 Hønefoss, Norway

² Genillard & Co: Ismaninger Str. 102 - 81675 Munich, Germany

³ SINTEF Digital: Gaustadalléen 23 C, 0373 Oslo, Norway

E-mail: bentelil@hotmail.com

Abstract: Norway's total exports from aquaculture production reached NOK 111.3 billion (€ 9.4 billion) in 2022, making it the 2nd biggest industry in the country. Fish farmers and their insurers are facing an increasing risk and hazard complexity with the impact of climate change and environmental, social, and governance (ESG) from the regulator that are challenging a traditional „let us wait and see what happens“ approach to risk management. Better predictive analytics are needed to ensure compliance, sustainability and a profitable future for the industry.

The Iliad Aquaculture Risk Metrics digital twin deploys data technology to gather all relevant risk data on a platform providing a holistic assessment tool for insurers and aquaculture farmers alike. It is leveraging other digital twins of the ocean, Iliad Aquaculture digital twin and Iliad Water quality digital twin in Norway, in an inter-operational fashion. This enables identification of future risk scenarios that can be mitigated through adaptation measures and/or enables the purchase of tailored insurance. In this presentation we will show a first version (mvp) that will be further developed to provide location risk mapping along the Norwegian coast and be made available to all stakeholders in fish farming through a licensing agreement. The Aquaculture Risk Metrics digital twin of the ocean can also be used to monitor policy compliance and inform future policy development both for fisheries, aquaculture industry as well as environmental and marine spatial planning policies.

Keywords: aquaculture, insurance, risk management, environmental monitoring, digital twins.

S4A1

Ballast Water Monitoring strategy at the Port of Valencia: A Comprehensive Study on Invasive Species

Rafael Company Peris¹, [Aida Mora Ayuso¹](#), Anis Zarrouk², Issam Achour² & Valentijn Venus³

¹ Fundación Valenciaport: Avinguda Moll del Turia, s/n, 46024 Valencia, Spain

² Regional Activity Center for Specially Protected Areas (SPA/RAC): Boulevard du Leader Yasser Arafat B.P. 337 - 1080 Tunis Cedex – Tunisia

³ RAMANI: RAMANI B.V. The Netherland

E-mail: amora@fundacion.valenciaport.com

Abstract: The Port of Valencia, a pivotal public entity, oversees the strategic management of three state-owned ports along the east coast of the Mediterranean in Spain—Valencia, Sagunto, and Gandía. The port of Valencia, Spain's premier Mediterranean port, excels in containerized cargo, owing its success to a robust global network and dynamic influence. Despite its prominence, the port lacks substantial experience in Ballast Water Management (BWM), a critical concern as invasive aquatic species poses a significant threat to marine ecosystems through maritime transport.

Maritime transport, identified as a key pathway for the introduction of invasive species, transports 7,000 to 10,000 different species globally each day through ballast water. This issue has worsened with increased trade and traffic volumes, leading to a rise in bio-invasions. Despite the ongoing surge in maritime trade, the full extent of the problem may not have manifested, raising concerns about harmful aquatic organisms and pathogens (HAOP) introduced through ships' ballast water.

Within the Iliad project, focused on the Digital Twin of the Ocean (DTO), the Port of Valencia is tasked with assessing invasive species risk. To this aim, with the support of SPA/RAC and RAMANI, technical and scientific expertise will be provided to develop a Non indigenous species (NIS) and ballast monitoring programme and early warning system in line with the Integrated Monitoring and Assessment Programme (IMAP), the Mediterranean Ballast Water Management Strategy, the regional harmonised procedures for the uniform implementation of the ballast water management convention in the Mediterranean sea, and considering the latest advances in technology and modelling and include the eDNA approach for species identification.

This assessment is integral in minimizing losses in biodiversity and economic impacts for ocean users and can eventually be replicable in other ports across the Mediterranean Sea. Additionally, it aids operators, port authorities, and shipping companies in maintaining compliance and avoiding legislative penalties. Precise information about the risk of HAOP becomes a cornerstone in navigating the delicate balance between maritime commerce and environmental sustainability.

Key words: Valenciaport, Invasive Aquatic Species, Ballast Water Management, Digital Twin of the Ocean (DTO), Barcelona Convention, NIS monitoring plan and early warning system.

S4A2

Maritime Spatial Planning (MSP) Challenge Simulation Platform: seven years of design, development and application

Harald Warmelink, Magali Gonçalves & Igor Mayer

Stichting Breda University of Applied Sciences (BUas): Monseigneur Hopmansstraat 2, 4817 JS Breda, The Netherlands

E-mail: warmelink.h@buas.nl

Abstract: Human activities at sea such as offshore wind farming, shipping and fishing, easily get into each other's way and have a long-term impact on the marine environment.

Maritime Spatial Planning (MSP) Challenge (www.mspchallenge.info) has been designed to help decision-makers, stakeholders and students understand and manage the maritime (blue) economy and marine environment. In the interactive simulation, country planners and stakeholders see the entire sea region and review many different data layers to make an assessment of the current status. They develop plans for future uses of sea space, over a period of several decades. The consequences of decisions for energy, shipping and the marine environment are simulated and visualized in indicators and heat maps. MSP Challenge integrates best available georeferenced, maritime and marine data with simulation models for ecology, shipping and energy production. Using advanced game technology and game thinking, MSP Challenge is designed to engage and immerse users, making it a great platform for stakeholder engagement, planning through co-design, learning and education.

This work reflects on the past seven years of MSP Challenge design and application through 60+ workshop with 2000+ participants.

Keywords: marine/maritime spatial planning, planning support systems, simulation game design, simulation game technology, higher education and training

S4A3

Towards best practices for global interoperable ocean observing and monitoring for ecosystem-based management including conservation planning

Talen Rimmer¹, Cora Hoerstmann², Jay Pearlman³ & Frank Muller-Karger⁴

¹ University of Victoria, BC, CANADA

² Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

³ FourBridges, Port Angeles, WA USA

⁴ University of South Florida, St. Petersburg, FL USA

E-mail: rimmertalen@gmail.com

Abstract: Ocean monitoring and forecasting activities are largely fragmented due to diverging priorities, customs, and spatial scales. This is characteristic of current ecological and marine life monitoring, with relatively slow convergence on standards or common methods such as on Essential Ocean Variables, data formats, and information publication strategies. This can make monitoring local or regional impacts of climate or environmental change challenging. As a result, it can be difficult to define or implement adaptation strategies or solutions. To successfully revolutionize ocean observing and forecasting, there is a need to create interoperable scientific methods and observations. These approaches can become accepted best practices. The Ocean Best Practices System (OBPS) provides an open access repository, a Research Topic in a peer-reviewed *Frontiers in Marine Science Journal*, and resources supporting capacity development. It offers a framework that fosters method development, creates a system to support FAIR and CARE principles, and can simplify the evaluation and cross-comparison of different methods. Several challenges remain in the implementation of consistent ocean observing, including convergence on common conservation and sustainable development goals, building trust in documented methods among local communities; adapting to different requirements from diverse disciplines, cultures, applications, and local capacities and infrastructure; and incorporating local observing approaches and cultural methods used in small island states, indigenous Arctic regions, and in developing areas in the global South.

This work outlines the main functions of OBPS, the challenges in best practice development, and the benefits from documenting these practices. Specifically, we focus on approaches for broader engagement with regional communities and the evolution of OBPS to support science, observations, citizen science initiatives, data management, and modeling for revolutionizing ocean monitoring. The goal is to implement a system through which the distribution and use of best practices leads to synergistic effects, whereby the outcomes are larger than those from individual and disconnected activities addressing global societal issues.

Keywords: Ocean Best Practices System (OBPS), Interoperable Scientific Methods, Challenges in Ocean Observing, FAIR and CARE Principles, Synergistic Effects.

S4A4

Littoral in situ data collection using drifting platforms

Marco Amaro Oliveira¹, José Pinto², Pedro Gonçalves³, Miguel Cândido⁴ & Rune Oyerhamn⁵

¹ INESC TEC: Campus da Faculdade de Engenharia da Universidade do Porto, Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

² OCEANSCAN: Denmore Road, Bridge of Don, Aberdeen AB23 8JW, United Kingdom

³ FEUP-LSTS: Universidade do Porto - Faculdade de Engenharia, Dep. de Eng. Electrotécnica e de Computadores, Rua Dr. Roberto Frias s/n, sala I203/4, 4200-465 Porto, Portugal

⁴ Instituto Hidrográfico, 1249-093 Lisbon, Portugal

⁵ NORCE: P.O.B 22 Nygårdstangen, NO-5838 Bergen, Norway

E-mail: marco.a.oliveira@inesctec.pt

Abstract: Digital Twins and Marine Spatial Planning play an important role by enabling what-if scenarios and promoting the efficient use of maritime space. Informed decisions require sound knowledge about the current state of the sea, including nearshore areas, where data acquisition requires innovative approaches.

A drifting sensor, originally named WAVY, was developed and upgraded in H2020 Project MELOA, now extended in the WAVY-NOS project for in-situ monitoring of nearshore areas. Through the development of new types of portable, rugged and modular drifters that can be repeatedly deployed by untrained users while monitored in real time (via a web browser) to quickly collect valuable data in the coastal ocean. The payloads vary but are time-synchronized across multiple drifters. The core hardware comprises: (i) CPU; (ii) GNSS receiver for position, (iii) speed and clock synchronization; (iv) IMU for attitude and estimating wave data; (v) 4G communications; (vi) Wi-Fi; (vii) Power control; (viii) Monitoring of Payload and; (ix) 270 Ah battery.

Three drifter types have been designed and field-tested: Wavy-Echo (echosounder), Wavy-Imager (camera) and Wavy-Hydro (hydrophone). In addition to position, speed and wave data, the drifters' payload allows outputting bathymetry, still images and underwater noise. The complete data sets are stored onboard, but positions and alarms are sent to off-board software. Drifter locations are always known, and relevant events are communicated in real-time.

Different payloads can be combined in multiple, heterogeneous deployments. These will enable the collection of data from sensors distributed over relatively large areas and will further increase the number of use cases and potential users. Co-temporal hydrophone readings may be used to estimate sound sources. Co-located readings of echosounders and cameras will improve bottom classification and a combination of these drifters may be used for continued ecology studies.

Mid-project data collection campaign was performed in a real environment and results presented in public event. More about WAVY-NOS on <https://www.wavynos.eu/>

Keywords: in situ measurements, littoral processes, drifting sensors, real-time data acquisition, nearshore monitoring

S4A5

Interoperability and MSP: Enhancing Marine Conservation through Digital Transformation at Al Hoceima Marine Observatory

Houssine Nibani

Association de Gestion Intégrée des Ressources (AGIR) : 188 Rue Mbarek Al Bekkay/ Quartier Al Menzah,
32000 Al Hoceima, Morocco

E-mail : agirnibani@gmail.com

Abstract: The Al Hoceima Marine Observatory, spearheaded by AGIR (Association de Gestion Intégrée de Ressources), in collaboration with various stakeholders and partners, including the ODYSSEA Project and Iliad Consortium, presents a pioneering initiative in North Africa for promoting a sustainable blue economy. This project involves the deployment of innovative tools and applications, such as SeaExplorer underwater gliders, Surface/landers Systems Drones and Roves, to collect comprehensive data on marine ecosystems in the Alboran Sea.

The initial missions of the SeaExplorer gliders focused on studying the Western Alboran Gyre (WAG), an area crucial for understanding ocean dynamics and biodiversity. Through satellite imagery and glider data, significant insights into temperature, salinity, and water currents have been obtained, shedding light on the complex dynamics of the WAG.

Moreover, AGIR's involvement in projects like Iliad underscores its commitment to interoperable, data-driven solutions for marine conservation. Through partnerships with aquaculture and fisheries sectors, AGIR advocates for the integration of high-resolution data from platforms like Ziphys to address challenges such as algal blooms and invasive species.

Furthermore, the observatory's strategic location near the Strait of Gibraltar a major shipping route, highlights the need for effective management of maritime risks, including oil spills and invasive species spread through ballast water. AGIR's collaboration with port authorities and environmental agencies aims to develop predictive models and monitoring systems to mitigate these risks and safeguard marine biodiversity.

In conclusion, the Al Hoceima Marine Observatory exemplifies the transformative potential of digital technologies and interoperable data systems in advancing marine conservation efforts. By fostering collaboration and leveraging innovative solutions, this initiative aims to promote sustainable practices and protect marine ecosystems for future generations.

Keywords: Interoperability, MSP, Al Hoceima Marine Observatory, AGIR

S4A6

EDITO Model Lab: a demonstration of an integrated application of the Digital Twin Ocean

Felix Dols¹, **Laurnic Meszaros**^{1,2} & **Ghada El Serafy**^{1,2}

¹ Deltares: P.O. Box 177, 2600 MH Delft, The Netherlands

² Delft Technical University: Postbus 5, 2600 AA Delft, The Netherlands

E-mail: Felix.Dols@deltares.nl

Abstract: One of the key contributions to a global Digital Twin Ocean are the twin projects EDITO Infra and EDITO Model Lab. EDITO Infra (<https://edito-infra.eu/>) offers a platform that integrates computational resources (cloud & HPC) and oceanographic/climate data (CMEMS, EMODnet, CCDS and more). EDITO Model Lab (<https://edito-modellab.eu/>) builds upon this platform by integrating pre- and post-processing tools as well as simulation software and models. With these tools and models all stakeholders can become knowledge partners and contributors to the Digital Twin Ocean.

In this presentation, Deltares presents the project outlines of EDITO and one application is demonstrated. The application is a workflow for mapping habitat suitability in the Wadden Sea, an intertidal flat, Marine Protected Area and World Heritage site of crucial ecological importance, offering food and shelter for endangered and protected higher trophic species like migrating birds and seals.

The workflow will be demonstrated on the EDITO platform and consists of:

- Setting up a model with dfm_tools
- Running a hydrodynamic simulation with Delft3d-FM
- Defining ecological knowledge rules (response of habitat specie to biotic conditions)
- Applying the knowledge rules with D-Eco Impact to create habitat suitability maps

There are opportunities for contributing to the development of the EDITO platform, by beta testing.

Keywords: Digital Twin Ocean application, EDITO platform, Habitat Suitability Mapping.

S4A7

Interoperability and Standards trends and challenges

Piotr Zaborowski, Rob Atkinson, Alejandro Villar & Raul Palma

Open Geospatial Consortium (OGC): 2300 Wilson Blvd. Suite 700-1026 Arlington, VA 22201, USA

E-mail: pzaborowski@ogc.org

Abstract: Digital representations of the marine and maritime environments have built significant groundwork for cross-platform and cross-organization data reusability. Now, the growing number of digital twins exploiting AI/ML models, together with changes in the availability of infrastructure and international efforts in marine exploitation, brings questions and challenges for sustainable interoperability. Novel approaches use cloud-native formats, lightweight APIs built in line with general ICT standards, and distributed data and processing. It all allows abstracting from the execution environment and integration with new data-sharing initiatives.

At the same time, increasing IoT data as core capacity and growing dynamic of the community requires good tools and agile organization of the common knowledge. The Iliad project is trying to answer these using good practices in the digital representation of the met-ocean data based on international standards and new trends in the evolution of digital platforms. The presentation will showcase tools that help communities boil data models and their representation in the data and metadata formats and agree on standard semantics. One example is the definition of the Ocean Information Model, gluing observation models, and Sensor Things standard with coverages' representations (in NetCDF/Zarr) popular within the marine community and adding new, web-friendly format support and formal API definition. The other one is the Application Package concepts combined with cloud infrastructure and refurbished OGC Processes extended with the specification of the service description and products compatible with CF conventions and based on the STAC community standard, already widely adopted and integrated with new OGC catalog services in an extendible way.

Keywords: Digital Twins, Cloud-Native Formats, APIs, IoT Data, Ocean Information Model.

S4A8

Toward Oceans' twin: modelling approaches from physics to fish and fisheries

Simone Libralato

National Institute of Oceanography and Applied Geophysics (OGS): Borgo Grotta Gigante, 42/c, 34010 Sgonico TS, , Italy

E-mail: slibralato@ogs.it

Abstract: Fisheries management at the global level needs to move rapidly from an approach that focuses on maximizing the catch of a single target species to a more comprehensive view that considers the well-being of the marine ecosystem as a whole. Ecosystem-based approaches to be used for marine resource management can include a variety of components linked by a detailed description of the biological processes involved, the physical and chemical factors that influence them, and the socio-economic dynamics that depend on (and drive) ecosystem health and services. These tools are especially needed in the context of global climatic changes and for analyzing trade-offs among different uses of the oceans. Despite being highly adaptive and enabling a balance between different societal goals, integrated approaches have been slow to gain acceptance and adoption in fisheries management. Lack of data, uncertainties, lack of precision and the complexity of results are some of the reasons that hinder the application of ecosystem approaches. The ecosystem-based approaches for fisheries represent a step toward the Twin of the Ocean and provide great benefits for policies and management actions.

Keywords: ecosystem-based approaches, fisheries, ecosystem modelling, climate change.

S4A9

Downstream operational services supported by the Copernicus marine environment service for Black Sea coastal and marine areas protection

Razvan Mateescu ^{1,2}, **Dragos Niculescu** ¹, **Elena Vlasceanu** ¹, **Liliana Rusu** ² & **Luc Valdenbulche** ³

¹ National Institute for Marine Research and Development "Grigore Antipa", 300 Mamaia Blvd, 900581, Constanta, Romania

² Department of Mechanical Engineering, Faculty of Engineering, "Dunarea de Jos" University of Galati, 47 Domneasca Street, 800008 Galati, Romania

³ Seamod, Valea Iepii nr.1, 117635 Salatrucu, Judet. Arges, Romania

E-mail: razvan_doru@yahoo.com

Abstract: A number of downstream services, user-oriented for specific activities related to safe navigation, water quality, aquaculture and fisheries development in the area, were based on Earth observation data provided by the European Space Agency (ESA) through the Copernicus Marine Environment Monitoring Service (CMEMS) and model data provided by several forecasting systems operating in the Black Sea basin.

Beyond the purpose of the various CMEMS funded projects, the modelling systems have been developed to model and forecast extreme marine events at a regional scale. The activities included are based on the capabilities of a functioning operational system, but also on the synergic integration of several products afferent to the Black Sea region, including EO data and products of the Black Sea Marine Forecast Center (BS MFC).

The present work describes the modelling-based results of several projects, including a forecasting system, together with the associated lessons learned for future implementations in different areas of the Black Sea. Similarly, third party services related to the development and maintenance of an operational system, already functional in March 2016 within the National Institute for Marine Research and Development (NIMRD), for the Romanian marine and coastal areas are in an ongoing stage of progress. The results obtained in the process of implementing the CMEMS downstream services for the Western Black Sea coast will be accessible to support specific coastal activities, such as the protection of the marine environment, but also the maritime decision support system. This will contribute to the increase of the data and information base necessary for the assessment and modelling of the impact of marine hazards on the Black Sea coastal and marine areas.

Keywords: Copernicus Marine Environment Monitoring Service, Black Sea Marine Forecast Center, Modeling-Based Results, Downstream Services, Operational System for Romanian Marine Areas.

S4A10

The Tunisian Coastal Observatory: Integrating Centralized GIS, Real-time Monitoring, and Satellite Observations for Coastal Management.

Mouna Ketata

Agence de Protection et d'Aménagement du Littoral (APAL): 02 Rue Mohamed Rachid Ridha, 1002 Belvédère,
Tunis, Tunisia

E-mail : mounaketata@gmail.com

Abstract: Coastal zones, as dynamic interfaces of terrestrial and aquatic ecosystems, are significantly influenced by atmospheric conditions and human activities. These areas, critical for diverse species, face intense pressures from urbanization, industrialization, overfishing, and pollution, leading to habitat degradation and biodiversity loss. Additionally, natural processes like erosion, sea level rise, and climate change exacerbate their vulnerability. The Tunisian Coastal Observatory, established within the Coastal Protection and Planning Agency (APAL) in 1995, is dedicated to the sustainable management of these sensitive areas through innovative monitoring and data integration approaches.

A key aspect of the Observatory's approach is the use of space-based observations for identifying and analyzing changes in the coastal zones. Employing satellite images from various dates and origins, the Observatory monitors and tracks coastal changes to detect anomalies and hotspots. This satellite observation, coupled with historical analysis and current status mapping, provides a comprehensive view of the coastal dynamics and aids in understanding the sources of various coastal challenges.

In conjunction with satellite remote sensing, the Observatory has developed a Centralized Geographical Information System (GIS) and implemented a real-time monitoring system, including a network of marine buoys and tide gauges. This integration of satellite imagery, GIS, and real-time data collection enhances the Observatory's capabilities in supporting climate adaptation decisions, facilitating coastal and marine planning, and implementing early warning systems for catastrophic risk.

This paper presents the integrated approach of the Tunisian Coastal Observatory in managing coastal hazards and reducing risk. The synergy of centralized GIS, real-time monitoring, and satellite observations exemplifies a model for sustainable coastal management, offering valuable insights and methodologies applicable to similar contexts worldwide.

Keywords: Coastal Zones, Tunisian Coastal Observatory, Centralized Information System, Real-time Monitoring, Satellite Observations, Remote Sensing.

S4A11

Using the IMAP Info System to collect, manage and share data from monitoring programs along the northern coast of Egypt

Mohamed Abbas Tahoon

Department of Lakes - Central Administration of Coasts and Lakes, Egyptian Ministry of Environment: 30 Misr Helwan El-Zyrae Road, Maadi , Cairo, Egypt

E-mail : matahoon2004@yahoo.com

Abstract: This work highlight the significance and usefulness of new applications and information platforms in data collection and analysis. It specifically focuses on the IMAP Info System, which has been developed by INFO/RAC. The system's objective is to collect, manage, and share data from monitoring programs within the Integrated Monitoring and Assessment Program of the Mediterranean Sea and Coast (IMAP), aligned with the Barcelona Convention. It enables Contracting Parties to report data concerning the Common Indicators (CI).

In the context of monitoring activities and data collection along the northern coast of Egypt, the sampling procedure adheres to the guidelines of the IMAP in the framework of the EU funded IMPA-MPA and EcAp Med III projects. Excel sheets are utilized to document information related to biodiversity and various sources of pollution.

The IMAP Info System is designed to facilitate the collection, management, and sharing of data from monitoring programs under the IMAP. It provides Contracting Parties with the ability to report on data related to the Common Indicators (CIs).

In the context of the northern coastal area of Egypt, specific sites such as Ras El-Bar, Burulus, Sallum, Matrouh, Ashtoum El-Gameel, and Rasheed have been selected to represent protected areas and densely populated cities (areas with high human pressure). Samples have been collected to study physicochemical parameters, contaminants, and pollution, specifically focusing on EO5 and EO9. Furthermore, the assessment includes the study of biodiversity and Non-indigenous species, represented by Ecological Objectives 1 and Ecological Objectives 2.

The IMAP List of Ecological Objectives (EOs) and Common Indicators (CIs) are followed based on the available data and possibilities. For example, EO5 is monitored comprehensively, while CI13 and CI14 have been studied using monitoring and assessment methodologies and tools. Regarding EO9, two indicators out of the four, namely CI17 and CI19, have been selected for study.

All data, along with detailed information, are registered in Excel sheets and uploaded to the IMAP Info System platform (<http://imapinfosystem.info-rac.org/app/#/>). Recently, a scientific team was assigned to complete work related to water pollution concerning EO5 and EO9, as well as to update all the aforementioned data. The IMAP provides opportunities for data analysis, comparisons between different sites and years, and allows Contracting Parties to submit new data sets for Mediterranean Quality Status Reports.

Keywords: Information platforms, Monitoring programs, Barcelona Convention, Egypt northern coast, Ecological Objectives.

S4A12

“SemFlow” (SemanticFlow Knowledge Hub): an online tool for cross-domain knowledge management for Marine Management and Innovation

Valentijn Venus, F. Wahyudi, P. Muchada & F. Kurniawan

RAMANI, ILIAD-project

E-mail: valentijn.venus@gmail.com

Abstract: For the ILIAD project, we are developing an online tool for cross-domain knowledge management called “*SemFlow*” aka “SemanticFlow Knowledge Hub”. *SemFlow* allows interdisciplinary teams to register their domain knowledge on a common, visual canvas. With this visual “mind mapping” canvas, consisting of semantic concepts -and their relationships- from a wide range of vocabulary, we connect to a Visual Workflow Builder called “FlowCell”. This facilitates ILIAD Pilots to create semantically enriched, user-defined analytics aka geo-spatial processing workflows. The aim is to make it easy for non-IT experts to wire together data from hardware devices (IoT), APIs, and online services with cross-domain knowledge.

Through the same semantic uplift, the co-creation environment automatically acknowledges contributions from co-authors and uses semantic concepts to make workflows easier to understand, modify, and share. By utilising Natural Large Language Modelling (LLM) and Natural Language Processing (NLP) on a Corpus of cross-domain, technical and thematic knowledge, e.g. the ITC Living Textbook, Geographic Information Science & Technology Body of Knowledge (BoK), EO4GEO BoK, the Ocean Information Model (OIM), the ⁴World Register of Marine Species (WoRMS), etc., and registering this on a visual “mind-mapping canvas” users are guided to use a common vocabulary and “talk the same language” from the start. This is essential when combining diverse, heterogeneous data sources and cross-domain analytics and algorithms in creating information from raw data. To address today’s maritime information needs, i.e. for shell-fishermen to understand risks posed by invasive species, we hope *SemFlow* ensures interoperability-by-design when developing digital information tooling to address emerging challenges.

Keywords: knowledge management, visual “mind-mapping canvas”, NLP, LLM, interoperability-by-design, cross-domain, Marine Management and Innovation

⁴ *WoRMS Editorial Board (2024). World Register of Marine Species. Available from <https://www.marinespecies.org> at VLIZ. Accessed 2024-02-16. doi:10.14284/170

S4A13

MSP Workspace for the Mediterranean

Marina Markovic

Priority Actions Programme/Regional Activity Centre (PAP/RAC): Kraj Sv. Ivana 11, HR-21000 Split, Croatia

E-mail: marina.markovic@paprac.org

Abstract: The MSP ICZM virtual workspace for Mediterranean Marine Spatial Planning (MSP) is an online platform that gives planners and policy makers' access to the MSP information and planning tools.

It provides basic information on MSP process and legal requirements in the Mediterranean. In addition, it gives detailed overview and step by step guidance to preparing MSP that is ecosystem-based, climate proofed and based on land-sea interactions. Step-by step guidance, in a form of checklist is available as online and offline version.

The available online version is a pilot version. Its full application will be operational as part of UNEP/MAP Programme of Work 2024/2025, following the COP 23 **Decision on** Conceptual Framework for Implementing Marine Spatial Planning in the Mediterranean (**IG.26/10**).

Key words: MSP, ecosystem-based, land sea interactions, climate actions

S4A14

The key for UNEP-MAP Knowledge Heritage: KMaP

Lorenza Babbini¹, Annalisa Minelli¹, Alessandro Lotti¹, Arthur Pasquale¹, Alessandro Oggioni², Paolo Tagliolato² & Gloria Bordogna²

¹ Information and Communication Regional Activity Centre (INFO/RAC): 48 Via Vitaliano Brancati, 00144 Roma, Italy

² Consiglio Nazionale delle Ricerche Area di Ricerca di Milano (CNR-IREA) : Via Alfonso Corti, 12, 20133 Milano MI, Italy

E-mail : annalisa.minelli@info-rac.org

Abstract: UNEP-MAP and the Barcelona Convention System collect a consistent amount of data across Mediterranean Sea on multiple topics for inventory, mapping, monitoring assessment, conservation, and reporting purposes: from marine biodiversity to pollution; from sustainability and blue economy to marine spatial planning. At the same time UNEP-MAP produces documents for different purposes: strategic plans, reports, guidelines, etc.

Barcelona Convention was signed in 1975 and, as often occurs, governance principles and practices evolve in time due also to both technological advancements and an increased data management attention. To this purpose UNEP-MAP data policy was approved during the Conference of the Parties held in Antalya (Türkiye) in 2021, and, since then, some actions have been pursued to put in practice data policy provisions.

The UNEP-MAP Knowledge Management Platform (KMaP) is one of these actions and it represents an ambitious project aimed to manage the entire UNEP-MAP knowledge heritage, by following data policy principles. It is mainly composed of geographical data and documents, but it also includes presentations, videos, webinars, and other dissemination material. KMaP is actually structured in two main hubs: Data and Knowledge hub, managing geographical data and documents respectively. The data is retrieved from the UNEP-MAP components thanks to the interoperability standards. A third hub is foreseen for the next biennium, the Knowledge Exchange Hub, which is supposed to become the place where dissemination activities should take place. A wide user-requirements study has been carried out before platform implementation and the KMaP prototype enables different access levels, according to the type of user (if internal or external to UNEP-MAP, if registered or anonymous).

Regarding technologies used, it is based on open-source software tools such as GeoServer and GeoNode , with a PostgreSQL and PostGIS extension for the management of both documents and geographical data. The system runs through Docker on a physical server and a Django admin interface allows INFO/RAC to manage the whole system.

Keywords: Knowledge Management, Interoperability, Data Standards, Mediterranean Sea, UNEP-MAP, Barcelona Convention.

S4A15

A 3D Immersive novel tool for digital twins using virtual choreographies: the oil spill use case

Fernando Cassola, Alexandre Carvalho, Demetrius Lacet & Marco Amaro Oliveira

INESC TEC: Campus da Faculdade de Engenharia da Universidade do Porto, Rua Dr. Roberto Frias, 4200-465
Porto, Portugal

E-mail: fernando.c.marques@inesctec.pt

Abstract: Understanding ocean dynamics is a challenging and costly endeavor that requires advanced technologies and methods to collect, process and represent data. An essential aspect of a digital twin for the ocean is the capability to visualize multi-source heterogeneous data in a digital representation. We propose an agnostic technology solution that supports collaborative, interactive and multiplatform visualization in the context of digital twins using virtual choreographies (VChor).

Virtual choreographies extend xAPI (Experience API) syntax to aggregate static (files) and dynamic (streams) data elements, mapping them to sequences of events and actions performed by actors (physical or digital) at a given place and time. This approach provides context and narrative to heterogeneous ocean data to facilitate the user's immersive exploration of data, behaviors and patterns.

Our method is supported by a conceptual visualization pipeline that receives historical, real-time or forecasted oil spill spatio-temporal data, that generates density isolines of the evolution over time, and maps it into a VChor, together with other relevant contents. The visualization tool interprets the VChor following Model-driven principles, via ontology mapping, formal models, transformation languages, partial order planning or hierarchical state machines, thus allowing the information contained in it to be envisioned in a platform-specific representation.

We demonstrate the potential of our solution in a 3D immersive environment with an oil spill use case where simulations and forecasts can be fully explored by stakeholders such as decision-makers.

This solution is an efficient way to represent behaviors and associated visual mappings while being neutral from a rendering technology perspective. It offers a declarative approach that does not require additional programming or compiling when changes (data elements, events, behaviors and mappings) are performed. It is suited for federated and distributed Digital Twins where the need to display same information across multiple and heterogeneous platforms is required.

Keywords: virtual choreographies, immersive environments, digital twins, ocean data, interoperability

S4A16

Iliad: Digital Twins of the Ocean for multi-sectoral governance and policy-making

Garabet Kazanjian

American University of Armenia (AUA): 40 Marshal Baghramyan Ave, Yerevan 0019, Armenia

E-mail: gkazanjan@aua.am

Abstract: A Digital Twin of the Ocean (DTO) is a virtual representation of the real ocean. DTO adapts to the real world changes by utilising near real time resolution observation data and by integrating a plethora of existing Earth Observing and Modelling Digital Infrastructures and Facilities, in combination with models and algorithms, data science and artificial intelligence (machine and deep learning).

DTOs provide a digital modelling platform to visualise, monitor, and predict natural and human activities in the ocean. They can also be manipulated to address “what if” scenarios and provide useful information to highlight at-risk or special interest regions of the ocean. Thus, they could become excellent decision-making tools for policy makers and industry managers for sustainable development.

Iliad will provide various DTOs, demonstrated through key innovative pilots, accessible through a central marketplace to distribute apps, plug-ins, interfaces, raw data, citizen science data, synthesised information, and value-adding services.

Iliad DTO pilots span across multiple sectors, including fisheries and aquaculture, maritime traffic, offshore renewable energies, tourism, harbour safety, insurance, water quality and marine pollution, and biodiversity. Given its broad applications and interoperable nature, Iliad DTOs have the potential to enable multi-sectoral impact analyses to gradually transition from a single-sector, single-pressure management to holistic governance with an ecosystem-approach. The Iliad DTO will also support planning and decision-making on blue growth to meet specific European environmental and socio-economic objectives/targets for a range of stakeholders and end-user groups.

In summary, ILIAD will support policymakers by:

- Making environmental monitoring data widely available and accessible.
- Helping in compliance reporting and implementation of legislation.
- Visualising complex environmental data for ease-of understanding ecosystem and domain interconnectedness.
- Highlighting policy gaps and potential conflicts among different international, EU, and national legislation, including between EU states and neighbouring countries.
- Analysing “what if” scenarios to support decision-making under uncertain conditions.
- Providing access to citizen science data with appropriate tools for their validation, analysis, and visualisation.

Keywords: ocean digitization, visualisation, policy tool, ecosystem approach, multi-layered governance, forecasting.

S4A17

Building interoperable Citizen Sciences Smartphone applications for Maritime information needs

Valentijn Venus, F. Wahyudi & P. Muchada

Affiliation: RAMANI, ILIAD-project

E-mail: valentijn.venus@gmail.com

Abstract: This work reflect on RAMANI experiences in co-creating Smartphone applications that bring a "critical mass of value" with the aim to trigger citizens and other users to report their own observations. In advancing the public use of geo-spatial data, we will share our experiences in building toolboxes that help provide easy access to Copernicus Marine data and image processing tools to extract information from raw data. With these enabling technologies, even organisations with limited GeolCT skills are enabled incl. regions with intermittent (mobile) Internet connectivity. Using the cloud platform [RAMANI Analytics](#), SemFlow, and [FlowCell](#) all sorts of Maritime GeoData can be processed, retrieved, analysed, and published to mobile and web. We will share from our +8 years of experience as key-technology provider of some of Europe's and Africa's largest innovation competition events, such as the Copernicus masters and various sponsored app developer camps, fully funded under contract with ESA, SAP, Deutsche Telekom/T-Mobile. Recently we provided these technologies also to support the European Commission's Copernicus Hackathons -as a preferred-downstream service provider for the Copernicus Data Ecosystem- but also to an African [Youth Ideathon](#).

This ideathon was run in parallel to the GEO Week November 2023 in South Africa helping young scientists to valorise their research work, using our native Android & iOS APIs to help bring decision-ready information to where value-chain players make their management choices, i.e. a fisherman leaving a port to find fishing hotspots or shell fishermen to understand risk posed by invasive species.

Keywords: Citizen science, Smartphone Applications, Copernicus Marine Data, GeolCT, RAMANI.



SMART MARINE CONSERVATION FORUM

International Forum on Database Management
and Digital Transformation for Marine Conservation
smart-marine-conservation-forum.spa-rac.org