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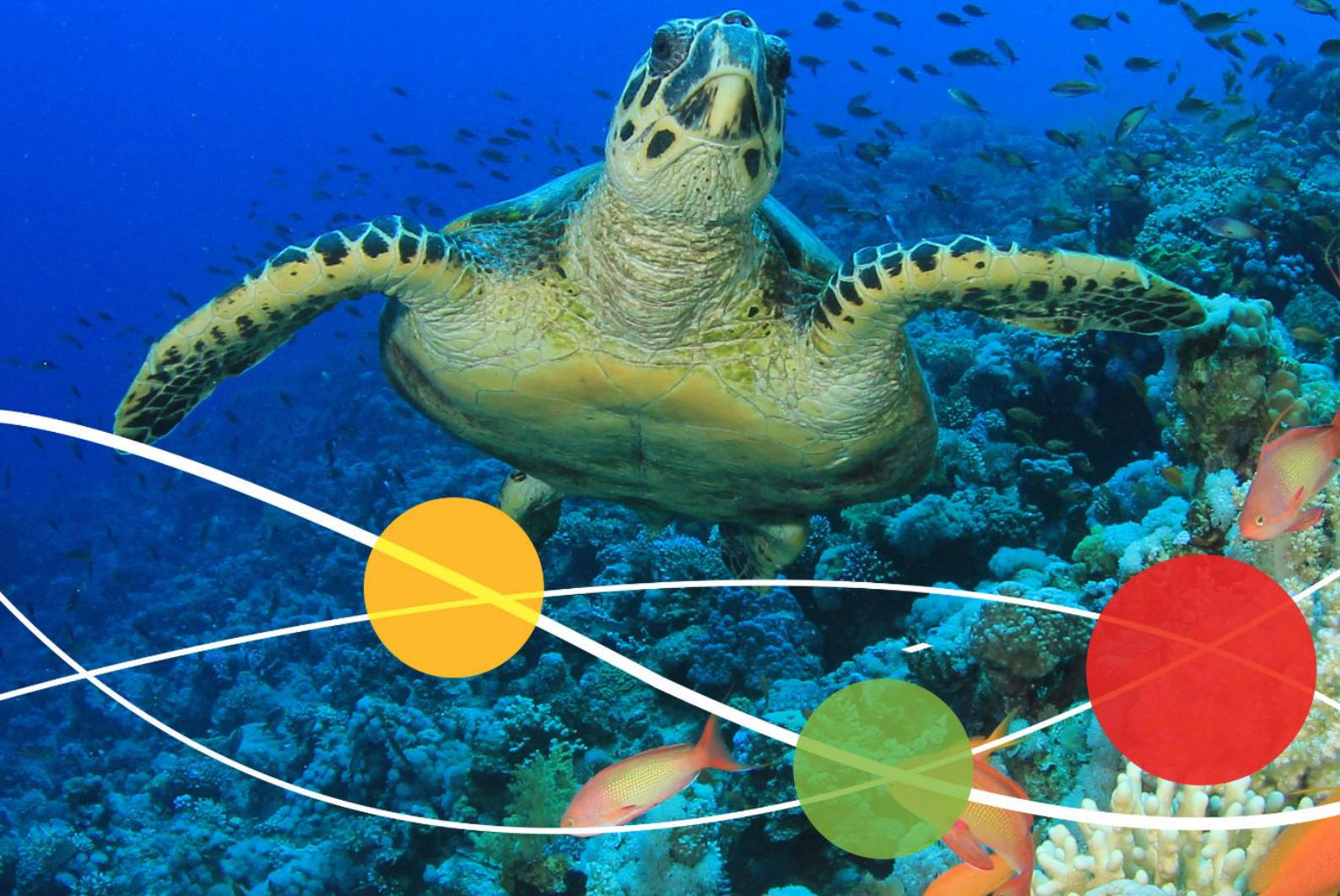
BODØ, JULY 06-09, 2025

EMBS EUROPEAN MARINE BIOLOGY SYMPOSIUM

EMBS SYMPOSIUM

Bringing marine biologists together since 1966



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This booklet serves as your guide to the symposium, providing key information about the sessions, speakers, and events. We hope it helps you navigate the exciting opportunities for collaboration and learning throughout the conference.

EMBS LOCAL ORGANISING COMMITTEE

Mark Costello
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58TH EMBS EUROPEAN MARINE BIOLOGY SYMPOSIUM

BODØ, JULY 06-09, 2025

Welcome to the 58th European Marine Biology Symposium (EMBS 2025)

On behalf of the organizing committee, I am delighted to welcome you to the 58th European Marine Biology Symposium here in Bodø, Norway. This year's event promises to be a unique gathering of marine scientists, offering an exceptional opportunity to engage with the latest research, foster new collaborations, and inspire innovative solutions for the challenges our oceans face.

We have about 240 attendees from 29 countries, including Australia, Belgium, Canada, China, Croatia, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Latvia, Malaysia, Montenegro, Norway, Poland, Portugal, Slovenia, Spain, Sweden, The Netherlands, Taiwan, Turkey, United Arab Emirates, UK and USA.

The 58th EMBS continues its tradition of a wide range of topics: pelagic and benthic, coastal and offshore, oceanography and chemistry and biology, microbia to megafauna, although with a noticeable increase in presentations related to climate change and marine restoration and protection.

As the symposium unfolds, you will experience a diverse program of keynote presentations, scientific sessions, and hands-on discussions, all set against the stunning backdrop of the Arctic Circle. I encourage you to take full advantage of the many opportunities to connect with fellow researchers, share your insights, and explore new ideas.

Thank you for being part of this important event. We hope it will be a rewarding and stimulating experience for all.

Warm regards,
Mark John Costello
Organizer, EMBS 2025

Mark John Costello
NORD University

KEYNOTE SPEAKERS

Daniel Pauly

UBC

Dr. Daniel Pauly, who is both French and Canadian, studied fisheries science in Germany and spent most of his career in the tropics, notably in the Philippines. Since 1994, he is a Professor of Fisheries at the University of British Columbia, in Vancouver, Canada, where he directs the Sea Around Us. Its research, funded by a variety of philanthropic foundations, is devoted to studying, documenting and mitigating the impact of fisheries, and increasingly, the effects of global warming, on the world's fish and marine ecosystems. The concepts, methods and software Daniel Pauly (co-)developed, are documented in over 1000 widely-cited publications, and have led to his receiving multiple scientific awards.

Nuria Teixido

Stazione Zoologica Anton Dohrn

Dr Nuria Teixidó is a Senior Scientist at the Ischia Marine Center of the Stazione Zoologica Anton Dohrn, Italy, and an Associate Scientist at the Laboratoire d'Océanographie de Villefrance, France. Her research focuses on understanding the effects of marine heatwaves and ocean acidification on marine benthic biodiversity and ecosystem functioning, as well as their resilience and the potential for species to adapt under ongoing and projected environmental change. Her work has been published in journals including Nature Communications, Global Change Biology, and Scientific Reports, along with numerous ecosystem reports and general interest articles. She is a "Make Our Planet Great Again" Laureate in France and a National Geographic Fellow. Since 2022, she is a member of European Marine Board Expert Working Group: Ocean and Climate. She has been primary advisor or co-advisor for four postdoctoral researchers, four Ph.D. students (one of whom recently started), and more than 20 undergraduates conducting Master's research. When she's not underwater conducting fieldwork, teaching, or advising students, Dr Teixidó can be found sharing her research through documentaries, social media, and virtual reality projects.

KEYNOTE SPEAKERS

Cornelia Jaspers

DTU-Aqua

Cornelia Jaspers is biological oceanographer by training and has extensive experience working at sea and conducting in situ experiments with gelatinous and classical zooplankton. She has worked experimentally with gelatinous zooplankton at laboratories around the world and kept different jellyfish, comb jelly and larvacean species in the laboratory for experiments as well as experimental evolution studies. Cornelia currently leads the research centre for gelatinous zooplankton ecology & evolution at the Technical University of Denmark, DTU Aqua.

Britas Klemens Eriksson

University of Groningen

Britas Klemens Eriksson is a professor in Marine Ecology at the University of Groningen, the Netherlands. Current research focus is on fish community ecology and the conservation of coastal habitats for fish. Lack of fish distribution data with high spatial and temporal resolution have pointed the research group in the direction of bioacoustics as a tool to understand the function of reefs for fish.

KEYNOTE SPEAKERS

Simonetta Fraschetti

University of Naples Federico II

Full Professor of Ecology at the University of Naples Federico II, member of the Administrative Council at the Anton Dohrn Zoological Station of Naples, and Co-responsible of the National Biodiversity Future Centre. I combine field-based descriptive research, manipulative experiments, and spatial analysis techniques to better understand the distribution patterns of marine biodiversity and the processes influencing marine communities. Chair of the Working Group on Marine Habitat Mapping for the European Marine Board, I am involved in several national and international projects aimed at setting criteria and priorities to guide the integration of conservation and restoration in marine coastal systems within the framework of Maritime Spatial Planning, promoting the sustainability of human activities. The quantification of biodiversity changes under the effects of multiple stressors and the study of ecological restoration's potential to support the recovery of disturbed ecosystems are also central to my research.

BODØ, JULY 06-09, 2025

EMBS EUROPEAN MARINE BIOLOGY SYMPOSIUM

Programme

6th July 2025

12:00-13:00		Arrival & Registration of participants
13:00-13:30		**Opening Ceremony** Jarle Jørgensen, Director of the Faculty of Biosciences and Aquaculture, Nord University Mark Costello, 58th EMBS Convenor and EMBS President
13:30-14:10		**Daniel Pauly** The Gill-Oxygen Limitation Theory (GOLT): principle and recent developments
14:10-14:20	1	**Filippomaria Cassarino** How do warming and fishing affect fish communities' functional diversity
14:20-14:30	2	**Chhaya Chaudhary** Life-cycle bottlenecks shape global marine biodiversity shifts under climate warming
14:30-14:40	3	**Giovanna Guadagnin** Climatic cues and coastal crabs: adapting to a changing world
14:40-14:50	4	**Inge van der Knaap** Small and large-scale fish migration along the southern Norwegian coast in relation to marine spatial planning and development
14:50-15:00	5	**Silas Principe** Predicting marine species distribution in Europe to support conservation targets
15:00-15:10	6	**Jan Phillipp Geißel** Larval phenology and thermal tolerance as predictor of range expansions
15:10- 15:20		**Questions and Answers**
15:20-16:00		***Afternoon Break***

Session Chair: Simonetta Fraschetti

16:00-16:10 7 **Osvaldo Tascón**
How do thermal variability and nutrient availability shape phytoplankton communities?

16:10-16:20 8 **Anna Ikonen**
Shifting fatty acid profiles of diatoms adapting to progressing warming

16:20-16:30 9 **Alexandra Hahn**
Transcriptomic and physiological evidence of local adaptation in a Baltic copepod

16:30-16:40 10 **Jonathan Tempesti**
Fouling and non-indigenous species in Western Mediterranean ports: patterns and drivers

16:40-16:50 11 **Norman Göbeler**
Hotfloor: A novel heating system to investigate the effect of heatwaves on benthic ecosystems

16:50-17:00 12 **Marco Anglano**
Seasonal cycle of mesozooplankton communities in two coastal sites with different depth in Tenerife, Canary Islands

17:00- 17:10 **Questions and Answers**

17:10-19:00 Welcome reception

19:00-20:30 Screening of "Ocean with David Attenborough"

7th July 2025

08:30 - 09:00 Registration opens

09:00 - 09:40 **Nuria Teixido**
Resilience of coastal benthic biodiversity under global environmental change

Session Chair: Stelios Katsanevakis

09:40- 09:50 13.1 **David Gillett**
Changes in infaunal macrobenthos of the Southern California continental margin over five decades

09:50- 10:00 14.1 **Arianna Pansini**
Cymodocea nodosa can take advantage of predicted acidification

10:00- 10:10 15.1 **Camilla Della Torre**
Tolerance to ocean acidification in the limpet *Patella caerulea* from CO_2 vents of Ischia

10:10- 10:20 16.1 **Marco Munari**
Acidification effects on contaminants & One Health risks at volcanic CO_2 vents

10:20-10:30 **Questions and Answers**

Session Chair: Lauriane Ribas-Deulofeu

13.2 **Ovidiu Popa**
AI on Deck: Enhancing Ocean Observations through high-resolution zooplankton analysis

14.2 **Inga Kirstein**
Plankton communities today & tomorrow – global change drivers and marine heatwaves in a mesocosm

15.2 **Sünnje Linnéa Basedow**
The impact of advection on a subarctic fjord food web dominated by the copepod *Calanus finmarchicus*

16.2 **Ellen Oldenburg**
Beyond blooms: winter ecosystem reset determines microbial community dynamics

10:30 - 11:00 Morning Break

	Session Chair: Barbara Horta e Costa	Session Chair: Thanos Dailianis
11:00-11:10	17.1 **Natalie Vachon** Spatial variation in carbon source use and functional diversity around Qikiqtait, Nunavut	17.2 **Henriette Horn** Evaluating plankton diversity with a new Atlantic-wide database: the Benguela case study
11:10-11:20	18.1 **Tiziana Durazzano** Depth-distributed zooplankton functional diversity related to vertical carbon export in the Central Arctic Ocean	18.2 **Florian Lüskow** Pelagic tunicate assemblages along two latitudinal transects across the Sargasso Sea in spring 2023
11:20-11:30	19.1 **Janina Pykäri** Carbon stocks and diversity in benthic macroinvertebrates across environmental gradients	19.2 **Janja Francé** Environmental status of pelagic habitats: lessons from phytoplankton case studies
11:30-11:40	20.1 **Méliane Deshaies** Carbon storage, dynamics and budgets sea cucumber *Cucumaria frondosa*	20.2 **Marco Thines** Diversity of marine oomycete parasites of marine primary producers and the zoospore loop
11:40-11:50	21.1 **Anaïs Richard** Beach wrack and greenhouse gas emissions in Baltic coastal ecosystems	21.2 **Moritz Nusser** Does bioturbation impact methane ebullition from soft marine sediments?
11:50-12:00	**Questions and Answers**	
12:00-12:10	22.1 **Sahed Ahmed Palash** Effects of warming on mesozooplankton in the Elbe estuary: a summer mesocosm experiment	22.2 **D K A Barnes** Fundamental relationships between iceberg disturbance and seabed spatial competition
12:10-12:20	23.1 **Kirsty Morris** Temporal health variation in Irish Mytilus in relation to SST	23.2 **Carolin Uhlir** A decade apart - comparison of benthic communities in the deep central Arctic Ocean
12:20-12:30	24.1 **Cristina Sánchez Jiménez** Effects of heatwaves on juvenile clam's biology and behaviour	24.2 **Marie Elisabeth Kaufmann** Macrobenthic diversity and distribution in the Beagle Channel region
12:30-12:40	25.1 **Tjitske Kooistra** Heat wave resilience of a mud-loving clam in different habitats	25.2 **Jorien Rippen** Habitat heterogeneity shapes marine biodiversity along a sea-dike
12:40-12:50	26.1 **Marie Fouet** Heatwaves exacerbate the impacts of invasive species in intertidal flats	26.2 **Kristjan Herkül** Distribution, co-occurrence and niche of charophytes and angiosperms in the northern Baltic Sea
12:50-13:00	**Questions and Answers**	

13:00-14:00 *Lunch Break*

14:00-14:40 **Britas Klemens Eriksson**
Using bioacoustics to uncover data deficient underwater ecosystems

	Session Chair: Silas Principe		Session Chair: Marco Munari	
14:40-14:50	27.1	**Siti Nurtahirah Ja'Afar** Redox proteomics of *Acropora digitifera*: protein thiol dynamics and thermal stress adaptation	27.2	**Daniela Yepsen** Juvenile hake *Merluccius gayi gayi* hotspots and overlap with the bottom trawl fleet in Chile
14:50-15:00	28.1	**Lucia Gastoldi** Temperature and phosphate effects on coral photo-metabolism	28.2	**Soraia Vieira** Food web attributes to assess estuarine benthic ecosystem
15:00-15:10	29.1	**Cédric Meunier** influence of temperature and nutrient availability on plant-ectotherm trophic interactions	29.2	**Adeline Tauran** Impact of environmental changes on coastal subtidal macrozoobenthic communities' evolution
15:10-15:20	30.1	**Brenda Walles** The impact of marine heatwaves on European flat oysters from different origins	30.2	**Constantinos Varotsis** Marine diatoms in the presence of microplastics, nanoplastics and isotopes of 13C and 15N
15:20-15:30		**Questions and Answers**		

15:30-16:00 *Afternoon Break*

16:00-16:10	31.1	**Francesco Fabiano** Microbiome dynamics in sponge aquaculture: wild and integrated fish farm cultivation	31.2	**Geraldina Signa** Unveiling loggerhead sea turtle diet and foraging areas in the Mediterranean Sea
16:10-16:20	32.1	**Nicole Jahnsen** Effects of artificial light pollution on the commercial bivalve *Mytilus chilensis*	32.2	**Danny Buss** Foraging preferences of North Atlantic right whale and fin whale using archaeological and museum specimens
16:20-16:30	33.1	**Margherita Burini** Effects of multiple stressors on Grado lagoon ecosystem functioning	33.2	**William Mills** Ecological and conservation implications of a declining fur seal population for giant petrels
16:30-16:40	34.1	**Iryna Kapshyna** Meiofauna sandy-beach communities reflect grain-size change after human impact	34.2	**Elisa Arroyo Martínez** Ontogenetic distribution of elasmobranch species in the ISRA Murcia Pockmarks
16:40-16:50	35.1	**Virginia Menicagli** Emerging contaminants effects on seagrass *Cymodocea nodosa*	35.2	**Andreja Ramšak** Mussel culture – an ecosystem service under threat
16:50-17:00		**Questions and Answers**		

19:30-21:00 *Conference Dinner*

8th July 2025

09:00-09:40 **Cornelia Jaspers**

Global change impacts on marine ecosystems: do gelatinous zooplankton traits facilitate jellyfish blooms in the ocean of tomorrow?

Session Chair: Jukka-Pekka Verta

09:40- 09:50 36 **Ana Azevedo**
Modelling habitat suitability of *Posidonia oceanica* in a changing ocean

09:50-10:00 37 **Isabella Provera**
Transcriptional memory in *Posidonia oceanica* seedlings: persistence and role in heat stress responses

10:00-10:10 38 **Fabio Blanco Murillo**
Unravelling the effect of marine heat waves on seagrass belowground

10:10-10:20 39 **Stefanie Ries**
Seascape genomics of Scandinavian eelgrass: implications for conservation

10:20-10:30 **Questions and Answers**

10:30-11:00 Morning Break

Session Chair: Jukka-Pekka Verta

11:00-11:10 40.1 **Patrizia Stipcich**
Seagrass leaf bleaching: does it affect the plant photoprotective mechanisms?

11:10-11:20 41.1 **Laura Steeves**
Biodiversity in northern European seagrass meadows: spatial and temporal trends

11:20-11:30 42.1 **Elisabeth Juliussen**
Changes in eelgrass fish community across a spatial gradient

11:30-11:40 43.1 **Johan Severinson**
Biodiversity impacts of ecosystem shift from seagrass to drift algae

11:40-11:50 44.1 **Cristina Galván**
Satellite-based assessment of seagrass habitat functions for ecosystem management

11:50-12:00 **Questions and Answers**

Session Chair: Mathieu Cusson

40.2 **Alberto Serrano**
Antarctic benthic habitats using non-destructive methods

41.2 **Martina Orlando-Bonaca**
Benthic vegetation distribution in the northern Adriatic: present and future

42.2 **Valentina Lauria**
Finding the surviving spots of the endangered bamboo coral *Isidella elongata* in the central Mediterranean

43.2 **Alice Premici**
Deep sea fauna associated with cold water corals of Bari Canyon, Southern Adriatic Sea

44.2 **Domen Trkov**
Pinna nobilis shells as key elements in the environment for coastal fish community

12:00-12:10 45.1 **Leo Minini**
Deciphering the genetic basis of growth and heat tolerance in sugar kelp

45.2 **Ana Fortič**
Empty *Pinna nobilis* shells: refuge for mobile macroinvertebrates

12:10-12:20 46.1 **Elvira Ramos**
Macroalgal communities: impact of climate change on species near their tolerance limits

46.2 **Louisa Alina Schulz**
The distribution and population structure of the quahog, *Arctica islandica* in the German Baltic Sea

12:20-12:30 47.1 **Alexander Jueterbock**
The application of thermal priming for kelp farming and restoration

47.2 **Hafiz Borkha-nuddin**
Temporal dynamics of reef invertebrates in Pulau Bidong and Pulau Yu, Terengganu: recovery and resilience

12:30-12:40 48.1 **Nina Larissa Arroyo**
Status of kelp forests in Spanish and Portuguese waters

48.2 **Piergiorgio Massa**
From ancient genomes to modern conservation in Atlantic bluefin tuna

12:40-12:50 49.1 **Ralf Rauten-berger**
Ecotypic salinity adaptation of *Saccharina latissima* from Skjerstadfjorden

49.2 **Olena Uzun**
Large-scale biodiversity assessment of Antarctic meiofauna using multi-gene DNA

12:50-13:00 **Questions and Answers**

13:00-14:00 Lunch Break

Session Chair: Stelios Katsanevakis

Session Chair: Mathieu Cusson

14:00-14:10 50.1 **Arne Berre**
Digital Twins of the Ocean for monitoring and management of marine biodiversity

50.2 **Cesar Bordehore**
Fisheries modelling: a new approach to maximising profits and landings

14:10-14:20 51.1 **Nicolas Bill**
BRUVS compared to eDNA and Trawls in the German Bight

51.2 **Bríd O'Connor**
Sensitivity analysis of fish species in the Northeast Atlantic

14:20-14:30 52.1 **Roxana Preston**
Developing genetic diversity estimates for charophytes in the Baltic Sea

52.2 **Sara D'Ambros Burchio**
An integrative framework for addressing taxonomic challenges in *Cystoseira*

14:30-14:40 **Questions and Answers**

14:40-14:50 53.1 **David Poling**
Computer vision for semi-supervised counting of fish in underwater video

53.2 **Stelios Katsanevakis**
Harnessing advanced technologies for monitoring and managing aquatic invasive species in European waters

14:50-15:00 54.1 **Juan José Ortiz García**
Otoliths vs eye lenses, parallel histories from different growth structures

54.2 **Guillaume Marchessaux**
Invasion of the blue crab *Callinectes sapidus*

15:00-15:10 55.1 **Mathilde Horaud**
Allochrony in Atlantic lumpfish: genomic and otolith shape in spring and autumn spawners

55.2 **Stefano Varrella**
Can multi-marker eDNA replace classical approaches for alien species detection?

15:10-15:20 56.1 **Chiara Papetti**
Monitoring Weddell Sea biodiversity using Antarctic fish as proxies for connectivity

56.2 **Lisa Sandri**
Macrobenthic biodiversity and functional patterns in three Adriatic marinas

15:20-15:30 **Questions and Answers**

15:30-16:00 Afternoon Break

Session Chair: Inga Kirstein

16:00-16:10 57 **Karolina Jonko-Sobuś**
Infrared spectroscopy: uses in marine biology data collection

16:10-16:20 58 **Ana Lokovšek**
Microalgal-derived biostimulants as a novel strategy for restoration of *Cystoseira*

16:20-16:30 59 **Paolo Cappa**
SMART drumlines reduce wildlife mortality in shark management programs

16:30-16:40 60 **Inma Herrera**
Long-term assessment of whale-watching trends in the proposed National Park of Guguy (Canary Islands)

16:40-16:50 **Questions and Answers**

16:50-17:00 61 **Mathieu Cusson**
From scour to recovery: macroalgal resilience in ice-disturbed coastal ecosystems

17:00-17:10 62 **Borut Mavric**
The circalittoral epibenthic communities in the Northern Adriatic Sea; A novel surveying methodology

17:10-17:20 63 **Jasmin S Mueller**
Insights into small-scale dynamics of intertidal and subtidal soft-bottom infauna

17:20-17:30 64 **Yuthika Jalim**
Diet and trophic position of *Cucumaria frondosa* and *Mytilus edulis* across populations from eastern and northern Canada

17:30-17:40 **Questions and Answers**

18:00-20:00 **Poster Session / Screening of documentary "Sea of Marmara"**
Yellow Submarine Quiz

9th July 2025

09:00-09:40 **Simonetta Fraschetti**
Restoring marine ecosystems: key achievements and future challenges

Session Chair: Eirini Apazoglou

09:40-09:50	65	**Marina Prieto-Amador** Temporal and spatial analysis of El Cachucho MPA effects
09:50-10:00	66	**Jesús Padrón García** Guguy, a key marine area for a National Park proposal
10:00-10:10	67	**Christian Nilsson** Depth Learning – using Digital Twin of the Ocean resources to uncover ecological trends in a Swedish MPA
10:10-10:20	68	**Kaja Balazy** Zooplankton for understanding Arctic change: perspectives from seabird diets
10:20-10:30		**Questions and Answers**

10:30-11:00 Morning Break

11:00-11:10	69	**Nur Eda Topçu Eryalçin** Assessing coralligenous habitats in an Aegean MPA (Eastern Mediterranean)
11:10-11:20	70	**Paolo Comandini** Salt marsh restoration in the Venice Lagoon: barriers and enablers
11:20-11:30	71	**Barbara Horta e Costa** Social attributes are key to global marine fishers' vulnerability to climate change
11:30-11:40	72	**Qianshuo Zhao** Prioritisation analysis for biodiversity conservation in the West Pacific
11:40-11:50	73	**Anna Maria Addamo** Systematic conservation planning of MPAs for a science-based MSP
11:50-12:00		**Questions and Answers**

12:00-12:30 Closing Ceremony

15:45-18:30 Excursion Arctic Coastal Walk near Bodø

ABSTRACTS

KEYNOTE

Dr Daniel Pauly

The Gill-Oxygen Limitation Theory (GOLT): principle and recent developments

There is less oxygen in the best aerated sea or freshwater water than on top of Mount Everest. Fish and other water-breathing ectotherms (WBE) deal with this through adaptations shaped by physical and dimensional constraints. These constraints are the key components of the Gill-Oxygen Limitation Theory (GOLT), which provides mechanisms for key aspects of the biology in fish and other WBE (their growth and its response to temperature, the timing of maturation, migrations, and others). The GOLT's basic tenet is that the surface area of the gills or other respiratory surfaces of WBE cannot, as 2-dimensional structures, supply them with sufficient oxygen to keep up with the growth of their 3-dimensional bodies, and with the spontaneous denaturation of their bodies' proteins, which is extremely temperature sensitive. This reduced oxygen supply per body weight induces sexual maturation, and a gradual cessation of growth, along with an increase of physiological processes relying on glycolytic enzymes and a declining role of oxidative enzymes. Recent new developments have allowed the GOLT to potentially explain aspects of the biology of WBE perceived as unrelated to respiratory physiology, e.g., sequential hermaphroditism, or the transition from iteroparity to semelparity; their presentation will conclude this lecture.

1. How do warming and fishing affect fish communities' functional diversity?

Filippomaria Cassarino, Julia Polo, Laurene Pecuchet

UiT The Arctic University of Norway, Tromsø, Norway

Fish communities of the Barents Sea provide critical ecosystem services, yet they face some of the fastest warming rates on Earth, alongside intense fishing pressure. This study explores the interplay of fishing and climate change in this area, quantifying their cumulative effects on the functional diversity of fish communities and on seafood provisioning. Survey data and functional traits were used to build probabilistic hypervolumes, which were later employed to compute functional diversity metrics. These, along with total fish biomass, served as response variables in generalized linear mixed models incorporating proxies for fishing and warming as explanatory variables. Preliminary results suggest that while both stressors may alter the communities' functioning, climate change seems dominant in shaping it, whereas the prolonged impact of fishing appears harder to discern. Barents Sea fish communities have endured fishing pressure, but its interactions with anthropogenic climate change may lead to unprecedented functional restructuring.

2. Life-cycle bottlenecks shape global marine biodiversity shifts under climate warming

Chhaya Chaudhary

Integrative Ecophysiology, Alfred-Wegener-Institute for Polar and Marine Research, Bremerhaven, Germany. Institute of Marine Ecosystem and Fishery Science (IMF), University of Hamburg, Hamburg, Germany

The global response of marine species to climate warming has led to an equatorial diversity dip and a poleward shift in species richness. Understanding the mechanisms driving these patterns is critical. While the role of ecophysiology in species biogeography has made some progress, the role of life cycle bottlenecks remains underexplored in large-scale biodiversity studies. Here, we highlight their importance by comparing the latitudinal distribution of fish species richness, sea surface temperature,

and the thermal tolerance of spawners and non-spawners. Our findings reveal that early life stages, particularly embryos and spawners, reach their thermal limits before adults in tropical regions, coinciding with the equatorial richness dip. This suggests that thermal constraints on early life stages may be a key driver of global biodiversity shifts. As climate change intensifies, these bottlenecks are at the forefront of marine species redistribution, making them a crucial component of biodiversity analytics and conservation planning.

3. Climatic cues and coastal crabs: adapting to a changing world

Giovanna Guadagnin[1,2,3], Alberto Barausse[2,3]

[1]DiSTeM - University of Palermo, Via Archirafi, 22 - 90123, Palermo, Italy. [2]National Biodiversity Future Center - Piazza Marina, 61 - 90133, Palermo, Italy. [3]DiBio - University of Padova - Via U. Bassi, 58/B - 35131, Padova, Italy

Coastal zones are characterized by strong and regular environmental fluctuations, such as those of dissolved oxygen and water temperature. These abiotic drivers affect species' physiological performance across different time scales. In this context, we used respirometry to provide empirical evidence of how seasonal and daily acclimations affect physiological traits and their circadian cycles. From the comparison between the native green crab of the Venice Lagoon, *Carcinus aestuarii*, and the invasive blue crab, *Callinectes sapidus*, our results confirm the key role of phenotypic plasticity and provide insight into the hierarchical physiological responses to climate change. A proactive daily response – feedforward – of oxygen consumption emerges, suggesting that environmental fluctuations may represent a cue that ectotherms use to maintain aerobic performance in stressful conditions. We conclude that acclimations affect the shape of Thermal Performance Curve and environmental fluctuations may reduce physiological differences between species that may exploit environmental predictability through proactive responses.

4. Small and large-scale fish migration along the southern Norwegian coast in relation to marine spatial planning and development

Inge van der Knaap[1], Esben Moland Olsen[1], David Villegas Ríos[2]

[1]Institute of Marine Research, Arendal, Norway. [2]Instituto de Investigacións Mariñas, Vigo, Spain

Our objective is to uncover small- and large-scale fish migration, corridor use and inter- and intra-species-specific co-occurrence, of a variety of fish species along the South Norwegian coast. In addition, we aim to assess their association to specific habitat features and marine spatial planning activities. We use existing telemetry data from over 100 fish, including Atlantic cod (*Gadus morhua*), Pollock (*Pollachius pollachius*), and Seabass (*Dicentrarchus labrax*), and preform a network analysis to gain insights into movement behaviour of individual fish. Our results will demonstrate how different fish species use the habitats available to them and understand the overlap with human activity, including fishing, MPA's, and offshore wind farm development. Ultimately, our results will contribute to understand the potential for multi-use of areas in support of fish migration. We are currently analysing the data and look forward to presenting the first insights during the EMBS conference.

5. Predicting marine species distribution in Europe to support conservation targets

Silas C. Principe[1], Ward Appeltans[1], Pieter Provoost[1], Team MPA Europe[2], Anna M. Addamo[3], Mark Costello[3]

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Countries aim to protect at least 30% of the ocean by 2030, with at least 10% fully protected. However, determining where to establish these areas to safeguard critical biodiversity and ensure climate resilience is challenging. The Horizon Europe project "MPA Europe" is using systematic conservation planning to map a network of MPAs that maximize biodiversity protection in Europe. Key to the prioritization is consistent, standardized biodiversity information. We produced species distribution models for over 12,500 species using occurrence data from OBIS and GBIF and environmental data from Bio-ORACLE v3.0. Models were fitted at high resolution (~ 5 km) and projected onto future conditions using five SSP scenarios based on CMIP6. By stacking these maps, we also generated range maps for six habitats (e.g., seagrass meadows). The open framework can be applied worldwide, and all maps are freely available. This work offers a valuable resource for marine biodiversity protection and management.

6. Larval phenology and thermal tolerance as predictor of range expansions

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Marine benthic crustaceans with pelagic larvae depend on a thermal window of successful larval release and survival (WLR). We investigated how warming affects WLR across latitudinal gradients in the European shore crab *Carcinus maenas*. We developed a phenological model integrating experimental survival and development data from two Norwegian populations (Bergen & Trondheim) with 29 years of sea surface temperature from 14 sites across Norway (incl. Svalbard), Russia, and Iceland. Positive WLR values aligned with the current *C. maenas* distribution (Norway, Iceland). Predicted larval failure (WLR = 0) occurred in Svalbard, Bear Island, and parts of the Russian Arctic. At range edges, WLR was intermittently open, limiting local recruitment. In W Norway and the White Sea, WLR increased over time, suggesting expanding suitability. Warming may facilitate range expansion by widening WLR, promoting self-sustaining populations in previously unsuitable areas.

7. How Do Thermal Variability and Nutrient Availability Shape Phytoplankton Communities?

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Global warming not only elevates ocean temperatures but also increases thermal variability, a factor often overlooked despite its potential to influence phytoplankton dynamics. Nutrient availability modulates the effects of temperature on these communities. To explore these drivers, we conducted three experiments using natural phytoplankton assemblages from the Vigo Ria (NW Spain) in March, September, and December. Communities were exposed to three temperature treatments—in situ control, constant warming, and fluctuating warming—under high- and low-nutrient conditions for 15 days. Our findings reveal that constant warming reduces species richness and evenness under high nutrients, while fluctuating warming mitigates these declines in March. Low-nutrient conditions consistently supported higher richness and evenness. These results demonstrate that warming impacts on phytoplankton diversity are shaped by thermal regime, nutrient availability, and initial community composition. This

underscores the importance of considering multiple drivers and variability when assessing global warming effects on marine ecosystems.

8. Shifting fatty acid profiles of diatoms adapting to progressing warming

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Diatoms adapt to global warming by increasing their temperature optima in natural conditions. Here we ask what consequences thermal adaptation may have for the nutritional value of diatoms. To test this, we grew strains of *Skeletonema marinoi* resurrected from the 1960s and 2010s. The fatty acid profiles of three strains per decade were assessed at Husö Biological Station below, at, and above optimal temperature conditions. Our results indicate that all strains' total fatty acid content per cell decreased with increasing temperature. We observed that the amount of unsaturated fatty acids per cell was constant across temperatures in strains from the 2010s. Strains from the 1960s, however, displayed a decrease in unsaturated fatty acids with increasing temperatures, suggesting that *Skeletonema marinoi* has evolved to maintain a higher content of nutritionally important unsaturated fatty acids also in higher temperatures. This may have implications for understanding thermal adaptation and its ecological consequences.

9. Transcriptomic and physiological evidence of local adaptation in a Baltic copepod

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Salinity is a key factor shaping marine species distributions that is rapidly changing due to global change, yet the mechanisms of salinity tolerance and adaptation remain poorly understood for many organisms. We investigated local adaptation in the calanoid copepod *Acartia tonsa*, a marine species that thrives in the Baltic Sea despite its steep salinity gradient. Using a common-garden approach with physiological measurements and transcriptomics, we quantified differences in low salinity tolerance between copepods from the North Sea (< 30 PSU) and those from the Baltic (< 15 PSU). Baltic copepods exhibited significantly higher survival and a more stringent transcriptomic response, suggesting local adaptation. We also identified a shared osmoregulatory strategy across populations involving active ion transport. These findings provide insights into the mechanisms enabling *A. tonsa*'s broad salinity tolerance and its potential for further adaptation to extreme conditions, offering a positive outlook on its persistence under climate change-induced salinity shifts.

10. Fouling and non-indigenous species in Western Mediterranean ports: patterns and drivers

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Fouling communities were studied in three Western Mediterranean port systems to assess the occurrence, establishment, and structuring of non-indigenous species (NIS) in relation to harbour type, use destination, and substrate morphology. Fouling samples were collected from large ports and recreational marinas, with further differentiation between commercial and touristic harbours. Moreover,

experimental substrates with varying morphological complexity were deployed in the port of Livorno to evaluate their influence on early-stage colonization. Results showed that harbour type and use destination significantly shaped fouling communities and NIS assemblages, with touristic harbours within large ports being particularly susceptible to NIS establishment. High spatial complexity of fouling basibionts, such as bryozoans and serpulids, enhanced NIS recruitment by providing structural refuges. These findings contribute to a better understanding of bioinvasion mechanisms in anthropized environments and will support the development of targeted management strategies for prevention, containment, and mitigation of NIS spread in Mediterranean port ecosystems.

11. Hotfloor: A novel heating system to investigate the effect of heatwaves on benthic ecosystems

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Understanding the real-world effects of marine heatwaves on benthic ecosystems remains a challenge. We developed a novel in situ heating system using domestic under-floor heating with benthic chambers to investigate these impacts. Ten chambers were deployed in bare-sediment habitat (2.5 m depth) for 15 days, with five chambers heated 5°C above ambient temperatures. Incubations were conducted to assess changes in metabolism and nutrient cycling, and sediment samples to examine benthic community shifts. The benthic community structure remained largely unchanged, adult *Marenzelleria* spp. were absent under warming. Elevated temperatures significantly increased community respiration and intensified nutrient fluxes (NH4+-N, PO43--P, Si), while primary production remained unaffected. This study confirms the suitability of the novel system for examining the impact of temperature on benthic habitats in situ and demonstrates its potential for investigation of complex habitats and communities, which is essential for our understanding of the ecosystem-level effects of climate change.

12. Seasonal cycle of mesozooplankton communities in two coastal sites with different depth in Tenerife (Canary Islands, Spain)

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This study investigates the annual cycle of mesozooplankton in a coastal area off Punta Blanca, Tenerife, Canary Islands, Spain, from September 2023 to August 2024. The primary objective was to analyse composition and abundance of key taxonomic groups, with particular attention to the order Calanoida (Copepoda). Two sampling stations in close proximity were selected (depth: 35 m, 90 m). Monthly samples were collected using bongo nets (mesh sizes: 250 μm, 500 μm) to capture a wide range of mesozooplankton taxa. The resulting annual cycles showed two main peaks of abundance, a long-lasting one during spring, and a shorter one in the early autumn. Copepods were the main representatives, followed by peaks of appendicularians, chaetognaths and hydrozoans. The results of this study contribute to a better understanding of the dynamics of mesozooplankton in this area. Furthermore, it underscores the need for continued monitoring for conservation efforts and sustainable management practices.

KEYNOTE

Resilience of coastal benthic biodiversity under global environmental change

Dr Nuria Teixido

In the Mediterranean Sea, a hot-spot for both biodiversity and climate change, temperatures are increasing faster and pH is declining more rapidly than in the global ocean. We use two "natural laboratories": (i) areas with extreme seasonal temperatures and marine heatwaves, and (ii) unique submarine volcanic CO2 vents, which cause local acidification of seawater and affect the surrounding ecosystems. These sites serve as natural analogues to assess species and whole-ecosystem responses in the long-term to future acidification conditions. We find a decrease in taxonomic and functional diversity, along with an increased abundance of erect macroalgae and seagrasses with increasing acidification. Additionally, record-breaking marine heatwaves are escalating in frequency and severity over recent summers, with contrasting ecological responses (e.g. species mass mortalities and mass flowering of seagrasses). I will discuss the generality of these results towards understanding and supporting resilience of marine coastal biodiversity under global environmental change.

13.1. Changes in the macrobenthic infaunal community of the Southern California continental margin over five decades in relation to ocean acidification and other oceanographic factors

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Climate change has altered the physiochemical conditions of the coastal ocean, but effects on infauna have not been well-assessed. We used multivariate ordination to examine temporal patterns in benthic community composition from a series of monitoring programs spanning 50 years. Temporal changes of individual taxa were then compared to variations in temperature, oxygen and acidification using random forest models. Species richness increased over time, coupled with a decline in overall abundance. Communities from the 2010s were comprised of a broader array of feeding guilds and life histories than the 1970s. Changing water temperature was associated with northward shifts in distribution and increases in species abundance, while acidification was associated with southward shifts and declines in abundance. Acidification was also associated with changes in depth distribution of molluscs declining in abundance. This community-level analysis sets the stage for more targeted studies investigating patterns for individual taxa and indicator development.

13.2. AI on Deck: Enhancing Ocean Observations Through High-Resolution Zooplankton Analysis

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Zooplankton play a crucial role in marine ecosystems, influencing nutrient cycles and supporting higher trophic levels. This study aimed to develop **DeepLOKI**, an AI-based framework for high-resolution zooplankton image classification and abundance estimation directly onboard research vessels. Using images from the Lightframe On-sight Keyspecies Investigation (LOKI) system, **DeepLOKI** was trained with a self-supervised ResNet18 model on data from four research cruises. It classified images into taxa or developmental stages and generated time-series abundance data for ecological analysis. **DeepLOKI** achieved an 83.9% classification accuracy, doubling the performance of EcoTaxa's standard settings. Species co-occurrence and causal relationships between phyto- and zooplankton taxa, collected from the Fram strait, were analysed, revealing the strong influence of mixed layer depth on population dynamics. This framework accelerates zooplankton analysis, enhances ecological research, and enables

real-time monitoring of fragile Arctic interactions, providing critical insights into ecosystem responses to climate-induced melting events.

14.1. *Cymodocea nodosa* performance can take advantage of predicted acidification conditions

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Future ocean acidification conditions can affect seagrasses, although the consequences of the impact are not easy to predict. This study aimed at evaluating how ocean acidification may affect the seagrass *Cymodocea nodosa* morphology and physiology through a transplant experiment along a natural low pH gradient (Vulcano Island, Italy), estimating the location, manipulation, and origin site effects. *C. nodosa* cuttings bearing five shoots were collected from three control sites, translocated and transplanted in a low pH site. Acidification increased the above and below ground plant size, biomass and pigments and reduced the brown tissue, counteracting the negative effects due to manipulation. The enhancement was stronger in apical shoots dedicated to the plant spread, suggesting a high clonal specialization. This study evidenced an acclimation of morphological and physiological traits of *C. nodosa* in response to future acidification highlighting that climate change effects could also favour the autochthonous seagrass.

14.2. Plankton communities today and tomorrow – impacts of multiple global change drivers and marine heatwaves in a mesocosm experiment

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Extreme events such as marine heatwaves are occurring more frequently, which takes place against the background of long-term changes in multiple climate drivers. We conducted a multiple-driver mesocosm experiment to test the response of a natural coastal planktonic community to the combined influence of warming, elevated N:P ratio and ocean acidification, with and without heatwave. We assessed the response of different trophic levels, including bacterioplankton, phytoplankton, micro-, and mesozooplankton in terms of abundance and taxonomic composition. We found short-term perturbations in biodiversity, abundances, and community composition at multiple trophic levels, and that marine heatwaves exacerbated these effects. Using a unique approach to examine the impacts of heatwaves under current and future environmental conditions on a natural multi-trophic marine plankton community, we show that the combination of multiple global change drivers have the potential to perturb the entire basis of marine food-webs.

15.1. Investigation of the tolerance mechanisms to ocean acidification in the limpet *Patella caerulea* from the CO2 vents systems of Ischia (Italy)

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This study aimed to investigate the multiple mechanisms that allow Patella caerulea to survive under ocean acidification (OA) conditions. Individuals of P. caerulea were collected from three sites of the pH gradient (pH~ 8.1; pH= ~7.7; pH <7.4) of the Castello Aragonese vent systems. Several end-points were assessed: i) morphological parameters ii) respiration and ammonia excretion rates iii) biochemical markers related to oxidative stress, energy metabolism and neurotoxicity iv) metabolic profile v) genetic structure of the population. Overall results show that several processes contribute to boost tolerance to OA in P. caerulea, including genetic adaptation, physiological functions, energetic performance and ecological interactions. Specifically, OA entails strong energetic expenditure, which might be outweighed by food availability. A marked degree of genetic differentiation emerged between the low pH population and the ambient pH population. These findings improve our understanding of processes which allow biodiversity to persist under altered environmental conditions.

15.2. The impact of advection on a Subarctic fjord food web dominated by the copepod *Calanus finmarchicus*

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Fjord and shelf food webs are frequently supplemented by the advection of external biomass. Here, we quantify the inflow of the copepod *Calanus finmarchicus* into the Vestfjorden fjord system using high-resolution measurements of ocean currents and zooplankton (laser optical plankton counter). We evaluate a spatio-temporal match/mismatch between the phytoplankton bloom and *Calanus* and assess the input of advected copepods at the lower trophic level fjord and shelf food web based on stable isotope analyses (C, N), fatty acid trophic marker analyses, and biovolume spectrum analyses. Our results suggest two different sources of the *Calanus* population in the fjord/shelf system with different phenologies. We highlight important factors that can contribute to the successful spawning of Northeast Arctic cod: an extended phytoplankton bloom that can support both locally and advected *Calanus*, which in turn can supply the essential nauplii prey for first-feeding cod larvae.

16.1. Investigating Ocean Acidification effects on contaminant dynamics and One Health risks at volcanic CO_2 vents

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This study investigates how ocean acidification (OA) influences contaminant bioaccumulation and physiological stress in the mussel *Mytilus galloprovincialis*. Recent research suggests that organisms living in naturally acidified environments experience significant stress, potentially impairing their ability to tolerate environmental contaminants. Leveraging OA gradients around Ischia, mussels were deployed for two months to assess how OA impacts contaminant uptake and toxicological responses. This research also involves quantifying contaminant concentrations in mussel tissues to evaluate potential risks within a One Health framework. Human cell cultures will be exposed to detected contaminant levels, simulating realistic environmental exposure scenarios. Findings indicate that while

acidified conditions can reduce contaminant accumulation, they also heighten physiological stress and mortality in mussels. These results underscore the complex interplay between OA, contaminant dynamics, with broader implications for ecosystem resilience and human health. Understanding the underlying mechanisms and long-term consequences of these interactions remains a critical area for future research.

16.2. Beyond Blooms: Winter Ecosystem Reset determines Microbial Community Dynamics

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The Arctic Ocean is undergoing rapid transformations due to global warming, with profound implications for its ecosystems. This study analyses microbial dynamics and resilience, to environmental changes. Furthermore, it aims to determine keystone species using advanced analytical tools. We applied co-occurrence networks, convergent cross-mapping, and energy landscape analysis to a four-year amplicon sequencing time series from Fram Strait, a transition zone between Arctic and Atlantic waters. In addition to the outlined seasonal cycle, our findings discover a “winter reset”, where spring microbial communities emerge anew, shaped by currently prevailing environmental conditions rather than previous winter interactions. Winter communities also exhibit greater adaptability to Atlantification than summer communities, underscoring their role in ecosystem resilience. This integrated approach provides novel insights into Arctic microbial ecology, offering predictive tools for understanding climate-driven changes and informing conservation strategies for fragile polar ecosystems.

17.1. Spatial variation in carbon source use and functional diversity around Qikiqtait, Nunavut

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Climate-driven changes in the Arctic affect primary production, species distribution, and trophic relationships. Around the Belcher Islands (Qikiqtait region) in southeastern Hudson Bay, where the hydrological cycle is rapidly changing, is of ecological and cultural significance, yet spatial variation in carbon source use among consumers and community composition is understudied. Invertebrates, fish, and marine mammals were collected in 2023 to examine carbon source use and trophic structure using stable isotopes ($\delta^{13}C$, $\delta 15N$) and highly-branched isoprenoids. Northern invertebrates relied more on sympagic carbon than southern invertebrates (34.0% vs. 26.6%), whereas no spatial difference occurred in fish. Among marine mammals, beluga whales were less reliant on sea ice algae (16%), in contrast to ringed seals (61%) and bearded seals (73%). Further, benthic diversity was higher in the north than in the south. These findings reveal spatial and taxonomic differences in carbon use that have implications for marine management and conservation.

17.2. Evaluating plankton diversity with a new Atlantic-wide database: the Benguela case study

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Plankton at the base of the food web play a crucial role as food source and linkage between trophic levels. Due to the complexity of planktonic food webs and a scarcity of data for parts of the Atlantic, plankton are often oversimplified or omitted from modelling efforts. We combined public databases with unpublished cruise data to increase the spatial and temporal resolution of phytoplankton, micro- and mesozooplankton. This approach allowed in-depth analyses of plankton communities and food webs in areas of high productivity in the Atlantic, e.g., the Benguela Upwelling System, and improved our knowledge of species distributions, habitat preferences, and environmental drivers. Our results will be combined with data on fish, mammals, and the impacts of shipping, fishing, and climate change in a modelling study aiming to develop decision-making guidelines for marine protected areas as part of the IMAPP project (Integrative Mapping and Prioritization of Atlantic Protection Areas).

18.1 Depth-distributed zooplankton functional diversity related to vertical carbon export in the Central Arctic Ocean

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This study investigates the functional diversity of zooplankton in the Central Arctic Ocean and its impact on vertical carbon export. We analyse data from five stations spanning the Nansen to the Amundsen basin, focusing on functional traits that influence the biological carbon pump, such as body size, feeding, and trophic modes. By employing short-term sediment traps, we connect zooplankton traits to vertical carbon fluxes and examine how e.g. body size and feeding modes relate to carbon cycling. Additionally, we explore the carbon demand surface and deep zooplankton communities to better understand the flow of energy at lower trophic levels. This involves comparing primary production measurements with the carbon demand of zooplankton communities in different depth layers. Our research aims to enhance understanding of this extreme und understudied habitat by providing insights into the diverse roles of zooplankton as modifiers of the biological carbon pump.

18.2. Pelagic tunicate assemblages along two latitudinal transects across the Sargasso Sea in spring 2023 – ecology linked to oceanography

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Gelatinous macrozooplankton (GZ) are critical components of open-ocean pelagic ecosystems, shaping food webs and biogeochemical cycles. We studied the epipelagic distribution, abundance, and diversity of GZ, particularly thaliaceans (doliolids, pyrosomes, salps), in the southern Sargasso Sea during spring 2023. We explored alpha and beta diversity along two transects (31–19°N) collected with a pelagic trawl (IKMT). About 4500 GZ specimens belonging to 26 taxa were processed. Doliolids accounted for >70% of these and were found at all stations – unusual in this oceanic province. *Salpa fusiformis* was collected on 36 of 43 stations, numerically followed by *S. aspera*. Thaliaceans fall under the Essential Ocean Variable (EOV) "Zooplankton Biomass and Diversity". EOVs are an approach for globally interoperable data and adhere to FAIR data principles. Including EOVs in routine collection and reporting will significantly enhance regional and global understanding and contribute to a holistic ecosystem view beyond otherwise sparse data.

19.1. Carbon stocks and diversity in benthic macroinvertebrates across environmental gradients in a coastal ecosystem

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Coastal ecosystems play a key role in climate change mitigation through carbon storage, but there is uncertainty about how carbon is stored and processed by benthic macroinvertebrates under varying environmental conditions. This study aims to estimate the carbon stock and turnover of benthic macroinvertebrates across both natural and human-induced environmental gradients. We sampled twenty sites from sheltered bays to exposed beaches along Hanko peninsula, Gulf of Finland. Samples were collected by SCUBA, and carbon stocks were estimated from biomass. The carbon stocks and diversity were highest at the most pristine sites in the outer archipelago and decreased towards the more sheltered and eutrophied bays. The sites in the outer archipelago were characterized by large bivalves, whereas the community in the inner archipelago was comprised of smaller animals with higher carbon turnover. Our results highlight the link of environmental problems, such as eutrophication, to carbon turnover and storage.

19.2. Environmental status of pelagic habitats: lessons from phytoplankton case studies

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In the Mediterranean Sea, the evasive distinction between natural variability and anthropogenic influences together with high diversity are hampering the identification of relevant phytoplankton indicators for the assessment of environmental status of pelagic habitats according to MSFD. We investigated the phytoplankton diversity in different areas of the Mediterranean, aiming to capture different temporal and spatial aspects to facilitate the assessment. Long-term analyses in the eastern and northern Adriatic showed increasing richness and decreasing abundance. Stations in the open sea showed more pronounced trends, suggesting that environmental changes affect phytoplankton independently of anthropogenic influences. Similarly, spatial analyses of Italian data underlined the considerable variability and highlighted differences between coastal and offshore stations related to water circulation and water masses, overshadowing direct anthropogenic influences. The observed trends were linked to processes related to hydrological and climatic influences on a larger scale and emphasized the importance of long-term ecological research.

20.1. Carbon storage, dynamics and budgets in Arctic and Northwestern Atlantic populations of the suspension-feeding sea cucumber *Cucumaria frondosa*: ecological and management implications

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Cucumaria frondosa is a late-maturing long-lived species occurring in locally dense populations, subjected to subsistence fisheries in some Inuit communities of the Lower Arctic, and to commercial fisheries in the Northwest Atlantic. Clarifying the ecological relevance of *C. frondosa* in Arctic and subarctic regions is becoming crucial and can be done by exploring its role in carbon storage and cycling

within benthic environments through multiple physiological processes integral to its pelago-benthic life cycle. Chemical analyses of carbon content in sampled organs and tissues of sea cucumbers paired with populations metrics were used to quantify the amount of carbon stored in the biomass and cycled through interactions with the surrounding environment. Extrapolated to a population level, findings can help assess the contribution of *C. frondosa* to ecosystem functions and services, estimate the ecological cost of large removals through industrial fishing and develop arguments for sound conservation programs.

20.2. Diversity of marine oomycete parasites of marine primary producers and their importance in the zoospore loop

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Despite their potential ecological importance, interest in oomycete parasites of diatoms and algae has only recently resurged. While until recently only few species were known, environmental sequencing suggested that this is just the tip of the iceberg. With the aim to find and characterise species only known from sequence data, extensive sampling was carried out in Germany, Denmark, Norway and Iceland. Thereby, many new species were found, and several were established in dual culture to conduct experiments to understand host/pathogen dynamics. Thereby it was found that different pathogen strains from the same host species differed in virulence to their diatom hosts and that also diatom strains exhibited different degrees of resistance to pathogen strains. This demonstrates that oomycete/host dynamics are complex, while some might be responsible for the breakdown of host blooms, thus playing an important role in global carbon cycling by contributing to the zoospore loop.

21.1. Beach wrack and greenhouse gas emissions in Baltic coastal ecosystems

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Coastal vegetated areas inhabited by macrophytes (seagrasses or macroalgae) are defined as Blue Carbon ecosystems, acting as carbon sinks. However, beach wrack (BW), organic biomass from macrophyte, may release greenhouse gases (GHG) like CO_2, CH_4 and N_2O during decomposition, limiting climate mitigation effect. This study aimed to evaluate BW climate effect by quantifying seasonal GHG emissions across Denmark, Lithuania, Poland, Germany, and Sweden. Laboratory incubations of BW, BW and sand, and bare sand were performed at 5, 10 and 20°C to estimate seasonal emissions. Results showed that BW increased GHG emissions, with a magnitude depending on gas type, BW species, and location. Higher temperatures tended to enhance GHG fluxes, especially in the presence of BW. These findings will allow to investigate the potential counteracting effect of macrophytes in Blue Carbon ecosystems, and the climate benefits of recycling BW for various purposes (soil fertilizer, and sand dune stabilization).

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21.2. Does bioturbation impact methane ebullition from soft marine sediments?

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Methane ebullition, the release of methane (CH_4) from sediments via bubbles, is known to be an important source of atmospheric CH_4 from the near-coastal Baltic Sea. This study investigates the impact of bioturbation – the alteration of sediment matrices by animal activity - on CH_4 effluxes from benthic coastal ecosystems. We conducted a microcosm experiment, incubating sediment cores with different common bioturbators from the Baltic Sea. CH_4 ebullitive and diffusive fluxes, along with pore water chemistry, were measured. Results indicate a reduction in CH_4 ebullition in the presence of the bioirrigating polychaete *Marenzelleria* spp. over 16 days. These findings highlight the significant influence of benthic macrofauna on sediment-to-atmosphere CH_4 fluxes and underscore their role in regulating CH_4 dynamics in coastal ecosystems. Understanding these interactions is important for refining coastal CH_4 budgets and assessing the ecological functions of macrofaunal bioturbation in biogeochemical cycling.

22.1. Effects of warming on mesozooplankton community structure in the Elbe estuary: insights from a summer mesocosm experiment

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This study investigates the impact of warming on mesozooplankton community structure and links to lower food-web dynamics within the Elbe estuary. Throughout a four-week mesocosm experiment (July-August 2024), nine tanks were exposed to three temperature regimes and mesozooplankton was sampled weekly. Samples were analysed using Zooscan for imaging, EcoTaxa for prediction and validation, and Python for further analysis. Our results revealed a distinct shift in mesozooplankton community composition, transitioning from copepod dominance to cladocerans, independent of the warming effect. Notably, this shift occurred across all temperature treatments, suggesting that warming did not significantly alter mesozooplankton community structure. Results from lower food web dynamics provide evidence that other factors drove changes in mesozooplankton community structures than temperature, such as prey availability and oxygen depletion. These findings highlight the complexity of ecosystem responses to climate change and provide important insights into the resilience of estuarine ecosystems.

22.2. Fundamental relationships between iceberg disturbance and seabed spatial competition

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Ecologists have long tried to elucidate relationships between disturbance, richness and competition for resources. In the sea this is difficult to measure. At UK's Rothera Research station, Antarctica we surveyed 225 seabed markers at ~10 m depth annually, since 2003. The history of iceberg-mediated disturbance was compared with spatial competition between animals there. Space occupation (% cover) and competition intensity (proportion recruits in spatial interactions) increased with recovery time from months-decades, in line with expectations.

'Diversity' of spatial contest competition showed parabolic relationships with recovery time as predicted by the Intermediate Disturbance Hypothesis. The complexity of competitive networks peaked at ~8 years recovery. Interspecific spatial competition, cf intraspecific, was 3-60% of interactions, peaking at ~6 years since disturbance. Severity (frequency of contests with decided [win/loss] outcomes) also

peaked at mid-disturbance levels. Iceberg-raked polar seas were thought to be extreme, but intensity of competition increases long after peaks in variety.

23.1. Temporal health variation in Irish Mytulis sp in relation to SST

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This study investigates changes in the health of Mytilus sp. in Irish waters using biometric data from legislative pollutant monitoring programs (1992–2022) and satellite-derived sea surface temperature (SST) data. During a cooling period (2006-2011), cold days (SST < 10°C) increased from 75 days in 2002 to 110 days in 2012, coinciding with tissue moisture content rising from 76% to 81%. Time series analysis revealed a 12% drop in mussel condition and a 25% decrease in tissue weigh since 2012, aligning with increased SST variability driven by warmer summers. Shell weight rose by 33%, which in conjunction with reduced tissue lead to shell-to-tissue ratio increasing from 1.3 to 2.3, indicating poorer health. Southern Irish waters had healthier mussels than northern and western regions, with transitional waters outperforming coastal areas. These findings emphasize the need for further research on climate change impacts, SST fluctuations, and water chemistry on mussel health.

23.2. A decade apart - Comparison of benthic communities in the deep Central Arctic Ocean

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With the increase of ocean warming episodes affecting deep Arctic waters, there is an observable ‘borealization’ across Arctic shelves, while matching data are lacking for the deep Arctic. Benthic samples (box corer, epibenthic sledge, Agassiz trawl) were collected in 2012 and 2023 at nine stations. Sea ice coverage, organic matter availability and further relevant parameters for species distribution were evaluated. We observed increased abundances, expanded distribution ranges of taxa, seven species potentially new to science and significant difference between communities of Amundsen and Nansen Basin in 2023, while some common taxa in 2012 were absent. Biomass analyses will provide deeper insights into spatial and temporal community compositions. Further, we started to generate taxonomic identification keys to standardize species identifications and build up a DNA barcoding pool of representative benthic taxa. Our findings suggest changes even affect the Arctic Ocean seafloor communities.

24.1. Effects of marine heatwaves on juvenile clam’s biology and behaviour

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In a context where marine heatwaves are more intense and frequent, this study aims to assess their impact on the performance of Manila clam (*Ruditapes philippinarum*). Juvenile were exposed in the laboratory to increasing temperatures (from 20 to 30ºC), for 5 to 31 days to investigate their effect on survival, behaviour (burrowing) and metabolism (respiration, filtration, excretion). A decrease in survival was observed as temperature and duration increased, with a critical threshold at 28°C. For the short-term metabolic response, respiration and excretion increased with temperature, while filtration decreased,

with all changes showing statistically significant differences. With longer heat exposures, respiration and excretion returned to control levels, but filtration continued to show a decreasing trend at higher temperatures. In addition, extreme temperatures seem to modify the burrowing behaviour of individuals. Our study confirmed the Manila clam's vulnerability to heatwaves, though metabolic responses to rising temperatures were lower than expected.

24.2. Macrobenthic diversity and distribution in the Beagle Channel region

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The Beagle Channel region features a complex system of channels and fjords influenced by marine-terminating glaciers from the Cordillera Darwin Icefield (CDI) and subject to glacio-marine and anthropogenic inputs. We investigated the effects of glacial-melt and other drivers on macroinfaunal abundance, biomass, richness, diversity, and evenness across local (fjord) and regional (channel system) scales. Sampling was conducted with a giant box corer during the *FjordFlux* Cruise aboard *R/V METEOR* in 2022, covering 19 stations located in fjords, channels, and adjacent shelf areas of the Beagle Channel. A total of 290 macroinfaunal taxa were identified. Abundance ranged from 1,124 individuals/m² in the channels northwest of the CDI to 19,467 individuals/m² in the Garibaldi Fjord. Sediment properties (C/N, gravel/sand) and bottom water temperature explain 72.88% of the observed macroinfauna distribution. The region's complexity creates substantial abiotic and biotic variability across and within subareas, influencing macroinfaunal distribution.

25.1. Heat wave resilience of a mud-loving clam in different sedimentary habitats

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With climate change, heat waves are increasing, and coastal sediments are foreseen to coarsen due to changing hydrodynamics and sand nourishments. To assess the resilience of benthic organisms, we should therefore test their temperature sensitivity in different sediments. *Scrobicularia plana*, is known as a mud dwelling clam. We hypothesise this sediment preference to be driven by food content, so that the species would not suffer from coarsening if food-supply remains unchanged. In a mesocosm experiment we tested whether *i)* the clam performs equally well in sand and mud under equal food availability, and *ii)* whether heat-wave sensitivity is unaffected by sediment type. Contrary to our expectations, resilience was lowest in sand, despite having a higher food availability. Valve gape activity, reburial and metabolic rates give a behavioural and physiological explanation for the decreased performance. These findings could aid in predicting the sensitivity of this key species to environmental change

25.2. Habitat heterogeneity shapes marine biodiversity along a sea-dike

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Coastal infrastructure often homogenizes marine ecosystems by replacing diverse shoreline habitats with artificial hard structures, a trend accelerating under climate adaptation. This study examines how increased habitat heterogeneity can support marine biodiversity by integrating artificial tidepools and subtidal reefs along a Dutch sea-dike bordering the Wadden Sea. Biodiversity development was monitored across various tidepool and reef types over three years, assessing functional diversity, percentage cover, biomass, and environmental variables. Sessile communities rapidly colonized subtidal reefs, reaching up to 70% cover within nine months. Diverse reef types fostered greater taxonomic

variation, and tidepools showed 20% higher benthic diversity than comparable dike habitats. Biodiversity benefits increased with scale, as diversity across tidepool clusters was 60% higher than in comparable sea dike habitats. These findings suggest that artificial tidepools and reefs can play an important role in management interventions to increase habitat heterogeneity and enhance marine biodiversity on modified shorelines.

26.1. Heatwaves exacerbate the impacts of invasive species in intertidal flats

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The invasive Asian mussel *Arcuatula senhousia* has colonised numerous ecosystems worldwide where it can lead to severe habitat modifications. In the context of global warming, the frequency of heatwaves increases with deep impacts on intertidal communities. Here, we addressed the potential effects of *A. senhousia* density associated with heatwaves on the biogeochemical functioning of an intertidal habitat. We exposed sediment cores collected *in situ* containing different densities of *A. senhousia* to simulated combined marine and atmospheric heatwaves for six days. We assessed the community-scale responses by measuring nutrient (NOx, NH_4^+, $PO4^{3-}$) and oxygen fluxes across the sediment-water interface. The results highlight that (1) heatwaves enhance oxygen consumption and nutrient release to the water column, and (2) these effects were further exacerbated by increasing densities of *A. senhousia.* Our results reinforce the notion that climate change combined with biological invasions may dramatically impact biodiversity and biogeochemical functioning of intertidal ecosystems.

26.2. Distribution, co-occurrence patterns and niche separation of charophytes and angiosperms in the northern Baltic Sea

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Charophytes and angiosperms shape shallow freshwater and brackish ecosystems as primary producers and habitat modifiers. This study examines the distribution of 11 macrophyte species in relation to georeferenced environmental variables to assess co-occurrence patterns and habitat niche separation in the Estonian marine waters, Northern Baltic Sea. Species co-occurred more frequently within taxonomic groups than between them. The greatest distribution overlap occurred between *Chara aspera* and *Chara canescens*, while *Zostera marina* exhibited the least overlap with other species. *Chara baltica* had the highest mean number of co-occurring species, whereas *Z. marina* had the most single-species occurrences. Distribution models indicated that *Stuckenia pectinata* had the largest distribution area. The angiosperms *Z. marina, Zannichellia palustris*, and *Potamogeton perfoliatus* occupied the most distinct niche centers, whereas *Chara connivens* and *Myriophyllum spicatum* overlapped. These findings highlight the role of environmental gradients and taxonomic affinities in structuring macrophyte assemblages in the low-salinity Baltic Sea.

KEYNOTE

Using bioacoustics to uncover data deficient underwater ecosystems

Dr Britas Klemens Eriksson

Co-authors: Annebelle Kok, Maryann Watson, Ilse Opzeeland

Concepts of tipping points and regime shifts dominate current ecological frameworks aiming to understand ecosystem responses to anthropogenic global change. However, coastal ecosystems largely lack data on mobile fauna that have the right spatial and temporal resolution to understand the complicated ecological dynamics that result in a mosaic of local tipping points. In a response to data deficiency and the increasing attention for noise as a marine disturbance, monitoring of soundscapes are currently under development as a method to evaluate ecosystem health across Europe. Many fish and marine mammals make sounds related to behaviour and Passive Acoustic Monitoring (PAM) therefore monitor local biological activity rather than individuals. Underwater PAM is still in a developmental phase, but here I aim to show that bioacoustics may be a way forward to sample biological activity on temporal and spatial scales that are relevant to understand both ecological processes and detect rapid changes in community structure.

27.1. Redox proteomics of Acropora digitifera: Linking protein thiol dynamics to thermal stress adaptation

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Coral bleaching, a consequence of thermal stress, is closely linked to oxidative stress, yet the role of protein thiol dynamics remains unclear. This study examines thiol composition in *Acropora digitifera* under thermal stress to elucidate cellular responses. Coral samples from Bidong Island, Malaysia, were subjected to controlled heat exposure. Thiol-enriched proteins were isolated using activated thiol sepharose (ATS) resin and identified via mass spectrometry. A significant decline in protein thiol content after two days at 31°C coincided with bleaching onset. Proteomic analysis revealed no hyperoxidation-associated proteins, suggesting bleaching may mitigate oxidative stress. Functional annotation indicated thiol-containing proteins were primarily involved in energy metabolism and molecular binding. Elevated temperatures increased endoplasmic reticulum (ER)-localized proteins, influencing protein folding and lumen regulation. *A. digitifera* exhibits a preemptive oxidative protein regulation mechanism, potentially contributing to thermotolerance. These findings enhance understanding of coral resilience and inform conservation strategies in warming oceans.

27.2. Juvenile hake (*Merluccius gayi gayi*) hotspots and overlap with the bottom trawl fleet in Chile

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Reducing fishing efforts on juveniles is fundamental to the sustainability of fisheries. In Chile, we estimated the occurrence and density (number per unit area trawled) of Chilean hake for each juvenile age (ages 0, 1 and 2) and plus group (ages 7+) from annual bottom trawl surveys (1997-2018) to identify juvenile hotspots. We used location data from the bottom trawl fleet operating on hake to identify areas of high risk of juvenile catch or HRAs. We find that the trawl fleet operation overlaps with a significant area of the identified Chilean hake juvenile hotspots, specifically between 33°S-34°S and 36°S-37°S. We conclude that there are key areas with a higher likelihood of catching juvenile hake, so further

research is required to collect data on fishery selectivity and trawl depth of the Chilean hake bottom trawl fleet.

28.1. A multi-stressor perspective: Temperature and phosphate effects on coral photo-metabolism

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The Arabian Gulf is an extreme marine ecosystem facing increasing eutrophication due to treated wastewater discharge, leading to elevated coastal phosphate levels. This study examines the metabolic effects of high phosphate on corals in this environment. Coral fragments of *Cyphastrea microphthalma* and *Platygyra daedalea* (n=80 each) were collected from Abu Dhabi reefs and aquarium-acclimated. Corals were exposed to control (33.5°C, 0.2µm phosphate) and experimental conditions (33.5°C, 4µm phosphate, 35.5°C, 0.2µm phosphate, 35.5°C, 4µm phosphate) for 14 days. Photosynthetic performance (Fv/Fm) was monitored every two days via PAM fluorometry, alongside assessments of antioxidant enzyme activity, symbiont density, and chlorophyll concentration. Results showed that elevated temperature reduced photosynthetic performance, symbiont density, and chlorophyll concentration, while high phosphate had minimal impact. These findings suggest that phosphorus does not exacerbate thermal stress at tested concentrations, reinforcing temperature as the primary driver of coral decline in Abu Dhabi reefs.

28.2. Food web attributes to assess estuarine benthic ecosystem

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Marine ecosystems need rapid and high-performance tools to assess biodiversity and ecosystem functioning. Descriptor 4 - food webs (MSFD) is the most functionally oriented but challenging to implement due to limited knowledge of benthic interactions. This study investigates how spatially and temporally regulated abiotic factors shape benthic food webs by analysing natural isotope ratios (δ13C and δ15N) and constructing 12 food web topologies at three sites (Navigator, Gambia, Tróia) in the Sado estuary over two years. Isotopic metrics, integrated with univariate and multivariate analyses, identified food web indicators sensitive to environmental variations. Spatial variability was concomitant to organic matter quality, with simpler food webs in high organic load sites (Navigator, Gambia) and complex structures in the protected site (Tróia). Temporal variability was less evident but detectable. These findings highlight the effectiveness of isotopic metrics in assessing food web complexity and contribute to MSFD D4 implementation in estuarine ecosystems.

29.1. Nutritional Thermal Ecology: investigating the combined influence of temperature and nutrient availability on plant-ectotherm trophic interactions

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As ectotherms, the metabolism, and therefore nutritional demands, of marine zooplankton are modulated by temperature. Further, nutrient availability largely influences the quality of resources consumed by zooplankton, and hence affects whether nutritional demands are fulfilled. From these considerations, a crucial question arises: how do temperature and nutrient availability together modulate trophodynamics at the basis of food webs? Addressing this question for marine zooplankton is essential since these consumers are the most abundant metazoans on Earth, and they link primary production to higher trophic

levels. Here, we synthesize current knowledge in the framework of Nutritional Thermal Ecology. We highlight four research topics which may advance this field: 1) metabolic requirements of ectotherms; 2) feeding behaviour; 3) eco-evolutionary processes; and 4) trophodynamics. We pose that further advances may provide a robust understanding of how modulations of consumer metabolic requirements and resource quality define consumer–producer interactions across ecosystems.

29.2. Impact of environmental changes on coastal subtidal macrozoobenthic communities' evolution.

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This study examines the impact of ecological shifts on coastal subtidal macrozoobenthic communities. Environmental changes were reported in Arcachon Bay (SW France) in the last 20 years, including NIS (ex: *Arcuatula senhousia*), leading to a regime shift whose consequences on the benthic fauna remain unknown. Uni- and multivariate analysis were used to identify benthic communities in 2023 (28 stations) and their evolution between 1988, 2002 and 2023 (16 stations). Four communities were identified in 2023 structured by depth, current speed and sediment type. The spatiotemporal analysis showed moderate changes from 1988 to 2023. The main findings were a higher diversity in 2002, the spatial extension of one community inward and siltation in the north of the Bay. This study illustrates the importance of pluriannual monitoring programs in the context of increasing pressures on coastal habitats. The seagrass regression consequences on the evolution of macrozoobenthic communities need to be addressed.

30.1. Should we rely on Norwegian oysters for restoration? Assessing the impact of marine heatwaves on European flat oysters from different origins.

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European flat oyster beds, once abundant in the North Sea, have largely disappeared. This study examined how marine heatwaves affect the physiological responses of European flat oysters (*Ostrea edulis*) from different origins, Norway, the Netherlands, and Croatia. Oysters were exposed to three temperature treatments over six weeks: constant 20°C, constant 25°C, and a heatwave alternating between 20°C and 25°C (three heatwaves). Heatwave exposure gradually reduced respiration rates and resulted in the lowest valve gape, with significant fluctuations, whereas constant temperatures led to stable valve gape, highest at 20°C. Elevated temperatures suppressed valve gape, particularly in Norwegian oysters, which showed the strongest stress response, including a marked decline in heart rate during heatwaves. These findings highlight the importance of origin-specific responses in restoration efforts, as Norwegian oysters appear particularly vulnerable to heatwaves, potentially affecting their resilience to climate change.

30.2. Marine Diatoms in the presence of Microplastics/Nanoplastics and Chemical isotopes of ^{13}C and ^{15}N

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We have investigated the Dynamics of Marine Diatoms in the presence of Micro-Nano Plastics and chemical isotopes of Carbon and Nitrogen. Resonance Raman, steady state Fluorescence and FTIR data will be presented to characterize the dynamics of marine diatoms in the presence of Micro/Nanoplastics and chemical isotopes of C and N. The interaction and growth conditions of marine diatoms in the presence of microplastics/nanoplastics and chemical isotopes of ^{13}C and ^{15}N has been monitored by a variety of spectroscopic techniques. The pH/pD-dependent Fluorescence-excitation spectra of the light-harvesting Fucoxanthin-Chlorophyll *a/c*-binding proteins (FCPs) of Marine Diatoms will also be reported. A decrease in the energy transfer efficiency from Chlorophylls c_1/c_2 to Chlorophyll *a* upon protonation of the 17-acrylates was observed, resembling that observed in marine diatoms under high light conditions. Marine diatoms interact with microplastics and accumulate a number of chemical isotopes of ^{13}C, $^{15}NO_2$ and $^{15}NO_3$.

31.1. Microbiome Dynamics in Sponge Aquaculture: Insights from Wild and Integrated Fish Farm Cultivation

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Sponge aquaculture holds significant applications promise in biomedical research and ecological restoration. Sponges have been identified as ideal candidates for integrated aquaculture in fish farms, where their cultivation may help mitigating aquaculture-related pressures. Sponges usually stand as complex holobionts, where microbiomes play crucial roles in host health and function. The DROP (Diversity of bacteRia assOciated to sPonges from wild and aquaculture) project aimed to characterize the microbiomes of wild sponge populations and assess potential taxonomic shifts when cultivated alongside fish aquaculture. A metabarcoding approach was applied to analyse the microbiomes of four Mediterranean sponge species: *Agelas oroides*, *Axinella cannabina*, *Sarcotragus foetidus* and *Chondrosia reniformis*. Results showed that *A. oroides* and *S. foetidus* exhibited higher diversity. The dominant bacterial phyla included *Protobacteria, Acidobacteriota*, and *Chloroflexi*. Notably, differences were observed between the two experimental groups, i.e. wild and aquaculture-associated microbiomes, highlighting their potential as indicators of sponge health and environmental conditions.

31.2. Unveiling loggerhead sea turtle diet and foraging areas in the Mediterranean Sea

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The loggerhead turtle *Caretta caretta* is one of the most iconic, yet vulnerable, marine megafauna species. Furthermore, *C. caretta* migrates between oceanic and neritic habitats and changes its foraging strategies throughout its life history. Here, a systematic review was conducted with the aim of providing a comprehensive summary of the state of the art on the diet and foraging grounds of *C. caretta* in the Mediterranean Sea. A total of 75 original articles were included, categorizing 16 on diet and 59 on foraging grounds; data were extracted and analysed using bibliometric analysis, multivariate analysis and geospatial mapping. Unexpectedly, the nMDS revealed no clear life-stage segregation but habitat-based dietary differences (benthic vs. pelagic). The Eastern Ionian and Adriatic Seas were the most frequently reported foraging areas. The results highlight regional knowledge gaps and emphasize the need for further experimental data to support conservation strategies for *C. caretta* in the Mediterranean.

32.1. Effects of Artificial Light Pollution (ALAN) on Biological Traits of the Commercially Important Bivalve *Mytilus chilensis*

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This study aims to evaluate the effects of artificial light pollution (ALAN) on the biological traits of *Mytilus chilensis*, a ecologically and commercially important bivalve species. Under laboratory conditions, juvenile individuals of *M. chilensis* were exposed to four different light intensities during the night to assess its growth, calcification rate, meat weight, consumption, metabolism, and byssus production. The results showed that ALAN exposure negatively affects the size, meat weight, and consumption of *M. chilensis* and these effects increased lineally with light intensity. The other biological traits were not significantly impacted. These findings suggest that light pollution primarily influences growth and feeding behavior, which could affect the commercial productivity of this species. Furthermore, the study suggests that considering the intensity of artificial light in coastal areas could serve as a potential mitigation strategy to minimize the impact of light pollution on both aquaculture and natural marine ecosystems

32.2. Temporal and spatial variation in the foraging preferences of North Atlantic right whale (Eubalaena glacialis) and fin whale (Balaenoptera physalus) using archaeological and museum specimens

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Unsustainable hunting drastically reduced great whale populations globally. Whales play a crucial role in ecosystem services, including nutrient cycling and carbon sequestration. Thus, their decline and subsequent recovery significantly influences ecosystem functionality. Nonetheless, we lack a thorough understanding of the foraging preferences of baleen whales which makes it difficult to assess the ecological consequences of whale population extinctions, depletions, or recoveries. In this study, we used radiocarbon dating and stable isotope analysis on archaeological and historical specimens to deduce the past feeding behaviours of two North Atlantic whale species: the critically endangered North Atlantic right whale (*E.glacialis*), with fewer than 400 individuals, and the fin whale (B.physalus), with numbers now over 50,000 in the North Atlantic following exploitation. By comparing historical isotope data with modern samples, we uncover temporal and spatial shifts in foraging patterns, providing insights into their opposing population trajectories since the 1986 moratorium on commercial whaling.

33.1. Effects of multiple stressors on Grado lagoon ecosystem functioning

Margherita Burini[1,2], Laura Baldassarre[2], Annamaria Albanese[2], Laura Caiazzo[3], Mauro Celussi[2], Cinzia De Vittor[2], Nessim Douss[2], Daniela Fornasaro[2], Martina Kralj[2], Maria Rita Montereali[3], Federica Nasi[2], Federica Relitti[2], Lisa Sandri[4,5,2], Simona Schiavo[6], Sonia Manzo[6], Tamara Cibic[2]

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This study investigated the resilience of Grado lagoon to combined stressors i.e., oxygen depletion and Hg contamination, using enclosures. In June 2024, 18 mesocosms were positioned in the most contaminated shallow lagoon area. The dynamics of contaminants, physical-chemical, biological and ecotoxicological variables were assessed in water and sediments at T_0, 96 hours (T_1) and 10 days (T_2), and compared to external sites. At T_2, oxygen concentration inside the mesocosms decreased (-48.1±7.3%) compared to T_0, triggering changes in key benthic and pelagic biological processes. Benthic Primary Production and Community Respiration decreased by 21.4±2.2% and 63.4±2.9% respectively. In contrast, from T_1 to T_2, inorganic nutrients concentration increased in the water ($P\text{-}PO_4$ +84.6±6.9%, $N\text{-}NH_4$ +77.7±1.0%, $Si\text{-}Si(OH)_4$ +59.7±3.6%) following organic matter remineralization by microbial activity (prokaryotic Heterotrophic C Production). These results provide insights into the potential impacts of future climate scenarios on fragile lagoon ecosystems.

33.2. Ecological and conservation implications of a declining fur seal population for giant petrels

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Having recovered from commercial extinction in the early 20th century, the Antarctic fur seal *Arctocephalus gazella* population at South Georgia has declined considerably since 2009. We investigated the repercussions of this decline for the trophic ecology and mercury (Hg) contamination of giant petrels *Macronectes* sp., which are major consumers of seal carrion. Total Hg concentrations, $\delta^{15}N$ and $\delta^{13}C$ values of giant petrel chick feathers decreased during the 2010s, and THg was positively correlated with numbers of dead seal pups and their mortality rate at South Georgia. Our results suggest a shift away from carrion (associated with the decreasing size and productivity of the seal population) and towards the consumption of lower trophic-level prey (e.g., Antarctic krill *Euphausia superba*), with a corresponding reduction in dietary Hg exposure. We discuss these findings in relation to the conservation status of giant petrels and potential ecosystem-level consequences of a declining fur seal population.

34.1. Meiofauna sandy-beach communities reflect grain-size change after human impact

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Sand nourishment is a common coastal protection measure along the beaches of northern Germany. Our aim was to investigate meiofauna community changes after nourishment using metabarcoding and to relate the results to environmental factors. Over two years, samples were collected at the beach-water interface of a frequently nourished Baltic Sea beach. For metabarcoding, the V1&V2 hyper-variable region of the 18S-rDNA was used. Sediment was described by grain-size and -shape analyses. Metabarcoding showed a significant change in the community compositions. Acari nearly disappeared, while Platyhelminthes increased notably. Differences were detected in grain size distribution with a higher percentage of finer fractions after the impact. Communities were found to correlate significantly with sediment composition. Copepoda and Platyhelminthes preferred coarse and fine sand, respectively. Sand nourishments profoundly alter beach habitats and the related meiofauna communities. A certain amount of time is required to return to the original state after an impact.

34.2. Ontogenetic distribution of elasmobranch species in the ISRA Murcia Pockmarks

Elisa Arroyo Martínez[1], Isabel Abel Abellán[2], Antonio Esteban[1], Alfonso Ángel Ramos Esplá[3], José Luis Sánchez Lizaso[3], María Francisca Giménez Casalduero[2,3]

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The IUCN has taken an important step in the protection of elasmobranchs by developing Important Shark and Ray Areas (ISRAs) that have the potential to be managed for conservation purposes. This study aimed to geo-reference the ontogenetic groups of several elasmobranch species (*Raja asterias, R. montagui, Etmopterus spinax, Dalatias licha, Scyliorhinus canicula, Galeus melastomus* and *G. atlanticus*) recorded in southeastern Spain and to propose the area as an ISRA in 2023. Biomass and abundance data were collected from the MEDITS surveys (1994-2023), and the length-weight equation was used to estimate the individual's size. The results showed that the proposed ISRA is a nursery area for several species, supporting the recent designation of the ISRA Murcia Pockmarks. Furthermore, this area is not only crucial for elasmobranchs but also a geologically complex zone with significant biodiversity in both pelagic and benthic communities, including Demospongiae, Pennatulaceas, gorgonians, corals (*Isididae* sp.) and others.

35.1. Emerging contaminants in seawaters: effects on the seagrass *Cymodocea nodosa*

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This work aims at assessing the impact of environmental concentrations of emerging contaminants, like plastics and anti-inflammatory pharmaceuticals, on the Mediterranean seagrass *Cymodocea nodosa* Ucria Ascherson. Plants were collected from natural populations of the Ligurian Sea, raised in specially designed facilities, and used in outdoor and laboratory mesocosms experiments. Macroplastics altered seagrass architecture and increased seagrass vulnerability to invasive algae shifting interspecific interactions from competitive to neutrality. Microplastics in seawater increased plant leaf loss, and nanoplastics caused oxidative damage. The anti-inflammatory ibuprofen did not affect plant growth but increased oxidative stress and altered antioxidant enzyme activity, specialized metabolites production, and photosynthetic machinery functioning. The results indicate that plastics and anti-inflammatory pharmaceuticals are further stressors for seagrasses, which are already threatened by anthropogenic and climate-change-related factors. They also underline the importance of evaluating the long-term consequences of such contaminants on seagrass ecosystems and associated services.

35.2. Mussel culture – an ecosystem service under threat

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To feed a growing population and compensate for the overexploitation of fishery resources, mariculture is developing into an important economic sector that provides a sustainable low-trophic protein source. Mussels are keystone species that perform numerous vital functions in the ecosystem, such as reef building, nutrient cycling, water quality improvement, and forming biodiversity hotspots. The successful expansion of mussel culture will result in more mussels and more ecosystem services. Unfortunately, scientific research has shown that mussel farming is in many areas in decline and faces various problems such as unexplained mortality of juveniles and adults, lack and inefficient spat use, predation, harmful algal blooms, pollution, lack of space, difficulty in obtaining permits and low profitability. A case studies from different regions will be presented (Mediterranean Sea, North Sea and New Zealand). The overlap in problems faced by farming communities worldwide calls for an integrated approach to address these issues effectively.

KEYNOTE

Global change impacts on marine ecosystems: do gelatinous zooplankton traits facilitate jellyfish blooms in the ocean of tomorrow?

Dr Cornelia Jaspers

Lately, gelatinous zooplankton organisms, especially jellyfish, have raised large public attention as they are regarded to be 'winners' of global change, negatively impacting coastal ecosystems and human welfare while being deemed a dead end in the food chain. However, the scientific knowledge-base supporting these paradigms is weak and, in general, gelatinous zooplankton are disregarded in most marine food web studies.

Gelatinous zooplankton span a wide range of taxonomic groups in the animal tree of life ranging from the most basal metazoans to higher evolved close relatives of vertebrates. They are often lumped under the term 'jellyfish' and share the trait of a mostly dilute carbon content, a soft, transparent body texture and the fact that they are severely understudied and even disregarded in most food-web models and biological oceanography investigations. Irrespectively, they can have important functions in marine food webs, contributing more to secondary production than classical crustacean zooplankton and are important food source for early life stages of commercially important fish species such as Bluefin Tuna and European Eel. Global change is expected to lead to wide ranging changes of the oceans, impacting food-web structure, carbon flow and secondary production, with consequences for the human exploitation of marine resources. In this talk I will outline some observed and anticipated changes of jellyfish and other gelatinous zooplankton groups. By presenting results from laboratory studies, experimental evolution investigations, field observations and whole genome re-sequencing analyses, I aim at outlining how species traits differ, how they can adapt to differing global change scenarios and what the consequences might be for the productivity of our future oceans.

36. Modelling habitat suitability of *Posidonia oceanica* in a changing ocean

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Aligned with EU priorities on biodiversity conservation and climate action, this study investigates potential changes in habitat suitability of a seagrass species (*Posidonia oceanica*) in the Mediterranean Sea. We used the *MaxEnt* model to assess it for present (2019–2023) and projected climate change scenarios (2050) – RCP 4.5 and 8.5. Published databases on seagrass presence were used to train and validate the model (OBIS, GBIF, BioTIME, SeagrassSpotter). Present-day environmental data come from remote sensing and reanalysis outputs (Copernicus Marine Service), while future projections are derived from the MEDERGOM-biogeochemical model. Our results reveal a net decrease of habitat suitability for *P. oceanica*, highlighting spatial heterogeneity in projected impacts, as some areas are particularly sensitive to environmental changes. These findings highlight the importance of forecast studies in a changing ocean context to support proactive conservation and restoration actions in suitable areas, preventing losses of habitat and key ecosystem services.

37. Transcriptional memory in *Posidonia oceanica* seedlings: persistence and role in heat stress responses

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This study explores transcriptional memory induced by heat-priming in *P. oceanica* seedlings, its persistence and its role in improving response to subsequent heat stress. Seedlings were exposed to a 5-day heat-priming stimulus (31°C) followed by triggering stimulus (33°C) after one, three or ten days of lag-phase. Results showed distinct transcriptional profiles between heat-primed and non-primed seedlings upon immediate exposure to triggering (one-day lag-phase). Non-primed seedlings displayed stronger upregulation of stress-response genes, whereas heat-primed seedlings prioritized growth- and development-related pathways. Heat-primed seedlings also showed preactivation of gene involved in metabolic regulation, ROS detoxification and protein homeostasis. However, transcriptional memory progressively faded as lag-phase got longer, with heat-primed and non-primed seedlings exhibiting similar gene expression patterns. This suggests the presence of memory-resetting mechanisms. These findings provide novel insights into the temporal dynamics of transcriptional memory in seagrasses, with potential implications for their resilience under climate change scenario.

38. Unravelling the effect of marine heat waves (MHW) on seagrass belowground dynamics

Fabio Blanco-Murillo[1], Ludovica Pedicini[2], Ella Guscelli[2], Alice Blanckeart[1], Elena Quintanilla[1], Irene Olivé[1], Emmanuela Dattolo[1,3], Laura Carrugati[3], Ulisse Cardini[2], Antonio Pusceddu[3], Fabio Bulleri[2], Gabriele Procaccini[1]

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Marine heat waves (MHW) negatively affect marine communities, such as seagrass meadows. This research aims to evaluate the potential buffering effect of the *Posidonia oceanica* matte against MHW and how sediment warming might influence biogeochemical cycles. Temperature loggers were deployed at -30cm, -10cm, sediment and canopy level in 4 locations along the Italian coast. Seasonal sampling was performed in 2024 and 2025, to assess variability in plant and sediment biochemistry and in rhizosphere microbial composition in relation to temperature.

Preliminary results revealed a temperature buffering effect on the sediment in respect to the canopy water. Carbon degradation and protease and β-glucosidase activities were lower in autumn, while presenting a high spatial variability. Temperature profiles, plant metabolism and microbiome dynamics will provide insights into the belowground processes being affected by MHW and how these changes might alter ecosystem functioning and services such as nutrient balance and carbon sequestration.

39. Seascape Genomics of Scandinavian eelgrass: implications for conservation and adaptation

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Objectives: Eelgrass, a partially clonal foundation species, supports northern coastal ecosystems by providing habitat and sequestering carbon. We aim to evaluate the genetic diversity, clonality, and environmental drivers of genetic variation in eelgrass meadows across the Skagerrak-Kattegat-Öresund and Baltic Sea. **Methodology:** We performed seascape genomic analyses by combining population

genomics, environmental data and biophysical modeling. **Results:** We discovered higher genetic diversity and dispersal probability in the Skagerrak-Kattegat-Öresund, while Baltic Sea populations exhibited lower diversity and increased clonality due to environmental stress. We identified temperature and salinity as key drivers of genetic variation in the Baltic Sea, whereas genetic structure was the dominant factor in the Skagerrak-Kattegat-Öresund. **Implications:** Genetic variation of eelgrass meadows is influenced by contrasting environmental conditions where eelgrass meadows grow across the Skagerrak-Kattegat-Öresund and Baltic Sea, along with dispersal probability and genetic structure. The information gathered here aids in predicting climate change resilience and informing conservation management.

40.1. Seagrass leaf bleaching: does it affect the plant photoprotective mechanisms?

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Seagrasses are vulnerable to climate change, although photoprotective mechanisms, through photopigments rearrangement, have been detected to avoid photoinhibition and photooxidative stress. *Posidonia oceanica,* endemic to the Mediterranean Sea, is not an exception. Leaf bleaching has been recorded but how it affects seagrass viability is still unknown. Through depth-cross-transplantation in Cyprus, we explored the role of temperature and irradiance in bleaching and analysed changes in photopigments after transplantation. Unexpectedly, after three months, leaf bleaching did not increase when plants were transplanted to a different depth from the origin (*e.g.* from -10 to -30). Rather, higher bleaching was found when cuttings were kept at their origin depth (*e.g.* -10 to -10). Photopigment rearrangement at different light and temperature conditions indicated the usual activation of photoprotective mechanisms, showing that the plants can respond to environmental stressors while leaf bleaching occurs. Understanding this phenomenon became pivotal to predict the future of *P. oceanica*.

40.2. Looking at antarctic benthic habitats using a non-destructive methodology

Alberto Serrano[1], Elena Prado[1], Francisca Moya[2], Juan Manuel Rodríguez[1], Desirée Palomino[2], Olga Sánchez-Guillamón[2], Pablo Lozano[2], Carmen Presas[3], Waldo Redondo[4], Jorge Tornero[5], Ana Ventero[6], Izaskun Villar[5], David Díaz-Viñolas[7]

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Antarctic biodiversity is a key issue for the assessment of impacts in pristine areas (e.g. climate change, fishing, tourism). Antarctic Peninsula and South Shetland Islands circalittoral benthic habitats have been studied using a ROTV. Habitat characterization has been performed using geomorphological information obtained with an EM712 multibeam echosounder, dredges and CTDs, during PROA0225 survey (IEO-CSIC). The following habitats have been defined: 1) brittle stars (*Ophionotus victoriae*) + sea urchins (*Sterechinus neumayeri*) + primnoid gorgonians (*Thouarella* spp; *Fannyella* spp; *Ainigmaptilon antarcticum*); 2) sponges (*Haliclona* spp, *Mycale acerata*) + ascidians (*Ascidia meridionalis*); 3) crinoids (*Promachocrinus kerguelensis*) + sponges (*Cinachyra* sp, *Rossella* spp) + sun seastar (*Labidiaster annulatus*); 4) ascidians (*Synoicum adenearum*) + sponges (*M. acerata, Dendrilla antarctica*) + briozoans (*Microporella* sp); 5) *Umbellula magniflora* + primnoid gorgonians; 6) Opportunistic bryozoan (*Flustra* spp) probably in areas of iceberg scouring. These habitats have shown a very high diversity, mainly of sessile filter-feeder species.

41.1. Biodiversity in northern European seagrass meadows: Spatial and temporal trends

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Although northern Europe has many seagrass monitoring programs dating back almost a century, few studies have examined these datasets together across broad spatial and temporal scales. Here, we examine how seagrass-associated biodiversity has changed in recent decades on a regional scale in this area. Datasets of epifauna and infauna species living in seagrass meadows have been collated from five countries in northern Europe beginning in the 1970s, with new data collected in 2024. It was hypothesised that biodiversity would be related to differences in environmental conditions, with salinity shaping large scale spatial patterns and temperature and nutrient conditions as drivers of local temporal trends. Results indicate spatial differences in species composition patterns are strongly linked to salinity gradients. The compiled datasets highlight the lack of standardised biodiversity sampling methodologies employed in the region. This project will provide foundational knowledge to improve coastal management and seagrass conservation in northern Europe.

41.2. Benthic vegetation distribution in the northern Adriatic: present and future

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Brown algal forests and seagrass meadows play crucial ecological roles and provide essential ecosystem services. In the last decades, significant declines in these habitats have been observed in the Mediterranean, alongside the endemic bivalve *Pinna nobilis*. This research aimed to assess the distribution of benthic vegetation in the northern Adriatic and identify the primary causes of its regression. A non-destructive visual observation method of sea-bottom segments was employed, complemented by remote sensing techniques and spatial patterns environmental predictors. The study successfully modelled the current geographical distribution of benthic vegetation, resulting in a detailed vegetation distribution map for the northern Adriatic. This product offers spatially accurate insights into different upper-infralittoral communities and highlights signs of decline linked to anthropogenic pressures. The predicted geospatial trends in vegetation cover/suitability serve as a valuable decision support system for enhancing conservation and management actions, such as the identification of *Pinna nobilis* restoration sites.

42.1. Changes in eelgrass fish community across a spatial gradient

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Eelgrass meadows play a vital role in coastal ecosystems and are known to harbor rich marine biodiversity across trophic levels. Although changes in community across a sheltered-exposed gradient have been found for invertebrates, little is known for fish. Using a beach seine we sampled 21 eelgrass meadows on the Norwegian Skagerrak coast, repeating the sampling four times. We found no strong trends for species richness or biodiversity. However, using multivariate analysis, we found indications that the eelgrass fish community changed along a gradient of sheltered to exposed water areas. The more sheltered stations were dominated by a different set of species than the exposed stations adjacent to the open ocean. This implies that the function of the eelgrass meadow in the local ecosystem varies among

locations. These findings are important for management, as they show the importance of conserving and restoring eelgrass meadows across a range of environmental gradients.

42.2. Finding the surviving hot-spots of the critically endangered bamboo coral *Isidella elongata* in the central Mediterranean Sea

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The deep-water coral *Isidella elongata*, indicator of Vulnerable Marine Ecosystems, has dramatically declined in the Mediterranean due to bottom trawling. This study aimed to identify its remaining hot-spots in the central Mediterranean and validate them through ROV surveys to propose Fishery Restricted Areas. Species Distribution Model was used to predict and map *I. elongata* habitat suitability and remaining hot-spots in the Strait of Sicily using MEDITS records (2017-2021). Successively, a high-resolution multibeam acoustic and ROV surveys were conducted to verify the presence and status of the *I. elongata* colonies. A total of 11 transects between 200-800 m depth were conducted. The results of the video analysis confirmed the SDM predictions and identified sites with healthy *I. elongata* colonies. Other species of conservation interest *Leiopathes glaberrima*, *Madrepora oculata*, and *Desmophyllum pertusum* were found. These findings will support the proposal of a FRA to protect VME in the central Mediterranean Sea.

43.1. Biodiversity impacts of ecosystem shift from seagrass to drift algae

Johan Severinson, Per-Olav Moksnes

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Along the Swedish west coast, mats of perennial drift algae have replaced several seagrass meadows following extensive eelgrass losses, hindering restoration and natural seagrass recovery. We have compared the macrofauna diversity and oxygen conditions between these algal mats and seagrass habitats in order to elucidate the ecological implications of this shift. We collected epi- and infauna from perennial drift algae (*Furcellaria lumbricalis*, *Fucus*), seagrass (*Ruppia maritima*, *Zostera marina*), and bare sediments in two bays over two years, spanning early and late summer. Oxygen loggers were deployed in each habitat. Results show lower oxygen concentrations and more hypoxia in the drift algae, yet their species richness and faunal abundances were still comparable to seagrass. However, species composition differed, indicating an altered fauna community. These findings help inform the management of shallow coastal areas and the conservation of seagrass and marine biodiversity.

43.2. Deep see fauna associated with cold water corals of Bari Canyon (Southern Adriatic Sea, Italy)

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Deep-sea habitats are heavily impacted worldwide by anthropogenic activities. Deep reefs, built by ecosystem engineers including cold-water corals, are among the most widespread and vulnerable deep-

sea habitats and provide essential ecosystem services and despite their important ecological role, they are seriously threatened. This study aims to assess the importance of deep coral reefs as hotspot of biodiversity by identifying the associated fauna through manual and AI-assisted visual inspection of videos. High-resolution video imagery collected through Remotely Operated Vehicles (ROVs) will be analysed to identify coral assemblages and associated species. These findings will contribute to a better understanding of the ecological role of deep-sea corals and support conservation strategies. By highlighting their ecosystem services, this study underscores the need for effective management and protection of these fragile habitats in the face of anthropogenic threats and climate change.

44.1. Satellite-based assessment of seagrass habitat functions for ecosystem management

Cristina Galván, Inés Mazarrasa, María Maza, Ana Silió, Farzad Hosseini, Araceli Puente, Alejandra G. Cabanillas, Bárbara Ondiviela

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Ecological restoration increasingly focuses on reversing biodiversity loss and enhancing ecosystem functioning. To support the design of restoration plans, this study seeks to upscale the assessment of ecological functions. Seagrass meadows and associated benthic macroinvertebrate communities perform critical functions, including carbon sequestration, wave attenuation, productivity, and biogeochemical cycling. Field campaigns, satellite imagery, and supervised machine learning techniques, and species- and trait-based approaches, were combined to assess these functions across the estuary. Satellite images revealed spatial and temporal (intra-/inter-annual) patterns of seagrasses in northern Spain, and enabled biomass and organic carbon estimation. By integrating satellite-based biomass with empirical laboratory data, we also inferred flow energy attenuation. Additionally, we examined how seagrass extent relates to macroinvertebrate composition and function, exploring the role of $\boldsymbol{\alpha}$- and $\boldsymbol{\beta}$-diversity. The ecological insights gained will guide restoration strategies, addressing questions on the extent and location of efforts to achieve specific goals at local and regional scales.

44.2. *Pinna nobilis* shells as key elements in the environment for coastal fish community

Domen Trkov, Valentina Pitacco, Ana Fortič

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The aim of the study was to determine the impact of *Pinna nobilis* shells on the coastal fish community. We sampled the fish fauna with the fish narcotic in the habitat where the *P. nobilis* shells occur. We sampled a total of 120 50 x 50 cm quadrats, 52 of which contained shells. A total of 70 fish belonging to 15 species were found. The average fish density in the group of quadrats with *P. nobilis* shell was 3.5 specimen/m^2, while in the group without shell it was 1.5 specimen/m^2. In addition, statistical differences in the species composition of the fish fauna were found between groups. The *P. nobilis* shells therefore have a significant influence on fish diversity and abundance in the area. The results offer important insights into how the disappearance of the shells due to mass mortality of *P. nobilis* might affect the coastal fish community.

45.1. Deciphering the genetic basis of growth and heat tolerance in sugar kelp: a genomics-driven breeding approach

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The sugar kelp *Saccharina latissima* is vital to coastal ecosystems and aquaculture across Europe and North America. However, rising sea temperatures cause a decline in kelp populations, requiring research efforts to enhance their heat tolerance. Meanwhile, kelp aquaculture would economically benefit from

cultivars with enhanced growth. Hence, developing sugar kelp strains with improved heat tolerance and growth rate through selective breeding is of increasing interest. Here, the genetic basis of these traits was investigated by phenotyping and genotyping sugar kelp genetic lines generated by crossing clonal gametophyte cultures from a Svalbard population. We found that growth is more maternally inherited than heat tolerance. Heterosis arose for heat tolerance but not for growth when breeding with locally available genetic diversity. Additionally, non-genetic factors have a stronger influence in determining those traits than genetics. These findings can contribute to improve the selection of robust sugar kelp strains for aquaculture and restoration.

45.2. Empty *Pinna nobilis* shells: refuge for mobile macroinvertebrates

Ana Fortič, Valentina Pitacco, Domen Trkov

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The mass mortality of *Pinna nobilis* left the northern Adriatic soft bottom covered with hollow shells, forming hard-bottom oases for marine life. To assess their role as feeding and refuge sites for mobile invertebrates, non-destructive scuba surveys were conducted at six locations along the Slovenian coast in summers 2023 and 2024. At each site, ten 50 × 50 cm quadrats, some with *P. nobilis* shells and some without, were examined. Mobile invertebrates and bivalves over 1 cm were identified *in situ*, photographed if needed, and either returned to the sea or collected for analysis. Animal abundance was significantly higher in quadrats with *P. nobilis*. It peaked where both *P. nobilis* and seagrass meadows were present, with certain species characteristic of specific habitats. This study highlights the importance of empty *P. nobilis* shells for benthic invertebrates and the negative impact of their degradation and removal.

46.1. Macroalgal communities at the edge: understanding the impact of climate change on species near their tolerance limits

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Macroalgae species are particularly vulnerable to climate change, especially those that are living close to their tolerance limits, as in the N and NW coast of the Iberian Peninsula. This study aims to analyse the changes in macroalgal distribution in this region in the last decades. 18 sites were sampled in 2011, 2017, and 2023 using a standardized sampling methodology. This data was related to the temporal variability of several meteoceanographic variables. Macroalgal cover has changed since 2011 particularly at both extremes of the coast (western and eastern). The evolution of the Community Thermal Index also exhibited different patterns along the longitudinal gradient. As expected, sea surface temperature appears to be the most influential variable, followed by air temperature. The effects of wave height, currents or nitrates should be further investigated. Understanding changes in macroalgae distribution allows us to analyse potential climate change effects and develop conservation strategies.

46.2. The distribution and population structure of the ocean quahog, *Arctica islandica* (Linneaus, 1767), in the German Baltic Sea

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This study aims to assess the distribution, abundance, biomass, and population structure of *Arctica islandica* in the German Baltic Sea. Species distribution models were developed using the Random Forest algorithm, based on data collected between 2015 and 2024. Population structure was analysed by measuring shell lengths across subregions. Results show that *A. islandica* thrives in fine-grained, organic-rich sediments below the halocline and is absent from shallow, hydrodynamically active coastal

zones. The population size structure indicates a reduced maximum size compared to Atlantic populations, likely due to the brackish conditions. Populations are primarily composed of recruits, with high early-life mortality and intermediate-sized individuals are rare. In the German Baltic Sea, *A. islandica* already exists near its physiological and distributional limits, making it vulnerable. Anthropogenic impacts and climate change threaten its long-term sustainability. Hotspots of abundant stocks identified in this study are crucial for marine spatial planning and conservation efforts.

47.1. The application of thermal priming for kelp farming and restoration

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Kelps support coastal marine ecosystems and the European blue economy, yet rising ocean temperatures threaten kelp forests and biomass production. Breeding for temperature resistance is slow and reduces genetic diversity. Thermal priming could rapidly enhance stress tolerance but its effectiveness in kelps remains underexplored. We primed gametophytes and small sporophytes of the kelp *Saccharina latissima* to cold (0°C) and warm (20°C) conditions, with 10°C as the control, and tested the effect on growth and thermal tolerance. Maternal effects and lipid provisioning contributed to priming memory. Cold priming doubled the yield in a mariculture trial experiment, while warm priming improved thermal tolerance of juvenile sporophytes, with survival at 1°C higher temperatures for seven days. Modeling suggests a 1°C heat tolerance increase could recover 40% of kelp range that is threatened under SSP3-7.0 by the year 2100. These findings offer solutions for both aquaculture and restoration.

47.2. Temporal Dynamics of Reef Invertebrate Communities in Pulau Bidong and Pulau Yu, Terengganu: Implications for Post-Disturbance Recovery and Environmental Resilience

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A monthly survey of reef invertebrates was conducted from March to October 2024 around Pulau Bidong and Pulau Yu, Terengganu, to examine post-disturbance colonization. Pulau Bidong, impacted by Storm Pabuk in 2019, served as a case study for invertebrate succession alongside coral recovery. Surveys were conducted at depths of 5–18 m using standard benthic invertebrate methods, with 60-minute observations per site. A total of 66454 invertebrates were recorded across 49 taxa. Emphasis was placed on Echinodermata (7%), particularly holothurians (5 species). Invertebrate abundance fluctuated monthly, with a significant decline in June 2024, coinciding with elevated sea temperatures and a regional coral bleaching event. However, coral-embedded barnacles thrived with up to 42% in accumulative months, suggesting their robustness and limited use as bioindicators. These findings highlight the varied responses of reef invertebrates to environmental stressors and underscore the need for multi-taxa monitoring to assess ecosystem resilience.

48.1. Status of Kelp forests in Spanish and Portuguese waters. A collaborative study

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We present a collaborative effort to compile data on the distribution of kelp species (orders *Laminariales* and *Tilopteridales*) in Spanish and Portuguese waters encompassing both coastal regions and their archipelagos. This effort involved a regional call for experts' knowledge input and data collection, followed by a workshop where findings were discussed. Discussions were focused on the current status of kelp populations, trends and causes of observed changes as well as priority areas for future research.

Preliminary findings revealed contrasting trends across species and geographic areas. Notably, there is a significant lack of knowledge about the distribution of certain deep-water species. These species have not been monitored as extensively as shallow water ones, so their temporal dynamics remain poorly understood.

These findings provide valuable insights to inform both protection and management strategies, as well as future restoration efforts, which are crucial for the preservation of kelp forests in the region.

48.2. From ancient genomes to modern conservation: an Atlantic bluefin tuna case study

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The Atlantic bluefin tuna (Thunnus thynnus, ABFT) has been heavily exploited for centuries, yet its full genomic response to human impact remains poorly understood. A recent whole-genome study (Andrews et al., under review) revealed that ABFT experienced a demographic decline as early as 1900, coinciding with a small but significant increase in homozygosity, suggesting genetic erosion. Building on these findings, this project will enhance sequencing depth for the ~45 modern and ~45 ancient samples (the latterT dating back up to 3000 BC) from the already mentioned study. Higher-resolution sequencing will enable a detailed investigation of non-neutral genomic variation. Our objectives include estimating genetic load, identifying signatures of human-driven adaptation, and developing predictive models of ABFT population dynamics. By integrating genomic, environmental, and fishery data, this study will refine our understanding of ABFT resilience and adaptation, offering critical insights for conservation and sustainable management.

49.1. Ecotypic Salinity Adaptation of *Saccharina latissima* from Skjerstadfjorden in Norway

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The macroalga *Saccharina latissima* occurs along the entire Norwegian coastline and in fjords that cut deeply into the country. In the Skjerstadfjord in North-Norway, the limited seawater exchange through the Saltstraumen Strait together with meltwater run-offs from surrounding mountains in spring causes very low seawater salinities in summer. This study was conducted to understand the largely unknown adaptation of *S. latissima* to low salinities. In a 6-week common-garden study, *S. latissima* from different locations in the Skjerstadfjord were exposed to a wide, ecologically relevant salinity range and physiological parameters were analysed. Macroalgal growth, photosynthesis, nitrogen and mineral contents suggest that *S. latissima* from the Skjerstafjord can tolerate low seawater salinities due to osmotic adaptation. Compared with other locations, *S. latissima* from the Skjerstafjord could be specific 'low salinity' ecotypes. This study is useful for a better understanding of the macroalga's speciation, climate change resilience and the development of macroalgae aquaculture.

49.2. Large-scale biodiversity assessment of Antarctic meiofauna communities using multi-gene DNA metabarcoding

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Antarctic shelf benthic ecosystems are highly impacted by climate change. To establish a baseline for scientific monitoring, we assessed meiofaunal diversity across different regions of the Weddell Sea using multi-gene DNA metabarcoding. Sediment samples were collected during four expeditions on board of RV *Polarstern* between 2013 and 2022. COI mtDNA and 18S rDNA gene fragments were amplified from whole meiobenthic communities and sequenced using the Illumina MiSeq platform. Our results revealed high meiofaunal diversity with distinct differences in meiofauna composition across the studied regions. Nematoda, Arthropoda, Annelida, and Platyhelminthes were the most dominant phyla, while rare taxa played a crucial role in differentiating communities. Further studies integrating DNA metabarcoding with ecological observations, will provide a foundation for spatial modelling of benthic assemblages. These models will contribute to the designation of marine protected areas in the Southern Ocean.

50.1. Digital Twins of the Ocean applications for monitoring and management of marine biodiversity

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The Digital Twin of the Ocean (DTO) program of the European Commission provides a foundation of an analytical environment that brings together data, models, and algorithms to support effective monitoring, restoration, and management of marine ecosystems by 2030. The Iliad and DTO-BioFlow projects are using the EU DTO foundation for the creation of local digital twins with support for biodiversity and ecosystem monitoring and analysis. This talk will introduce the use of local digital twins of the Ocean based on ecosystem management programs in the region around Oslo fjord, including the two national parks Kosterhavet (Sweden) and Ytre Hvaler (Norway) and the Trondheimfjord. The examples feature novel biomonitoring methods such as Genetic Biodiversity Observatory Networks and

the Swedish platform for subsea image analysis (SUBSIM). In the context of AI-based Image analytics for Norwegian fjords, the AI processing approach has been extended with an Ensemble approach combining various AI methods.

50.2. Fisheries modelling: a new approach to maximising profits and landings

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Marine Protected Areas (MPAs), size selectivity, fishing effort and landings, and subsidies play a crucial role in the sustainability of marine resources. This study aims to optimise stock recovery, landings and profits through different combinations of those variables including subsidy reallocation (e.g. towards MPA promotion or temporary fishery closure). Using a spatially explicit, age-structured, dynamic model, we analysed a monospecific fishery. The results suggest that direct subsidies artificially prolong profitability and exacerbate stock depletion, while redirecting subsidies towards MPAs and temporary closures improves fish stocks and long-term economic returns. We also find that reducing fishing effort has limited effects compared to increasing MPAs. Our results highlight the need for policy reforms that shift the design of subsidies from supporting overfishing to promoting maximisation of stocks. This research provides valuable insights for fisheries management that is consistent with global sustainability efforts and supports long-term ecological and economic stability.

51.1. BRUVS compared to eDNA and Trawls in the German Bight

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Anthropogenic activities have a profound impact on benthic habitats and their associated faunal communities in the North Sea. Marine Protected Areas and Fishery Restricted Areas (FRAs) were established to restrict these impacts in Sylt Outer Reef and Borkum Reef Ground. Traditional investigations of benthic communities with beam trawls were prohibited in the FRAs. To evaluate possible effects of these actions, new, non-invasive methods were applied to monitor macrofauna. To investigate their appropriateness and features, we used Baited Remote Underwater Video Stations (BRUVS) and compared them to eDNA water sampling and to beam trawls.

Our results revealed similarities and differences in species community composition between BRUVS to trawls and BRUVS to eDNA findings. Also differences between size distributions of encountered individuals from BRUVS and trawls were discussed. The results underscore complementary aspects of these three approaches and provide valuable insights for optimizing future monitoring strategies and evaluating novel assessment techniques.

51.2. Sensitivity analysis of fish species in the Northeast Atlantic

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Our objective was to enhance our understanding of the sensitivity of fish species by exploring both their intrinsic sensitivity and their sensitivity to fishing. We calculated r_{max} for a range of commonly-captured marine fish to determine intrinsic sensitivity and assessed sensitivity to fishing with a length-based spawning stock-per-recruit model (Rindorf et al., 2020). A significant positive correlation was found between both metrics, demonstrating that intrinsically sensitive species are also particularly sensitive to fishing, though this was not always the case, highlighting the need to use multiple metrics for a realistic assessment of species' sensitivity. We found chondrichthyans to be particularly sensitive by both metrics. Of the top twenty most sensitive species by both metrics, more than half are not covered by species-specific protective legislation within European waters, suggesting that many sensitive species lack adequate protection and highlighting the need to incorporate sensitivity metrics into conservation and management.

52.1. Developing genetic diversity estimates for charophytes in the Baltic Sea

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Charophytes are ecologically significant in coastal lagoons in the Baltic Sea, being important primary producers and habitat modifiers. Yet in Nordic countries a high proportion of charophyte species are IUCN Red Listed; including 50% of charophyte species in Finland. An understanding of population structure and connectivity is imperative to aid in both protecting and restoring habitats dominated by these species. This study has developed a suite of microsatellite markers to facilitate the production of the first intraspecific genetic diversity estimates for two species of *Chara* in Finnish coastal waters. Using these markers, it was determined that brackish charophytes in Finland partially reproduce asexually, and the fragmented archipelago environment has led to structuring of the population at smaller spatial scales. The results of this study will guide the selection of effective restoration techniques with the aim to improve the prospect of achieving sustainable and resilient restored habitats dominated by charophytes.

52.2. An integrative framework for addressing taxonomic challenges in *Cystoseira* s.l.

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Brown algae within the *Cystoseira* sensu lato (s.l.) complex constitute essential components of Mediterranean marine forests, yet their taxonomic delineation remains a significant challenge due to pronounced phenotypic plasticity and recent reclassification into three distinct genera. These taxonomic uncertainties, further exacerbated by the addition of new species, impede conservation efforts and ecological research. To address these challenges, we developed an integrative framework combining advanced molecular tools with morphological assessments to achieve precise species identification and robust phylogenetic resolution. This standardized approach incorporates rapid DNA extraction techniques, high-resolution molecular markers (*COI*, *RuBisCO*, *ITS2*), and rigorous phylogenetic analyses, ensuring reliable results at both interspecific and intraspecific levels. Our comprehensive database, derived from Atlantic and Mediterranean specimens, provides critical insights into the taxonomy of *Cystoseira* s.s., resolving long-standing ambiguities. This framework not only enhances species classification accuracy but also supports future research, conservation planning, and ecosystem management strategies for Mediterranean marine forests.

53.1. Computer Vision for Semi-supervised MaxN Counting of Marine Fish in Underwater Video

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Camera based underwater surveys have become a popular method to study marine faunal populations, yet manual video processing time remains the primary bottleneck in many studies. To address this, we propose a semi-supervised approach for species MaxN counting using YOLOv8 object detection and classification. Unlike conventional machine learning methods that prioritize accuracy metrics, our framework specifically optimizes for ecological relevance. Our method automatically identifies tuneable video intervals most likely to contain MaxN observations for classes based on the number of consecutive detections across frames and average confidence scores. This method achieved 99% accuracy compared to human counts while reducing the annotations workload, and maintaining engagement with raw data. Importantly, it also reduces the need for labelled training data and accommodates classes with limited examples, demonstrating that imperfect models can be useful in ecological work as long as they are handled appropriately.

53.2. Harnessing Advanced Technologies for Monitoring and Managing Aquatic Invasive Species in European Waters

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The spread of invasive alien species (IAS) poses a major threat to aquatic biodiversity and ecosystem services. The Horizon Europe project GuardIAS integrates cutting-edge technologies—including AI, robotics, eDNA, satellite imaging, and citizen science—to enhance IAS monitoring, early detection, and management in aquatic environments. Machine learning algorithms optimize species identification and risk assessment, while autonomous underwater vehicles and camera traps enable real-time mapping of IAS distributions. AI-powered image recognition and citizen engagement improve large-scale IAS surveillance. eDNA metabarcoding boosts detection and AI-driven data workflows strengthen biodiversity databases. Novel antifouling nanotechnology coatings are being developed to reduce IAS introduction via hull biofouling. The project also pioneers hydroacoustic monitoring for IAS with distinctive sound signatures. By integrating these innovations with systematic conservation planning and stakeholder engagement, GuardIAS advances policy-driven solutions for IAS mitigation in European aquatic environments. This interdisciplinary approach exemplifies the transformative role of emerging technologies in aquatic conservation.

54.1. Otoliths vs Eye lenses, parallel histories from different growth structures

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Sclerochronology of fish otoliths is a well-known and widely used technique in marine biology. However, recent studies have started to use eye lenses growth in different marine taxa as a reference structure. In this study, we aim to validate the feasibility of these structures as a growth indicator for European anchovy (*Engraulis encrasicolus*). Using paired comparisons (same individual), we confronted the growth pattern based on the diameter of successive eye lenses with the standard otolith measurement for specimens caught in the South Atlantic and Mediterranean Iberian coasts. Our results establish the relationship between both structures, providing relevant information about functioning and

evolution of growth through ontogeny. Therefore, we suggest that the analysis of eye lenses increments could be a reliable methodology for the study of growth in *Engraulis encrasicolus*, while its biochemical analyses have the potential to reflect key processes during ontogeny like migrations or dietary changes during development.

54.2. The invasion of the American blue crab *Callinectes sapidus*: Research applied to the implementation of management plans

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The American blue crab Callinectes sapidus, an invasive species, has significantly expanded its range in French Mediterranean lagoons, present in over 20 French lagoons and numerous estuaries, with different invasion gradients. The aim was to understand how the species was adapted to local environmental conditions, in order to implement appropriate measures, by studying the blue crab's tolerance to temperature and salinity, as well as its population dynamics. It has been established that the blue crab is eurythermic (tolerates a wide range of temperatures; 0-40°C), which makes temperature a non-limiting factor for its proliferation. Salinity is a critical factor as blue crabs require a salinity gradient for the reproduction. The salinity tolerance of C. sapidus shows that it tolerates a wide range of salinities, between 0 and 62.4 psu. Based on the various studies carried out, a control plan for the blue crab was implemented in Corsica in 2024.

55.1. Allochrony in atlantic lumpfish: genomic and otolith shape divergence between spring and autumn spawners

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The Atlantic lumpfish (*Cyclopterus lumpus)* spawns in spring and autumn, however, the role of allochrony (differences in spawning time) on its genomic structure has not been addressed. Therefore, we combined whole genome sequencing data and otolith shape, of spring and autumn spawners sampled at two distinct spawning grounds along the Norwegian coast. We identified a region of chromosome 1 encompassing the same SNPs driving differential season spawning for both localities, suggesting parallel responses. Their functional analysis revealed genes associated with responses to environmental stressors. The otoliths shape analysis supported these findings, showing differences compatible with adaptations to seasonal light availability. Moreover, genomic islands of divergence, alongside a general lack of differentiation across the mitochondrial genome, suggest recent and rapid selection processes potentially modulated by ongoing gene flow. This study underscores the importance of considering temporal genetic structures, particularly for species with bimodal spawning time, in conservation and management strategies.

55.2. Can multi-marker eDNA replace classical approaches for alien species detection?

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The Mediterranean Sea is experiencing a rapid increase in non-indigenous species (NIS), with commercial ports acting as key entry points into new environments. Certain NIS can spread to surrounding areas and remain undetected for a long time. We conducted seasonal samplings in three ports located in distinct Mediterranean sectors. We compared results obtained using eDNA methodology and classical approaches to evaluate the efficacy of both techniques for assessing the overall biodiversity and detecting NIS. The multi-marker eDNA metabarcoding identified more species than morphological analyses, yet only a small fraction was detected by both methods. Comparing data obtained by molecular and morphological approaches for NIS identification, the percentage of commonly detected species was less than 10%. Here, we discuss limitations of these approaches and future perspectives of ecological studies aimed at assessing marine biodiversity and enabling the timely detection of invasive species to minimize their impacts on marine ecosystems.

56.1. Monitoring Weddell Sea biodiversity using Antarctic fish as proxies for connectivity

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A recent, breakthrough discovery from seabed imaging provides the opportunity to test connectivity hypotheses in an iconic Antarctic species. A vast breeding ground (45,000 km2) of the Antarctic icefish *Neopagetopsis ionah* was found in the Weddell Sea (Southern Ocean), which is under consideration as a Marine Protected Area. That first evidence that Antarctic icefish perform large spawning aggregations raises the question of how important the site discovered is; do *N. ionah* migrate from far to that nesting site or are there other circum-Antarctic nesting sites? By genetic analysis of fish samples collected from the Weddell Sea spawning aggregation as well as the Antarctic Peninsula, we found evidence of very low differentiation between the two geographic sites. Genetic connectivity can provide valuable insight into the number and distribution of *N. ionah* spawning sites. How well does connectivity in this species proxy for other icefish with similar distribution and behaviour?

56.2. Macrobenthic biodiversity and functional patterns in three Adriatic marinas

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Synergistic pollution effects are pronounced in touristic marinas, but their impact on macrobenthos has not been sufficiently researched. In this study, the macrofauna communities in three marinas of the central Adriatic Sea were analysed: Spinut and Strožanac (Croatia) and Marina Dorica (Italy). Structural and functional diversities were analysed using sediment samples and physico-chemical parameters at five stations per marina, considering confinement gradients and human activities. In Spinut and Marina Dorica, species abundance, richness and traits occurrences were determined by confinement gradients and sediment grain size, with sandier stations favouring diverse marine species, whereas finer sediments

favoured euryhaline species and surface deposit feeders. In each marina, high concentrations of heavy metals were found near boathouses, which affected biodiversity in Spinut but not in Marina Dorica. These results highlight the complex interplay of natural and anthropogenic factors in shaping marinas biodiversity, emphasizing the importance of monitoring strategies for sustainable marinas management.

57. Infrared spectroscopy: uses in marine biology data collection

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Relationships between living organisms are complex and require multiple data for more profound understanding. Obtaining as much information as possible from individual samples is very valuable, especially in environmental research. Infrared spectroscopy is a method that provides various information within a single measurement and is non-destructive to the sample.

Results from previously conducted pilot studies revealed the feasibility of creating a method for indicating intraspecies differences (stock identification) and measuring individual characteristics (i.e. fat content in muscles) of Baltic herring. The ongoing project is focused on creating a screening tool for qualitative analysis of cods' stomach content for monitoring changes in the feeding habits of the fish.

The spectra database of organisms being elements of the marine food web can also be applied for creating a spectrometric model for further research on biota from the Baltic Sea (i.e. identification of closely related species or assessment of general fish condition).

58. Microalgal-derived biostimulants as a novel strategy for *Cystoseira s.l.* restoration

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Species within the *Cystoseira s.l.* complex provide essential habitat and ecosystem services in the Mediterranean, yet they face significant population declines due to anthropogenic stressors and climate change. This study assessed the effects of microalgae and cyanobacteria-derived biostimulants on the fitness and stress resilience of *Gongolaria barbata* and *Ericaria crinita* seedlings. Experiment with *Desmodesmus sp.* (Chlorophyceae), *Cylindrotheca closterium* (Bacillariophyceae), and *Trichormus variabilis* (Cyanobacteria) extracts in a mesocosm comprised of three phases. Initial tests with *Desmodesmus*, *Trichormus*, and *Cylindrotheca* at concentrations of 2.25 mg/mL and 4.5 mg/L resulted in high mortality rates. Subsequent trials with diluted concentrations revealed that *Desmodesmus* (at 0.07 mg/mL) yielded the best performance. The final phase, tested on both *G. barbata and E. crinita*, demonstrated that this concentration was at least as effective as Algatron (a commercial biostimulant), indicating *Desmodesmus's* potential for larger scale cultivation of *Cystoseira s.l.* for restoration purposes.

59. SMART drumlines reduce wildlife mortality in shark management programs

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We evaluated the effectiveness of SMART drumlines, a new shark management tool designed to increase catch efficiency of target species and minimise wildlife mortality, compared to traditional fishing gear such as longlines and gillnets. We analysed capture selectivity and at-vessel mortality of target shark and bycatch species from La Réunion and Australia. Traditional gillnets resulted in increased mortality rates and showed lower CPUE of target sharks than SMART drumlines and longlines. Traditional longlines provided a balanced approach, demonstrating moderate capture efficiency with lower associated mortality than gillnets but not SMART drumlines. This research highlights the potential of SMART drumlines to improve shark management by enhancing target species capture efficiency and reducing bycatch mortality.

60. Long-term assessment of whale-watching trends in the proposed National Park of Guguy (Canary Islands)

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This study presents a long-term assessment of whale sighting distribution, using data obtained from an ecotourism company in the southwest of Gran Canaria, in the central-eastern Atlantic Ocean. This area is located near the Guguy region, which is proposed to be designated as a National Park due to its rich biodiversity and the importance of conserving key species, such as cetaceans. The study analyses trends in the presence and absence of these animals over time, correlating them with oceanographic variables. The results help improves our understanding of the factors influencing cetacean distribution in the region and provide valuable information for their conservation, as well as for the management of the ecosystem services these animals provide.

61. From scour to recovery: macroalgal resilience in ice-disturbed coastal ecosystems

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In subarctic coastal marine systems, the ice regime structures benthic communities. While ice cover may protect the benthos in winter, drifting sea ice removes large amounts of biomass from canopy-forming macroalgae and associated species. As ice regimes change, we assessed community dynamics under different ice-scouring regimes in the St. Lawrence marine system (Quebec, Canada) using rocky intertidal approaches, including macroalgal growth/mortality monitoring, long-term sampling, drone imagery, and manipulative experiments. Undisturbed macroalgal carbon production reached 1 $kg \cdot m^2 \cdot yr^{-1}$, dropping 99% after severe ice scour but rebounding to 0.35 $kg \cdot m^2 \cdot yr^{-1}$ within a year, demonstrating rapid recovery. Full community structure recovery occurred after two growing seasons. Aerial drone imagery quantified winter macroalgal loss and summer regrowth, helping identify high-risk scour zones. With warming winters, reduced drifting sea ice and ice foot cover may significantly alter intertidal community dynamics and their functional role in subarctic coastal ecosystems.

62. The circalittoral epibenthic communities in the Northern Adriatic Sea; A novel surveying methodology

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High biomass epibenthic communities found in the circalittoral sandy bottoms of the Northern Adriatic serve as crucial feeding grounds and play a significant role in benthic-pelagic coupling. Their distribution and structure remain poorly studied, and their status in an area facing high levels of anthropogenic pressure is largely unknown. Both destructive (dredging) and non-destructive techniques (video-sledge) have been employed to assess the composition of epibenthic communities. In several cases, these methods were applied simultaneously, allowing for a direct comparison of both approaches. Although taxonomical precision and reliability are greater with physically obtained samples, visual records of the seafloor offer several advantages, including a broader surveyed area, insights into the micro-distribution of species, behavioural observations, more reliable data on the abundances of dominant taxa and surveys of bottom structures including physical damages. Based on these findings, a new non-destructive method for surveying the seafloor and epibenthos has been proposed.

63. Insights into small-scale dynamics of intertidal and subtidal soft-bottom infauna

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In a rapidly changing world, a comprehensive understanding of ecological dynamics under extreme natural conditions is crucial for predicting the future impacts of climate change. This study aims to investigate how small-scale abiotic factors influence the dynamics of soft-bottom infauna. We examined how community composition varied across different daytimes and tidal phases by analysing infauna in intertidal and subtidal areas of Spiekeroog Island (East Frisian Wadden Sea, North Sea) at two sediment depths (0-5cm and 5-10cm). Our results indicate that intertidal infauna dynamics in deeper sediments are affected by tides during summer, while total abundances in the upper sediment remain stable but fluctuate with tides in deeper layers. In contrast, subtidal infauna consistently exhibited higher abundances in the upper sediments, irrespective of tides or daytime. These findings contribute to a deeper understanding of ecosystem functioning and provide insights into the potential effects of environmental changes on the Wadden Sea.

64. Diet and trophic position of *Cucumaria frondosa* and *Mytilus edulis*: a comparative study across populations from eastern and northern Canada

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Benthic suspension feeders like the sea cucumber *Cucumaria frondosa* and active filter feeders like the blue mussel *Mytilus edulis* are an integral part of cold-ocean food webs and benthic-pelagic processes. However, the trophic position of passive suspension feeders relative to active filter feeders remains poorly known, including whether interactions might be competitive. We compared the diet and trophic position of *C. frondosa* and *M. edulis* from two latitudes (Northwest Atlantic and Lower Arctic) over two seasons through analyses of digestive contents and stable isotopes. Overall, *C. frondosa* from the

lower latitude appeared to occupy the highest trophic level ($TL_{consumer}$= 2.46, mean $\delta^{15}N$= 10.50 ±0.61 ‰ in fall), while the highest variety of food items in its digestive tract occurred in spring. The relative trophic positions of *M. edulis* to *C. frondosa* did not change seasonally nor across latitudes, although distance between the two was shorter at the higher latitude.

KEYNOTE
Restoring marine ecosystems: key achievements and future challenges

Dr Simonetta Fraschetti

Marine habitats are facing unprecedented threats, with 60% of coastal areas showing signs of degradation. The deep sea is not faring any better. Moreover, the global climate crisis is introducing synergistic and unpredictable effects across the planet. Given these challenges, the goal of protecting 30% of the marine environment by 2030—while important to be reached—may not be sufficient to reverse the current trends of decline, especially when applied only to benthic habitats, taken as representative of whole ecosystems. Ecological restoration is increasingly seen as a promising strategy for regenerating biodiversity and restoring the ecosystem services it provides. Numerous studies document that ecological restoration appears viable for a wide range of marine habitats across various spatial scales, with evidence showing that successful restorations do not always require the complete removal of all stressors. However, despite these promising results, and the ambitions of the new Restoration Law along with substantial funding opportunities, a long list of gaps still exists, raising important open questions: Which habitats can be restored? Where is it best to invest? What are the key drivers of success for scaling up restoration efforts, and how can restoration success be measured? How to establish a seascape perspective that includes functional connectivity? How to align ecological, economic, and social goals for successful marine restoration? These questions will be explored and discussed, since crucial to better frame the potential and future of ecological restoration and support its use as a scientifically credible management approach.

65. Temporal and spatial analysis of El Cachucho MPA effects

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The objective of this study was to assess the effects of the El Cachucho Marine Protected Area (MPA) on the biomass and diversity of commercial and non-commercial fish species in adjacent non-protected waters. Data from the DEMERSALES bottom trawl surveys, conducted annually over a 20-year period around the study site, were analysed to compare fish biomass and diversity before and after the MPA's implementation, as well as based on proximity to the reserve. Preliminary results indicate an increase in species diversity in waters closer to the MPA after its establishment, and an increase in the biomass of some fish species. These findings underscore the utility of MPAs as an effective fisheries management tool, promoting not only the conservation of marine biodiversity but also benefiting adjacent fishing grounds.

66. Guguy, a key marine area for a National Park proposal

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The western coast of Gran Canaria (Canary Islands, Spain) is considered as a keystone area of subtropical biodiversity in the Central Eastern Atlantic Ocean. The marine area includes habitats and species of conservation interest such as seagrass meadows of *Cymodocea nodosa*, marine turtles (*Caretta caretta* and *Chelonia mydas*), cetaceans (mainly *Tursiops truncatus*), black coral reefs and emblematic fish. Most of this area is already recognised as a Special Area of Conservation in the Natura 2000 Network (SAC ES7011005 “Sebadales de Güigüí”). We shall introduce its major biological features from planktonic to pelagic species and the socio-cultural environment associated with the official proposal of a novel Spanish National Park. The enactment of the Guguy National Park status will contribute to preserving its exceptional natural heritage and the provision of ecosystem services.

This new condition also supports the objectives of the Marine Biological Corridor along the Central Eastern Atlantic Ocean.

67. Depth Learning – Using Digital Twin of the Ocean resources to uncover ecological trends in a Swedish MPA

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In this study we describe benthic community structure, ecosystem functioning, and associated temporal trends at a rock wall in a Swedish MPA using 26 years of archived ROV-footage. With this information, we identify potential drivers behind observed trends and evaluate their implications for management strategies. Data was extracted with an object detection model trained under SUBSIM, part of the Digital Twin of the Ocean. Temporal trends were correlated to traits of lifestyle, size, and temperature preference. The model exhibited strong performance, with occurrence data bearing high resemblance to previously documented findings, displaying changes in community structure along the rock wall's depth gradient. Significant increases in abundance were found in half of the modeled taxa, however, taxa with low preferred temperatures were associated with declining abundances. These findings suggest that while the MPA's establishment in 2009 widely benefits the investigated community, it fails to protect species susceptible to global warming.

68. Zooplankton as the key to understanding Arctic change: ecological, biochemical, and ecotoxicological perspectives from seabird diet studies

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One of the most reliable yet overlooked approaches to assessing the health of Arctic ecosystems is the analysis of seabird diets. Our study analysed the diet of little auks (*Alle alle*) from key colonies in Svalbard and Greenland, focusing on zooplankton composition, carotenoid content, mercury, methylmercury, and stable isotopes. We found regional differences in carotenoids, with Svalbard birds primarily consuming astaxanthin in its basic form, while Greenland birds had a diet enriched with its monoesters and diesters. Total mercury and methylmercury levels were significantly higher in Greenland's zooplankton, linked to the higher presence of largest and older *Calanus* species which are more prone to mercury bioaccumulation. Stable isotope analysis and distinct carbon-to-nitrogen ratios confirmed differences in zooplankton from various regions. These results highlight the complex relationship between diet, contaminants, and the health of Arctic marine ecosystems, emphasizing the growing risk of pollution in regions increasingly affected by climate change.

69. Assessing coralligenous habitats in an Aegean MPA (Eastern Mediterranean)

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Coralligenous habitats in the Eastern Mediterranean exhibit distinct ecological characteristics that challenge the applicability of existing assessment indices developed for the Western Mediterranean. This study analysed the community structure, species richness, and biological diversity across multiple sites under varying levels of anthropogenic pressure at Ayvalık Islands Nature Park. Gorgonian-dominated and non-gorgonian communities differed significantly, with gorgonian-rich sites showing higher evenness and diversity. Anthropogenic pressure significantly influenced community composition, particularly in non-gorgonian sites, where increased pressure corresponded to higher turf algal cover and reduced coralline algae. Commonly used ecological indices, including COARSE, CBQI and ESCA, required modifications, such as adjusting species sensitivity weightings and redefining reference conditions based on diversity metrics and low anthropization scores. The findings highlight the need for a tailored index that accounts for the unique structural and functional traits of Eastern Mediterranean coralligenous habitats to improve conservation and management strategies.

70. Salt marsh restoration in the Venice Lagoon: barriers and enablers.

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The Venice Lagoon presents a decades long history of salt marsh restoration but a comprehensive critical analysis of the factors that determined their success, or lack thereof, is lacking.

We merge ecological monitoring with the results of a continuous dialogue with the stakeholders to compile a list of technical, social and economical barriers and enablers for ecological restoration of salt marshes in the Venice Lagoon. From our work emerged a complex network of priorities and trade-offs that need to be taken into account in a transdisciplinary perspective when planning the restoration of fragile and complex environments threatened by climate change and anthropic pressures. Our results are the foundation for a Multi Criteria Analysis which represents a useful tool to approach the future challenges for salt marsh restoration, among which the EU's Nature Restoration Law, through a participatory and evidence-based approach.

71. Social attributes are key to global marine fishers' vulnerability to climate change

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Marine ecosystems are being reshaped by climate change, triggering cascading impacts on fish populations and the fisheries that rely on them. Understanding both the exposure and adaptive capacity of fisheries under future climatic conditions is crucial for guiding sustainable management practices. In this study, we present a novel evaluation of fishers' vulnerability across 1,571 commercial species, offering a global, interlinked assessment of social-ecological vulnerability in fisheries facing climate change. Our analysis reveals that key social factors—such as the proportion of full-time employment in fisheries and indicators of adaptive capacity like fishers' flexibility and management effectiveness—can significantly bolster resilience in regions most affected by climate pressures. These findings emphasize the need for tailored interventions that address both the social and ecological dimensions underlying fisheries' vulnerability to climate change.

72. Prioritisation analysis for biodiversity conservation in the West Pacific

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The Convention on Biological Diversity Target 3 aims for at least 30 % of each marine habitat to be protected by 2030. How much biodiversity will be protected depends on where this 30 % is located. The West Pacific region, having the richest marine biodiversity on Earth, is especially important for nature conservation. Here, using multiple data-driven measures of the breadth biodiversity, from species to ecosystems from the sea surface to seabed, at a spatial resolution of 0.5◦ (~55 km latitude), we mapped the optimal "Representative Biodiversity Areas" (RBA) for West Pacific countries using decision support software. The measures included surface and near seabed Ecosystems, which were mapped by physical, biochemical and nutrient variables relevant to ecological functioning. Species richness, seagrass, kelp, mangrove, and shallow water coral reef biomes (biological habitats at a local scale) and seabed topographic variation (as rugosity) were also included as complementary measures to maximise representivity of biodiversity overall. The 30 % RBA generally covered 30 % of the Ecosystems, over 77 % of the Biomes of seagrass, kelp, mangrove, and shallow water corals, and 60 % of physical habitat heterogeneity (topography) and the most species rich areas. Because protecting only these four biomes was not sufficient to include all species, physical habitat heterogeneity and ecosystems should be included in conservation prioritisation because they extend offshore and to all depths. To cover the distributions of 80 % species in the region, at least 53 % of the total area should be under protection. Only 25 % of the RBA were in MPAs, and < 1 % in no-take MPAs. Three countries, Indonesia, Australia and New Zealand, occupied almost half (47 %) of the RBA, and 11 countries had more than 30 % of their Exclusive Economic Zones in the RBA. Opportunities exist to expand and merge existing MPA, increase levels of protection, and having MPA in areas of disputed or shared governance, including 5 % of RBA being in the study area's High Seas. Consideration of the geographically uneven distribution of biodiversity is thus necessary in achieving the 30 % by 2030 target. Systematic conservation planning, as shown here, can lead to at least twice as much biodiversity being protected per area. That at least half of the West Pacific Ocean in MPA may be necessary to protect all marine biodiversity, indicates how critical it is to use resources outside MPA in an ecologically sustainable way.

73. Systematic conservation planning of MPAs for a science-based MSP

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We have prepared Regionally standardised data layers have been used to design an ecologically coherent network of Marine Protected Areas (MPA) for all European seas (including Exclusive Economic Zones and Mediterranean and Baltic High Seas). The map layers are based on new species distribution models for 10,000 species with projected range shifts due to climate change.

While most species are projected to extend their northern- and contract their southern distribution ranges, they will remain present in almost their entire current range. Thus, the proposed MPA network will generally accommodate future distributions under different climate change scenarios. In addition, a new database of organic carbon concentrations in the seafloor, correlated with environmental data, enabled mapping carbon stores in the pan-European marine regions. Areas of high organic carbon content occurred in more wave sheltered and colder areas , such as in the Baltic, Black, Aegean, and Adriatic seas, and in coastal fjords of Scotland and Norway.

We will present these results and comparisons between species richness, IUCN Red List threatened species distributions, species threatened by climate change (if any), seabed habitats, carbon stores and potential MPA network for 10% (strict protection) and 30% of the area of European seas. The outcome will be a scientific foundation for deciding where MPAs would maximize the protection of marine biodiversity while also considering carbon stores across European seas.

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1. How “fit” is sardine in Adriatic?

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Sardine (*Sardina pilchardus*) is the most important small pelagic fish in the Croatian Adriatic, comprising over 69% of national landings, with annual catches of ~47,000 tonnes in the last decade. As a shared stock among Adriatic countries, its status is assessed within the GFCM area GSA 17 and 18. A 2024 benchmark indicated an increased risk of overexploitation and overfishing. From 2000 to 2023, over 30,000 sardine specimens, from DCF samples, were analysed in Croatian waters. A significant decline in mean total length was observed, from 15.19 cm (2006) to 12.65 cm (2021) suggesting a possible biological response to environmental stress, while Fulton’s condition increased from 0.71 (2006) to 0.82 (2023) and relative condition coefficient fluctuated between 0.97 and 1.07 showing the relative well-being of the species. Further research is needed to understand the relationship between biomass, length, and condition in order to improve stock assessment and conservation strategies.

2. Can oxygen supersaturation enhance thermal resilience in marine organisms?

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Coastal marine ecosystems are increasingly affected by global warming, with extreme temperature events like marine heatwaves threatening species' physiology, distribution, and survival. These impacts are often linked to elevated aerobic metabolic demands under thermal stress. However, coastal habitats host photosynthetic organisms that enhance oxygen availability, potentially mitigating these effects. This study investigated whether oxygen supersaturation, simulating high primary production, could improve thermal tolerance in marine fauna. Species from two phyla (Echinoderms and Cnidarians) were collected from macrophyte-rich sites in the Venice Lagoon during summer 2024. Individuals were exposed to a thermal ramp (1°C/30 min) under normoxic (~90% O_2) and supersaturated (~160% O_2) conditions. Results showed that oxygen supersaturation increased thermal tolerance, prolonging survival and reducing metabolic stress during heatwaves. No significant site-based differences emerged, highlighting the generality of this response. These findings provide new insights into how natural oxygen fluctuations may enhance organismal resilience to climate change.

3. Adaptive strategies of *Dictyota dichotoma* in volcanic acidic environments

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This study explores the eco-physiological and structural adaptations of *Dictyota dichotoma* in the site of Fuencaliente (Canary Islands) subjected to natural acidification, in order to assess ecological traits allowing this species to thrive in acidified environment. Replicated algal thalli were collected from three sites along a pH gradient: acidified, transitional pH, and normal pH (control) and analysed for photosynthetic efficiency, anatomical characteristics, pigment content, and antioxidant charge. Results showed no differences in photosynthetic efficiency across the sites, indicating that *D. dichotoma* maintains photosynthetic performance in acidified conditions. Thalli of acidic environments exhibited higher Total Dry Matter Content and carotenoids, while thalli sampled in transitional zones displayed lower Surface Thallus Area and chlorophyll content than control. The difference in morpho-functional traits among sites at diverse pH may likely indicate an adaptation of thalli in terms of resource utilization giving insights on species' resilience in a changing environment.

4. Environmental factors influencing bacterial growth in the Adriatic seawater lakes

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The influence of physico-chemical parameters on bacterial growth was studied in Malo (MJ) and Veliko Jezero (VJ), Mljet National Park (South Adriatic, Croatia), weekly from February to April 2019. Biofilm development of bacterial population was analyzed on Plexiglas and glass surfaces at two depths (bottom and near the surface). Temperature and salinity were measured using a CTD probe and seawater samples were collected for laboratory analysis of nitrates, nitrites, ammonia, phosphates, silicates, oxygen saturation, and chlorophyll concentration. Although significant differences were observed between the lakes—VJ generally exhibiting higher salinity and MJ showing elevated NO_3 and TIN concentrations—no significant difference in bacterial density was detected (MJ: 0.212 cells mL^{-1}; VJ: 0.225 cells mL^{-1}). Values of bacterial abundance and environmental parameters in lakes were low compared to other marine environments, indicating oligotrophic conditions. These findings contribute to understanding microbial dynamics in marine lakes and their relationship with environmental factors.

5. Interactions between micro- and macroorganisms in chemosynthetic marine ecosystems

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In chemosynthetic ecosystems (i.e., hydrothermal vents and cold seeps), microbes act as primary producers through chemosynthesis, habitat formers and symbionts. Such extreme environments host microbial mats (e.g., cotton-like and gelatinous morphologies) and mineralized habitats (microbial-precipitated mineral crusts), while microbial forests (filaments visible to the naked eye) are exclusive of hydrothermal vents, as outcrops (carbonate rocks) for cold seeps. We conducted a macroscopic, microscopic (epifluorescence, SEM, TEM), biochemical and molecular (microbiomes) analyses of different microbial habitats in chemosynthetic systems. We present novel information on the potential interaction between microbial habitats and their associated macrobial biodiversity. Our results indicate that microbial habitats can support biodiversity hotspots and a large number of undiscovered yet, endemic or rare taxa.

6. Mating pattern of kuruma prawn in the aquarium tank

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Kuruma prawn, *Penaeus japonicus*, is an important aquaculture species in Japan. Due to its nocturnal habits, the reproductive behavior of the prawn is not well understood, except that mating occurs after molting, when the females have a soft exoskeleton. This study conducted a rearing experiment to investigate the mating pattern of the prawn. The sequences of molting, growth and mating were recorded in 2-ton tanks. The behaviors of the prawns were recorded in a 0.5-ton tank every night with an infrared floodlight and an additional infrared light attached to the top of the tank. Females with copulation plugs were observed in both tanks. The male chased a female swimming in circles after her molting. The male maneuvered from below the female and copulated. Some females mated several times during the rearing period, whereas some other females did not mate at all regardless of the rearing density.

7. Trophic shift during ontogeny of the sea cucumber *Cucumaria frondosa* in northern Canada

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While adults of the commercial sea cucumber *Cucumaria frondosa* are known to be planktivorous suspension feeders, it has been proposed from laboratory studies that very early juveniles might rely more heavily on benthic deposit feeding. We assessed the diet composition and trophic position of *C. frondosa* across life stages in a wild Arctic population, from newly settled recruits measuring <2 mm until sexually mature adults measuring >100 mm in contracted length. The intestinal contents and stable isotope profiles displayed a shift between juveniles <2 mm and >5 mm, suggesting a possible change in diet with ontogeny. Coarse visual analysis of diet composition showed consistency across all sizes. At a finer scale, proportions of the different food items across size classes might highlight a gradual change in food preference. Values of δ15N and trophic levels did not show clear changes across life stages and body size based on preliminary analyses.

8. Is fish behaviour affected by wave height around fishing ports?

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Toward proposing a method for enhancing the “nursery function” of fishing ports, we examined the effect of wave height on fish behaviour around fishing ports and evaluated the “shelter function” of fishing ports under high waves. In the examinations, we conducted physical environment observations and wave field analyses, as well as interval photographic and biotelemetric surveys of fish. In the interval photos at the port mouth, the ratio of photos with fish to photos without fish decreased with increases in the significant wave height. In addition, for individual rockfish (*Sebastes schlegelii*) equipped with an ultrasonic transmitter, the transmission reception rate was higher inside the port and in the deep-water area outside the port than it was in the shallow-water area outside the port. These results indicate that fish behaviour is affected by wave height and that the calmness of a fishing port serves to protect fish against high waves.

9. The microbiome of the Polychaete L. conchilega in the Wadden Sea: Seasonal and spatial dynamics

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Lanice conchilega, a key bioengineering polychaete, plays a crucial role in structuring benthic communities and influencing ecosystem dynamics in the Wadden Sea. In this study, we characterize the bacterial community associated with *L. conchilega* and its surrounding sediment. Using 16S rRNA gene sequencing, microbial communities were analysed from individuals collected across different abiotic conditions, including intertidal/subtidal areas, tidal cycles, seasonality, and diurnal cycles. The results revealed a fluctuating, diverse microbiome, with key bacterial taxa associated with biogeochemical cycling and potentially forming essential symbiotic interactions. Notably, ASVs associated with the genus *Endozoicomonas* increased their relative abundance more than three-fold during summer, suggesting an adaptive role in environmental resilience. These findings highlight the complexity of the microbiome of these animals and serve as a base for future research aimed at unravelling the symbiotic interactions of marine invertebrates and their effect on the host´s adaptative capabilities.

10. Antarctic sponges and their prokaryotic symbionts (Terra Nova Bay, Ross Sea)

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Sponges (Phylum Porifera) play crucial roles in benthic community dynamics. The interest in Antarctic Porifera is increasing in a microbiological perspective, highlighting their extraordinary plasticity as hosts of diverse associated microorganisms. In this study, the sponge species *Haliclona dancoi*, *Haliclona scotti*, *Dendrilla antarctica*, *Mycale acerata*, and *Microxina sarai* were collected from the Terra Nova Bay (Ross Sea), along with sediment and water samples. Samples were targeted for the characterization of the prokaryotic communities by the 16S rRNA next generation sequencing. The structure of the sponge-associated prokaryotic communities, even if differing at order and genus levels among the analysed sponge species, was dominated by Proteobacteria (mostly Alpha- and Gammaproteobacteria) and Bacteroidota (with Archaea abundances that were negligible) and appeared in sharp contrast to communities occurring in the abiotic matrices. Our findings contribute to the still scarce knowledge on Antarctic sponges as underexplored hotspots of microbial diversity.

11. Antarctic sponge-associated bacteria with biotechnological potentialities

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A total of 133 bacteria were isolated from the sponge *Microxina sarai*, *Dendrilla antarctica*, *Mycale acerata*, *Lissodendoryx flabellata*, *Myxodoryx hanitschi*, *Myxilla elongata*, and *Isodictya erinacea* from Antarctica. Isolates were screened for the production of extracellular enzymes and the utilization of polychlorinated biphenyls, DDT and DDE as the sole carbon and energy source. Most promising isolates were affiliated to the Gammaproteobacteria and Actinomycetota, followed by Alphaproteobacteria and Bacillota. *Psychrobacter* and *Salinibacterium* prevailed among retrieved genera. Overall, the production of extracellular enzymes was in the order: esterases >gelatinase/lipases >agarose >protease >chitinase/keratinase. A number of bacterial strains were able to produce multiple enzymes among those tested. Growth in the presence of DDT and DDE was seldom observed. Finally, four bacterial isolates were able to grow in the presence of Aroclor 1242. Our observations contribute in shedding light on the diversity and biotechnological potentials of sponges-associated cultivable bacteria from cold habitats.

12. Identifying spatial patterns of egg nursery habitat for a demersal shark in the northwestern Mediterranean Sea: Conservation and management implications

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We aimed to identify the suitable habitat distribution of small-spotted catshark (*Scyliorhinus canicula*) egg nursery areas and assess their current protection extent in the Balearic Sea (northwestern Mediterranean Sea). Egg cases collected over 5 years (2018–2022) were used together with various environmental variables to model their habitat suitability using maximum entropy modelling. Sea bottom temperature was the most important variable explaining their habitat suitability, and eggs were

found attached to various species of habitat forming organisms. We found only 3.6% (381 km2) of their suitable habitat in the Balearic Sea to be currently covered by a no-take MPA network, even if it was not initially planned with elasmobranchs as conservation targets. However, the current MPA implementation is not sufficient for the conservation of small-spotted catshark egg nurseries and their associated benthic community. Mapping the distributions of these essential fish habitats has the potential to guide future conservation efforts.

13. Do adults *Sparus aurata* remain near the nursery grounds?

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Connectivity between juvenile and adult *Sparus aurata* populations between nearest nurseries and channel waters in the middle Adriatic were investigated. Juveniles were sampled during settlement seasons 2019-2021. Adults from the commercial fishery were collected in 2024, and fish with birth years during 2019-2021 were selected. Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) was used for otolith elemental analysis. Significant differences in elemental composition of juvenile region were found. Adults of S. *aurata* were re-assigned to the nurseries with moderate success (61%) using canonical Analysis of Principal coordinates (CAP). Higher discrimination rate was obtained for estuaries and coastal lagoons. Results suggest that adults in middle Adriatic channels outside coastal lagoons have come from nurseries closest to them with little transfer from other coastal nurseries. They confirm a link between juvenile and adult populations and importance of estuaries and coastal lagoons for sustainability of seabream populations.

14. Effect of nutrients and size on *Phyllorhiza punctata* locomotion

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This study aimed to evaluate the impact of food intake and size on the locomotion of the jellyfish *Phyllorhiza punctata*. Experiments were conducted over three weeks using two kreisel tanks, each containing five adult jellyfish. Jellyfish in Kreisel A were fed 7.17 nauplii/mL of *Artemia salina*, while those in Kreisel B received 0.72 nauplii/mL. After a two-day incubation period, the jellyfish were transferred to larger tanks, where their movements were recorded and analysed using ImageJ software. Statistical analysis revealed that while speed was not affected by feeding levels, it strongly correlated with jellyfish size, with larger individuals swimming significantly faster ($F(1,28) = 10.088$, $p = 0.0036$). These findings provide key insights into the relationship between jellyfish physiology and locomotion, with potential applications in aquaculture and conservation efforts. Extending the incubation period in future studies could yield further valuable data.

15. Biochemical Composition of kelp-fed green Sea Urchins from northern Norway

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Underwater kelp forests are highly productive and diverse coastal ecosystems. However, they have largely disappeared in northern Norway in the past 50 years because green sea urchins (*Strongylocentrotus droebachiensis*) have grazed on these seaweeds unhinderedly due to overfishing of their predators. For the restoration of kelp forests, it is important to know how the harvested sea urchins can be sustainably valorised. For this purpose, this study investigated the biochemical composition and

nutritional value of ranged green sea urchins that were solely fed on the kelp *Saccharina latissima* as feed source over 4 months. Biomass parameters, elemental analyses, protein and lipid contents along with amino acid and fatty acid profiles were determined from both entire animals and fractions (tests, gonads and intestinal tissue/coelomic fluid). This knowledge helps to understand the valorisation potential of harvested and ranged sea urchins to support the restoration of kelp forests in Norway.

16. Impact of Phlorotannins on the Stress Management in brown Macroalgae.

Sara Roosvall[1,2], Ralf Rautenberger[1]

[1]Norwegian Institute of Bioeconomy Research (NIBIO), Division of Food Production and Society, Ås, Norway. [2]Nord university, Bodø, NorwayBrown macroalgae provide significant services to coastal ecosystems but must acclimate to changing environmental conditions to survive in their habitats. There is insufficient information on the role of phlorotannins in their physiological stress management.

Stress experiments were conducted to understand the effects of high temperature and low salinity on the accumulation of phlorotannins in *Saccharina latissima*, *Fucus vesiculosus* and Ascophyllum nodosum from the Saltfjord and the Skjerstadfjord, North-Norway. Changes in phlorotannin contents were analysed.

Lower phlorotannins contents in *S. latissima* than the other species imply species-specific differences. Different phlorotannin contents of macroalgae between the Skjerstadfjord with generally low seawater temperatures and salinities in summer and the Saltfjord due to heat and hyposaline stress suggest that the physiological acclimation patterns are strongly controlled by the oceanographic conditions at the growth site. This study helps to understand how North-Norwegian brown macroalgae can cope with environmental stress in different habitats.

17. Resilience of biological feedback mechanisms and their impact on sediment dynamics

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Unique geomorphological and ecological processes shape the Wadden Sea, making it an important ecosystem for many organisms. To understand these processes, I investigate the interactions between biological organisms and sediment dynamics. Bivalve reefs, communities of blue mussels and oysters, alter the ecosystem's organisms, functions, and services. This project will combine observational and experimental data to quantify and analyze the effects these ecosystem-altering species have on both the abiotic and biotic components of the habitat. These effects will be assessed through field surveys and in situ manipulation experiments. Later, the scope of these positive feedbacks will be analysed, incorporating additional ecosystem interactions such as predation and inter- and intraspecific competition. Building on previous research, we aim to contribute by assessing the extent of feedback mechanisms under various scenarios, which could be applied to monitor and predict future changes in bivalve banks within the Wadden Sea.

18. Insights into growth pattern of *Pagellus bogaraveo:* otolith morphometry

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The relationship between otolith morphometry and fish growth patterns in blackspot seabream from the Adriatic Sea was examined. The length, width, thickness, and mass of the otoliths were measured and compared with total length. The length of the otoliths was measured along their longest axis. Relationships between fish age, total length, and otolith morphometrics were established using a linear

model. The sagittal otoliths of 230 specimens, ranging from 9.30 to 47.80 cm in total length, were elongated, oval, and had irregular edges. The linear regression parameters between fish total length and otolith length showed the highest coefficient of determination ($R^2 = 0.97$). The relationship between otolith dimensions and fish age indicated that the age of this species can be best estimated from otolith length ($R^2 = 0.865$). These findings have important implications and could be particularly valuable for stock assessment purposes.

19. Citizen science in studying cephalopod ecology in European waters

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European cephalopods are data-limited species with unknown population structure and unmanaged fisheries. Several international Cefas projects are aimed to direct efforts of citizen scientists to study reproductive ecology and life cycle parameters of squid and cuttlefish. Recreation divers, fishers, beach cleaners and beach walkers gathered information on the occurrence of egg masses and cuttlebones in situ, and respective reports in internet (e.g Facebook, Instagram). The partially published information permitted to delineate spawning grounds of two commercial squids around Europe (ICES Journal of Marine Science 79 and submitted), to reveal seasonal and spatial variability of cuttlefish spawning grounds, and climate impact on the life cycle (Fisheries Research 263 and Marine Ecology 45), to estimate natural mortality of cuttlefish in the different geographic areas (data under analysis). Citizen-science represents a perspective novel approach to study inshore cephalopod life cycles being important complementary source of information for professional scientific institutions.

20. Investigating climate change resilience in marine invertebrates: a multidisciplinary approach

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The Mediterranean Sea is warming two to three times faster than the global ocean, with increasing temperatures and acidification posing serious threats to marine biodiversity. Sessile and low-motility marine invertebrates, being highly susceptible to environmental fluctuations, depend on physiological adaptations and microbial symbionts for survival. This study investigates their responses to climate change through controlled experiments exposing a sponge (*Chondrilla nucula*) and a gastropod (*Hexaplex trunculus*) to combined temperature and pH stressors, simulating future ocean conditions. Using an integrative, multidisciplinary approach — including micro-computed tomography, metabolic rate analysis, transcriptomics, and NGS metabarcoding — the study examines morphological, physiological, and genetic responses, as well as shifts in microbial communities. By comparing geographically distinct populations from two latitudinal extremes of the Aegean Sea, it aims to identify intraspecific resilience patterns and adaptive mechanisms. The findings provide valuable insights into species adaptability, crucial for understanding ongoing shifts in a rapidly changing Mediterranean environment.

21. Tropicalisation and the Changing Landscape of Marine Species in Southwestern Europe

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The climate-driven range expansion of West African marine species into European waters, known as *African Creep*, has intensified in recent decades, contributing to the broader process of *tropicalisation*. This study provides evidence of an accelerated shift in fish and decapod crustaceans of the Gulf of Cadiz, which connects the Atlantic and the Mediterranean. Observations of previously unrecorded non-native

species include recent records of twenty fish species and decapod crustaceans, with a sharp rise in the last ten years. Their expansion appears to be driven by ocean warming over the past decade, coupled with anthropogenic factors such as habitat modification, increased maritime traffic that intensifies propagule pressure. These findings reinforce the importance of Long-Term Ecological Research diversity in the Gulf of Cadiz as a key area for monitoring tropicalisation and detecting early bioinvasion processes in the context of climate change.

22. Exploring the Impact of Thermal and Salinity Stress on *Posidonia oceanica*

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Shifts in salinity and temperature pose significant threats to seagrass ecosystems. This study aims to evaluate the vulnerability of *Posidonia oceanica* to these stressors. Plant samples were collected from the "Stagnone di Marsala" lagoon in western Sicily, an area with extreme salinity and temperature fluctuations. A mesocosm with six tanks hosted *P. oceanica* shoots from the outer and inner lagoon. The experiment followed a multifactorial design with two temperatures (20°C and 30°C) and three salinity levels (38, 42 and 48 PSU). Preliminary results from plants collected from the inner lagoon show changes in Fv/Fm and Y(II) under stress conditions (30°C, 42 and 48 PSU), indicating decreased photosynthetic efficiency. In addition, temperature intensified the effects of salinity on all parameters (i.e. Fv/Fm, Y(II), pigments and growth). These findings establish a basis for further investigation into the eco-physiology of *P. oceanica* under climate change.

23. Marine heatwaves drive biomass changes in western Mediterranean marine ecosystems

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Marine heatwaves (MHWs) are becoming more prevalent, yet most studies addressing their effects focus on specific surface events or single-species impacts. We aimed to address this gap through a holistic analysis of accumulated effects of MHWs between 1995-2022 on the Western Mediterranean ecosystem structure and functioning. We detected MHWs at multiple depths (surface, 150m, and bottom) using high-resolution sea temperature data and integrated them into a spatiotemporal food web model of the region. We found that since 2016 MHWs have extended deeper, potentially driving recent biomass changes. Results showed long-term biomass declines in higher trophic levels, especially in the southwestern area, while mid-trophic responses varied regionally. Phytoplankton showed little accumulated response, likely due to its rapid turnover, but short-term impacts on its biomass can be transferred to other groups through trophic amplification. These findings highlight the importance of considering depth and long-term MHW accumulation when assessing their ecological impacts.

24. Warming effects on an Elbe estuary microzooplankton community - a mesocosm experiment

Max Lambrecht, Diana Nicole Puerto Rueda, Sahed Ahmed Palash, Luisa Listmann, Henriette G. Horn, Arne Malzahn, Elisa Schaum, Nicole Aberle

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This study investigated the impact of warming on microzooplankton community dynamics from the Elbe estuary during summer. An indoor mesocosm experiment was conducted in July/August 2024 simulating three different temperature regimes (Δ+0°C, Δ+2°C, Δ+4°C) for four weeks. Along with regular microzooplankton sampling, weekly dilution experiments were conducted to analyze phytoplankton growth and micro- and mesozooplankton grazing rates. The results indicated significant reductions in microzooplankton biovolume and species diversity across all treatments with time, with less impact observed at Δ+0°C. The initially high grazing pressure decreased during the experiment and slightly recovered towards the end irrespective of temperature. Our findings suggest that interactions within the lower food web of the Elbe estuary are influenced not only by temperature but also other factors like biotic pressure and nutrient and oxygen availability. Understanding these processes is vital for predicting ecosystem responses to climate change and anthropogenic stressors.

25. Is thermophilic ichthyofauna a good medium-term indicator of climate change?

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Climate change is driving significant shifts in the distribution of numerous marine species. The Mediterranean Sea is among the regions most rapidly affected by rising temperatures. This study aims to assess the abundance of six native Mediterranean fish species in a Marine Protected Area in southeastern Spain (Western Mediterranean), identified in the literature as thermophilic indicators. Periodic censuses have been conducted over eight years at two sites within the Marine Reserve of Tabarca Island (Alicante). Additionally, water temperature has been recorded using permanent sensors. The number of days per year with extreme temperature values (>28°C) has increased. However, no significant changes have been observed in fish abundance. These findings suggest that the selected fish species may not be the most suitable for medium-term monitoring. A longer observation period or the selection of more temperature-sensitive species with a faster response, such as benthic species, may be necessary.

26. How climate change shapes *Ostreopsis* cf. *ovata* geographic distribution

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Harmful algal blooms (HABs) are expanding, threatening marine life, human health, and economic activities like aquaculture. In this study, we used ecological niche modelling to assess how climate change may affect the geographic distribution of the toxic microalga *Ostreopsis* cf. *ovata* under warming scenarios from ~2 to 4 °C. Our projections indicate an initial expansion of the area potentially occupied by this species at 2 °C warming. Geographic contraction to levels below current distribution starts in the tropics at 3 °C, with reductions in temperate waters only expected at scenarios ≥4 °C. Considering these spatial changes, our results do not indicate an increased risk for aquaculture sites where the target species may already occur. However, many currently "free" aquaculture sites will shortly become exposed to this harmful species. These findings highlight the need for marine spatial planning to address climate-driven shifts in HABs and implement effective mitigation strategies.

27. Effects of warming on summer phytoplankton dynamics in the Elbe estuary

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University of Hamburg, IMF-institute for marine ecosystems and fishery science, Hamburg, Germany

This study investigates the impact of warming on phytoplankton community dynamics in the Elbe estuary during summer. We set up an indoor mesocosm experiment to simulate different temperature scenarios using climate-controlled chambers in August 2024, collecting water from a tidal-influenced, freshwater stretch upstream of the port of Hamburg. Over four weeks, we analyzed pico-, nano-, and microphytoplankton communities through inverted microscopy, chlorophyll-α fluorometry, and flow cytometry. The results indicate a significant reduction in overall phytoplankton abundance and chlorophyll levels, with a notable increase in the picophytoplankton fraction towards the end of the experiment. The microphytoplankton community shifted from dominance of diatoms to large, chain-forming cyanobacteria. These findings highlight the complexities of phytoplankton responses to warming, suggesting that grazing pressure and abiotic factors such as nutrient availability play critical roles. Understanding these dynamics is vital for predicting ecosystem responses to climate change and developing strategies for environmental sustainability in estuaries.

28. Resilience of phytoplankton communities in the Central Adriatic: adaptations to global warming

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Numerous studies confirm the impact of global warming on the marine environment, including the impact on phytoplankton community. The aim of this study was to review the recent structure of the plankton community in the central Adriatic compared to 1970-80s when Kaštela Bay was subject to significant ecological fluctuations. We observed stability with a weakening of the fluctuations in the community in recent decades. The decline in chlorophyll-a content and phytoplankton abundances are consistent with other studies of global change, but some indicators of resilience are also evident. We found that the increase in sea surface temperature and solar radiation in summer had no negative impact on phytoplankton structure. Instead, species diversity increased throughout the community, particularly among dinoflagellates. Given the pronounced seasonality of dinoflagellates, especially in summer, we assume the higher number of dinoflagellate species compared to diatoms could be an adaptation to warmer conditions.

29. Cellular-level response of the nereid *Hediste diversicolor* to CO_2-induced seawater acidification at increased hydrostatic pressure

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Despite sub-seabed CO_2 storage is considered safe, experimental studies addressing the environmental impacts of leaks still support ecological risk assessment. This study investigated the cellular-level responses of the polychaete *Hediste diversicolor* to seawater acidification (pH 7.7, 7.0 and 6.3) in a range simulating pH reduction due to CO_2 leakage from the storage site in the Baltic Sea. Hypercapnia induced oxidative stress in cells including inhibition of GST and activation of CAT and GPx. The acidic environment did also cause damage to cellular membrane as indicated by an increase in the

concentration of MDA. In addition, pH 7.0 increased activity of AChE implying elevated contamination likely due to release of metals from sediments. Activation of defence processes in the nereids did not interfere, however, the energetic metabolism. Patterns of temporal variation revealed that after a 15–20-day initial response, antioxidant and detoxification systems recovered their capabilities to cope with acidification.

30. Insights into the evolution and survival of *Pinna nobilis*.

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Pinna nobilis, an endemic Mediterranean bivalve, has faced significant threats throughout its history, endangering its survival. This study, the first to integrate historical and modern genetic data of *Pinna nobilis* over several centuries, analysed 119 mitochondrial COI gene sequences from historical (1700-1990s) and modern (2000s) samples, including those from surviving populations. By standardising DNA extraction from ancient byssus gland samples, we reconstruct the evolutionary history of *Pinna nobilis* with unprecedented detail. Phylogenetic and phylogeographic analyses reveal two main sources of modern genetic variability: (i) lineages descending from ancestors around 2.5 million years ago, and (ii) a broader group deriving from Pleistocene adaptive radiation. The study highlights the species' resilience, likely supported by ancient genetic traits, and evidences the importance of maintaining a proper effective population size for the recruitment of resistant individuals with advantageous genetic characteristics. These findings provide crucial insights for the conservation and management of *Pinna nobilis.*

31. Streamlining restoration: optimizing strategies for recovering Cystoseira sensu lato

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Macroalgal forests dominated by *Cystoseira sensu lato* are undergoing severe range contractions due to anthropogenic and climate-induced stressors, emphasizing the need for effective restoration strategies. Assisted regeneration techniques offer sustainable solutions to mitigate biodiversity loss. This study aimed to refine *ex situ* recruitment methods by combining controlled-environment cultivation with suspended algaculture to improve scalability and cost-effectiveness. Specifically, we tested whether integrating a suspended algaculture stage prior to outplanting could reduce the resource-intensive mesocosm culture phase. Three experimental conditions, varying in laboratory culture and suspended aquaculture durations, were evaluated using growth metrics (e.g., percent cover and thallus length) and physiological health (e.g., photosynthetic efficiency). Results show that reducing the mesocosm phase from three to two weeks still yields satisfying outcomes and resilience in the field, whereas shortening the laboratory period to one week leads to poorer results. These findings help optimize protocols for large-scale macroalgal forest restoration.

32. Assessing changes in Marine Protected Areas along the Italian coasts

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Marine Protected Areas aim to protect biodiversity and ensure sustainable resource management. However, for most MPAs, quantitative evidence of seascape recovery remains rare. Here, more than 20 years after a previous study, the status of rocky benthic communities under fully protected and unprotected conditions was assessed through the Ecosystem-Based Quality Index in six Italian MPAs, each characterized by different socio-ecological settings. The relationship between human pressures and the ecological condition of rocky reefs in each MPA was also explored. After 20 years, few significant differences between fully protected and unprotected areas were found. Although local signs of regression in ecologically important habitats, such as macroalgal forests, were observed, indications of a general improvement in ecological status also emerged over time. This leads to a discussion about the need of adopting multiple response variables to elucidate the complexity of the effects of protection in the framework of long-term monitoring programs.

33. Restoring Mediterranean biodiversity: innovative 3D-printed substrates for reversing urchin barrens

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This pilot study, funded by the Italian Recovery and Resilience Plan (NRRP) within the framework of the "National Biodiversity Future Center" (NBFC), aims to test innovative technologies for restoring biodiversity in degraded Mediterranean marine environments. 3D-printed cement disks with varied size and geometry to mimic the natural complexity of rocky surfaces were placed in barren areas (3-5m depth) along the Ionian coast of the Gulf of Taranto, a region impacted by date mussel harvesting. The results show that the disks with higher structural complexity were more effective in limiting the predatory activity of *Paracentrotus lividus* and *Arbacia lixula*, promoting algal growth and the development of the sessile community. By monitoring the sea urchin grazing and algal recolonization it will be possible to evaluate the effectiveness of these interventions. This method shows promise for mitigating ecological degradation and could be applied to other Mediterranean regions suffering from biological desertification.

34. Exploring survival of *Austinogebia edulis* from the coast of Taiwan

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This study aims to explore the survival of mud shrimp *Austinogebia edulis* that has been protected in marine protected areas in the western coast of Taiwan since 2006, but no significant conservation effectiveness was observed. We observed burrow openings after hatching and applied models to estimate mortality and survival rates for larvae and juveniles. Moreover, we measured the body lengths of captured individuals to support the estimation of the mortality for adults based on

the length-converted catch curve and Bertalanffy growth model. Results showed that survival rates of *A. edulis* at larval, juvenile, and adult stages were 0.62 ± 0.08, 0.94 ± 0.01, and 0.80 ± 0.03, respectively, with the growth rate of 0.00156 ± 0.000562 day^{-1}. We incorporated experimental/filed data into mathematical models, providing a basis for future study to explore the population dynamics of *A. edulis* and their conservation effectiveness in the marine protect area in Taiwan.

35. Disappearance of the sea urchin *P.lividus* in the Mediterranean Sea

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The sea urchin *Paracentrotus lividus* is the most exploited echinoid in the Mediterranean Sea, with catches increasing significantly over the last two decades. This study presents: i) findings from two demographic monitoring campaigns conducted in summer 2023 in shallow coastal waters of Sicily and Apulia (Italy), and ii) a Mediterranean-wide meta-analysis of *P. lividus* density trends over the last 30 years. Recorded densities were extremely low, averaging 0.2 ind/m², also, a meta-regression analysis of 44 studies (1990-2020) confirmed a long-term population decline, which began in 2003, coinciding with a pan-European heatwave and anomalous Mediterranean warming. These findings highlight the urgent need for conservation strategies to address the continued decline of this ecologically and commercially important species.

36. Marine habitat restoration through coral-sponge ecological interactions

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The multispecies approach to habitat restoration is relatively widespread in terrestrial systems but scarcely explored in marine environments. This study is part of a restoration project in the Porto Cesareo MPA (Italy), where illegal date mussel harvesting caused extensive benthic damage and the formation of barren grounds. The aim is to enhance restoration success by transplanting fragments of species collected in neighbouring areas that co-occur under natural conditions, *Cladocora caespitosa* (Anthozoa) and *Aplysina aerophoba* (Porifera). Two hypotheses were tested: (1) mechanical damage from coral fragmentation does not negatively affect donor colonies; (2) transplanting coral fragments with the co-occurring sponge influences survival and growth of both. Results indicate that *C. caespitosa* donor colonies are resilient to mechanical fragmentation. Additionally, post-transplantation survival was 93% for sponge fragments and 74% for coral fragments. These findings provide insights into the potential benefits of integrating ecological interactions in restoration efforts, contributing to ecosystem recovery.

37. Angel Shark Conservation: New Records from the Adriatic Sea

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The angel shark (*Squatina squatina*) is a critically endangered species found in the eastern Atlantic Ocean and the Mediterranean Sea. Once abundant in the Adriatic Sea, particularly in the northern Adriatic, its population has drastically declined due to overfishing and habitat loss. As a result, conservation efforts have become crucial to protecting this species. These bottom-dwelling predators feed on various fish and invertebrates and can grow up to 1.5 meters in length. In 2024, eight new angel shark sightings were recorded in the central eastern Adriatic Sea through collaboration with local fishermen. A total of 19 specimens were observed, most of which were caught as bycatch and subsequently released alive. The presence of both adult and juvenile individuals suggests that this region may serve as one of the last remaining nursery areas for the species in the Mediterranean Sea.

38. Coralligenous Communities of Gökçeada (Aegean Sea/Eastern Mediterranean): Diversity and Threats

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We studied the coralligenous communities of Gökçeada Island, located in the northeastern Aegean Sea, using a non-destructive photo quadrat technique. Our findings revealed that the communities were primarily dominated by sponges and calcareous algae, with sponges being the most diverse group. The assemblages exhibited high structural complexity, providing important habitats for various marine species. Bryozoans were rare and typically small in size. Gorgonian colonies, primarily dominated by *Eunicella cavolini,* were found at only one site, suggesting a limited distribution. Additionally, we observed the invasive macroalga *Caulerpa cylindracea* colonizing some substrates, which could potentially disrupt the ecosystem. Fishing activities, common in the area, were identified as a potential threat to the delicate coralligenous communities. Our study highlights the importance of monitoring these ecosystems to assess the impacts of both natural and anthropogenic factors, underscoring the need for conservation efforts to protect these valuable habitats.

39. Stocking effectiveness investigation of sea trout from the Rega River (genetic approach).

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Sea trout (*Salmo trutta m. trutta*) is of significant economic importance for coastal fisheries and play a crucial role in tourism and recreation, especially angling, in Poland and the many European countries. The continued pressure on this species, leading to a decrease of sea trout resources, necessitates the intensive stocking activities on this species. The goal of this study is to control the effectiveness of this action. Popular in aquaculture practices parentage assignment methods are engaged to investigate the effectiveness of fish stock enhancement. Microsatellite-based genetic genotyping of sea trout spawners, participating in artificial spawning on the Rega River, and fish returning to the river in subsequent years combined with the use of FAP, COLONY and SOLOMON programs allows to assign family of origin to progeny and estimate the proportion of artificial breeding sea trout from spawning season. The results obtained from the research (2016 – 2021) will be presented.

40. Global conservation planning for climate-resilient marine protected areas

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Climate change threatens marine biodiversity, requiring conservation strategies that consider its impacts. With global goals to protect 30% of the ocean by 2030, marine protected areas (MPAs) must integrate climate resilience. We present a global prioritization framework to identify conservation areas that safeguard biodiversity while minimizing climate exposure. Using climate projections under three Shared Socioeconomic Pathways (SSP1-1.9, SSP3-7.0, SSP5-8.5), we assessed the exposure of 2,382 commercial and threatened marine species to environmental changes. Employing *prioritizR*, we identified conservation priorities balancing biodiversity representation and climate resilience. The resulting priority areas highlight regions critical for sustaining biodiversity and inform a global MPA network adaptive to future conditions. Our findings emphasize the need for proactive, climate-informed marine conservation to ensure long-term ecological and socio-economic benefits.

41. Fish Waste Valorization: Chitin Extraction Techniques from different marine sources

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The exponential increase in fish waste production poses pressing economic and environmental challenges, which require sustainable solutions from a circular economy perspective. This study focuses on the extraction of chitin and chitosan-valuable biopolymers by using different raw materials, including shrimp exoskeleton (*P. longirostris* and *A. foliacea*), squid gladii (*O. caroli*, *L. vulgaris*, *T. sagittatus*), mussel shell (*Mytilus galloprovincialis*) and fish scales (*C. cuculus* and *C. macrolepis*). Different extraction methods were applied after pre-treatment of specimens. The results obtained suggested shrimp waste as a most promising source, confirming its established potential. Additionally, cephalopod gladii were proved as an innovative and promising alternative, while mussel shells showed lower and suboptimal yields. Overall, the findings emphasize the critical role of efficient waste valorization in advancing sustainability within the fishing and aquaculture fields. Here we contribute to resource optimization, environmental stewardship, and to the development of industrial applications for chitin and chitosan.

42. Offshore windfarms eDNA metabarcoding reveals fish diversity for monitoring activities.

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Offshore wind farms are an excellent potential source of renewable energy, but can impact marine ecosystems during realization and operation activities. Comprehensive monitoring is essential to prevent and limit damage. Fish biodiversity investigation using environmental DNA (eDNA) is an innovative and promising approach. Water samples were collected from 15 stations located 80km west of Marsala at two different depths. Metabarcoding of 12S and 16S fragments and a multi-stage bioinformatic pipeline, were used to obtain sequences and process amplicon sequence variants. A total of 29 families (mainly affiliated with *Gobiidae* and *Serranidae*) and 49 genera were identified, among which 10

families and 23 genera some were not detected with classical census methods. This approach confirmed its effectiveness in assessing biodiversity. Integrated approaches combining eDNA metabarcoding and traditional fish census methods provide an important method to elucidate the ecological impacts of offshore wind farms.

43. Fish biodiversity assessment in seamount geothermal ecosystem through eDNA metabarcoding

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Environmental DNA (eDNA) offers a non-invasive method for ecological research, enabling species identification from environmental samples. This approach bypasses traditional methods of organism capture, proving valuable for monitoring endangered and invasive species and assessing ecosystem health. Furthermore, eDNA provides insights into population genetic diversity, which is crucial for understanding resilience and adaptability. This study employed eDNA metabarcoding to decipher the fish diversity in the Palinuro Seamount's geothermal ecosystem. Water samples from five locations were collected to investigate resident and possibly transient organisms. A multi-step bioinformatic pipeline, incorporating DADA2, LULU, and VSEARCH, was employed to process and curate amplicon sequence variants. In silico PCR, using databases like NCBI and MITOFISH, aided in target sequence identification. Analysis of 12S and 16S rRNA revealed diverse fish classes (mainly *Actinopterygii* and *Chondrichthyes*), including genera like *Serranus*, *Chromogobius*, and *Galeus*. Results confirmed eDNA's effectiveness in assessing biodiversity in peculiar environments, such as Mediterranean seamounts.

44. Genetic Characterization of the seagrass *Posidonia oceanica* at its Eastern Distribution Limit

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This study assessed the genetic traits of range-edge populations of the Mediterranean seagrass *Posidonia oceanica* at its easternmost distribution limit. Using sixteen microsatellite loci, we evaluated the genetic diversity, connectivity, and structure of five *P. oceanica* populations from diverse thermal regimes around Cyprus. To contextualise our results, we included sixteen previously described populations from Türkiye in the analyses. Our findings revealed a strong differentiation, low genetic and genotypic diversity, and low connectivity in the southern Cypriot populations, contrasting with the higher diversity and connectivity displayed by the northern Cypriot and Turkish populations. This contrast was potentially due to barriers to geneflow along southern Cyprus and different sexual reproductive outputs of the populations linked to their local thermal regimes. This study highlights the influence of genetic connectivity and balance between reproductive strategies over the genetic diversity of *P. oceanica*'s range-edge populations and provides relevant information for conservation and restoration initiatives.

45. Genetic variability of *Callinectes sapidus*: evidence of a species complex.

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The Atlantic blue crab, *Callinectes sapidus*, is an invasive species in the Mediterranean, threatening biodiversity and ecosystems. This study explores its distribution dynamics and evolutionary history through phylogeographic and phylogenetic analyses of 667 mitochondrial Cytochrome c Oxidase subunit I (COI) sequences. Of these, 36 were newly collected from under-investigated Mediterranean sites, while 631 were obtained from literature, representing global populations. Results identified two distinct but closely related genetic groups, potentially representing sister species and suggesting the existence of a species complex for *C. sapidus*: one predominantly found in South and Central America and the other in North America and the Mediterranean. Mediterranean populations exhibited general mitochondrial homogeneity, indicating a recent introduction, while Turkish populations showed early signs of differentiation, likely due to a longer-established presence in the region. These findings improve understanding of the species genetic variability, offering valuable insights into its taxonomic status and supporting management strategies.

46. Genetic investigations into the recent Mediterranean expansion of *Pinna rudis*

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Pinna rudis, the rough pen shell, is a close relative of the endangered Mediterranean *Pinna nobilis*. Despite its Atlanto-Mediterranean distribution, *P. rudis* remains less common in Mediterranean, mainly inhabiting the warm southwestern regions on rocky substrates. Following the mass mortality of its congener, *P. rudis* appears to be expanding into its vacant ecological niches. This study investigates the genetic variability of *P. rudis* in the Mediterranean through phylogeographic and phylogenetic analyses of the mitochondrial Cytochrome c Oxidase subunit I (COI) gene. Preliminary results evidenced that *P. nobilis* and *P. rudis* are sister species, likely originated in the Mediterranean and Atlantic, respectively, from a common Atlantic ancestor. *P. rudis* is progressively replacing *P. nobilis* in several habitats, with potential hybridization events occurring, where hybrids show increased resistance to pathogen-induced diseases. This is the first extensive study on *P. rudis* populations in Mediterranean, providing crucial insights into species conservation and management.

47. Integrating traditional and emerging methodologies with the eDNA-based approach for marine biodiversity assessment.

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This research aims to assess the marine biodiversity of coastal ecosystems by combining environmental DNA-based approaches with emerging technologies and traditional methods to identify their respective limitations and complementary uses. Seawater and sediment samples were collected in an area characterized by the presence of seagrass meadows along coast- to- open sea transects of the Adriatic coast (Gabicce Mare, Italy) and according to a putative anthropogenic impact gradient (due to beach establishments). Metabarcoding analyses coupled with microscopy-based analyses were employed to assess prokaryotic and eukaryotic biodiversity. Additionally, drone surveys and photo/video analyses were conducted to map the habitat at different spatial scales. The results of this study, carried out as part of the DiverSea project (Integrated Observation, Mapping, Monitoring and Prediction for Functional Biodiversity of Coastal Seas) will help broaden knowledge of biodiversity and provide a comprehensive approach to biodiversity assessment.

48. Genetic insights into Baltic Sea garfish (*Belone belone*)

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The garfish (*Belone belone*) is an increasingly important species in Baltic Sea recreational fisheries, yet its population structure and genetic diversity remain poorly understood. This study aims to address this gap by developing a microsatellite-based genetic analysis approach, which has not been previously applied to this species. By testing the cross-amplification of microsatellite loci from related Beloniformes, we aim to establish a reliable method for assessing genetic diversity in *B. belone.* Identifying polymorphic loci will provide a foundation for investigating population connectivity, genetic variability, and potential substructuring within the Baltic Sea. These insights will contribute to a more comprehensive understanding of the species' biology, supporting future research on its distribution, population dynamics, and ecological role. Additionally, the results will inform conservation and management strategies as the species gains prominence in the Baltic ecosystem and fisheries. Preliminary results are to be presented at the conference.

49. Investigating mesozooplankton diversity in the central Adriatic Sea using DNA metabarcoding

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Molecular-based approaches are becoming increasingly important in plankton biodiversity surveys, as they overcome the limitations of time-consuming morphological analyses. With the aim of assessing genetic diversity of the eastern central Adriatic coastal plankton, we investigated the mesozooplankton structure using DNA metabarcoding and morphological assessment. The extracted bulk DNA from net samples was analysed by high-throughput sequencing of the COI region. A total of 61 taxa were identified by metabarcoding compared to 68 taxa identified by microscopy. There were significant differences in species composition, with metabarcoding performing better in detecting meroplankton larvae (28 vs. 10 taxa) and hydrozoans (5 vs. 4 species), while morphotaxonomy performed better in detecting copepod species (34 vs. 22 species) and less abundant groups (e.g. appendicularians, thaliaceans, ostracods and chaetognaths). The results confirm the high sensitivity of DNA

metabarcoding for coastal plankton with highly diverse meroplankton component and its usefulness in the context of biodiversity monitoring.

50. Can barnacles replace copepods in the diet of cod larvae?

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Prey availability is critical for cod (*Gadus morhua*) larvae survival. While cod spawn consistently in spring, the abundance of their primary prey, *Calanus* nauplii (Copepoda), fluctuates with environmental conditions. A mismatch in timing between cod hatching and peak copepod abundance might therefore impact larval growth and survival. *Calanus* spp. overwinter in deep waters and ascent to surface layers in response to environmental cues. Barnacle nauplii are abundant in coastal waters during spring blooms and may serve as alternative prey. In this experiment we will compare cod larval growth, condition, and feeding preference by feeding them either only copepod or barnacle nauplii, or an even mix of both. We hypothesize that cod larvae will develop a preference for prey they were initially fed with and that barnacle nauplii represent a suitable prey. This study will improve our understanding of cod feeding ecology and their resilience to changes in prey availability.

51. Diversity of the Adriatic marine benthic diatoms with updated nomenclature

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The investigation of benthic diatom diversity in the Adriatic Sea, based on updated nomenclature from the past 35 years of research, identified 822 taxa (species, varieties, and forms) within 163 genera and 70 families. A total of 719 species belonged to the pennate diatoms. Species and genus names were validated with the most recent nomenclature using AlgaeBase (Guiry & Guiry, 2024) focusing on the current names of the cited taxa. The most abundant families were Naviculaceae (95 taxa) and Bacillariaceae (88). Dominant genera included *Mastogloia* (65), *Navicula* (62), and *Nitzschia* (53). Following the latest taxonomic sources, this checklist serves as a valuable reference for future research on diatom biodiversity in coastal ecosystems. Given the evolving systematics of diatoms, continuous taxonomic updates are essential. Despite decades of study, the composition and spatial distribution of benthic diatoms in the Adriatic Sea, influenced by varying chemical-physical parameters, remain only partially understood.

52. Diel prey distribution patterns shape predators shared strategies and niche divergence

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Diel prey distribution patterns drastically alter their availability to predators, but how that affects predator behaviours remain poorly understood due to limited data overlap. Using spatiotemporally concurrent tracking of sympatric seabird species and their fish prey, we reveal how diel prey distribution

patterns influence foraging behaviour. The seabirds invested greater effort during twilight, peaking at dusk, with 25-80% enhanced efficiency. Prey vertical migration increased shallow depth abundance at night with 20%, but number of aggregations showed diel asymmetry, peaking at 140° azimuth before decreasing with 25% in 20°. These dynamics created elevated foraging windows in late afternoons, with extended duration of high efficiency and effort (56–70% of dives). The deep-diving predator *Uria aalge* followed prey depth, while the comparatively flight-adapted *Alca torda* was more sensitive to prey depth and aggregations. We provide novel details of diel prey behaviour shaping predator foraging, demonstrating how morphological adaptations drive niche differentiation.

53. Variations in macro-epibenthic community structures around the sea cucumber *Cucumaria frondosa* in subtidal areas of Nunavut and Newfoundland

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Community structures are tightly entwined with habitat support services and ecosystem functioning. Echinoderms living on the seabed in locally high densities, like sea cucumbers, can modify the habitat and influence local biodiversity. Using underwater videos of subtidal areas of Nunavut and Newfoundland (northern and eastern Canada), communities occupied by the commercial sea cucumber *Cucumaria frondosa* were characterized. The effects of low vs high densities of *C. frondosa* on surrounding macro-epibenthic biodiversity were assessed, along with substratum use and feeding types of co-occurring epibenthic species. Findings showed a decrease in overall macro-biodiversity where high densities of *C. frondosa* (≥30 ind m^{-2}) create a canopy, and increased macro-biodiversity with diverse feeding types when *C. frondosa* occurs more sparsely (<5 ind m^{-2}). Studying these community assemblages contributes to a better understanding of inter-species interactions with *C. frondosa* and helps determine its impacts on benthic assemblages, including as a possible ecosystem engineer.

54. Mild changes in the phytoplankton community along Montenegrin coast

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During July 2023 and January 2024, researching of phytoplankton community and frequency of algal blooms were conducted at 18 positions at three depths (0m, 10m and bottom) in area of Boka Kotorska Bay and coastal part of the Montenegrin sea. The methodology used for biological sampling was according to MEST ISO 5667-9: 2020, and for the phytoplankton analysis according to the MEST EN 15204: 2014. The abundance of phytoplankton communities was in range for oligotrophic-mesotrophic area with dominant groups: diatoms, dinoflagellates, coccolithophores, silicoflagellates. The potentially toxic species from the genus *Pseudo-nitzschia* spp. were noticed with abundance up to 10^5 cells/l. From the toxic and potentially toxic species of dinoflagellates, it was reported genus *Dinophysis, Gonyaulax, Lingulodinium, Phalacroma, Prorocentrum*. The appearance of species that prefer areas rich in nutrients and the presence of harmful and toxic organisms indicate mild changes that must be continuously monitored.

55. Taxonomic sufficiency applied to coralligenous assemblages from two biogeographical regions

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Coralligenous habitat is considered a priority habitat at the European and regional levels due to its biodiversity importance. Previous studies have led to the assumption of the 1) biotic gradient hypothesis, which states that the coralligenous assemblage patterns are heterogeneously distributed across the Mediterranean ecoregions; and 2) the taxonomic sufficiency hypothesis, which indicates that different Mediterranean coralligenous assemblages can be effectively studied at higher taxonomic levels without significant loss of information. In this study, we test these two hypotheses by comparing coralligenous assemblages from a Mediterranean and North-Atlantic region in order to investigate the habitat heterogeneity and to evaluate the potential information loss when using different taxonomic categories. Preliminary results show significant differences between the coralligenous outcrops at the investigated regions even when information is reorganized at higher taxonomic levels. Although preliminary, these findings can support the use of Artificial Intelligence and Machine Learning approaches in monitoring coralligenous habitats.

56. Kelp Forests in Deep-Water Habitats at the Gorringe Bank

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The Gorringe Bank, an underwater mountain (~5000 m to ~30 m), was documented in 1875 and designated part of Natura 2000 in 2015. A 2024 expedition studied the distribution, abundance, and ecology of *Saccorhiza polyschides* and *Laminaria ochroleuca* at Gettysburg and Ormonde peaks. Using scientific diving and video analysis (SACFOR classification), kelp populations were assessed. *L. ochroleuca* dominated both peaks, with densities of 2,200–2,600 individuals per 2,000 m², while *S. polyschides* remained sparse (<150 individuals). Age analysis showed no individuals <2 years, suggesting recruitment deficits. Variability in *L. ochroleuca* abundance, especially at Ormonde, reflects hydrodynamic and abiotic factors such as temperature and currents. These findings highlight its ecological dominance and provide valuable insights into the structure, distribution, and resilience of deep-water kelp forests at the Gorringe Bank, contributing to future conservation and management strategies.

57. In- and epifauna communities of a potential CCS site in the German Bight

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In the DAM CDRmare project GEOSTOR we study the spatial and seasonal variability of in- and epifauna taxa numbers, abundance, biomass, diversity, as well as the distribution of communities at a potential submarine CO_2 storage site in the German Bight. Additionally, endangered and non-native species will be identified. Infauna was sampled at 24 stations using a 0.1 m² van Veen grab, while epifauna was collected with a 2 m beam-trawl at five transects in August and October 2024 with RV "Senckenberg". A total of 143 infauna taxa were recorded, mean abundance ranged from 920–2835 ind/m². Dominant species were *Abra nitid*a, *Nucula nitidosa*, *Echinocardium cordatum* and *Spiophanes*

bombyx. Epifauna sampling revealed in total 43 taxa/500 m², showing seasonal differences. Further data analyses including environmental parameters will be carried out. The findings provide baseline data for an integrative monitoring concept supporting CO_2 storage and nature conservation efforts.

58. The global copepod microbiome

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Copepods are the most ubiquitous and abundant zooplankton forms in the oceans. They inhabit nearly all aquatic environments, from coastal areas to deep sea, in both marine and freshwater systems. A key factor in their evolutionary success is their ability to develop unique and efficient solutions potentially supported by their associated microbiomes. In this study, we systematically reviewed all published research on microbiomes of copepods and conducted a meta-analysis of 16S rRNA gene sequences from different families of freshwater, transitional, and marine copepods published in various projects. Using metabarcoding, we explored the diversity and origin of the copepod microbiomes to highlight their ecological interactions and patterns across ecosystems worldwide.

59. Population dynamics of *Rhizostoma pulmo* in the Northern Ionian Sea

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This study aims to examine the population dynamics of the jellyfish *Rhizostoma pulmo* in the Northern Ionian Sea and explore the factors driving its bloom events. Monthly monitoring was carried out from June 2023 to December 2024 to record jellyfish abundance, bell size, the related environmental variables and plankton community composition. Preliminary findings suggest that the population of *R. pulmo* is well established in the area. During 2023, two strobilation events were recorded in June and August. Jellyfish survived the winter 2024 but showed a reduced growth rate. No jellyfish were observed during summer 2024, possibly due to changes in environmental conditions and shifts in plankton community composition and abundance. These results highlight the importance of gaining knowledge of jellyfish population dynamics and their effects on natural ecosystems. Continuous monitoring and further research are essential to better understand these organisms and to develop effective predictive ecosystem models.

60. Insights into the Lower Circalittoral rocky habitats of the Central Tyrrhenian Sea (southern Lazio)

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ISPRA carried out a characterization study off the southern coast of Lazio (Central Tyrrhenian Sea) to identify a marine site suitable for potential sediment dumping, between 100 and 200 m depth. The

study (2016–2017) included geophysical surveys and physical, chemical, and biological characterization of the seabed. Geophysical investigation highlighted several morphologically elevated structures and depressed features interpreted as pockmarks. A further survey was performed using a ROV to assess the presence of protected species. Results showed the predominance of species typical of VTC and VB biocenoses. Video surveys revealed three protected and vulnerable Anthozoa species: Callogorgia verticillata, Parantipathes larix, and Funiculina quadrangularis. Furthermore, Vulnerable Marine Ecosystem taxa indicators of "Coral garden" and “Sea pen fields” were observed. This paper focuses on the first occurrence of black corals, habitat-forming species of circalittoral and deep-sea habitats in the central Tyrrhenian Sea, representing a biodiversity hotspot to preserve.

61. Echoes from the past: hydroacoustic baseline for pelagic fish in the coastal Baltic

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Small pelagic fish such as herring are by far the largest base for the Baltic Sea's fish production but little information is available on their abundance in inshore coastal areas. By combining historical hydroacoustic data from various research projects (1985–2012) we aim to create a robust baseline for comparisons with more recent data (2021-2024). Differences and trends will be interpreted in light of environmental and anthropogenic stressors such as large-scale fishing. In spite of a remarkable development in the hydroacoustic technology (e.g., from single- to split-beam) and data-processing workflows (from HADAS to the modern software), preliminary results show that consistent standardized metrics can be obtained, which will allow for analyses of pelagic fish abundances over time span of half a century. To our knowledge, this is the longest hydroacoustic data set available from the coastal Baltic Sea, an area of critical importance for spawning herring.

62. Cyanobacterial blooms toxicity: enzymatic and behavioral responses in three-spined sticklebacks

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Cyanobacterial blooms are intensifying worldwide, increasing exposure of aquatic biota to toxins. We tested the physiological, biochemical, and behavioral impacts of bloom material dominated by either the toxic *Nodularia spumigena* or the non-toxic *Aphanizomenon sp.* on three-spined sticklebacks over a two week captivity experiment. Toxin accumulation, enzymatic activities (EROD, GSTs, GR and Catalase) and swimming performance (kinetics of escape response) were evaluated as endpoints. Results indicated that the toxic-dominated treatments induced significant increases in detoxification activities and reduced efficiency in fish escape responses, suggesting an energetic trade-off between detoxification and swimming performance. Additionally, EROD, commonly used to assess exposure to persistent organic contaminants, proved to be an effective biomarker of cyanobacterial toxicity. This could influence the results of biomonitoring programs conducted during bloom period. Our findings highlight how future increases in bloom intensity could hamper fish performance and underscore the need to refine biomonitoring methods for a changing environment.

63. Antarctic ice melting: implications for virus-host interactions and microbiome composition in seawater and ice

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This study aims to assess whether Antarctic ice melting in the Ross Sea could alter virus-host interactions and the microbial community composition in ice and seawater. To achieve these objectives, experiments were conducted to simulate the temperature increase of 2.5°C predicted for 2100 by the IPCC and the melting of ice into seawater. Viral and prokaryotic abundances, viral production and infection rates as well as the microbiome of seawater and ice, were analysed before and after ice melting. Results show that rising temperatures reduced viral production and infection rates, especially in ice and caused shifts in seawater and ice microbiomes. Since a part of the sympagic viruses remain infective in water after ice melting, this could affect planktonic microbial communities. Predicting the effects of global warming on biodiversity and functioning of polar ecosystems is crucial for identifying adaptive management plans and making informed decisions to mitigate these effects.

64. Reinvestigating museum zooplankton samples with digital imaging and AI-assisted tools: A 42-year study of two Norwegian arctic fjords

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Since 1983, biannual (February & October) zooplankton sampling in Saltfjord and Mistfjord (Nordland, Norway) has relied on manual identification of key taxa—a time-intensive process with limited quantitative output. Advances in AI-assisted tools and high-resolution digital imaging now enable the reanalysis of these historical samples, providing enhanced data on taxa composition, abundance, individual size, and biomass. This approach refines our understanding of long-term zooplankton dynamics in the Arctic amid accelerating climate change. As part of the European BioBoost+ project, museum samples were digitized using an Epson Pro scanner, processed with ZooProcess for object extraction, and analysed in EcoTaxa for annotation and measurement. This workflow facilitates collaborative AI training and dataset interoperability. By leveraging modern technologies, this study unlocks critical ecological insights from decades-old biological archives.

65. The Marine Biodiversity Database of Cyprus: how it can be used to fill in biodiversity gaps. An example from Pycnogonida

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The development of the "Marine Biodiversity Database of Cyprus" aims to gather all available marine biodiversity data of Cyprus in one easily accessible online database. Information regarding marine biodiversity of Cyprus is scattered and big information gaps exist, especially regarding some specific taxa. The database will be open-access for everyone and it will consider confirmed published and grey literature data. Beyond species classification, the database will contain additional information about the

recorded species including their ecology, origin, etc. An information gap example is Pycnogonida, with only two species recorded to date. Following biannual sampling at various sites in Cyprus, individuals of this group were identified at a species level, revealing at least four additional species belonging to genera *Achelia*, *Callipallene* and *Anoplodactylus*. In conclusion, these findings highlight the need for further research on lesser-known taxa in Cyprus, something that will be supported by the establishment of this database.

66. Interactions in epi- and infaunal bivalve-seagrass communities

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Seagrasses host diverse communities, but their interactions with co-existing bivalves and their impact on habitats are poorly understood. In a mesocosm experiment, we investigated the individual and combined effects of epifaunal (*Mytilus* spp.) and infaunal (*Macoma balthica*) bivalves on the performance of *Zostera marina* and their influence on porewater and water-column nutrients. Both bivalves increased nutrient availability, with *Mytilus* having a stronger effect. Overall, the two bivalve species had strongly antagonistic effects on the performance of *Zostera*, where in co-occurrence, the positive impacts from *Mytilus* (shoot number, growth rate, leaf length, nutrient availability) could mitigate the negative impacts from *Macoma,* despite the nutrient increase. This study examined the interactions of three ecosystem engineers and found that their performance depends on the presence and interactions with co-occurring species. The findings have implications for understanding ecosystem processes and potential changes and can guide seagrass habitat restoration.

67. Seasonal and spatial variation in the chemical composition of different arctic seaweeds

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Marine Seaweeds are becoming a more and more important natural resource. Not only is the chemical composition highly variable between different groups and species of macroalgae, but also regarding the location and season. We set out to characterise the chemical composition of 8 different seaweeds (*S. latissima*, *A. esculenta*, *A. nodosum*, *F. vesiculosus*, *P. palmata*, *Ulva* spp., *P. umbilicalis*, *V. lanosa*) from different habitats within the arctic circle in the province of Nordland (Norway) from March 2023 till March 2025. We measured mineral, fatty acid and amino acid content as well as AFDW, salinity and dissolved nutrients. Preliminary results show clear spatial and temporal differences both between species and within a species. This data will both be important to identify different ecotypes as well as for picking the right site and harvesting time for cultivating algae.

68. Has Gambierdiscus come to Western Mediterranean continental coasts to stay?

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The marine dinoflagellate *Gambierdiscus* R. Adachi & Y. Fukuyo produces toxins that cause Ciguatera poisoning, one of the most common non-bacterial foodborne illnesses worldwide. Widely distributed in

circumtropical zones, its presence on the continental coasts of the Western Mediterranean was first reported in March 2023 along the Dénia-Jávea littoral (Spain). This study investigates the spatio-temporal distribution and abundance of *Gambierdiscus australes* Chinain & M.A Faust (the only species detected) from then until October 2024, with quarterly sampling. Water samples (1:1 mix of surface and 5 m depth) were collected from 12 points across a 30 km^2 grid. Species identification was taxonomically performed. *G. australes* was present year-round with variable abundances, confirming its establishment in the area. These findings indicate its continued expansion in the Western Mediterranean and highlight a potential risk to human health, requiring a specific monitoring plan to assess its impact on public health and the fishing industry.

69. Pacific oyster's role in transferring microplastics into the food chain

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This study investigates whether the Pacific oyster (*Magallana gigas*), one of the most important species in aquaculture worldwide, acts as a vector for transferring microplastics to the trophic chain and the role of the presence of hydrocarbons adsorbed on them in this transfer. Assays were conducted in aquaria. The response of oysters following administration of diesel-contaminated and uncontaminated microplastics was assessed by quantifying ingestion rates, retention times and colour preferences. Oysters ingested 92% of the polyester fibres supplied without showing a statistically significant colour influence. Diesel contamination also did not affect their palatability, but microplastics with adsorbed diesel were retained significantly longer before being expelled with a maximum retention of 24h, while uncontaminated ones had a mean of 21 min. Thus, the temporal availability of microplastics to oyster predators would be related to the associated chemicals, further highlighting the ability of microplastics to act as carriers of other pollutants.

70. A long-term time series of microplastics: an investigation into ingestion of microplastics by the Antarctic cushion star *Odontaster validus*

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Long-term investigations into the proportion of plastic entering ecosystems are difficult because of the complex nature of interactions within populated coastal ecosystems. Samples of pyloric caeca of the Antarctic seastar *Odontaster validus* were collected next to Rothera Research Station, Adelaide Island (67.57, -68.12) over 23 years and processed to quantify microplastic loading. Microplastics were measured using UV microscopy and Laser Direct Infra-Red techniques. Peak plastic density (455.02 ±30.71 SD particles/g of tissue) was observed after a fire in 2001, whereas a decline in plastic levels coincided with new waste management strategies implemented in 2019. A relationship between plastic density and pyloric caeca weight ($f(2,294) = 17.82.8$, adjusted $r^2 = 0.11$, $p < 0.05$) suggests that plastic uptake changes based on physiological factors. Ecological factors also impacted these data, such as a relationship between plastic density and ice-scour ($f(2,238 = 2.58$, adjusted $r2 = 0.01$, $p < 0.05$).

71. Identifying a Suitable Digestion Protocol for Microplastic Extraction from Octocoral Tissues

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Monitoring microplastic pollution requires standardized methodologies. Data on microplastic occurrence in anthozoans is scarce and often rely on unvalidated protocols. This study aims to develop a newly validated digestion protocol for efficiently isolating microplastics in octocorals. Two existing protocols were adapted and evaluated for efficiency in digesting bamboo coral *Isidella elongata* tissues. The most efficient protocol involves NaClO and HCl, and its effects were assessed on polyethylene, polypropylene, and polystyrene particles down to 50µm. Validation tests provided the evaluation of recovery rate and alterations in size, morphology, and polymer composition. After digestion, 87.6% of particles were recovered, 77.2% of which preserved their integrity. Minor average size deviations were reported; discoloration, degradation and deformation were negligible, while fragmentation was common in polystyrene. FT-IR spectral analysis confirmed the preservation of polymers composition. Results suggest the proposed protocol as a reliable and replicable methodology for future microplastic investigations in octocorals.

72. Assessment of energy consumption and genotoxicity after exposure to TBT and microplastics in *Mytilus galloprovincialis*

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Microplastics are ubiquitous in the marine environment, and adsorption of TBT may exacerbate their combined effects on biota. We investigated whether MP is a possible vector for the transfer of TBT in *Mytilus galloprovincialis* by exposing mussels to MP (50 mg/L), TBT (0.001 mg/L), MP+TBT (0.02 mg TBT/g MP) in seawater for 21 days. TBT concentrations were higher in mussels exposed to MP+TBT. Significant DNA damage was observed in haemocytes after 7 and 14 days in the TBT and MP-TBT groups compared to control mussels without pollutants. No significant effect on ETS activity was observed during the experiment. Our results suggest that MP may be a vector for the transfer of TBT into mussels and enhance genotoxic effects. Adsorption of TBT to MP can enable remobilisation of TBT despite a high specific gravity and increased bioavailability via ingestion of adsorbed TBT on MP.

73. The Italian fouling community: port NIS peracarida with new records

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The aim of this work was to inquire into the variability and dynamism of peracarid fauna in the key sites of the Palermo and Trapani ports, both highly anthropised located in the central Mediterranean and facing two protected marine areas, Ustica Island and Aegadian Archipelago. We sampled the fouling communities growing on submerged ropes in 2024 and 2025 and identified 734 peracarids belonging to 15 different species. Of these species, 6 were NIS or cryptogenic species. New records of NIS from this work are *Laticorophium baconi* (Shoemaker, 1934) in both Trapani and Palermo and *Jassa slatteryi* Conlan, 1990 and *Caprella scaura* Templeton, 1836 in Trapani. The sampled sites showed an ample variety of peracarid species occupying the available trophic niches of a community characterized by NIS suspension-feeders.

74. Contemporary catch composition and abundance in Montenegrin small-scale fisheries

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Small-scale fisheries operating with passive gears represent the most common type of fishery in the Mediterranean Sea, including the Adriatic region. This study collected data on composition and abundance of both retained and discarded part of the catch originating from trammel nets and gillnets used in waters of Montenegro. A total of 72 samplings were carried out at landing places during the end of 2023 and the entire 2024. Vessels belonging to two different length classes were sampled (<6 m LoA and 6-12m LoA) at six different ports. A total of 72 different species were recorded in the catch, with vast majority belonging to fishes. Most commonly landed species were *Liza ramada*, *Mugil cephalus* and *Alosa fallax*, while the most commonly discarded species were *Diplodus annularis*, *Scyliorhinus canicula* and *Scorpaena porcus*. The ratio between the retained and discarded catch was 94.81% to 5.19% in the favour of retained.

75. Pollution Effects within a Multi-Stressor context: Implications for Smelt in the Elbe Estuary

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Estuaries present challenging habitats for aquatic life due to their inherent heterogeneity compounded by significant anthropogenic influences that push fish to their physiological limits. Smelt (Osmerus eperlanus), a key species in the Elbe estuary, has experienced a marked decline in recent decades, linked to various global and local stressors. While increased temperature, hypoxia, and dredging have been in focus, the potential impacts of pollution remain underexplored. This case study builds on a previously identified xenobiotic stress response to evaluate the effects of chronic micropollutant exposure on smelt within a multi-stressor context. Samples were collected from five stations along an estuarine gradient across three seasons, using tissue analysis, transcriptomics, and gill histopathology to investigate the extent and impact of pollutant exposure. We hypothesize that chronic micropollutant exposure may impair the resilience of estuarine fish to additional stressors, such as hypoxia and thermal stress, by triggering similar molecular stress responses.

76. Applying a novel video analysis approach for studying fish farm impact on deep-sea epibenthic species densities and diversity

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Sessile deep-sea benthic epifaunal communities, including vulnerable habitat forming species like corals and sponges, occur on varied coastal topography in the vicinity of Norwegian aquaculture. Aquaculture production in open cages release particulate organic waste (fish feces and uneaten food), producing an organic enrichment gradient in the water column that can accumulate on the seafloor, potentially affecting epibenthic communities. Non-invasive visual technologies like remotely operated vehicles (ROV) enable monitoring of aquaculture impacts on habitat forming epifaunal communities on flat soft seafloor as well as steep bedrock walls, previously difficult to survey. Applying a novel method to adjust for complex 3D seafloor topography, we used ROV videos to assess epifaunal density along gradients of organic waste dispersion. Changes in the diversity of the associated fauna and physical stress responses of habitat forming species were assessed. Results enhance knowledge of potential impacts of aquaculture on benthic epifaunal communities informing sustainable management policies.

77. Impact of wastewater diversion on nutrient concentration and phytoplankton dynamics in the Urdaibai Estuary (northern Spain)

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In the Urdaibai estuary (Bay of Biscay, northern Spain), sewerage works were carried out to divert wastewater outside the estuary, ending 50 years of discharges in its inner area. After this improvement, the concentration of nutrients of human origin (ammonium and phosphate) has significantly decreased, in some cases reaching concentrations 50 to 100 times lower. However, no significant changes in chlorophyll *a* concentration have been observed, except for a slight decrease at the outer stations. Likewise, the relative abundance of the different phytoplankton groups along the estuary has remained similar. It is possible that the resilience of the estuary has prevented more noticeable changes and a longer period may be required to observe shifts in the phytoplankton community.

78. Benthic habitat damage from Lithophaga lithophaga fishing: 30-year comparison

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This study assessed the ecological impact of illegal date mussel fishing *Lithophaga lithophaga* harvesting along the Apulian coastline, focusing on the distribution of damage, barren grounds formation, and the relationship with the population density of sea urchins. Between 2023-2024, 42 sites were surveyed, divided into six sectors, covering a total of 59196 m². The results showed an overall low impact from date mussel fishing, with an average Damage-Index of 0.07, indicating that recent damage is limited and localized. The Rock Desertification Index (RDI) identified several areas of barren grounds, particularly in the Ionian Sea, where higher sea urchin densities were recorded. Statistical analysis showed a strong correlation between sea urchin presence and barren grounds, with larger individuals of *P.lividus* stabilizing these areas and smaller ones linked to recent damage. This study highlights the need for continued monitoring and protection to preserve Mediterranean coastal biodiversity and supports future restoration efforts.

79. Modeling the invasive lifecycle and economic management of *Rugulopteryx okamurae*

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The rapid spread of *Rugulopteryx okamurae* in the Mediterranean has raised ecological and economic concerns, particularly for coastal environments and local economies. This study focuses on replicating the complete lifecycle of *R. okamurae*, integrating its reproductive strategies, growth dynamics, and environmental adaptability. We assess potential control measures and long-term management scenarios. Additionally, we developed an economic model to quantify the financial burden of beach clean-ups on local administrations. Results will highlight the effectiveness of intervention in the species' lifecycle where management efforts could be most effective. Furthermore, the economic component analysis the valorization of the algae, as a counter measure to the escalating clean-up costs. The combination of

biological replication and economic modeling provides a comprehensive tool for policymakers, offering insights into cost-effective and ecologically sustainable strategies to mitigate the impacts of this invasive species.

80. Do fish really use artificial reef?

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Artificial reef is known to be important for sustainable fisheries as it provides habitat for various marine organisms. Unlike the coastal area, it is difficult to observe the fish assemblages on artificial reef in offshore. Therefore, to evaluate the efficiency of artificial reef, we used fish finder to detect the fish (Okhotsk Atka mackerel) in the offshore of Rishiri Island, Hokkaido, Northern Japan. From one month observation, 2.4 times more fish were detected near the artificial reef than the control site which is 2 km apart from artificial reef. Also, fish those were caught near the artificial reef showed higher body mass index compared to the fish from control site. Our finding showed that the artificial reef might have the effect for fish assemblage and fish finder could be an effective monitoring method for fish behaviour in offshore.

81. Mapping multispecies Essential Fish Habitats in the central Mediterranean Sea

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Essential Fish Habitats (EFH) of four commercially important demersal species - *Merluccius merluccius*, *Mullus barbatus*, *Aristaeomorfa foliacea*, and *Parapenaeus longirostris* - were modeled and mapped in the Strait of Sicily (GSA16) and the Southern and Central Tyrrhenian Sea (GSA10) using data from the MEDITS survey. EFH identification was based on the spatial distribution of abundance of key life stages, specifically recruits and spawners. Universal Kriging, with depth as a significant covariate, was applied to interpolate species distribution by life stage, while Hotspot analysis using Getis-Ord Gi statistics was employed to identify annual EFH areas. Additionally, a Persistence Index (PI) was calculated to evaluate EFH temporal stability, identifying the most persistent areas ($PI \geq 0.8$) as critical for species conservation and sustainable fisheries management. Finally, spatial overlap of hotspots across species highlighted key regions in the GSA16 and GSA10 that are vital for the life stages of multiple species.

82. Identification of essential fish habitats in Latvian marine waters

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Fish species have evolved different habitat requirements for reproduction and juvenile development. Specific environmental conditions form the species niche, and it is crucial to identify such areas when considering species conservation. The aim of the study was to identify essential fish habitats (EFH) in the Latvian waters of the Baltic Sea. Information on the environmental preferences of commercially important and endangered species was collected and related to available habitat data to create data layers with the spatial distribution of species-specific EFH. Population trend analyses were conducted for selected species, and information on species-specific reproductive traits was collected. Based on this information, species-specific EFH layers were cross-validated and combined into one geospatial data layer that broadly represents EFH and can be further used for marine spatial planning and zoning of MPAs in Latvian waters.

83. Mapping and genetic variability of *Gongolaria barbata* and *Fucus virsoides* forests in the Venice lagoon

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Gongolaria barbata and *Fucus virsoides* represent key species in Venice Lagoon. *Gongolaria barbata* is one of the most widespread species belonging to the *Cystoseira* sensu lato group in Mediterranean, but nevertheless subject to serious regression events. *Fucus virsoides* is an endemic species of the Adriatic Sea and is considered a glacial relict, with a restricted distribution between the Gulf of Trieste and the coasts of Montenegro. The aim of this research was to characterize the genetic variability of these species and to identify possible populations that could be useful as best source for future restoration actions. After first monitoring of distribution of these algal species and collection of specimens from different sites of Venice lagoon, preliminary genetic analysis was conducted by amplifying a fragment of 630 base pairs of mitochondrial gene of cytochrome oxidase subunit one (COI). Preliminary results show the presence of only one haplotype for each species.

84. Predicting habitat suitability of sensitive fish species in the Northeast Atlantic

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Our objectives were to use joint species distribution modelling (jSDM) to predict habitat suitability of biologically sensitive fish species in the Northeast Atlantic, using fisheries observation, scientific survey, and environmental data. Using the R package Hmsc, we employed jSDMs to predict habitat suitability for data-poor and sensitive fish species. By leveraging species co-occurrence, we incorporated knowledge from more abundant species, creating more robust and realistic predictions for suitable habitats of data-poor species. These predictions will help to improve the understanding of the local variability of sensitive and data-poor fish species and provide support for the expansion and advancement of management approaches that benefit particularly vulnerable species in addition to overall marine biodiversity.

85. Exploring Mesophotic Marine Communities in the Sea of Marmara

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Mesophotic communities in the Sea of Marmara represent a unique assemblage of marine organisms inhabiting depths between 20 and 150 meters, where light penetration is rapidly limited by mesotrophic-eutrophic surface waters. This semi-enclosed sea, characterized by strong hydrodynamic processes, a sharp halocline, and distinct water masses of Mediterranean and Black Sea origin, provides a complex setting for mesophotic ecosystems. Despite its transitional nature, the Marmara Sea harbors diverse mesophotic Marine Animal Forests, including sponge aggregations, octocoral assemblages, and oyster beds. However, increasing anthropogenic pressures, including sedimentation, episodic mucilage events, pollution, coastal development, and seawater warming, threaten the stability and resilience of these habitats. Research on Marmara's mesophotic ecosystems remains limited, necessitating further investigations to assess biodiversity, connectivity, and ecosystem functioning. Understanding these understudied communities is essential for conservation planning and mitigating human impacts in this ecologically and biogeographically significant marine system.

86. Distribution of worm *Eunice roussaei* along eastern Adriatic coast (Croatia)

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The large worm *Eunice roussaei* Quatrefages, 1866 (Annelida: Polychaeta: Errantia: Eunicidae) is a commercially important species in Croatian fisheries, traditionally used as bait for catching high quality fish. In this study, its distribution, abundance and ecological preferences are investigated. In 2023, surveys were conducted by diving at 28 sites on the east coast of the Adriatic Sea. Observation data were also collected from marine users in Croatia, as the species is easily recognisable in the field and suitable for using citizen science approach. The map is created with locations where *Eunice roussaei* has been observed. The species prefers rocky-sandy bottoms with or without algae cover. The highest abundance was found at sites in the central Adriatic, while it was almost absent at sites in the southern part. The results obtained improve the knowledge of its distribution and ecology and help in management of its future use on Croatian coast.

87. Brown algae *Stypopodium schimperi* – the ultimate invader!

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Stypopodium schimperi (Kützing) Verlaque & Boudouresque is a Lessepsian species, first recorded in the Adriatic in 2020. Within three years, its population exploded from a few thalli to nearly 100% coverage of the rocky seabed at depths of 5–25 m, significantly altering the infralittoral community. By 2025, it had spread across the entire islands of Vis and Biševo, becoming the most invasive species on the eastern Adriatic coast. Its fast expansion suggests a high dispersal capacity, indicating further spread throughout the Adriatic. Recent analyses confirm that *S. schimperi* undoubtedly originates from the Red Sea. Notably, it is the only recorded Lessepsian alga in the Adriatic and represents the northernmost distribution among all invasive Lessepsian species. Its ecological impact and spread dynamics resemble those of *Caulerpa taxifolia* (M.Vahl) C.Agardh. Will it follow the boom-bust cycle of the 'killer alga', or are we facing an impending biodiversity collapse in the Adriatic?

88. Using citizen science to collect elasmobranch observations in Montenegro

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Elasmobranchs represent one of the most threatened vertebrate groups globally, with about one third of the species threatened with extinction. The current low abundance of many species in heavily exploited regions such as the Adriatic Sea necessitates the use of other monitoring methods apart from standard fishery monitoring. Since 2016, a total of 1834 elasmobranch individuals were recorded using citizen science in Montenegro. These contributions include observations derived from the active participation of local community, as well as those obtained from surveying social networks and other internet sources. The obtained dataset includes observations of 28 elasmobranch species, of which many are considered threatened. Citizen science proved as a valuable tool for monitoring elasmobranch diversity at the local level, particularly in cases of species that are considered rare. Moreover, its cost-effectiveness plays a key role in maintaining continuous monitoring in developing countries such as Montenegro.

89. A low-cost custom-built hydrophone toolkit for underwater recordings

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Coastal ecosystems and their biodiversity face rapid changes and degradation due to anthropogenic stressors, necessitating monitoring biodiversity and ecosystem functions at various spatial and temporal scales. Given the complexity and cost of such efforts, the NEMO-Tools project develops low-cost, user-friendly tools for marine biodiversity observation. To this end, this study reports on the construction of affordable, custom-built hydrophones designed for widespread use by the scientific community and citizen scientists. Using off-the-shelf components such as piezoelectric elements, consumer-grade audio cables, and PVC housings, these devices are designed for obtaining underwater recordings when coupled to general-purpose cell phones or hand-held WAV recorders. The construction process, materials, and end products are reported herein, alongside comparative results from concurrent recordings with scientific hydrophones. While these budget-friendly hydrophones cannot match professional models in specifications and data quality, they offer valuable opportunities for citizen science applications, research, and education.

90. Insights from a long-term seagrass monitoring project in Abu Dhabi's coastline

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Within the Arabian Gulf, Abu Dhabi's waters are home to three tropical seagrass species, *Halodule uninervis*, *Halophila ovalis* and *Halophila stipulacea*, which accounts for approx. 4% of the world's seagrasses. However, seagrass research in the region is still in its infancy, especially when it comes to seagrass long-term monitoring. We set up a long-term monitoring project on 4 different sites along the Abu Dhabi's coastline which represent different environmental conditions and conducted bi-monthly surveys on meadow dynamics from the beginning of 2025. Preliminary results from some first field expeditions provided pioneer understandings of seagrass meadow characteristics (seagrass coverages, biomasses and photo-physiology) and revealed a complexity in the meadow dynamics among different species of the same location and different populations of the same species. Our continued study provides a crucial database on seagrasses that is beneficial for on-going and future seagrass research and restoration activities in the Arabian Gulf region.

91. Environmental effects on viral infections in natural strains of *Ostreococcus*

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Marine viruses are a major driver of phytoplankton mortality and influence biogeochemical cycles. Observational studies based on "omic-approaches" form the basis for finding potential host-virus interactions. However, wet-lab based experimental investigations of host-virus dynamics on a broad spatial, temporal and environmental scale are still scarce. We studied the effects of phosphate limitation and salinity on virus infections in the picoplankton species complex of *Ostreococcus* from several regions of the Western Baltic and the Mediterranean Sea. We used culture experiments followed by plaque based infection assays on more than 50 hosts and 120 viruses. Salinity only had minor effects on the infection dynamics, whereas nutrient limitations affected mainly the infection intensities with a dependence on the region of origin of hosts and viruses. We conclude that understanding the variability of infection responses in this globally distributed picoplankton species will allow for a better prediction of persistence in rapidly changing environments.

92. Evaluation of the genetic variability of *Callinectes sapidus reovirus 1*

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Callinectes sapidus reovirus 1 (CsRV1) is a pathogenic virus with a segmented double-stranded RNA genome, characterized by high mutation rates, short periods of generation, and segments recombination and reassortment. Since CsRV1 is causing fluctuations in the distribution of the blue crab, we present a phylodynamic reconstruction based on a genomic approach using genomes and segments from the NCBI virus database. Molecular dating based on the whole genome suggests a temporal origin around 40 years ago, followed by an increase in genetic variability and an expansion of the viral population around 10 years ago. Estimated evolutionary rates for the 12 segments are similar, indicating that no segments are more subject to selective pressure. Continuous monitoring of CsRV1 in regions with the presence of *Callinectes sapidus* and, in general, genetic monitoring of segmented viruses is crucial due to the risk of genetic reassortment and, consequently, the creation of more dangerous variants.

93. The Mediterranean Blue Crab Project: Biodiversity conservation strategies.

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The Mediterranean Island of Sardinia has launched a regional project to capture and quantify the blue crab, *Callinectes sapidus* Rathbun, 1896, in each lagoon under state concession. Crabs are actively captured using traps to collect key biometric data, extract stomach contents for environmental DNA (eDNA) analysis and detect the presence of *C. sapidus* reovirus (CSRV1). The study will investigate the ecology and biology of the blue crab, focusing on population structure, reproductive period, and size at maturity. Additionally, eDNA analysis will provide crucial insights into the crab's dietary preferences. *C. sapidus* reovirus will help infer future demographic fluctuations in Sardinian populations. Furthermore, a predictive model will be developed to integrate all available biotic and abiotic data in order to forecast fluctuations in species abundance over time. This pilot study in the Mediterranean region could provide key insights for blue crab management across the entire Basin.

94. Recruitment-based restoration in deep-sea habitats: timing, ecological succession and drivers

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The present study aims to provide a baseline understanding of the timing, ecological succession and environmental drivers defining the colonization of artificial structures for deep-sea ecosystem restoration. The deployment of artificial substrates is increasingly used to support deep-sea restoration; however, its efficacy is contingent on the poorly understood process of larval recruitment. Artificial Structures for Deep-sea Species Recruitment and Ecosystem Restoration, supporting Autonomous Reef Monitoring Structures (ARMS), are tested in the Dohrn Canyon (Tyrrhenian Sea) and compared with 3D-printed Eco-reefs. All structures are monitored with Remote Operated Vehicles, while ARMS retrieval enables data collection through HD image analysis, electron microscopy, and DNA

metabarcoding. This integrated methodology enables comprehensive characterization of the eukaryotic and prokaryotic components of the community, thereby providing a framework for evaluating and optimising species recruitment. This approach will refine the implementation of recruitment-based solutions, with the overarching goal of sustainable and effective restoration of deep-sea habitats.

95. New technologies for the research of elasmobranchs in southeastern Spain

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In order to address the lack and inconsistency of data on the biology and population status of elasmobranchs in southeastern Spain, this project uses machine learning tools to analyse imagery, assess fishing pressure in ISRAs and conduct outreach activities to improve public perception of these species. The project will propose methods for automatically classifying species of elasmobranchs in images using DNN. These methodologies tend to be data-hungry, which is a drawback given their scarcity. Novel methodologies based on large language models (LLMs) and multimodal systems, combining images and textual descriptions of elasmobranchs, will be used to improve recognition capabilities. Finally, this research aims to improve knowledge of the conservation status of elasmobranchs in the study region to support management strategies and raise awareness of their ecological importance.

96. Bringing science and citizenship together: an advisory experience

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Scientific advice on marine species is essential for both administrations and citizens for several key reasons; appropriate advice allows for the dissemination of accurate information on the status of species, promotes sustainable practices and raises awareness about the importance of the oceans. Within the CIMAR project, five advice channels have been established to facilitate enquiries. A total of 40 valid advice interactions were recorded, showing that the predominant channel was WhatsApp, mainly used by members of public administrations. The most common requests were for species identification and ecological information, focusing on bony fishes, crustaceans and molluscs. The accessibility, accuracy and rapid response time make this consultation service a key tool, highly valuable both for scientific consultation and for the general public. In conclusion, scientific advice is an essential tool for administrations and citizens, enabling responsible management of the oceans, protecting biodiversity and promoting sustainable development.

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