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BOOK OF ABSTRACTS

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Olivier Thebaud (IFREMER)

Plenary Speaker:
Jason Link (National Marine Fisheries Service (NMFS), NOAA, USA)

The transition to Ecosystem Based Management necessitates a suite of socio-ecological models and approaches to explore uncertainty around transition periods and trade-offs across all social and ecological objectives. However, there is still much to be learned in developing these interdisciplinary models. This session explores best practices in socio-ecological modelling from approaches spanning agent-based modelling, scenario development and analysis, integrated ecosystem assessments, and broader qualitative and quantitative modelling techniques. Particular focus will be placed on context-appropriate methods of integrating social objectives and knowledge systems (including economics), governance processes, system uncertainty, and behavioral heterogeneity into coupled models. The role of each approach, or alternately a suite of techniques, in developing management advice will be explored.

The session will look to answer questions including:

- What are the recent advances and key challenges in assessing deep uncertainty for ocean and coastal systems through approaches such as scenario development?
- How have social indicators been integrated into the management process given the spatial and temporal scale challenges of social data?
- How can approaches such as agent-based modelling, which account for individual heterogeneity but are likely to be capacity-constrained, be effectively used in assessing multi-sector trade-offs?
- How can governance processes best be incorporated in models of marine socio-ecological systems?
- What roles can qualitative and quantitative modelling play in generating management advice, and what are best practices with respect to communicating their combined outputs to stakeholders and managers?
- Given the importance of stakeholder participation and knowledge in fostering trust in management, what are best practices in engaging these individuals formally in modelling endeavors?

S01-17611-Plenary-Link

A brief overview of modeling to operationalize ecosystem-based management of marine socio-ecological systems

Jason S. **Link**

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There is a widely recognized need for marine ecosystem-based management (EBM) in marine socio-ecological systems (SES). Key to making EBM operational is the judicious use of modeling, and then placing those model outputs, results, and efforts in the appropriate scoping, engagement, management and decision-making processes, frameworks, and contexts. Importantly, any such modeling is increasingly recognized as needing to be integrated— either as modules within a model, coupled models, or entire modeling systems— across disciplines and imperatively inclusive of human dimensions. These tenets are widely accepted, but are not universally applied. So, what are the main impediments to these tenets, and how do make modeling for EBM of SES more routinely used, i.e. more operational? Beyond the usual 5-10 key criteria to make these models more widely acceptable, I submit that an ongoing, dynamic model taxonomy needs to be maintained and that the classes of models need to be mapped to particular and salient applications. I conclude by proposing a synthesis of global best practices for modeling SES to implement EBM more operationally. Doing so will help us better explore scenarios and options, understand cumulative and compound SES responses, address tradeoffs, predict future conditions, and evaluate and mitigate risks for marine SES.

S01-17432-Oral-Letschert (ECOP)

Potential effects of spatial fishing restrictions and co-location opportunities on North Sea fisheries

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The North Sea is a global hotspot for anthropogenic uses and offers great potential for the expansion of offshore wind farms (OWF). Alongside the implementation of marine conservation areas, newly constructed OWFs will progressively reduce the available space for fisheries. For smallscale fishing businesses, this constitutes a stress factor additionally to existing pressing issues such as rising fuel costs, the ban of fuel-efficient electric pulse gear, and competition of international fishing industries. We created scenarios up to 2040 comprising OWF and conservation no-take zone distributions in the southern North Sea and combined these with the potential use of passive fishing gear in OWFs. The latter involves several potential management rules for co-location of fisheries and offshore wind energy, as well as suitable fishing areas for passive gear overlapping with OWFs. To assess the effect of these scenarios, we employ an agent-based model to simulate the German southern North Sea fisheries. Primary results indicate a strong condensation of future fishing effort in the remaining fishable areas and the partial switching of demersal fish trawlers to shrimp trawlers. Analyses on the effect of potential co-location strategies are work in progress. Currently, many North Sea riparian states are drafting policies to regulate co-location between fisheries and OWFs with large inconsistencies between the different plans. This adds to the existing uncertainty for fishers, especially affecting small businesses that lack the necessary political leverage. With our work we intend to reduce this uncertainty and offer important insights in the effects of co-location strategies.

S01-17460-Oral-Eddy

Scenarios for the future ocean: A FishMIP approach

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The Fisheries and Marine Ecosystem Model Intercomparison Project (FishMIP) brings together regional and global marine ecosystem models to better understand and project the long-term impacts of climate change on fisheries and marine ecosystems using an ensemble approach. The goal is to explore the future of seafood supply, marine biodiversity, and marine ecosystem functioning**.** Until this point, FishMIP has used simplistic future fishing scenarios such as no-fishing and status quo fishing (holding all fishing constant at 2005 levels) in order to isolate fishing from climate effects. Moving forward, FishMIP has recognized the need to include more complex future fishing scenarios, and has created the FishMIP scenarios working group to address this challenge. We have developed a methodological approach to include experts from socio-economic, biophysical, policy, historical, and legal backgrounds. Our aim is to develop scenarios that are as simple and few as possible, while being consistent with existing IPCC efforts (shared socioeconomic pathways – SSPs), aligned with future IPBES scenario endeavors (nature futures), and as relevant as possible for policy-orientated agencies such as FAO. To achieve this goal, we extended and operationalized the existing contextual SSP storylines for the oceans and fisheries, that we call the ocean system pathways (OSPs). The OSPs form the basis of quantitative and spatially resolved future fishing scenarios that can be used as input by fisheries and marine ecosystem models.

S01-17471-Oral-DePiper

Coupled Socioecological Qualitative Modeling in Support of Management: The Mid-Atlantic Fishery Management Council's Ecosystem Approach to Fishery Management

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In support of Ecosystem Approaches to Fishery Management, the Mid-Atlantic Fishery Management Council has employed numerous coupled socio-ecological models. The Council's 2017 Ecosystem Risk Assessment strategically assessed risks to achieving management objectives and triage ecosystem concerns for management action at a broad level. Conceptual system models have been used to inform a gap analysis with respect to ecosystem knowledge surrounding Summer Flounder, a species of substantial commercial and recreational value within the Mid-Atlantic, and the species facing the highest ecosystem risk as determined by the Risk Assessment. In addition to the gap analysis, a technical scientific working group, in close collaboration with the Council's Ecosystem and Ocean Planning Committee and stakeholders, used the Summer Flounder conceptual model to scope questions for a Management Strategy Evaluation (MSE). In a collaborative exercise with a core stakeholder group, a quantitative bioeconomic model was then developed specifically for the MSE, with a focus on mitigating ecosystem-level risks to the fishery. The use of these coupled models are a key component of the deliberate approach the Mid-Atlantic Council is employing to integrate ecosystem components into the current single-species management process. This presentation aims to trace the development and utility of these models, and lessons learned with respect to the co-development of knowledge. Of specific interest is the technical group's focus on production efficiencies, which have allowed the science to keep pace with management timelines, interactive system models, which help transfer knowledge between stakeholders, managers, and scientists, and quantitative models providing strategic management advice.

S01-17472-Oral-Gourguet

Representing key interactions driving the dynamics of marine mammal -fisheries conflicts: a qualitative modelling approach

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Global expansion of fisheries over the past decades has intensified the conflicts between human activities and marine biodiversity. More specifically, the increasing interactions between fisheries and marine mammals represent a major ecological and economic viability issue. Since the 1990s, France has regularly experienced in winter major dolphin (*Delphinus delphis*) mortality in the Bay of Biscay. On the Atlantic coast, strandings have reached unprecedented levels since 2016 and are mainly due to bycatch in fishing gear. There is a need to better understand the environmental and human factors driving this bycatch and its increase. As part of the Delmoges project, two participatory workshops were organized to develop an integrated representation of these interactions. The workshops were based on a qualitative modeling method considering Political, Ecological, Social, Technological, Economic and Legal (PESTEL) dimensions. We aimed to identify the elements perceived as important by different stakeholder groups to understand the determinants and possible evolutions of common dolphin bycatch in the Bay. Building on workshop outcomes, a synthetic representation of elements categorized as "causes", "consequences" and "solutions", and interactions between these was developed. A notable result of the analysis is that the ratios of "causes" to "solutions" differed greatly between stakeholder groups. We also identified potential levers of action, as well as indicators to include in multi-criteria evaluations such as co-viability approaches.

S01-17483-Oral-Surma

Tradeoffs and uncertainty: towards ecosystem-based management of Northeast Pacific herring fisheries

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This paper investigates potential ecosystem-based management strategies for northeast Pacific herring (*Clupea pallasii*) fisheries and evaluates tradeoffs between ecological and socioeconomic impacts of candidate strategies while accounting for natural and anthropogenic uncertainty. The operating model was constructed in Ecopath with Ecosim (EwE) for the marine ecosystem around Haida Gwaii (an archipelago in the southeastern Gulf of Alaska). Both ecological effects (e.g. on herring and predator biomasses) and socioeconomic impacts (e.g. on revenue and employment) of fisheries management strategies were comparatively examined with a powerful management strategy evaluation (MSE) algorithm accounting for ecosystem model parameter uncertainty along with stock assessment and strategy implementation errors. Results indicate that herring and predator biomasses are moderately impacted by the current management strategies in Canada and Alaska. More precautionary strategies could substantially mitigate these ecosystem impacts. However, this ecological improvement would come at the high socioeconomic cost of lower mean catches and more frequent fishery closures (i.e. lower and less stable revenues and employment). The tradeoff between herring and predator biomasses on the one hand, and catches and fisheries openings on the other, could be resolved by reducing target fishing mortality within existing management strategies or by promoting the ecologically benign spawn-on-kelp fishery. However, consideration of uncertainty in ecological and management subsystems reveals that herring and predator biomasses could decrease under all strategies. This study emphasizes the necessity of viewing northeast Pacific herring fisheries within a single social-ecological system, and identifies tradeoffs between ecological and socioeconomic goals, while accounting for both ecosystem and management uncertainty.

S01-17487-Oral-Thebaud

(Mal)adapting to climate change: a stylized fishery example

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Adaptive fishery responses to climate-induced changes in marine fish populations may lead to fishery maladaptation. Using a stylised bio-economic model of the global fishery, we demonstrate the importance of adaptive management regimes. We show how the losses resulting from poor access regulation increase in a fishery system negatively impacted by environmental change, and demonstrate the proportional benefits provided by management strategies that control the levels and allocation of fishing effort. Indeed, under poor to nonexistent access regulation, highly adaptive actors can generate significant bio-economic losses. This might lead to foregone benefits and cascading economic and ecological losses, whereas well-designed adaptive management regimes may enable making the most of the best, and the least of the worst, climate-induced outcomes for fisheries. These findings emphasize the need for integrated assessment approaches to the impacts of climate change on fisheries, which should incorporate not only ecological responses but also the industry and management responses.

S01-17542-Oral-Xu

Combining agent-based modelling and Bayesian exponential random graphs for calculating social-ecological fit: The case of *sousa chinensis* reserves in China

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Although recent advancements in modelling social-ecological fit have captured the complex dependence structure of network data in various applied contexts, individual heterogeneity concerning social actors' objectives are largely missed out. The governance processes of intractable marine socio-ecological systems need to be better incorporated not only in graph features, but also in micro-level interactions like cooperation, competition, etc. Agent-based modellings (ABMs) are especially useful when the agents interact in non-random ways, like social-ecological networks of spatial explicit social-ecological systems. Furthermore, they are useful to test different cognitive processes and heterogeneity of decision-making processes in a coupled system, exemplifying the possibilities of more dynamic interactions of agents, preferences of agents and more complex recursive reasoning. This study combines agent-based modelling with Bayesian exponential random graphs (BERGM) by generating pre-knowledge about social actors' decision preferences based on location, knowledge, wealth, social connections, cognitive processes; passing the prior distribution through Bayesian parameter inference; and then estimating the probability of motif types via the ERGM process. Using field investigation data in 6 *sousa chinensis* (Chinese white dolphin) reserves, the decision preferences of social actors are predetermined by local economic development level, distance from the reserve to the coasts, as well as the administrative level, area size, and history of the marine protected areas. The social-ecological fit types of these reserves are assessed through ABM-generated pre-assumptions and Bayesian-inferred parameters in the ERGM approximation process, suggestions for governance improvement are given and further applications of the hybrid method in studies of other scales are discussed.

Keywords: agent-based modelling, Bayesian parameter inference, exponential random graphs, social-ecological fit, sousa chinensis

S01-17564-Oral-Picone (ECOP)

The Cruise Control Guide: a social-ecological framework to navigate the impacts of cruise tourism on nature and local communities

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Cruise tourism has emerged in the last years as the fastest-growing segment in coastal and ocean-based tourism, attracting tens of millions of passengers each year to explore more remote destinations than ever before. However, as the cruise sector expands, there is a growing need to transition towards more sustainable tourism models. To tackle this challenge, cruise lines must account for their far-reaching impacts on the environment, societies, economies, and cultures of their destinations. Addressing these impacts requires holistic frameworks and interdisciplinary indicators that can provide information for adaptive management, facilitating sustainable decision-making. In this study, we developed and applied an innovative approach that combines social-ecological systems (SES) modeling with the Driver-Pressure-State-Impact-Response (DPSIR) framework. This methodology aims to identify the impacts on nature and local communities resulting from the interactions among the cruise sector actors. Our study revealed several direct and indirect impacts on natural capital and the well-being of local communities, spanning from habitat pollution and biodiversity loss to risks of social and economic inequalities as well as cultural heritage erosion. For each impact, we developed indicators and suggested responses to avoid or mitigate them. Indicators and responses were integrated into a single assessment and monitoring framework, named the "Cruise Control Guide." This framework serves as a valuable adaptive management tool for cruise lines, enabling them to assess the sustainability of their operations and informing the development of more sustainable cruise tourism practices.

S01-17575-Oral-Pfeiffer

A Toolbox for Socio-Ecological Modeling in Multi-Use Marine Spaces

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Large-scale offshore renewable energy development presents one of the largest changes in human use of the marine ecosystem in history. Resources are being devoted to understanding, predicting, and mitigating many aspects of the impacts of offshore development on the marine environment. One urgent need is a greater understanding of the impacts of offshore renewable energy growth on fisheries and fishing communities, and the ability to utilize quantitative analysis and modelling to inform Ecosystem Based Management (EBM). We have developed a toolbox (Spatial Economics Toolbox for Fisheries, or FishSET) that provides spatial data analysis tools with which to quantify the spatial overlap between historical fishing effort and proposed offshore energy developments. FishSET provides modelling tools to understand the drivers of fisher behavior–what factors explain historical fishing effort patterns; how fishing behavior has responded to a dynamic world of changing markets, management, competing uses of marine space, communities, and the environment. This information is used to predict how fishers will respond to a closure or gear limitations associated with a proposed wind energy development.

The modelled impacts include the redistribution of fishing effort to other areas, albeit at a higher cost and/or lower revenue. The ability to measure the change in welfare associated with the development of offshore wind in historically fished locations provides the opportunity to compare development options and their potential impacts, and to minimize impacts of the energy transition. FishSET is designed to be a flexible tool to contribute to quantitative EBM and evaluation of management objectives.

S01-17633-Oral-Planque

Causal modelling of climate-fish-fisheries. Confronting conceptual models with data.

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Mental models of socio-ecological interaction, such as Bayesian belief networks, are foundational to the development and implementation of EBM. These models are grounded in expert causal understanding of interactions between environmental drivers, human activities, and ecosystem responses. Observational data that can inform these models are usually included at a later stage. The recent development of structural causal models (SCM) offers an avenue to jointly model marine socio-ecological systems while accounting for well identified causal mechanisms, and quantify the interactions based on existing observations.

Here we develop simple structural causal models for small pelagic fish, fisheries, and climate in the Norwegian Sea aiming to quantify the effect of specific interventions (e.g. changes in fishing opportunities or climate conditions) on socio-ecological outputs (e.g. fish biomass or profit from fish landings). The models are informed by observational time-series. We show that the choice of model structure is highly dependent upon the nature of the available data. We also show that reasonable differences in model structure can lead to important deviations in results and in the interpretation of causal relationships in socio-ecological systems. Finally, we address the issue of using conceptual models drawn from expertise only (= no data) for the later purpose of data-supported causal identification and quantification. Through this example, we illustrate some of the current challenges of developing robust, meaningful, and data informed causal models to support Ecosystem Based Management.

S01-17648-Oral-Suarez-Caballero (ECOP)

Developing an integrated land-ocean-ecosystem model to assess terrestrial anthropogenic impacts on coral reef areas

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Coral reef ecosystems around the world are facing impacts at both global and local scales. Beyond global warming and ocean acidification, nutrient and soil discharge from human activities in coastal areas (e.g. agriculture, livestock farming) are important factors that influence water quality, food web structure, and ecosystem balance. However, quantitatively assessing these effects is a highly complex task, requiring an interdisciplinary approach. In this study, we developed an integrated land-ocean-ecosystem model to assess the impacts of terrestrial nutrient runoff on a coral reef ecosystem in Sekisei Lagoon, Okinawa. The model was able to simulate the ocean's physical parameters using the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) Modeling System and incorporating terrestrial runoff estimations from the Soil and Water Assessment Tool (SWAT+). Coupled with a pelagic low-trophic ecosystem model and a benthic ecosystem model, we simulated the nutrient impacts on marine phytoplankton, as well as carbon and nutrient cycling in coral reef areas. The results of this integrated model show the potential effects of terrestrial nutrients on coral reef ecosystems, enhancing the accuracy of future ocean modeling research. Furthermore, this study provides a foundation for devising strategies linking ecological conservation with socioeconomic considerations. By incorporating the outcomes into an ecosystem services context, we can support the effective management of coral reefs by offering a comprehensive approach to sustainable coastal development. While contemporary methodologies advocate for interdisciplinary approaches to understanding complex socioecological problems, challenges persist in implementing these methods effectively. This presentation illustrates an interdisciplinary research effort, highlighting its significance and emerging challenges.

S01-17669-Oral-Saul

Biological, economic, and nutritional trade-offs managing Indonesia's snapper and grouper fishery

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Fishing is a commercially important industry to the Indonesian archipelago, as the second largest wild catch producer in the world. Formal assessments of Indonesia's fisheries have been limited by sparse data. In 2015, a collaborative data collection system was initiated to obtain catch and length data from commercial fishers who target demersal species. An ensemble of data-limited fisheries assessment models evaluated 43 species across 10 management areas within Indonesia with life history and catch sensitivity analyses. Current fishing mortality and population size estimates were compared with management reference points and populations were forecasted at different management targets. The Upside Economic Model was used to forecast trade-offs in revenue, cost, and profit when the fishery is managed at different targets in comparison to continuing its current pattern of exploitation. The NutriCast model was used to calculate the nutritional content trade-offs of the forecasted catch from each management scenario compared with business as usual. For most snapper species, the estimated biomass was below the limit reference point, and current fishing effort higher than the target reference point. Most grouper populations were found to have healthy biomasses and low fishing mortalities. Fish families at lower trophic levels were moderately or lightly fished. Species below the limit reference point required between five and 20 years to rebuild and between a 50 and 80 percent reduction in fishing mortality. Despite uncertainty, the approach provided meaningful results managers could use to make informed decisions that balance biological sustainability with economic and nutritional outcomes.

S01-17687-Oral-Hobday

Foresighting as a means of improving anticipatory scientific capacity and strategic planning

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In a rapidly changing world, scientists and their research institutions need to plan for the infrastructure, skills, and policy engagement that will be demanded to help society navigate current and emergent social-ecological challenges. Foresighting draws on approaches used in long-range (>10 year) and strategic planning, and participatory futures studies. It is outcome-oriented and typically involves development of scenario narratives that can inform planning in a qualitative sense. Here we describe a new quantitative approach to develop and rank 14 foresight scenarios of potential futures across a range of general and marine-relevant science domains. Indicators for each foresight were used to assess the time-specific probability of each scenario being realised and replicate assessments by scientists were undertaken to test for entropy sources and surprises. There was high variation among scientists in scoring the year that each indicator would occur and across years. These differences are revealed when their indicator information-content is particularly noteworthy and changes over time. We discuss our insights and provide recommendations on how this approach can motivate and guide strategic planning and investment decisions by scientific institutions in response to different anticipated futures.

S01-17534-Poster-Mammel (ECOP)

Ecological modeling of greater amberjack habitat: Unraveling the impact of El Niño and La Niña events in the Taiwan Strait

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Greater amberjack are the fastest-emerging and most significant commercial species landing in the waters of Taiwan. El Niño–Southern Oscillation (ENSO) is a crucial oceanographic phenomenon that leads to interannual fluctuations in the climate and ecosystem productivity of tropical and subtropical areas. These fluctuations affect the suitability of habitats for many commercial fish species. The aim of this study was used to identify the suitable habitat area of the target species and the influential effects of ENSO in the coastal regions of Taiwan Strait (TS) using ecological modeling approach. However, detailed information on the effects of this major phenomenon and the resulting environmental changes on the habitat and catch rates of the economically and ecologically crucial species of the greater amberjack (*Seriola dumerili*) in the TS is lacking. I employed a weighted habitat suitability index (HSI) ecological modeling method and used remotely sensed marine environmental data as well as data from recorders in Taiwanese fishing vessels to understand the effects of ENSO events on the habitat suitability and catch rates for greater amberjack in the TS. The catch rates were higher in spring, summer, and autumn (>9.0 kg/h) in El Niño years, and in winter, the catch rates were higher in normal years (>12.0 kg/h) and lower in La Niña years. The predicted HSI for the southern and northern TS revealed that greater amberjack populations were predominantly distributed at 20–24°N and 24–28°N, respectively. These results will guide future conservation priorities and habitat management for enhanced ecological monitoring.

S01-17578-Poster-Cho (ECOP)

Simulation study on the impact of COVID-19 on sustainable marine tourism: A system dynamics approach

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This research employed a system dynamics model to conduct a simulation study, aiming to predict the changes in marine tourism and evaluate the effects of policy alternatives during the COVID-19 situation. The conceptual model encompassed attractiveness factors, capacity, demand index, and policy capacity index of marine tourism. Additionally, a causal diagram and stock-flow diagram were created, taking into consideration tourism demand, tourism supply, and internal/external risk factors. The research period spanned five years, from January 2018 to December 2022. Observational data from January 2018 to December 2021 were utilized to build the model, and time-series trends of marine tourism for January to December 2022 were estimated using the model. Two scenario analyses were performed based on the simulation results and observational data. The first scenario explored the impact of adjusting social distancing measures—a significant risk factor in recent tourism—on coastal marine tourism. The second scenario assessed the effects of amenity and infrastructure investment ratios in promoting marine tourism and creating favorable conditions. The analysis results suggest that effectively addressing the decline in marine tourism and regional economic crisis during situations like COVID-19 requires a combination of short-term strategies involving infrastructure investments and long-term strategies focused on amenity investments. Furthermore, targeted promotional activities during peak tourism seasons in coastal areas can yield multiplier effects.

For future research, efforts should be directed toward enhancing the model's reliability through additional data, developing theoretical foundations to enhance model sophistication, and validating the modeling results by applying them to diverse case regions.

Session 2: Improving marine governance with interdisciplinary research and cross-sectoral approaches

Convenors:
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Manuel Bellenger (IFREMER)
Alan Haynie (ICES)
Céline Jacob (Canada)

Plenary Speaker:
Emily Ogier (Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Tasmania, Australia)

Delivering research that is valuable for policy-making requires expanded interdisciplinary efforts to support governance. This theme session explores paths to better include the human dimension in marine research and governance. The topics will be organized in two complementary streams: 1) how to do interdisciplinary science to manage marine social-ecological systems; 2) how to utilize different approaches to the governance of marine social-ecological systems, including competing uses by multiple sectors of interconnected ecosystems components.

We welcome papers on methodological approaches, conceptual frameworks, comparative analyses, case studies, and critical reviews intended to advance a roadmap for effective collaboration and management-relevant research.

S02-17725-Plenary-Ogier

Taking stock: how are interdisciplinary research and cross-sectoral approaches serving marine governance? Vignettes and provocations from southern waters.

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The 'turn' to marine research which integrates the human dimensions and the interaction of co-existing activities within interconnected marine systems is well underway. Interdisciplinary marine science is increasingly able to account for not only marine systems in a comprehensive sense but for affected peoples and their multiple sectoral rights, interests and activities as agents of change in system conditions.

But is marine governance being better served as marine science grows in the scope of what it discovers and in the complexity of the systems understanding it can offer? Are marine systems more governable as a result?

Interdisciplinary science that is 'actionable' for policy makers and managers governing marine estates needs further transforming into forms that can be applied to real world problems. These forms need to accommodate the legal frameworks and institutions through which marine systems are governed.

Globally, marine science and policy communities are applying different approaches and engaging in cross-disciplinary, sectoral and institutional collaborations to meet this pragmatic need. These emerging practices and artefacts are most called for and observable in response to cross border and sectoral marine issues, oceans commons contexts and to climate-driven changes to local conditions.

In this presentation I share observations from scientists, policy makers, and managers of marine systems in Australian and Southern Ocean waters drawn from their experiences with a range of collaborative and interdisciplinary marine science initiatives. I compare how these initiatives were designed to support governance of ocean areas and marine systems at different scales, and take stock of the work to do.

S02-17433-Oral-Acosta

The economic effects of the Individual Transferable Quota (ITQ) system on the catch of the bluefin tuna in the Strait of Gibraltar

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The Individual Transferable Quota (ITQ) is the management system used by the Common Fisheries Policy to regulate fishing, maintain the economic level and favour the sustainability of resources. This policy has been developed in the Ports of the Strait of Gibraltar since 2008 for the bluefin tuna fishery, which has evolved from relatively low number of catches, during the first years of application, to become the only species caught nowadays in this area. The main objective of this paper is to evaluate the effects of the application of the ITQ in the ports of Tarifa and Algeciras. We address the following research questions: How was the ITQ established in the Ports of the Straits? How was the catch allocated to vessels? What economic and social effects has ITQ had on the fishing community?

The analysis of catches and income will allow us to compare over time the effects of the ITQs for bluefin tuna and for other species caught in the past. The results reveal the counterproductive effect on the economic sustainability of fishermen that the application of the ITQ has had in those ports. The automatic allocation of ITQ has generated a situation of concentration of quotas in few vessels, which in turn causes the expulsion of many vessels and the disappearance of employment. Therefore, we propose a system to mitigate the concentration problems caused by the current system of ITQ in the Strait of Gibraltar.

S02-17438-Oral-Chen

Integrating the interdisciplinary of marine natural sciences and social sciences to promote the paradigm shift of Social Oceanography

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To better understand the complex interdependence between humans and the ocean in a constantly changing world, we need to innovate and integrate interdisciplinary paradigms and methods of marine natural and social sciences to generate new knowledge to solve various problems in marine/coastal social ecological system. Socio oceanography is an emerging research realm that uses holistic research methods to explore the interrelationships and feedback mechanisms between human social systems and marine natural environmental systems, and integrates marine natural science and social science knowledge using interdisciplinary methods to form a new interdisciplinary framework. As a new branch of marine science, Socio oceanography regards the relationship between humans and the ocean as a complex adaptive system, and regards the marine social ecological system as the core and logical mainline,, and comprehensive research has been conducted from the dimensions of temporal, spatial, organization, and institution. In order to comprehensively address the relationship and mutual feedback mechanism between social and marine systems, Socio oceanography conducts research around six major topics: resilience assessment, transformation, ecological services and human well-being, regime shift, and adaptive governance. Of course, Socio oceanography is still in the formation and construction stage, and the theoretical system, research methods, and practical applications still need to be continuously improved. But we call for the joint efforts of global marine scientists to ultimately improve this interdisciplinary research of natural and social sciences.

S02-17453-Oral-Chiaroni (ECOP)

Collaborative marine governance with Indigenous Nations: The case of the Chumash Heritage National Marine Sanctuary

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Rural coastal communities are balancing the complexities of ensuring equitable marine governance and multiple conflicting uses, including aquaculture intensification, fisheries commodification, and renewable energy development. In California specifically, Indigenous Nations are seeking equal governance authority with state and federal marine resource managers for the management of marine spaces. This dissertation research examines an emerging collaborative governance relationship for the proposed Chumash Heritage National Marine Sanctuary between numerous Chumash and Salinan nations and the National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries. This project specifically investigates the integration of equity and Indigenous self-determination in governance and management practices through examining social learning and cultural literacy among governance actors and how the social and ecological goals of the Sanctuary are influenced by the governance process. This project includes a case study using qualitative and quantitative social science research methods, including participant observation, semi-structured interviews, and document analysis. These methodologies emphasize the perspectives of a diversity of stakeholders/rightsholders involved in the governance process. Participants and community members have informed the research process and findings will be shared with all participants, tribal government officials, the academic community, and state and federal marine policymakers. The findings of this dissertation research will contribute to the understanding of how equitable collaborative governance arrangements evolve within rural coastal communities, and how these arrangements influence the social and ecological goals of marine planning.

S02-17482-Oral-Surma

Applicability of the *satoumi* concept to Pacific herring management and conservation

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This paper presents the relevance and suitability of the Japanese concept of *satoumi* (里海) for social-ecological systems revolving around Pacific herring (*Clupea pallasii*). *Satoumi* (literally "village sea" or "hometown sea") refers to management of coastal social-ecological systems in waters with intensive human activity using techniques promoting high biological productivity and biodiversity. These include habitat restoration, ecologically responsible marine engineering, and small-scale fisheries and mariculture. Pacific herring require healthy spawning and nursery habitat in intertidal to shallow subtidal waters to sustain local populations. Many herring stocks in Japan, British Columbia (Canada), and the continental United States spawn and mature in waters with intensive human activity. Several components of *satoumi* hold promise for Pacific herring conservation. Firstly, protection of spawning habitat through prevention of polycyclic aromatic hydrocarbon pollution (e.g. from creosote pilings) has been shown to increase herring breeding success and ecosystem health near Vancouver, BC (Canada). Secondly, restoration of biogenic nursery habitats (e.g. kelp forests and eelgrass beds) could assist successful recruitment of juvenile herring. In the case of kelp forests, this approach could combine with ecologically benign harvest of herring spawn on kelp to yield a high-value product for both local consumption and international trade. Thirdly, promotion of small-scale herring fisheries integrated into local social-ecological systems over wide-ranging industrial fisheries could benefit herring stocks (by reducing fishing power) and communities (by redirecting fisheries revenue and employment away from metropolitan ports and corporations). Thus, multiple components of *satoumi* appear highly promising for Pacific herring fisheries management and conservation.

S02-17495-Oral-Smith (ECOP) (RECORDED)

The legal and ecological complexities of establishing the North Atlantic Current and Evlanov Sea-basin (NACES) marine protected areas in the North-East Atlantic region

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There is a fragmented ocean governance structure with numerous regulations and policy that govern some aspects of human use on a regional level, but that are not necessarily recognised on a global scale. There is a myriad of regulations and policy that govern various industry sectors by international organisations, and bodies that are recognised globally but have very little linkage to other marine industry sectors that is necessary to provide an overarching governance structure for all oceans. There are regulations and policy implemented on a national level that have been and can be influenced by global targets, and initiatives, and there are areas outside of national jurisdiction where certain rules, regulations, and procedures under 1982 UNCLOS apply to manage activities such as seabed mining, fishing and shipping but not for conserving and protecting the biodiversity of the oceans. The newly agreed BBNJ treaty aims to bridge this gap but how it is implemented remains to be seen. In addition to jurisdictional and sectoral governance approaches, consideration needs to be taken to ensure a more holistic ecologically integrated governance solution is taken. This paper looks at the legal and ecological complexities of establishing the NACES marine protected areas (MPAs) in the North-East Atlantic region under the 1992 OSPAR Convention.

S02-17499-Oral-Barclay

Interdisciplinary fisheries management through social harvest control rules

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Fisheries are supposed to be for the benefit of society, producing nutritious food, providing livelihoods, and enabling cultural continuity. While fisheries policies often state socio-economic objectives, such as enhancing the livelihoods of coastal communities, those are rarely, if ever, incorporated into management procedures. The lack of articulation of social goals into operational objectives and lack of monitoring of social outcomes around fisheries amounts to poor public policy. Biological productivity goals for fish stocks operationalised through Harvest Control Rules (HCRs) are central to contemporary fisheries management. In this paper we explore the potential for Social Harvest Control Rules (sHCRs) with reference points and agreed predefined actions to make the social dimensions of fisheries explicit. We introduce two potential types of sHCRs, one based on allocation of catch within biological limit reference points, and one for when fishing exceeds biological limit reference points. The application of sHCRs, we argue, could foster accountability and help avoid non-transparent negotiations on size and distribution of the catch. Our proposal is a call to action for policy makers and fisheries managers to properly integrate social criteria into fisheries governance, and for both biophysical fisheries scientists and social scientists to do better in practical collaboration for methods and knowledge development to support this integration.

S02-17524-Oral-Haynie

The past, present, and future roles of national and international organizations in interdisciplinary marine science

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MSEAS represents what is becoming the standard of modern marine science, as we more completely recognize that marine ecosystems are social ecological systems in which humans are central actors. This recognition is the result of an evolution in both thinking and governance, which is visible in the changes observed in many national and international marine science and management organizations. At the national level, organizations like the US NOAA and Australia's CSIRO have permanent interdisciplinary groups of economists and other social scientists working with biologists, oceanographers, managers and stakeholders to improve science and management. Others are are taking initial steps, such as the SpanishIEO At the international level, ICES and PICES have made human activities central to marine science, while social science organizations such as the International Institute of Fisheries Economics and Trade (IIFET) are increasingly interdisciplinary. At the international, national, and local scales, Integrated Ecosystem Assessments (IEAs) have expanded as tools to evaluate and describe the complexity of marine and coastal human and natural environments. In parallel, supranational and national management bodies either claim to or are encouraged to base their decision on integrated advice.

This talk charts key steps in the evolution of several of these organizations and lessons learned about what changes have been effective a promoting improved interdisciplinary science and management. Additionally, we focus on current national and international challenges to expanding interdisciplinary research. Across organizations, how can we can more efficiently collectively advance interdisciplinary marine science and better manage the global marine environment?

S02-17533-Oral-Bingham (ECOP)

The role of knowledge and governance pluralisms in supporting fisheries co-governance and Indigenous rights assertion in Clayoquot Sound, British Columbia.

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In Clayoquot Sound on the west coast of Vancouver Island (WCVI), wild salmon are integral to the wellbeing of coastal communities including Nuu-chah-nulth First Nations but are at risk of extirpation. The federal government, through Fisheries and Oceans Canada, is tasked with incorporating Indigenous knowledges into WCVI fisheries management and with recognizing recently formalized commercial fishing rights of five Nuu-chah-nulth First Nations. Alongside amplified concerns regarding salmon populations, the development of the five Nations' rights-based fisheries and complex dynamics between multiple Indigenous and Canadian actors in Clayoquot Sound presents a challenge for local governance reform and directly confronts the historical distribution of power between Canadian and Nuu-chah-nulth governance structures. This presentation considers the lessons learned through five years of research regarding the role of science and Indigenous knowledges in governance development, conducted in partnership with Tla-o-qui-aht First Nations and Ha'oom Fisheries Society. Reflections offer important strategies for Indigenous rights implementation and knowledge mobilization in small scale, multispecies fisheries with evolving governance power relations. Specifically, pluralistic and relational approaches to institution building and the production, sharing, and application of Indigenous and Western scientific knowledges support local decision-making and informed co-management. In the development of the five Nations' rights-based fisheries, these approaches and the strategic mobilization of Fisheries Science are key to responding to colonial structures and knowledge hegemonies in State fisheries management. In these strategies, Indigenous leadership and power sharing through co-governance are imperative to supporting First Nations' paths toward self-determination and in advancing equity in coastal governance.

S02-17540-Oral-Abdel-Fattah (ECOP)

Developing EU-wide policy recommendations on ethical marine spatial planning under climate change: implications and challenges in creating science-informed policy recommendations for future marine uses

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In this presentation, we will discuss a set of policy recommendations that were developed for the forthcoming EU Climate Policy book (2024), for how to develop ethical marine spatial planning (MSP) models that consider the impact of their possible interpretations on affected stakeholders across the EU. Marine industries – such as aquaculture and green energy – are expected to grow in the decades to come. However, the continued exploitation of ocean and marine resources has both envisioned and unintended consequences on biodiversity, safety, economies, and surrounding communities. Therefore, MSP models that will be developed to plan the utilisation of marine resources have an ethical responsibility to also consider how such efforts affect all possible stakeholders. We discuss in this presentation the necessity of robust scientific information to generate viable MSP models, particularly amidst climate change, but also the necessity to integrate a multi-stakeholder perspective in such models, to minimize in particular negative unintended consequences. In order to develop this interdisciplinary set of recommendations, our work drew upon perspectives from ecologists and social scientists to provide a realistic and actionable framework for what an ethical MSP model entails. We will also present case studies from Norway and Portugal, to illuminate important challenges and considerations in such an approach, particularly regarding how legislation and policies can and should be brought forth in both the European Green Deal and the EU Adaptation Strategy.

S02-17547-Oral-Blandon (ECOP)

Seafood sustainability values in Japan and Sweden

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Sustainability has many different dimensions, such as environmental, social and economic. Different actors within the seafood sector may prioritise one dimension over another. Given that seafood is the largest traded food commodity globally, these differences in opinion may have large implications.

The study focuses on actors along the seafood supply chain, the government, NGOs and industry bodies, in two different countries: Japan and Sweden. Both countries are advanced economically and democratically, but are likely to have differences in thinking around seafood and sustainability. The Japanese seafood market is diverse and fragmented, whereas Swedish seafood consumption is homogenous and supermarkets are highly consolidated. Their approach to sustainability also differs: Sweden has embraced certification whereas uptake is slower in Japan.

We used Q-methodology to collect opinions on sustainable seafood from 29 participants. The participants ranked 40 prepared statements on seafood sustainability according to their perceived importance. Factor analysis was used to pull out four different "paradigms" of how the participants conceptualise sustainable seafood.

We found a clear split in opinions based on country, as well as prioritisation of different dimensions of sustainability. One paradigm represented only Japanese participants and focused on social and economic sustainability. Two paradigms represented only Swedish participants and were split into eco-centric and socio-economic-centric views. The last paradigm represented participants from both countries, and prioritised social and ecological sustainability. We also found specific points of contention that the seafood industry will need to negotiate to move forward with sustainability, and areas of consensus that already exist.

S02-17556-Oral-Thebaud

Potentialities of incentive-based approaches to reduce marine mammal bycatch

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Relative to top-down regulation, incentive-based bycatch reduction measures – such as bycatch levies, penalty-and-reward systems, cap-and-trade approaches, real-time incentives, market measures – provide vessels with greater flexibility to design solutions to reduce bycatch in creative and cost-effective ways. They can allow vessels to respond flexibly to changing market, environmental, technological and resource conditions. They also allow vessels to use decentralized and private information that is not available to the management authority. Based on the discussions around case studies presented at a workshop held in Brest in March 2023, we review a variety of incentive-based approaches to reduce bycatch and explore the potential applicability of these approaches to address marine mammal bycatch. The scope of this review includes governance dimensions related to implementation of these approaches, concerns for political and legal feasibility, equity, information sharing, as well as compliance. We discuss the lessons learned from cases where these have been implemented and identify important operational aspects, barriers, and opportunities for their potential applicability to limit marine mammal bycatch in other contexts.

S02-17572-Oral-Matorres (ECOP)

Political economy and institutional effectiveness of coral restoration in the Philippines

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Coral restoration is an emerging tool that can potentially complement wider programs of coral reef governance and is increasingly being implemented in diverse contexts. The Philippines is among the countries that has a relatively high number of coral restoration projects, which have evolved over time and now generate significant interest from donors and governments. However, existing literature on coral restoration in the Philippines has had a predominantly technical focus, with limited attention to policy or social-economic aspects. This study presents the key findings of an ongoing project that seeks to understand the governance and social dimensions of coral restoration. It first provides an overview of national programs and other efforts at coral restoration and discusses the weaknesses in existing policies and regulatory frameworks for reef restoration applications and implementation. We then analyzed the reciprocal relations as to how coral restoration becomes subject to marine protected area governance conditions at the local level and conversely, how coral restoration has the potential to affect governance of MPAs. Finally, we explored in a case study the interaction of coral restoration with existing dominant economic coastal sectors in rural Philippines, by identifying the central features of each of the sector that interact with coral restoration, and how these features influence the governability of coral restoration. These interrelated studies provide important insights to consider for coral restoration to work effectively and ultimately to generate sustainable socio-economic and environmental benefits.

S02-17574-Oral-Ban

Research support for moving towards reconciliation in fisheries and marine spatial management: examples from Pacific Canada

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Indigenous peoples have managed their marine territories, including fisheries, for thousands of years through Indigenous governance and stewardship approaches. Place-based knowledge passed down through generations, embedded in laws, customs, worldviews, practices and language formed the basis of sustainable fisheries. In the centuries that followed colonization in what is now Canada, Indigenous management of marine territories and fisheries was undermined and criminalized as part of Canada's attempted assimilation of Indigenous peoples. There are now efforts underway by the Canadian federal governments and First Nations to work towards reconciliation in marine governance and fisheries, such as the Fisheries Resources Reconciliation Agreement. In this presentation, I will reflect on my experience, as a non-Indigenous researcher, of supporting Indigenous Nations in what is now known as British Columbia, Canada, in their efforts to have their authority to govern their territories recognized. Providing several examples of past and ongoing research project co-created with Indigenous partners, I will reflect on ethical and practical considerations of working in this space. Furthermore, I will outline the responsibilities of all researchers working on Indigenous lands of upholding the United Nations Declaration on the Rights of Indigenous Peoples.

S02-17589-Oral-Morrison

Overcoming lock-in of policy responses to reef heating: a global roadmap

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Marine heating is the long-term climate-induced warming of oceans. Marked by more frequent, longer, and widespread marine heatwave events, the severity of marine heating is generating catastrophic impacts on reef social-ecological systems. Here, we review the range of policy solutions proposed to address reef heating. We find that, until recently, science-informed policy solutions were dominated by recommendations for more 'inclusive adaptation' and more 'usable' science. While these are laudable goals, such a narrow and locally-focused set of solutions suggests many researchers, policymakers, and funders have restricted their responses to the highly visible symptoms of reef heating, thereby locking in a particular science-policy pathway. Policy lock-in is concerning because it can popularise solutions that place the burden of response on to already vulnerable groups, avoid tackling deeper structural drivers of change, and overlook a wider range of viable solutions. In response, we highlight emerging trends proposing a broader and more impactful roadmap for reef science and policy. Such a roadmap is explicitly designed to expand the policy-making space to secure a wider, more effective, and more just range of responses to ongoing marine heating for reef social-ecological systems.

S02-17593-Oral-Kraan

Estimating the socio-economic consequences of a decommissioning scheme on the Dutch fishery and fishing communities

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Since 2017, the Dutch demersal fishery has faced a cumulation of challenges with the ban of their innovative fishing technique, the ban of discards, BREXIT, the closure of fishing areas for offshore renewable energy and nature conservation, the energy price crisis and the lack of qualified crew members. In this context, when the Dutch government opened a decommissioning scheme at the end of 2022, there was an overwhelming interest to apply to this scheme and a substantial part of the Dutch demersal fleet cashed out and put an end to many family-owned businesses that were often active for generations. In this study we look at the expected socio-economic effects of this decommissioning scheme on the functioning of the Dutch fishing sector at sea and on land. How will the fishers remaining active adapt and change their behaviour? What will it mean for the landing volumes of fish and the profitability and employment for the supply chain and technical services such as auctions, processing industry and markets? How will it impact fishing communities?

Using a mix of quantitative modelling methods and interviews and surveys, we assessed the potential effect of the scheme on the fishery looking at change in catch and economic performances of the fleet and the consequences for the fishing communities and the value chain.

S02-17618-Oral-Novilla (ECOP)

The privatization of marine protected area management in the Philippines: can businesses be held to task to deliver sustainable outcomes?

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Participation, control and influence of coastal communities over policies and decisions that impact their livelihoods and access to resources are central to the principle of co-management adopted in the Philippines. But while marine protected areas have generally been under this co-management framework, there has been a considerable rise in the involvement of the private sector in the governance of MPAs. In this study, we take the example of four (4) marine protected areas in Cebu Province managed by resorts and corporations. We examine the different typologies of tenure, formal and informal instruments of control and how these are negotiated and institutionalized. Using interviews and focus group discussions, also investigate ecological outcomes, flow of capital and the different ways by which socio-economic benefits are distributed back to the communities. Results show that private and quasi-private management has had positive impacts to fish stocks, and that businesses have greater capacity to finance the rehabilitation of MPAs impacted by both anthropogenic and natural activities. However, this has not necessarily translated to improved incomes and opportunities to coastal communities but in fact has perpetuated further displacement. The private sector can play a critical role to speed up the recovery of degrading ecosystems, and our findings presents ways in which businesses can be more transparent, accountable, participatory and equitable if they are to manage public goods.

S02-17627-Oral-Chan (ECOP) (CANCELLED)

Minimum information management in U.S. fisheries: Can we infer changes in stock abundance from trends in market-based indicators?

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With ongoing shifts in fish populations and fisher behavior due to climate change, increasing offshore wind development, and other anthropogenic impacts, fisheries managers will require more frequent updates on the abundance of fish stocks. While stock assessment estimates are essential tools for management of fisheries, they are time-consuming and costly to produce. As a result, many stocks are assessed infrequently, or lack the necessary data to perform a stock assessment. Establishing a relation between abundance of species and market-based indicators, such as fish prices and costs, could prove to be an effective minimum information management approach facilitating policy decisions. Building upon previously published work with red snapper, we used panel data from a large number of species of fish from all regions of the U.S. to examine the information content of dockside prices and fishing costs, controlling for landings, trade flows, Individual Fishing Quota (IFQ), and other regulatory tools. We apply panel Vector Autoregressive (VAR), Bayesian VAR (B-VAR), and Vector Error Correction (VEC) frameworks. Parameter uncertainties are addressed through Bayesian regression and forecasting methods. Also, the VEC model allows investigating the long-run relation between abundance of major fish species in U.S. waters and market indicators. Our results offer information on potential changes in stock abundances to support fisheries management decisions in a rapidly changing world.

S02-17629-Oral-Fisher

Enhancing ecosystem-based management practices through transdisciplinary research

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Ecosystem-based management (EBM) is a holistic approach to managing marine environments that can potentially reconcile cross-sectoral conflicts, scale mismatches, and fulfil sustainability objectives. While there has been attention given to the governance arrangements to support the implementation of EBM, there has been less attention given to how governance approaches are conceptualised, constituted, and enacted and the support needed to navigate different worldviews, knowledge systems and values. Our research in Aotearoa New Zealand has focused on exploring opportunities to enhance EBM practices among local government authorities and central government agencies using a transdisciplinary approach to co-develop research projects, and to generate knowledge insights that deliver meaning and value to implementing agencies. Drawing on critical social theory, socio-legal studies, geography, social-ecological systems thinking, and applied policy research, we found strong synergies and complementarities between EBM and Indigenous (Māori) relational worldviews that could overcome policy fragmentation and institutional inefficiencies while attending to environmental injustices and providing roadmaps for improved environmental outcomes that are location specific. Underpinning our research is recognition of the fundamental importance of the Treaty of Waitangi/Te Tiriti o Waitangi in shaping how coastal and marine spaces are governed, and the corresponding rights afforded Māori as Indigenous peoples of Aotearoa, along with Crown obligations and responsibilities in relation to Māori.

S02-17646-Oral-Mullany (ECOP)

Who's actually dependent? Investigating coral reef dependency in the Philippines.

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As the world grapples with the increasing pressure on coral reef ecosystems, practitioners and policy makers are urgently investing in and developing novel approaches to safeguard coral reef futures. Yet, conservation resources are limited, and decisions must be made about where to prioritise investment. Rationally, investment into regions that are of biological, social, and economic significance may yield favourable outcomes, yet research investigating coral reef livelihoods through a wholistic examination of the intersection of these biological and socio-economic characteristics are scarce. This study uses a transdisciplinary approach, combining quantitative indicators and social research to investigate the key social and economic factors influencing coral reef 'dependence' in two communities in the Philippines. This study reveals that geography, education, market access, healthcare, tradition, and culture all influence communities' dependence on coral reef ecosystems. The study also emphasises that dependency is not constant across time but fluctuates in reaction to livelihood opportunities and disturbances. This study acknowledges the challenges for integrating socio-economic data into coral reef governance in the Philippines context and provides recommendations on how this process may be achieved. The study also echoes the calls for co-ordination of conservation effort and collaboration across fields in the face of unprecedented pressure on coral reef ecosystems and the communities who depend upon them.

S02-17656-Oral-Buchholzer (ECOP)

Vulnerability applied to space competition between offshore wind farms and commercial fisheries: a critical approach.

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Emerged from sustained research and practice on risks, hazards and resilience, the concept of vulnerability has been developed to measure the degree to which a component's attribute is susceptible to, or unable to cope with, adverse effects of one or more stressors. To prevent changes from stressor, numbers of disciplines including economics use this concept capturing social-ecological systems issues. They first used the concept of vulnerability on hazards caused by climate-related stressors. However, individuals, communities and sectors and not only affected by climate change and need to adapt to a broad array of multi-scalar, temporal, social, political, economic and marine environmental fluctuations. As a result, vulnerability has been applied to stressors more related to human pressure such as loss of space due to offshore wind farms development and other human uses of marine ecosystems. However, these assessments often lack theoretical or empirical foundations and are applied without a good understanding of the determinants and processes affecting vulnerability in the context of multiple ocean uses. The aim of this paper is to discuss about the adaptability of vulnerability method applied to space competition between commercial fisheries and offshore wind farms projects including economic concept in particular discount rate and opportunity cost.

S02-17672-Oral-Szaboova (ECOP)

Addressing conceptual and methodological tensions on resilience for sustainable marine governance

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Resilience-building is often a key target articulated by policies, plans and programmes that are seeking to support social, economic, and environmental sustainability within coastal social-ecological systems. Despite this, there is still significant variation in definitions and conceptualisations for what resilience is and how it should be measured or evaluated. For example, some people conceptualise resilience as a state of being, whereas others conceive it as a process, and there is ongoing tension around whether the goal of resilience is stability or whether there is room for transformation in response to change. Within social-ecological research, there have been attempts to draw together ideas about what resilience looks like for ecosystems vs. social systems, and collectives vs. individuals, with mixed success. Importantly, current discussions within academic circles can be misaligned with the general populations' understanding of resilience. This confusion can lead to misunderstandings and disagreements about the methods and goals of policy initiatives and interventions with the aim of "building resilience". These issues have been a recurring theme of discussions throughout the Resilience of Coastal Communities Project. This paper draws on insights from resilience literature spanning diverse disciplines and primary data collected through semi-structured interviews with 30 marine resource users. It will present reflections on the challenges of defining and measuring resilience, and the implications this has for sustainable marine governance. It will offer insights on ways to resolve existing conceptual mismatches and reach shared understandings when communicating with diverse stakeholders and designing resilience-building initiatives.

S02-17674-Oral-Sugino (ECOP)

Visualization of the overarching value network connecting people and sea

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There has recently been a growing call for the incorporation of coastal and marine social-ecological systems (SES) in discussions about the sustainability of coastal and island countries, given their close connections between people and the sea and coastal environments. These connections are not simply linear or direct; rather, they form a complex and intricate network mediating values and benefits between them. Gaining a comprehensive understanding of this network, which has yet to be fully understood and explored, is imperative to develop effective strategies that promote the sustainability of coastal and marine SES. To address this challenge, sentence completion survey, which has been developed as a projective test in the study field of psychology, was used in this study to explore individuals' attitudes and opinions how people recognize the values of sea. By integrating biterm topic modeling (BTM) and network (structure) analysis, this study succeeded to aggregate and visualize the network of individuals and sea connected through various values of sea people recognized. As one outcome, it was revealed that the respondents recognize several clusters of beneficiaries; the respondents themselves, their intimate others, those who are engaged in fisheries and maritime transportation, culture and philosophical concepts, countries in the world, and the Earth. Also, the study found that there are some significant hub structures with fish/seafood. Finally, the study discusses the potential of this value network as a visualization method for implementing explorable, explainable, evidence-based policy making (E3PM) toward the sustainability of SES from the social science side.

S02-17697-Oral-Bush (CANCELLED)

~~Aquaculture co-management in coastal and marine ecosystems~~

~~Simon. R. **Bush**[1], KwangSuk Oh[2], Elisabetta Martone[2] and Ava Razmjoo[2]~~

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~~[2]Food and Agriculture Organization of the United Nations, Rome.~~

~~Aquaculture is not commonly considered a collective form of aquatic food production. Nevertheless, aquaculture in its many forms is dependent on a range of shared public resources derived from coastal and marine ecosystems. Aquaculture producers also face a range of production risks - such as disease and water quality - that also extend beyond the boundaries of their farms and interact with these wider ecosystems. This presentation introduces the concept of collaborative aquaculture management or 'aquaculture co-management' as a means of addressing impacts of the sector on coastal and marine social-ecological systems. Defined as a set of strategic and operational collaborative arrangements that enable shared but differentiated responsibility, rights and benefits, aquaculture co-management can assist members states to the implement ecosystem-based approaches to aquaculture, and also achieve many of the wider social and environmental ambitions set out in global aquatic food policy, such as the FAO Blue Transformations Roadmap to 2030. The presentation will elaborate on the potential of aquaculture co-management by presenting a set of good aquaculture co-management practices and examples of their implementation in coastal and marine socio-ecological systems around the world.~~

S02-17702-Poster-Ballesteros POSTER->ORAL

Integrating the socioeconomic dimensions in the Marine-Maritime Spatial Planning

Jose Luis Santiago , Davinia Lojo and Marta **Ballesteros**

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Managing marine and maritime uses require systematically integrating the human dimension into the ocean data systems. Despite its relevance, socioeconomic data supporting MSP processes is missing or limited to descriptive activities. Providing evidence on the Human Dimension entails conceptual, methodological and technical developments. The analysis of the literature, data, portals, tools and methods shows four main challenges: 1) dataset limitations 2) absence of methods for gathering and aggregating socioeconomic data; 3) disconnection of information among disciplines; 4) lack of guidance on how to use these data to support decision making. An innovative approach has been tested to address them, applying a triangulation of methods supported by EMODnet and the Technical Expert Group of MSP data to a pilot case study in Galicia (Spain). While challenges are similar for datasets at different geographical scales, the solution differs. On the one hand, the granularity of the data allows for higher geographical accuracy in at the regional level. On the other, setting blue boundaries for economic activities at the national or European level is simpler. The result allows responding to critical questions for different societal actors. Policy makers can visualize the consequences of economic activities' emergence, displacement and disappearance. Practitioners and researchers can assess the total socioeconomic impact of the changes in the use of the marine space foreseen in a given plan. Professional organizations benefit from the information to improve their economic performance. Civic organizations take advantage of the capability to explore data sets covering the social, economic and ecologic dimensions.

S02-17726-Oral-Obregón

Mapping CBFM stakeholders' landscape in Vanuatu

Clara **Obregón**[1], Ryan Admiraal[2,] Pita Neihapi[3], Ajay Arudere[3], Regina Ephraim[3], Vasemaca Malverus[3], Abel Sami[3], Aurélie Delisle[1] and Dirk J. Steenbergen[1]

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To tackle complex, cross-sectoral challenges, such as food insecurity, climate change or overfishing of marine resources, collaborative governance is needed, as not one single actor has the capacity to support an adequate governance of such complex and dynamic issues. To build capacity for addressing complex challenges affecting Vanuatu's coastal fisheries, national and international agencies have substantially invested on governance networks, community-based fisheries programs, and in scaling up community-based fisheries management (CBFM) approaches through information sharing, with the ambition to move from 'small and few' to 'large and many' communities implementing CBFM. We combined quantitative social network analysis with qualitative data to analyse the pathways used for information sharing among coastal fisheries governance stakeholders in Vanuatu and the strength of their collaborative relationships. We explored two network configurations among Vanuatu's coastal fisheries' stakeholders: i) information sharing and ii) collaboration interactions. Understanding the network position among marine resource management and governance organisations is increasingly recognised as a central indicator of the resulting management outputs. Our study complements a relatively recent body of work on the influence of network structure in resource management successful outputs. We present some of the current barriers on information sharing and collaborative relationships between development organisations, government agencies, NGOs and other groups at different scales in Vanuatu, and showcase some of the opportunities that such agencies could explore to support and enhance the scaling of CBFM at a national and regional level.

S02-17527-Poster-Ballesteros (CANCELLED)

~~Unfolding governance for the integrated analysis of marine social-ecological systems~~

~~Marta **Ballesteros**~~

~~Centro Tecnológico del Mar, Fundación CETMAR, Vigo, Spain. E-mail: mballesteros@cetmar.org~~

~~The systematic analysis of the governance of marine social-ecological systems is pivotal to produce usable science. Unfortunately, knowledge advances are lagging due to discipline isolation, rhetoric application and confusion between governance as empirical phenomena and the theories about how it works. Governance, institutions and policies are used interchangeably in fisheries research and policy setting. In parallel, the multiple systemic interdependencies between the social and natural processes call for rethinking governance to facilitate interdisciplinary and transdisciplinary approaches. Currently, fisheries governance research is dominated by conceptual and meta-analytical efforts. In the search for generalization and theoretical developments, priority has been given to the comparative analysis to measure the effectiveness of management regimes worldwide; analysing management tools for rebuilding fisheries; advancing in the identification of the principles of institutional design that contribute to resources sustainability and documenting the attributes that guarantee the social, economic and ecological success of co-management. By comparing two major conceptual governance frameworks -the Social-Ecological Systems Framework and the Interactive Governance Framework- this presentation launches the debate of how best governance studies may contribute to the understanding of the functioning of marine social-ecological systems as well as to supporting integrated analysis.~~

S02-17546-Poster-Zhu (ECOP) (NO SHOW)

~~The experiences sharing of Implementing the Yellow Sea Large marine Ecosystem Project~~

~~Zhengguang **Zhu**~~

~~WWF, China. E-mail: 13552538239@163.com~~

~~The presentation will focus on the best practices and challenges on the ground of implementing the large marine ecosystem project by the environment officer of this project. The prestation will answer the concerns how to improve marine governance with interdisciplinary research and how to promoter the cooperation by cross-sectoral approaches. The Yellow Sea Large Marine Ecosystem will be an example to further discussion.~~

S02-17588-Poster-KIM (ECOP)

Putting blue carbon and ESG into ocean-based climate actions

Jungho Nam, Sunmi **Kim**, Seokmun Choi, Changwoo Kang, and Jiho Jung

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Ocean-based and nature-based solutions to mitigate climate change have garnered increasing attention from international bodies, expert groups, private companies, civil societies, and similar entities. The Ocean for Climate Declaration, established during the UNFCC's COP25 in 2019, emphasized the role of a healthy and productive ocean in both mitigating and adapting to climate change. This declaration served as a catalyst, compelling states and multilateral organizations to advocate for the ocean-centered climate action and formulate related policies.

The blue carbon, denoting carbon captured and sequestered by ocean and coastal ecosystems, stands as a fundamental element within both ocean-based climate actions and broader nature-based solutions. Public sectors, including governments and international entities, have integrated the safeguarding, expansion, and establishment of blue carbon habitats into their climate change and ecosystem-related policy frameworks. Successful implementation of blue carbon policies necessitates realigning regulations, advancing technology, conducting research, garnering societal support, and securing financial resources.

Securing sustainable financial resources is vital for executing on-site blue carbon projects, which involve bolstering and establishing blue carbon habitats. Given that public funding alone cannot meet the entirety of the demand for such projects, engagement from private sectors becomes indispensable. The Environmental, Social, and Governance (ESG) framework, initiated by the UN Global Compact, emerges as a pivotal mechanism to promote the ocean-based climate action and nature-based solutions.

This research evaluated the potential of blue carbon initiatives in temperate zones with less-vegetated tidal flats while identifying ESG (Blue ESG) inventories applicable to the ocean-based climate action.

S02-17628-Poster-Kang

Blue Carbon-based response to coastal city decline

Chang-Woo **Kang**, Ji-ho Jung, Il-Sun Choi, Sang-Hyeok Lee, Ye-Lim Kim

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As Korea's population risks such as low birth rate, super-aging population, and youth population outflow intensified, the population decline in local coastal cities also accelerated. Population decline shrinks socio-economic activities in local coastal cities, thereby reducing the city's capacity to develop, leading to the risk of decline and extinction of local coastal cities. In a situation where concerns about the risk of local extinction are being emphasized, policy responses are needed for local coastal cities that have a relatively high risk of decline.

Unlike inland cities, coastal cities have development potential that can utilize the value and resources of the coast and the ocean. In particular, at a time when awareness of the value of the coast and the ocean is increasing, in order for coastal cities to grow rather than decline, it is necessary to establish a coastal and marine resource-based urban development system, create a growth base coastal city, and promote cooperation in the cultural, ecological, and economic values of the ocean between coastal cities.

Coastal cities can seek ways to respond to coastal city decline by utilizing blue carbon as a marine resource. As the importance and utilization strategies of blue carbon are expanding globally, responding to urban decline using blue carbon can ensure timeliness in preparing response measures.

Therefore, by analyzing domestic policy trends related to blue carbon and cases of policy utilization in response to decline in local coastal cities, we aim to present a direction for comprehensive blue carbon-based response to decline in coastal cities.

S02-17660-Poster-Islam (ECOP) **CANCELLED**

~~Who's who in the mud crab fishery and business in Bangladesh: Mapping the production and value chain~~

~~Mohammad Minhazul **Islam**[1] and Robbel Hossain[2]~~

[1]~~Vaasa University of Applied Sciences, Vaasa, Finland. E-mail: e2002010@edu.vamk.fi~~
[2]~~Department of Coastal and Marine Fisheries, Sylhet Agricultural University, Sylhet, Bangladesh~~

~~Understanding the functions and mapping of the seafood value chain is a burgeoning challenge toward improving the sustainability of marine socio-ecological systems. This paper employed a structural mapping approach to identify different forms of coordination and interaction among actors and the key players involved in the mud crab production and value chain in Bangladesh. The main actors involved in the live mud crab production and value chain are the crab collectors, fatteners, wholesalers, suppliers, and exporters. Based on in-depth interviews, participatory observation, focus group discussion, and secondary literature analysis, the findings revealed the interactions among a diversity of actors within the chain, which is shaped by the middlemen and the exporter that control the business and export. The fishers comprise the largest group in the production chain, but they are the least empowered and disadvantaged. Formal and informal arrangements among actors increase fishers' dependence on other actors. The study also focuses on undue influence by the middlemen for unsustainable fishing, which could lead to further stress on the mud crab stock and its trade. Finally, the paper highlights the role of different actors, particularly middlemen and their trade, that shape the functioning of fisheries and the need for institutional arrangements in tackling the challenges towards sustainable mud crab fisheries and fair trade.~~

Session 3: Sustainable Ocean Development

Convenors:
Amber Himes-Cornell (FAO), corresponding
Tony Charles (Canada)
Stewart Frusher (Australia)
Beth Fulton (CSIRO)
Juan Lechuga Sánchez (FAO)
David Smith (CSIRO)

Plenary Speaker:
Cristiana Simão Seixas (Environmental Studies and Research Center (NEPAM), Brazil)

Ensuring sustainable use and development of the world's oceans is of global significance due to the recognition of its importance to address key global challenges and the ocean's importance to humankind in many ways. To ensure future sustainability, it is necessary to focus on what has been achieved, where we are going, and what challenges we will face including the role that local, national, regional and global actors play. This session will examine factors and perspectives for sustainable ocean use and development including the lessons learned from the past to inform the future. Sub-sessions will focus on the intersection between sustainable use and biodiversity conservation in the context of global agreements, community involvement, user rights, and the equitable distribution of capital, resources and returns.

S03-17671-Plenary-Simão Seixas

The role of biodiversity and ecosystem services in Ocean-based prosperity

Cristiana S. **Seixas**

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The role of biodiversity and ecosystem services for human well-being, economies and society, particularly regarding those provided by continental biomes, has been well addressed by the Global, Regionals and Thematic Assessments concluded by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and other national-level assessments inspired by IPBES. However, not much attention had been yet devoted by this international community of experts to the role of biodiversity and ecosystem services in Ocean-based prosperity, nor the social-environmental, political and economic challenges that need to be overcome for a sustainable Ocean development. In face of that, the Brazilian Platform on Biodiversity and Ecosystem Services (BPBES) has innovated in carrying out the 1st Brazilian Marine-Coastal Assessment on Biodiversity and Ecosystem Services (2023), which I co-chaired. Based on this recent experience, and as a co-chair of the 1st IPBES Regional Assessment for the Americas (2018), I will examine here challenges and opportunities for sustainable ocean use and development. The contribution of Indigenous Peoples and local communities' (IPLC) knowledge and practices to both assessments will be highlighted as well as the need for multi-level and multi-sector governance approaches to build Ocean-based prosperity and more equitable access to Ocean's contributions to people.

S03-17435-Oral-Wise (RECORDED)

The United Arab Emirate's Blue Economy

Mohammed Salman Alhammadi[1], Brent **Wise**[2,3], Marcus Sheaves[3,4]

(*by Alistair Hobday*)

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The United Arab Emirates (UAE) is advancing research and systems thinking across government, industry, and academia, to lead transformational change in a knowledge-based blue economy for the country and region. Four lenses have been acknowledged as critical to UAE's blue economy specifically (1) food security, (2) sustainable development, (3) environmental optimization, and (4) human capital.

Integrated management for the blue economy will be though provision of research-informed environmental impact assessments and spatial marine policy to inform decision-making. This will be supported by the implementation of ecosystem approaches to utilize, conserve, and enhance resources so that ecological processes are maintained, and quality of life in the future is improved.

Key research initiatives include recovery of fish stocks and enhanced aquaculture to reduce dependency on imported seafood thereby improving food security. Blue engineering through research on habitat restoration, and engineered solutions to reduce human impacts on coastal and offshore developments. Climate change mitigation and adaptation through science for blue carbon sequestration and research on environmental change within marine and coastal ecosystems including novel marine biodiscovery for species readily resilient to impacts of climate change.

Critical to success will be to increase participation in the Blue Economy by developing specific curricula in schools and universities reflecting the blue economy by harness the intellectual potential through incubating innovative ideas and encouraging entrepreneurship, while developing the knowledge sector within the UAE.

This talk will explore these initiatives and collectively how they will meet the United Nations Decade of Ocean Science for Sustainable Development 2021-2030.

S03-17437-Oral-Tembo (ECOP)

Sustainable fisheries: Bridging the gap between legislation and implementation

Danai **Tembo**

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South Africa's marine and coastal resources are rich, diverse national assets that represent an important interface of human activity, socio-economic influence and ecological diversity. Use of this resource rich ocean space has increased over time and the challenge for South Africa is finding a balance between protecting the ocean space while simultaneously encouraging research, investment, and use of the ocean resources in a manner that will contribute to economic upliftment and job creation. In order to maintain sustainable use of such a valuable resource, the country has favourable marine living resource legislation that not only mirrors the key fisheries management principles promoted by the international legal order but integrates the key aims of the Food and Agriculture Organisation (FAO) Code of Conduct. However, the implementation of various aspects of the legislation continues to be a challenge for the country and has resulted in increased pressure on the marine and coastal environments, many instances of poor policing, corruption, and heightened levels of illegal, unreported, and unregulated fishing. These factors highlight an urgent need to bridge the gap between legislation and implementation through amendments to the penal code, more transparent processes that do not compromise the functioning and effectiveness of state institutions, and greater attention in addressing the human resources and financial limitation, as well as the enforcement challenges associated with addressing pressures on marine living resources.

S03-17458-Oral-Haugen (ECOP)

A performance measure framework for ecosystem-based management

Janne B. **Haugen**[1], Jason S. Link[2], Elizabeth A. Fulton[3,4], Mark Dickey-Collas[5,6], and Alida Bundy[7]

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Marine ecosystem-based management (EBM) is a transdisciplinary approach to management that accounts for interdependent components, structure, and functioning of ecosystems and human activities. EBM has been recognized as the best practice for managing multiple ocean uses and their associated ocean-use sectors, explicitly addressing cumulative effects and tradeoffs. However, implementing EBM has been challenging, and its effectiveness has not always been clear in instances where it has been attempted. Therefore, one of the key challenges to EBM is knowing if EBM is successful and functioning as intended. We need performance measures to assess the effectiveness of EBM strategies in achieving desired ecological, economic, governance, and social outcomes. To achieve this, we have developed an adaptable performance measure framework that consists of four main categories: 1) Sectoral Performance, 2) Marine Ecosystem Status, 3) Management and Tradeoffs, and 4) Overall Ecosystem Integration, each with suitable indicators and reference points. The adaptability of the framework is demonstrated with real case studies from the U.S., and Europe. Additionally, we show how the framework responds to two hypothetical case studies, a non-EBM scenario and EBM nirvana.

S03-17503-Oral-Richter

How non-compliance behavior affects investments in fishing quota and capital

Florian Diekert[1,2], Yuanhao Li[3], Linda Nøstbakken[3,4] and Andries **Richter**[1,5]

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A key challenge of fisheries management is to design rules and regulations that incentives fishers to operate profitably and sustainably. Management authorities usually use a combination of instruments, ranging from technical requirements to quota regulations. There is considerable heterogeneity among fishers to what extent different violations can be justified. While some fishers show greater acceptability to violate technical requirements, such as minimum sizes, others are more tolerant towards violating quota. These differences in moral costs regarding violation of rules may lead to ramifications on capital and quota markets. In an industry with imperfect enforcement, agents with lower intrinsic moral costs of violating technology regulations may receive higher profits from fishing compared to their compliant counterparts. Hence, they invest more in both physical capital and quota to be able to harvest more. Agents with lower intrinsic moral costs of violating quota regulations are not expected to alter their choice of capital level, but less compliant agents will purchase less quota. To test our predictions, we collect data on resource users' risk preferences, intrinsic moral motivations to comply with regulations, and their self-reported frequencies of violations. The data was collected by conducting a series of incentivized economic experiments and a survey on Norwegian fishers. In line with our hypotheses, we find evidence that fishers who are more likely to justify technology regulations are more likely to invest in quotas. Fishers who are more likely to justify quota regulations are less likely to invest in quotas.

S03-17516-Oral-Himes-Cornell

Community-based Fisheries Management, Tenure Rights, and Achieving International Sustainability and Conservation Targets by 2030: Implications for Local Communities

Amber **Himes-Cornell**[1], Juan Lechuga Sánchez[1], Anthony Charles[2]

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The implementation and reinforcement of spatial management strategies across various sectors, including the establishment of marine protected areas (MPAs) and the utilization of other forms of area-based management tools (also known as 'other effective area-based conservation measures' (OECMs)), offers an opportunity to drive positive outcomes for biodiversity and people, as captured in the Kunming Montreal Global Biodiversity Framework Targets and the United Nations Sustainable Development Goals (SDGs). Notably, the push for effectively conserving more of the ocean has gained momentum in recent years, and targets for the amount of ocean to be conserved have expanded from 10% to 30% by 2030. Meeting those targets in the marine realm with MPAs alone will not be feasible, as has been shown by the failure to achieve the 10% conservation target by 2020 set by the Aichi Biodiversity Target 11 and SDG 14.5. This has increased the interest in the identification of OECMs. Although few OECMs have been reported so far, governments are increasing their efforts in identifying areas in their national waters that provide, or potentially could provide, biodiversity benefits and could be recognized as OECMs. Many of those areas are already managed in some way, either by governments, Indigenous communities or local communities. This paper will explore both the positive and negative implications of OECM recognition for communities and the rights and role of local communities in the OECM recognition and reporting process.

S03-17552-Oral-Frusher

Developing a new era for seafood production for a sustainable ocean

Stewart **Frusher**

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The offshore marine national jurisdiction (marine exclusive economic zone) supports a number of surface based industries (e.g. shipping and transportation, oil and gas, fishing, recreational yachting). With growing interest in this region and predictions of the maritime industry landscape being poised to undergo a profound transition, many countries are viewing their offshore marine estate as a "blue fields" development opportunity. This is particularly the case offshore for sector specific industries such as aquaculture or for platforms to support multiple uses for existing, emerging and new industries. By focusing on incorporating ecosystem services and the sustainable development goals from the outset in the design of aquaculture systems it is possible to develop more holistic systems that move beyond a single focus on seafood production. Coastal restoration, coastal livelihoods, conservation and climate mitigation can all be additional benefits of offshore aquaculture development. In this presentation, we describe two conceptual offshore production systems to illustrate the dispersed benefits. Developing these systems requires co-ordinated efforts across inter-disciplinary researchers and innovative industry partners to ensure appropriate governance, economic viability, community acceptability. We finish by demonstrating how incorporating system design into inter-sectoral offshore platform activities can further enhance these broader benefits.

S03-17555-Poster-Matovu (ECOP) ORAL and POSTER

Women in Maritime Transport: Persistent Challenges and Emerging Opportunities for Inclusion in the Blue Economy: A Case Study of India

Baker **Matovu**[1]; Meltem Alkoyak-Yildiz[2]

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Maritime transport is recognized as a key component in the attainment of the Blue Economy (BE) Agenda and Sustainable Development Goals (SDGs); especially for developing maritime nations. More than 80% of the world's goods commerce is transported by sea, and this figure is much higher for the majority of the global South's nations, such as India, where marine transport accounts for more than 95% of trade volume. The Government of India launched the Sagarmala program in 2015 and has created a draft BE Framework to increase investment in coastal infrastructure e.g. ports, and shipping to tap the BE potential and opportunities. Unfortunately, increased investments have not coincided with increased gender parity e.g. in women's labor participation and socioeconomic empowerment. This could hamper the national and global targets for women's inclusion in the maritime transport sector thus affecting sustainable livelihood. This conundrum forms the basis for this study to explore the challenges and identify possible opportunities for women's inclusion. A transdisciplinary research approach involving the use of a systematic literature review and participatory interactions (interviews and discussions) with women in the maritime transport sector will be used. The findings will be key in identifying systemic barriers to women's inclusion and creating a novel framework to guide women's inclusion that can be used by national/regional policy actors to develop evidence-based and inclusive strategies to boost women's participation in male-dominated maritime transport activities and sub-sectors.

S03-17577-Oral-Xavier

Harmony in the Wind: Unveiling Social Impacts of Wind Farm Development, a scoping review

Luciana Y. **Xavier**[1], Geovanna P. Pereira[2] and Alexander Turra[1]

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As the global demand for renewable energy rises, wind farms play a vital role in sustainable development. However, the social impacts of these projects are often overshadowed by environmental concerns. This paper analyzes the current state of social impact assessments for wind farms and their potential contribution to a just blue economy. Through a scoping review, we examine scientific literature, probing methodologies, findings, and gaps in assessing social impacts related to wind farm installations, operations, and decommissioning. By characterizing the field, we identify opportunities and gaps in understanding and addressing social dimensions in decision-making processes and how they impact sustainable ocean development. The paper emphasizes the contribution of comprehensive social impact considerations to the goal of a sustainable blue economy, including implications for local communities, user rights, and equitable distribution of benefits. It argues that understanding social impacts is crucial for ethical development and long-term project sustainability. Our findings contribute to integrating social considerations into decision-making for wind farm developments, advocating for an inclusive approach that prioritizes social aspects in ensuring the economic success and well-being of coastal communities.

S03-17601-Oral-Olsen

How expanding the blue economy is increasing interest in ecosystem-based Marine Spatial planning in the Global South

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Ecosystem-Based Management (EBM) emerges as a crucial solution to address sustainability challenges within marine socio-ecological systems. Despite being perceived as intricate and resource-intensive, operational management plans embodying EBM principles remain scarce, particularly in countries beyond the global north. Recently, the heightened emphasis on the blue economy as a conduit to realize the United Nations Sustainable Development Goals (SDGs) has revitalized interest in EBM among nations in the global south. Recognizing that the augmentation of their blue economy hinges on the sustainable spatial governance of marine ecosystems and associated human activities, these countries are strategically pursuing EBM through a pragmatic and spatial lens.

To concretize this vision, Marine Spatial Planning (MSP) is being leveraged as a pivotal tool. Its essence lies in achieving a harmonious equilibrium between sustainability objectives and economic sector expansion. Prominent examples of this approach are countries such as Kenya, Mozambique, and India, where the common thread is a resolute top-down political commitment. This commitment is complemented by international support from entities like the Intergovernmental Oceanographic Commission (IOC) through initiatives such as MSP Global and the Ocean Panel. Furthermore, financial backing from key donors iunderscores the global community's commitment to fostering sustainable marine management.

These initiatives undertaken by key marine nations in the global south signal a promising trajectory towards enhancing ocean sustainability. As these countries and regions aspire to assume a more prominent role in addressing ocean sustainability challenges, they contribute significantly to realizing the ambitions of the UN 2030 agenda.

KEY WORDS:

Ecosystem-based management, Marine spatial planning, global south, India, Mozambique, Kenya, SDGs, Blue economy

S03-17614-Oral-Lawless (ECOP)

Toward socially responsible governance of marine climate interventions

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Marine climate interventions are intentional actions to achieve climate mitigation and/or adaptation goals in marine social-ecological systems. *Socially responsible* marine climate interventions not only prolong the sustainability of marine ecosystems, but improve social conditions, protecting or advancing the rights and wellbeing of ocean dependent people, communities, and societies. To understand social considerations, we undertook a global survey of 333 scientists and practitioners proposing, testing and/or implementing 76 'new and emerging' marine climate interventions. We triangulated these data with key-informant interviews with best-practice leaders (n=7), and a review of regulations and guidelines influencing interventions (n=10). Survey data indicate that among most scientists and practitioners, social considerations tend to focus on securing 'upstream' acceptance of interventions (i.e., public and stakeholder buy-in), with little (relative to best practice leaders) consideration for 'downstream' social benefits and burdens. Survey and interview data reveal intervention feasibility assessments predominately rely on biophysical, oceanographic and economic risk modelling, potentially obscuring understandings of the social implications. All data sources highlight that societal improvements are rarely considered as desired end goals of interventions. Our study highlights unfilled potential to pair technical and ecological models and intervention assessments with innovative methods that anticipate and promote socially equitable and desirable futures. We argue socially responsible governance of new marine climate interventions needs more deliberate focus on achievement of mutual ecological and societal gains, improved ethics and social science competency, operationalisation of social justice mechanisms, as well as a broadened view of what viable and favourable climate interventions may entail.

S03-17616-Oral-Lewis

Building a blue economy in Aotearoa / New Zealand: Practices, principles, and possibilities

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Achieving sustainable development in ocean spaces will require altered decision making at all points of economic action from investment to consumption as well as regulatory interventions. This paper outlines the blue economy research programme of New Zealand's Sustainable Seas National Science Challenge, which is designed to encourage sustainable economic development in New Zealand's marine estate. Underpinned by a commitment to economic activities that deliver social and cultural returns and healthy ocean futures as well as economic returns, the programme has focused attention on indigenous economy, restoration economy, and innovative uses of marine resources as well as achieving more environmentally appropriate production practices. This paper describes the focus of the research and outlines its impacts to date. It highlights a set of research-based 'Blue Economy Principles' designed to socialize sustainable development and guide a broad range of decision making at multiple sites from policy to investment and production to consumption. These principles are focused on shifting economic practices and decision making and creating possibilities for sustainable development. They are designed to operate in tandem with Te Ao Māori (Indigenous) approaches and ecosystem-based management to build a blue economy that will prevent further degradation of the oceans, restore ecosystems, and serve generations of New Zealanders by providing livelihoods and diverse social values.

S03-17651-Oral-Claudet

The MSP Index: A tool to guide and assess marine spatial planning

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Marine spatial planning (MSP) has the potential to balance demands for ocean space with environmental protection and is increasingly considered crucial for achieving global ocean goals. In theory, MSP should adhere to six principles, being: (1) ecosystem-based, (2) integrated, (3) place-based, (4) adaptive, (5) strategic, and (6) participatory. Despite nearly two decades of practice, MSP continues to face critical challenges to fully realize these principles, hindering its ability to deliver positive outcomes for people and nature. Here, we present the MSP Index, a tool for assessing progress in MSP processes based on MSP principles that can guide practitioners in operationalizing these principles. Using qualitative analysis of fundamental MSP guides, complemented with a literature review, we identified key features of MSP principles and developed these features into a scoring guide that assesses progress relative to each principle. We trialed and validated the MSP Index on six case studies from distinct regions. We found that the MSP Index allows for high-level comparison across diverse marine spatial plans, highlighting the extent to which MSP principles have permeated practice. Our results reveal successes, especially for the place-based principle, and failures to fully adhere to the adaptive and participatory principles of MSP. The Index serves as a guidance tool that would be best employed by practitioners and can inform science on the evolution of MSP. It is the first tool of its kind to translate MSP principles into practice, allowing for assessment of individual initiatives and comparison of diverse initiatives across ocean regions and nations.

S03-17708-Oral-Stephenson

Blueprint for Blue Economy Implementation

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Many nations aspire to Integrated Management (IM) for development of the Blue Economy (BE). This requires explicit consideration of the social-ecological system (SES), and development of a practical framework for implementation and evaluation of success. Based on our experience in Australia and Canada, where there is increasing BE/IM activity, new developments are leading to ocean crowding and increasing the risk of undesirable outcomes. We propose a blueprint for implementation involving four steps: 1) articulation of common SES objectives (ecological, economic, social-cultural and governance), 2) development of a governance framework in which SES objectives can be applied in management of all activities in an area, 3) a process to address conflicts, risks and trade-offs, and 4) evaluation of cumulative effects and performance. We illustrate the blueprint using candidate objectives relevant to offshore wind energy development. While there is a potential problem for ocean crowding and for 'plan crowding' caused by a proliferation of sector-based planning, we suggest that there is the potential for the BE/IM concept, properly implemented, to assist in overcoming long-standing deficiencies in existing sector-based approaches and to avoid deficiencies in planning and management associated with new or expanding industries. Implementation of BE/IM will also facilitate achieving ambitious aspirations associated with national and international initiatives including the High Level Oceans Panel and Sustainable Development Goals.

S03-17555-Poster-Matovu (ECOP) ORAL and POSTER

Women in Maritime Transport: Persistent Challenges and Emerging Opportunities for Inclusion in the Blue Economy: A Case Study of India

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Maritime transport is recognized as a key component in the attainment of the Blue Economy (BE) Agenda and Sustainable Development Goals (SDGs); especially for developing maritime nations. More than 80% of the world's goods commerce is transported by sea, and this figure is much higher for the majority of the global South's nations, such as India, where marine transport accounts for more than 95% of trade volume. The Government of India launched the Sagarmala program in 2015 and has created a draft BE Framework to increase investment in coastal infrastructure e.g. ports, and shipping to tap the BE potential and opportunities. Unfortunately, increased investments have not coincided with increased gender parity e.g. in women's labor participation and socioeconomic empowerment. This could hamper the national and global targets for women's inclusion in the maritime transport sector thus affecting sustainable livelihood. This conundrum forms the basis for this study to explore the challenges and identify possible opportunities for women's inclusion. A transdisciplinary research approach involving the use of a systematic literature review and participatory interactions (interviews and discussions) with women in the maritime transport sector will be used. The findings will be key in identifying systemic barriers to women's inclusion and creating a novel framework to guide women's inclusion that can be used by national/regional policy actors to develop evidence-based and inclusive strategies to boost women's participation in male-dominated maritime transport activities and sub-sectors.

S03-17647-Poster-Choi

Sustainability assessment system for the ocean

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Since the adoption of the Sustainable Development Goals (SDGs) by the UN, countries have been encouraged to monitor sustainability through tailored objectives and assessment methods. The UN specifically delineates SDGs 14, focusing on ocean-related goals. Achieving SDGs 14 by 2030 necessitates evaluating the sustainability status and changes in the ocean, closely monitoring progress toward goal attainment. Assessing ocean sustainability requires a comprehensive framework that transcends individual elements and functions, considering societal, economic, and environmental factors. This process links the diverse tangible and intangible resources provided by the ocean to human utilization. Currently, there is a deficiency in assessment criteria and methods for evaluating ocean sustainability, reflecting a lack of research and attention in this area. The purpose of this study is to develop an evaluation framework that considers the health of the oceans and human well-being to assess ocean sustainability. Based on the Doughnut Economics theory, this framework connects ocean activities and human welfare to harmonize ocean growth and sustainability while minimizing environmental degradation. The research proposes an integrated assessment system for ocean sustainability at the national level, incorporating environmental, economic, and social aspects, and emphasizes the need to monitor progress toward achieving SDGs 14. The study's results are expected to contribute to formulating strategies and policies for sustainable ocean development, presenting a multidimensional and integrated analysis with about 110 evaluation indicators across four sectors and thirteen sub-sectors.

Session 4: Risk perception and assessment for marine ecosystem-based management

Convenors:
Jess Melbourne-Thomas (Australia), corresponding
Debbi Pedreschi (Ireland), corresponding

Plenary Speaker:
Jess Melbourne-Thomas (CSIRO Environment, Australia)

Integrated actions are needed to address the many pressures impacting marine ecosystems and the communities that depend on them. Resource managers are increasingly required to assess the cumulative risk of these pressures; however, public perception of risk often deviates from technical assessments. Managers thus face a dilemma: if they base their policies on technical assessments alone, they may lose public support; if they use only the perceptions as guidance, they may spend resources dedicated to risk reduction unwisely. Our highly interactive session will explore risk and vulnerability assessment, perception, and management across a range of topics including climate, habitat, and fishing communities, among others.

S04-17410-Plenary-Melbourne-Thomas

Collaborative approaches to navigating different risk perspectives in decision making for marine social-ecological systems

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Decision making for marine social-ecological systems is underpinned by assessment of cumulative impacts, vulnerability and risk. Increasingly managers of marine spaces and ocean activities must integrate diverse perspectives and needs with information streams on current and future risk related to climate change and other human impacts. Navigating value pluralism (i.e. different people having different worldviews and hence different values) and differences in risk perception and risk literacy will be increasingly important in the future – for integrated management and in developing adaptation pathways for marine social-ecological systems. This will be a particular challenge in the development of a sustainable and equitable Blue Economy, where there is currently limited empirical information in many places to quantify risks associated with novel activities and emerging industries (such as offshore renewable energy and multi-trophic aquaculture).

Collaborative approaches to developing and implementing decision support tools amongst researchers, managers, rightsholders and stakeholders can help achieve more robust and equitable outcomes in climate change adaptation and sustainability pathways for marine social-ecological systems. Engagement of communities and integration of local knowledge can also improve social acceptability for decisions and developments, and help ensure responsible and ethical innovation in marine spaces. This presentation explores examples and learnings from transdisciplinary development and implementation of decision support tools for climate change adaptation and sustainable development in the Blue Economy. It considers how the use of interactive games and participatory modelling approaches can build engagement and support knowledge integration. It also highlights the importance of monitoring, evaluation and learning to better characterise the impact of transdisciplinary research.

S04-17455-Oral-Trebilco

Integrated system assessment and reporting for marine ecosystem-based management

Rowan **Trebilco**[1,2], Piers Dunstan[1], Mibu Fischer[1,2], Cass Hunter[1], Alistair Hobday[1,2], Karen Evans[1,2] and Beth Fulton[1,2]

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Regular assessments of the 'state of the environment' are essential for guiding sustainable management of marine social-ecological systems. Such assessments are therefore the focus of considerable effort worldwide, typically aiming to synthesise information on pressures, the risks posed by these pressures, and the effectiveness of management measures in place to address pressures and mitigate risks.

Efforts to date in this space have been valuable but shortcomings of current approaches are increasingly recognised. Foremost among these shortcomings is a lack of accounting for how the environment functions as an interconnected and dynamic system. This is problematic because it means that feedbacks, non-linearities and associated system-level behaviours such as tipping points are not captured, and cumulative pressures and risks are not adequately accounted for. An additional problem with the compartmentalised approach is that it dissonant to the Indigenous world view, in which all aspects of the environment and culture are linked, and therefore creates an additional barrier to engaging Indigenous people in assessment, reporting and management processes.

In this presentation we aim to stimulate discussion and highlight potential solutions for these issues, drawing examples from our recent experiences in assessing cumulative impacts within Australia's fisheries, Australia's national 5-yearly State of the Environment Report and the World Ocean Assessment. We consider potential approaches for accounting for system properties in assessments and outline a set of 5 key principles to support integrated system assessment and reporting in support of ecosystem-based management: coordination, integration, inclusiveness, transparency and repeatability, responsiveness and adaptiveness (the "CITRI" principles).

S04-17477-Oral-Blanz (ECOP)

Probabilistic Time to Collapse as a Risk Communication Tool

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We propose that shifting the harvest level negotiations from how much fish to harvest to how long a fishery should be sustained may help managers, fishers, and stakeholders understand the risks and provide a more tangible context for a precautionary approach. We provide a proof of concept where scientific advice is not only given in terms of a yearly harvest level for fisheries management decisions; but, in terms of how long a given harvest level could sustain a fishery for a wide range of harvest levels. Our case study is based on a time series from the Canadian Cod fishery of the Southern Gulf of St. Lawrence, for which we calibrate a simplified model as an emulator of more comprehensive models that would be used for specific fisheries and species. Crucially, however, our simplified model satisfies the requirements of allowing for time varying natural mortality rates observed in our study area and incorporating uncertainty about the system properties and uncertainty from random shocks to growth and natural mortality. Using the model we predict the distribution of the time to collapse for a wide range of relevant harvest levels. The predicted distributions of collapse times are then shown and translated into risk matrices. All results are shown for four selected years 1974, 1986, 1993, and 2017 allowing an evaluation of the risk communication method in different states of the system with different availability of observational data.

S04-17518-Oral-Pedreschi

Cumulative effects in integrated ecosystem assessments.

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Despite efforts to minimize the impacts of human activities, human demands are driving increases in maritime activity which will intensify pressures and their impacts. There is a need to sustainably balance the multiple marine and coastal human activities required to support our communities and realise the potential of the Blue Economy with the need to achieve favourable conservation status for vulnerable habitats and species. Thus, a better understanding of how multiple pressures interact and their combined effects is needed so that ecological tipping points can be identified and avoided, and trade-offs can be fully examined. One way to do this is through Integrated Ecosystem Assessment (IEA).

Here we present the risk assessment components of a Celtic Seas IEA which identifies the human activities, associated pressures, and impacts on the marine ecosystem. There are many ways to interrogate the output from a risk analysis, allowing multiple equally correct, yet differing perspectives. How those risks are perceived is vital to interpreting the outputs to tackle the relevant issues. We present how we have expanded and spatialized the Celtic Sea risk assessment using multiple data sources, and producing various 'risk maps'. Further, we illustrate how we have engaged with stakeholders throughout its development to ensure their perspectives are accounted for, and illustrate the difficulties that emerge when technical assessments and stakeholder perspectives differ. This work highlights the challenges of perspective, perception, and the limitations faced in the course of progressing marine ecosystem-based management.

S04-17551-Oral-Solberg (ECOP)

Applying Indigenous knowledge to identify drivers of change for Arctic char in Nunatsiavut, Canada

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Arctic char (*Salvelinus alpinuys*) is an important sociocultural and commercial species in Nunatsiavut, Canada, with a history of exploitation dating to the 1860s. Understanding the social, cultural, economic, and environmental pressures on the stock is key for supporting sustainable outcomes. An integrated risk assessment – a holistic, stakeholder driven approach towards documenting the status of, and threats to, the stock – is an effective way to ensure the long-term health of this important fishery in Nunatsiavut. In addition to environmental changes that impact stock trajectory and life history, changing socio-cultural-economic conditions—which are mediated by global climate change—can have unanticipated impacts on stock health. In Nunatsiavut, the availability of wild foods, changing cultural norms, and increasing connectivity with the global economy influence fishing pressure on Arctic char, affecting behavior, life-history, and abundance. We interviewed Indigenous harvesters of Artic char to gain insight into trends and patterns of Artic char and perceived threats. We found that there is interconnectedness of drivers. This case study provides a pathway to implement community and ecosystem-based fisheries management in Canada and provides a framework to meaningfully incorporate Indigenous knowledge into science advice.

S04-17569-Oral-Pilditch

Using ecosystem response footprints to guide environmental management priorities

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The coastal marine zone is subjected to a multitude of human stressors that originate both on land and in the ocean itself. The cumulative effects of multiple stressors have the potential to erode ecological resilience making ecosystems prone to threshold responses and tipping points from which recovery can be prolonged. Managing cumulative effects and predicting outcomes of mitigation or restorative actions represents a major challenge globally for environmental decision makers. Current cumulative effects management practice considers the spatial extent of each activity and the associated stressor footprint generated. However, activity and stressor footprints do not necessarily inform ecosystem responses, which often occupy different space and time scales and are characterised by context dependencies (i.e., the same responses do not occur everywhere). Because of the challenges in characterising ecological responses based solely on stressors and activities we suggest a shift is needed to emphasise the 'ecosystem response footprint'. We present a new framework that lays out a series of ecological characteristics of responses that can be used to define the ecosystem response footprint that includes; potential stressor legacy effects and non-additive stressor interactions, disturbance-recovery dynamics implicated in recoverability, and the spatial and temporal scales of stressor regimes. We use these characteristics to define the extent and depth of ecosystem response footprints and link these attributes to suitable actions for generating ecological recovery and resilience. Defining and reframing the focus on ecosystem response footprints can inform a holistic ecosystem-based approach to managing cumulative effects and inform guidelines for marine environmental management.

S04-17583-Oral-Hewitt

Dealing with risk and uncertainty in contested marine spaces

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Dealing with risk and uncertainty is critical for decision making, and no less so for the marine environmental management space. Everyone has a personal view on "what" they are prepared to risk, how uncertainty affects how they want that risk handled and, importantly, how prepared they are to listen to others' assessments of risk. To negotiate this space we need to be able to assess risks to multiple "whats" (e.g., business, cultural, social and ecological), deal with flow-on effects, and demonstrate the risks of decisions in a transparent fashion. This is compounded in the marine space, where data is often sparse and uncertainty may be expected consequently to be high. Moreover in coastal areas multiple activities generate cumulative effects with the probability of synergistic responses, non-linear responses and tipping points. Our research in Aotearoa New Zealand has highlighted the utility of understanding world views and allowing for multiple lines of evidence. We have also found Bayes Net to be a useful tool able to incorporate most "whats", flow on effects and non-linearity in a transparent fashion. We have also been able to use it to incorporate local and traditional ecological knowledge and expert opinion based on ecological and stressor principles.

S04-17604-Poster-Penglong POSTER->ORAL

Can common consumer judge freshness of fish in visual way? In the case of Japanese consumer

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In modern seafood markets, where fish are often obscured by packaging, consumer visual perception plays a crucial role in assessing fish freshness. This study bridges marine ecosystems and human sensory evaluation by examining Japanese consumers' ability to gauge fish freshness using only visual cues. We conducted an online survey with 529 participants, who evaluated the freshness of Horse mackerels based on photographs. This approach statistically validated the visual judgment skills of consumers.

Crucially, the study utilized principal component analyses to quantify the visual attributes of fish, including color and shape, revealing the human dimension of seafood assessment in marine ecosystems. These analyses, combined with measurements of physical characteristics like fatness and luster, allowed us to map how consumers visually interact with marine products.

The results highlighted that consumers predominantly rely on eye luminosity and specific color patterns to determine fish freshness, with less emphasis on shape. This indicates a nuanced understanding of visual cues in seafood selection, integral to consumer behavior in marine socio-ecological systems. Notably, consumers adept at making accurate assessments tended to correctly devalue high-eye luminance fish, suggesting a sophisticated interpretation of visual signals.

By exploring the interface between human perception and marine resource quality, this research provides insights into consumer behavior in marine ecosystems. It underscores the importance of integrating human dimensions in marine ecosystem management, especially in market contexts where sensory evaluation guides consumer choices.

S04-17617-Oral-Kaikkonen (ECOP)

Integrating Human Values and Emotions into Environmental Risk Assessments for Enhanced Decision-Making in Marine Resource Management

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Gaining insight into human impacts on marine ecosystems is important to leverage the ocean's potential at a time of global sustainability and governance challenges. Managing risks in these environments goes beyond technical assessments; it depends on individual perceptions of the risks which shape decision-making processes. Yet, human values and emotions are frequently overlooked in environmental decision-making, despite their significance in shaping our care for the marine environment and the actions we take to look after it. Here, I present an ongoing study where I investigate how to integrate human values and emotions into technical risk assessments within the domain of marine resource management. Drawing on an interdisciplinary approach, this study delves into the relevance of current risk assessment methodologies and investigates how people perceive the severity of impacts both to the marine environment and broader social-ecological systems. I focus on three offshore activities, seabed mining, offshore wind, and bottom fishing, and study the public sentiments around these industries, together with the specific risk perceptions of scientists, environmental managers, and policymakers involved in assessing the impacts of these activities. By focusing on these groups, this study aims to understand how public perceptions of human activities may relate to individuals' personal risk perceptions and the values and emotions they hold for the environment, focusing on offshore marine areas.

S04-17639-Oral-Buttay (ECOP)

An ecosystem risks assessment of the Norwegian Sea offshore ecoregion

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Ecosystem risk assessment considers how multiple sectors and pressures affect ecosystems components. Here, we conducted the risk assessment of the Norwegian Sea ecoregion using the expert-driven approach ODEMM (Options for Delivering Ecosystem-Based Marine Management), which is suitable to deal with contrasted sources and quality of information.

First, we identified the impact chains that link sectors to ecological components through different pressures. Each chain was scored semi-quantitatively according to the degree of impact of the pressure on the ecological component and to the spatial and temporal overlaps between the sector's pressure and the ecological component. In addition, we considered the persistence or the pressures and the resilience of the ecological components in order to evaluate recovery time. A total of 523 impact chains were identified, linking 12 Sectors to 17 ecological components through 9 pressures. The distribution of impacts is wide-ranging and all ecosystem components are, to some degree, impacted by human activities. The sectors representing the highest impact risk are *fishing*, *oil and gas* and, *shipping*, *land-based industry* and *agriculture*. *Fishing* impacts all ecological components via multiple pressures (e.g., *species extraction*, *bycatch*, *abrasion*) while the other sectors contribute mostly through *contaminants*, *noise*, and *litter*. *Noise* and *litter* have a broad impact, but the knowledge basis is weak, which points to knowledge gaps that need to be addressed in the future. By ranking all sectors, pressures and ecological components by impact risk, our results provide a robust basis to identify priorities for managing ecological risks in the Norwegian Sea offshore ecoregion.

S04-17657-Oral-Claudet

3D ocean conservation: Fisheries reach deep but marine protection remains shallow

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The wave of new global conservation targets and area-based conservation tools, the conclusion of the high seas treaty, and the rapid expansion of extractive use into the deep sea call for a paradigm shift in ocean conservation. The current reductionist two-dimensional representation of the ocean to set targets and measure impacts will fail at achieving effective biodiversity conservation. Here, we develop a framework that overlays depth realms onto marine ecoregions to conduct the first three-dimensional spatial analysis of global marine conservation achievements and fisheries footprint. Our novel approach reveals conservation gaps of twilight and abyssal depths and an underrepresentation of high protection levels from the shallow to the deep. In contrast, the 3D footprint of fisheries expands across all depths, with benthic fishing occurring down to the lower bathyal and mesopelagic fishing peaking in areas of abyssal depths. The three-dimensional mismatch between areas heavily fished and those highly protected emphasizes the need to shift towards a 3D approach to achieve effective biodiversity conservation and in turn, ocean sustainability.

S04-17662-Oral-Niiranen

Combining numbers with expert knowledge: Stakeholder guided ecosystem risk assessment of multiple ocean uses and their trade-offs

Susa **Niiranen**[1], Saskia Otto[2], Juncal Cabrera-Busto[3], Lucie Buttay[4], Débora Ferrari[5], Inês Gomes[6], Helene Gutte[2], Marcos Llope[3], Mamadou Ndiaw Seck[3], Kelly Ortega Cisneros[7], Debbi Pedreschi[8] and Benjamin Planque[4]

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The exploitation of natural resources is moving from land to sea at unprecedented rates. Together with rapidly changing climate, the risks for the deterioration of coastal and ocean ecosystems are increasing, and trade-offs between the different uses of ocean space and resources are unavoidable. Thus, the challenge of sustainable ocean management is not only getting more complex, but also urgent, calling for risk assessment approaches that can make the best use of existing evidence of social-ecological system interactions and vulnerabilities. This talk will introduce a probabilistic, stakeholder guided risk assessment approach that builds on both quantitative data and qualitative evidence, and is applied across seven Atlantic Ocean case-studies. The approach is hierarchical, and at each case study the key sectors, pressures and ecosystem components contributing most towards the risk of ecosystem degradation, or decrease in ocean-derived benefits to humans, are identified by a stakeholder dialogue process. Next, Bayesian Belief Networks (BBNs) are used to quantify the probabilities of change in ecosystem state and services, including cumulative effects and trade-offs, caused by the high-risk ocean sectors in different climate and socio-economic scenarios. The BBNs are parameterized with a mix of quantitative (observational, modelled) and qualitative (expert knowledge, existing publications) data to be able to include sectors (e.g. shipping, oil and gas), and regions (e.g. West African coast), where no sufficient quantitative data are available, but risks are evident. Finally, a semi-quantitative comparative regional analysis is carried out contributing towards an All-Atlantic risk assessment.

S04-17663-Oral-Llope

Fisheries, non-renewables and migration off west Africa, an integrated assessment of the Canary Current socio-ecosystem

Juncal Cabrera-Busto[1], Eduardo Ramírez-Romero[2], Raul Jumpe[3], Alfredo García-de-Vinuesa[1], Mamadou Ndiaw Seck[1], Eva García-Isarch[1], Babacar Diop[4] and Marcos **Llope**[1]

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The Canary Current Large Marine Ecosystem (or CCLME) is one of the most productive upwelling systems in the world. As such, the CCLME is key in providing food and resources to its bordering countries and beyond. The continuously increasing anthropogenic pressures arising from the various human activity sectors combined with climate change is jeopardising its ecosystem services and associated livelihoods, which results in enhanced migration to Europe.

Our Integrated Ecosystem Assessment (IEA) focussed on two subregions: the Senegal- Gambia-Guinea-Bissau and the Canary Islands as these are very distinct in terms of sectors, pressures, ecological characteristics and social, economic and institutional objectives. Our IEA included various ethodologies: (i) a structured risk assessment following the ODEMM methodology, (ii) a number of informal (interviews) and formal (workshops) scoping and validation exercises with stakeholders and (iii) the co-creation of a conceptual model with actors from diverse backgrounds: NGOs, fishers, managers, natural and social scientists.

Our semi-quantitative risk assessment identified which links of the sector-pressure- ecosystem component linkage chain has the highest impact risk while the more flexible conceptual modelling helped us incorporate local ecological knowledge and perceptions.

The Canaries future is perceived to revolve around blue growth and the energy transition (i.e., renewables). On the other hand, the southern stretch has great hopes on the prospects that the exploitation of fossil fuels can bring in terms of development, blame foreign fleets for stock depletion, which ultimately becomes a driver for migration.

S04-17502-Poster-Martins **ORAL and POSTER**

Using numerical frameworks to assess stressors impacts on deep-sea ecosystems

Irene **Martins**, Alexandra Guerra, Ana Costa and Fabíola Amorim

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In this presentation, we will show a numerical framework encompassing ocean circulation, Lagrangian dispersion and food web models, developed to predict the impacts of different stressors on Atlantic deep-sea ecosystems. Models were implemented in open source software (ROMS, OpenDrift, AQUATOX, Ecopath with Ecosim) aiming at understanding the impacts of various stressors, from hazardous and noxious substances (HNS) spills to seabed mining plumes, on seamounts and deep-sea hydrothermal vents. Results point out key-species on the functioning of Atlantic seamounts and vent fields. Sensitivity and uncertainty analyses were conducted to support results interpretation in the context of significant data gaps. Overall, we show that numerical frameworks, such as this one, are paramount to support Environmental Risk Assessment (ERA) on remote marine ecosystems.

S04-17561-Poster-Park (ECOP)

Threat of microplastic ingestion and chemical accumulation to stranded cetaceans in the Republic of Korea

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Plastic, while incredibly useful, is a hazardous pollutant that poses risks to the environment and wildlife. Cetaceans, in particular, may face extreme exposure to microplastics, yet the extent and how they ingest these microplastics remain poorly understood. In this study, we investigated the correlation between microplastic intake from different sources and the accumulation of chemicals through necropsies of stranded cetaceans in Korea. Firstly, we analyzed the ingestion of MPs in the digestive tract of five species (fin and sei whale, Indo-Pacific bottlenose and common dolphin, finless porpoise). Secondly, we compared the intake of MPs in the digestive tract and respiratory system of finless porpoises. Thirdly, we analyzed the ingested MPs and the concentration of Bisphenol A in the fat of finless porpoises. In all samples, MPs were detected with a mean abundance of 3.42±3.2 items/g and were predominantly transparent-white, fragment-shaped polypropylene smaller than 200 μm. The biological characteristics of the finless porpoises didn't show a correlation with the number of ingested microplastics. Finless porpoises had microplastics in their lungs, matching the properties of those ingested. Moreover, finless porpoises with higher microplastic counts in their bodies exhibited elevated concentrations of Bisphenol A in their fat. There is limited knowledge regarding the direct effects of microplastics. However, given the observed positive correlation between plastic ingestion and Bishpnol A accumulation, it is anticipated that plastic ingestion is linked to chemical accumulation. Our findings suggest that for species struggling to recover from human-induced pressures, understanding the threat posed by microplastics is crucial.

Session 5: Mapping human dimensions onto seascapes: Progress and challenges in integrating and applying human dimensions data in spatial considerations for marine ecosystem-based management

Convenors:
Karma Norman (USA), corresponding
Kirsten Leong (USA)
Jamie Tam (Canada)

Plenary Speaker:
Kevin St. Martin (Rutgers University, USA)

Marine social-ecological systems encompass benefits to society that are often spatially managed. As scientists develop spatial analyses of marine ecosystems and associated benefits, the demand for diverse data that reflect human dimensions expands, alongside the emphasis on integration of social-cultural, economic, and governance data with the more commonly collected ecological data. We highlight 1) the intersection of spatial approaches and social-cultural,economic, and governance data in decision making frameworks such as integrated ecosystem assessments, 2) describe their integration with ecological data, 3) outline and address challenges in human dimensions data collection and integration, and 4) provide dialogue opportunities on future spatial marine research and policy efforts.

S05-17717-Plenary-St Martin (RECORDED)

Responding to Climate Change: Revealing Fishing Community Precarity and the Foundations of Environmental Justice

Kevin **St. Martin**[1], Leonardo Calzada[1], Borja Nogué Algueró[2], Rebecca L. Selden[3], Zoë Kitchel[4], and Kaycee E. Coleman[5]

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Longstanding calls for environmental justice are only now being enacted within agencies responsible for fisheries management in the United States. This turn in policy foregrounds impacts upon the livelihoods and wellbeing of marginalized populations under conditions of precipitous industrial and climate change. Where the focus of management has long been the maximization of harvest, there is now a mandate to assess uneven and inequitable outcomes as experienced by fishing communities. This turn in fisheries policy implementation resonates with recently established policies and practices globally, such as the FAO's Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication.

The inclusion of environmental justice within fisheries policy in the U.S., and globally, will, however, require new metrological frameworks designed to make visible a range of "underserved communities" and to trace, over time, the impacts of not only government policy and practice, but also the uneven impacts of climate change. A research project in the Northeast of the U.S. is building metrics that document and map the precarious conditions and struggles for survival of fishing communities which had been made invisible by hegemonic accountings and metrics. These statistical and spatial measures of community health and decline, interpreted as indicators of community vulnerability and survival, and increasingly integrated into established institutions of fisheries management, document where and at what scale one might address questions of environmental justice.

S05-17451-Oral-Satterthwaite (ECOP)

Toward a social ecological ocean observing system for society

Erin **Satterthwaite**[1], Patricia M. Clay[2], Cassandra Wilson[3], Rachel Seary[2], Emily Smail[2] ,Victoria Ramenzoni[4] , & OSI Task Team Members

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The connection of social and ecological variables allows for the consideration of benefits that management interventions could have on both ecological and social systems, even where one or the other is the main objective. Compiling existing sets of social and socio-ecological indicators is an important step in making accessible, and therefore promoting the use of, the already expansive information available in this area. Through the U.S. Interagency Ocean Observation Committee (IOOC) Ocean Societal Indicators Task Team (OSI-TT) we: 1) solicited existing ocean societal indicators from U.S. federal agencies to understand to what extent they incorporated social science into ocean observing management programs, 2) identified types of ocean-related societal indicators and data from federal programs that could be clearly connected to data from ocean observing systems, and 3) identified gaps in and opportunities , and recommendations for integrating social indicators into ocean observing programs. We found suites of social and ecological indicators in 11 publications, of which 7 (63%) included both social and ecological indicators. Within these 11 publications we found 366 indicators, of which 333 were social indicators. Of the 333 social indicators, 35% (116) were or could be linked to ecological indicators. Most indicators were connected to biological Essential Ocean Variables (EOVs), such as fish, invertebrates, macroalgae, marine mammals, seabirds, sea turtles, microbes, phytoplankton, and hard coral and to physical and chemical EOVs such as sea state, wave height, sea surface height, and geological aspects. Recommendations emerging from this study encompass resource allocation, fostering collaboration, making social-ecological connections explicit, and prioritizing research to deepen the understanding of socio-ecological systems and improve decision-making.

S05-17461-Oral-Tam (ECOP)

Defining social-cultural and economic indicators for a lobsters fishing area using participatory modelling

J. C. **Tam**, C.E. Parlee, V. Pourfaraj, J. Campbell-Miller, A. M. Cook

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Social-cultural, economic, and ecological indicators that are used as performance measures for social-ecological systems (SES) support Ecosystem-Based Management (EBM) scientific advice processes (e.g. IEA) that are often spatially mismatched to the management level of individual fisheries. This can hinder progress in integrating SES information into single species management (Ecosystem Approaches to Fisheries Management; EAFM) or mutlispecies management (Ecosystem Based Fisheries Management; EBFM) as resource allocations and associated management options are regulated at smaller spatial scales or have stock/species management boundaries that do not align, respectively. Thus, developing SES information at spatially relevant management levels is an important component of progressing EAFM/EBFM/EBM.

Lobsters are a culturally and economically important species to Indigenous and fishing communities in the Maritimes Region of Canada. Scientific advice is provided through a framework, and managed through a Moderate Livelihood Fishing Plan or Integrated Fisheries Management Plan for 13 Lobster Fishing Areas (LFAs). Social Sciences and Humanities research into the Inshore lobster fishery in the Maritimes Region has revealed that relevant objectives and indicators that reflect human dimensions may be different across LFAs. Here we present the development of a SES for the lobster fishery in the Maritimes, and the refinement process through participatory modelling to define relevant indicators for an individual LFA. We conclude that regional SES will look different than area level SES, but both are relevant to the progress of EBM.

S05-17469-Oral-Norman

Spatial concerns in the use of social data to assess fishing communities for the California Current marine ecosystem

Karma C. **Norman**[1], Connor Lewis-Smith[2]

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As social scientists interested in the California Current large marine ecosystem have worked to integrate their data and approaches with biophysical data and analyses associated with the same ecosystem, developing and mapping socioeconomic measures for U.S. West Coast fishing communities have featured in these efforts. The initial focus has been on establishing narrow measures of community social vulnerability, particularly in the context of ecosystem connections realized through commercial fishing. These measures are presented at the community-level and spatially oriented along the California Current coastline. Nevertheless, conceptual models of the marine ecosystem have sought to characterize and integrate coast-wide social and ecological components more broadly. Collaborative work on measures of human wellbeing appropriate to socio-ecological analyses of marine ecosystems have identified major "domains" of wellbeing within which useful measures may be developed through new or extant data collections, and applied in the context of exogenous shocks to the socio-ecological system, such as the emergence of climate-oriented threats like frequent harmful algal blooms (HABs). Marine social scientists on the U.S. West Coast have further linked human communities adjacent to the California Current to its marine biota more holistically, through recreational and subsistence fishing as well as marine interactions that move beyond a singular focus on commercial fishing. Here, an examination of these more expansive approaches to fishing communities and associated social data on the West Coast serves to highlight spatial disparities both in terms of available data and analytical potential, and in terms of how fishing communities are defined and delineated.

S05-17481-Oral-Kasperski

Redefining sustainable fishing community participation in the United States in support of National Standard 8

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National Standard 8 of the Magnuson-Stevens Act is intended to support U.S. communities sustain their participation in state and federal fisheries activities whether for commercial, recreational, or for subsistence or cultural reasons. However, there is currently a lack of any quantitative metric to define whether a community has ceased to sustain its participation or for those communities nearing that level that are at risk of losing their access to the fishery. This study develops a novel methodology to exploit the cross sectional and temporal variation of fishing activities across communities to create a more holistic new index of overall community participation in Alaska fisheries that incorporates activities from commercial, recreational, and subsistence fisheries activities from 2008-2020. It also identifies six distinct components of community participation in Alaska fisheries and develops quantitative indices of community participation for each component, including: Working Harbors, Fishing for Food and Fun, Commercial Harvesting, Commercial Processing, Federal Marine Mammal Subsistence, and Subsistence Usage. This approach has revealed, heretofore unexamined declines in community participation across nearly all categories of participation in Alaska fisheries over that time period. These methods allow for a more holistic, yet specific, review of cumulative effects on communities and across all types of fishing activities and should help provide context for potential impacts of proposed management actions on communities in the future.

S05-17484-Oral-Leong

Incorporating spatially explicit sociocultural values in marine management for West Hawai‘i

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Spatial tools that incorporate socioeconomic and ecological data are increasingly desired in marine planning to help build an understanding of the linked human-environment relationships that constitute social-ecological systems. For example, the spatial heterogeneity and intensity of human activities in West Hawai‘i have been mapped using participatory geographic information systems. In addition to activities, social-ecological systems analyses are also emphasizing the importance of cultural ecosystem services (CES, the non-material benefits of nature) and relational values (the important relationships made possible by marine resources). Yet these are some of the most challenging concepts to represent spatially, especially when many of the local communities are grounded in Indigenous cultures. Further, existing CES methods are ill-equipped to adequately represent connections to which people ascribe multiple values (i.e., value pluralism), as well as those that are difficult to describe using a common measure (i.e., incommensurability). To address these challenges, we conducted a pilot project in West Hawai‘i that developed processes to improve spatial representation of social values in marine planning. This project identified three crucial changes in approach that were needed: (1) elicitation of the underlying meanings of cultural ecosystem services, (2) reframing the research question to focus on spatial representation of reciprocal values, and (3) recognizing the limitations of scaling analyses between place-based values and practices to large marine ecosystem dynamics. In this presentation, we summarize the research associated with each of these new approaches and implications for marine management.

Note: This replaces accepted abstract S5\14841_Nakachi

S05-17493-Oral-Wise (NO SHOW)

~~Challenging power asymmetries in integrating and applying human dimensions in Integrated Ecosystem Assessments~~

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~~Ecosystem-based approaches such as NOAA's Integrated Ecosystem Assessment (IEA) provides a platform to integrate and apply human dimensions into spatial management. The IEA framework should draw on the best available expert knowledge to understand the past, present, and future of social and ecological conditions in a region, providing a pathway to inform spatially explicit decision-making. Integrating human dimensions into spatial analysis through IEAs can better inform the delineation and designation of certain uses for specific activities. While IEAs support consideration of human dimensions into marine ecosystem-based management; the role of power within knowledge production and governance processes is often under-examined. People hold deep rooted epistemological differences that can undermine equitable inclusion of multiple knowledge systems, worldviews, and cosmologies. Social linkages and relationships with the marine ecosystem can diverge in meaning across scale, cultural understanding, experience, and location, involving complex social dynamics that further complicate understanding human dimensions of ecosystems. Human dimensions involve complex social dynamics and some information may be more easily integrated due to compatible technologies, shared experience and training, existing information pathways, and imbalanced representation. This paper draws from recent transdisciplinary work to reconfigure the Northern Bering Sea IEA to address power asymmetries within knowledge production and governance, and support broader inclusion in ecosystem assessments to inform decision-making. Exploring some of these challenges, the author highlights the important role of social science and its focus on power to explore diverse epistemologies and knowledge hierarchies as it relates to the IEA framework.~~

S05-17497-Oral-Sakai (ECOP)

Ex-ante Diversification, Limited Entry Permit Portfolio, and Fishers' Participation Decisions

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While livelihood diversification in terms of species, space, and time is considered key for fishers to cope with external shocks (Abbott et al. 2022), measuring the impact of diversification is challenging due to its ex-ante nature. An ideal measure of diversification should capture the possible choices fishers have, rather than the realized choices or outcomes. In this paper, we use the limited entry (LE) permit portfolio from the previous year to construct an ex-ante measure of diversification at the individual level. We first show that LE permit portfolios in the previous year can effectively be seen as a choice set of the vessel this year. We then show that our diversification measure—the number of types of LE permits in the portfolio in the previous year—is strongly correlated with popular ex-post measures of species, spatial, and temporal diversification, but they tend to deviate when an external shock hits the fisheries. Focusing on the US West Coast from 1995 to 2016, where most fisheries were limited entry, we find that ex-ante more diversified vessels are more likely to participate in the following year, and they exhibit a smaller coefficient of variation in gross revenue. Overall, our measure of diversification is conceptually sound and can be used as an alternative to popular ex-post measures.

S05-17520-Oral-Himes-Cornell

Challenges and opportunities for fisheries 'other effective area-based conservation measures' in meeting marine conservation goals by 2030 and beyond

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The global decline of biodiversity threatens our food supplies, opportunities for recreation and tourism, sources of building materials and medicines, and the practices, relationships, and identities central to the cultural survival of many groups. This loss has led to increasing awareness of the urgent need to safeguard the environment, including its components, processes and functions. Target 3 of the new Kunming-Montreal Global Biodiversity Framework includes an area-based target, including protected areas and 'other effective area-based conservation measures' (OECMs), to help mitigate such loss. OECMs in particular allow area-based management initiatives that are not considered to be protected areas to be counted as conserved areas and consequently contribute towards global biodiversity conservation goals. However, there is a question of how this will be interpreted, applied, and monitored. In an effort to help answer some of these questions, this presentation reviews the work of the Food and Agriculture Organization to develop global guidance on OECMs in fisheries and results of shared learning regional workshops aimed at building the capacity of countries on identifying, evaluating, and reporting fisheries-related OECMs. In addition, this initiative aims to document how the fisheries sector and managers can contribute to current and future area-based conservation goals based on observed impacts and expected threats to marine biodiversity. Lastly, we provide recommendations as well as highlight challenges for OECM identification. Ultimately, this research aims to help illuminate innovative practices for marine conservation and contribute to the achievement of the global marine conservation targets in a meaningful way.

S05-17532-Oral-Nomura (ECOP)

International Fishing Activities and Conflict Risks in the Pacific Ocean

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International conflicts over fisheries resources are becoming increasingly common, with wide-ranging environmental, social, economic, and political impacts. As distant water fishing fleets expand their spatial extents over the global ocean, the potential for conflicts between international fishing fleets is evolving. Two factors that may increase the likelihood of fisheries conflicts are a) sharing geographic space and b) having a history of conflicts (i.e., enduring rivalry). Here, we use fishing vessel locations and historical conflict data to study fisheries conflict risk in the Pacific Ocean. With spatial and network analyses, we identify regions and actors with higher conflict risk. We find that the spatial extents of fishing activities are dominated by relatively few countries (e.g., China, Taiwan, Japan), and the Tropical Pacific is the most diverse international area for fishing activity. Generally, there are higher conflict risks in regions of ungoverned high seas, near Exclusive Economic Zone borders, and the South/East China Seas. The network analyses identify distinct groups of countries as high-risk, suggesting that certain groups of countries are more likely to engage in conflict with each other than others. Overall, this study describes which country actors and ocean regions may be at an elevated risk of future fisheries conflict. The insights into international spatial overlap and conflict dynamics can provide relevant context for fisheries management objectives.

S05-17537-Oral-Welch (ECOP) CANCELLED

~~Selection of planning unit size in dynamic management strategies to reduce human-wildlife conflict~~

~~Heather **Welch**[1,2], Owen R. Liu[3,5,6], Leena Riekkola[3], Briana Abrahms[4], Elliott L. Hazen[2,1] and Jameal F. Samhouri[5]~~

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~~[6]Ocean Associates, Inc., Arlington, VA, USA~~

~~Conservation planning traditionally relies upon static reserves; however, there is increasing emphasis on dynamic management (DM) strategies that are flexible in space and time. Due to its novelty, DM lacks best practices to guide design and implementation. We assessed the effect of planning unit size in a DM tool designed to reduce entanglement of protected whales in vertical ropes of surface buoys attached to crab traps in the lucrative U.S. Dungeness crab (*Metacarcinus magister*) fishery. We conducted a retrospective analysis from 2009-2019 using modeled distributions of blue (*Balaenoptera musculus*) and humpback (*Megaptera novaeangliae)* whales and observed fisheries effort and revenue to evaluate the effect of seven planning unit sizes on DM tool performance. We measured performance as avoided whale entanglement risk and protected fisheries revenue. Small planning units avoided up to $47 million of revenue loss and reduced entanglement risk by up to 25% compared the large planning units currently in use by avoiding the incidental closure of areas with low biodiversity value and high fisheries revenue. However, large planning units were less affected by an unprecedented marine heatwave in 2014-2016 and by delays in information on the distributions of whales and the fishery. Our findings suggest that the choice of planning unit size will require decision-makers to navigate multiple socio-ecological considerations, - rather than a one-size-fits-all approach - to separate wildlife from threats under a changing climate.~~

S05-17543-Oral-Mengo (ECOP)

A place-based approach to explore sense of place in UK coastal areas using Participatory GIS Mapping (PGIS)

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There has been substantial growth globally in research on marine natural capital and ecosystem services in an attempt to improve the consideration of the environment in public decision-making. Although the importance of cultural ecosystem services (CES) is broadly recognised thanks to their inclusion in international frameworks, CES and other types of social values are often neglected due to their highly complex, intangible and immaterial nature. A further challenge associated to CES is understanding their spatial patterns, particularly in marine and coastal areas.

This work focuses on Sense of Place (SoP) and seeks to understand the factors shaping the local identity by spatially mapping the people-place relationship in UK coastal towns. Specifically, we use a Participatory Geographical Information System (PGIS) approach that employs spatial, quantitative and qualitative data collected via an online survey and stakeholder workshops, to develop a framework - which can be applied across a range of coastal contexts - for investigating SoP. This framework, comprising indicators of place attachment and place meaning, will be tested in selected coastal communities in the East of England.

Our research aims to demonstrate how spatially referenced cultural and social survey data can be coupled with place-based local knowledge to advance the inclusion of the SoP concept, and CES in general, into ecosystem services research and assessment. Ultimately, results from our study will directly inform future marine planning and coastal management decisions by developing an evidence base which can be used to analyse potential trade-offs, conflicts and synergies between ecosystem services and users.

S05-17558-Oral-Zhu (ECOP)

Microplastics in the seawater from the Beibu Gulf, South China Sea, China: Occurrence, sources and ecological risk

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In this study, microplastics in the seawater and bottom seawater were collected in the Beibu Gulf, South China Sea, China. The microplastic abundance in the surface layer was 1.35 ± 0.93 items/m3 and 0.79 ± 0.50 items /m3 in the bottom layer. The shape of microplastics in both surface and bottom waters was dominated by fragments and fibers, and the color was dominated by green and black. The surface water composition was dominated by Poly (methyl methacrylate) (45.39%) and Polyethylene (14.33%), while the bottom water composition was dominated by Polyethylene (28.99%), Poly (methyl methacrylate) (20.29%), Polypropylene (17.39%) and Polyethylene terephthalate (11.59%) dominated. Positive definite matrix factorization (PMF) model was applied to analyze the sources of microplastics, and it was found that the main sources of microplastics are pipeline abrasion, fishing activities, plastic waste, landfills, transportation, aquaculture and construction activities. The results of the pollution load index (PLI) showed that the overall risk of microplastic pollution was low in the Beibu Gulf. However, the polymer hazard index (PHI) of MPs polymers in water samples was high, and the overall risk of pollution was at level IV. These data emphasize the need for timely and effective actions to reduce the contribution of intensive human activities to the pollution of MPs and to inform further MPS ecotoxicology research, pollution control, and policy development.

S05-17559-Oral-Ellis

Scale and Ecosystem Based Management: Navigating mismatches between socio-ecological systems

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Ecosystem Based Management (EBM) is a dynamic process, focused on understanding and managing ecosystems across a range of organisational, spatial and temporal scales. Despite the importance of scale, only rarely is scale-dependency in different disciplines and the interactions between them explicitly stated and bought into play as affecting both the decision-making process and its success. Unsurprisingly, many of the problems encountered by societies in managing natural ecosystems arise because of a mismatch between the scale of management and the scale(s) of the ecological processes being managed. This research therefore aims to produce new knowledge to better understand and communicate scale-dependencies for EBM. We evaluate scale-dependencies in socio-ecological systems and provide case study examples where scale is explicitly recognised resulting in 'scale fit'. Case studies include customary practices such as rāhui (restricted access) and research that acknowledges ecological heterogeneity when scaling up information. We further explore spatial and temporal aspects of ecological connectivity in relation to the size of the proposed management area and the duration and timing of the management actions. We do this against a background of the organisations and legal instruments that are responsible for managing marine systems to ensure social-ecological resilience. This research aims to facilitate the development of decision-making practices that explicitly identify scale-dependencies to increase the success of EBM decision-making processes.

S05-17563-Oral-Kageyama (ECOP)

Local people's values and motivations toward marine protected areas (MPAs) as a communication tool for inclusive and just MPA management

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Recently, many countries agreed on the ambitious goal called 30 by 30 and have tried to expand MPAs. However, due to the difficulties in monitoring and prohibiting activities in the ocean, there are many "paper MPAs" worldwide. To maintain MPAs properly and promote local people's involvement, an inclusive decision-making process and appropriate communication considering their preferences are vital. This study aims to investigate how to navigate MPA expansions, involving various actors and considering their diverse values and motivations toward MPA management. This study focused on three points: What kind of values local people emphasize for an MPA as their motivation to support it, what characteristics affect people's values and motivations, and how people's values and motivations are reflected in the MPA management.

The place-based case study was conducted from November 14th to December 22nd, 2023. The study area was the Yonarasuido Strait in the Yaeyama archipelago in Japan. This area has been conserved through a government-led national park and a fisheries' self-regulated spawning ground reserve. Q-methodology and semi-structured interviews are used in this study. Q-methodology was selected to explore people's subjective values and motivations toward the MPA. In addition, this method can inform those who have similar views about the MPA by grouping them. Semi-structured interviews were conducted with policymakers, researchers, fishers, and divers to understand the decision-making process. In the end, this study is expected to gain insights into how to promote inclusive and just MPA management as well as the effective way to communicate with local people.

S05-17567-Oral-Takeuchi (ECOP)

Modeling fish production of purse seine fishing in Tokyo Bay

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Fishers traditionally determine the most fruitful fishing locations by considering factors such as weather, seasons, and water temperature, relying heavily on their accumulated experiences. However, with the declining number of fishers in many parts of the world, there is a risk that this valuable knowledge may be lost. To address this, our research aims to visualize and preserve their empirical knowledge for future generations. In our study, we have incorporated environmental and fishing location data as explanatory variables and the quantity of fish caught as the dependent variable within our mathematical model. This approach enables us to visualize fishermen's predictions on the location and quantity of fish catches. We focused on purse seine fishing in Tokyo Bay, which provides spatially and temporally detailed data. This study's novelty lies in predicting the quantity of fish caught per net using this granular data, in contrast to previous studies which estimated daily catches. Since fishing conditions vary with each net, our model, leveraging detailed data, mirrors the actual decision-making process of fishermen who consider minor environmental changes. Such a model is anticipated to reveal the relationship between fish catches and environmental conditions with greater precision than before. Our preliminary results suggest that environmental variables that affect catches vary by species. Our findings are expected to contribute to the advancement of smart fisheries, as advocated by the Fisheries Agency of Japan, and to the promotion of efficient fishing practices that require fewer personnel.

S05-17579-Oral-Collier

Integrating conservation objectives with human activities and ecological data to develop performance measures for seagrass management area planning in Long Island Sound, USA

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Marine spatial planning (MSP) that meets conservation objectives, and results in socially acceptable and effective marine management, depends on understanding and addressing social, economic, ecological and governance factors in a planning area. The Fishers Island Seagrass Management Coalition is a local group of stakeholders in New York, USA, with goals that include: 1) effective management of 100% of the island's eelgrass (*Zostera marina*) to ensure no net loss from its 2017 extent, 2) maximizing levels of eelgrass protection, 3) maximizing suitable area for eelgrass recovery or restoration, and 4) reducing nitrogen loading from island-based sources. We worked with this Coalition and local government agencies to facilitate a community-driven MSP process for the development of the first seagrass management plan in Long Island Sound. Seagrass management areas were developed with stakeholders including commercial and recreational fishers, vessel operators, scuba divers, oyster farmers, golf course operators, landscapers, and others that use the island's marine and coastal areas. To support a transparent, inclusive, participatory, and science-based MSP process, we used SeaSketch software to facilitate ocean uses data collection, social and ecological data integration and visualization, scenario development for seagrass management areas, and interactive spatial planning discussions. This talk will feature how performance measures were developed to build custom analytics in SeaSketch and summarize results based on the Coalition's conservation goals and human activities in eelgrass habitat around Fishers Island. This project used a science-based approach that could be applied in other geographies to support MSP in relation to social and ecological goals.

S05-17591-Oral-Chen (ECOP)

Perspective transformation: How traditional fishery heritage fosters pro-environmental behavior change in marine protected areas in Taiwan, Sri Lanka, and the Marshall Islands

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Marine Protected Areas (MPAs) are considered a valuable solution to mitigate marine depletion in the context of global economic liberalism. However, the inefficacy of MPAs limits their performance in fisheries management and marine protection. Many studies suggest the human dimension is crucial in MPAs, yet they are often overlooked due to their intangibility and relative difficulty in control. Based on field surveys conducted in Taiwan, Sri Lanka, and the Republic of the Marshall Islands, this paper explores the human dimension potentials in MPA effectiveness from the perspective of place attachment. Place attachment is a psychological phenomenon viewed as pro-environment intention. We observed that the traditional fishery heritage (TFH) could induce the formation of place attachment among local fisherfolk. This place attachment is based on psychological connections, including collective memory, group identity, and a sense of belonging to the specific TFH. Individuals with stronger place attachments we have observed tend to demonstrate a higher commitment to sustainable marine resource management, such as compliance with fishing restrictions and participation in collective discussions on the trade-offs between unsustainable fishing methods and conservation. Further, place attachment can potentially form a psychological group within the community that is independent of occupation, gender, and age. This psychological coalition may contribute to resolving intense conflicts arising from using or protecting natural resources. Exploring place attachment derived from TFH may help facilitate a more comprehensive understanding of fisherfolk's perception formation and behavior transformation, providing a low-conflict implementation basis for MPA.

S05-17610-Oral-Garcia de Vinuesa Gutierrez (ECOP)

A balanced participatory process to advance towards a legitimized Ecosystem-Based Management in complex Social and Ecological Systems

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The coupled Guadalquivir estuary - Gulf of Cadiz (Ge-GoC) system is located in southwest Europe. There, a valuable estuarine nursery area sustains stocks of marine commercial species living in the gulf. The natural system is strongly impacted by human activities such as fishing, agriculture, shipping, aquaculture and mining, which exert direct pressures on the nursery role. The social context is extremely complex, with sectors competing for natural and economic resources. A Social Network Analysis (SNA) carried out over 55 stakeholders across 11 sectors revealed, among other social characteristics, homophilic patterns (i.e., a preference for intra-sectoral interactions). Inter-sectoral connectivity is essential for effective marine resources management, and participatory processes have proved to be efficient in establishing inter-sectoral links, engaging stakeholders in management practices. Conceptual modelling is a participative tool for extracting local/fishers' ecological knowledge, and ultimately facilitating the co-creation of legitimate frameworks. On the other hand, Bayesian Belief Networks (BBNs) can be used to formalize and quantify conceptual models and are commonly used to support decision-making in complex social and ecological systems. In this context, we used information provided by SNA to build a balanced participative process. We employed conceptual modelling through several workshops to collaboratively construct the first conceptual map of the Ge-GoC, including both the ecological and the social dimensions. Finally, a conceptual model was formalized using BBNs to inform management strategies aiming at achieving a harmonious equilibrium within the ecosystem boundaries.

S05-17625-Oral-Lowe Mackenzie (ECOP)

Integrating spatial dynamics and recreational values from the impacts of ocean acidification on coral reefs of the Main Hawaiian Islands

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Coral reefs, characterized by their rich diversity, are productive ecosystems contributing to the provision of a wide range of ecosystem services, including recreation, coastal protection, and marine biodiversity. Climate change impacts, including ocean acidification, pose a significant threat to coral reefs and the associated provisioning of ecosystem services. The spatial variability of these impacts underscores the need to develop more nuanced and spatially explicit tools in coastal ecosystem management that integrate ecological and socio-economic frameworks. To address this gap, we employ a spatial predictive Atlantis model to project changes in coral reef cover and fish biomass using downscaled ocean acidification predictions of three shared socioeconomic pathway (SSP) climate scenarios. Our analysis extends beyond the broad scale, aiming to identify vulnerabilities in both the overall provision and specific localized variations of ecosystem goods and services for the Main Hawaiian Islands (MHI). As a part of the socio-economic framework, we conduct a benefit transfer exercise, triangulating with empirical nonmarket valuation estimates from both revealed and stated preference assessments, measuring the recreational values associated with coral reef cover. Welfare losses are then calculated using spatial dynamic predictions for coastal recreational sites across the MHI under the various climate scenarios. Our process considers both site-specific characteristics and income distributions across islands to bridge the gap between ecological consequences and economic considerations. Our findings can inform policy decisions and resource allocation strategies aimed at minimizing vulnerabilities of ocean acidification, promoting a more comprehensive and holistic approach to ecosystem management in the MHI.

S05-17634-Oral-Lu (ECOP)

Bridging perspectives: Multi-objective conflict analysis in marine spatial planning – a case study in Penghu Archipelago, Taiwan

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Under the global net-zero policy objective, promoting renewable energy becomes a crucial component. Marine renewable energy is one of the critical sources to fit the target. However, the site selection for marine renewable energy raises conflicts in the utilization of maritime spaces. Taiwan faces the challenge of this green dilemma, and maritime spatial planning is considered a vital tool for energy policy. Social justice is another issue during the process of energy transition. To understand and mitigate the social and economic costs of multi-objective conflicts in maritime space usage, this study analyzes maritime space usage patterns through systematic interviews with stakeholders. Penghu Archipelago has precious marine resources and is also a major fishing ground, tourism destination, and transportation route in Taiwan. This research takes the Penghu Archipelago as a case study site, and the analysis combines scientific data with stakeholders' attitudes and awareness. This study attempts to clarify critical issues for marine renewable energy and conflicts among uses. Aligned with the overall goals of renewable energy policies, considering the multi-objective utilization of maritime space, the study proposes a framework for holistic maritime spatial planning. This framework will serve as a scientific basis for addressing issues related to developing renewable energy sectors, regulations, cross-sector governance, special regions, etc., and guide future maritime spatial planning.

S05-17644-Oral-Nazia (ECOP)

Impact of Blue Economy Initiatives on Small-Scale Fisheries Sector in Bangladesh

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Bangladesh government is focusing on Blue Economy (BE) as a priority policy surrounding Bay of Bengal (BoB). The main difference BE brought in relation to previous marine development approach is that the economic growth was supposed to be sustainable and inclusive. Under BE, Bangladesh has drafted Marine Spatial Plan (MSP) for the entire BoB which has divided the marine and coastal space for industrial development, fishing, energy, tourism that will require space reclamation among various actors. As access to marine and coastal space and resources is critical to Small-Scale Fisheries (SSF), it is necessary to understand the changes in access to physical and institutional space for them in MSP. Though MSP is considered as an effective tool to manage multiple uses, there are risks (marginalization) and benefits (exclusive rights) in how spatial allocation plays out politically. Maximum global evidence highlights that growth-based policies privilege large-scale enterprises and economic growth over the rights and livelihoods of small-scale fishers. The aim of this paper is to explore the multidimensional nature of vulnerability of small-scale fishers under BE initiatives of Bangladesh. More specifically, it will analyze MSP from political ecology perspective to assess how it fosters the marginalization of small-scale fishers. Therefore, it will outline conceptual questions that anthropology brings to look at BE driven impacts in SSF sector and how does that help us understand the human dimensions of BoB social-ecological systems. Both primary and secondary data will be explored and analyzed as evidence to develop key arguments of this paper.

S05-17664-Oral-Ball (ECOP)

Evaluating spatial management scenarios using mixed fisheries model: a Celtic Sea case study

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Mixed fisheries models explore how technical interactions in multi-fleet, multi-stock fisheries affect management outcomes. Historical patterns and relationships between effort, catch, gear use and stock interaction are used to project how fleets impact multiple stocks under differing effort drivers and fishing patterns. Forecasts of fleet effort can identify imbalances in quotas, "choke" stocks and the impact of consequent over or under-exploitation on fishery and stock sustainability. These models often assume static distribution of fishing patterns, species targeting and fleet effort. However, fleets may – to some degree - adapt to fishing quotas by changing their prosecuted fisheries or target species. This can have a large impact on our perception of technical interactions and overall stock sustainability.

Here, we define spatially explicit métiers (fishing activity) for the UK fishing fleets via constrained hierarchical clustering of catch composition and incorporate these into the ICES Fleet and Fishery (FCube) mixed fisheries model for the Celtic Sea. Using this, we explore scenarios that alter assumptions around fishing patterns and assess impacts on outcomes and tradeoffs in meeting single stock management. The model is used to identify optimal effort allocations for fleets to maximise quota uptakes, reduce quota imbalances and to assess possible improvements to stock sustainability in mixed fisheries. Optimal effort distributions are compared to recent observations, and the potential for spatial adaptations to address imbalances in single species quotas from a mixed fisheries perspective discussed. This study contributes to the development of Mixed fisheries models, demonstrating how assumptions around fleet dynamics can be explored.

S05-17685-Oral-Lam

Seascapes: Eliciting values and negotiating policy trade-offs related to the sea

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Seascapes are intersections of land and sea, culture and nature, art and science. They are at once visual depictions of the sea (art), spatially heterogeneous and dynamic spaces (ecology); coastal landscapes and adjoining areas of open water (anthropology), and the visible interaction of abiotic, biotic and human processes on the coast, sea and adjacent waters (geography). This multiplicity of meanings, imaginaries, and disciplinary representations of seascapes make them a useful linking concept for integrated assessments of the ecological and human dimensions of marine resources. Resource conflicts are exacerbated when seascape activities (e.g., fisheries, aquaculture, oil and gas production, transportation, and recreation) overlap in space and time. To reconcile competing uses and/or protection of marine and coastal waters, ecosystem-based management focuses on the integrated marine social-ecological system in science and policy. This integration has conceptual appeal, but it leads to high system complexity and uncertainty in implementation, requiring coordination and collaboration across diverse human perspectives, interests, and goals among multiple communities, stakeholders, and agencies. Recognizing that management goals are ultimately statements of values, we conduct empirical research to probe what and how values influence human preferences, decisions and behaviours with respect to marine and coastal environments. We present results of a survey conducted on Norwegians´ values and identities related to the sea, their perspectives on topical issues in ocean and coastal management and governance, and their perceptions of marine threats. We discuss how these results, combined with ecological modelling of management strategy evaluations, might help identify, evaluate, and negotiate policy trade-offs.

S05-17699-Oral-Yang

Marine resources and environment carrying capacity & spatial development suitability assessment in China

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Since the 21st century, marine economy has been in a period of vigorous development worldwide. However, behind the rapid growth, marine resources and environment system has quietly undergone irreversible changes. The shortage of marine resources, the destruction of marine environment and the imbalance of marine ecological environment have gradually become important limiting factors for the development of current and future marine economy. In recent years, China has attached great importance to the construction of ecological civilization, and actively promoted the reconstruction of national space planning based on the evaluation of the resources and environment carrying capacity and spatial development suitability, thus emphasizing the bottom line of resources and environmentand promoting high-quality development. Based on comprehensive data such as resources, environment, ecologyand social economy, we explored the comprehensive application of multi-type data in marine spatial planning, andusesyntheticalindex system to establish the appraisal method for marine resources and environment carrying capacity and spatial development suitability. Our goal is to know the status and changing trend of marine resources and environment, identify the maximum carrying capacity and suitability zoning of marine utilization,and provide scientific support for marine spatial planning.

S05-17667-Poster-Courtier (ECOP)

Using Vessel Monitoring Systems Data to analyze the spatial distribution of the Pacific Salmon Ocean Troll Fishery in response to highly variable oceanographic conditions on the West Coast of the U.S.

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This study uses historical data on the spatial distribution of fishing vessels from 2007 – 2022 to develop models of spatial distribution and behavior of the Pacific Salmon Ocean Troll Fishery on the West Coast of the United States. This period is characterized by highly irregular oceanographic conditions, most notable of which was a severe marine heatwave (MHW) that persisted from 2013-2016. Previous studies have primarily investigated the biological impacts of this MHW, but less is known about the economic and social consequences among port communities. We analyze oceanographic variables, Vessel Monitoring Systems data, and landings receipts to understand the spatial redistribution of fishing effort in response to environmental shocks (e.g., MHWs) by evaluating changes in the location of salmon fishing effort in relation to port-level distribution of landings and revenue. Preliminary results indicate that during the MHW: 1) Landings were much lower than in previous years; 2) Fishing locations shifted northward; and 3) Fishing trips were longer both in terms of distance from port and number of days at sea per trip. Results from this study will be used to link the spatial distribution of fishing effort to port-level landings to assess community impacts and economic consequences of fleet responses to climate-induced changes and create a production and technical efficiency analysis which will examine the productivity of the commercial salmon fishery, particularly addressing increases in some measures of catch per unit effort amid low abundance in recent years.

S05-17668-Poster-Willis-Norton (ECOP)

A synthesis of socioeconomic and sociocultural indicators for assessing the impacts of offshore renewable energy on fishery participants and fishing communities

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Offshore renewable energy, particularly wind farms, is rapidly expanding globally and has become an essential component of many coastal nations' decarbonization plans, including the United States. The addition of these physical structures to the marine space may impact fish production and may preclude fishers from traditional fishing grounds - both of which have the potential to affect fisheries outcomes. Understanding the socioeconomic and sociocultural impacts of implementing offshore wind is crucial to determining appropriate mitigation strategies and to developing data collection, monitoring, and adaptive management strategies. This review synthesizes quantitative and qualitative indicators that have been used to assess the impact of fisheries preclusion and shifts in fished species' biomass on fishery participants. By providing a description of the indicator, a list of the datasets required to calculate its value, and a list of studies that used the indicator, this review can serve as a guide to those designing monitoring plans to determine socioeconomic and sociocultural offshore wind impacts.

Session 6: Social-ecological systems thinking: From ecosystem services perspectives

Convenors:
Shang Sunny Chen (China), corresponding
Andrea Belgrano (Sweden)
Ling Cao (China)
Sebastian Villasante (Spain)

Plenary Speaker:
Ling Cao (Xiamen University, China)

Marine Ecosystem Services (MES) which link ecosystem state and human well-being are one of the most important languages of social-ecological systems thinking. In theory, MES are a vital component of Ecosystem-Based Management underpinning sustainable Blue Economic growth. In practice, large-scale assessment of ecosystem services concepts in sea and ocean are generally limited to the supply side and critically, lack consideration of human demand. This is particularly true for cultural and regulating services. This session, therefore, welcomes quantitative and qualitative contributions from any discipline which help to incorporate ecosystem services into marine governance and regional economic development. In particular, we encourage the utilization of some boundary objects (maps, games, etc.) which can contribute to the visualization of ecosystem services from both demand and supply sides.

S06-17731-Plenary-Cao

Blue food assessment

Ling **Cao**

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Global aquatic or “blue” food production faces the challenge of maintaining supply in a changing environment and providing significant and essential nutrition to over 3.2 billion people while meeting standards of food safety and sustainability. Despite growing concerns over the environmental impacts of blue food production, little attention has been paid to how production is influenced by anthropogenic environmental changes. To quantify the global vulnerability of blue foods to ongoing environmental shifts, we first identify the predominant anthropogenic stressors that have the potential to affect the quantity and safety of blue foods. We then perform an indicator-based an indicator-based analysis on a global scale, utilizing the most reliable public databases available to evaluate the spatial ranges of the predicted impacts of these stressors on blue food production. Our study seeks to identify highly susceptible blue food systems and production countries, in addition to the diverse geographical patterns of various environmental threats to production systems. The insights garnered from our study can lay the groundwork for future research to map environmental challenges and opportunities on various scales. This will aid strategic planning and policy development with the aim of maintaining resilient and sustainable blue food production.

S06-17444-Oral-Faith (ECOP)

The potential of plankton as indicators of changes to marine natural capital assets

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Plankton monitoring surveys have been continuously pursued since the early 20th century, due to the ability of plankton to signal changes to marine ecosystems which could impact society, from changes to commercially important fish stocks to the sequestration of atmospheric carbon. More recently these monitoring surveys have contributed to the development of indicators of Good Environmental Status (GES) for pelagic habitats in European biodiversity assessments, but these indicators are yet to be used to directly assess the potential human impacts of not meeting GES. To understand the societal benefits of meeting GES and to better target management measures in the marine environment, it is first necessary to understand the potential impact to ecosystem service provision (and subsequently natural capital assets) resulting from ecological changes to plankton communities.

Here we demonstrate the potential of plankton as indicators of both ecosystem services and hazards in the marine environment as a foundation to the development of plankton-informed natural capital accounting. We present a conceptual framework developed to help classify the different ways marine plankton can impact human wellbeing; this framework is then applied to the current literature, allowing us to identify a range of ecosystem services and hazards associated with marine plankton. Further, we identify the key mechanisms by which some key plankton taxa can both support and inhibit the provision of ecosystem services. Using this output, we explore the future role plankton monitoring surveys could play in assessing changes to marine natural capital.

S06-17506-Oral-Scemama

Three different methods to assess cultural services in French marine protected areas

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The Life IPE Marha (2018-2025) aims to restore and sustain a favourable conservation status of marine natural habitats. To support this objective, we conducted ecosystem service (ES) in three French marine protected areas (MPA). The first step of the assessment implied a strategic assessment of the conservation issues with experts of the site (local managers and scientists), called the TRIAGE approach. In all three sites, TRIAGE put forward issues regarding the increase of recreational activities and demand for cultural services (CS). As a result, we applied three different methods to assess CS in accordance with the needs of managers.

Firstly, in north Brittany, we applied a method of ecological accounting to assess the importance of CS provided by the local MPA in the territory's economy. Secondly, in the bay of Marseille (Mediterranean Sea), we conducted an institutional analysis of the various form of CS demand from recreational users to other connected users (complementary or antagonist). Finally, in the Chausey archipelago (Channel sea), we assessed the capacity of the mosaic of habitats to provide ES and its compatibility with a potential increase of visitors' attendance. Each method tackles the CS assessment with a different angle (capacity, flow or demand for ES) and provide different indicators.

The objective of this communication is (1) to present a variety of methods available to assess CS regarding a common objective of biodiversity conservation, (2) to apply a comparative analysis of their pros and cons and (3) to discuss their ability and complementarity regarding managers' concerns.

S06-17538-Oral-Diekert

Changing Collective Action: Nudges and Team Decisions

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Nudges that rely on social norms are widely used and a broad literature documents that they successfully affect individual behavior. However, in most settings where nudges are needed to change collective action, teams -- not individuals -- determine outcomes. Because team decision making is pervasive, learning whether nudges work with teams in social dilemmas is important, especially when institutions are weak and formal enforcement is difficult. Here, we show in follow up work to our paper "The creation of social norms under weak institutions" that a norm-nudge increases team cooperation by 14 to 16 percentage points in a social dilemma among fishing crews at Lake Victoria, Tanzania. The nudge is particularly effective when team decisions are made by a team member with leadership experience. Our findings are a proof of concept that expands the toolkit of empirical researchers and policy makers that address social dilemmas among teams.

S06-17549-Oral-Li

Spatial disparities of social-ecological infrastructures and their coupled relationships in Marine Cities: A case study of Macau

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Marine cities are typical marine social-ecological systems (MSES) involving the coupling of Earth's physical and chemical processes with human activities. The resource endowment of marine cities tends to give them a higher urbanization and international competitiveness. However, the sustainable development of ocean cities is constrained by factors such as human activities, ecological environments, and marine dynamic processes. Macau, as one of the cities with the highest population density globally (approximately 2.04×10^4 persons/km^2), faces significant pressures and challenges within its MSES. Therefore, it is of significant reference value for the future development and planning of other marine cities worldwide to conduct a study on Macau's MSES. This study focuses on urban infrastructures, utilizing GIS and RS, and combining field research, to analyze the spatial coupling relationship between social infrastructures (e.g. supermarkets, hospitals, residential areas, etc.) and ecological infrastructures (e.g. green spaces, mangroves, etc.) in Macau. Then, the accessibility map is utilized to quantify and evaluate the spatial compatibility and gradient of social-ecological infrastructures in Macao, and the core areas and buffer zones of spatial conflicts are identified based on the supply and demand of socio-ecological infrastructures. Lastly, this study, with the help of AI technology, predicts the future development trends of urban space in Macau and provides optimization suggestions for its spatial development patterns. This study provides new perspectives for in-depth understanding of the coupling of MSES, and is of theoretical and practical significance for improving the quality of infrastructure services of in highly populated cities.

Keywords: marine cities, social-ecological systems, urban infrastructures, spatial heterogeneity, Macau

S06-17581-Oral-Nam

Evaluating gain or loss of ecosystem services from the invasion of alien species to Korea's marine ecosystem

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The Korean government have endeavored to establish an ecosystem-based management (EBM) regime for ensuring sustainability in coastal and marine areas. A pivotal effort in this pursuit is a five-year research project focusing on the assessment and mapping of marine ecosystem services (MES), aimed at making the EBM functional and applicable to marine management. The comprehensive MES map covering the entire national jurisdiction serves as a decision-making support system, especially crucial in an era of accelerating climate change.

The introduction of alien marine species, coupled with the rise in sea surface temperatures, is anticipated to alter the structure and function of Korea's marine ecosystems. This invasion could result in either damage or benefits to the coastal society, which heavily relies on marine ecosystems. The core research question is how to quantitatively determine the positive or negative impacts of this invasion.

The MES map represents status quo contribution of marine ecosystem to the Korean society. The anticipated invasion will inevitably modify the structures and functions of these ecosystems, consequently leading to changes in the provision of marine ecosystem services. Negative changes signify damages, whereas positive changes denote benefits to society.

In the specific case of mangrove invasion into Korea's marine ecosystem, it has the potential to transform less vegetated tidal flats into mangrove forests. To assess the impact, we conducted an analysis of MES values before and after the introduction of mangroves to Korea's marine ecosystem.

S06-17602-Oral-Nozomi (ECOP)

World Natural Heritage Shiretoko: research on banya at the tip area of the Sea of Okhotsk side

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Shiretoko, renowned for its significant interaction between land and sea, was designated a World Natural Heritage Site(WNH) in 2007. The coastal area on the Sea of Okhotsk side of the peninsula's western region, which marks the southern limit for seasonal sea ice in the northern hemisphere, features intricate marine cliffs formed by the sea ice. This region is also highly productive for salmonid fisheries, not only in Japan but globally, with fixed net fishing being prevalent despite its remote location, where a few fishermen's work and accommodation huts, known as "banya," can be found.

In the Shiretoko World Natural Heritage Site, fishermen and authorities have been working on marine conservation. However, the impact of human activities in the remote areas hasn't been discussed. This study interviewed fishermen, local stakeholders, and conducted surveys of 'banya' structures to reveal who benefits from the area's ecosystem services and investigated how the heritage's fishing grounds affect the surroundings.

From this survey, it's been established that there are a total of eight areas on the Sea of Okhotsk side of the peninsula where remaining "banya" structures, along with their ruins and traces, exist. It's evident that stakeholders benefiting from the ecosystem services in these relevant coastal areas, including the "banya," span across a diverse range of individuals beyond fishermen, encompassing tourism operators, researchers, and more. This strongly suggests the need for increased monitoring and management of this region moving forward, surpassing previous efforts.

S06-17673-Oral-Chalkiadakis (ECOP)

Modelling and mapping social-ecological system flows generated by the small-scale fishery in Senegal

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In this research, we aim to model and map flows of ecosystem benefits to society across distances and spatial scales, particularly in marine social-ecological systems. Our paper extends the current knowledge on the assessment of flows from small-scale fisheries by considering costs and benefits emerging across Ecosystem Services (ES) flow paths, and by investigating the role and contributions of intermediaries from the point of supply to the final benefit. Our approach focuses on the spatial assessment of ES flows related to food provision and employment from wild fisheries in Senegal. While the existing literature on social-ecological systems related to fisheries has predominantly focused on either the supply or demand side, there have been cases where researchers examined flows by considering their spatial attributes across different spatial levels. We address this gap by integrating socioeconomic and environmental variables to determine the magnitude of ES flows and use various distance metrics, e.g. distance of trade, to model the ES distribution at different spatial levels. By adopting this multi-dimensional approach our research provides crucial information for decision-making and ensures the inclusion of multiple biophysical and social values. We identify the quantity, direction, and scale of spatial flows and analyze different types of transfer mechanisms. We also study the environmental impact associated with intermediate activities, i.e. carbon emissions from catching, processing, and transportation. The maps produced depict the flow of marine ES to both domestic and foreign beneficiaries. These maps provide valuable insights into the overall function and dynamics of a fishery social-ecological system.

S06-17735-Oral-Chen

Coastal ecosystem assets accounting

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Based on the income capitalization approach, the stock value of ecosystem assets is calculated through the ecosystem service value. The area of ecosystem assets of Yancheng city, a west coastal city of the Yellow Sea, is 2.8185 million hectares, including sea, wetland, forest, grassland, and cropland. From 2019 to 2021, the stock value of Yancheng's terrestrial and marine ecosystem assets was 17.62 trillion CNY, 17.71 trillion CNY, and 19.92 trillion CNY respectively, with an average annual growth rate of 6.5 %. From 2019 to 2021, Yancheng's ecosystem assets provided 863.288 billion CNY, 867.972 CNY, and 975.980 CNY of ecosystem services. The study shows the annual growth rate of ecosystem assets is the potential indicator to measure the sustainability of coastal ecosystem.

Keywords: ecosystem, asset, services, valuation, coastal, Yancheng, Yellow sea.

Session 7: Co-production of knowledge, participatory approaches and engagement with stakeholders

Convenors:
Louise Gammage (South Africa), corresponding
Matthew McPherson (USA)
Mitsutaku Makino (Japan)

Plenary Speaker:
Eric Wade (East Carolina University, USA)

Complexity in marine social-ecological systems presents challenges for achieving balance between ecological sustainability and the needs and desires of resource users. Inter- and transdisciplinary research methods provide the opportunity to integrate diverse perspectives and to engage stakeholders to foment the co-production of knowledge and visions to inform decision-making. This session provides case studies of innovative use of interdisciplinary and participatory methods, applied at various scales to inform fisheries and other global ecosystem challenges. We seek to understand best practices in converting co-production of knowledge to management relevance. A panel will discuss the lessons learned for the design of SES projects and for the sustainability of marine ecosystems.

S07-17557-Plenary-Wade (ECOP)

Toward an inclusive and intentional approach for centering communities in small-scale fisheries management

Eric **Wade**

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Global fisheries are grappling with escalating threats—overexploitation, declining stocks, biodiversity loss, and ecosystem degradation—requiring a departure from entrenched paradigms. This plenary advocates for an inclusive framework that transcends conventional economic boundaries within marine social-ecological systems, emphasizing the co-production of knowledge, participatory approaches, and active stakeholder engagement. A comprehensive perspective deepens our understanding of stakeholder dynamics and fosters environments conducive to informed decision-making. In small-scale fisheries, challenges arise from stakeholder imbalances and restricted access to fisheries/conservation controls. Accommodating diverse stakeholder needs is particularly challenging due to mistrust, power imbalances, and fears of exploitative encroachments. Failure to consider historical realities rooted in early colonial exclusion, historical racial inequities, and negative experiences risks misunderstanding current power relations. Drawing insights from ongoing research in the Caribbean, this presentation explores how non-monetary drivers shape decision-making in small-scale fishing communities. It proposes an intentional framework that centers communities and stakeholders as integral elements in cultivating sustainable collaboration within the broader discourse on fisheries management. Recognizing economic drivers and the intricate interplay of non-monetary factors contributes to an enhanced understanding of stakeholder dynamics. This approach broadens the discourse on fisheries management and enriches our understanding by considering the nuanced interplay of non-monetary factors.

S07-17394-Oral-Casal-Ribeiro (ECOP)

Go with the flow: How to communicate fisheries management processes using information flows

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Participatory fisheries management relies on a shared understanding of how management works. Each stakeholder should grasp not only their roles and responsibilities, but also how they fit into broader processes and decisions. In the Azores, the complexity of management has made fishers distrustful of researchers' motives and reluctant to participate in science. Other stakeholders – such as researchers, industry representatives, fish processers and policy-makers – also possess an incomplete understanding of management, struggling to follow the stream that flows from data collection to implementing policies. To cope with this, stakeholder engagement in the Azores is borrowing expertise from business administration by using Swimlane diagrams, to communicate how information flows within fisheries management processes. A management process is defined here as the interrelated activities that, triggered by an event, achieve specific and discrete results for stakeholders (e.g. a request for advice on stock management triggering the activities that result in the establishment of catch limits). These processes are often not apparent, being obscured by organisational structure, systems, geography, jargon and other factors. Swimlane diagrams help clarify management processes: they depict what is done from beginning to end, by whom, and in what sequence, using simple and highly visual notation. The use of Swimlane diagrams in the Azores is recent and ongoing, yet if used correctly, should help stakeholders overcome institutional and language barriers, create a common understanding of each other's roles and responsibilities, and allow them to structure dialogues on complex management processes unrestrained by frustration.

S07-17420-Oral-Steins

A will-o'-the wisp? Systematic integration of knowledge co-produced with the fishing industry into marine science and advice

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Future sustainable management of marine resources requires deeper and more diverse best available information. In fisheries, we see clear appetite from a new generation of scientists and the fishing industry to co-produce knowledge for management. Systematic integration of such knowledge in scientific advisory systems remains, however, a challenge. Advisory systems remain firmly rooted in traditional modes of knowledge production: incorporating fishers' knowledge is associated with carrying risks of losing credibility, saliency and legitimacy of their scientific advice. Understanding the reasons that inhibit adaptations of current advisory systems is essential to develop way forwards for real sea-change. Our review of fisheries advisory systems in Europe, United States, Canada, Australia and New Zealand identified three interrelated issues that hindered systematic integration of co-produced knowledge: (1) concerns about data quality; (2) beliefs about limitations in useability of unique fishers' knowledge; and (3) perceptions about the impact of industry contributions on the integrity of science. Our assessment of these issues suggests that the first and second can easily be addressed through a combination of mechanisms. The third issue, which entails perceptions from a variety of stakeholders with different belief systems, is more difficult to tackle. It inhibits 'mainstreaming' knowledge co-production in fisheries science, even when the first and second concern have been successfully addressed. While no panaceas apply, entrenching effective science-industry research collaboration (SIRC) calls for action in three areas: (i) transitioning to alternative knowledge production modes, (ii) instituting appropriate quality assurance frameworks, and iii) adaptations to governance frameworks towards new cultures of cooperation.

S07-17423-Oral-Kihira

Stakeholders' participation in reference to decreasing short-neck calm fisheries in Lake Hamana, Japan using VPA(Visual Problem Appraisal)

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Hamana brackish-water lake (Lake Hamana) is located in Hamamatsu, Shizuoka prefecture of Japan, and it is connected to Pacific Ocean. Lake Hamana provides various kinds of fish and shellfish and also tourism resources, however; according to the report of Shizuoka Prefectural Research Institute of Fishery, a commercial catches of the short-neck clam Ruditapes pholippinarum have decreased there. In 2022, the volume of landings of the short-neck calm decreased by 97% over 2009. In addition to the commercial catches, a fun activity of the short neck calm gathering which used to take root in our life as well as was a big tourism resource was canceled recently. Nevertheless, the specific causes cannot be specified under the complicated situation with various stakeholders.

A production team and I are experts on communication for rural innovation, the documentary filmmaking. We also have knowledge about VPA (Visual Problem Appraisal) methodology in order to enhance the analysis of "wicked problems" and social learning about complex problems. We filmed narratives with relevant seven stakeholders such as commercial fishers, local government, tourism association, dwellers like bamboo forest management near Lake Hamana, and local chefs for public participation and stakeholders' consultation. A workshop was conducted for University students using the VPA audio-visual media data set that was produced, and the wicked problems of diverse stakeholders, and action proposals were made by participants. Our study would contribute to how to deal with the wicked problems in the situation of each relevant stakeholder by public participation and consultation.

S07-17446-Oral-Gammage (ECOP)

Building adaptive capacity to ocean change by promoting ecosystem-based adaptation and community engagement

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Marine-dependent communities are especially vulnerable to the impacts of environmental variability change impacts. At the same time, limited implementation of systems-based approaches to management (such as ecosystem-based management) exacerbates the day-to-day challenges experienced by communities, further eroding adaptive capacity. Participatory and inclusive approaches to management are required to address this complex challenge at both small and large scales. The use of participatory modelling to support an ecosystem approach to management is widely recognized. However, there has been limited uptake of model outputs to advise fisheries management in South Africa. Incorporating small-scale fisheries and coastal communities in South African marine system models can facilitate better decision-making through co-production and scenario testing. The transdisciplinary "Ecosystem-based adaptive capacity through a community engagement (Eco-ACE)" project aims to facilitate and improve the adaptive capacity of vulnerable groups in coastal communities by following a co-design and collaborative research approach that uses multiple methods. We have taken a community-based research approach to co-design and develop interventions and tools with stakeholders to improve adaptive capacity at the local level. Our presentation will showcase progress and learning to date in integrating social and ecological knowledge into different types of models (fuzzy cognitive and ecosystem models) using a participative modelling approach and facilitating science and stakeholder engagement in climate change and variability and its effects through various interventions.

Keywords (max 5): participatory modelling, adaptive capacity, fisheries,

S07-17449-Oral-Breckwoldt

Look Who's Asking—Reflections on Participatory and Transdisciplinary Marine Research Approaches

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Marine conservation transdisciplinary researchers often get to the field with a previously designed question, often formulated outside the actual geographical, social, cultural and ecological setting in which the research projects are supposed to be anchored. Involving people on the ground in the initial phase of formulating the questions and setting the research agenda is still uncommon. Once in the field, transdisciplinary researchers may or may not have the support of local communities to sample their data, although they will regularly need to count on these same communities if a collaborative regime is to be pursued and informed by the research outcome. This paper discusses measures that can be taken by marine fisheries and marine conservation researchers to improve participation in, and ownership of, the research by local counterparts, most importantly members of the communities where research is being conducted. The data was generated with a purposively sampled survey of 18 members of our research networks. Key proposed measures derived from this data include: (1) build rapport; (2) engage and exchange; (3) be accommodating and attentive; and (4) be respectful. Knowing who is asking the questions and assuring that all stakeholders have a voice in this process becomes especially relevant under extreme circumstances (e.g., disasters, pandemics), when problems are numerous but can only be accessed by those on the ground. We advise for faster progress in transforming academic and funding environments for true "level-playing-field" transdisciplinary and co-designed research projects that can help change top-down research tendencies.

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S07-17452-Oral-Satterthwaite (ECOP)

Centering knowledge co-production in sustainability science: Why, How, and When

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Solving complex sustainability problems requires novel, creative approaches. One such approach is knowledge co-production, where individuals with diverse expertise collaborate to generate knowledge in support of transformative solutions. Although the concept is not new, there is growing interest in using knowledge co-production in sustainability science, yet relatively few resources offer a practical guide, rooted in theory, to help researchers and practitioners understand when and how to co-produce. This paper synthesizes the existing literature across multiple disciplines to present a novel framework and actionable strategies for effective knowledge co-production. It includes examples from NOAA Sea Grant, a boundary organization in the United States of America, supporting coastal marine and Great Lakes communities through research, extension, and education. The wheel of knowledge co-production, the conceptual framework presented, emphasizes the importance of iterative phases of relationship-building, assessing available resources, involving diverse participation, considering context, and working together with partners to design mutually beneficial and respectful processes and outcomes. The wheel implies the non-linear continuous nature of knowledge co-production, where different phases do not always occur sequentially, can co-occur, and can be repeated over time. Underlying all phases is the importance of listening, building trust, being inclusive, understanding power and resources, and being flexible to achieve meaningful and effective results while maintaining scientific integrity. The framework, actionable strategies, and illustrative case studies can help to equip researchers, practitioners, and communities with

foundational tools to effectively engage in knowledge co-production to address complex sustainability challenges.

S07-17457-Oral-Seary (ECOP)

Community informed social indicators for the California Dungeness Crab Fishery under whale entanglement mitigation regulations

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A 2013-2016 large marine heatwave in the Pacific Ocean brought about changes in natural and social systems that created social and economic challenges for fishing communities and decision-makers on the US West Coast. A particular societal impact that arose and persists through effects of this extreme event is an increase in reported whale entanglements in the California Commercial Dungeness Crab Fishery. Resource managers, together with the fishing community, continue to develop strategies to balance marine mammal protection with maintaining a productive fishery. Thus far, regulations enacted have been successful at reducing whale entanglements, but fishery delays and closures have had substantial and heterogeneous impacts on ex-vessel revenues across the fishery. This research uses information from semi-structured interviews with fishery participants to first understand how and why actions taken to mitigate whale entanglements affect the fishery. This information was used to develop a set of stakeholder-informed considerations that could help guide decision-making. Second, the interview was used to identify social indicators that can be used to monitor the social and economic health of the fishery in the context of this regulation change. Beyond extreme climate events, building partnerships with stakeholders is an important process in finding solutions to conflicts with wildlife which can also occur due to marine mammal population growth or distribution change. These social indicators, together with ecological indicators developed for this fishery, will enable managers to evaluate the impact of regulatory changes on both social and ecological objectives as management responses continue to evolve.

S07-17473-Oral-Murphy

Torres Strait futures, adapting modern management to traditional fishing and community values

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The Torres Strait Bêche-de-Mer (TSBDM) Fishery is a wholly commercial, indigenous-owned fishery. Current management of the TSBDM Fishery incorporates a structure of classical modern harvest strategies, traditional fisheries practices and community decision making. This has involved the integration of socio-cultural practices with ecological aspects of the fishery, as well as allowing scope for local decision making and ownership of decisions at the community level.

Fisheries data collection has trialled innovative ways by engaging both Island fishers and scientists taking part in field stock assessment surveys. BDM fishers have been trained to record data while processing BDM catch and are able to update conversion ratios for the fishery. Social information has been incorporated in the management of the fishery including respect of sea country boundaries and informing the harvest strategy.

Management of the fishery considers a number of spatial issues. Although the BDM fishery itself is relatively small, TS covers a large and remote area, offering opportunities to increase the value of the fishery. For example, high value species such as White teatfish are found in deeper waters and have only been surveyed for the first time in 2019/20 using new technology to map deep water habitats and estimate population size. Social science has also informed on voluntary spatial closures for species, using spawning season information and verbal agreement between fishers.

This talk outlines a unique integrative model aligning science, management and traditional fisheries practices towards building future sustainable livelihoods for TS communities.

S07-17474-Oral-Ogier

Reflections on a decade of climate change communication and engagement using a wide range of approaches with different marine stakeholder groups

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Climate change poses a serious threat to marine ecosystems and the industries and human societies that depend on them. However, there is often a fundamental mis-match between the reality of what lies ahead and both the level of public or industry understanding and/or concern, and the committed actions required to mitigate and adapt to the impacts of climate change. Over the last decade, our team has conducted and evaluated different models of communication and engagement with marine stakeholders in Tasmania, Australia, where coastal waters are warming almost four times the global average and climate-driven ecosystem and subsequent industry changes have been extensive. Our approaches to engagement and communication have ranged from awareness-raising (e.g., traditional information campaigns as well as games that highlight climate-driven changes in local marine systems), through to dialogical activities (e.g., structured collaborations with media and schools to discover and address climate questions) and knowledge co-production (e.g., participatory workshops, and contributory and collaborative citizen science projects). Here, we synthesize lessons learned from across that suite of activities, based on a combination of formal project evaluations and self-reflection. Participatory and collaborative approaches to documenting change in fast-warming regions are promising vehicles because they engage individuals cognitively, normatively, experientially and behaviorally. Creating opportunities for people to engage in activities that relate climate change to their lived experience can lead to greater acceptance of climate science, and normalising climate change impacts in people's daily lives presents a pathway for building resilience and adaptive capacity, and for motivating committed climate actions.

S07-17485-Oral-Saldívar-Lucio (ECOP)

Fine-tuning climate resilience in Marine Socio-Ecological Systems: the need for accurate space-time representativeness to identify relevant consequences and responses

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Climate resilience in marine social-ecological systems (MSES) is of critical interest, because of their global relevance for food production, livelihoods, and future sustainability. There is an urgent need to improve multiple response capacities under contexts of uncertainty and change, since the interactions between MSES and climate are very complex and take place at different temporal and spatial scales. This work explores climatic features of coastal communities in Mexico and Zanzibar, Tanzania, which are subject to different climate dynamics. The aim was to make evident how local attributes may guide climate resilience, life care and sustainability of different coastal socio-ecological systems. Building place-based resilience requires tools to motivate participation and argumentation by those social actors at the target territory, complementing the necessary local knowledge and generating social engagement. Engagement drives collective participation and can be motivated by reducing the psychological distance and stimulating the collective memory. For example, displaying local attributes and dynamics captured in adequate narratives (*e.g.* climate variability) and visualizations (*e.g.* drones and underwater imagery, participatory maps, stories from elders). The Pelagic Seascape Habitat Classification provides a contemporary example of spatially explicit environmental information connecting small-scales to regional conditions and the interests/needs of information from local communities (*e.g.* artisanal fishermen). In conclusion, the comparative analysis between Mexico and Zanzibar shows that the better represented (in space and time) the local components and dynamics of climate, the better connection of social actors with local change and risks, thus the better integrated and designed response protocols supporting climate resilience.

Keywords: Ocean climate, climate risks, socio-ecological resilience, coastal communities, global warming, climate adaptation.

S07-17510-Oral-Jarre

Ethnography, action research and indicators, qualitative and quantitative modelling, power plays and social learning: a decade-and-a-half of inter- and transdisciplinary marine SES research in the Benguela

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The SESs of the Benguela Current are characterized by developing societies and extreme natural variability, rendering systems approaches in support of decision making for sustainability difficult. High exploitation over the past century has left natural sub-systems impoverished, and past as well as recent history have left many coastal communities in crisis. Our team's research over the past 15 years has engaged stakeholders in coastal and offshore fisheries with researchers of disciplinary backgrounds spanning anthropology, decision science, environmental science, geography, history, marine biology, mathematics, oceanography and statistics. We here synthesize the experiences from our inter- and transdisciplinary collaborative and/or participant-led work, aiming to contribute to the discussion of best practices particularly in cases where rebuilding is imperative and human social dimensions just cannot be ignored.

S07-17515-Oral-Pedreschi

Working together; Irish Science-Stakeholder Collaborations

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Fishing industry stakeholders have unique and important contributions to make to fisheries research. Co-operative and collaborative research approaches between science and industry are critical to access fishers' knowledge, improve scientific understanding, and ensure the co-creation of knowledge. Successful collaborations require open communication, trust and social capital, but numerous barriers exist to establishing these effective partnerships.

Here we present our experiences as ecologists-by-training delving into the social science realm, and the challenges faced in both crossing and integrating disciplines, and overcoming hesitation and distrust among stakeholders. We outline multiple collaborations with Irish fishers for a range of purposes, the barriers faced, and the approaches and circumstances that have enabled successful outcomes. Through case study examples, we reflect on issues surrounding misunderstandings regarding the roles of scientists and the scientific process, a lack of transparency, historical/legacy issues, and contemporary pressures including the COVID-19 pandemic and impacts of Brexit. Finally, we provide insight into the key elements and approaches that have facilitated integration between science and society to produce new data, knowledge, and outcomes.

Keywords: social capital, trust, industry-science partnerships, stakeholders, fishers' experiential knowledge

S07-17530-Oral-Bingham (ECOP)

FishFlOW IEA: An Integrated Ecosystem Assessment (IEA) of interactions between fisheries and floating offshore wind in the Gulf of Maine using participatory knowledge coproduction

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The development of floating offshore wind in the Gulf of Maine (GOM) will likely impact ecological, oceanographic, socioeconomic, and cultural dynamics of GOM social-ecological systems. Impacts to fisheries and fishing communities are of particular concern, and the local ecological knowledge (LEK) of fishers is minimally considered in existing development plans. The Fisheries and Floating Offshore Wind Integrated Ecosystem Assessment for the Gulf of Maine (FishFlOW IEA) is a transdisciplinary inter-institutional collaborative effort seeking to address these concerns using an Integrated Ecosystem Assessment framework. Our methodology emphasizes human dimensions considerations in ecosystem approaches by forefronting qualitative social science, community engagement, and LEK in an effort to identify complex interactions between offshore wind, fisheries, and the environment, produce tools for environmental analyses, and support community empowerment. We are engaging with fishers, processors, and community members as well as scientists, state and federal managers, and offshore wind developers to build a comprehensive assessment with the best available knowledge. We developed an initial conceptual model of interactions between fisheries and offshore wind using thematic analysis of public comment forums and existing scientific knowledge. We then facilitated a series of participatory workshops with multiple GOM ocean user groups to collaboratively refine the model and determine key indicators and data needs. We are continuing to work with fishing communities and research and management groups to identify quantitative and qualitative data sources, apply LEK, and co-produce information for indicator assessment. In this presentation, we discuss insights from our work so far and reflect on our methodological approach.

S07-17536-Oral-McPherson

Integrating scientific and local knowledge to address socio-ecological impacts of red tide on Florida's west coast

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Red tides in the Gulf of Mexico are regular occurrences reported as far back as the 1500s but some evidence suggests they may be increasing in duration and severity. Red tides are harmful algal blooms that produce a neurotoxin that kills marine life and provoke respiratory issues in humans. Stakeholder workshops led by NOAA Fisheries on the southwest Florida coast in 2018 coincided with a severe red tide event. The workshops highlighted the potentially severe and interconnected impacts of red tides on ecosystems and communities including extensive damage to habitat and fish populations and related impacts on local fishing, aquaculture and tourism. A series of collaborations between NOAA scientists and fishermen grew out of these workshops to better understand and address the causes and impacts of red tides, focusing primarily on the use of local ecological knowledge (LEK) to address the relative scarcity of data on historical red tide occurrences and impacts. Major objectives of the LEK assessment included documenting red tide locations, frequency and intensity over time; identifying ecological signals and stakeholder-driven hypotheses of red tide occurrence and intensity; and documenting fishermen adaptation strategies. Some 54 oral history and participatory mapping interviews were conducted with fishermen along the southwest Florida coast by social scientists and biologists working in tandem. Major assessment results will be discussed along with applications to fisheries management, including the use of the LEK information to inform the red grouper stock assessment and to identify strategies to help fishermen increase their resilience to red tide events.

S07-17584-Oral-Matsubara (ECOP)

Synergies between Gender Equality and Sustainability in Coastal Fisheries Resource Use: Case study of Malaita Province, Solomon Islands

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While an international agreement to promote gender mainstreaming has been made, efforts in the fisheries sector tend to fall behind. One of the reasons would be the gap in motivations between stakeholders in the development sector and the fisheries sector. To bridge this motivational gap and promote a Nexus approach addressing multiple SDGs including SDG5 and SDG14, it is crucial to identify how synergies between gender equality and sustainable marine resource use can be created.

This presentation aims to illustrate an example of such synergy, using a case study of the Solomon Islands, where Community-Based Resource Management (CBRM) is legally recognized at the national level and promoted to ensure sustainable coastal resource use by local communities with the involvement of diverse stakeholders (e.g., women, youth). This study conducted semi-structured interviews (n=25) centered on five communities undertaking marine resource management in Malaita Province. It explored (1) gender roles in local fisheries, (2) social and ecological impacts of CBRM, and (3) benefits from increased women's participation in CBRM. The results indicated perceived enhanced coastal resource conditions, leading to increased income, food security, and improved household environments through CBRM. CBRM activities also provided women opportunities for capacity development, and women's engagement facilitated diverse perspectives and knowledge inclusion in management rules, strengthening awareness and enforcement at the community level. Women's participation in CBRM offers potential solutions for sustainable resource management and gender equality simultaneously, whereas some challenges still remain, such as gender disparity in accessing alternative fishing grounds and full participation in CBRM activities.

S07-17586-Oral-Rodrigues

A transdisciplinary case study on sea urchin-algae interactions, climate change, and the Ama divers of Mie prefecture

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Sea urchins are economically important ecological keystone species that control macroalgal density, distribution, and composition through grazing. Healthy populations of sea urchins can benefit algal habitats by providing trophic control of primary productivity and habitat heterogeneity. Conversely, the absence or overabundance of sea urchins can lead to unfavorable ecosystem shifts and the proliferation of 'weed like' algae or the formation of heavily grazed 'urchin barrens' devoid of algae. In Mie Prefecture, ocean warming is increasing sea urchin densities and feeding rates, leading to the destruction of kelp forests and the loss of economically important fishery species. In 2021, Shima City launched a sea-urchin Diadema eradication initiative offering Ama divers, female free divers whose livelihoods depend on collecting shellfish and seaweed, daily allowances to carry out targeted eradications in ten regional districts. Although this initiative was well received, Diadema continues to proliferate, affecting Ama divers' livelihoods. We collaborated with Ama divers in Goza village and collaboratively conceptualised, designed and monitored urchin-algal interaction, using observations from sites in Goza area to predict future ecosystem states. We use a transdisciplinary approach, drawing upon marine science, social science, and TEK (traditional ecological knowledge). This talk presents findings, particularly focused on how monitoring, reporting, and observing urchin-algal interaction is articulated from the lens of Ama divers and researchers. We note that Ama communities are examples of good natural observers of their local environment and their knowledge, situated in cultural and ecological contexts, can provide important models and unique understandings of marine climate change impact.

S07-17599-Oral-Vaidianu (ECOP)

Blue Justice and Just Transformation: far-fetched concepts for Romania's marine protected sites?

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The search for exploitable natural resources has turned the oceans into new frontiers, giving rise to concepts as Blue Economy and Blue Growth, which often sideline ecological and, particularly, social demands. There is a growing risk that the unchecked adoption of these concepts will accentuate injustices in the way the marine environment is accessed and its benefits are shared. Indeed, even attempts to protect the oceans from uncontrolled economic exploitation through conservation can lead to ocean grab and the exclusion of users. Blue Justice is then a new movement that seeks to bring less powerful actors, as small-scale fishers, to the forefront of the discussion on ocean uses and rights. Framed in three main questions and using the Romanian Natura 2000 network as a benchmark, this proposal will investigate the effects of coastal and marine conservation on Blue Justice and whether conservation initiatives could lead to Just Transformation. Transformation implies a radical departure in the way results are achieved, often with the aim of responding to global changes. To be just, transformation cannot accentuate inequities. Thus, the first question will focus on whether marine protected areas (MPAs), including Natura 2000 sites, have promoted Recognitional, Procedural and Distributive Justice; the second will investigate whether MPAs can buffer some risks to Blue Justice, and the third will assess, in particular, whether Natura 2000 sites are or could be drivers of just transformation. Through a combination of methods ranging from systematic reviews to surveys and mapping of ecosystem services, this proposal intends to advance mid-range theory on Blue Justice and Just Transformation. Although Romania is used as a case study, the findings are likely to reflect how EU's main conservation strategies have or have not overlooked social justice, with consequences that may hinder beneficial socioecological effects.

S07-17603-Oral-Hoareau

Knowledge, power and the blue economy: breaking down barriers

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Developing and integrating a local blue economy framework is complex. Navigating existing ocean-user interests and emerging opportunities, while integrating sustainability considerations can be supported by an innovative local knowledge system, but innovation requires trust, risk, capacity and enabling resources. Informal knowledge systems underpinned by dynamic multinational collaboration have facilitated knowledge coproduction for many developing nations, but lingering past collaboration tensions, embedded practices and extractive processes could hinder emerging innovative transdisciplinary approaches to knowledge coproduction. This paper highlights the pioneering blue economy approach undertaken by Seychelles and relates existing opportunities and challenges to advancing integrated ocean planning and management by considering the local knowledge system that empowers (or disempowers) effective implementation. The paper will summarize key findings from interviews with blue economy-related knowledge users, knowledge producers and knowledge beneficiaries (i.e., those sectors benefiting from more efficient and trustworthy decision making) to determine which aspects of the local knowledge system support (or are a barrier to) empowered decision making and adaptive management in a Small Island Developing State like Seychelles. This work will emphasize key components that are vital for innovative knowledge coproduction in countries aiming to advance a more sustainable blue economy.

S07-17605-Oral-VERSCHUUR (ECOP)

Exploring the role of science-industry collaboration in Small Scale Fisheries co-management: a lobster fisheries case study in the Netherlands

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A sustainable future for small-scale fisheries and the (marine) environment they operate in, requires the development of innovative approaches to fisheries management. In the Eastern Scheldt (the Netherlands), the fisheries association OWV co-manages a small-scale, seasonal European lobster fishery - yet little information is available on the Eastern Scheldt lobster (*Homarus gammarus*).We collaborated with the industry to systematically collect qualitative and quantitative data on the lobster species, the stock, and perceptions of current management systems to inform and improve future management strategies. We found that the qualitative data collected on fishers' knowledge can be used to complement or confirm insights from quantitative approaches (e.g. laboratory experiments and growth models) and vice versa. Fishers can provide near real-time observations of changes happening in the population and environment, and fishers' perceptions provided valuable insights into the co-management system, as well as suggestions for improvement. The implementation of a jointly developed, industry-managed, systematic data collection method could facilitate future stock assessments. The case study provides lessons learned regarding methods for including alternative forms of knowledge and data collection in small-scale fisheries management. Our research does not only contribute to understanding the Eastern Scheldt lobster fishery, but also offers insights applicable to similar contexts, emphasizing the potential for sustainable practices through sector-led data collection, ownership, and management.

S07-17608-Oral-Ballesteros

Not who you are, but what you do: exploring stakeholder roles in a boundary organisation

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Stakeholder engagement has become pivotal in the provision of science for environmental policy. Engagement contributes to securing and improving the credibility, legitimacy and saliency of organizations operating at the science-policy interface. But it also results in trade-offs between those three attributes. Managing participation across boundaries entails inherent challenges that need to account for the relative power dynamics, the rights around representation and legitimacy of actors. Many actors can engage and influence in many ways in a large boundary organisation. We argue that a typology developed through our study of ICES, to understand how participation performs at the science-policy interface in the marine social-ecological system, has merits to be considered in other situations. The typology is based on the goal and rationale that participation may play within an organization. It explores, how participation takes place and impacts an organisation's performance and the feasibility of increasing its legitimacy without compromising credibility. There is evidence of distinctive attributes of participation at the interface: stakeholder roles are defined by the process rather than by their profile; processes are multiple and frequently iterative so the same stakeholder may interact in different arenas with different roles. The typology provides a means for tailoring participation in organisations to navigate diverse demands for policy relevance and scientific integrity, whether they are assessment, advice or solution-oriented bodies.

S07-17635-Oral-Beckensteiner (ECOP)

Assessing the performance of a national participatory scheme for the co-management of the mangrove crab fishery in Madagascar

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In the context of the FAO's Small-Scale Fisheries (SSF) Voluntary Guidelines, inclusive management and participatory research approaches to SSF have been encouraged. To date such initiatives have been limited at the sub-national and national levels. The CORECRABE action research project (2019-2023) addressed that challenge in mangrove crab export-fisheries in Madagascar. Our research aimed at assessing local stakeholders' learning and participation in the processes of collaborative management of these fisheries through this transdisciplinary case study. We first evaluated the technical, normative and relational learnings of 52 stakeholders who have participated in the project's regional working groups and/or the national workshop organized from 2020 to 2022. Then, in 2023, we interviewed 300 local SSF actors (fishers, buyers, and community leaders) within 77 focus groups (separated by occupation, age, and gender) in 12 coastal villages involved or not in the project activities. Their fishery knowledge, project participation, social network construction, and management perceptions were collected. The actors' participation and representation in the project workshops were compared across two intervention regions, as well as the transfer of knowledge to and from the local communities at the regional and national levels. The study highlights the challenges and opportunities of transdisciplinary approach associated with learning mechanisms at varying scales for operationalizing SSF co-manyagement.

S07-17654-Oral-Poos

Combining old with new: multiple perspectives on enhancing community-based fishery management

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Small-scale fisheries (SSFs), which employ 500 million people globally, are under increasing pressure due to social and environmental changes. While many SSFs are managed through co-management, they are based on different models with varying objectives and governance systems. This study aimed to understand the variation in socio-economic-environmental outcomes in three SSF co-management models and the Socio-Ecological System (SES) factors that affect outcomes. A literature review was conducted, which showed that co-management models building on local/community governance practices have better social outcomes such as reduced intra-community conflicts. Moreover, co-management forms which ignore pre-existing governance practices may have better short-term fishery outcomes but frequently suffer unintended consequences such as increases in illegal fishing. A total of thirteen different SES factors positively or negatively impact SSF co-management outcomes. Five factors are relevant in all different co-management models. For eight SES factors the effect on SSF co-management outcomes varied between different co-management models. These findings contribute to improving SSF co-management and consequently, enhancing SSF sustainability.

S07-17658-Oral-Longo

Stakeholder collaboration and communication as key outputs of MSC multi-fishery improvement initiatives in Mexico and South Africa

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Standard setting and ecolabeling programs, such as the Marine Stewardship Council (MSC), are promoted as pragmatic market-based incentives to improve fisheries' environmental sustainability. When fisheries do not yet meet the required sustainability benchmarks, they will often work towards them through a multi-stakeholder Fishery Improvement Project (FIP).

However, the path to environmental sustainability entails highly technical scientific evaluations to develop effective improvement plans and, importantly, broad coordination and cooperation across harvester groups, managers, NGOs, researchers, etc. To address these barriers, the MSC has been engaging in regional multi-fishery collaborations, referred to as a pathway projects, offering capacity building on MSC Standards and financing pre-assessments (i.e., rapid evaluations prior to attempting a full MSC assessment) and the development of milestone-focused action plans. These initiatives are designed so as to use the MSC Fishery Standard as a tool to improve the understanding of sustainability issues, and buy into agreed improvement actions, while leveraging a local multi-stakeholder steering group to achieve a collaborative critical mass engaging with institutions, scientists, and interested market actors.

Though there is broad consensus that elements such as awareness of sustainability concerns, collaboration across groups and genuine engagement are key to the success of Fishery Improvement Projects, it is difficult to measure whether these intangible outputs are being achieved. Here we present the results of key informant interviews designed to monitor the achievement of such outputs, and discuss the perceived socioeconomic benefits and challenges found in pathway project participants in three fisheries in Mexico and two in South Africa.

S07-17675-Oral-Kyriazi

A Simple Social-Ecological Systems analysis framework for marine biodiversity resilience and ecosystem sustainability

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Ecosystem-Based Management (EBM) is essential for ensuring the uninterrupted production and circulation of marine Ecosystem Goods and Services (ES) and thus facilitating the transition towards a resource-efficient, competitive, and low-carbon Sustainable Blue Economy (SBE). Concurrently, systems thinking is inherent in EBM and so in the planning, implementation, and monitoring of EBM interventions. Within the context of the European research project Marine SABRES, an integrated marine social-ecological system (SES) analysis framework (the "Simple SES") that uses the DAPSI(W)R(M) problem structuring is being co-developed with stakeholders, for enhancing the uptake of the EBM approach. This framework is currently at the testing stage in three marine demonstration areas i.e. in the Tuscan Archipelago focusing on the maintenance and restoration of natural carbon sinks, in the Arctic that examines the effects of climate change and changing oceanographic conditions on fisheries and in the Macaronesia with focus on balancing biodiversity conservation and responsible use of the region for maritime activities. We demonstrate the steps taken for selecting among a number of existing frameworks the most appropriate SES framework for the aims of the project (using SWOT Analysis and assessing the level of compliance with a number of desired characteristics, e.g. simple in application, addressing resilience and adaptive features, unbiased, cross-scale, holistic, stakeholder inclusive and applicable in the marine environment). We also share insights into SES operations, anticipate potential challenges, and offer recommendations for addressing them. These efforts contribute to refining the Simple SES, ensuring its effectiveness in advancing EBM goals across various marine regions.

S07-17676-Oral-Rahyantel (ECOP)

The incorporation of indigenous local knowledge in marine conservation: *Investigating co-creation and co-optation practices*

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Incorporating Indigenous Local Knowledge (ILK) into conservation is crucial yet often neglected in marine conservation. There are gaps in recognizing the socio-cultural aspects often overlooked amidst predominant ecological conservation paradigms and fails to acknowledge the valuable contributions of indigenous and local communities. The study focuses on the role of Non-Governmental Organizations (NGOs) in co-creating marine conservation initiatives with indigenous and local knowledge holders. Its objective is to scrutinize the authenticity and depth of ILK incorporation. Utilizing a systematic literature review, this study aims to evaluate the accuracy of NGO claims on co-creating marine conservation programs with indigenous and local communities. We examine how ILK is genuinely integrated into decision-making, exploring the delicate balance between co-creation and co-optation in marine conservation practices. The investigation also focuses on identifying the predominant social values and examining whose knowledge takes priority in decision-making processes related to marine conservation management. The study highlights a notable issue concerning the blurred lines between claims of co-creation and potential instances of co-optation within the management of marine conservation. describes the complexities of integrating indigenous knowledge into marine conservation, providing essential insights to address the existing disparities. By highlighting the need for more comprehensive research and practical guidelines, this study can reinforce the crucial role of indigenous and local knowledge in strengthening equitable and sustainable marine conservation practices.

S07-17507-Poster-Scemama

A strategic approach to assess marine and coastal ecosystem services in French Natura 2000 sites

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The Life IPE Marha (2018-2025) aims to restore and sustain a favourable conservation status of marine natural habitats in Natura 2000 sites. In this context, ecosystem service assessments (ESA) are carried out in various French sites. The incompleteness of current knowledge and the priorities expressed by the stakeholders and / or reflected in the existing management plans are expected to be taken into account from the beginning of the ESA process. To identify these priorities and clarify the scope of these assessments, the TRIAGE method is used. The TRIAGE guides the ESA by seeking to specify the purpose, the scale, the methods and the tools needed to implement it. It thus constitutes a preliminary step in the ESA as such and makes it possible to conduct the latter in a more strategic and operational way.

The poster presents the implementation of the TRIAGE in four different sites: (1) the Chausey archipelago (Channel Sea); (2) the Bay of Marseille (Mediterranean Saea); (3) the national reserve of Sept-Iles (Channel Sea) and (4) the Morbihan Gulf (Atlantic). The results show the diversity of issues that French MPAs have to deal with. In addition it reflects a national trend regarding intensification of recreational and tourist uses within coastal and marine socio-ecosystems that lead to reconsider the nature-society relationships.

The poster describes the implementation process of TRIAGE and presents, in a comparative approach, the analysis of the benefits of this method before listing the obstacles to its optimal implementation.

S07-17523-Poster-Gammage (ECOP)

Understanding drivers of fishing pressure in South Africa's Western Cape: insights from the development of a synthetic set of social indicators

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Fishers and the communities they support face various challenges brought on by changes in their marine social-ecological systems (SES). The resulting complexity and uncertainty hamper their ability to achieve sustainability, while holding implications for decision-making at various scales. Fishers must respond proactively to change at the level of their fishing operation. Managers, however, must apply the principles of ecosystem-based management on larger scales. Despite many anthropogenic drivers of change, fishing pressure remains the most impactful on the southern Benguela marine ecosystem. As such, understanding the drivers of fishing pressure is crucial to implementing ecosystem-based fisheries management. Social well-being and vulnerability indicators for fishing communities provide an essential tool for understanding these drivers and can thereby aid managers' decision-making. As a first step in creating such indicators for South African fisheries in the southern Benguela, we have adapted the methodology developed in the U.S. by NOAA Fisheries to construct an initial set of indices for communities of fishers residing on the west and south coast of South Africa's Western Cape. Using Census data, we developed six quantitative indices related to population composition, personal disruption, and poverty to describe social vulnerability, whilst gentrification pressure is defined by labour market status, housing characteristics, and retiree migration. Additionally, two qualitative indices represent fishing engagement and reliance related to economic and social/cultural importance. We provide an overview of how we implemented the methodology before making recommendations for future work.

S07-17562-Poster-Hamilton (ECOP)

Safeguarding Indigenous oceanic custodianship: The evolution of Sea Country Planning in Australia

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Sea Country Planning (SCP) is a culturally-centred process empowering Indigenous communities to manage and safeguard their coastal and marine spaces. Originating in response to concerns voiced by Aboriginal and Torres Strait Islander (ATSI) communities during the development of Australia's 2004 South-east Regional Marine Plan, SCP emerged as a response to the need for recognizing Indigenous rights and obligations within large-scale planning tools. Recent developments, fuelled by growing spatial demands, the expansion of government-supported Indigenous protected areas, and global advocacy for social equity in marine governance, have sparked a resurgence in SCP development in Australian waters. This equity-informed planning tool, rooted in honouring cultural connections and Indigenous knowledge systems, considers legal and regulatory frameworks governing Indigenous rights and negotiations. SCP facilitates cultural exchange and fosters collaboration among Indigenous communities, government entities, NGOs, and stakeholders to achieve holistic marine management. Existing plans borne out of the SCP process are inherently place-based, recognizing the diverse practices of ATSI groups. However, ATSI communities looking to develop such plans face challenges in precisely defining Sea Country and identifying resources to guide the planning process. This study aims to systematically analyze existing plans, identifying thematic patterns in defining Sea Country, recognizing tools utilized in guiding the planning process, and understanding how SCP has been used to foster and strengthen partnerships. The insights derived from this research aim to enhance accessibility to justice-oriented marine planning, provide a pathway for advancing reconciliation in nations with ongoing colonial structures, and empower Indigenous decision-making and autonomy in ocean governance.

S07-17709-Poster-Tojo (Poster and Oral)

Participatory survey and comprehensive co-investigation of tropical reef fishes and habitats with local fishers using geographic information system and length-based evaluation approach

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In tropical islands, it is often difficult to obtain necessary biological information of cohorts and to conduct sufficient scientific surveys for fisheries resources. Satellite conditions of islands limit access to the sites and collect information for resource evaluation and fishing management. For sustainable fisheries management, it is necessary to carry out surveys and investigations from multiple perspectives, such as resources, fishings, and habitat ecosystems. However, comprehensive investigation of those aspects requires significant resources and efforts, so management measures are often depending upon the empirical information. With practical empirical information, such as local ecological knowledges (LEK), convenience but reliable scientific surveys should be applied with low cost in especially local scale of tropical islands. With locals in Mauritian coast, size information of key species from both ecological and economic importance, such as *Naso unicornis* and *Epinephelus merra*, and their habitat information are collected by field surveys then analyzed with local fishers in the workshops. Habitat information corrected in the collaborative surveys were organized as a spatial database using geographic information system (GIS), and parameters of the size-based models were collected by focus group discussions and field experiments with fishers. Still comprehensive evaluation activities are ongoing, and additional surveys and experiments for interpretations have been conducted with GIS visualizations. Through the activities of coinvestigations with comprehensive surveys, we found changes of interests of the participants in activities with predefined key species. Simple but effective activities with clear reasonings and interactive communication are necessary for the success of comprehensive surveys and future monitoring.

Session 8: Applying and integrating marine biodiversity indicators and assessments to evaluate progress towards policy goals

Convenors:
Abigail McQuatters-Gollop (USA), corresponding
Laurent Guerin (France)
Cristina Vina Herbon (UK)
Amber Himes-Cornell (FAO)
Saskia Otto (Germany)
Jake Rice (Canada)

Plenary Speaker:
Christopher Lynam (Centre for Environment, Fisheries and Aquaculture Science (Cefas))

Assessing the overall status or trends of biodiversity and ecosystems is increasingly required as part of reporting progress towards national and international policy goals. Such assessments often require the integration of indicators across multiple biodiversity features and can cover the effects from a range of human activities for large areas of ocean. The evidence used in these assessments may be collected at different geographic scales and come from multiple knowledge systems. This session welcomes presentations on qualitative and quantitative multi-scale approaches to biodiversity ecosystem assessments, including indicator development, integration methods, available tools and resources and baseline and target setting approaches, and how they can be used to assess ecosystem services and improve conservation measures.

S08-17598-Plenary-Lynam

Cumulative impacts on biodiversity and new tools to guide marine policy and governance

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Human activities at sea (e.g., fishing, shipping, oil and gas exploitation, renewable energy structures, aquaculture) and land-based areas (e.g., agriculture and industry) have expanded considerably, leading to an increased level of pressures and subsequent degradation of ocean health. The cumulative impacts and footprints from such human activities and pressures are further exacerbated by the effects of climate change, which is altering marine ecosystems, with large-scale effects on biodiversity and habitats worldwide. A number of recent European projects (including www.ges4seas.eu; www.futuremares.eu; www.actnow-project.eu; https://obama-next.eu/) are working to expand the tools available for (i) mapping, analysing, and assessing cumulative pressures, (ii) evaluating environmental status (i.e. ocean health), (iii) understanding the risks to ecosystem functioning and services, (iv) improving monitoring of the ocean, and (v) proposing nature-based solutions and management strategies to halt biodiversity loss and safeguard the benefits humans derive from marine ecosystems. We discuss the approaches developed and give examples for European Regional Seas and associated learning sites from these projects. These tools aim to enable the effective implementation of an ecosystem-based marine management approach for human activities that should be valuable for policy-makers and implementing authorities aiming to achieve regional aims (e.g. Marine Strategy Framework

Directive, Common Fisheries Policy, Regional Seas Conventions) and global (e.g. UN Sustainable Development Goals, Aichi and beyond-2020) targets.

S08-17417-Oral-McQuatters-Gollop

Assessing the state of marine biodiversity in the Northeast Atlantic

Abigail **McQuatters-Gollop**[1], Laurent Guerin[2,3], Anita Gilles[4], Christopher Lynam[5], Ian Mitchell[6], Paul Stebbing[7], Ulrike Schuckel[8], Cristina Vina-Herbon[6] and the OSPAR COBAM 2017 Biodiversity Assessment Team

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The Northeast Atlantic has been exposed to a wide range of direct human pressures, such as fishing, shipping, coastal development, pollution, and non-indigenous species (NIS) introductions, in addition to anthropogenically-driven global climate change. Nonetheless, this regional sea supports a high diversity of species and habitats, whose functioning provides a variety of ecosystem services. In 2017, OSPAR, the Northeast Atlantic Regional Seas Commission, delivered an assessment of marine biodiversity for the Northeast Atlantic. This assessment examined biodiversity indicators separately to identify changes in Northeast Atlantic biodiversity. Here, we expand on this work and for the first time, a semi-quantitative approach is applied to evaluate holistically the state of Northeast Atlantic marine biodiversity across marine food webs, from plankton to top predators, via fish, pelagic and benthic habitats, including xeno-biodiversity. Our analysis reveals widespread degradation in marine ecosystems and biodiversity, which is likely the result of cumulative effects of multiple human activities, such as overexploitation, the introduction of NIS, and climate change. Bright spots are also revealed, such as recent signs of recovery in some fish communities and recovery in harbour and grey seal populations in some regions. The status of many indicators, however, could not be assessed due to gaps in data, unclear pressure-state relationships, and the non-linear influence of some pressures on biodiversity indicators. This work has now been integrated into the 2023 OSPAR Quality Status Report and the UK Marine Strategy 2024 assessment. Lessons learned will drive progress towards a better integrated assessment of wide-scale marine ecosystems.

S08-17464-Oral-Guérin

Applying ecosystem and risk-based approaches, toward an integrated assessment of benthic habitats communities at regional sea scales

Laurent **Guérin**[1,2], Maider Plaza Morlote[3], José Manuel González-Irusta[3], Abigail McQuatters-Gollop[4], Anna J. Lizińska[2,5], and the OSPAR OBHEG & COBAM teams

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The European Marine Strategy Framework Directive (MSFD) aims to implement integrated ecosystem-based and risk-based approaches, to manage anthropogenic pressures on the marine environment within European Union waters. Through work developed within scientific projects, in conjunction with works within the North-East Atlantic Regional Seas convention (known as OSPAR), several indicators were developed to assess marine biodiversity and integrate methods to combine them.

Three current benthic habitat indicators have been adopted to contribute to the OSPAR 2023 Quality Status Report. The key messages from the indicator results and habitat status assessments have been summarised for each of the five OSPAR Regions, including an overall assessment of confidence. The availability of data and the limited access to high-resolution pressure data from anthropogenic activities present a key challenge to assessing benthic ecosystems. Currently, there are large areas with very limited or no monitoring data. Pressure-state-impact relationships, particularly in regard to exposure levels and the recovery of some sensitive habitats, are not always well understood, thus affecting the levels of confidence.

Integration methods provide perspectives towards a more efficient and complete assessment of benthic habitats, against various pressure types. These integration methods do not only integrate biodiversity-related indicators but also provide a mechanism to strengthen and improve confidence in indicator assessment, where prior information is missing or expert judgement is used. Its specific development under science-policy coordination enables the identification of specific knowledge gaps and progress to be made towards more efficient and applied guidance to ecosystem management.

S08-17508-Oral-Scemama

A representation of ecosystem services provided by mangroves in French Guiana using Fuzzy Cognitive Maps

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France claims its ambition to protect 55 000 ha of mangroves. As it shelters 70 000 ha of mangrove, French Guiana is particularly concerned by this protection objective. Meanwhile, French Guiana experiences a rapid growth of its population - expected to double by 2050, and this population is concentrated on the coast. In this context, ecosystem services (ES) assessment seems particularly appropriate to facilitate the identification of trade-offs between biodiversity conservation and socio-economic development.

We gathered expert knowledge of mangrove socio-ecosystems using Fuzzy Cognitive Maps (FCM). Use of FCM allows capturing expert representations of complex socio-ecological systems using graphical conceptual models, from a diverse set of stakeholders. The approach is based on the combination of (1) individual interviews to record individual cognitive maps, (2) analytical treatment to homogenize concepts for aggregation and (3) group workshops for validation and results dissemination. We conducted this work in two-steps. First in 2019, we applied the approach at the scale of French Guiana (2019). Second in 2023, we reproduce the assessment at a closer scale (the Cayenne river estuary).

This work enables identifying the mangrove ES which are considered most important by stakeholders, as well as those which seem to be poorly understood. This can support both further research and collective decision-making regarding the conservation of mangroves in French Guiana. In addition, the elicitation process also served as a support for knowledge transfer between heterogeneous stakeholder groups and scientists.

S08-17519-Oral-Himes-Cornell

Understanding role of fisheries management in delivering Target 3 of the Kunming-Montreal Biodiversity Framework: A fisheries biodiversity outcome framework

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Area-based fishery management measures are heavily used globally. They are intended to benefit the targeted fisheries for which they have been designed, but often also have conservation co-benefits that are rarely assessed or accounted for. In the Convention on Biological Diversity, such measures with demonstrated conservation co-benefits are called 'other effective area-based conservation measures' (OECMs). They are currently receiving international attention because their effects on biodiversity conservation are in many ways similar to those of MPAs, offering a new opportunity and perspective for a more ecosystemic approach to fisheries, while contributing to achievement of Target 3 of the Kunming-Montreal Global Biodiversity Framework. However, there is confusion about what exactly counts and a great need to develop sectoral guidance to facilitate the implementation of this concept. This presentation will summarize FAO's Fisheries OECM Biodiversity Outcomes Guidance, including: 1) a review the potential of diverse fisheries ABMTs to produce positive in situ biodiversity outcomes across distinct ecosystem types; 2) a framework to support identification of a site's important biodiversity attributes, and in what specific ways the fisheries ABMT is influencing these attributes to produce positive biodiversity outcomes; 3) indicators and methods useful for understanding and tracking the influence of a fisheries ABMT on distinct biodiversity attributes; 4) support for establishing baselines when resource-intensive targeted biodiversity surveys are not feasible; and 5) discussion the roles of diverse knowledges in the identification and evaluation of biodiversity outcomes

S08-17541-Oral-Vina-Herbon

Biodiversity indicators for policy goals: reaching across policy, science and management.

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The status and health of marine ecosystems are assessed using a variety of tools and indicators, such as the sensitivity traits analysis, changes of diversity across pressure gradients, and the loss of seafloor integrity among others. Indicators could be used in isolation or integrated with other data to inform progress on the effectiveness of environmental policy and legislative implementation at different scales, from Marine Protected Areas (MPAs) to regional and international assessments. Moreover, biodiversity indicators are increasingly being used to identify risks and benefits to marine ecosystem services.

However, lack of extensive long-term data from monitoring programmes to assess the effects of impacts from anthropogenic pressures, combining different types of data without compromising the quality of the results or downgrading high quality datasets, is very challenging, and in many cases requires a complex model of integration and validation. Understanding the capacity of indicators to be used for multiple purposes, the viability of setting thresholds and links to marine ecosystem services, as well as, evaluating levels of confidence are essential to ensure the successful acceptance of assessments results and their use to guide policy decisions. This complexity requires a strong interaction between scientists, policy makers and managers, alongside stakeholders such as industries and NGOs. This talk will present how the methods used for the regional OSPAR Quality Status report 2023 are being applied for different purposes, such as the development of national thresholds, and evaluation of conservation measures comparing indicator results within and outside MPAs.

S08-17570-Oral-Hale (ECOP)

Hindcasting estuary ecological states using sediment cores, modelled historic nutrient loads, and a Bayesian network for informed management.

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Nutrient enrichment is an issue in many of Aotearoa New Zealand's estuaries, however guidance on how to assess the extent of eutrophication with a view to management is limited. The Estuarine Trophic Index (ETI) toolkit was developed to assist regional councils in determining the susceptibility of an estuary to eutrophication, assess its current trophic state, and assess how changes to nutrient load limits may alter its current state. However, for most of Aotearoa's estuaries, ecological monitoring data are unavailable, or only cover recent periods, meaning the long-term effects of land-use change and intensification and the resulting impacts are poorly documented. As a result, when determining suitable management thresholds, current guidance defaults to using the "baseline" state of an estuary when it was first determined. For impacted estuaries this is after significant degradation has already happened.

To overcome this lack of knowledge, we have developed a method combining dated sediment core geochemistry, historic land-use data layers, and water column nutrient modelling, with a Bayesian Belief Network model, to hindcast historic estuary condition, providing a time series of trophic health (ETI) scores and associated ecological parameters including a macroalgal ecological quality rating index, sediment redox potential depth, a seagrass health index, and macrobenthic fauna diversity using an NZ adapted AZTI Marine Biotic Index (NZ-AMBI). We validate these modelled indices with recent observations of estuarine quality in a highly impacted eutrophic estuary, alongside mātauranga (indigenous knowledge) from mana whenua on historic changes of estuarine cultural values including kaimoana health and abundance.

S08-17596-Oral-Yamakita

Nationwide evaluation of Marine Ecosystem Services of Japan: achievements from the PANCES project

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Although the recent increase in the number of researches on ecosystem services, the researches on the marine ecosystem services (MES) are still minor. Nationwide scale evaluation of MES is necessary to contribute to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) that conceptualized ecosystem service or Nature's Contributions to People (NCP) together with the flow of the values from biodiversity to human well being. Since we started a project named Predicting and Assessing Natural Capital and Ecosystem Services through an Integrated Social-Ecological Systems Approach (PANCES) in 2016, marine & coastal natural capitals and major MES were mapped across Japan. As a result, areas with high provisioning services (catch of several major coastal fish species) were found within the southwestern part of Japan from the Seto Inland Sea to Nagasaki. There are smaller regions where we can observe synergy of regulating services (CO2 absorption) and provisioning services such as the northwestern part of Kyushu, Ise Bay, Tokyo Bay, Sado. Regarding the evaluation of regulating services and cultural services (diving, clamming and sea bathing distribution), a different tendency from that of Honshu should be considered. We will show the comparison with local version Ocean Health Index in the presentation.

S08-17653-Oral-Karisa (ECOP)

Developing indicators for monitoring coral reef resilience in Kenya

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Coral reefs are highly biodiverse and offer a range of ecosystem services. However, they are in serious decline and their resilience is eroded by threats originating from both global and local scales. Climate change is recognised as one of the greatest threats to coral reefs. While there are global efforts to reduce green-house emission (e.g Intergovernmental Panel on Climate Change), climate change is still expected to challenge coral reefs in the next century. Resilience-based management provides a framework for managing corals reefs, by focusing on local and regional stressors that managers have control over. In Kenya, and most countries in the Western Indian Ocean (WIO) region, there is no comprehensive monitoring plan that focuses on resilience principles for Marine Protected Areas. Here we present a set of primary coral reef resilience indicators, that can be used in conjunction with coral reef monitoring programs, in an effort to localize and operationalise resilience-based management efforts in Kenya. Using a set of 61 resilience indicators that we collected in 2009 and their replication done in 2016, we are utilising multivariate analysis to prioritise the most relevant indicators for Kenya. We are ranking indicators by their weighted measure which is based on, 1. Relevance to science, 2. Reliability (including ease to be measured) 3. Relevance to management and 4. Ease of indicators to be altered by managers. This study will enrich coral reef monitoring programs in Kenya towards resilience-based management and has the potential to be applicable to countries within the WIO region.

S08-17688-Oral-McKellar (ECOP)

Setting thresholds for good status in marine ecosystem management.

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Setting thresholds for 'good' status is an important part of effective marine ecosystem management and key to achieving sustainability goals. Thresholds are used to distinguish between ‘good’ and ‘bad’ ecosystem states. A range of methods are used to estimate thresholds, but these are often chosen without a clear understanding of which will provide the most accurate and reliable estimations of 'good' status based on available data. We evaluated the statistical robustness of different methods for setting thresholds, using computationally simulated ‘indicator’ data, representing either pressure-state or reference condition datasets. We examined the impact of varying levels of stochasticity (noise), sample size (range), and the shape of the pressure-state relationship (linear, tolerant, sensitive) of ‘indicator’ datasets, on the thresholds estimated by four different methods.

Methods using pressure-state datasets (tipping points and distance to degradation) estimated similar thresholds across varying levels of stochasticity and sample size but were unreliable, in that they frequently failed to estimate a threshold if there was high stochasticity or a small sample size. Methods using reference conditions (range of natural variation and statistically detectable change) reliably estimated thresholds across datasets with low sample sizes and high stochasticity, but these were often estimated at a low state level, not representative of ‘good’ status. We recommend that methods using reference conditions are prioritized when estimating thresholds for ‘good’ status, but that the accuracy of reference condition data in representing an indicator in ‘good’ condition is carefully considered to ensure the estimated thresholds are accurate, as well as reliable.

S08-17690-Oral-González-Irusta

Assessing the environmental status of benthic habitats in relation with trawling impact in Spanish waters by integrating two OSPAR benthic indicators

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Indicators are key tools to monitor and to assess human activities and their impact on the marine ecosystems, including benthic habitats. In general, no indicator can meet all requirements since all have caveats, limitations and knowledge gaps. Therefore, to combine individual indicators is usually the most adequate way forward to better assess the environmental status of benthic habitats. Here, we propose the integration of two OSPAR indicators, the BH1 and BH3, to assess the state of benthic habitats in response to bottom trawling in Spanish waters. The BH1 is a sample-based indicator that measures the proportion of sentinel species within each habitat as a proxy for its environmental status. It requires detailed monitoring data which reduces uncertainty but creates spatial gaps in the assessment in areas with not enough data. The BH3 is a risk indicator that determines the overall impact on each habitat based on a theoretical disturbance matrix. It allows the evaluation of large marine areas where only limited data are available. Therefore, the evaluations of BH3 see their uncertainty increase concerning BH1 but cover the gaps that BH1 do not. In the Spanish approach to the evaluation of D6 we have used the complementary assessment of both indicators, to reduce evaluation uncertainties and spatial gaps. Specifically, our approach used the BH1 pressure-state curves to calibrate or ground-truthed the BH3 disturbance matrix categories. This approach has allowed us to assess all broad habitat types in response to trawling across Spanish waters with not spatial gaps and low uncertainty.

S08-17700-Oral-Zeng

Discussions and adjustment suggestions on the marine ecological protection red line

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Due to the unclear basic data, unclear control rules and the continuation of various historical problems, the Ministry of Natural Resources and the Ministry of Ecology and Environment jointly organized the adjustment of the ecological protection red line. In order to meet the new requirements of building the pattern of marine ecological security, this paper analyzes the effectiveness of the marine ecological protection red line system in China, the main problems, and puts forward the relevant considerations of the adjustment, which are expected to serve as valuable references for future studies related to marine ecological protection red line zoning and managing.

Key words: marine ecological protection red line; adjustment; suggestions

S08-17418-Poster-McQuatters-Gollop

Plankton on the move – implications for global biodiversity goals

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Plankton form the base of the marine food web, are integral to ecosystem functioning, and respond quickly to changes in their environment. Climate warming, ocean acidification, and human activities leading to the spread of invasive species are causing distributional shifts in plankton communities which directly affect ecosystem services such as carbon cycling, oxygen generation, and food production. Change in plankton distribution, therefore, is a sensitive and important indicator of marine climate change throughout the world ocean. Spatially-extensive, multi-decadal plankton datasets, such as the Continuous Plankton Recorder survey, have revealed that the base of the marine food web is changing, with spatial shifts identified in phytoplankton productivity, phytoplankton composition, and zooplankton composition. Northeast Atlantic zooplankton communities, for example, are becoming 'tropicalised' with warm water taxa increasing in abundance and cold water taxa shifting poleward. Similarly, temperate marine plankton communities are becoming characterised by large-sized zooplankton species, which have replaced smaller species during recent decades, suggesting an altered trophic functioning in these systems. These shifts in plankton distribution are linked to change in higher trophic levels, such as commercially important fish species, as well as to changes in marine ecosystem functioning and productivity, including carbon and nutrient cycling. Commercial fisheries, conservation efforts, and international policy commitments therefore must consider and adapt to plankton on the move.

S08-17468-Poster-López (ECOP)

Evaluating the effectiveness of a deep-sea regional MPA network for *Nephrops norvegicus* using connectivity indicators

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Information on marine connectivity, as the link between populations through the dispersal of individuals, is a valuable resource for policy makers involved in spatial conservation planning decisions. One of the objectives of marine governance and the 2030 horizon is to assess the effectiveness of marine protected areas (MPAs). A large network of 35 MPAs has recently been implemented in the northwestern Mediterranean Sea and a programme of monitoring and assessment has been initiated with the support of stakeholders and research projects. However, robust information on the potential connectivity within and beyond these MPAs is lacking. We propose new indicators of connectivity that allow to compare the establishment and temporal variability of connections in MPAs. The indicators are based on larval transport simulations, which are the results of modelling tools combining ecology, physics, and technology and represent three aspects of the connectivity: occurrence, quantity, and frequency. These indicators have been tested on MPAs designed to restore and protect a commercially important species, *Nephrops norvegicus*. We expect these indicators to highlight the persistence and variability of connectivity in each MPA throughout the species' spawning season (January to March). The connectivity of the entire MPA network is likely to be limited due to the presence of mesoscale circulations along a density front. However, connectivity within sub-groups of MPAs distributed on different sides of the front is assumed to persist throughout the spawning season. Our study is a preliminary analysis to support regional marine governance decisions that may be applicable elsewhere.

S08-17509-Poster-Scemama

Evaluation of the cost of marine habitat conservation in France: application to the Natura 2000 network

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The European Habitat Directive aims to reach and maintain a favourable conservation status of natural habitats including marine habitats (SDG 14). Its operationalization relies on Natura 2000, a coherent network of 163 marine protected areas (MPA) where managers define and apply a set of actions to preserve, raise awareness and restore marine habitats. Despite this extensive network, France fails in reaching conservation objectives. One of the explanation of this failure is the inadequacy of the resources regarding the policy's ambition in terms of both amount and utilization.

In this way we conducted an analysis of the cost of the Natura 2000 network in three parts. The first part of the study is dedicated to the assessment of the actual cost of the Natura 2000 network at sea at a global level, but also regarding the distribution of these cost between actors, sites and actions. We also address the question of overlaps between the existing marine policies (e.g. marine spatial planning, MSFD). The second part of the study is dedicated to assessing the potential cost of the network to fully implement its actual management plan. Based on an analysis of the actions planned in the objective document, we estimate the cost of its full implementation. The third part of the study is based on the analysis of the complete cost of the network, i.e. the cost of the Natura 2000 network once conservation objectives are reached.

This communication also highlights how cost assessment can help to guide conservation policies.

S08-17539-Poster-Wang

Assessing Socio-Ecological Fit of International Marine Agreements and Marine Product Trade Flow Networks

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The trade of seafood plays a significant role in the interaction between humans and the sea. However, certain nations, particularly Small Island Developing Nations, frequently experience unfair distribution and imbalanced roles in seafood trade and international ocean cooperation. It is essential to comprehend the level of coordination between international maritime agreements and seafood trade flows in order to advance an equitable blue economy. The research establishes a socio-ecological network by utilizing a dataset encompassing bilateral trade in marine products among 195 countries or areas from 1995 to 2021, alongside an international maritime accords database. The research begins by quantifying the trade patterns of marine products and evaluating their compatibility by associating them with the social network. This evaluation is conducted using advanced statistical methods such as QAP-weighted network correlation and Logistic regression quadratic assignment procedure analyses processed by ERGM. The results indicate the presence of significant network hubs, such as China and the United States, in both the social and ecological network. Furthermore, there is a growing alignment between international maritime cooperation and trade flows of marine products, indicating a distinct three-stage development pattern. Furthermore, the logistic QAP regression coefficient validates the primary determinants of international marine agreements and seafood trade flows, which encompass national border contiguity and economic dependency. The research presents a study of the positions of nations in the seafood trade network and the network of marine agreements using sensitivity analysis. It also examines the risks associated with unfair behaviors that arise from these uneven situations and proposes solutions for improvement.

Session 9: Emerging conditions and transformations for coastal communities – The role for supporting science and assessment

Convenors:
Emily Ogier (Australia), corresponding
Tony Charles (Canada)
Alyne Delaney (Japan)

Plenary Speaker:
Aoi Sugimoto (Japan Fisheries Research and Education Agency (FRA))

Coastal communities are located at the cusp in multiple senses. Emerging conditions for coastal communities are being shaped by the changing interaction of land and sea systems, sectors and climate-driven impacts, as well as by shifting social factors and axes of contestation and inequity concerning tenure and coastal zone use, human development and food security, and concerning social collectives and forms of community. Applying a "lens" of coastal communities, this session will use presentations and facilitated discussions to explore the changing conditions being experienced by coastal communities and the responding changes in our knowledge and science capacity to understand what's happening. This session welcomes presentations on emerging conditions and transformations for coastal communities and on the role for supporting science and assessment. Specifically, topics may include: change of land use in coastal zones and its impact on socio-ecological systems; changing coastal values and preferences, and implications for trade-offs, cooperation and conflict in the coastal zone; responses to changing climate and the changing nature of poverty and food insecurity in coastal communities; and, monitoring change in ocean uses, with coastal communities as units of analysis in multi-sectoral integrated assessment.

S09-17713-Plenary-Sugimoto

Transformation of the coastal communities and science: Current status and future directions derived from empirical research and observation

Aoi **Sugimoto**

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This talk will present some of the transformative initiatives in local communities, emerged and implemented for the sustainable development, and discuss how/if marine and fisheries science communities can effectively support those (or not), based on the latest works of mine. Examples of transformative initiatives include the Hida city and several communities along the coast of Sagami bay, Japan. The former case demonstrates that the citizen, scientists and private companies in and outside the community collaborate for community development with the focus on people's well-being and succession of traditional culture, not on GDP-driven development. The latter demonstrates the dialogue on community fisheries and marine ecosystems among local stakeholders. Further, I will present two of the latest works on marine/fisheries science community (organization and scientists) as a self-examination of the capacity of "ourselves" in order to support the communities' transformative initiatives.

As the group pf people, it could be said that coastal communities and science communities share some analogical structures. Humanities, Arts and the Social Sciences (particularly behavioral and organizational fields) have accumulated the theories and case studies to better shape the decision making and behavior of any kind of human community, which has the potential to be incorporated into transformative ocean science. I would like this session to enrich the discussion of such innovative field of marine social science.

S09-17422-Oral-Roy (ECOP) **RECORDED**

Assessment of locally available seaweeds as sustainable organic compost fertilizer resources

Durlave **Roy**

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Marine red algae from the Bangladesh Bay of Bengal Hypnea Sp have been used as organic materials due to the presence of a number of plant growth-stimulating compounds. The effect of various seaweed species on plant growth and development with an emphasis on the use of this renewable bio-resource in sustainable agriculture of northern fertilizers raw materials system. Organically made fertilizers play an important role in increasing crop yield and the quality of crops promises improvements considering climate adaptation. Seaweed wastes compost was put in evaluation trials at Sreemangal, Bangladesh to evaluate its efficacy and find out the optimum dose for profitable Betel leaf production. This part of the study is directed toward the analysis of the future trend and performances of composting seaweed wastes. The science of seaweeds explores, how analysis of the future trend and performances of composting seaweed wastes. A field study was conducted at three treatments at khasia farmers of Sreemangal khasia betel leaf cultivation community area of Bangladesh. Seaweed wastes mixed with compost organic fertilizer dose of 50g per support tree . The highest betel leaf yield was obtained from seaweed wastes mixed with compost organic fertilizer applied to plants. Table 1. (2880 leaf). This study suggests that seaweed wastes mixed with organic fertilizer are suitable for betel leaf cultivation. Area-based conservation is a key tool for delivering the Sustainable Development Goal of responsible production and consumption and climate action.

Keywords: Seaweed, Plant Growth, Organic Material, northern fertilizer, Sustainable.

S09-17434-Oral-Doolittle Llanos (ECOP)

Ancestrality in action: Contestations and entanglements in a mangrove community-based management area

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As a response to mangrove degradation worldwide, academics and governing institutions as well as NGOs have advocated for Community-Based Mangrove Management as a way to maintain sustainable mangrove forests and acknowledge and strengthen local livelihoods. In this talk, we examine the case of the Don Goyo mangrove concession area, in the Gulf of Guayaquil, Ecuador where the majority of Ecuadorian mangrove forests lie, and where ancestral communities have been granted custody of the mangroves by the Ecuadorian State. We do so with the aim of understanding how community-based management works based on ancestrality as an identity marker, what power dynamics develop in the area, and what can these tell us about community-based management as an empowerment tool. We will discuss tensions related to constructing a concession based on natural resource extraction, the shifting responsibility of natural resource protection from governments to local communities, and the exclusionary aspects of the concession. Finally, while acknowledging ancestrality as an entirely valid identity, we explore how it is deployed and negotiated between State and communities and its ability to ensure social and ecological sustainability in these mangrove forests.

S09-17466-Oral-Ogier

Which communities have standing and how? Developing regional marine resource management and assessment frameworks in Western Australia

Emily M. **Ogier**[1,2], Sarah Jennings[1,2], Klaas Hartmann[1], Jenny Shaw[1,3], Caleb Gardner[1]

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This talk will address the inclusion and assessment of community benefits in management of fisheries and aquaculture activity. Mechanisms for considering and reconciling the preferences of coastal communities, communities of interest (fishers), and the wider state community ('the public') are applied and discussed. A case study is presented of Western Australia where, through the introduction of new legislation and a management framework, goals for managing suites of aquatic resources (i.e. targeted fish species) are intended to include generation of social, cultural and economic benefits (both direct and indirect) for relevant communities of interest. Selection of indicators is required in which these 'benefit pathways' can be assessed. A study is underway to develop decision support tools to support selection of community goals and relevant indicators for ongoing assessment of social, economic and cultural outcomes. Three aquatic resources are considered in this study: Western Rock Lobster, South Coast Estuarine and Nearshore fishery; and Gascoyne Demersal Scalefish fishery. For each resource, community interests vary from the highly localized to the state-level and are often countervailing. Benefit pathways vary from those which seek to maximize the economic value of the fish for the production sector, through to those which seek to increase the flow-on benefits (including food provision) to regional communities from fisheries activity. The interests and aspirations of different communities associated with these fisheries are discussed, drawing on the mixed method applied in the study. Benefit pathways which characterize the current, and preferred, generation and distribution of different types of benefits to various communities are then explored. Results of preliminary assessment using indicators selected for their relevance management goals are presented.

S09-17500-Oral-Barclay

From 'fishing communities' to 'coastal communities': lessons from Japan and Australia on science and policy as commercial fisheries activity declines

Kate **Barclay**[1] and Yinji **Li**[2] (we will present as a team)

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Around the world coastal communities have shifted from being mainly based on fisheries, to fisheries being one industry among several based on the sea, including aquaculture, tourism around fisheries heritage and current seafood production, food service including local seafood and recreational activities including fishing, snorkeling, swimming, boating, diving and so on. We use the idea of *umi gyo*, a notion developed in Japan for shifting policy and supporting research from a focus on fisheries as the main source of livelihoods in coastal areas, to a broader notion of a variety of interrelated marine-based activities as central to coastal communities. The paper illustrates the *umi gyo* idea using case study material from Japan and Australia, where commercial fishing has declined in absolute terms and also in relation to other marine-focused activities. We find that taking an *umi gyo* approach to research and policy to support wellbeing in coastal communities is inherently interdisciplinary and cross sectoral. In addition to the conventional science from fisheries biology, ecology and economics, input is also needed from regional or community development studies, business studies, tourism studies, heritage studies and other fields. Likewise, *umi gyo* policy development requires input not only from the agencies responsible for managing fisheries and aquaculture, but also agencies for food policy, rural and regional development, culture and heritage, planning, transport, and environmental protection.

S09-17511-Oral-Delaney

Highlighting stakeholder-engagement, collaboration, and trans-disciplinarity in the quest for sustainable coastal communities: Lessons from stakeholders "captaining the ship"

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Using Japan's Miyagi Prefecture as a case study, this paper introduces stakeholder efforts to strengthen coastal community sustainability through collaboration, knowledge co-creation, transdisciplinary research, and community activities.

Local and small-scale fishers are socially and economically vital for coastal communities, especially in Japan where they make up 94% of fisheries employment. Yet, demographic and environmental challenges are increasing from societal and climatic changes. In the Miyagi case, these challenges are exacerbated by political decision-making, particularly those made in response to the disasters of 2011 which transformed people's historic connections with their coasts, altered coastal ecosystem functioning, and introduced contaminants into the sea. In the face of this, community stakeholders have emerged who possess great enthusiasm, ingenuity, and entrepreneurial zeal for rejuvenating their communities and strengthening the environmental sustainability of their ocean activities.

The SEAQUEST project brings together these stakeholders towards the realization of their vision of a sustainable, ocean-connected future (using native *satoumi* and *umigyou* concepts) through designing environmental education activities, accessing local knowledge via oral history, and collaborating on interdisciplinary research activities, including combining local ecological knowledge and western scientific data for ocean monitoring, and co-collection of eDNA. The presentation highlights three specific types of activities: environmental education with children surrounding *satoumi* and octopus DNA; inclusion of local ecological knowledge into ocean models; and the women's knowledge and activities within coastal communities.

S09-17526-Oral-Kraan

Putting fishing communities on the map in ICES regions

Marloes **Kraan** and WGSOCIAL members

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This paper discusses the importance of identifying fishing communities for fisheries - and ecosystem-based management. Fishing communities are an important, yet often neglected unit of analysis for fisheries management. However, all fishers working on and owning the fleets land their catches and live somewhere, are part of fisher families and provide for many livelihoods in fleet and trade related activities. Understanding the impact of fishing beyond the fleet level, requires the consideration of fishing communities. Once this unit of analysis is identified data collection can be formulated and an assortment of analysis conducted to better understand fisheries impact and change. ICES WGSOCIAL has developed a method to identify fishing communities for all ICES regions. This method has been applied in the Ecosystem Overview (EO), one of the advice products of ICES. With this method fishing ports have been used as a proxy for fishing communities. In this paper we describe why putting fishing communities on the map is so important for an ecosystem approach to fisheries, the process that was undertaken and the methods that were. We will discuss ways that a fishing community can be defined and why that is not a straightforward task. Finally, we will discuss ways to better understand the social, cultural and economic value of fishing, and why this matters for applied marine research and fisheries & blue economy policy. The challenges surrounding this work and how they can be overcome will also be discussed.

S09-17531-Oral-Matsui (ECOP)

Coping with social-ecological changes: Diversifications of sea cucumber fisheries in western Hokkaido, northern Japan

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The rapid expansion of the global sea cucumber market since the late 1980s has drawn attention to sea cucumber conservation and impacting species. Similarly, it altered the landscape of local fisheries and livelihood, i.e., local social-ecological systems. Exports of sea cucumber (*Apostichopus japonicus*) from Japan surged in the early 2000s, reaching a peak in 2007, after which the volume plateaued and declined, indicating a stabilization of the market. This report delves into the social-ecological system surrounding the sea cucumber fishery in western Hokkaido, Japan. Resource use patterns and management systems vary locally in the sea cucumber fishery. An influential factor in this diversification is the influence of local winds that blow over the study area during the sea cucumber fishing season. To elucidate this social-ecological complexity, a community-scale wind observation survey, small GPS loggers on fishing vessels, and interviews with relevant actors were conducted during the June-July 2021 fishing season. Survey results revealed differences in the number of operational days and patterns of fishing ground usage among communities surrounding a single bay, influenced by local winds. Each community is similarly affected by the "fever" and engages in sea cucumber fishing in the same waters, and the issue lies in managing resources while improving their livelihood. Despite these conditions, sea cucumber fisheries in the study area have diversified based on topographical conditions, including wind direction and fishing ground characteristics, as well as community decision-making. Understanding the response of local fisheries to social-ecological changes requires careful consideration of these micro-scale differences.

S09-17554-Oral-Ran (ECOP)

Research on regional management of marine tourism—Taketomi Island entrance fee as an example

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Marine tourism is an important part of the tourism economy, an industry related to traditional fishing, and a different industry. The marine tourism industry is a new industry that uses marine resources to motivate passengers to travel and meet the needs of modern people. The sustainable development of marine tourism is based on tangible, intangible, natural, and humanistic marine tourism resources.

Therefore, in this study, we focused on the management of marine tourism from the viewpoint of environmental management and conducted an empirical examination of the island entry fee policy (the first in Japan) on Taketomi Island. The purpose of this study was to explore the functions and issues of entry fees.

We conducted a literature survey on marine tourism and regional management from existing materials. In addition, we conducted a field survey on the island entrance fee as a measure for regional management on Taketomi Island, in order to understand the actual status of environmental problems and countermeasures that have emerged with the development of marine tourism.

S09-17631-Oral-Soejima

Emerging conditions and transformations of Fishery women's entrepreneurship in Japanese coastal communities

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We have identified that fisheries women groups in Japan changed their activity from volunteer work focused on reducing expenses and taking care of families and communities to environmental protection, promotion of fishery products, and to entrepreneurial activities (Soejima & Frangoudes 2019). In the paper, we brought out one of the problems that the businesses are marginal and are less lucrative than other businesses. Therefore, young women often choose to work in other industries and not in the women's groups. Consequently, the groups suffer from a lack of young labor.

However, there are slowly beginning to be transformation. We can observe some cases of young women running even small businesses how they can contribute to the local fishing and community while at the same time making their own businesses profitable.

In this presentation, the case study of Akoya Hime in Uwajima, Ehime prefecture, shows how young leader is trying to improve management their business, and how improving their community involving other local fishery women's groups. Through this case study, we will discuss about how these developments can be evaluated.

S09-17637-Poster-Tamura (POSTER->ORAL)

Towards a transformative approach in fisheries improvement in Japan: Insights from MSC certification assessments and accelerating improvement with multi-stakeholder collaboration

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In Japan, only ten MSC certifications currently exist, exclusively covering non-extractive aquaculture of filter-feeding bivalves and internationally managed tuna fisheries. Despite numerous preliminary assessments in the past decade, mainstream coastal fishing operations in Japan have yet to secure MSC certification. Analyzing the results of MSC certification assessments, known for their stringent criteria, this research categorizes and analyzes the distinctive features of Japan's fisheries audit results. The findings contribute to understanding the best practices in Japanese fisheries management crucial for achieving international sustainability standards and identifies barriers to progress. Through an integrative analysis using the assessment frameworks of MSC, this study also uncovers weaknesses and opportunities for Japan's fisheries management implementation. With recent Fishery Act amendments aligning Japan's fishery management objectives with global standards, leveraging market incentives for fisheries improvement projects emerges as a promising avenue. However, structural barriers surrounding Japan's fisheries impede progress. The research proposes a transformative collaborative framework among Japanese stakeholders, addressing these structural impediments. By actively encouraging the internalization of environmental costs, collaborative fisheries improvement projects can foster Nature-Positive impacts in fisheries, promoting sustainability and the recovery of marine ecosystems.

S09-17710-Poster-Tojo POSTER &ORAL

Comparable study of fisheries cooperative and cooperative fisheries for sustainability and resiliency in Mauritius

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Cooperative fisheries and community based management are models of sustainable rural development in coastal communities. A variety of efforts as projects has been practiced around world, but not all are successful as expectations. Mauritius locates in the Western Indian Ocean, and expectation of the future development is quite large upon the large Exclusive Economic Zone (EEZ) with blue economy. To protect coastal ecosystems, government has encouraged fishers to do offshore fishing and to form fisheries cooperatives. In spite of a variety of management efforts, fisheries cooperatives in Mauritius still face constraints with economic difficulties and environmental uncertainties. In this study, we expect to find potentials in Mauritian fisheries cooperatives for sustainable development. We compare cases of the North Pacific, Japanese fisheries cooperative associations and Mauritian cases. Law and codes of fisheries cooperatives will be examined and interpret the strength, weakness, opportunities and threats are investigated for both Japanese case and Mauritian case. With proper implementations of necessary cooperative law, bottom-up activities with local leaders with competencies need to be encouraged. Ownerships of the cooperative actions and development of community cultures are most likely necessary in Mauritius based on our preliminary investigations.

S09-17682-Poster-Watanabe

The impact of environmental change on the rationality of the local farming ground allocation system: A case study in Japan

Reon **Watanabe**[1], Ryutaro Kamiyama[2], Takahisa Shoji[1], Tsubasa Nakamura[1,3], Takashi Atsumi[4], Hiroyuki Okumura[4], Yoshihito Senda[5], Fukuji Yamada[6], Junpei Shinji[7] and Takahiro Matsui[1]

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Recent marine environmental changes may affect not only fishing activities but also the validity of governance systems that support them. This study aims to examine the impact of environmental changes on the allocation system of oyster farming ground in Uramura, Mie, Japan. The fishers have separated the farming ground into several sections, and the section with the best water quality for oyster farming have been allocated equally to all fishers including small-scale fishers, while the other sections have been allocated mainly for large-scale fishers. This system imposes different usage fees on each section of the farming grounds, whose prices would reflect the fishers' evaluation on the quality of the farming grounds (higher prices on better sections). However, the quality can be changed recently due to environmental changes. We conducted a marine environmental survey and an oyster-culturing experiment at nine stations in the farming grounds. The results showed that the growth rate of the oysters cultured in the section with highest usage fee was low. Our environmental surveys supported this result by showing low phytoplankton flux in the section. We found that the small-scale fishers would experience the worst effect from the low quality of farming grounds by evaluating the overall effects on the fishers with different combinations of sections. Thus, small-scale fishers were negatively affected in this case, indicating that environmental changes may undermine the rationale of the systems.

Session 10: Vulnerability of marine SES to climate change and anthropogenic pressures: Adaptation as a pathway to resilience

Convenors:
Stefan Koenigstein (Germany), corresponding
Lotta Kluger (Germany)
Jonas Letschert (Germany)
Irene Martins (Portugal)
Ana Spalding (Germany)
Martina Stiasny (UK)

Plenary Speaker:
Nathalie Niquil (French National Center for Scientific Research (CNRS), The University of Caen, France)

Marine systems are vulnerable to environmental changes, such as intensifying climate change, deoxygenation and acidification. At the same time, the oceans are subject to increasing human pressures, such as exploitation of living, fossil and mineral resources, industrialization and pollution of the ocean. The combined impacts of these pressures can have severe consequences for marine organisms, ecosystem services and their users, hence challenging the resilience of socio-ecological systems (SES). When the adaptive capacities of marine ecosystems or user groups and communities are exceeded, unexpected thresholds and tipping points may be reached.

We invite case studies, regardless of their spatial scale, scope and governance settings, and methodologies that address the responses to environmental or anthropogenic drivers, and/or users' adaptive capacities in SES. By improving understanding of the vulnerability to multiple drivers, we aim to identify adaptive governance strategies that can strengthen the resilience of marine-human systems under global change.

S10-17729-Plenary-Niquil

Cumulative and interactive effects of human uses and climate change: a point of view based on networks

Nathalie **Niquil**[1], Quentin Noguès[1,2], Théo Grente[3], Valérie Girardin[3], Aurore Raoux[1,4], Georges Safi[5], Emma Araignous[5], Rhoda Fofack-Garcia[5], Ghassen Halouani[6], Jean-Claude Dauvin[4], Maud Thermes[1], Marco Scotti[7,8], François Le Loc'h[9], Frida Ben Rais Lasram[10]

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Ecological theories identify links between the structural and functional properties of food webs and their stability. Together with the search for general rules reflecting changes in the functioning of marine ecosystems in the presence of anthropogenic pressures, they led to the formulation of ecosystem health indicators derived from ecological network analysis.

In particular, this framework has been applied to the study of the cumulative effects of local offshore wind farms and climate change; here, in the Baie de Seine, Eastern English Channel. Recent research has focused on assessing cumulative impact on food webs, considering both the artificial reef effect caused by e.g. wind turbine masts and the effects of species displacements due to changes of temperature and salinity. Several numerical tools based on trophic and social-ecological networks have been used. We present a summary of both their advantages and drawbacks, with a focus on some recent innovations. The climate change has a crucial influence on different ecosystem components, and hence affects the overall responses of ecological network analysis indices. The effects appear to be heterogeneous across space, over time, and among ecosystem functional properties (e.g., recycling, flow redundancy or detritivory over herbivory ratio). Modifications within the ecosystem are accompanied by modifications in the relationships between the actors and the ecosystem, by transforming collective actions and different values characterizing systems, that yield sustainability issues. Thus, social-ecological system models are of interest to explore both these changes and cascading indirect effects linked to the implementation of offshore wind turbines.

The methods presented here can be applied to impacts caused by a large variety of maritime activities. Their main advantage is that they focus on characterizing the network complexity,

either of marine ecosystems or socio-ecological systems. Accordingly, they provide an original assessment of cumulative impacts.

S10-17454-Oral-Mollier

Human-predator coexistence in the oceans: resolving the growing depredation conflict in global fisheries

Margaux **Mollier**[1,2], Camille Mazé[2], John Arnould[3], Sophie Gourguet[4], Mary-Anne Lea[5], Mark Hindell[5], Dirk Welsford[6], Christophe Guinet[7] and Paul Tixier[1]

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The increasing expansion of human populations and activities has inevitably exacerbated interactions and conflicts with wildlife species, primarily through increased competition for habitats and resources. The feeding on fisheries catches by large marine predators, a behaviour termed "depredation", has recently grown as a global human-wildlife conflict affecting socio-ecosystems. Depredation interactions impact i) the socio-economy of fishing communities through fish losses, gear damage, and extra fishing effort, ii) the conservation of predators through injuries or bycatch, and iii) the functioning of ecosystems through changes in trophic interactions. While resolving depredation conflicts in fisheries has become a priority challenge for fishers, communities, managers, conservationists and scientists, it remains, as yet, intractable. Through an extensive literature review and two contrasted longline fisheries – large marine predators conflict cases (the French Southern lands and South Pacific Ocean), this study assesses the ecological and anthropogenic causes and consequences of the depredation conflict. More importantly, we examine the effectiveness of previous approaches implemented to mitigate the conflict, identify the lessons learnt from these attempts, and propose future directions for research to lead to more successful outputs. Among these directions we discuss how to make interdisciplinary and collaborative research frameworks more efficient in finding the conditions needed for a long-term sustainability of socio-ecosystems impacted by depredation. Combining increased knowledge on the key drivers of the conflicts at species, fishery and community levels with integrated modelling techniques and sociological approaches; adaptive co-management strategies in open governance systems were identified as the key prerequisites for depredation conflict resolution success.

S10-17459-Oral-Daures

A socioecological approach for managing the small-pelagic fishery in France: the DEFIPEL project

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French small pelagic (SP) industry have structured the coastal activity of the Brittany region for over a century. In recent years, SP have shown worrying signs of deterioration in size, weight and fat content, which may have a negative impact on the canning sector. Moreover, the sardine fishing mortality is increasing. The challenge for the sustainability of this industry is therefore twofold: first, preserving the resource (volume and quality) in a context of climate forcing; second, maintaining fishing and processing activity in Brittany in a context of internationalization of seafood trade. The DEFIPEL project aims to implement a socio-ecological approach to the management of SP fisheries, bringing together a multidisciplinary research team and the fishing industry.

The aim of this paper is to present the results concerning the vulnerability/resilience of the French sardine value chain to changes in the small pelagic ecosystem. Surprisingly, the canning sector, thought to be vulnerable, has developed adaptive strategies based on international sourcing and foreign investment. In turn, these strategies are detrimental to other ecosystems. Initially seasonal, the sardine is now targeted all year round due to the lack of other fishing opportunities. This strategy increases fishing pressure on stocks and the vulnerability of fishers. Finally, the sardine sector is increasingly concentrated at all levels. A few large companies with great adaptability coexist with small, vulnerable ones. These results underline the need to adopt a socioecological-based management, including markets and industry behaviours, especially in the context of climate change.

S10-17476-Poster-Blanz (ECOP) POSTER->ORAL

More than the sum of its parts: Assessing the vulnerability of an interlinked marine socio-ecological system

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In order to investigate the responses to external drivers of a marine socio-ecological system (SES) we created an analytical model of a time dynamic ecosystem harvested by profit maximizing fishers, who sell their catch to utility maximizing households. With these three components the model contains all the elements of an SES. We find that the adaptation behaviour by the human actors is the main cause of feedback effects within the SES. We derive the analytical solution of the model, taking knock-on and feedback effects into account. The sensitivity, adaptive capacity and therefore also vulnerability of the SES are then determined from derivatives of the system properties to the forcing caused by the external drivers. We find that the interaction effects are critical in determining the vulnerability of the SES to external drivers that only directly impact one component, but indirectly affect the entire system. This approach further allows us to identify the effects of combined drivers for the vulnerability of the SES. We illustrate these results using a version of the model calibrated to the German North Sea coastal fisheries. We find that the effects of the combined drivers differ from the exposure to a single drivers. We explore the exposure of the system to sixteen drivers and we could identify which of these drivers affects the vulnerability the most.

S10-17488-Oral-Griffiths (ECOP)

Building resilience and embedding respect of Sea Country through a Marine Spatial Planning Framework for Australia.

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Australia has the World's fourth largest EEZ, covering an area twice the size of its landmass. Yet, despite land planning well established, a national marine planning framework is absent. Jurisdiction over the marine estate is divided between the federated states and territories (out to 3 nautical miles[nm]) and the Commonwealth government (from 3 to 200 nm) and is governed by sectoral based processes. Indigenous interests and traditional rights are not well represented in these processes. A lack of a consistent national planning framework is a perceived risk for emerging industries and causes issues for regulatory approval, where offshore development applications cross state and commonwealth boundaries. The need for an integrated, multi-sectoral marine spatial planning (MSP) process was recognized following extensive consultations with industry proponents, regulators, policy makers, and environmental and community groups. The needs of First Nations Australians for management of Sea Country were also identified concurrently through a culturally appropriate consultative process. These discussions have identified an approach for a holistic MSP framework for Australia's marine estate that addresses stakeholders and rightsholders needs and aspirations. We present this framework and discuss the challenges of working across sectors, jurisdictions, and value systems to develop a holistic, multi-sectoral planning approach.

S10-17550-Oral-WANG

Spatiotemporal evolution of the resilience of urban social-ecological systems in China's coastal cities

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Coastal cities represent intricate and ever-changing social-ecological systems characterized by the interplay between land and sea geophysical chemistry and intensive human activities. Resilience is widely acknowledged as a fundamental characteristic of social-ecological systems, and the examination of resilience can provide valuable insights into the dynamics of human-ocean interactions in coastal regions. This study utilizes the Social-Ecological-Technological system (SETs) framework to establish an evaluation index system for assessing the resilience of social-ecological systems in coastal cities. The evaluation is conducted across three dimensions: resistance, resilience, and transformation. A comprehensive assessment of the resilience of social-ecological systems in 53 coastal cities in China is performed, covering the period from 2001 to 2020. The study utilized the Local Indicators of Spatial Association (LISA) time path and spatiotemporal transition probability matrix to conduct Exploratory Time-Space Data Analysis. The findings indicate that between 2001 and 2020, the general level of social ecosystem resilience in Chinese coastal cities exhibited a fluctuating upward trajectory, which can be categorized into three distinct stages. Notably, variations in the development level were observed among the three major regions, namely the Bohai-Yellow Coastal Zone Cities, East Coastal Zone Cities, and South Coastal Zone Cities. However, despite these regional disparities, there exists a discernible pattern in the resilience level changes, while the overall spatial characteristics remain relatively stable. Investigating the dynamic evolution of social-ecological systems can offer a scientific foundation for achieving sustainable development in coastal cities. Additionally, it can provide theoretical backing for enhancing the complete management capabilities of coastal areas.

S10-17576-Oral-Tavera Ortiz (ECOP)

Socio-ecological resilience of the Baja California red sea urchin fishery

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Translocation, the assisted movement of marine living organisms, has emerged as a conservation tool and strategy to rebuild stocks and increase fisheries yields worldwide. This study investigates the social and ecological dimensions of red sea urchin (*Mesocentrotus franciscanus*) translocation in El Rosario Bay, Baja California, Mexico. The red sea urchin is the most critical regional Small Scale Fishery, and currently, some stakeholders are involved in a Fishery Improvement Project. However, urchin translocation carries significant ecological risks, as sea urchin overpopulation can lead to deforestation of macroalgal forests and trigger catastrophic environmental changes. Social aspects were examined through ethnography, using participant observation, interviews, and surveys. We used the Before-After Control-Impact method to compare the ecological community structure for ecological elements. The data was collected using underwater visual surveys. Fishers implement translocations because they benefit the species, increase economic gains through improved quality and quantity of gonads, and reduce health risks to divers. Actions surrounding sea urchin translocation make it a management measure, including an exclusive translocation zone and a protocol to regulate and monitor translocation activities. Ecological assessments indicate stable algal densities after translocation but changes in invertebrate and fish assemblages. Although fishers consider the measure effective, continued monitoring and improvement of the control in the actions are advised to address potential negative ecological impacts and prioritize alternatives proposed by ongoing fishery management initiatives.

S10-17582-Oral-Córdova-Zavaleta (ECOP) **CANCELLED**

Socioecological challenges in the artisanal gillnet shark fishery in northern-central Peru

Francisco A. **Córdova-Zavaleta**[1,2], Joanna Alfaro-Shigueto[1,2,3], Jeff. C. Mangel[1,4] and G. Ponce[1]

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Sharks are targeted by artisanal gillnet fisheries in northern-central Peru as they are part of their gastronomy and cultural heritage. This fishery is the most predominant along the coast but, currently, faces challenges due to strengthening of fishing regulations upon sharks. Annual reproductive closures and Total Allowance Catch for hammerhead (*Sphyrna zygaena*), as well as the recent establishment of ordinance measures for shark fishery, are some of the late regulations fishermen were forced to adopt in order to contribute to the management of these resources. Nevertheless, national efforts affect fishermen in their daily activities and the subsequent rentability of their activity. Based on field work and questionary surveys, fishermen declared changes on their captures and a reduction on their benefits due to fishing. In addition, they mentioned that sale pricing decreased considerably (around 20%) when selling their product at major markets, attributable to national inflation. One of the concerns we found is that the fishing effort that were exerted upon hammerheads have been reassigned to other species such as blue sharks (*Prionace glauca*), a species that has low sale price. Thus, we found that fishermen to compensate for historical benefits taken with hammerheads they must capture higher quantities of blue sharks, representing a risk on their populations and, therefore, a disbalance on the marine ecosystem. This study aims to assess socioecological challenges in this fishery. The knowledge of changes in patterns both social and ecological are crucial to understand how ecosystems and societies goes through transitions.

S10-17623-Oral-Jeong (ECOP)

Socioeconomic effects of the spread of subtropical marine species by climate change

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Sea water temperature has the greatest impact on the habitat of marine life and is a key variable that changes the ecosystem. Due to recent climate change, sea temperatures are rising and the rate of increase is accelerating. As a result, subtropical species are gradually spreading to the Korean Peninsula, and recently, *Alveopora japonica* Eguchi and *Ciona intestinalis* have been attracting attention. Projecting how future subtropical species will be distributed according to climate change is necessary for marine ecosystem management and adaptation to marine climate change. In order to predict future distribution patterns, literature data was reviewed to determine the habitat temperature of target organisms and the SSP5-8.5 scenario was applied. Using the SSP5-8.5 scenario derived through a global model, the northern habitat limits of target organisms in 2030, 2050, and 2100 were identified. It was confirmed that the marine environment characteristics of the East Sea, West Sea, and South Sea of the Korean Peninsula are different, and the speed of water temperature increase due to climate change is different, so regional environmental characteristics must be considered when establishing adaptation measures to marine climate change. The spread of subtropical animal species has the negative impact of reducing existing biodiversity and changing food sources for important commercial species. On the other hand, there are also positive impacts, such as economic value for edible purposes, industrial materials, and medicinal purposes, and academic value such as variety development and biotechnology research, so both benefits and damages must be comprehensively considered when implementing adaptation policies.

S10-17643-Oral-Salazar (ECOP)

Enhancing Resilience in Marine Small-Scale Food Production on Tropical Islands: A Pacific and Caribbean Perspective

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Marine small-scale food production on tropical islands faces multiple challenges posed by climate change and plays a pivotal role in transforming island food systems. This study evaluates resilience in three key case studies: the Republic of the Marshall Islands, Pohnpei in the Federated States of Micronesia, and San Andres and Providencia in Colombia. Employing a mixed-method approach and comparison through QCA with more that 221 participants, the research characterizes marine food systems in island territories using a socioecological approach, identifies climate threats, describes local adaptation strategies, and evaluates resilience drivers. In the Pacific, small-scale traditional fishing production displays diversity but high vulnerability, primarily due to its dependence on reef species. Conversely, in the Caribbean, targeted demersal and generalist species demonstrate lower vulnerability under climate change scenarios. The predominant adaptation strategies are reactive, involving shifts in fishing sites or times based on immediate climate challenges, highlighting the necessity for more transformative, long-term adaptations. The study underscores that resilience is a context-dependent process, emphasizing that there is not one-size-fits-all solution. However, common characteristics among marine food production systems in islands include the significance of baselines for decision-making, the management of connectivity, and the promotion of complex thinking to enhance resilience against perceived climate threats. To enhance resilience, strategies should focus on promoting less coral-dependent marine species, fostering dialogues among diverse knowledge sets, and implementing transformative adaptations such as restoring natural ecosystems and revitalizing traditional knowledge.

S10-17645-Oral-Sutcliffe (ECOP)

Synergies and tradeoffs between wellbeing, sustainability, and resilience in responses to shocks in UK coastal communities

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Coastal communities are at the forefront of recent unprecedented changes, for example disruptions due to climate change, COVID-19 and the cost-of-living crisis. Due to their dependence on marine resources, they are at heightened risk of exposure to many disturbances, particularly in relation to climate change. It can be difficult to respond to shocks without undermining their long-term wellbeing, resilience, or the health of the marine environment. To date, there is a dearth of research into the circumstances in which people can achieve synergies or are forced to make trade-offs across the nexus of wellbeing, resilience, and environmental sustainability. We sought to address this gap using surveys and semi-structured interviews with marine resource users working in coastal communities in the South-West UK to investigate their responses to recent disruptions and the implications for their wellbeing, the environment, and their future resilience. We found significant variation in how well different people responded to recent disruptions. While some were able to respond in ways that minimised the impacts on their wellbeing, many still experienced negative wellbeing outcomes. While some of the adaptations may have positive implications for their future resilience, e.g. building social networks and livelihood diversifications, many people depleted their resource bases to maintain their short-term wellbeing, with negative implications for their future resilience. Most respondents indicated that they are generally able to maintain their livelihoods and wellbeing without compromising the marine environment but indicated that disruptions undermine their ability to balance their wellbeing, resilience, and environmental sustainability.

S10-17677-Oral-Perng (ECOP)

Modeling the impacts of climate change on coral reef social-ecological systems: Insights from the Main Hawaiian Islands

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Marine social-ecological systems (SES), particularly coral reef-based SES, face an intricate web of interacting stressors that can lead to unprecedented shifts in basic ecosystem functioning and thus ecosystem service provisioning. Ocean acidification (OA) and rising temperatures disproportionately affect coral reef ecosystems, impairing calcification rates and exacerbating coral bleaching. Complex species interactions, modulated by fishing activities and nutrient runoff, complicate natural functional group responses to these climate-induced changes. We investigate the impacts of these interacting pressures on nearshore coral reefs and the reefs' capacity to provide ecosystem services (e.g., sustainable fisheries) until the end of the century. Using the Atlantis ecosystem model, we integrate climate sensitivity, species interactions, fishing pressure, and land-based pollution to predict how the main Hawaiian Islands (MHI) coral reef SES will evolve under three climate scenarios. Atlantis is a 3D food web-based model with the unique capacity to incorporate fishing activity, allowing us to predict spatial changes in fisheries activity and productivity alongside ecosystem changes. By simulating responses of 59 dynamically interacting reef and reef-associated functional groups across all trophic levels, our model predicts stock-specific impacts on fisheries. To enhance the accuracy of our predictions, we build on previous work that refined responses of coastal and nearshore species in Hawai‘i to decreasing pH. Our findings not only underscore the heightened vulnerability of coral reef SES to OA but also reveal unprecedented coral reef community reorganization and the subsequent fishery impacts.

Keywords: social-ecological systems, coral reef, ecosystem modeling, ocean acidification, Hawai‘i, fisheries

S10-17678-Oral-Wright (ECOP)

Can AI help us better characterise tipping points in marine social-ecological systems?

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Rapid anthropogenic climate change is bringing abrupt and unprecedented change to marine systems globally. Compounding drivers of change mean that marine social-ecological systems are particularly vulnerable to such change, and multiple tipping points – critical thresholds beyond which systems shift from one qualitative state to another – are close to being reached or have already been crossed. Tipping points have been considered separately for biophysical and socioeconomic systems, but there is limited research into understanding the features and interactions of marine social-ecological tipping points across scales and regions. This knowledge gap limits our ability to proactively manage the risks or opportunities associated with tipping points in marine social-ecological systems.

In this presentation, we present a conceptual framework that can be used to characterise the nature of social-ecological tipping points in marine systems, in order to facilitate improved understanding of the processes, drivers, feedbacks and adaptive responses to tipping points. We test a collaborative AI-assisted systematic literature review methodology to synthesis current knowledge on how social-ecological tipping points arise and play out in polar, temperate and tropical marine systems. We demonstrate how the framework can be applied to case studies that differ in their climatic zones, ecosystem characteristics, socioeconomic context, as well as management and governance frameworks. Finally, we discuss how results can be used by marine systems managers to better understand marine tipping points, develop adaptive governance strategies, and build resilience within marine social-ecological systems.

S10-17681-Poster-Espasandín (ECOP) POSTER->ORAL (updated)

Climate change effects on catch composition and revenue in the Northwestern Mediterranean Sea

Lucía **Espasandín**[1], Valerio Sbragaglia[1], Francisco Ramírez[1], Miquel Ortega-Cerdà[1], Ernesto Villarino[2], Guillem Chust[2], Marta Coll[1]

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Climate change-induced ocean warming can have profound implications for marine ecosystems and the social-economic activities dependent on them. Marine species respond to ocean warming through different mechanisms, including poleward distribution shifts, advances in phenology, or reduction in body size. These changes can result in changes in the community composition of economically relevant fish stocks, ultimately affecting the catch composition and fishing revenues. Our study evaluates spatial-temporal changes in the Northwestern Mediterranean marine catch composition and their fishing revenues tied to ocean warming and disentangled different underlying processes, underpinning potential changes over time. To address this, we analyzed the weighted mean thermal affinity of the catch (Mean Temperature of the Catch: MTC) and revenue (Mean Temperature of Revenue: MTR) using a 23-year time series from commercial fleets across the Catalan coast. Our results indicated an overall increase of both indexes, in correlation to the changes in ocean warming. Importantly, deborealization (i.e., decrease in the contribution of cold-affinity species), emerges as a significant process, particularly influencing pelagic fisheries (i.e., purse-seiners and surface longliners). Even if the increase in both MTC and MTR was the most common result, the spatial dimension revealed counter-expected results showing decreases in some cases. In summary, our study provides valuable information about changes in catch composition over time in the Northwestern Mediterranean Sea, which may have important consequences for ecosystem functioning and structure. Moreover, we revealed that the effects of ocean warming on the catch composition may cascade through the entire social-ecological system, reflected by the changes in revenue composition over time. Overall, adaptation plans are needed to mitigate the ecological and economic impacts of ocean warming and species redistribution.

S10-17684-Oral-Tapia-Lewin (ECOP) **NO SHOW**

Sustainability in small-scale fisheries through the lens of property rights-based management, stability and Adaptive Capacity

Sebastian **Tapia-Lewin**[1], Benjamin Halpern, Fiorenza Micheli, Elena Finkbeiner, Stefan Gelcich and Joshua Cinner

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Sustainability science can inform sustainable renewable natural resource management so that future generations can benefit from them by helping understand the interactions between humans and nature. In data-limited small-scale coastal fisheries, sustainable management can be assessed by analysis catch and income stability. This is a way of exploring if a stable level of natural resource harvest and/or profits that meets our current needs without hindering the ability of future generations to meet theirs. Territorial User Rights for Fisheries (TURFs) is a form of community-based management in coastal fisheries that grants spatial property rights to fishers' organizations for them to exclusively manage and harvest resources within, and has lately gained popularity as a tool to avoid overexploitation. Here, we use catch and income stability as metrics of sustainable management in a data-limited context. Since stability is by no means a comprehensive metric and can mask other dynamics, we complement this approach by assessing the capacity that organizations have to adapt to a changing environment. This concept is known as Adaptive Capacity (AC) and is our way to incorporate social resilience in our assessment. Specifically, we test if TURF co-management enhances 1) AC and 2) sustainable management (catch and income stability). We also assess if 3) AC is related to sustainable management. We do these exercises in two distinct countries. Our study provides a unique cross-country empirical investigation on the relationship of TURF co-management institutions with AC and resource stability. Our results challenge current assumptions and one-size-fits-all approaches while we discuss alternative focal points for future management initiatives. These findings are relevant to government agencies and nongovernmental organizations promoting the creation of new co-management systems.

S10-17691-Oral-Seijo

Ocean acidification effects on fishing communities targeting calcifying species: A latitudinal qualitative and quantitative risk assessment approach

Juan Carlos **Seijo**[1], Fernando Aranceta[2], German Ponce[3], Edgar Josymar Torrejón -Magallanes[3], Danie[1] Lluch-Cota[2], Salvador Lluch-Cota[2], Romeo Saldivar-Lucio[4], Sergio Scarry Gonzalez-Pelaez[2], Ricardo Morris[1]

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This study reports on a qualitative and quantitative risk analysis of ocean acidification (OA) effects on three communities targeting calcifying species in heterogeneous latitudinal coastal areas. A qualitative risk analysis was undertaken to obtain fishers perception of the likelihood of occurrence of OA and its possible undesired biologic, economic and social impacts on their fisheries targeting gastropods and bivalve mollusks. Qualitative risks were compared for different latitudes where these types of species are harvested. These qualitative risks perceptions are contrasted with quantitative ones calculated by Monte Carlo analysis using a socio-bioeconomic approach. Quantitative risks of falling below biologic, economic and social limit reference points, with and without ocean acidification, are reported in this study. Time varying distributions of pH are calculated by using Copernicus daily data base (©) for the period 2020-2023 in three coastal areas. Considering alternative IPCC scenarios, these random variates of OA are incorporated in a dynamic age structured bioeconomic model to calculate a dynamic $k(pH_t)$ of von Bertalanffy individual growth function, and dynamic natural mortality $M(pH_t)$ for each targeted species. Study results allow for the identification of priority management or co-management decisions in each specific coastal area to determine whether or not there is a need to foster community awareness of possible biologic, economic and social consequences of ocean acidification in their specific coastal areas, and (2) the corresponding fishers' capacity building to adapt over time to this additional and exogenous environmental stressor.

Running title: Ocean acidification effects on fishing communities targeting calcifying species in different latitudes.

Key Words: Ocean acidification, qualitative and quantitative risk assessment, calcifying species, socio-bioeconomics, latitudinal.

S10-17513-Poster-Lee (ECOP)

Enhanced jellyfish hazards unveil anthropogenic driven ecosystem health degradation

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Global anthropogenic changes have profoundly modified the dynamics of marine ecosystems and promoted the increase of harmful populations, such as jellyfish. Enhanced frequency of jellyfish proliferations have been reported in many coastal areas, where they alter ecosystem health and have wide socio-economic damages. Although a marked increase of envenomation cases warns potential threats to human wellbeing, the magnitude and hazard level of such change remains so far elusive. In this study, we trace the long-term trend of harmful jellyfish to reveal their geographical patterns and potential relationship with marine ecosystem degradation. Using jellyfish envenomation records covering 40 years (1980 - 2020), we identify (i) jellyfish risk grade in Large Marine Ecosystems (LMEs), (ii) the chronicle pace of biogeographic distribution with environmental conditions, and (iii) estimated model for spreading hazardous group and its relationship with anthropogenic stress. We found that faster biogeographical expansion of harmful species after 1990s is concurrent with increased thermal range of oceans in the recent two decades. Furthermore, higher risk regions were associated with their rapid warming rate. These findings highlight that mounting tendency of jellyfish risks impair ecosystems services, thereby reflecting vulnerable marine environments. Our results provide a comprehensive framework to track anthropogenic driven ecological hazards, and to support healthy and resilient socio-ecological systems.

S10-17565-Poster-López (ECOP)

Modeling species distribution scenarios and Marine Protected Area effectiveness in conserving and restoring highly impacted ecosystems and demersal fishery resources in the NW Mediterranean Sea

Miguel **López**[1], Morane Clavel-Henry[1], Nixon Bahamón[1] and Joan B. Company[1,2]

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No-take marine protected areas (MPAs) are considered one of the most effective tools for protecting biodiversity and habitats, increasing species' resilience and, ultimately, recovering depleted fishery resources and the areas' ecosystem services. A network of 35 MPAs was recently implemented in the northwestern Mediterranean Sea with the aim of protecting demersal commercial species such as the Norway lobster (*Nephrops norvegicus*), the deep-sea red shrimp (*Aristeus antenatus*) and the European hake (*Merluccius merluccius*). However, the warming trend of the last two decades in the Mediterranean Sea is known to have altered the spatial distribution of some species, which could in turn compromise the effectiveness of MPA designs. Using a Joint Species Distribution Modeling approach, we show the distributions and suitable habitat ranges of several commercial species currently protected under the MPA network. We then modelled and explored scenarios of ocean warming and changes in fishing effort to assess the impact on the habitat suitability of the species, as well as potential changes in their distributions. To anticipate these changes, adaptive modifications of the MPA network design are proposed to make it suitable for expected environmental changes and potential shifts of target species. Increasing the marine areas under protection is essential, and a main policy objective currently aiming for 10% of the seas under strict protection by 2030 in European Union waters. Still, understanding and future-proofing present MPAs is crucial to ensure they remain effective over time.

S10-17613-Poster-Blundell (ECOP)

Exploring how policy interventions affect resilience of social-ecological relationships in California kelp forests

Mei Z. **Blundell** and Marissa L. Baskett

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In much of the social-ecological system literature, humans are modeled as separate from the ecology and the only interaction considered is resource-use. Focusing on resource-use alone, however, does not account for the diversity of our reciprocal relationships within ecosystems. We consume but we also cultivate, care for, and restore species. These forms of social-ecological interactions are increasingly important as people seek to foster resilient social-ecological systems in a changing world. In California's kelp forest social-ecological systems, policy interventions can be used to speed up or slow down processes related to kelp forest restoration, which can then influence resilience. For example, disaster relief funds can be dispersed to slow the loss of resource-dependent income and speed up the restoration response to kelp loss. Permitting, monitoring, public outreach, and investments into research and development can also affect the rate of response to kelp loss. However, investments into all these policy interventions are subject to decline as public sentiment decreases after the initial shock of an environmental disaster like kelp loss. This study uses a mathematical model to ask how the relative rates of processes which act on kelp forests and public sentiment affect the resilience of a high kelp density and high public sentiment state. This study also considers how policy interventions can be used to tune those relative rates to maximize time spent in a high kelp density and high public sentiment state. In this poster, I will present a theoretical framework for exploring these questions.

S10-17701-Poster-Espasandín (ECOP)

Spatially explicit Climate Risk Assessment for key fish species in the Western Mediterranean Sea within the scope of Nature-Based Solutions

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Climate change and human hazards act in synergy maximizing the impacts on the marine ecosystem, a fact that is expected to persist in the future. These impacts and their magnitude are distributed heterogeneously in space and time, affecting also differently depending on the species. Recognizing the need for comprehensive assessment tools, the Climate Risk Assessment methodology have recently gained the attention of the scientific community as a useful approach for understanding and advancing on the present and future consequences of several hazards on species and ecosystems. In the present study, we moved one step further by employing a spatially explicit application of the Climate Risk Assessment methodology within the scope of Nature Based Solutions, considering different future scenarios. Focused on the Western Mediterranean Sea, two case studies assess the Nature-Based Solution of Sustainable Harvesting for commercially important small pelagic species (i.e., sardine and anchovy) and the Nature-Based Solution of Effective Conservation for an emblematic species (i.e., the dusky grouper). Preliminary findings indicate that both Nature-Based Solutions consistently reduce overall risk for all species across scenarios, showcasing their mitigation effects. The spatially explicit analysis employed in this study further reveal specific areas in the Western Mediterranean Sea that deserve special attention for establishing conservation priority areas.

Identifying these priority conservation areas is crucial for adapting to and mitigating the combined pressures from climate change and human activities. This research not only enhances our understanding of the intricate interplay between climate change, anthropogenic stressors, and marine ecosystems in the Western Mediterranean Sea, but also provides actionable insights for managers and policymakers.

S10-17704-Poster-Busumprah (ECOP) (NO SHOW)

West Africa Ocean-Based Solutions Hub: A Collaborative Platform to Combat Climate Change

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This Poster address UN Ocean Challenge 5 & 6 which focuses on Unlock ocean based solutions to climate change and increase community resilience to ocean hazards.

The West Africa Ocean-Based Solutions Hub is a collaborative platform designed to address the challenges of climate change in the region through ocean-based solutions. The hub brings together stakeholders from various sectors, including government agencies, academic institutions, non-governmental organizations, and the private sector, to promote the development and implementation of sustainable ocean-based initiatives.

The Hub aims to provide a platform for knowledge sharing, capacity building, and collaboration among stakeholders. The hub will focus on four key areas: coastal protection and management, sustainable fisheries, renewable energy, and blue carbon. These areas have been identified as critical for addressing climate change in West Africa.

The hub will also serve as a catalyst for innovation and entrepreneurship in ocean-based industries. Through the hub, startups and small businesses will have access to resources, funding opportunities, and mentorship to develop and scale their ocean-based solutions.

The Hub will facilitate the development of policy frameworks that promote sustainable ocean use and management. The hub will also provide technical assistance to governments in implementing these policies.

The poster presentation will showcase the activities and achievements of the West Africa Ocean based solutions Hub since its inception. It will also highlight upcoming initiatives and opportunities for collaboration with stakeholders. The poster will feature infographics, maps, and images to illustrate the impact of ocean-based solutions on climate change mitigation and adaptation in West Africa.

GP – General Poster Session

GP-17465-Poster-Guérin

Co-production of knowledge: a case study of some European science-policy expert groups networks involved in marine biodiversity management challenges

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Through a long history of marine ecology, Europe has only recently reinforced dedicated regulations and strategic planning of progress to be reported for marine environment management. The evolution of social perceptions, regulations and concrete implementation of nested scale assessments will be presented, to set the recent context of ecosystem-based approach through conservation and science discoveries.

Each European country with a marine border can witness both cultural and social long history of co-production of knowledge, to better understand and use through socio-economic activities this particular environment. Sea travellers, scientists and artists also contributed to the exchange of resources and knowledge for centuries, creating specific links and a better understanding of these different pieces of the puzzles of the European regional seas.

In the last few decades, in the context of increasing anthropic pressures on the marine environment, including global and climate changes, European policies, science and stakeholders elaborated management objectives and work plans to assess and better manage European seas. The current networks and links analysis between some expert groups, and ways to interact and communicate, will be presented to illustrate and reflect the recent evolution and current contribution of science to this wider societal and geographical awareness.

GP-17467-Poster-Macario

The temperature-induced effects on ecdysis frequency, feeding habits, and growth response of Gazami (*Portunus trituberculatus*) crablets

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The Gazami crab (*Portunus trituberculatus*) is a commercially important species in Japan, and its management is a focus of stock enhancement programs. Recent interviews in the Seto Inland Sea have indicated a decline in wild Gazami populations, leading to a cessation of crabbing activities among local fishermen. Thus, a continuous effort must be made to improve the enhancement program. This study aimed to evaluate how temperature affects Gazami crablets in the hatchery culture prior to their release into various fishing grounds, with a particular emphasis on their molting (ecdysis) frequency, feeding, and growth. Water temperature treatments using 100-L tanks set at 18°C, 22°C, 26°C, 30°C and 34°C were conducted on 10-12 mm Gazami crablets, while salinity was maintained at 33 ± 0.08 ppt across all set-ups. The water temperature treatment at 30°C significantly influenced and provided insights into the responses of juvenile Gazami crabs. It influenced high ecdysis frequency, increased feeding intake, and promoted competent growth performance. While crablets in the 34°C tank did not significantly differ in ecdysis frequency compared to the 30°C treatment, it impacted the crablets by slowing their growth and decreasing food intake. Based on these findings, a temperature of 30°C is more favorable for accelerating ecdysis, feeding, and growth of cultivated crablets. However, it is essential to account for the disparity compared to the natural temperature when releasing these juveniles in the wild. By understanding the temperature effects on Gazami crabs, we can better update the conservation and management strategies to support their population recovery.

GP-17585-Poster-Sugisaki

The communication tool between the fishery product consumers and fisheries scientists – the challenges of SH”U”N project of FRA

Hiroya **Sugisaki**[1], Yoshioki Oozeki[2] and SH”U”N project team

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From ancient times Japanese society has been relying on marine products as their protein source. The stock managements and usage rules of their fisheries have been usually followed by traditional local rules and cultures during long Japanese history. In recent times, people in the world realize that the global ecosystem has been changing drastically, and we need to think of more appropriate management of fisheries stocks scientifically for future global ecosystems and human societies. The ecolabels by certification systems for the management of fisheries products (e.g. MSC, ASC, and MEL) become reliable in the world fisheries industry communities.

Japan Fisheries Research and Education Agency (FRA) is one of the representative fisheries research institutions in Japan, and they have the accumulations of scientific data information, and knowledges for Japanese fisheries. Therefore, it is appropriate for FRA to establish the network system supporting the ecolabel for Japanese fisheries such as MEL. The SH”U”N project of FRA started in 2017, and information on the conditions of Japanese fisheries had been shown and useful messages were sent to the public through SH”U”N homepage. SH”U”N ‘s unique point is that their information were divided in groups of 1) stock status, 2) ecosystem impact, 3) fisheries management, and 4) regional sustainability, and 5) health and seafood safety information for the assessments of the sustainability of the Japanese fisheries resources. SH”U”N system contributes to both suppliers (fisherman, fisheries companies etc.) and consumers (housekeepers, game anglers etc.) to practice the SDGs’ life, especially Goal 14: Life below water.

GP-17606-Poster-zhang (NO SHOW)

~~Research on the Correlation between Coastal Marine Ecological Environment and Marine Industrial Clusters~~

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~~The marine ecological environment system is encountering the serious threats from the human society while it carries the rapid development of the marine economy. Therefore, guided by the overall characteristics of the marine ecological environment system, explore the relationship between the coastal marine ecological environment system and industrial agglomeration that is most directly affected by social and economic development. The agglomeration of industrial sciences and the sound and coordinated development of the marine economy have important theoretical and practical significance.~~

~~Take the coastal marine ecological environment that is most directly affected by economic development as a breakthrough point, and analyzes the correlation mechanism between the coastal marine ecological environment and the agglomeration of marine industries.By constructing a coastal marine ecological environment evaluation index system that considers the impact of socio-economic development, selecting specific sea areas, empirical research is conducted on the coupling and coordination relationship between coastal marine ecological environment and marine industry agglomeration, revealing the degree and pattern of correlation between the two, reveal the degree and law of the correlation between the two, and provide support for improving resource utilization efficiency and realizing the transformation of green development methods.~~

GP-17615-Poster-Shiga

A study of consumer preference for Tohoku products using discrete choice experiments

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The accident at the Fukushima Daiichi Nuclear Power Plant following the Great East Japan Earthquake caused a serious problem of radioactive contamination of food products. This resulted in consumers' reluctance to buy food products from the Tohoku region. The restoration of fisheries and coastal communities requires not only the restoration of fishing facilities, but also a social science approach to identify consumers' perceptions of the marine products of the area in question. In this study, a discrete choice experiment was used to measure consumers' marginal willingness to pay (MWTP) for seafood products from the Tohoku region 12 years after the disaster and to clarify how the accompanying fishery eco-labels and radiation tests affect consumers' choices.

A discrete choice experiment was conducted on clams, and three forms were created, with eight questions presented within each form. The attributes of the choices were price, place of origin, presence of a fishery eco-label, and presence of a radiation test. A conditional logit model was estimated using R to calculate the marginal willingness to pay (MWTP) for each attribute.

A comparison of MWTP revealed that consumers perceived a price premium of -10 yen for products from Miyagi Prefecture and -32 yen for products from Fukushima Prefecture when compared to other domestic production areas. On the other hand, the results also suggested that the negative price premium could be compensated for by radiation testing and fishery eco-labeling. Further research and analysis are needed to determine what information would be most effective in increasing consumption.

GP-17632-Poster-Uotani

A study on the value of Marine Stewardship Council certification and the influence of advertising methods

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Although the Marine Stewardship Council (MSC) certification system is believed to help realize sustainable use of marine resources, the recognition of certification is lower in Japan than in Europe and the United States, and the number of certified businesses is small. As a result, Japanese people have difficulty perceiving the value of certified marine products. This is thought to be partly because Japanese people tend to place more importance on freshness, safety, and domestic production than on environmental considerations. For this reason, Japanese farmers are devising ways to increase the value of their produce to consumers by displaying producer information in the form of photographs and other information. Although this is not generally done for marine products, it may be possible to use similar methods for marine products to make consumers perceive more value in certified marine products. The purpose of this study is to clarify how the disclosure of producer information for MSC certified marine products affects consumer preferences. Specifically, an experiment was conducted with visitors inside the Tsukiji market on September 25 and 26, 2023. Participants were divided into groups that differed in whether the products shown within the experiment had producer information and were surveyed on their sensory evaluation of MSC certified bluefin tuna and the amount they were willing to pay. A total of 212 participants took part in the experiment, and tentative results suggest that the presence of producer information has a positive effect on both sensory evaluation and willingness-to-pay.

GP-17680-Poster-Matsuoka (NO SHOW)

~~Enhancing Consumer Engagement and Sustainability in Seafood Consumption: The Impact of Innovative Carbon Footprint Label on Consumer's Awareness and Willingness to Pay~~

~~Tsubasa **Matsuoka**, Yutaro Sakai~~

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~~The aim of this study is to identify the most effective method for communicating the carbon footprint of farmed sea bream (Pagrus major) to consumers. In a preliminary experiment, we developed a new traffic light label that focuses on color and location to convey this information. Specifically, we transitioned from the traditional green-to-red gradient color scheme to a variety of gradient schemes based on saturation, lightness, and hue theories.~~

~~In the main experiment, we plan to extend this approach by incorporating diverse label positions, sizes, and designs. Utilizing large-scale online choice experiments and advanced eye-tracking techniques in real-world purchasing scenarios, we intend to assess the impact of these varied label designs on consumer decision-making. Studies that focus on gradient color schemes in traffic light labels are limited, especially those integrating eye-tracking with choice experiments.~~

~~We anticipate that this study will reveal that not only color but also the position, size, and design of labels can more effectively attract consumer attention to environmental information, thereby encouraging sustainable purchasing habits for seafood. Our newly developed label designs are expected to particularly enhance consumer engagement and their willingness to pay for environmentally friendly options. This research is expected to deepen our understanding of environmentally conscious consumer behaviors in seafood consumption and foster a more sustainable approach in this field.~~

GP-17706-Poster-Busumprah (ECOP) (NO SHOW)

~~Digitalization of Ghana Fisheries Sector~~

~~Peter Teye~~ **~~Busumprah~~**

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~~This poster is to address UN Ocean Decade Challenges 8, 9 & 10 which focuses on digital representation of the ocean, create skills, knowledge, technology for all, and Change human relationships with the ocean. It focuses on SDGs 9 & 14 which is centred on industry, innovation and infrastructure, and life below water. This poster focuses on An advanced app for the Fisheries Enumerators in Ghana to replace the old ODK app for data collection The Sea Rock App features includes: i. Every Enumerator would be given a unique number and any data submitted to the FFSD team would be easily identified by their names. ii. Any Enumerator that lost his Phone can retrieve their data when they login with their credentials iii. The app has a species button, where the picture of the species can be search through the internet or a fisheries database displaying the Binomial nomenclature from Kingdom to Species. iv. The Inbox button display messages from the Ministry, FSSD and other Agencies working hand in hand with the Enumerator. v. The landing sites button display information about every detail of the landing sites including the Region, district, landing sites names and the species mostly found on that landing site. The Enumerator can set it landing site where He/ She mostly operate. vi. The chat button, the Enumerator can communicate with app developers about any upgrade that is needed to be added. vii. The Fishes life button would be connected to a database of documentaries where the Enumerator can watch all the videos concerning the species caught on their landing sites and across the globe. Viii. The catch button would display the Fishing unit, duration of the trip, binomial classification of the species caught, nature of the sea, species catch in sizes and Geographic point (GPS) where the species is caught. This Sea Rock Base App would be connected to the Internet where GPS, google map location, longitudes and latitudes would be displayed automatically. xi. The Effort Button, The Enumerator would enter number of fishing units that went on fishing, the monthly frame unit, boat coefficient, automatically GPS generated with the internet. The Setting Button, the enumerator could change his personal information.~~

GP-17720-Poster-Agfianto (ECOP)

Have the Marine-Based Tourism Industries Provided Safety Assurance to Visitors?

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The tourism sector in Asia and the Pacific is growing rapidly, with an average growth rate of 18.83% higher than the global trend in the last decade. This growth presents an opportunity for Indonesia to develop its domestic tourism market and attract more international tourists. However, Indonesia's location along the Pacific Ring of Fire, a geological region prone to earthquakes and volcanic eruptions, poses a risk to the tourism industry. Given the need for tourists to feel pleasant participating in tourist-related events, a host collaborating with a local agency has a constant responsibility to ensure the security of visitors. Some tourism providers are still unclear about the potential of natural disasters, which can occur at any moment, particularly in an active volcanic tourism destination. The purpose of the study is to develop a model for disaster mitigation in the tourism industry, particularly for areas of the archipelago with volcanic features. A qualitative approach will be employed by the author in this research through a penta-helix model to generate an understanding of multi-sector involvement. Budhi et al. (2022) described that a tourism penta-helix consists of five main stakeholders, namely Academia, Business, Community, Government, and Media (ABCGM). Mainly, this research will implement several Focus Group Discussions (FGD) to collect the data needed. Banda Neira-Indonesia, a Volcanic Archipelago Tourism Destination (VATD), is determined as a locus of the research since this tourism destination has an active volcano and therefore potential for a natural disaster. Ultimately, the research aims to develop a set of recommendations to enhance the readiness of the Indonesia Volcanic Archipelago Tourism Destination (VATD) in the stage of mitigation and preparedness from natural disaster by involving multi-sector stakeholders. Holistic stakeholder involvement is an important activity for the future of the readiness of a tourism destination in the face of a natural disaster. By considering every stakeholder role which can be integrated into each other, it is possible to reduce the impact received when a disaster occurs. Apart from that, this research also contributes academically by evaluating the importance of stakeholder partnerships in the preparation and execution of the pre-disaster stage of the disaster management cycle (Alexander, 2016). The study's findings will have significant implications for the development of Disaster Risk Reduction (DRR) in certain areas, particularly in tourism sites which optimize small islands and maritime resources as a main attraction of tourism destinations from the threat of natural disasters.

GP-17724-Poster-Huang (ECOP)

Socio-economic status and occupational mobility of China's fishery population: a quantitative analysis based on social-survey data

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China ranks as the first fishery nation globally in terms of its fishery production, with a total production of more than 66 million metric tons in 2021. Underlying this number, more than 16 million people work in and earn their livelihoods from fisheries, directly or indirectly. A better understanding of the characteristics of this large group of people could lead to an improved appreciation of the human dimensions of China's fisheries. In this study, we analyze longitudinal social-survey data from 1989 to 2015 to derive several key indicators representing the socio-economic status of China's fishery population. We find that, first, the size of the fishery population is shrinking. Second, the average age of the fishery population is increasing but at a slower rate than in the total population. Third, the education levels of the fishery population are rising but remain below those of urban residents. Fourth, the incomes of the fishery population have grown considerably, albeit more slowly than those of the general rural population and the urban population. Fifth, the employment of the fishery population is exhibiting a high degree of dynamism, with high rates of occupational mobility between the fishing sector and other sectors.

GP-17728-Poster-Miñarro

Does catching more fish increase the subjective well-being of fishers? Insights from Bangladesh

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Small-scale fisheries have been argued to contribute much more than just food and income to the communities they sustain. They have been associated with the subjective well-being of coastal communities through their links with culture, identity, and social cohesion. But although fish catches are usually considered the primary ecosystem service that benefits fishers, little is known about how subjective well-being is influenced by the fishing activity itself. Here, we applied the experience sampling method in two small-scale fisheries in Bangladesh to assess the effects of fishing on fishers' occurrence of positive and negative affect, two measures of subjective well-being. We found that fishing activities were not directly associated with increased momentary affect and that the frequency of positive affect actually decreased as the fishing trip progressed. Furthermore, although very low catches were associated with less positive affect, the highest frequency of positive affect was achieved with relatively small catches. Our results imply that the benefits provided by small-scale fisheries to the momentary subjective well-being of fishers are not strongly related to the actual catching of fish, suggesting that other factors such as the social fabric and way of life in coastal communities may be more relevant for the overall welfare experienced by fishers.