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A BAYESIAN MODELLING FRAMEWORK FOR ASSESSING THE ECONOMIC EFFECTS OF MARINE SPATIAL PANNING MEASURES ON FISHERIES

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The implementation of Marine Spatial Planning (MSP) requires comprehensive consideration of key sectors and their spatial requirements. The European Commission has emphasized the importance of incorporating together with spatial analyses the consideration of fishing-related economic aspects in MSP decisions. This study proposes a novel spatially explicit modelling approach based on Bayesian networks (BN) to assess the direct economic effects of alternative scenarios on fisheries. The BN allows policymakers to evaluate competing strategies through the expected values of deterministic nodes for each alternative decision, addressing uncertainty with limited data (Pearl, 2014). An influence diagram was defined to combine the fishing effort from predominant fisheries and the economic variables under different management scenarios to assess total variations in Gross Value Added (GVA). This approach allows for estimating the fisheries' dependence of areas subject to management, providing the potential direct economic effect of assuming closures to fishing, considering both small-scale fisheries (SSF) and large-scale fisheries (LSF). The model was applied to the Italian GSA17 based on real-world management measures. The results indicate that planned Marine Protected Areas overlap with valuable areas for SSF, affecting 4% of their GVA. These findings suggest management recommendations that balance conservation and socio-economic goals, including gear selectivity and zoning strategies. For LSF, the model projected a significant potential direct economic effect of 15.3% under planned Natura 2000 sites, indicating the need for proactive stakeholder engagement to ensure long-term su- stainability. Regarding planned offshore wind farms, the results indicate no direct economic effects on SSF, thereby supporting their sustainability. In contrast, a direct economic effect of 4.8% was projected for LSF, suggesting co-location strategies to generate additional fisheries benefits while reducing planning costs due to changes in fishing grounds or harbors. Moreover, the estimated direct economic effects of losing fishing grounds in areas designated for offshore wind farms pro- vide evidence of potential economic losses that could justify compensation for fisheries. Overall, this study aims to advance the development of new methods for sustainable ocean and fishery management within the context of MSP.

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AQUACULTURE FEES IN THE FAROE ISLANDS

Hans Ellefsen (University of the Faroe Islands Heri á Rógvi), Lóður Daniel W. Bromley (University of Wisconsin–Madison)

The economic valuation and governance of ocean space for aquaculture remain complex challenges. Many coastal nations provide aquaculture firms with free access to near-shore waters, with little or no compensation for the use of this valuable natural capital. Additionally, corporate accounting practices, such as transfer pricing, make it difficult for governments to impose fair taxation on fish farming profits. This paper explores how to establish rational and transparent pricing mechanisms to ensure equitable compensation for the commercial use of ocean space, with a specific focus on marine planning and aquaculture fees in the Faroe Islands.

A major challenge in marine planning is the absence of a market price for ocean space. This paper proposes an economic framework based on rental valuation, using financial models to estimate a fair compensation structure. The approach suggests deriving rental fees by determining the market value of production facilities-including the ocean habitat-based on net operating income and capitalization rates. This allows for the integration of economic valuation into marine spatial planning, ensuring that ocean resources are allocated efficiently while protecting public interests.

In the North Atlantic, fjords provide significant advantages for aquaculture, including optimal fish-growing conditions, protection from harsh ocean environments, and free waste disposal services. These factors contribute to the economic value of fjord space, justifying the need for structured fees within marine planning frameworks. A fair pricing regime could incorporate three components: (1) a production-based fee, (2) a premium reflecting cost savings from infrastructure protection, and (3) a pollution fee compensating for environmental externalities. By integrating marine planning with economic valuation, the paper proposes two possible fee structures for the Faroese aquaculture industry, ensuring sustainable resource use, fair compensation, and improved governance of ocean space.

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BOATING TOURISM AND FISHING: SOME INSIGHTS ON SOCIAL NETWORK ANALYSIS USING AIS DATA

Jorge Ramos (CinTurs – University of Algarve), Benjamin Drakeford (CBG – University of Portsmouth), Francisco Leitão (CCMAR – University of Algarve)

Boating tourism in coastal-maritime areas often overlaps spatially and temporally with other economic activities, such as fishing, leading to complex interactions. These interactions can create opportunities for positive cooperation or generate conflicts that pressure natural resources and stakeholders. This study focuses on the interplay between maritime-tourism activities and fishing in the south of Portugal, using a social network analysis (SNA) approach based on automatic identification system (AIS) data to evaluate spatial and temporal patterns. The findings reveal that tourism activities dominate zones closer to the coast, with intermediate areas serving as shared spaces where interactions are most likely.

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CONSIDERING CUMULATIVE IMPACTS WITH SEQUENCE FACTOR IN THE IMPACT ASSESSMENT OF OFFSHORE WINDFARMS ON FISHERIES

Huixin Wu, Olivier Thébaud, Fabio Boschetti, Emily Ogier and Steven Rust

In many parts of the world, rapidly growing numbers of offshore wind farms (OWF) are causing inevitable and incremental marine spatial conflicts, particularly with commercial fisheries. These conflicts are often described in relation to the local implications of individual wind farm developments with respect to restricted access to fishing grounds and associated impacts on economic profitability. A key question relates to assessing the cumulative impacts on fisheries of developing multiple wind farms. To investigate existing evaluations of such cumulative impacts, we reviewed the literature and found that, to date, impact assessments have largely focused on project-by-project impact assessment approaches. Only a few papers already use the specific phrase "cumulative impacts" to describe the comprehensive impacts of OWF on fisheries. Diverse definitions of this term are used, from ecological or anthropological perspectives, with limited homogeneous analytical framework to consider cumulative impacts from an economic and social perspective. We propose a definition of cumulative impacts based on previous work, and emphasise the impacts assessment of multiple OWF in areas where commercial fishing pre-exists. The approach involves considering the possible sequences of OWF developments, and related effects resulting from fishery responses under alternative development sequences. This proposed cumulative economic impact assessment approach can be used to guide empirical evaluations to inform decision makers regarding marine spatial planning of the sequence of OWF developments. It could also be used to help formulate potential compensation rules associated with impacts on fisheries.

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EMERGING HOTSPOT ANALYSIS AS A TOOL FOR UNDERSTANDING CLIMATE IMPACTS: A SPATIOTEMPORAL STUDY OF CATCH RATES IN THE CANADIAN LOBSTER FISHERY

Dana Wright (Norwegian College of Fishery Science – Faculty of Biosciences – Fisheries and Economics – The Arctic University of Norway) Dr. Yajie Liu (Norwegian College of Fishery Science – Faculty of Biosciences – Fisheries and Economics – The Arctic University of Norway)

Spatial management of fisheries has gained attention in recent years, as competition for space intensifies and the effects of climate change are felt ununiformly across different regions. For the lobster fisheries in the North Atlantic, it is undeniable that warming ocean waters are causing distributional shifts. However, lack of sufficient data has meant that few studies have attempted to uncover how this affects the performance of fisheries. This paper uses a novel approach (emerging hotspot analysis) to examine how changes in lobster catch rates track with warming trends in Atlantic Canada. We use emerging hotspot analysis to identify areas which are experiencing significant trends in temperature changes, and the direction and intensity associated with each patch. We then use a generalized linear model (GLM) regressing catch rates on the percentage of each fishing area that experienced these hot or cold spots. We find clear evidence that emerging hotspots are associated with higher catch rates but moreover, the intensification of these warming effects have a large positive association.

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EXPERIMENTAL GILL NET FISHING FOR SOLE IN TWO OFFSHORE WIND FARMS IN THE NETHERLANDS

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The Ministry of Agriculture, Fisheries, Food Security, and Nature is actively working to assess the need for additional regulations to ensure safe and sustainable fishing practices within offshore wind farm areas. Ongoing and completed projects provide valuable insights into the opportunities and challenges for fishers operating in wind farms, with particular attention to safety, risk management, and operational aspects. This study thus builds upon a desk study and earlier field trials, which involved various fishing gears and practical field tests, to further investigate the practical aspects of passive fishing in wind farms (Neitzel et al., 2024). Since data on gill net fishing was limited in prior research, the field trials were extended into the 2024 season and expanded to include another, newly built wind farm. The costs of fishing in a wind farm are higher due to the restrictions in place. Nets cannot be set freely, access is limited to daytime and communication and planning is needed here and takes time. Most of the current gill net fishing takes place closer to the shore (1-12 miles) than where the wind farms are located, so fishing in the wind farm requires longer trips leading to higher fuel costs. Adjustments to both fishing operations and policies are necessary to align co-use ambitions with the current capabilities of the fisheries sector. However, mismatches between co-use aspirations, the existing policy framework, and the characterization of the current passive fishing sector have been identified. Challenges that need to be addressed include offshore wind farm accessibility, vessel optimization, and gear application (such as spatial deployment and gear combinations).

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FISHERMEN'S SURVEYS FOR ANALYZING QUALITATIVE DRIVERS IN THE CONTEXT OF RECENT OFFSHORE WIND FARMS IN FRANCE

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A series of three surveys carried out in 2024 contributes to a better understanding of fishermen's perceptions of the implementation of the first wind farms. Using the vulnerability approach, the authors attempt to assess the degree of sensitivity and adaptive capacity of fishermen in the event of area closures or access restrictions linked to the implementation of a wind farm. The issue focuses on the non-monetary factors - cultural dependence, human capital, social capital - and their assessment through statistical analysis of survey data. Three survey sites were selected to gather information on non-monetary factors, with a control site with no wind park project, and two sites with a park in operation or under construction. Results from a logit model highlight two non-monetary factors, human capital and cultural dependence. Fishermen from the two sites impacted by a wind farm in operation or under construction differ from those at the control site in their responses to questions relating to human capital. Learning effects seem to occur in fisheries located close to wind turbines. Cultural dependence reflects an attachment to the fishing area. Younger fishermen show greater difficulty in changing zones in the event of wind farm closures. However, the model's results do not explain the role of social capital in the behavior of fishermen face to spatial competition with wind farms. This is a limitation of the surveys carried out at the three sites, calling for modifications to the questionnaire to better account for social capital within fishing communities.

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FLEXIBILITY AND STRATEGIC BEHAVIOR IN THE MARKET OF ITQS

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In this article we show benefits of quota flexibility in a model where one of the firms is allowed to behave strategically in the trading of quotas while other firms in the fishery are price takers. The ex-vessel price for fish is assumed constant. Quota flexibility is implemented through a settlement at the end of each regulation period. In that settlement firms having unused quotas are compensated by a subsidy, while those who have quota shortfalls are obligated to pay a tax. For the same deviation the tax is higher than the reward. Former literature shows that market power under a traditional ITQ system can lead to inefficiencies. However, losses due to market power can be subdued when quotas are more flexible. A simple argument to account for this view is that the competitive fringe of firms in the flexible case have the option to make use of the tax/reward system. Thus, rather than being exploited by the price manipulating firm the competitive fringe might find it better to deviate from the 1:1 "quota - realized catches" - relationship that characterizes competitive equilibrium.

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MAPPING THE MISMATCH: QUALITY OF SPATIAL INFORMATION ON SMALL–SCALE FLEETS FISHING AREAS PROVIDED BY SURVEYS

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Small-scale fleets still lack sufficient and accurate information on their spatial activity across the EU, which hinders their management and marine spatial planning (MSP) where they are present.

Missrepresentation of SSF in spatial data hampers a proper assessment of socioeconomic impacts and decision-making in current EU issues as relevant as the protection of vulnerable ecosystems (VMEs) or the proposal of new areas for off-shore energy production. An alternative to close these gaps for vessels undere 12 meters can be collecting this information through surveys where fishers declare the fishing areas. However, this method poses challenges of reliability, accuracy, and integration with other sources of information. This paper compares the quality and accuracy of the spatial information collected through surveys of artisanal fleets, using as a case study, the octopus artisanal fishing fleet of Asturias (North-West Spain), which also has GPS devices on board. In addition, a statistical analysis was also addressed to explore the potential relationship between discrepancies in declared-registered fishing areas and variables linked to fishers´ behavior and economic incentives (such as value and quality of the octopus caught, vessels´s dependence on octopus, culture of monitoring and co-management, etc.). Results show that spatial information from surveys is very representative of the real spatial activity in this artisanal fishery, with little discrepance and a high level of overlapping between declared and registered fishing areas. In the discrepancies detected, errors due to overestimation of the declarations predominate, although in the westernmost part of the fishing ground, there is a greater propensity for under-declaration of fishing areas. These differences between recorded and reported spatial activity also seem to be associated with the first-sale value of the resource and the level of dependence of each vessel on this fishery. Finally, the paper discusses methodological issues at the survey design and data collection stage (including map appearance and the relevant scale - squares - to which the reported information refers), as a critical issue to get good quality and reliable information. Results are also discussed concerning the current socioeconomic and operational context of these fleets and the management challenges in the EU.

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NAVIGATING ECONOMIC & MARITIME SPATIAL PLANNING FOR GALICIA'S MARINE LIVING RESOURCES

Jose L. Santiago (CETMAR), Davinia Lojo Amoedo (DoMar – CETMAR)

Maritime Spatial Planning is essential for balancing ecosystem conservation with the sustainable development of activities such as fisheries, aquaculture, and other marine living resources. Effective planning requires detailed information to assess the socioeconomic impact of these sectors and optimise the allocation of marine resources. However, the integration of economic data into maritime space management remains limited, making it difficult to identify strategic areas and support evidence-based decision-making.

In this study, we develop a framework that integrates, quantifies, and distributes economic, social, and geographical data to assess marine areas based on fisheries and aquaculture activities. Specifically, it distributes the production value of fisheries (€400 million) and aquaculture (€232 million), both key contributors to the regional economy. The economic value of mussels, the primary aquaculture resource, has been analysed using data collected since 2004, with detailed monitoring of production and its geographical distribution within mussel farming polygons. In shellfish harvesting, the catches of clams, cockles, razor clams, and sea urchins have been evaluated since 2003, allowing for a breakdown by production area and fishermen's guild, providing detailed insights into their economic evolution. In the fisheries sector, catch data since 2003 have been analysed, differentiated by fishing gear and home port, enabling an assessment of their impact on the local and regional economy.

To quantify economic value, ARIMA time series models have been applied, enabling the estimation of production trends and resource prices over time. Additionally, a value allocation system based on the geographical location of each activity has been employed, providing a detailed and spatially precise analysis. Finally, macroeconomic estimations have been conducted to assess potential variations linked to Maritime Spatial Planning, such as the closure of fishing grounds. These estimations consider not only the value of production but also the broader economic interconnections of these activities. The results demonstrate that integrating economic and geospatial data enhances marine space management, enabling a more efficient and equitable approach. This methodology strengthens the blue economy and sector competitiveness while facilitating strategic decision-making that harmonises economic development with marine ecosystem conservation.

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OFFSHORE WIND ENERGY AND MARITIME SPATIAL PLANNING: SOCIOECONOMIC IMPACTS ON FISHERIES

Monica Gambino (CNR–ISMed), Vito Pipitone (CNR–ISMed), Tommaso Russo (Università Roma Tor Vergata), Alice Sbrana (Università Roma Tor Vergata)

The transition to renewable energy is a global priority to mitigate climate change. The European Union aims to decarbonize its energy sector, setting a target of at least 32% renewable energy in gross final consumption by 2030. Italy's National Integrated Energy and Climate Plan (PNIEC) aligns with this goal, targeting 131 GW from renewable sources, including a significant expansion of offshore wind power. Given the limited availability of land for onshore wind farms, the PNIEC identifies offshore wind as a key technology for sustainable energy production.

However, offshore wind farms occupy large sea areas, reducing space for other maritime industries, particularly commercial fishing. This issue is critical in ecologically and economically significant areas, where activities like trawling and longline fishing require extensive operational areas. As offshore wind energy expands, understanding its socioeconomic impact on fisheries is essential for sustainable maritime spatial planning.

This study employs the SMART individual-based spatial model to simulate the effects of closing a specific maritime area to fishing. By reconstructing spatial productivity (LPUE) and fleet dynamics, SMART enables the assessment of potential fishing displacement and the resulting economic variations. The study focuses on the "7seas med" wind farm, located approximately 35 km off Marsala, at depths of 130-316 meters. Among the 22 offshore wind farms proposed south of Sicily, "7seas med" is the only one currently approved by the Italian Ministry of Environment and Energy Security. Although centered on a specific case, this study provides a methodological framework for policymakers, offering insights into the trade-offs between renewable energy expansion, ecosystem conservation, and the protection of local economies. It underscores the need for an integrated approach to maritime spatial planning that harmonizes sustainable development with the interests of affected industries.

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TESTING THE IMPACT OF MARINE SPATIAL CLOSURES ON DUTCH FISHERIES USING DISPLACE

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This study explores the potential impacts of closing certain parts of the North Sea on Dutch fisheries and local fish stocks, utilizing the agent-based model 'Displace' to simulate the behavior of individual fishing vessels. A primary strength of this model lies in its ability to incorporate the decision-making processes of individual fishers, reflecting their responses to changes in fishing regulations and economic circumstances. In Displace, these decisions are modeled through carefully constructed decision trees, which in this study are informed by recent interviews with Dutch fishers. The interviews provide insight into how fishermen determine where, when, and how to fish, accounting for factors such as environmental conditions, economic incentives, and regulatory constraints. By simulating the actions of individual vessels, the model can capture the heterogeneity in fishing strategies and assess the cumulative impacts of policy changes at both the individual and fleet level. We applied the model to past area closures and compared our simulation results to what we observed in the fishery. The past behavior of fishers was further investigated by asking them how they adapted to those closures.

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THE ECONOMIC IMPACT OF SPATIO–TEMPORAL FISHING CLOSURES IN THE BAY OF BISCAY

François–Charles Wolff (Nantes University)

This study examines the economic consequences of recent spatio-temporal fishing restrictions in the Bay of Biscay, which were introduced to reduce incidental catches of small cetaceans (particularly dolphins). The regulation, adopted by France in October 2023 and applicable for the 2024 to 2026 fishing seasons, imposes closures for vessels over eight meters using specific gear in defined areas during critical periods when cetaceans are most vulnerable. In practice, fishing activities in the Bay of Biscay were closed from January 22 to February 20, in 2024. Our analysis uses unique transaction data from the Réseau Inter Criée, collected by the national agency FranceAgriMer, which records more than 36 million transactions from 2018 to 2024. These transaction data include detailed information on sales values, quantities, species, and quality grades. Using this rich dataset, aggregated at the daily level for 34 fish markets in different French coastal regions, we construct an unbalanced panel that allows us to assess the impact of the closure on daily sales revenues.

We turn to econometric regressions to identify the causal effect of the closure of the Bay of Biscay. A before-after comparison reveals an average 26% reduction in daily sales revenue in the treated zone compared to pre-closure levels. To further isolate the impact of the policy, we use difference-in-differences (DID) models, comparing sales trends in the Bay of Biscay with control (non-closed) regions over several winters. Preliminary results indicate that the closure led to significant revenue losses in several key markets located in Aquitaine, Poitou Charente and Pays de la Loire, with some markets experiencing loss in excess of 40,000 euros. Our results highlight the economic trade-offs inherent in conservation policies and contribute to policy debates on how to balance marine conservation efforts with the economic sustainability of the fishing industry.

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FISHERS' PERCEPTIONS OF OFFSHORE WIND FARM DEVELOPMENT IN THE CONTEXT OF MARINE SPATIAL PLANNING (MSP): INSIGHTS FROM THE POLISH BALTIC SEA COAST

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With the recent adoption of the spatial plan for Polish marine waters, MSP has become the primary governance tool for managing the sea. However, since its inception, MSP has often been seen—by more traditional users-as a way to bring new players into an already crowded marine space, such as offshore wind energy (OWE). While OWE investments are well-established in many parts of the world, they are still in the early stages of development or planning in Poland. Despite this, local communities, particularly fishers, have long raised concerns about OWE.In this study, we assessed the attitudes of local communities towards OWE in four harbor towns along the Polish coast. Through discussions during workshops with community members, we gathered their concerns and expectations about OWE and later explored how their views evolved over time.We observed general reluctance towards OWE in all four locations, though one was more optimistic. The primary concern was the decline of the fisheries sector. In the spatial context, fishers-strongly supported by other community members-re- ported a lack of information about exclusion zones around the installations, pressure to expand areas for OWE, and concerns about increased seabed disruptions and harmful vibrations potentially affecting fish populations and altering fishing grounds. Other issues included the absence of social and economic assessments of OWE's impact on fisheries, inadequate compensation for losses, and limited job op- portunities. Additionally, threats to coastal areas, including small harbors losing their cultural character and transitioning to an industrialized landscape, were widely discussed.These are longstanding concerns, many of which were raised during the early phases of MSP. However, we observed that the questions became more detailed, and coastal communities began to propose their own solutions. A clear shift towards a more environmental narrative emerged, with more questions focused on how OWE affect the marine and coastal environment at different stages of their life cycle. What remained unchanged was a generally negative view of the inclusiveness of the planning processes and the re- sponse of 'science' and 'administration' to research conducted 'with' fishers and 'for' fishers.

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THE IMPACT OF OFFSHORE WIND ENERGY ON FISHERIES – THE CASE OF SWEDISH TRAWLING FOR NORTHERN SHRIMP (PANDALUS BOREALIS)

Johan Blomquist (Department of Economics – Swedish University of Agricultural Sciences), Staffan Waldo (Department of Economics – Swedish University of Agricultural Sciences)

Sweden has three Marine Spatial Plans (MSPs) providing guidance on appropriate uses of the sea, including e.g. offshore wind energy, fishing, nature conservations and other uses that may compete for marine space. Currently, there is ongoing work to amend the Swedish MSPs to meet the need for increased renewable electricity production. The large expansion of offshore wind power in the amended MSPs will have consequences for commercial fisheries. Economic analysis in terms of impact assessments of offshore wind parks can play a key role when identifying suitable energy areas in the MSP process. This is the focus of the current study. The paper analyses how the amended Swedish MSPs affect the Swedish fishing industry, with a focus on the trawl fishery for northern shrimp (Pandalus Borealis). Using matched VMS data and vessel logbooks, we start by mapping the overlap between proposed energy areas and historical fishing activities. We then specify a random utility model (RUM) for analysing location choices in the shrimp fishery. The RUM is used to analyse the revenues and costs associated with adaptation to the amended MSPs. A challenge when applying the RUM framework is to define relevant choice alternatives. The trawl hauls typically follow the bathymetry contours resulting in an irregular trawling pattern. We suggests a novel approach based on a spatial cluster algorithm to identify spatial choice alternatives. The clustering approach makes use of Hausdorff distances, which take into account both the positioning and the shape of spatial objects. This approach makes it possible to identify realistic fishing site alternatives with distinct spatial shapes. The paper thus contributes to the growing body of literature on how to define appropriate fishing choice alternatives in the spatial context.

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Theme session B – Biodiversity: the economic opportunities and challenges that it brings for fisheries and aquaculture, including ecosystem services

A Comprehensive Exploration of Human Well-Being Indicators for Effective Ecosystem Approach to Fisheries (EAF) Implementation

Davinia Lojo Amoedo (DoMar), Marta Ballesteros (IEO – CSIC), Jose Luis Santiago Castro-Rial (CETMAR), Maria Grazia Pennino (IEO – CSIC)

Implementing an Ecosystem Approach to Fisheries (EAF) requires a comprehensive understanding of socio-ecological systems and their interdependencies. However, the limited consideration of the human dimension remains a significant barrier to its effective application. This study conducts a systematic review of how human indicators are used in fishery ecosystem assessments. Using the human well-being framework, the identified indicators were classified and analyzed based on their frequency, geographic scope, and type of measured variables (simple or composite). The findings show that more than 50% of the indicators used in previous studies focus on economic and governance aspects, while intangible factors such as culture, identity, and community resilience are largely underrepresented. The analysis also highlights a gap in the explicit integration of social indicators into fishery ecosystem models. While tools have been developed to rapidly assess socio-economic aspects, their implementation in predictive models remains limited. The lack of specific data and the need for complementary methodological approaches are identified as key challenges in incorporating the human dimension into fisheries management. The results of this study emphasize the importance of developing integrated approaches that incorporate human well-being indicators to strengthen sustainability and equity in fisheries resource management. It is recommended to promote interdisciplinary research and actively engage fishing communities in designing management strategies that balance ecological, economic, and social objectives.

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ADAPTIVE GOVERNANCE FOR SUSTAINABLE FISHERIES: INSIGHTS FROM THE SCALLOP FISHERY OF THE EASTERN ENGLISH CHANNEL (FRANCE) FACED WITH EMERGING CHALLENGES

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Fisheries social ecological systems are highly complex due to the combination of ecological and socio-economic factors. In the context of intensified human activities, environmental threats, and governance issues, these systems are becoming increasingly vulnerable, raising concerns about their resilience and sustainability. Maritime spatial planning and fisheries management have emerged as strategic tools to optimize resource exploitation, reduce conflicts, and limit impacts on marine ecosystems. Despite strong scientific and policy recommendations for holistic, adaptive governance that meets community needs, practical implementation remains challenging. In France, fisheries governance relies on two complementary frameworks: an ecosystem-based approach regulated by the Common Fisheries Policy, and a spatial management approach integrated into maritime planning initiatives. Recently, a third regulatory pillar focusing on environmental monitoring and risk mitigation has been introduced in response to rising harmful algal blooms (HAB) and related public health and socio-economic issues. However, the resilience of fisheries remains uncertain due to governance limitations and an insufficient integration of social and economic dimensions. This study focuses on the Eastern English Channel (France), a region facing pressures from climate change, toxic algal blooms, resource sustainability challenges and spatial competition from emerging maritime sectors. The scallop fishery, a key socio-economic resource, is significantly affected by fragmented governance, which limits the sector's ability to respond effectively to emerging challenges. Based on an integrated spatial and temporal modelling, this research examines the effectiveness of current management systems and explores decision-support mechanisms that could promote a more adaptive, resilient, and collaborative governance approach, ensuring the ecological, social and economic sustainability of this fishery.

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BLUMATER: EMPOWERING FISHERS WITH DIGITAL INNOVATION FOR MARINE LITTER RECOVERY AND SUSTAINABLE SEAS

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The BluMater project has pioneered the use of digital tools and participatory approaches to address the issue of marine litter while promoting sustainable fisheries. The initiative introduced a mobile and cloud-based application, BluMater, which enabled the systematic collection, geolocation, and classification of marine litter by fishing vessels, facilitating a data-driven approach to marine waste management. The overarching objective of BluMater was to establish an efficient and user-friendly system for monitoring and recording the waste retrieved at sea, acknowledging the pivotal role of fishers in ocean conservation. Through the BluMater APP, fishers were able to document marine litter using GPS-tagged photos and structured reporting forms, enabling the identification of pollution hotspots. The collected data were used to test the potential implementation of a traffic light approach, built on sustainability indicators and scoring system aimed to assess the impact of different fishing fleets and fishing areas. This evidence-based framework provided insights for policy recommendations related to marine waste management. A key component of the project was the stakeholder engagement process, which involved fishers, policymakers, and researchers in the development of practical procedures for waste recovery and disposal. The participatory approach ensured that the guidelines and methodologies developed within BluMater were adaptable to different fleets and local contexts, making the model scalable and replicable. Furthermore, deliberations were initiated concerning the prospective implementation of premium price mechanisms, with the objective of offering financial incentives to fishers who make active contributions to the cleanup of the marine environment. Notwithstanding the regulatory limitations on the provision of direct economic incentives for the collection of marine litter, the project explored alternative pathways for the recognition of fishers' contributions, including the establishment of certification schemes and the prioritisation of access to funding opportunities.

BluMater demonstrates that digital innovation can be leveraged to support marine conservation efforts while enhancing the role of fishers in waste recovery. The project's findings contribute to the ongoing discussions on traceability, circular economy models, and fisheries' contributions to ecosystem services, offering a practical model for integrating marine litter management into sustainable fisheries policies.

ORAL PRESENTATIONS

Theme session B – Biodiversity: the economic opportunities and challenges that it brings for fisheries and aquaculture, including ecosystem services

ECONOMIC EVALUATION OF TROPICAL TUNA HARVESTING THROUGH AN ECOSYSTEM SERVICES APPROACH

Helene Gomes (AZTI), Xavier Corrales (AZTI), María José Juan Jordá (IEO), Arantza Murillas (AZTI), Eider Andonegi (AZTI), Josu Meléndez Arteaga (AZTI)

The Tropical Atlantic Ecoregion (TAE) supports a wide range of ecosystem services, including food provisioning, cultural and regulating and maintenance services, such as carbon storage. Particularly, the TAE is one of the most important fishing grounds for tropical tuna species in the Atlantic Ocean. Beyond the direct effects of fishing on target species and non-targeted vulnerable species, fishing can also disrupt the structure and function of food webs, potentially compromising the ability of marine ecosystems to provide ecosystem services, that support human well-being. Here we conduct a trade-off analysis including an economic assessment of ecosystem services gained and lost due to the harvesting activity of European tuna fishing fleets operating in the TAE. To achieve that, an Ecopath with Ecosim ecosystem model is combined with economic valuations under different fishing scenarios. Our findings contribute for the first time to the implementation of an ecosystem-based fishery for tropical tuna management. Evaluating trade-offs between social, economic and ecological objectives will support the adoption of an ecosystem services approach to inform fishing managers and other policy makers.

ORAL PRESENTATIONS

Theme session B – Biodiversity: the economic opportunities and challenges that it brings for fisheries and aquaculture, including ecosystem services

Optimizing Abalone Fisheries Management in Oman: An Integrated Bioeconomic Approach for Sustainability and Profitability

Ibtisam Al Abri (Sultan Qaboos University)

Abalone fisheries are among the most valuable marine resources due to their high market prices and profitability. However, overfishing has led to stock depletion, prompting Oman to impose a fishing ban for several years to support stock recovery. Despite these efforts, a long-term management strategy is needed to balance economic returns with sustainability. This study develops the first integrated bioeconomic model for fisheries management in the Arab world, combining ecological, eco- nomic, and policy dimensions. The model determines the optimal harvest effort policy that maximizes the present value of returns while ensuring sustainability. Additionally, it evaluates the effectiveness of fisheries management policies, such as seasonal closures, in maintaining abalone stock levels and stabilizing market value. The methodology applies a modified bioeconomic model incorporating the Hamilton-Jacobi-Bellman (HJB) equation to derive optimal harvesting strategies under dynamic conditions. The model extends the Gordon-Schaefer framework by integrating biological data on abalone stock dynamics and economic data on market prices, harvesting costs, and fishing effort. Empirical data from government reports, fisheries surveys, and market analyses are used for calibration and validation. A scenario-based analysis will compare different harvesting policies, including unrestricted fishing, regulated quotas, and seasonal closures, to identify the most effective long-term strategy. Preliminary results indicate that an optimal harvest effort policy derived from the HJB equation can maximize economic returns while preventing stock depletion. Seasonal closures may enhance stock regeneration and stabilize supply, reducing price fluctuations. Additionally, adaptive management strategies that adjust harvesting effort based on stock assessments could lead to a more resilient fishery with long-term profitability. This research makes a significant contribution to fisheries management in the Arab world by providing the first fully integrated bioeconomic model. Beyond its application to abalone, the model can be adapted to manage other high-value fisheries in the region. The findings offer critical insights for policymakers, supporting evidence-based fisheries policies that balance conservation and economic objectives. By establishing a robust bioeconomic framework, this study promotes sustainable fisheries management and enhances marine resource resilience in Oman and beyond.

ORAL PRESENTATIONS

Theme session B – Biodiversity: the economic opportunities and challenges that it brings for fisheries and aquaculture, including ecosystem services

SEAFOOD CONSUMPTION BEHAVIOR AMONG YOUNG PEOPLE UNDER 18: WHAT KNOWLEDGE AND EXPECTATIONS?

Stéphane Gouin (UMR SMART – L'Institut Agro–INRAE), Sylvie Thoby (Pôle Alimentation Durable – L'Institut Agro)

Little work on young people under 18 has been conducted in France to understand beliefs, knowledge and expectations in terms of seafood consumption. At the request of FranceAgriMer and the magazine 'Produits de la mer', from October 2023 to March 2024, a behavioral study was car- ried out among these young consumers but also among parents to understand the lexical field and reasoning of seafood consumption. Initially, two questioning methods were used in school classes of different levels (CE2, 5th and second): the focus group and the means-end chain. Three cities were selected: Rennes, Paris and Tours for the three focus groups in primary and secondary schools. Work on the preferred species was carried out as well as the definition of an ideal fish… In a second step, a Means-Ends Chain made it possible to structure the reasons for consuming seafood pro- ducts. More precisely, to identify the relationships between the attributes of the product, the benefits that the young consumer gets from it. As part of our study, we wanted this method to highlight benefit-attributes in order to better understand what attracts under-18s in their consumption of seafood products. Our target identified three most important attributes when consuming fish/seafood products and three most important benefits, linked to these attributes. The results were analyzed on R-studio by separating fish from seafood products. In a third step, and in order to understand the consumption habits of children, we studied the consumption habits of their pa- rents. A Shopping Trip was studied in order to understand the purchasing habits of parents. For this analysis, we studied different cases of shopping with parents of children. This study was able to complement the work carried out with young consumers and accompany the data obtained on their consumption habits and those of their children.

ORAL PRESENTATIONS

Theme session B – Biodiversity: the economic opportunities and challenges that it brings for fisheries and aquaculture, including ecosystem services

THE GORDON – SCHÄFER MODEL AFTER 70 YEARS

Anders Skonhoft, Norwegian University of Science and Technology

There have been three dominating theoretical schemes, or models, within conventional (neoclassical) natural resource economics; the Hotelling model for non-renewable resources, the Faustman model for the optimal timing problem of storable and renewable resources and finally, the Gordon-Schäfer model for renewable, but depletable, resources. The last model, coined after the work of the economist H. Scott Gordon (1954) and the biologist Milner B. Schäfer (1957), was originally formulated as an equilibrium single species fishery where natural growth was exactly balanced by harvest. The natural growth function was assumed to be of the standard logistic type while the harvest function was assumed to be linear in stock size and effort use ('the Schäfer function'). The Gordon - Schäfer model has basically been related to rent (or maximum economic yield, MEY) maximisation. The original contributions of Gordon and Schäfer have been extended in various directions where the work of Colin Clark, where fish is considered as capital, has been of most importance.

*Gordon formulated a static model, but the formulation tacitly assumed that the two events included the analysis, harvesting and natural growth, took place simultaneously. This setting may fit to a continuous time dynamic modelling framework. However, within a more realistic time-discrete framework, this will generally not be the case. Natural growth, comprising recruitment and natural mortality, take place during certain periods of the year cycle, while fishing often take place in other periods. This paper studies the timing of events issue in the Gordon-Schaefer model, and where the two events included in the model, natural growth and harvesting, are generally assumed to take place at different periods over the year cycle. As will be shown, whether harvest takes place before or after natural growth may have rather significant effects on exploitation and profitability compared to the situation where these events are assumed to take place simultaneously, as was tacitly assumed by Gordon.to rent (or maximum economic yield, MEY) maximisation. The original contributions of Gordon and Schäfer have been extended in various directions where the work of Colin Clark, where fish is considered as capital, has been of most importance. *

* Gordon formulated a static model, but the formulation tacitly assumed that the two events included the analysis, harvesting and natural growth, took place simultaneously. This setting may fit to a continuous time dynamic modelling framework. However, within a more realistic time-discrete framework, this will generally not be the case. Natural growth, comprising recruitment and natural mortality, take place during certain periods of the year cycle, while fishing often take place in other periods. This paper studies the timing of events issue in the Gordon-Schaefer model, and where the two events included in the model, natural growth and harvesting, are generally assumed to take place at different periods over the year cycle. As will be shown, whether harvest takes place before or after natural growth may have rather significant effects on exploitation and profitability compared to the situation where these events are assumed to take place simultaneously, as was tacitly assumed by Gordon.*

ORAL PRESENTATIONS

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TOURIST DEMAND IN BRITTANY FOR ACTIVITIES LINKED TO FISHING AND MARITIME HERITAGE

Carole Ropars-Collet (UMR SMART – L'Institut Agro-INRAE), Catherine Laidin (UMR ESO – L'Institut Agro)

Tourism linked to fishing, aquaculture and maritime heritage is developing throughout Europe. It is motivated both by the decline in income from fishing and the search for additional income for fishermen, and by the development of a leisure economy. Traditional fishing activities and maritime heritage can support local tourism. This is the case in Brittany, where there are numerous tourism initiatives in coastal areas, with a variety of actors and economic models, aimed at attracting a diverse clientele. We want to find out if there is a real demand for these tourist activities linked to fi- shing, aquaculture or maritime heritage, which are present on the coast. To do this, we have set up a choice experiment that will allow us to discover tourists' preferences for different types of activities, whether they are linked to environmental education, cultural and heritage activities or corporate tourism activities. By analysing the choices made by respondents, we can see how the various activities proposed in the experiment are valued. Based on a survey of 336 people in Brittany, we first estimated a random logit parameter model to take into account the heterogeneity of preferences for different activities between respondents. We then estimated a latent class model to take into account the heterogeneity of preferences between classes of respondents and characterised these classes. We show that there is a demand for all the environmental education activities offered in the experiment. Of these, the activity most in demand by all respondents is 'nature-based outings at sea'. There is less demand overall for cultural and heritage activities such as museums, maritime festivals and seafood cooking classes. Visits to fishing boats, on the other hand, were only requested by some respondents. There was less demand overall for business or skills tourism activities. However, there is a demand for 'seafood tasting' activities and 'visits to fish auctions', although demand for the latter is lower. The activity 'Pescatourism' was only requested by some of the respondents. The results indicate that there is considerable heterogeneity in the preferences among the respondents.

ORAL PRESENTATIONS

Theme session C – Decarbonisation: a response to current European regulations through innovation, subsidies, CO2 markets etc.

A Comparative Multi-Fleet Analysis of the Costs and Benefits of Decarbonising the UK Fishing Sector

Stephen C. Mangi (MRAG Ltd), Sebastien Metz, (Sakana Consultants), Liam Wakefield (Risk & Policy Analysts Ltd), Harry Owen (Western Fish Producers' Organisation)

Finding solutions to decarbonise and bring greenhouse gas emissions to net zero is a major challenge for the UK fishing sector, which will require switching to alternative technologies and fuels that produce less carbon dioxide (CO₂). Starting with nine technological solutions that could be used to reduce CO₂ emissions, literature review and stakeholder perceptions indicated that three (biofuel 50%, diesel-electric and ammonia) had the highest potential of being taken forward by the fleets. Subsequently, a multi-fleet cost-benefit analysis was carried out to assess these three potential solutions for a fleet-wide transition to a green future. Costs and benefits were calculated, discounted across a 25-year period and benefit-cost ratios (BCRs) were determined. Fishing industry stakeholders were consulted to verify findings, including the potential costs and benefits, and the feasibility of implementing each of the three solutions. BCRs varied across fleet segments but diesel-electric and ammonia scored most highly, for most segments. BCRs for biofuel 50% were tightly linked to its price. The potential uptake for biofuel 50% is high due to its relatively low upfront costs, compatibility with existing diesel engines and low safety risks. Conversely, the high capital investment costs to implement diesel-electric and ammonia fuel cells could hinder their implementation, as could the port infrastructure required for ammonia and biofuel 50% storage facilities. Stakeholders remarked that any replacement engine, whether using diesel-electric or ammonia fuel cells, would likely cause issues relating to compliance with regulatory requirements. While fishers and vessel owners will bear most of the costs, they will not experience most of the benefits from CO₂ emission reductions, which could potentially have an impact on their willingness to switch to a greener solution.

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EVALUATING THE TOTAL IMPACT OF OFFSHORE RENEWABLE ENERGY FARMS FROM A HUMAN-CENTRED POINT OF VIEW

Claudio Pirrone (University of Palermo – National Biodiversity Future Centre)

* In recent decades the demand for marine space dedicated to offshore renewable energy has expanded dramatically. Early pilot projects occupied only modest areas, but today significantly larger zones are being designated for offshore wind and other ORE technologies. For instance, a recent brief from EEA (2024, Harnessing offshore wind while preserving the seas) emphasizes the goal of increasing offshore wind energy production by more than 16 times by 2050 as a critical element for decarbonizing Europe's economy. Also, Europe aims to expands MPA up to 30% by 2030. These projects mainly concern coastal areas, which are historically a common multipurpose asset. In this context, ORE and MPA constitute a form of appropriation that excludes (by rule or de facto) concurrent activities from the use of concerned areas. Consequently, the need for evaluating trade-offs among concurrent interests and goals, and across the economic, environmental and social dimensions, becomes crucial. For this scope, a common metric for estimating the total effect of the initiatives is necessary. In 2025, ICES produced a report aiming to establish guidelines for assessing trade-offs between ORE development and fishery (2025, WKWIND Report, ICES Scientific Report, vol. 7, issue 8), followed by a subsequent work (2025, WKCOMPORE Report, forthcoming) that encompasses the "three pillars" and identifies methodological challenges and data gaps needing resolution. This contribution seeks to enrich the debate, illustrating how a non-monetary measure of sustainable development can be a useful complement to classical estimations. For this purpose, it adopts the conceptual framework proposed by Fazio* et al. *(2023, Developing HI-EBFM Conceptual Frameworks in Sicilian Gulfs, EAFE 2023 Conference) and it reinterprets the Development Space Creation index, inspired from the capability approach and first proposed by Pirrone and Charles (2011, L'espace de liberté comme mesure synthétique du développement territorial durable. Revue Tiers Monde, 207, 61-77), which provides a useful metric and allows for the smooth integration of land-seas dynamics in the analysis. *

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FLEET RESILIANCE UNDER VARIATIONS ON FISH SIZE AND FISHING GROUND LOCATION: THE SPANISH ANCHOVY FISHERY

Gomes Marga Andrés (AZTI – BRTA), Leire Ibaibarriaga (AZTI – BRTA), Naroa Aldanondo (AZTI – BRTA), Sonia Sánchez–Maroño (AZTI – BRTA), Josu Paradinas (AZTI – BRTA), Oihane C. Basurko (AZTI – BRTA)

Populations of small pelagic fish are highly susceptible to climate variability and environmental factors. Consequently, to remain sustainable the fleets targeting these stocks try to adapt to these changes with varying degrees of success. The anchovy fishery in the Bay of Biscay faced a five-year closure (2005-2009), changes in the spatial distribution of the population, and a reduction in the individuals mean body size. The economic impact of the fishery closure has already been analysed both for the French and Spanish fleets. However, the impact of the other changes remains unknown. This study evaluated the resilience of the Spanish purse-seine fleet under the recent varying conditions. The analysis was carried out at a subnational level to avoid diluting the economic impact that would occur if analysed at the national level. First, potential spatial shifts of fishing grounds were assessed using the centre of gravity of catches and its consequent variation in energy efficiency depending on the port of origin. And second, the fleet resilience under spatial shifts was evaluated, incorporating the impact of the anchovy mean size on the first sale price and the impact of the historic fuel prices highs since 2008 (1.2 €/L in 2022 vs 0.3 €/L in 2008). The analysis confirmed a westward shift of the fishing ground in the recent years, coinciding with high population levels. Vessels from some regions were more impaired than others, a damage that was amplified by the decreased first sale prices and increased fuel prices. In the context of the European Union's commitment to enhancing energy efficiency and reducing fossil fuel consumption, understanding fleet energy efficiency under displacement of fishing grounds can help identify management measures to achieve energy goals. This study provides valuable insights into the resilience of the Spanish anchovy fishery and offers recommendations for future management strategies to ensure sustainable and efficient exploitation of this resource.

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MODELING THE EFFECT OF FISHING GROUNDS AND TOTAL ALLOWABLE CATCHES (TACS) ON NORWEGIAN COD TRAWLERS´ EFFICIENCY: AN ORDER–M FRONTIER ANALYSIS

Thanh Viet Nguyen (University of Akureyri), Yajie Liu (UiT The arctic University of Norway), Michel Simioni (MoISA – INRAE – TSE)

The Atlantic cod fishery in Norway boasts a rich history and holds significant economic and cultural importance. Harvesting methods encompass various techniques, including trawlers, demersal seine (also known as Danish seine), as well as traditional gears like hook and hand line and gillnet. Modern fishing vessels are equipped with advanced navigation systems, echo sounders, and sonar technology to effectively locate fish. Vessel Monitoring Systems (VMS) are mandated to electronically track fishing activities at sea. Trawlers and demersal seine vessels typically operate offshore in the Barents Sea, while vessels with traditional gears focus on nearshore areas. This study employs robust and conditional data envelopment analysis to assess the impact of the production environment on the productivity growth of Norwegian trawlers using the catch and activity reporting (ERS) and VMS data spanning from 2010 to 2022. The findings reveal that larger trawlers consistently exhibit higher technical efficiency, while medium and smaller trawlers experience fluctuations in their technical efficiencies. Additionally, the results indicate that fishing grounds and the Total Allowable Catches (TACs) have an impact on technical efficiency throughout the study period.

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MODELING THE FRENCH FISHING FLEET ADAPTIVE RESPONSE UNDER SCENARIOS OF FUEL TAX EXEMPTION REMOVAL USING AN ECO–VIABILITY APPROACH

Sarah Landru (Bloom association), Augustin Lafond (Bloom association), Valérie Le Brenne (Bloom association) Florence Briton

The fuel tax exemption for the EU fishing fleet has resulted in a revenue loss of 883 million euros for EU Member States in 2021. Beyond its fiscal impact, this exemption exacerbates environmental degradation, contributes to increased fishing capacity (Sumaila et al., *2010), and artificially inflates the profitability of the most polluting vessels (Carvalho et Guillen, 2021; Vaughan et al, 2023). Phasing out these subsidies is therefore a crucial step toward the ecological transition of the fishing industry and achieving the goals of the European Green Deal passed in 2021. In the context of ongoing negotiations within the Council of the European Union on the revision of the Energy Taxation Directive, this study presents a prescriptive analysis modeling different scenarios for the elimination of the fuel tax exemption for the French fishing fleet, including the complete removal of the exemption and the introduction of a progressive fuel consumption-based tax. Using data from the Scientific, Techni- cal and Economic Committee for Fisheries and vessel trajectories from the Global Fishing Watch platform, we developed a model to assess the adaptive behaviors of different fleet segments under rising fuel costs. Using the eco-viability approach, we assess whether adaptive strategies can meet socioeconomic and environmental objectives simultaneously. This analysis aims to provide policy-makers with insights into the potential consequences of eliminating fuel tax exemptions and inform the design of sustainable fisheries policies.*

ORAL PRESENTATIONS

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OFFSHORE WINDFARMS AND FISHERIES

Ragnar Arnason (University of Iceland)

The establishment and operation of offshore windfarms (OWFs) have impacts on the marine ecosystem and, therefore, the economics of its other uses. Fisheries, both commercial and recreational, are among the activities that are likely to be affected. This paper attempts to model in a general analytical way the key economic interactions of OWFs and fisheries. In particular, it attempts to:
(i) Identify the crucial variables and relationships of the situation.
(ii) Investigate the potential impacts of OWFs on fisheries and highlight the economic trade-offs involved.
(iii) Employ dynamic maximization techniques to characterize conditions for socially optimal co-utilization of limited marine resources for energy production by OWFs and fisheries.
(iv) Examine the economic consequences of uncoordinated marine use of these two activities.
(v) Outline institutional arrangements conducive for socially optimal co-utilization of marine resource by OWFs and fisheries.

ORAL PRESENTATIONS

Theme session C – Decarbonisation: a response to current European regulations through innovation, subsidies, CO2 markets etc.

REDUCING CLIMATE GAS EMISSIONS IN FISHERIES – A REVIEW OF NORWEGIAN EXPERIENCE

John R. Isaksen (Nofima)

A stronger focus on sustainability, and the need for avoiding global climate threats, have increased the need for global agreements - and in line with those; hairy national objectives for reducing climate gas emissions in next to all sectors of society. Fisheries and aquaculture have been viewed upon as a relatively climate friendly means of protein productions, as compared to agricultural meat - especially red meat. Nevertheless, a pan-societal transition into a greener future, encompassing a goal of carbon neutrality within the next 30 to 40 years, involves carbon emission reductions in all parts of society - also the ones today deemed as climate friendly. For fisheries, as for other protein production, the lion's share of carbon emissions connected to seafood production, takes place under the primary production - the furthest upstream link of the value chain.

In this paper we utilise Norwegian fishing industry as an example to point out the historical development in view of carbon emissions, and the managerial means to influence the incentives of conducting a fishery where incentives to reduce climate gas emissions are present. The historical development of the industry, and the management of the industry, will be put under scrutiny. From the main managerial objectives and changes in these, highlighted against more up-to-date emphasis on climate awareness. We also point to the need of statistics of good quality to evaluate the effect of different measures, but also the ineffectiveness of national measures in a mobile industry who, partly at least, can exploit alternatives in neighbouring countries, without such measures - and the lack of internationally harmonised protocols. Moreover, we provide a coarse evaluation of the most recent, and sophisticated, plan for reducing carbon emissions in the Norwegian fishing industry: the preliminary carbon dioxide compensation scheme - which was levied the fishing fleet as they lost their reimbursement of the carbon dioxide fee in 2020. A scheme set to last in five years with diminishing funds over time, which today has grown to the double of the initial support.

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VESSEL SIZE RESTRICTIONS AS A MEANS OF CONTROLLING FISHING CAPACITY

Thomas Nyrud (Nofima), Bent Dreyer (Nofima)

Fisheries regulations often aim to influence catch patterns and capacity development in the fishing fleet. In this article, we report findings from an analysis of how changes in vessel size restrictions affected vessel design, quota allocation and capacity development in the Norwegian coastal fishing fleet. The analysis studies the interaction between quota market regulations and changes in parameters that determine size restrictions. In Norway, the coastal fleet has since 2002 been divided into 4 size groups, each of which is allocated a fixed share of the total quota for cod. For many years, the longest length of the vessel was the size restriction parameter used in each group. From 2008, this size restriction was changed for the group of largest vessels, from length (up to 28m) to storing capacity (up to 300m3, later increased to 500m3). The main argument for this change was that vessels were built that had poor stability and an energy-intensive hull shape, stemming from attempts to increase catch capacity without overstepping the length restriction. The change from length to storing capacity resulted in huge changes in design of the vessels and growth in catching capacity within a short period. In this article we develop an explanatory model for why this happened, and what consequences this had in shaping a completely new group of vessels in terms of hull shape, harvesting capacity and harvest patterns. The article uses the explanatory model to assess what structural consequences a similar regulatory change would have for the other, smaller size groups of the Norwegian coastal fishing fleet. The article also discusses the theoretical, methodological and industrial implications of the findings reported.

ORAL PRESENTATIONS

Theme session D – Sustainable value chains: from production to processing down to touristic services and more

CONTRASTING MEDIA NARRATIVES ON AQUACULTURE IN SPAIN AND FRANCE

Raquel Lopez Martinez (Western Brittany University), Bertrand Le Gallic (Western Brittany University)

Aquaculture has gained increasing recognition as a key sector contributing to food security, economic development, and environmental sustainability. However, its expansion is influenced by societal perceptions, which are shaped by media representation. This study presents a comparative analysis of media coverage and societal perceptions of aquaculture in Spain and France, with a particular focus on the differing narratives surrounding the trout and salmon industries. By employing content analysis and sentiment classification, we assess how these sectors are portrayed in the media, the key themes associated with them, and the evolution of public discourse over time. The methodology consists of a systematic media analysis, collecting and categorizing news articles related to aquaculture from national and regional sources. Sentiment classification was conducted to determine the portrayal of aquaculture as positive, neutral, or negative, while thematic content analysis identified key stakeholders, recurring narratives, and dominant concerns in the discourse.

Our findings indicate that in Spain, media coverage of aquaculture has intensified in recent years, with a growing emphasis on sustainability, innovation, and market development. While the perception remains largely positive (48% of articles), there has been an increase in neutral (26%) and negative (27%) portrayals, often linked to environmental concerns and regulatory challenges. In contrast, in France, discussions were more centred on traditional fish farming, particularly trout and salmon production, with a predominance of positive coverage (63%). However, issues such as policy constraints and environmental sustainability were also significant themes. A notable divergence emerges in the media representation of trout versus salmon. In France, trout farming has been portrayed as a traditional and localized industry, benefiting from strong regional identity and consumer trust. In contrast, salmon aquaculture, particularly in relation to international markets, has faced greater scrutiny regarding environmental impact, disease outbreaks, and regulatory challenges.

In Spain, the commercialization of trout has been positioned as an innovative and growing segment of the market, while salmon remains a dominant but sometimes controversial sector, often linked to broader discussions on global sustainability and competitiveness.

This study highlights the importance of transparent communication and knowledge dissemination in fostering public trust and social acceptability of aquaculture. Understanding how media narratives evolve can inform policy strategies to enhance societal engagement and support the sustainable development of the sector.

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Theme session D – Sustainable value chains: from production to processing down to touristic services and more

ECONOMIC VALUE OF SEAFOOD NUTRITION ATTRIBUTE IN A CONTEXT OF CLIMATE CHANGE: A PRICE HEDONIC ANALYSIS IN THE CANNED SARDINE INDUSTRY

Fabienne Daures (AMURE), Marie Estelle Binet (AMURE)

CONTEXT

The effects of climate change on the availability and survival of marine resources are not well documented. However, in certain fishing areas in France, we are now seeing a decline in the nutritional quality of Small Pelagic Fish (SPF), particularly sardines (or pilchards). This change, which is not yet apparent to consumers, is raising questions throughout the sector. While sardines are a key product in French seafood consumption, they are also known for their nutritional benefits due to the presence of omega-3. Indeed, health and nutrition are among the many reasons why the French eat seafood and sardines in particular. Furthermore, sardines, which are mainly available in tins, are an affordable food product for people on a limited income, often with children.

OBJECTIVES

This decline in omega-3 in SPF is one of the many shocks that we will have to deal with in the context of climate change. To do this, we focus on how the sardine industry is dealing with these changes and developing its differentiation strategies. We also examine the current value to consumers of the different food attributes, or "food values" associated with sardines, particularly the health attribute.

METHOD

The first step is to analyse differentiation strategies by identifying food values promoted on a sample of sardine tins from different producers, brands and distribution place. The second step is to estimate a hedonic price model that incorporates these characteristics, including the Food Values, and to measure their economic value. These food values include, among others (environmental, origin, taste, tradition…), the health dimension, measured by the mention of omega-3. We also use quantile regression to analyse the differentiation strategies by market segment.

ORIGINALITY

In contrast to hedonic pricing research on the seafood attributes, which is usually based on consumers' willingness to pay for fish characteristics, here we are interested in producers' differentiation and marketing strategies in a mature market facing several challenges. This work also provides an overview of how a currently abundant food attribute is perceived and valued.

ORAL PRESENTATIONS

Theme session D – Sustainable value chains: from production to processing down to touristic services and more

ENHANCING EFFICIENCY AND PRODUCTIVITY IN THE NORWEGIAN AQUACULTURE INDUSTRY: A METAFRONTIER DEA APPROACH

Yajie Liu (UiT The arctic University of Norway), Dengjun Zhang (Business School – University of Stavanger)

This study investigates the efficiency and productivity of the aquaculture industry by employing a metafrontier Data Envelopment Analysis (DEA) approach. The Norwegian aquaculture sector, a global leader in seafood production, faces challenges in enhancing productivity, profitability, and sustainability while maintaining its comparative advantage. By utilizing a metafrontier framework, we assess the performance of different aquaculture farm groups, accounting for technological heterogeneity across farming groups and production systems. The group DEA analysis allows for the evaluation of relative efficiency within each group, while the metafrontier approach provides a comprehensive benchmark across all groups. Our preliminary findings reveal variations in efficiency and productivity levels, highlighting the impact of technological disparities and operational practices. The results suggest that while some farms operate near the efficiency frontier, others have room for improvement in efficiency and productivity. These improvements can be achieved by adjusting production scales or optimizing certain inputs. These insights contribute to the strategic development of the Norwegian aquaculture industry, promoting sustainable growth and competitiveness in the global market.

ORAL PRESENTATIONS

Theme session D – Sustainable value chains: from production to processing down to touristic services and more

FISHING AND AQUACULTURE CONTRIBUTION TO THE EU'S ECONOMY

Jordi Guillen (JRC – European Commission), Natacha Carvalho (EEA), Frank Asche (University of Florida – University of Stavanger), *Et al*.

Fishing and aquaculture can play a crucial role in ensuring food security and fostering coastal communities in high-income countries. While often neglected from an economic perspective, their economic importance cannot be underestimated. In the European Union (EU), fishing and aquaculture production, with more than €5.4 billion of gross value added (GVA) and almost 198 thousand jobs in 2022, contributed approximately to 0.03% of the overall EU GVA and accounted for 0.10% of total EU employment. However, it is essential to recognize their economic importance - beyond just the production activity - in the entire supply chain, particularly in downstream activities. Outcomes from this study show that the direct GVA and employment increases between 6- and 8-fold, when considering the whole fishing and aquaculture supply chain, with indirect GVA accounting for almost the same as the direct GVA. However, it is important to take into account that the EU, as many high-income countries, imports a large share of the aquatic products consumed by their population. When correcting for the role of imports, the multiplier of the fishing and aquaculture production activity is estimated to be about 3-fold. These overall values highlight the important contribution to the economy of the fishing and aquaculture activities, as well as trade, even in high-income countries, which has important policy implications.

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FROM MÈTIER TO MERTIERRE: MOVING TOWARDS THE SOCIOECONOMIC ASSESSMENT OF FISHING COMMUNITIES

Jose L. Santiago (CETMAR), Marta Ballesteros (IEO – CSIC), Davinia Lojo Amoedo (DoMar – CETMAR)

Small-scale fisheries (SSF) support livelihoods and local economies worldwide, yet conventional management often overlooks the social and economic dimensions embedded in fishing communities. The concept of fishing communities in fisheries management highlights the need for policies that sustain these communities by incorporating socioeconomic data. International guidelines advocate for integrating bioecological, social, cultural, and economic information into SSF management. However, in practice, socioeconomic data remain underutilised, as marine policies focus predominantly on biological indicators and provisioning services, neglecting community-level impacts. To address this gap, we develop a four-step framework integrating socioeconomic data into the management of Galicia's small-scale gillnet fishery (~1,400 vessels in NW Spain). First, a clustering analysis of sociodemographic characteristics, vessel registry records, and fishing activity is conducted to define distinct fishing community segments. Second, qualitative data on economic and social aspects (e.g. operating costs, income streams) are collected to complement and validate the cluster profiles. Third, these community profiles are cross-referenced with ongoing bycatch reduction initiatives, enabling an evaluation of their socioeconomic effects. Fourth, an input-output analysis simulates potential supply shocks (e.g. stricter bycatch regulations) and quantifies their direct, indirect, and induced im- pacts on the Galician economy.

This approach demonstrates that framing fisheries data through fishing community clusters enhances understanding of management measures' effects and trade-offs. By structuring socioeconomic information around community segments, we identify how conservation initiatives, such as bycatch mitigation, affect different groups of fishers and their coastal economies. This methodology provides managers with a tool to test policy scenarios and anticipate outcomes.

Beyond fisheries management, this study contributes to socioeconomic disciplines by offering a quantitative and qualitative framework to assess the economic resilience of resource-dependent communities. It strengthens the integration of spatial, economic, and demographic data in policy evaluation and provides a transferable methodology for analysing the broader socioeconomic impacts of environmental regulations on small-scale industries.

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Is Fishing Profitable?

Antonio Alvarez (University of Oviedo), Sandra Fernández–Tejón

This paper investigates the profitability of the fishing fleet in Asturias, a region in Northern Spain, focusing on three primary segments: purse seine, bottom longline, and gill nets. We analyze data from voluntarily participating vessels, simulating the economic outcomes for a typical boat in each segment based on actual figures related to investment, income, and expenses.

Unlike traditional studies that rely on survey data, our research involves collaborating with shipowners and their tax advisors to obtain precise financial data reflecting several years of operational activity. This approach ensures the reliability and accuracy of the economic information utilized in our analysis.

While most fisheries studies assess economic performance primarily through profit levels, we argue that profit alone is insufficient for evaluating business viability. In this paper, we adopt a profitability framework that links profits generated by the firm over a specified period to the investments made during that time. A firm may report profits, yet still be unprofitable if those profits, relative to the investment, fall short of the returns achievable through a risk-free alternative. To quantify profitability, we compute both the Net Present Value (NPV) and the Internal Rate of Return (IRR) for each of the three fishing segments. Additionally, we explore the underlying factors that contribute to variations in profitability across different fishing gears. This study aims to provide a nuanced understanding of the financial dynamics within the Asturian fishing fleet, offering insights that can inform policy decisions and investment strategies within the fisheries sector. By focusing on profitability rather than merely profit, we highlight the importance of evaluating investment efficiency and long-term viability in fisheries economics.

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RENEWING THE FRENCH FLEET: FINANCIAL BURDEN OR OPPORTUNITY FOR A SUSTAINABLE TRANSITION?

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Bottom trawlers generate around a third of the French fleet revenue. Previous studies have demonstrated the extent of the environmental footprint of bottom trawling. Shifting away from environmentally damaging fishing techniques could significantly lower the environmental impact of seafood consumption (Lucas et al., *2021). Recent studies showed that this transition could also provide socioeconomic benefits as bottom trawlers have some of the worst economic performances among the French fishing vessels when measured per tonne (Quemper* et al., *2024). However, few studies focused on the cost of this transition. In this paper, we used the SIH national database on the state of the fleet (https://sih.ifremer.fr>) to estimate the cost of renewing the aging French fleet at around €3 billion. Then, using STECF AER and FDI databases,*
we simulated a gradual exit of bottom trawlers, from 20 to 100%, by redistributing their catches to vessels respectively specialized in the use of dredges, trawls and pelagic seines, and passive gear, prioritizing passive gear. We assessed the additional costs associated with the construction of new vessels and computed new environmental (including CO₂ emissions and seabed abrasion) and economic indicators, including tax revenues. We found the economic performance of the simulated fleet to be greater, with a higher level of employment, and greater added value and profitability when redirecting subsidies previously directed at bottom trawlers (exemption from TICPE) towards practices that generate jobs and wealth. Our results show that enhanced socioeconomic and environmental sustainability could be attained at a reasonable cost for the state and the fisheries sectors by implementing a well scheduled transition. Our findings suggest that public policies organizing the fleet renewal should not only focus on modernization and energy efficiency gains but should also seize this opportunity for a broader sustainable transition of the fishing sector.

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SOCIAL ACCEPTANCE OF NEW MARINE PROTEINS IN EUROPE

Sterenn Lucas (L'Institut Agro Rennes–Angers), Rayan Le Gall (L'Institut Agro Rennes–Angers)

Diversification of marine protein sources is a significant challenge in the context of sustainable blue food management and food security. One strategy to achieve dietary diversification is to increase the consumption of low trophic species, whether animal or plant-based, particularly if these species are readily available at the local level. However, while the consumption of these species may be prevalent in certain regions, this is not the case in Europe, where the consumption of fishery and aquaculture products continues to be driven by a limited number of key species. In the Aquafish0.0 project, we are investigating the social acceptance of two new marine protein sources for the European mar- ket: Holothuria (sea cucumbers) and seaweeds. Both species are by-products of Integrated Multi- Trophic Aquaculture in Europe but remain little or not at all consumed in the countries where they are produced. To study the barriers and levers of consumption of these species, we use a survey of 4000 people in four European countries (Ireland, Spain, Portugal and France) conducted in October 2024. After general questions regarding fisheries and aquaculture consumption habit and by-product acceptance, half of people were asked more precisely about holothuria and half about seaweeds. Specifically, we investigate the effect of information on social acceptance. After assessing acceptance in the absence of information, we randomly provided either a positive environmental benefit or a positive health benefit about the new species prior to a new assessment of acceptance. Using the treatment effect method, initial results suggest that health information seems to be more effective in increasing acceptance of sea cucumbers, while environmental information does not have a significant effect on the results. For seaweed, initial acceptance is higher than for holothuria, and the information provided does not seem to have a significant effect on acceptance.

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SUSTAINING COASTAL ECONOMIES: A SOCIOECONOMIC ASSESSMENT OF FISHERIES LOCAL ACTION GROUPS (2016–2024)

Jose L. Santiago (CETMAR), Edgar Soto Cespón (CETMAR), Melisa Santiago Nieto (CETMAR)

Fisheries Local Action Groups (FLAGs) play a crucial role in implementing Community-Led Local Development (CLLD) strategies, fostering economic and social resilience in coastal regions. This study presents an innovative socioeconomic analysis of FLAG-supported projects in Galicia over an extended period (2016-2024). By systematically monitoring project execution and aligning outcomes with policy priorities, this research advances the methodological framework for assessing the socioeconomic effects of public policies at a regional scale. The study focuses on quantifying the impact on regional economies, private investment mobilisation, and employment generation, while also characterising the activities developed by the fisheries sector and assessing their alignment with fisheries policies. A dual-perspective socioeconomic approach is employed:

• Initial Investment Impact: This examines the direct economic effects of capital expenditures, including infrastructure development, technological upgrades, and marketing initiatives. These investments stimulate multiple sectors, such as construction, IT services, and manufacturing, fostering short-term employment and economic activity.

• Sustained Economic Activity Impact: This phase analyses how projects contribute to long-term economic growth, increase business revenues, and strengthen value chains within the fisheries sector. Key indicators include employment creation, value-added growth, and regional economic integration. Results related to the fisheries sector indicate that 45% of all projects focus on value chain enhancements, processing innovations, and market access improvements. Additionally, 28% of projects contribute to cultural heritage and maritime tourism, reinforcing socioeconomic sustainability in coastal areas. Between 2016 and 2024, a total of 786 projects were executed, mobilising €110 million in investment, of which €45 million was public aid and €65 million was private investment. The input-output analysis estimates a cumulative socioeconomic impact of €179 million, significantly contributing to the regional economy. These investments also generated over 3,750 direct and indirect jobs, reinforcing the role of FLAGs in supporting coastal livelihoods and economic diversification.

This study underscores the effectiveness of participatory local development strategies in catalysing private investment, enhancing employment opportunities, and strengthening regional economic resilience. By employing advanced socioeconomic modelling based on input-output analysis, it provides a replicable framework for evaluating the macroeconomic impact of public policies, offering valuable insights for policymakers, researchers, and fisheries stakeholders in coastal development and fisheries management.

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UNLOCKING OMAN'S MARINE TOURISM POTENTIAL: A PSYCHOLOGICAL AND ECONOMIC ANALYSIS OF DEMAND AND LOYALTY

Ibtisam Al Abri (Sultan Qaboos University)

Oman has identified tourism as a key sector for economic diversification under its Vision 2040, aiming to increase the share of non-oil sectors in GDP. Despite its vast marine resources and efforts to promote tourism, Oman's tourism sector remains underdeveloped compared to regional counterparts. Marine tourism, leveraging Oman's extensive coastline and rich biodiversity, presents a significant opportunity for sustainable economic growth. However, existing research on marine tourism demand in Oman is limited, particularly regarding the role of psychological factors in shaping tourist behavior. This study aims to bridge this gap by examining how attachment, satisfaction, familiarity, and per- ceived value influence marine tourism demand, with attitudinal and behavioral loyalty as mediators. The study employs Partial Least Squares-Structural Equation Modeling (PLS-SEM) to analyze survey data from tourists visiting Oman's marine destinations. PLS-SEM is particularly suitable for this study as it effectively handles complex variable relationships and is ideal for analyzing tourism demand in data-limited contexts. The model assesses the direct effects of psychological variables on marine tou- rism demand and the mediating role of loyalty. Empirical data was collected through structured sur- veys targeting international and regional tourists, ensuring a robust dataset for analysis. Results indicate that satisfaction and attachment significantly impact demand, emphasizing the importance of delivering high-quality tourism experiences to foster repeat visits. While perceived value positively influences loyalty, attitudinal loyalty unexpectedly exhibits a negative effect on demand, suggesting that positive perceptions alone may not directly translate into increased tourism. Behavioral loyalty, however, does not significantly impact demand, indicating that repeat visits may depend on external factors such as affordability and accessibility. This study makes a significant contribution by integrating economic and psychological dimensions into a single model, offering the first structured examination of marine tourism demand in Oman. The findings provide policymakers and tourism stakeholders with actionable insights to enhance marketing strategies, improve ser-vice quality, and develop loyalty-driven tourism policies. By leveraging its marine tourism potential effectively, Oman can strengthen its tourism sec-tor and achieve sustainable economic growth.

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A PRACTICAL FRAMEWORK TO EVALUATE THE POTENTIAL OF INCENTIVE-BASED APPROACHES TO REDUCE MARINE MAMMAL BYCATCH

Manuel Bellanger (Ifremer – UMR AMURE), Benjamin Dudouet (EqualSea Lab – CRETUS – Universidade de Santiago de Compostela), Sophie Gourguet (Ifremer – UMR AMURE), Olivier Thébaud, (Ifremer – UMR AMURE), Lisa T. Ballance (Marine Mammal Institute), Nicolas Becu (CNRS – UMR LIENSs), Kathryn D. Bisack (Northeast Fisheries Science Center – NOAA Fisheries), Annie Cudennec (Université de Bretagne Occidentale), Fabienne Daurès (Ifremer – UMR AMURE), Sigrid Lehuta (Ifremer), Rebecca Lent (International Whaling Commission), C. Tara Marshall (University of Aberdeen), David Reid (Marine Institute), Vincent Ridoux (Pelagis), Dale Squires (Southwest Fisheries Science Center – NOAA Fisheries), Clara Ulrich (Ifremer)

Fisheries bycatch is one of the biggest threats to marine mammal populations and an important conservation and management problem worldwide. Conventional marine mammal bycatch mitigation approaches typically rely on top-down, command-and-control regulations that often fail to create desired incentives for fishers to avoid bycatch. There is a growing recognition of the need to explore alternative approaches that encourage behavioral change through the creation of an appropriate set of incentives - both economic and social - towards bycatch reduction. We present a practical framework that considers a range of dimensions related to feasibility and durability, for evaluating the potential of incentive-based approaches in mitigating marine mammal bycatch. We use this framework to examine six case studies where incentive-based measures have been implemented and outline a range of important operational aspects to consider in such implementation. The framework is applied to the Bay of Biscay dolphin bycatch issue to demonstrate how it can be used to assess the potentialities and limitations of alternative bycatch mitigation options. Our analysis highlights the need for fine-scale data collection, the involvement of fishers in solution development, and the pivotal role of collective organizations in addressing marine mammal bycatch issues.

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ANALYZING THE MARKET POWER OF EUROPEAN FLEETS THROUGH MARKUPS. A CLOSER LOOK INTO THE SSF AND THE CFP INSTRUMENTS

Adrián Rodríguez del Valle (University of Oviedo – INDUROT), Laura García de la Fuente (University of Oviedo – INDUROT)

First-sale prices of fish products are key to the socioeconomic sustainability of fleets and fishermen, with small and artisanal producers traditionally considered price-takers. In the EU, fisheries are highly regulated to avoid the over-exploitation of marine resources, and subsidized to reduce fishers' vulnerability to competition. Additionally, the current CFP also focuses on promoting fish markets and competitiveness, albeit without considering specific market power indicators or assessing their potential relationship with CFP measures. According to the literature, market power can be measured by estimating markups - the wedge between the marginal cost of production and pricing. However, no studies have been done to date that analyze their evolution in the fishing industry, due to the unavailability of comprehensive economic data on individual fishing vessels, and the challenges arising from micro-econometric approaches. Nevertheless, an extensive body of literature has found that markups have been increasing nearly continuously for manufacturing and service sectors in the EU and globally, prompting concerns by policymakers and academia due to the economic inefficiencies that might arise and the subsequent implications for consumers, welfare, and sustainability. This paper applies a macroeconomic approach based on Gutierrez (2017) to quantify the market power of the EU fishing fleets between 2013 and 2023 based on data provided by the STECF, with special attention to markup trends of European SSFs and fishing regions. In addition, a fixed-effects panel regression model was applied to explore the relationship between technical-economic and policy variables and markups at a fleet segment level. We find that markups for LSF are higher relative to SSF, although this gap has been rapidly closing in recent years (2020-23), with LSF seeing a marked decline in markups since 2016. Regression results outline that certain variables influence market power differently for SSF and LSF, or the Mediterranean fleets compared to the Atlantic fleets, and country effects were also found. Several policy measures such as operating subsidies and the dependency on species managed by Total Allowable Catch (TAC) also seem to influence the market power of EU fishing segments.

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ASSESSING THE EFFECTIVENESS OF THE EUROPEAN MARITIME AND FISHERIES FUND (EMFF) IN THE MEDITERRANEAN: A NOVEL APPROACH

Gianluigi Coppola (Department of Economics and Statistics – University of Salerno), Sergio Destefanis (Department of Economics and Statistics – University of Salerno), Monica Gambino (CNR–ISMed)

The European Maritime and Fisheries Fund (EMFF) serves as the financial instrument of the EU Common Fisheries Policy and was established primarily to help fishers transition to sustainable fishing practices, support the diversification of coastal economies, create employment opportunities, and improve the quality of life in coastal regions. Despite substantial financial support for Mediterranean fleets, the region remains the most overfished in Europe, with overexploitation exceeding the maximum sustainable fishing mortality rate (Fmsy) for 75% of assessed stocks (FAO, 2020).
This paper conducts a quantitative assessment of the EMFF in the Mediterranean at the Geographical Subareas (GSA)level. Specifically, we estimate the impact of the EMFF on both economic performance and biological sustainability on the basis of a multi-output, multi-input transformation function approach. The investigation took into consideration the potential trade-off between biological sustainability and economic performance offering a holistic view of the fund's impact. In general, the EMFF is found to support both economic and biological sustainability, which aligns with the CFP's primary aim of balancing the economic performance of the fishing fleet with environmental protection.

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AVOIDING A MODERN TRAGEDY OF THE COMMONS BY SHARING INFORMATION

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The collective action problem of common natural resource exploitation is more complex than Hardin's tragedy parable explained solely by absent or illstructured property rights. Property rights may resolve the common resource externality but because others remain the 'modern tragedy of the commons' remains. Knowledge, information, and social learning, new technology, biodiversity, network economies, and transboundary common resources are other positive and negative external effects left all or partly unaddressed regardless of the type of property right assigned. The case of high-seas fisheries based on drifting fish aggregating devices (DFADs) illustrates perfectly the gains of common property in which conservation, rent and social equity may benefit from information and capital sharing among fishers with social learning and the creation of network economies for a transboundary resource. With an individual-based model simulating the fishing behaviour of purse-seine vessels in an array of DFADs, we show that a reduction of fishing investment by a factor 4 combined with a fully sharing behavior would improve social, economic and ecological results in high-seas fisheries.

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BEHAVIOR ANALYSIS OF TYPICAL SMALL-SCALE FISHING VESSELS IN THE SZCZECIN LAGOON AREA

Adam Mytlewski (MIR-PIB), Marcin Rakowski (MIR-PIB)

The problem of low economic efficiency and the declining position of small-scale fisheries as suppliers of fish in European markets is widely perceived and discussed in the literature. One of the regions where this problem is noticeable is the Szczecin Lagoon area in Poland. This reservoir is characterized by numerous low-value fish stocks and, despite the large number of tourists, most of the catch is not used for consumption. At the same time, the low value of fish is accompanied by a systematic increase in costs due to exogenous factors. The study aimed to identify and analyze typical behaviors of the owners and microeconomic models of fishing boat under deteriorating economic conditions, and to identify the scale of other sources of income in fisheries The categorization of behaviors and descriptions of economic models can be used to improve governance of fishing sector. The study identified five typical boats operating on the lagoon and subjected them to deep analysis. Using face-to-face interviews, 5 microeconomic models were created to project costs depending on operational variables (time at sea, catch, number of employees). Fishermen were willing to cooperate and share information which resulted in the estimation of economic performance and typology of market behavior. Analysis of the results and interviews yielded the definition of different levels of financial management that give owners different motivations to perform fishing activities and related market behaviors. The identified problem of the typical vessels of this basin in microeconomic terms was the declining scale of operations (measured by boat revenues), which in the case of fishing in the Szczecin Lagoon, even with positive profitability, do not allow for an income from which the owner can make a living. There are also no prospects for increasing revenues due to the limited resources, limits, protection periods and fish prices. The reaction is therefore to shift away from this activity and supplement fisheries with other income. The results presented did not take into account subsidies received by these entities in the form of compensation, participation in scientific or other programs. The essence of the approach is the search for "pure" economics which means that state interventions must be excluded.

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CHANGES IN THE SEAFOOD SECTOR AT IRELAND'S MAIN PORTS, 2018–2023

Richard Curtin (Co. Dublin), Bord Iascaigh Mhara (Co. Dublin), Dun Laoghaire (Co. Dublin)

In 2019 the top ten ports in Ireland were analysed to assess the economic structure and dependence of these ports on the fishing, aquaculture and fish processing subsectors. Upstream economic multipliers were estimated for each port with national results showing that for every four people directly employed in the seafood sector, another three people were employed upstream through indirect or induced economic activity. In 2024 this study was carried out again for the same ports of Clogherhead, Howth, Kilmore Quay, Dunmore East, Union Hall, Castletownbere, Dingle, Rossaveal, Killybegs and Greencastle. The 10 ports selected here are the ports with the highest volume and value of seafood landings in Ireland and are located all around the coastline in the northeast, east, southeast, southwest, west and northwest corners of the island. The hinterlands around these ports were designated as the local zones of influence of these ports through dialogue with local stakeholders and to capture all the major seafood activity in the localities. In the five year period the seafood sector in Ireland has faced a number of global events including Brexit, the Covid-19 pandemic and the war in Ukraine. These events have impacted the sector in a variety of ways including quota transfers of important species, loss of access to fishing grounds, logistical interruptions, trading barriers and unprecedented inflation. Unsurprisingly, this has led to higher multiplier effects in each port and at the regional and national levels. Direct employment in the ten ports declined by 6% while total employment increased by 14%. The same trend occurs for wages where direct wages declined by 9% across the ten ports but total wages grew by 5%. A significant shift has occurred from the direct channel to the indirect channel, with the direct channel accounting for two thirds of total GVA in 2018 before falling in 2023 to 53%.

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DISCARDS AND HIGH-GRADING IN THE ICELANDIC ITQ SYSTEM

Birgir Thor Runolfsson (Dept of Economics – University of Iceland)

Iceland adopted an ITQ system for most of its fisheries four decades ago. The system has worked well in increasing the economic performance of the fisheries and, at least seemingly, the enforcement of the TACs. The Fisheries Directorate (FD) is aware of the potential problem of discards and has from the outset done studies and monitored the level of discards. Monitoring has shown low levels of discards in most fisheries, although the level varies between species. Iceland has in place a comprehensive system to monitor discards. A group of observers alternate between on-board monitoring and on-land monitoring. An on-board observer monitors samples from the catch, the mix of species, the size of individual fish, etc.

On-land observers monitor samples from landings from other trips. Data from the reports are an input into a data bank where it can potentially be analyzed in various ways, such as comparing catch between trips. All analysis shows the level of discards being low. Despite this, there have always been rumors and even video clips seemingly showing "higher levels" of discards.

We provide a case-control analysis of on-board monitored catch versus on-land monitored landings of catch. Observations are paired based on all available information, such as vessel, time of year, species and degree of processing. This allows for a systematic estimation of the difference in catch composition between trips with on board observers and where no observer is on board, providing an estimate of the level discards. Results show increased frequency but not in volume.

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ECONOMIC VALUATION OF SHRIMP VESSELS IN THE DUTCH FISHERIES

J.A.E. van Oostenbrugge (Wageningen Social and Economic Research), Pavel Salz (FRAMIAN)

In the Netherlands around 150 vessels have been active in the shrimp fisheries over the last years. Partly due to changes in coastal zone spatial planning and fisheries and the failure to achieve Natura 2000 conservation targets, the economic sustainability of shrimp fisheries has recently come under pressure. To restore the balance between the catch capacity in the shrimp sector and the ecological carrying capacity of the Dutch coastal waters, a reduction of the shrimp fleet is considered desirable by the Dutch government. Therefore, the government is planning to open possibilities for permanent cessation for shrimp vessels. This study is a valuation of the economic value of the Dutch shrimp vessels for the cessation scheme. Based on an analysis of the economic information of the target group of vessels over the last 5 years, the study proposes different valuation schemes, taking into account considerations about the type of economic indicator to be used, the reference period, and the characteristics of individual vessels in the target groups.

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EVOLUTION OF THE SMALL VESSEL FISHERIES MANAGMENT SYSTEM IN ICELAND 1984–2024

Birgir Thor Runolfsson (Department of Economics – University of Iceland)

We provide a brief description of the evolution and current structure of the individual quota system (IQ) in the Icelandic fisheries. This fisheries management system was introduced at different times in different fisheries-over a period of three decades, from the 1970s to the 2000s Nearly all Icelandic fisheries are now subject to a uniform system of individual transferable quotas (ITQs). There has been both social and economic impact because of the adoption of the ITQ fisheries system. Although a definitive study of this impact is not available, the various indicators presented generally indicate an improvement, sometimes substantial one, in the economic efficiency of the fisheries in question. Here we focus particular attention on small scale or small vessel fisheries, and what has been the social and economic impact on those fisheries. The smaller vessels, under the size of 10 gross registered tons, were originally exempted from the ITQ system, but subsequently managed within a separate system and eventually issued ITQs in 2004. The small vessels were limited to only using fishing gear based on 'hooks and line'. We trace the development of the small vessel system, the changes and the eventual impact on size and shape of this section of the Icelandic fisheries.

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FISHERS IN CRISIS: THE DESIGN OF FUEL PRICE SUPPORT FOR EUROPEAN UNION FISHERIES AFTER RUSSIA'S ATTACK ON UKRAINE

Cecilia Hammarlund (AgriFood Economics Centre – Lund University), Johan Blomquist (AgriFood Economics Centre – Swedish University of Agricultural Sciencies)

This article examines temporary economic support measures for the EU fishing industry during the fuel crises triggered by Russia's attack on Ukraine in 2022, focusing on how different EU member states designed and implemented such aid. The study highlights variations in compensation schemes, including lump-sum versus vessel-specific payments and the trade-off between fairness and administrative simplicity. It also explores the challenges of defining economic losses, assessing crisis impacts, and ensuring equitable distribution of funds. Additionally, the risks of prolonged subsidies, potential distortions in competition, and the need for clearer EU-level guidelines to enhance transparency and efficiency are discussed. Finally, the article considers the feasibility of market-based insurance solutions as an alternative to government support.

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GHG Emissions of the UK Fishing Fleet

Carlos Paredes (Seafish), Arina Motova–Surmava (Seafish), Sebastien Metz (Sakana Consultants)

Information about the amount of fuel consumed by the catching sector is a cornerstone in establishing a system for monitoring greenhouse gas emissions in seafood supply chains. Energy consumption is one of the indicators introduced to Data Collection Framework (DCF) a decade ago through the EU Multiannual Data Collection Programmes. As part of DCF, Seafish has been conducting and analysing annual socio-economic surveys of the UK catching sector for many years. Among others, different vessel parameters are gathered as part of the survey. Fuel per day at sea is one of the factors that has been collected continuously, however not used in fuel estimation procedures due to high variability of observations. To estimate fuel consumption for DCF Seafish with industry collaboration determined during a process that was in place from 2007 to 2010, a set of predefined fuel use coefficients per fleet segment, size band and VCU which are currently in need of revision.

In order to revise, update and verify fuel use coefficients Seafish put in place an additional data collection exercise in 2021. Currently ongoing, the data collection process requires provision of fuel volumes per date or period of refill and opens a wide range of opportunities to better understand fuel consumption relation to fishing pattern. The new approach for analysis and calculation of coefficients proposes a fuel consumption per day at sea modelling for individual vessels based on their length, engine power and gross tonnage.

Despite some hurdles, new data collected has allowed for development of new approaches to estimate daily fuel consumption, and therefore emissions, by vessel characteristics. A new baseline has been established for the greenhouse gas emissions associated with the primary source of emissions: the use of fossil fuel. Combining the estimates with landings data, we were also able to estimate two important indicators to provide an additional perspective of emissions of each segment: GHGe per kilogram of fish landed, and GHGe per value of fish landed.

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THE FISHING SECTOR AND THE EUROPEAN GREEN DEAL – WILL THE CATCHING SECTOR BE MARGINALISED?

Sébastien Metz (Sakana Consultants), Marie–Pierre Mommens (Sakana Consultants)

The European Green Deal (EGD) represents a transformative policy framework to achieve climate neutrality, biodiversity restoration, and sustainable resource use by 2050. While the European Green Deal builds on ambitious environmental goals, its implications for the fishing sector, particularly the catching industry, remain underexplored. This paper examines the potential marginalisation of the catching sector within the context of the European Green Deal, focusing on the growing pressures from offshore wind energy development and the expansion of marine protected areas. Offshore wind farms, a cornerstone of the European Green Deal's renewable energy strategy, increasingly compete with fishing grounds, restricting access to traditional fishing areas and disrupting marine ecosystems. Similarly, the rapid designation of MPAs, while crucial for biodiversity conservation, often imposes fishing restrictions that disproportionately affect small-scale and coastal fishers. Dra- wing on policy analysis and case studies from key European fishing nations, the study highlights these developments' socio-economic and cultural impacts, including reduced fishing opportunities, displacement of fishing communities, and the erosion of traditional practices. The paper argues that without careful planning and stakeholder engagement, the European Green Deal risks exacerbating the marginalisation of the catching sector. The study calls for integrated marine spatial planning, equitable compensation mechanisms, and greater inclusion of fishers in decision-making processes. By doing so, the paper contributes to the broader discourse on balancing ecological sustainability with the socio-economic resilience of the fishing sector under the European Green Deal.

ORAL PRESENTATIONS

Theme session E – CFP: lessons from the Mediterranean shared stocks exploitation and management, international agreements, UK arrangements and straddling stocks

THE FUTURE(S) OF (AQUACULTURE) SEAFOOD PRODUCTS

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While seafood issues are often related to Sustainable Development Goal (SDG) 14, one should have in mind that fisheries and aquaculture activities also contribute to SDG 2 - End hunger, achieve food security and improved nutrition and promote sustainable agriculture. With traditional large scale fisheries facing key challenges (Landing Obligation, closures for biodiversity conservation, ban of some fishing practices and some subsidies) and small-scale coastal fisheries being threatened by several factors (e.g. loss of fishing grounds, shifts in species distribution), the production of seafood needed to accompany the population growth will come from other sector. This presentation addresses the future scenarios for the seafood sector. It will in particular relies on the findings obtained as part of the EATFISH project, which deals about the aquaculture sector from a multidisciplinary perspective. However, is will also consider the development of different types of alternative seafood products.

ORAL PRESENTATIONS

Theme session E – CFP: lessons from the Mediterranean shared stocks exploitation and management, international agreements, UK arrangements and straddling stocks

UNUSED QUOTAS AND THE VESSELS' QUOTA PORTFOLIOS

Bent Dreyer (Nofima), John R. Isaksen (Nofima), Anastasia Henriksen (Nofima)

Over the past 35 years, fisheries management has been based on avoiding overfishing. Key measures have been to limit fishing to total quotas and to remove capacity-driving subsidies. Despite these recommendations, the FAO reports that there are still many - and in some cases an increasing number - of fisheries in the world where stocks are overfished (FAO, 2024). At the same time, some stocks produce large volumes of biomass on which harvesting hardly take place - although authorities have distributed quotas to the fleet.

A well-established explanation for this phenomenon is that fishing operations are unprofitable because the market value does not cover the fishing costs. In this article, we will present a study that analyses an alternative explanation for underutilised quotas. The case studied here is the implementation of a Norwegian management plan - including allocation of vessel quotas - for harvesting of Calanus finmarchicus. Vessels with quotas on a wide range of species to be caught may face challenges with, for example, lack of capacity; they do not have time to catch all the quotas they have. Another challenge may be that the time of year when profitability/catch efficiency is the highest, coincides with similar conditions for several other species in their quota portfolio. When they in periods must prioritize between species to catch, an opportunity cost arises - where catch values may be lost, or where the costs of catching at another time increase. It also indicates a management challenge if, for example, quotas for species with marginal profitability are "locked" to vessels with a broad quota portfolio of species with high profitability. The marginal species are then not caught because vessels with the fishing rights are engaged in fisheries with higher profitability.

ORAL PRESENTATIONS

Theme session E – CFP: lessons from the Mediterranean shared stocks exploitation and management, international agreements, UK arrangements and straddling stocks

RESOURCE RENT CHARGES IN ICELANDIC FISHERIES, RECENT DEVELOPMENT, OR USE AND MISUSE OF ECONOMICS ARGUMENT IN POLITICAL DISCOURSE

Þórólfur Matthíasson, the University of Iceland

The Individual Transferable Quota (ITQ) system was introduced in Icelandic fisheries as an instrument to stop overfishing, rebuild stocks and enhance the economy of fisheries and fishery communities. The ITQ system induced a structure of fewer and bigger firms and vessels and closure of multiple processors. The dream of ITQ bringing happier days did become reality for some few but not for the many living in hamlets losing out in the battle for quotas. Still, the objective of transforming the fishery management system was to serve the Icelandic people, not a chosen few, as manifested time and again by Acts of law in the Parliament. It is the intention of the lawmaker that one third (33%) of the net income related to use of the marine resources in Icelandic waters should accrue to the population at large as a specific fishing fee. Most trades of catch for processing is an internal affair within vertically integrated firms opening the possibility for profit shifting that reduces the base for the fishing fee. The present government of Kristrún Frostadóttir has proposed application of arm's lengths pricing for fixing that base. This paper gives the flavour of arguments for and against.

ORAL PRESENTATIONS

Theme session F – Advances in social aspects of Economics

Theme session G – Harnessing digital and social transformation for sustainable Small-Scale Fisheries

ASSESSING SOCIO-ECONOMIC CHALLENGES AND SUSTAINABILITY IN MEDITERRANEAN SMALL-SCALE FISHERIES

Loretta Malvarosa (NISEA – Fishery and Aquaculture Economic Research), Rosaria Felicita Sabatella (NISEA – Fishery and Aquaculture Economic Research), Paolo Accadia, (NISEA – Fishery and Aquaculture Economic Research), Alessia Bacchi (WWF Italia), Luca Eufemia (WWF Mediterranean)

The presentation will report the preliminary results of a study whose aim is to assess the economic conditions, social challenges, and perceptions of fishers engaged in small-scale fisheries (SSF) in the Mediterranean, with a focus on the social dimension of the sector. Conducted as part of the Transforming Small-Scale Fisheries project led by WWF, the research utilizes a structured questionnaire designed to collect both quantitative and qualitative data. The questionnaire is divided into multiple sections covering socio-demographic characteristics, livelihoods, access to marine resources, labour dynamics, gender roles, and policy engagement. The analysis covers six selected sites located in Italy, Croatia, and Türkiye.

The survey investigates key aspects of SSF, including income sources, job security, resource availability, conflicts with other marine activities, and the role of women in the sector. It also addresses major challenges such as declining fish stocks, regulatory constraints, generational turnover, labour shortages, particularly concerning the employment of non-national workers. Fishers are asked to provide insights on their levels of satisfaction with fisheries governance and the extent to which policies and management strategies reflect their needs.

By integrating fishers' experiences with empirical data, the study aims to generate actionable insights to support more sustainable and inclusive fisheries management. The findings will inform policymakers, fishery organizations, and coastal communities, fostering strategies to enhance the resilience and long-term viability of SSF in the Mediterranean. Furthermore, the study will contribute to a deeper understanding of the social and economic dimensions of EU Mediterranean fisheries, including their critical role for the coastal communities.

ORAL PRESENTATIONS

Theme session F – Advances in social aspects of Economics

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DIVERSIFICATION IN THE SWEDISH SMALL-SCALE BALTIC FISHERY

Sara Andersson (Luleå University of Technology), Jessica Lidberg (Luleå University of Technology), Jesper Stage, (Luleå University of Technology), Staffan Waldo (Swedish University of Agricultural Sciences)

Small-scale fishing has undergone significant changes over time and there are numerous examples of small-scale fishers who have diversified their activities by selling and/or processing a large part of their products themselves. This type of activity is significantly less well documented than the fishing itself. In this paper, we have investigated how the catches of the Swedish small-scale Baltic fishery are used after landing, what economic values the small-scale fishery generates through their on-land activities, and what challenges the fishery sees in further developing and diversifying its activities. The study is based on a survey of 379 small-scale commercial fishers along the Swedish Baltic Sea coastline. We find that fishers have indeed diversified significantly and about 50 percent do their own processing, which includes smoking, filleting, and making pickled herring. However, few fishers have their own restaurants or diversify into fishing tourism. We also find that rather than problems with access to markets, access to skilled labor or capital, most small-scale fishers identify government management as the main obstacles to their activity. This includes for example the management of seals and cormorants competing for the same fish resources and interacting with passive gears such as gill-nets.

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How does Climate Information Affect Artisanal Fisherfolk's Market Participation Decision in Nigeria?

Lawrence Olusola Oparinde (Institute of Agricultural Policy and Markets – University of Hohenheim), Sebastian Hess (Institute of Agricultural Policy and Markets – University of Hohenheim)

Climate change has been a significant threat to the attainment of higher level of market participation by reducing fish yield, which is the main element of artisanal fisherfolk's market participation. In spite of the importance of climate information in promoting adoption of climate change adaptation, which subsequently increases agricultural output, literature is void of the impact of climate information use on market participation of artisanal fisherfolk. Therefore, it is of utmost importance to answer the question 'How does climate information affect artisanal fisherfolk's market participation decision in Nigeria'. Data collected from 853 artisanal fisherfolk were analysed using marginal treatment effects (MTE) approach for the estimation of treatment effect heterogeneity and policy-relevant treatment effects (PRTE) to simulate the effect of policy change. Our findings reveal that the use of climate information had significantly increasing impact on the level of market participation of artisanal fisherfolk at the reduced level of unobserved resistance to climate information use. Also, PRTE simulation results show that doubling sources of climate information could raise the rate of using climate information and subsequently lead to about 14.61% increase in the artisanal fisherfolk's level of market participation. Therefore, policymakers aiming at increasing fishers' level of market participation should prioritise promotion of climate information use and improvement in the sources of climate information services in Nigeria.

ORAL PRESENTATIONS

Theme session F – Advances in social aspects of Economics

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IS THERE ANYTHING LEFT OF COVID? AN ANALYSIS OF THE EVOLUTION AND RECENT CHANGES IN FISH CONSUMPTION IN SPAIN

Gonzalo Rodríguez-Rodríguez, Sergio Acevedo Iglesias, María do Carme García Negro, Fernando González Laxe

COVID 19 has caused rapid and profound disruption, unprecedented in triggering a series of systemic shocks and disruptions in fish production and marketing with the literature supporting the existence of substantial impacts. Nevertheless, there is a lack of research examining the existence of structural effects. In doing so it´s key not only to measure changes but to identify effective drivers. Main methods used for that are measurement of the significance of pre-and post-COVID differences and building a framework simultaneously analysing data on apparent consumption and effective consumption, avoiding results based on partial data (household consumption) or overly aggregated data (apparent consumption). In the long term, COVID impact has been negligible. On the contrary, once overcome the market disruption the underlying tendencies resumed driving the fish market, probably due to factors such as the gradual nature of changes in food consumption, public support measures implemented and the limited substitution possibilities of social and symbolic functions of consumption. Factors leading the evolution of fish consumption include the maturity of the market, the emergence of new diets, consumers new orders of value, the growing multiculturalism of Spanish society or the competitiveness of aquaculture. Results are relevant not only for managing future crises but for addressing economic, social, health and ecological goals.

ORAL PRESENTATIONS

Theme session F – Advances in social aspects of Economics

Theme session G – Harnessing digital and social transformation for sustainable Small-Scale Fisheries

QUANTITATIVE DATA FOR THE SOCIO-LABOR STUDY OF FISHING IN SPAIN AND EUROPE

Luis Miret-Pastor (UPV), Paloma Herrera Racionero (UPV), Meritxell Maimí (UPV), Andrea Escamilla (UPV)

At the European level, the decline of the fishing sector, especially small-scale fisheries, has been discussed in recent years. The causes and consequences of this recession are the subject of a wide and complex professional, political and even academic debate. In Spain, voices are beginning to be heard claiming that the lack of generational replacement could even jeopardize the future of this millenary profession, which has shaped the populations and societies of many coastal areas to a large extent. However, quantifying the socio-labor crisis is not an easy matter, first of all because of the lack and complexity of existing statistical sources, which are scattered and inaccessible. This paper aims to review the main existing Spanish and European databases: Eurostat, the Scientific, Technical and Economic Committee for Fisheries, the Ministry of Agriculture, Fisheries and Food, the General Treasury of the Social Security and the Social Marine Institute. For this purpose, a comparative analysis of the structuring and availability of data for each of the official sources has been carried out, as well as a quantitative analysis of the trend observed and the significance of the differences detected. This work, carried out on Spanish data, is intended to be a first step for a similar work at European level to quantify the socio-labor crisis in the fishing sector in Europe.

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An Enhanced TURF–Based Model Coupled with Blue Economy and Green Transition Initiatives for Sustainable Fisheries Management within MPAs: the Case of Alonnisos National Marine Park

Angelos Liontakis (Agricultural University of Athens), Vassiliki Vassilopoulou (Hellenic Center for Marine Research – Institute of Marine Biological Resources and Inland Waters)

The sustainable fisheries management within Marine Protected Areas (MPAs) is a key challenge for coastal communities, requiring governance models that balance conservation objectives with socioeconomic viability. Under this context, the potential implementation of an enhanced Territorial Use Rights for Fishing (TURFs), coupled with blue economy and green transition initiatives is explored as an approach to reduce environmental pressure, and strengthen local economic resilience in Alonnisos National Marine Park (ANMP). This is particularly important for the small-scale fisheries (SSF) sector in the area, which underpin cultural heritage but face threats from overfishing, climate change, and marginalization in governance [1]. The study applies a SWOT combined with PESTLE analytical framework to explore the feasibility and the socio-economic implications of a potential introduction of a TURF in ANMP. Findings suggest that exclusive fishing rights, combined with mandatory digital monitoring (activity tracking and catch recording), can support ecosystem-based fisheries management [2], by addressing existing data gaps, enable equitable resource allocation and enhance the role of local fishers in co-management. However, incompatibilities with the EU and National legislation framework that treat marine resources as communal, require adaptive solutions. In addition, integrating fishing tourism into TURF structure could assist in income diversification for local professional small- scale fishers and foster a more balanced fishing effort, ensuring that conservation objectives align with socio-economic resilience [3]. However, transparent data-sharing mechanisms are critical to pre- vent benefit inequalities and the marginalization of vulnerable fishers [4]. Finally, incentives for green transition investments are also important to align SSF practices with climate resilience [5]. These incentives can accelerate the shift toward a low-carbon, sustainable SSF sector while maintaining eco- nomic viability within MPAs. Overall, this study offers a first step toward an integrated fisheries management model, where TURFs, digital monitoring, fishing tourism, and green transition strategies collectively contribute to a resilient and sustainable SSF sector in ANMP.

Applying a Regional Certification Scheme for Aquatic Non-Indigenous Species Fishery: The Case of the Atlantic Blue Crab (Callinectes sapidus) in the Northern Adriatic Sea

Sara Bonanomi (CNR-IRBIM – NBFC), Simone Libralato (OGS – Section of Oceanography), Loretta Malvarosa (NISEA – Fisheries and Aquaculture Economic Research), Karolina Maria Czechowska (NBFC – OGS – University of Trieste), Giulia Sandalli (Ministry of Environment and Energy Security), Alessia Cariani (University of Bologna), Alice Ferrari (University of Bologna), Ernesto Azzurro (CNR-RBIM – NBFC), Giuseppe Scarcella (CNR-IRBIM)

The Mediterranean Sea is considered the world's most invaded marine region facing increasing threats from AIS due to rising temperatures and human-mediated introductions. This impacts biodiversity, fisheries, and local livelihoods. However, some of these invaders may hold economic potential to be exploited as new fishery resources. Supporting fishers harvesting Aquatic Invasive Species (AIS) with selective fishing methods will contribute to reduce the negative impacts driven by the increasing abundance of AIS (Azzurro et al., *2024). Fishers might also develop specific labelling requirements for edible species to enhance their perceived economic value and, consequently increase the marketability of AIS. The present study aims to document, through local ecological knowledge (LEK), the Atlantic blue crab (Callinectes sapidus) fishery in a coastal lagoon of the northern Adriatic Sea where blue crabs captured using selective fishing gear (traps), developed to protect clam populations, are also sold on local market outlets. The case study, generating new knowledge on this invasive species, has also been used to evaluate whether it meets specific criteria to achieve the Adriatic Responsible Fisheries Management (ARFM) certification scheme, developed under the Interreg Prize- fish project. The study also explores how adaptive harvest strategies could promote responsible fishery, mitigate ecological damages and create economic opportunities thereby fostering a more structured approach to AIS management.*

Data Fit for Purpose: Standardizing and Harmonizing Fisheries Data Inputs for Integrated Socio–Ecological Modelling in the EU Context

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The European Union's (EU) Mission, "Restore our Ocean and Waters", aims to preserve ocean health and biodiversity while promoting a sustainable blue economy by 2030. To support this goal, commercial and artisanal fisheries must be managed according to a holistic approach that considers eco- logical, biological, social and economic aspects, which is defined as ecosystem-based fisheries management (EBFM). In recent years, advanced simulation models have been developed to evaluate the effectiveness of various fishery management strategies to support the EBFM. The SURIMI project, recently funded by the EU Horizon Europe Program, aims to provide a suite of ready-to-use socio- economic and ecological simulation models that can be integrated into the EU Digital Twin Ocean. The process involves the implementation of advanced interoperability and harmonized practices for data integration and model coupling. A critical challenge to achieve this goal is the comprehensive collection and processing of fisheries data. The Fisheries Data Collection Framework (DCF) within the European Union provides a robust system for collecting, managing and analysing data related to fi- shing activities in EU waters. However, the aggregated nature of DCF data (categorized by fleet segments based on gear type, vessel size, and area of operation) limits its spatial resolution and applicability to fine-scale assessments and simulation of vessel behaviour.

<p>In order to address these challenges, the present study aims to: develop methodologies for ana-

lysing socio-economic data; implement standardised procedures and algorithms to harmonise data across spatial and temporal scales; and synthesise information at the micro, meso and aggregated levels in EU waters. Additionally, the project aims to establish methodological protocols for linking socio-economic and environmental datasets, thereby enhancing the precision and usability of fisheries data for management and conservation efforts. The outputs will contribute to improving fisheries go-vernance by providing robust decision-support tools, such as virtual scenarios for policy testing, that align with EU sustainability goals

DIGITAL VS. TRADITIONAL CONSUMER ENGAGEMENT IN LOW-TROPHIC AQUACULTURE

Sezgin Tunca (Department of Business and Sustainability – University of Southern Denmark), Mausam Budhathoki (Department of Food Science – University of Copenhagen), Javier Cantillo (SINTEF – Ocean AS Department – Climate and Environment)

Low-Trophic Aquaculture (LTA) products, including mussels, oysters, and seaweed, offer a sustainable alternative in marine food systems, contributing to food security and climate mitigation. However, consumer trust and purchasing behavior remain shaped by diverse socio-demographic and cultural factors. This study employs a cross-national comparative analysis across Denmark, the United Kingdom, and Türkiye, applying regression with marginal effects analysis to examine the determinants of consumer engagement with digital and traditional touchpoints. Findings reveal a generational di- vide, with younger consumers in Denmark and the UK exhibiting greater trust in digital platforms, whereas offline touchpoints remain dominant in Türkiye. Environmental literacy significantly influences consumer confidence in both online and offline channels, with ecological benefits mitigating concerns over high prices and limited availability. The study highlights the urgent necessity of tailoring omni-channel marketing strategies to cultural and generational preferences while strengthening trust across multiple consumer engagement platforms. These insights inform policymakers and industry actors on effective approaches to fostering LTA adoption and integrating sustainability into consumer decision-making.

Estimating Energy Multipliers and Price Sensitivity in the Fisheries and Aquaculture Sector of Greece: An Input–Output Analysis Approach

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Stamatis Mantziaris (Agreri),Alexandra Sintori (Agreri), Irene Tzouramani (Agreri)

This study investigates the energy dependence of the Greek Fisheries and Aquaculture Sector (FAS) and quantifies the sector's exposure to rising energy costs using input-output analysis. By estimating both demand-side and supply-side energy multipliers, the analysis highlights the direct and indirect effects of energy consumption in the sector and its broader economic implications.

Empirical results show that the FAS exhibits high energy multipliers, particularly in gasoline consumption, exceeding the economy-wide average on both the demand and supply side. Specifically, a 1 million euros increase in final demand for FAS output results in total increases of 0.240 TJ (gasoline), 0.452 TJ (diesel), and 0.398 TJ (oil) in energy use. Similarly, an equivalent increase in primary inputs leads to 0.236 TJ (gasoline), 0.356 TJ (diesel), and 0.391 TJ (oil). In both cases, over 90% of the energy impact stems from direct consumption, confirming the sector's energy-intensive nature.

Incorporating energy costs into an input-output price model reveals strong inflationary effects. Under a hypothetical energy cost of 1 million euros/TJ, FAS output prices increase by 23.96% (gasoline), 45.21% (diesel), and 39.82% (oil). These findings indicate the sector's vulnerability to fuel price volatility and its potential ripple effects across the economy.

The analysis contributes to the policy discussion on decarbonization and energy transition, particularly in the context of the European Green Deal and sector-specific sustainability goals. The high dependence of the FAS on fossil fuels highlights an urgent need for energy diversification and efficiency strategies, both to reduce exposure to future energy shocks and to align with broader cli- mate commitments.

IO–CGE Model for the Galician (NW Spain) Fisheries

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This paper presents a Computable General Equilibrium (CGE) model for the region of Galicia (northwest Spain), based on a Social Accounting Matrix (SAM) that reflects the regional economic structure. The detailed disaggregation of the fishing sector into 11 extractive subsectors is highlighted, which allows for a more precise analysis of the productive dynamics and economic flows inherent to this strategic activity.

The CGE model, built on the SAM, incorporates price formation and the substitution of production factors, as well as of goods and services in final demand. Specifically, the model is designed to facilitate the nesting of sectors, enabling the substitution not only of capital and labour, but of any other input. This opens the possibility of analysing, for instance, how fossil fuel is substituted in the event of implementing a tax that favours other energy sources according to elasticity.

As regards demand, LES-type functions are combined with CES-type functions. The central idea is that primary goods are easily substituted for each other as relative prices vary (modelled using a CES function), while the substitution of primary goods for other goods and services depends to a greater extent on the level of income (modelled using a LES function). In this sense, the higher the income, the lower the weight of primary goods in the consumption basket.

In this way, the CGE approach overcomes the limitations of the SAM, since the use of fixed coefficients in the latter does not adequately reflect the economy's ability to adjust to variations in demand and supply.

Among the advantages of the CGE model are its ability to simulate economic policy scenarios, assess the impact of environmental regulations and explore the repercussions of changes in the competitiveness of the fishing sector. The application of the model in Galicia provides a valuable tool for decision-making and contributes to sustainable economic development, optimising the management of fishing resources.

WHAT IS THE VALUE OF A FISHING BOAT?

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The estimation of the capital value of fishing fleets represents a significant challenge for economists mainly due to the heterogeneous nature of capital stock and the necessity for restrictive assumptions in the aggregation of capital inputs (Kirkley and Squires, 1988). The estimation is still a controversial issue also in the EU data collection. In order to estimate the value of physical capital (i.e. tangible assets), the fishery data collection regulations prescribe an adaptation of the Perpetual Inventory Method (PIM), based on a capital stock inventory taken from the Community Fishing Vessel Register. Nevertheless, a uniform methodology for the valuation of intangible assets has yet to be established. In the context of European studies and reports, a number of approaches have been proposed, primarily focused on the estimation of the value of tradable fishing rights, such as fish catch quotas. However, for less structured fishing rights, including the fishing licence or tradable fishing rights with scarce transaction opportunities, the assessment of the intrinsic value appears to be more influenced by data availability. Estimation is even more complicated in contexts such as those in Italy, where fishing licenses (the main fishing right) are coupled to the vessels and, therefore, haven't a separate market. The present analysis aims to investigate the potential of utilising data from the second-hand market to explore the impact of several influential factors, such as the fishing licence, on second-hand ship prices in the Italian market. To this end, hedonic pricing regressions were employed to demonstrate the responsiveness of second-hand prices to all dimensional characteristics of the vessel, with the length being a particularly salient variable in terms of policy relevance. Further salient variables encompass the hull material and the fleet segment, which is defined by the prevalent fi- shing gear. The latter is a principal indicator of the type of fishing license to which an Italian vessel should apply.

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Identifying Gaps in Maritime Spatial Planning (MSP) in Achieving Socio-Economic Objectives for Marine Spatial Planning Directive Framework (MSPD): Northeast Atlantic Case Study

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Spatial planning involves the future distribution of activities and has increasingly emphasized integrating different sectors to achieve the United Nations' sustainable development goals (SDGs) (Sanyal, 2012; Reimer, 2013). Marine spatial planning (MSP) is essential for coordinating marine habitats and activities (Ehler et al., 2019). However, activities such as renewable energy production, oil and gas exploration, shipping, fishing, aquaculture, seabed mining, and tourism exert pressure on the ocean (Directorate-General for Maritime Affairs and Fisheries, 2010). MSP faces integration challenges due to competing interests, making it complex to coordinate policies, ensure adequate information provision, achieve social acceptance, and evaluate effectiveness (Soma et al., 2014). Integration requires consideration of multiple scales, administrative boundaries, stakeholder interests, and the land-sea interface (Zaucha & Gilek, 2016). According to Saunders et al. (2016), integration in MSP is a multifaceted process involving various elements. Historically, ocean research and management occurred in specialized fields, focusing on specific sectors in isolation (Cicin-Sain et al., 2000). MSP draws from ecological science, physical planning, resource management, and conservation (Gazzola et al., 2015; Ehler, 2012; Gilliland & Laffoley, 2008). Its success relies on interdisciplinary collaboration among experts in ecology, oceanography, social sciences, economics, law, governance, and policy-making (ICES, 2016; Ehler & Douvere, 2007). Establishing synergies between these fields is crucial for addressing MSP's complexity. Despite progress, further integration of economic, social, and cultural perspectives is needed. Limited tools exist for analyzing socio-economic impacts of MSP decisions. To bridge this gap, cost-benefit analysis, participatory assessment, scenario analysis, and input-output methods will be employed. These approaches evaluate financial advantages, identify beneficiaries, and examine spatial distributions, addressing present and future integration challenges. This study will assess the socio-economic dimensions of MSP's strengths and gaps specifically in the Bay of Biscay where MSP has been applied. The overall objective is to produce readable maps on MSP's socio-economic benefits using cost-benefit analysis, participatory assessment, scenario analysis, and input-output methods (mixed method approach). These tools support informed decision-making by illustrating financial consequences and formulating recommendations.