

Supplementary Materials

Case Study	Section 4.1, Table 1 and 2- details Description	Section 4.1., Figure 3.a details Type of co- creation	Section 4.3., Table 4-A details Benefits/advantages of partnerships	Section 4.4., Table 4-B details Use of results for decision-making	Section 4.5 details Difficulties	Section 4.5 details Perspectives- recommendations
1 Dutch Science- industry research collaboration	<p>Joint collaboration between government, industry and science, originating from the start of the century, initially funded by the government then also by the industry. SIRC was initiated in 2007 when demersal fishers questioned the stock assessments of North Sea plaice and sole and relationships between fishers and science were at an all-time low. The project initiated to address this issue became the basis for an extensive research collaboration on stock assessment and gear innovations between fishers and scientist, with involvement of government (Steins <i>et al.</i>, 2020). Since then it has included over 20 partnership projects in the demersal (North Sea) alone, of which at the time of the workshop, 6 were ongoing. Since recently, NGOs are also involved in the demersal fisheries SIRC. There are now also SIRC projects in the pelagic, shellfish, crustaceans</p>	<p>Co-construction, joint problem definition, joint workplan, data collection, joint discussion of results and room for improvement</p>	<p>Increased transparency, legitimacy and salience of science, trust building and maintenance, increased understanding of different roles and responsibilities in the process from research to policy-decision, improved data collection</p>	<p>Different projects. Some used directly in stock assessments and others in support of fisheries management plans.</p>	<p>Risks of decreased credibility of science, Difficulty to keep fisher informed, Pace of science and policy too slow for fishermen</p>	<p>Deal with dilemma of cooperation, Set up research and collaboration from the start, Improve fisher knowledge integration and collaboration, Difference between those actively involved and those being informed</p>

and freshwater fisheries (not included the case study).

2 Australian Partnership model

Comprehensive national fisheries framework developed in the 1990's and early 2000's for Australian Commonwealth capture fisheries, following the observed decline of fisheries production, resulting in an unprofitable industry. It integrates the scientific, management and users of the resources for management purposes, and consists of a spectrum of scientific fisheries management tools (Smith *et al.*, 1999 and 2001). Funding is provided by the Australian Fisheries Management Authority and the industry based on a cost recovery model.

Communication, co-construction, discussion on model assumptions, data, interpretation with search for consensus

Broad consultation and institutionalization of a transparent operating framework for decision-making

Used for setting Recommended Biological Catches and providing strategic scientific advice

Cost-recovery framework provides fewer opportunities to pursue low value or high-risk lines of inquiry.

3	<p>French Partnership Bio-economic Working Group Project</p>	<p>Partnership Project with stakeholders funded by the French Fisheries Administration (convention agreement 2009-2015) to support development of tools, methods and a participatory decision-support framework in the context of the implementation of new management plans under the European Common Fisheries Policy (CFP) (Macher <i>et al.</i>, 2018). The project was initially developed based on 3 case studies (3 partnerships associating scientists of different disciplines, stakeholders from the fishing industry and the French administration). It was then continued on the Bay of Biscay demersal fisheries from 2011 to 2015 to support the development of management plans in this area.</p>	<p>Co-construction, information sharing (through regular meetings and workshop), interviews</p>	<p>Bring additional knowledge/expertise, clarification of needs and requests and better compatibility of knowledge provided by science with management issues, expectation of better buy-in by stakeholders, increased legitimacy of tools, new research issues identified with stakeholders</p>	<p>Application of the tools and approaches for STECF impact assessment and national requests but unknown of real use made of results + Partial use of intermediate descriptive products more than full bio-economic assessment at national level</p>	<p>Mismatch between time for research and political agenda, unformal relationship between participants and leadership, unclear expectations, potential making tool of the partnership</p>	<p>Higher engagement and active participation from the administration, need for clear partnership agreements with transparent governance and deliverables</p>
4	<p>Italian Partnership for demersal fisheries Management Plan (MP)</p>	<p>Agreement between the Italian Administration and the National Research Council (CNR) for developing a scientific technical framework to support the preparation of multiannual management plans in accordance with the CFP. The project was implemented from 2017 to 2018. It involved scientists of different disciplines and the</p>	<p>Co-definition of the scenarios to be simulated with the Italian administration</p>	<p>Well-structured partnership and role of the scientists defined</p>	<p>Used for assessing the biological and economic impacts of alternative management scenarios. Not used to set the management targets.</p>	<p>Absence of involvement of stakeholders in the definition of scenarios due to time constraints</p>	<p>Increase collaboration between stakeholders – scientists and managers to generate trusted and credible management process, Monitoring of the achievements of objectives and good governance will strengthen the partnership</p>

		Italian Administration. The objective was to set up the scientific background and to assess impacts of different management scenarios.					
5	AZTI-Spanish secretary partnership	Partnership Agreement between the marine research center AZTI and the Spanish Fisheries Secretary to assess impact of scenarios supporting decision-making and negotiation of Total Allowable Catch (TAC) and quotas in particular. The Agreement was renewed on a yearly basis for three years to support bio-economic impact assessment of various scenarios considered for the management of Spanish fisheries.	Initial co-construction and definition of expectations then routinely produced	High, in terms of the value of the negotiations trade-offs clearly highlighted in the report and advice given	used For TACs negotiations	Conclusions beyond the results, potential inadequation of scientific information given with needs, pb with uncertainties, comparison of scenarios	Clearer definition of strategies and priorities would be useful to adjust research priorities
6	Irish Discardless Challenge Trials – Research Partnership	Discard reduction trials undertaken jointly with national fisheries development agency and the Irish Marine Institute involving Irish Fishers and their representative organisations within the Discardless EU research project (2015-2019).	Partnership data collection and co-construction of discard mitigation measures/devices	Improved data provision quantitatively and qualitatively	No formal link to decision-making and direct use of results	fears from industry about information provided potentially damaging them	

7	French industry self-sampling in Celtic Sea	<p>French national projects contracted between industry and scientists for self-sampling and survey to improve quality for some stock assessment (International Council for the Exploration of the Sea, ICES) through external data collection programmes. Self-sampling projects started in the mid-2000s and are still ongoing. Each project is species specific in terms of sampling protocol. The collaboration involves scientists and National fishing organisations at ecoregion scale (Bay of Biscay, Celtic Sea, French deep-sea industry)</p>	Scientific support to data collection	<p>Added information/data to science, responsible image for fishing industry, higher-resolution data collection at low costs</p>	<p>Integration of external data bases/indices peer-reviewed scientifically in stock assessment</p>	<p>Interest from the industry depends on the stock status and the complexity of the sampling program</p>	<p>Ongoing partnership to improve knowledge, room for more contribution from the industry to knowledge production</p>
8	IA and evaluation of Harvest Control Rules (HCR) for the Bay of Biscay Anchovy Long Term MP	<p>Impact assessment and evaluation of the anchovy LTMP requested by the Scientific, Technical and Economic Committee for Fisheries (STECF) under EU guidelines. The process involved French/Basque Country fishing industry, French/Spanish research institutes, National administrations and the South-Western Advisory Council (SWWAC). Objective was to evaluate HRCs defined with the fishing industry to minimize biological risks while maximising profits. The</p>	<p>Consultation through Advisory Council, joint definition of options and HCR, MSE framework with science and industry meetings (for anchovy)- co-construction - meetings</p>	<p>Development and use of modelling tools, stability for the fishing industry reduction of risks for the industry</p>	<p>Used for Tac setting in anchovy fishery</p>	<p>Absence of collaboration during the anchovy collapse</p>	<p>Keep iterative processes of design and evaluation</p>

process started in 2007. It was formally updated in 2013.

9	Western waters Multi-annual MP Impact Assessment	<p>Impact assessment of the Western waters management plan requested by STECF in 2015 under EU guidelines. The IA process involved scientists of different disciplines and institutes, EU DGMARE and the Joint Research Centre (JRC). The process took place in 2015 and was based on two meetings interspersed by developments in-between. Representatives of stakeholders (SWWAC) were invited as observers. Impact assessment was based on the partnership approach developed up to 2009 with the fishing industry in the French Partnership Bio-economic Working Group Project. Requests for scientific support formulated by ICES for the Bay of Biscay sole based on options proposed by the industry. The collaboration, limited to the request process, associated ICES, the French ministry for Fisheries, scientists from Ifremer and the industry who</p>	Interactions with DGMARE in the definition of the terms of Reference	Higher reactivity/adequation of science to management issues, Increased capacity for Participation to impact assessment of stakeholders (Protocol for IA guideline)	Assessment is part of the process for decision-making but unknown real use made from the assessment and restriction of results presented in terms of economic evaluation	No real consultation of stakeholders during the scoping meeting as advised in the protocol for impact assessment due to time constraints and political agenda, No active engagement of managers in definition of expectations with risks for knowledge produced to remained used	More engagement needed of managers in definition of expectations
10	Evaluation of HCR for the Bay of Biscay Sole	<p>Impact assessment of the Western waters management plan requested by STECF in 2015 under EU guidelines. The IA process involved scientists of different disciplines and institutes, EU DGMARE and the Joint Research Centre (JRC). The process took place in 2015 and was based on two meetings interspersed by developments in-between. Representatives of stakeholders (SWWAC) were invited as observers. Impact assessment was based on the partnership approach developed up to 2009 with the fishing industry in the French Partnership Bio-economic Working Group Project. Requests for scientific support formulated by ICES for the Bay of Biscay sole based on options proposed by the industry. The collaboration, limited to the request process, associated ICES, the French ministry for Fisheries, scientists from Ifremer and the industry who</p>	Indirect interactions	Interesting process with HCR proposed by stakeholders and assessed by scientists	No management plan implemented at the end	Interactions reduced to the max to request and report	

		provided HCR. The objective was to support the assessment of options considered for the management plan of the Bay of Biscay sole.					
11	French National Request on EU Landing Obligation	<p>Requests for scientific support on the implementation of the LO formulated in 2015 by the French Fisheries Administration to Ifremer under Convention Agreements. The objective was to provide clarifications of the LO regulation, in relation to <i>de minimis</i> and survival exemption and the quota flexibilities. It was also to investigate the potential consequences of various interpretation/implementation of the regulation.</p> <p>Requests for scientific support on the socio-economic consequences of TAC and quotas in the Bay of Biscay formulated by the French Fisheries Administration to Ifremer (Convention Agreements) in 2015. The objective was to support the negotiations for TAC and quotas 2016 based on scientific assessment of potential impacts of proposed TAC for the French fleets. The work applied the methods and tools developed in the French</p>	Indirect interactions through provision of report to answer administration question	Not applicable	used For exemption negotiations	Interactions reduced to the max to request and report	
12	French National Request on impacts of TAC and quotas for the Bay of Biscay Fisheries	<p>Requests for scientific support on the socio-economic consequences of TAC and quotas in the Bay of Biscay formulated by the French Fisheries Administration to Ifremer (Convention Agreements) in 2015. The objective was to support the negotiations for TAC and quotas 2016 based on scientific assessment of potential impacts of proposed TAC for the French fleets. The work applied the methods and tools developed in the French</p>	Indirect interactions through provision of report to answer administration question	Not applicable	used For TACs negotiations	Difficulties to engage all the stakeholders, need to work with a reference group, Financial resources required	More engagement needed of managers in definition of expectations

Partnership Bio-economic Working Group Project.

13 A participatory-based mapping of the SSF in the Basque fisheries	<p>Long-term local project included within the Basque Government Strategy Plan 2014-2020 with key collaboration between regional administration, Scientist (AZTI) and the fishing sector, in particular, the SSF in the last decade. To create an optimal data collection system, the scientists proposed new monitoring systems installed on board on a voluntary basis, tracking the vessels' catches in real time. The mission is to increase the transparency of bottom up information flow, empowering small-scale representation and administration in decision-making with good information. The incentive for fishers is that of improving the SSF's reputation in comparison with other maritime users.</p>	Co-construction, information sharing, co-definition of new measures	<p>Mutual trust, co-creation of new tools to gather spatially level data on a voluntary based, increase of the compliance . Increase of quality information flow relevant for the whole sector. Improvement of some good governance principles (transparency, legitimacy and connectivity).</p>	Engagement of fishers in decision-making, management measures introduced by regional administration based on the scientific knowledge after agreeing with the SSF sector	Limited project, Technical limitations (dimensions of the model), science-related limitations, Concerns from stakeholders that tools are used against fisheries	First step towards the formalization of the process
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14	EU DGMARE DAMARA project in the Celtic demersal fisheries	<p>European DGMARE project (2013-2014) - A scientific decision-support tool for the development of a management plan in the Celtic Sea. The project associated the fishing industry and scientists of different disciplines and research institutes from/operating in the Celtic Sea region in relation to the DGMARE and the Irish Administration. This demonstration R&D project aimed at developing a platform for science-administration-stakeholders sharing and co-construction. The objective was to provide the scientific support for the development of a management plan in the Celtic Sea” under the DG MARE call “Studies for carrying out the CFP”.</p>	Co-construction, information sharing, companion modelling, co-definition of scenarios, shape of the online web interface	<p>Knowledge sharing, co-construction of scenarios, use of science to inform management, increased development and legitimacy of tools, better acceptance of weaknesses in data and science, use of modelling tools based on realistic scenarios chosen by fishers, engagement of stakeholders in the next generation type of management for mixed fisheries. Improved link with other projects and networking between scientists and fishers organizations</p>	<p>Proof of concept, validated Tools designed to be used by European Commission and industry to improve management and negotiation, bespoke analysis with direct relevance to the process and interest from stakeholders (Shiny interface provided to EC and stakeholders to provide scientific information on potential impacts of alternative options). ICES mixed fisheries advice influenced the conceptualization and discourse on mixed fisheries and the need to establish management plan + work done in north on the MSY ranges shaped the</p>	<p>Not easy to engage stakeholders on abstract topics such as management objectives, Obvious results often obtained like the fact that different stakeholders have different objectives are often highlighted or that less fishing gives higher stocks at less risk</p>	<p>Clear partnership and transparent process to be designed in international context, scientists often asked to provide advice based on continuing assessment and modelling, Stakeholders buy in can improve the process and use of research, Long term and close interactions with stakeholders are a strength for stakeholders engagement (e.g. local implantation of Ifremer Lorient), Frequent interactions to be organized</p>
15	North Sea mixed fisheries research projects, ICES request and DGMARE direct contracts	<p>Research conducted in the North Sea mixed fisheries case studies for the last 5 to 10 years under European research projects (EFIMAS, MYFISH, SOCIOEC, MAREFRAME, GAP, DrumFish, ECOFISHMAN etc.) and scientific support to ICES and STECF in the current design of the North Sea mixed fisheries management plan, including F_{MSY} ranges. Research were</p>	Workshop - information sharing, Communication in Parliament	Favourable window with efficient research projects and scientists involved in advice processes	<p>ICES mixed fisheries advice influenced the conceptualization and discourse on mixed fisheries and the need to establish management plan + work done in north on the MSY ranges shaped the</p>	<p>Poor institutional support, lack of experience in stakeholders engagement, lack of commitment, barriers between scientists and fishers representatives</p>	<p>Favourable window to be considered right person, right answer to right question, opportunity and legitimacy, Visualization can help, Difficult to make clear rules for partnership but presence in meeting is very important</p>

<p>16 EU project MAREFRAME- Strait of Sicily trawl fishery Case study</p>	<p>developed in connection to ICES, STECF and DGMARE needs and associated stakeholders in workshops conducted at regional level (Kempf <i>et al.</i>, 2016; Rindorf <i>et al.</i>, 2017a,b).</p> <p>European research project MAREFRAME (2014-2017) - Co-creating Ecosystem-based Fisheries Management Solutions funded under the FP7. Mareframe involved collaboration between scientists, managers and stakeholders developed in 7 Case studies in European waters (including the Strait of Sicily). It aimed at developing a decision-support framework that can highlight alternatives and consequences through close integration and co-creation with stakeholders in all development phases. The process developed in the Strait of Sicily aimed at supporting the development of multiannual management plan as defined in the General Fisheries Commission for the Mediterranean Resolution GFCM/33/2009/2. It involved fisheries scientists and social scientists, the Mediterranean Advisory Council (MEDAC), NGOS, local fishers, fishers</p>	<p>Workshop-meetings with stakeholders consultation and co-creation (definition of management objectives, incorporation of preferences of stakeholders into a decision-support tool) and presentations and workshops at FAO-GFCM</p>	<p>Incorporation of stakeholders preferences, research design tailored to real policy-contexts, trade-offs among multiple objectives are clearly presented, increase understanding of interactions within social-ecological systems</p>	<p>actual design of these plans</p> <p>Transfer of tools and results to national and international (GFCM) bodies</p>	<p>Lack of presence and participation of decision makers/managers, fears from industry about information provided potentially damaging them (in particular in landing obligation context)</p>	<p>Required full engagement of national and regional administrations in the process, define clear rules for stakeholders engagement and institutional framework</p>
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representatives, Managers (Italian DG pesca), Sicily region and the FAO.

17 EU project SOCIOEC – Bay of Biscay and Celtic sea Case studies	European research project SOCIOEC (2012-2015)- Socioeconomic effects of management measures of the future CFP- funded under EU FP7. The project was developed based on collaborations between scientists of different disciplines (biology and economy mainly), the fishing industry and managers in different Case studies in European waters (including the Bay of Biscay Case study and the Celtic sea Case study). Collaborations were particularly developed with Producers Organisations. The research included the design and application of a framework for Impact assessment of scenarios (Malvarosa <i>et al.</i> , 2019), based on a strong engagement of	Surveys, consultation, co-construction, communication of results	Learning on all sides about nature of management process and Building of robust relationship and trust	Inform about wider issues, or indirect use	Diversity in the stakeholder group at RAC level making difficult to focus the discussions because of the diversity of problems and objectives according to fisheries. Easier at more regional level but they only take the messages that they were interested on. Lack of clear objectives.	Involvement of decision makers and primary stakeholders, Avoid overly academic or black box approaches to decision makers, Early involvement of stakeholders
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stakeholders in research at each step of the process.

18	EU project MYFISH-Iberian waters Case study	European research project MYFISH (2012-2016) - Maximizing Yield of Fisheries while Balancing Ecosystem, Economic and Social Concerns - funded under the FP7. The project was developed based on different case studies in European waters (including the Iberian waters case study). It was based on a strong collaboration between scientists of different disciplines, managers (DGMARE) and stakeholders, who were associated to the research at different steps.	Co-construction, feedback on preferences (Management targets, landing obligation...). Validation of model, suggested alternative conditioning, new scenarios, communication of results	Building trust in modelling approaches, participatory modelling and identification of preferences (management objectives and strategies), increase the understanding of the system, how the industry works and why, which are their objectives, improve the model conditioning, validate the model	not directly used in decision-making but the case study implementation was used to evaluate the multi-annual management plans	Perception of the governance system by stakeholders, Difficulty to increase responsibility and skills in the governance area of fishers and representatives	Improve the way of presenting the results, develop more interactive approaches. Start the collaboration from the very beginning of the conditioning of the models and definition of the scenarios, i.e. enhance the participatory modelling. Work at local level, engage the stakeholders working in issues that really matter to them.
19	EU DGMARE project on SSF sector's participation in decision-making	European DGMARE promoted enhancing SSF sector's participation in decision-making in a project (2015-2016). The objective was to develop a participatory process under the umbrella of the SWWAC to identify actions encouraging a broader participation from the local to	Consultations, focus groups, workshop, interviews	Stakeholders involved in SSF in Western waters benefited of an improved governance: A good practice guidelines for enhancing the participation of SSF sector in decision-	Improve participation in decision-making processes	Financial resources needed	Empowering representatives and stakeholders by external contracts and reinforcing connectivity and networks. Develop mechanisms for equal, inclusive and proactive participation. Increase transparency and frequency of

<p>20 Celtic Sea Herring recovery plan and LTMP decision-support</p>	<p>the European decision-making levels. The project involved collaborations between scientists from AZTI, the SWWAC and fishing representatives in Spain (Federaciones and Cofradías), France (fishing committees) and Portugal (associations) transferring the outputs to the DG MARE. The project established whether, and to what extent, the standards embodied in the good governance principles are satisfied in SSF governance across the Atlantic Area.</p> <p>Informal collaboration between science and industry to help inform the development of recovery and management plans in the Celtic Sea herring fishery within context of PhD research on ecosystem-based fisheries governance (2012-2015). It involved scientists and the industry collaborating closely in connection to the Celtic Sea Herring Management Advisory Committee, a local management forum for Irish participants in this fishery.</p>	<p>Consultations: Surveys and interviews</p>	<p>making was agreed taken into account evidence from Atlantic case studies in EU. The guide establish the necessity of satisfying the standards principles of good governance: legitimacy, transparency, accountability, resilience, connectivity, fairness, inclusiveness and finally, engagement.</p> <p>Limited</p>	<p>Knowledge sharing</p>	<p>Lack of presence and participation of decision makers/managers</p>	<p>communication. Need for facilitators and external actor</p>
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