

Pulling mechanisms and pushing strategies: How to improve Ecosystem Advice Fisheries Management advice within the European Union's Common Fisheries Policy

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Abstract

While European policies have progressed towards an Ecosystem Approach to Fisheries Management (EAFM), limited attention has been paid to the implications for its advisory system. This paper analyses the advisory landscape in the European Union (EU) by addressing two questions: to what extent can the needed advice be provided? how prepared is the management system to integrate ecosystem advice? We provide a systematic analysis of the relevant advisory bodies, explore gaps related to the requested and delivered advice, and identify paths for improvement. The findings confirm earlier observations of lack of a formalized process to provide and integrate advice in support of an ecosystem approach into EU fisheries management. Instead of enabling existing capacities to embed ecosystem components (e.g. investments and initiatives made by stakeholders (and authorities) to move to EAFM *-pushing strategies*), the system relies heavily on mandatory requests from policy makers (*pulling mechanisms*). Furthermore, social and economic dimensions are the weakest aspects in the advisory process, which hampers the balancing of objectives that represent one of the hallmarks of EAFM. The policy framework has adopted EAFM for European fisheries, but the advisory processes have not yet been adapted to substantially support EAFM.

Keywords: Ecosystem Approach advice; Advisory Council; Member States Regional Group; STECF; RFMO

1. Introduction

The European Union (EU) continues advancing towards the goal of managing fisheries under an ecosystem approach (EA). Progress can be considered fragmented and *“the recipe for putting it all together is still missing some instructions”* (Trenkel, 2018: 391). Limited attention has been paid to the implications for an advisory system in support of an EA to fisheries management (EAFM advice); and it has been pointed out that in most worldwide-countries, no formalized scientific advice system on the EA has been set up (Coll et al., 2015). Providing and integrating EAFM advice into EU fisheries management thus remains a challenge.

Once the legal framework to implement EAFM was put in place (2002 CFP; 2008 MSFD; 2013 CFP), the provision and integration of EAFM advice into management was considered to be embedded (formalized) in the ordinary policy-making processes. However, observations indicate otherwise (Ballesteros et al., 2018; Rudd et al 2018). Impediments to an effective implementation of the EAFM have been linked to unevenness of capacity among stakeholders and authorities to operationalize the concept (Garcia and Cochrane, 2005; Linke et al., 2019; Stephenson et al., 2019). The need for capacity building for stakeholders providing EAFM

advice has been reported (Garcia and Cochrane, 2005; Ramírez-Monsalve et al., 2016a; Ramírez-Monsalve et al., 2016b). Institutional impediments to integrate EAFM advice into management have been identified as well (e.g. Trenkel 2018; Mackinson and Middleton, 2018; Pope et al., 2019; Ohms and Raakjær, 2019).

Capacity has been presented in terms of financial availability and staff-related resources. The latter refers to the ability of stakeholders and authorities to maintain the human resources, institutional memory, and social networks needed to evaluate and manage EAFM issues. It also includes access to information and understanding of issues that cut across the natural and social sciences (Rudd et al., 2018). Both, financial and staff-related capacity relate to the long term and persistent commitment required in EA processes (Rudd et al., 2018). In this article we focus on capacity in terms of the capacity to provide EAFM advice, and in terms of the preparedness to integrate the advice into management. We also understand EAFM advice in line with what is specified in the 2013 Common Fisheries Policy -CFP (Reg. 1380/2013).

By elaborating on what could be understood as an EAFM advice, as well as by identifying –within the current 2013 CFP governance system, the actors involved in the provision of advice and integration of it into management, this paper aims to explore to what extent the process of providing EAFM advice and integrating it into management has been formalized.. We understand formalization in terms of capacity and preparedness. Capacity to provide EAFM advice –as conceptualised in the 2013 CFP, and preparedness to integrate the EAFM advice into management. We examine this in terms of two questions (i) *to what extent can the EAFM advice be provided?* And (ii) *how prepared is the management system to integrate EAFM advice?* We argue that the provision of EAFM advice responds mainly to *pulling mechanisms*: mandatory requests from the advisory system, whereas the advisory system does not leave much space for the formation of *pushing strategies*: investments and initiatives made by stakeholders (and authorities) to move to EAFM. Calls have been made for articulating better the benefits of an EAFM in a political, economic, and social context (Link et al., 2019). For some it will mean a clearer and stronger business case, for others it will mean the non-market and social benefits important to society being adequately accounted for under the current status quo –*business as usual* governance system (Rudd et al., 2018; Link et al., 2019). Contrary to the costs, the benefits of taking action to implement EAFM are less specific, may be temporally delayed, and relate to diverse beneficiaries (Rudd et al., 2018).

The research has been developed under the FP7 project: MareFrame, *Co-creating Ecosystem-based Fisheries Management Solutions*.

EAFM advice and the EU fisheries advisory landscape

Within the 2013 CFP, advice has been conceptualized as the best available scientific advice, being this the basis for decision-making and for the establishment of conservation and management measures (§14, art 3(c)). Conservation measures are set to achieve the objectives in relation to a sustainable exploitation of marine biological resources (art 6(1)) and the social, economic and institutional objectives that are described in the pre-amble of the CFP. Conservation measures are adopted taking into account available scientific, technical and economic advice (art 6(2)).

Building on the notion of best available scientific advice, and on the definition of EAFM provided within the 2013 CFP, advice in support of an EA (EAFM advice) -see Figure 1, can be understood as being the best available scientific, technical and economic advice used for managing fisheries and requiring knowledge concerning:

- (i) Status of fishery resources
- (ii) Status of the ecosystem where such fishing activities take place
- (iii) Ecosystem impacts from fishing and other activities.

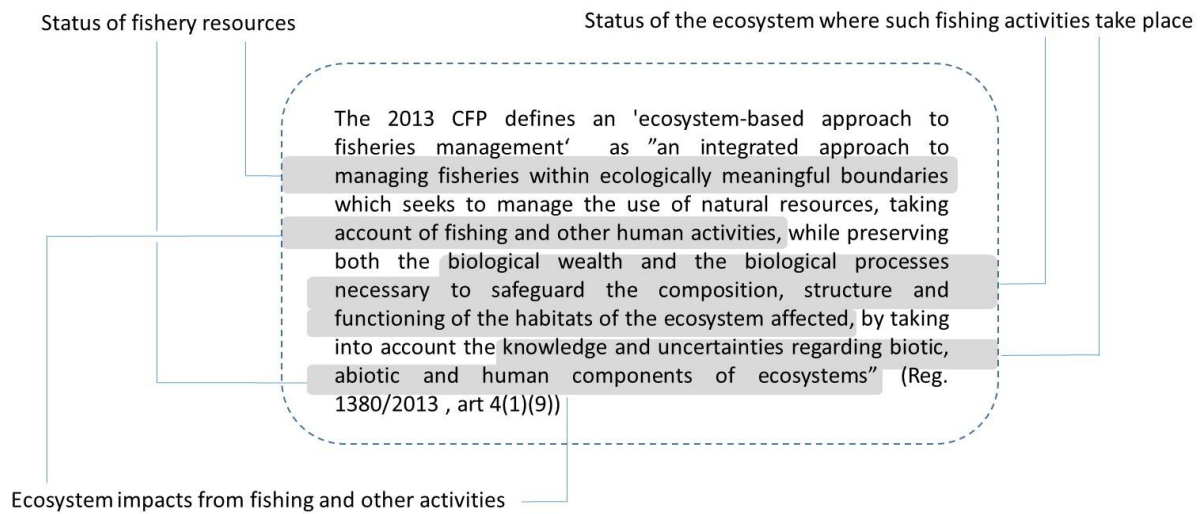


Figure 1: Elements which form the basis of EAFM advice (text outside the box). Text within the box is the definition of EAFM as provided in the 2013 CFP.

Within the current 2013 CFP governance system, several actors are expected to provide EAFM advice. These actors can be identified after mapping the building blocks of the EU fisheries advisory landscape (Figure 2).

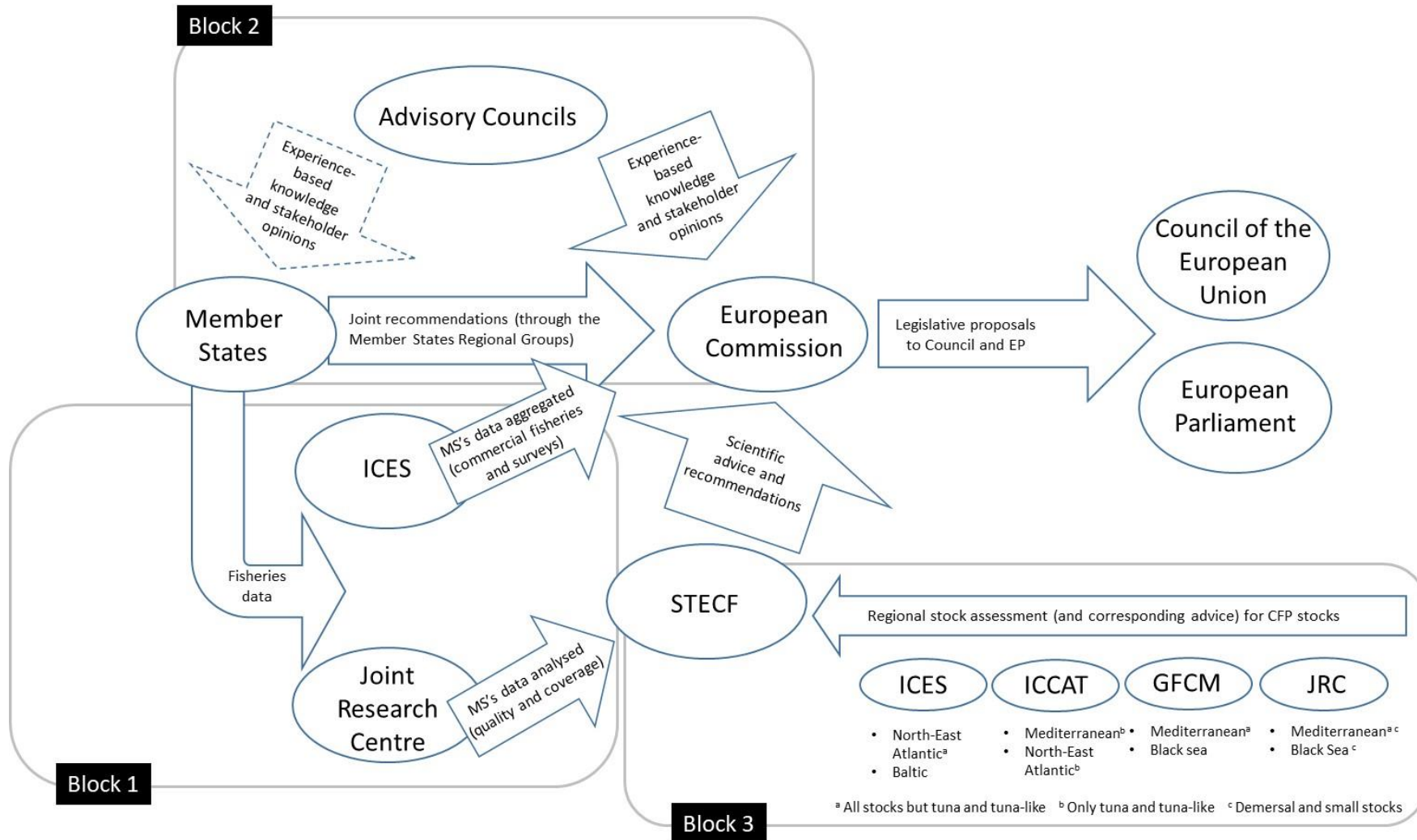


Figure 2: Actors and advisory process for fisheries management in the EU (adopted from Rätz et al., 2010; Ballesteros et al., 2018). Block 1 relates to the Data Collection Framework where Member States (MS)' fisheries data is sorted, analysed and aggregated. Block 2 relates to Advisory Councils (ACs)' advice and Member States Regional Groups (MSRGs)' joint recommendations which is used to inform the CFP decision-making process. The dotted arrow between ACs and MSRGs reflects an unclear or underdeveloped relationship (Eliassen et al., 2015; WEA, 2016). Block 3 relates to regional stock assessment and advice from the different scientific bodies within the regional seas. On the basis of the output from Block 1 and 3, the Scientific, Technical and Economic Committee for Fisheries (STECF) formulates scientific opinions and recommendations for the European Commission (EC).

The first block (Block 1) relates to the Data Collection Framework, an EU framework for the collection and management of fisheries data established in 2000 and reformed in 2008 and 2017. Under this framework the Member State (MS) collect, manage and make available a wide range of fisheries data using regional coordination groups needed for scientific advice (JRC, 2017; Reg. 1380/2013 §46, art 25). The data is sorted in databases and analysed –in terms of quality and coverage, by the Joint Research Centre (JRC) and by the International Council for the Exploration of the Sea (ICES), who also play a role in aggregating data from commercial fisheries and from surveys and are developing the Regional Database and Estimation System. As it will be discussed later, JRC and ICES are also included in Block 3 due to their role in assessing fish stocks. JRC’s data is made available to the Scientific, Technical and Economic Committee for Fisheries (STECF) who then formulate scientific recommendations which later on are used by the European Commission (EC) –along with ICES’ data, for preparing the yearly proposal on fishing opportunities (quotas).

A second building block (Block 2) of the EU advisory landscape is related to the Advisory Councils (ACs), who provide experience-based knowledge and viewpoints of stakeholders (e.g. fisheries sector organisations and other interested groups such as environmental organisations) in the form of advice on specific fisheries, fish stocks or specific regional seas. E.g. the Pelagic Advisory Council has initiated research initiatives to increase the knowledge base of its stocks by carrying out industry surveys and genetic stock identification projects (Ohms and Raakjær 2019). Before the 2013 CFP, this advice was provided directly to the EC. With the 2013 CFP, ACs may act as advice providers to the Member States Regional Group (MSRG). MSRGs are cooperative regional MS structures, organized by sea basin, established to submit joint recommendations for *inter alia* multiannual management plans (Ballesteros et al. 2018).

A third building block (block 3) includes regional stock assessment and corresponding advice formulated by different scientific bodies for the different regional seas. Scientific assessments and advice for the North-east Atlantic and for the Baltic stocks is conducted and provided by ICES. As for the Mediterranean, two of the Regional Fisheries Management Organisation (RFMOs) provide scientific advice (stock assessments) for stocks under EU sovereignty. These RFMOs are the General Fisheries Commission for the Mediterranean (GFCM) and the International Commission for the Conservation of Atlantic Tunas (ICCAT). Tunas or tuna-like species in the Mediterranean are assessed by the SCRS –the Standing Committee on Research and Statistics of the ICCAT. The other species in the Mediterranean are assessed by the Scientific Advisory Committee (SAC) of the GFCM (Rätz et al., 2010). In addition, at the end of 2000s, the STECF was requested by the EC to assess (through the JRC) the status of demersal and small pelagic stocks in the Mediterranean and Black sea, and to provide fisheries management advice (Rätz et al., 2010). This could be seen as parallel to the work developed by GFCM’s SAC, but in the JRC’s group only the EU MS participate. Both groups (GFCM’s SAC and JRC) constitute two sources of technical scientific information on the state of exploitation of fishery resources in the Mediterranean (GFCM 2, 2017). The stocks in the Black Sea are also assessed by the GFCM’s Scientific Committee. All these regional stock assessments and corresponding advice from ICES, GFCM, JRC or the scientific committees of RFMOs (to which the EU is contracting party).

A fourth block of the EU advisory landscape (not depicted in figure 2) relates to the regular commissioning and use by the EC of tenders and research projects, as well as the European Parliament’s commissioning of reports and use of parliamentary hearings –later in the legislative process, which strengthen the knowledge base ahead of decisions (Ballesteros et al. 2018).

Finally, also not depicted in figure 2, are the Regional Sea Conventions (RSCs) OSPAR¹, HELCOM², UNEP-MAP³, and Bucharest Convention, organisations relevant for EAFM as each of them are in charge of multilateral environmental action in one of the main European marine ecosystems, allowing them to potentially play a role as platforms for coordination at regional level. The organisations provide advice and information on pressures and human activities in their area of competence. However, due to –among others, the EU dichotomy between fisheries and environment (Ramírez-Monsalve et al., 2016a; Langlet and Rayfuse, 2019) their advice is not fully integrated and most of the time arrive through different channels, an aspect that is hoped to be improved as the EC is calling for better coherence of approaches under the Marine Strategy Framework Directive (MSFD).

2. Methodology

Through a sequence of different research activities building upon one and another (Table 1), data was collected which contributed to the systematic analysis of the actors identified in Figure 2. Participants in the events (focus groups, workshops, round table discussions) were selected following MareFrame’s co-creation approach (MareFrame, 2017). This involved: scientific advisory bodies (ICES, STECF), stakeholder advisory bodies (ACs –as the forum for articulating and representing plural interest: fisheries organizations, NGOs, and other organizations), and recipients of advice (decision-makers). As the project aimed to “*significantly increase the use of EAFM when providing advice relating to European fish stocks*” (MareFrame, 2017), priority was given to those decision-makers involved in the tactical management (setting and distributing TACs and Quotas). Members of the Directorate-General for Maritime Affairs and Fisheries (DG MARE) and fisheries managers at MS level attended the events. The events were facilitated by scientists from the research institutes that were project partners and key findings documented in fact-sheets. Key informant interviewees (JRC, RFMO, and MSRG) were identified following a snow-ball approach and semi-structured interviews were carried out. Document analysis was used to review the collected material, and two main guiding questions were used for the analysis:

- a) *What does the 2013 CFP state about the role of the different actors in the advisory system? Role in terms of provision of EAFM advice and integration of it into management.*
- b) *What are these actors currently (2014-2018) bringing into the advisory system? Findings in terms of which EAFM advice is being delivered, and which challenges have been encountered associated to the uptake by recipients of advice.*

The analysis also builds on the text of the 2013 CFP Regulation, and on literature review of peer reviewed articles, official and grey reports, and websites of the different advisory actors. Additional contributions were included from other EU projects on similar issues (i.e. “*Maximising yield of fisheries while balancing ecosystem, economic and social concerns*” – MyFish, and “*Socio-economic effects of the main management principles of the future CFP – SocioEC*).

¹ Convention for the Protection of the Marine Environment of the North-East Atlantic

² Baltic Marine Environment Protection Commission - Helsinki Commission

³ The Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean

Actor	Event	Topic addressed	Date
AC	Focus group (1)	Status of ACs on providing advice on EAFM (ACs secretariats of North Sea AC (NSAC), North Western Waters AC (NWWAC), PELAC (Pelagic AC), Mediterranean AC (MEDAC))	June 2014
	Key Informant interviews (6)	ACs constrains for providing EAFM advice in terms of resources, scope and processes (ACs secretariats of NSAC, NWWAC, PELAC, MEDAC, South Western Waters AC (SWWAC), Baltic Sea AC (BSAC))	July – October 2014
	Key Informant interviews (4)	Interaction between actors during development of multiannual, multi-species plan for Baltic and (potential) Atlantic, pelagic fisheries (Members of BSAC and PELAC)	October 2015 – January 2016
	Workshop (WEAF) (1)	Ecosystem Approach to Fisheries Advice in the EU (BSAC, NWWAC, MEDAC, NSAC, PELAC, DG MARE, ICES, STECF)	October 2016
	Key informant interviews (4)	Perceptions on development of AC's capacity to provide EAFM advice (AC's secretariats of PELAC, NSAC, MEDAC, BSAC)	September 2017
ICES	Round table discussion (RTD) (1)	EAFM in EU's CFP (DG MARE, ICES, STECF, European Fisheries and Aquaculture Research Organisations (EFARO))	January 2015
	WEAF (1)	Ecosystem Approach to Fisheries Advice in the EU (BSAC, NWWAC, MEDAC, NSAC, PELAC, DG MARE, ICES, STECF)	October 2016
STECF	RTD (1)	EAFM in EU's CFP (DG MARE, ICES, STECF, EFARO)	January 2015
	WEAF (1)	Ecosystem Approach to Fisheries Advice in the EU (BSAC, NWWAC, MEDAC, NSAC, PELAC, DG MARE, ICES, STECF)	October 2016
	Key informant interviews (2)	Perceptions on EAFM advice: content and challenges	September 2017
JRC	Key informant interview (1)	Perceptions on EAFM advice: content and challenges	September 2017
RFMO	Key Informant interviews (2)	Perceptions on EAFM advice: content and challenges	September 2017
MSRG	Key informant interviews (3)	Interaction between actors during development of multiannual, multi-species plan for Baltic and (potential) Atlantic pelagic fisheries (Members of Baltfish and Scheveningen group)	October 2015 – January 2016
DG MARE	WEAF (1)	Ecosystem Approach to Fisheries Advice in the EU (BSAC, NWWAC, MEDAC, NSAC, PELAC, DG MARE, ICES, STECF)	October 2016
	RTD (1)	EAFM in EU's CFP (DG MARE, ICES, STECF, European Fisheries and Aquaculture Research Organisations (EFARO))	January 2015

Table 1: Overview of primary sources of information. The research was developed under the FP7 MareFrame project. Number in parenthesis indicate the amount of research activities for each type of event

3. Analysis

For each of the actors, the collected and analysed information is presented in terms of three components: (i) the role on the provision –or integration into management, of EAFM advice in accordance with the 2013 CFP; (ii) the type of EAFM advice delivered and reflections –where relevant, on the capacity to provide the advice; and (iii) the preparedness of the system to integrate EAFM advice into management. Figure 3 summarizes (in grey circular textboxes) the findings of what is the EAFM advice currently (2014-2018) provided by the advisory actors. The analysis of EC (DG MARE) is presented as part of the analysis of the advisory bodies that provide EAFM advice to it.

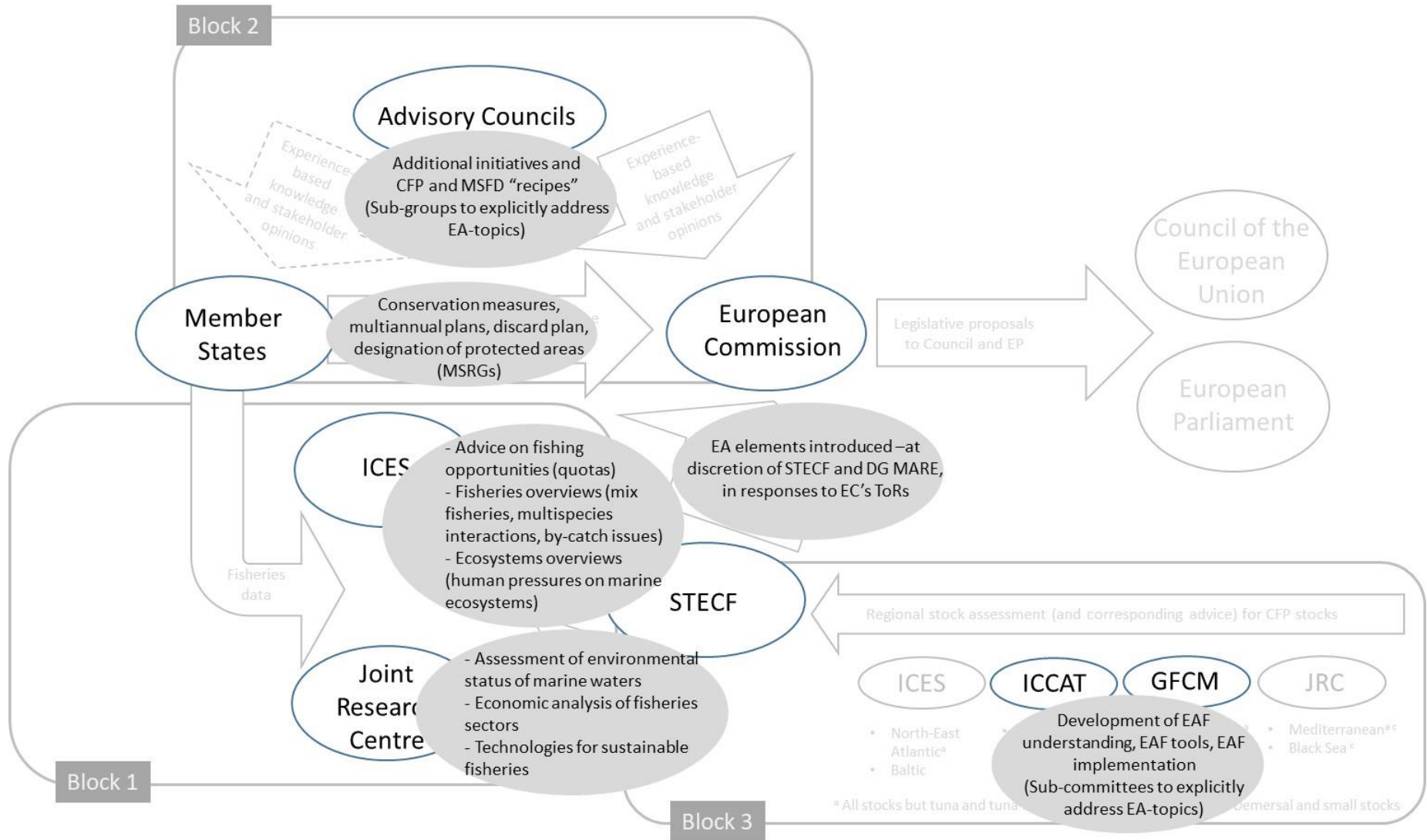


Figure 3: EAFM advice currently (2014-2018) provided by advisory bodies.

3.1 International Council for the Exploration of the Sea (ICES)

ICES stewards and facilitates the research efforts of the marine institutes in its member countries, and provides information, knowledge and advice for the sustainable interaction of humans and the marine environment (ICES, 2014). Advice from ICES as such is not referenced in the 2013 CFP, but the ICES-EU Memorandum of Understanding (MoU) sets the framework for the provision of services and scientific advisory deliverables (Ballesteros et al., 2018). This has now evolved into a grant agreement between ICES and DG MARE.

ICES has gone through major reforms, among other things driven by the need to respond to the evolution of policy and science, and to the specific requests of its clients such as deliver advice based on the EA concept (Stange et al., 2012; Wenzel, 2017; Ballesteros et al., 2018). As a result, an incremental inclusion of ecosystem considerations in its advice can be seen, for example when making reference to biomass escapement to support predators, advice on avoidance of bycatch and of area closures to protect benthic habitats.

In more recent years, ICES' EAFM advice could be understood in terms of three components: The first includes advice on fishing quotas or Fishing Opportunities, i.e. the type of advice that ICES is traditionally known for. The second includes Fisheries Overviews and advice on mixed fisheries, multi-species interactions, and by-catch issues. The third is the Ecosystem Overviews, where primary pressures from anthropogenic activities are identified and assessed for each of the ICES ecoregions areas. Mainly the latter two components are considered to represent the scientific basis for ecosystem-based decision in ICES (CSG et al, 2016; ICES, 2016; 2017). Another instance of an EAFM advice is the allowance of observers and stakeholders to participate in various stages of the advisory process (Wenzel, 2017). By enabling interaction and dialogue platforms between scientists and stakeholders, ICES facilitates advances for an operational EAFM in the EU (Ballesteros et al., 2018).

In a framework characterized by policy tensions, a plurality of actors, and an institutional vacuum at the regional level, ICES is working to develop a structured process within which EAFM advice can fit in appropriately. ICES is pushing to increase its capacity to produce and evaluate knowledge, aiming to generate answers to the questions of *for whom* the EAFM advice is generated and *for what purposes* (Ballesteros et al. 2018). However, epistemological and communicative challenges have been recognized within ICES (Wenzel, 2017), and given the operation under a full cost recovery system there is a limited capacity to provide advice above and beyond what clients are asking for (e.g difficult for fisheries scientists to provide advice based on an EA as they are primarily asked to deliver advice based on single species and on setting and distributing quotas (Wenzel, 2017).

3.2 Joint Research Centre (JRC)

The JRC supports the implementation of the CFP with independent scientific evidence (JRC 2016a). Further, the JRC provides to the EC –in cooperation with the European Environment Agency (EEA), ICES, and the RSC, scientific and technical advice on marine and coastal stewardship in Europe (JRC, 2016b, 2016c).

The CFP does not identify the JRC as a direct provider of advice, but it can provide EAFM advice through the work of the STECF. JRC coordinates the scientific advice process of the STECF; it collects, maintains and disseminates the scientific fisheries data from EU MS (JRC, 2016b). In addition, members of the JRC's fisheries team have participated in many of the STECF working groups; have contributed to STECF's reports; have acted as a secretariat or have chaired the meetings on occasional basis. It is only on an ad-hoc basis that JRC has been asked for direct advice to the EC (JRC 1, 2017).

The JRC activities are clustered into ten science areas. The clusters of *Agriculture and food security* and of *Environment and climate change* cover areas of research which are relevant within the EAFM advisory process (Table 2).

Cluster	Areas of research
Agriculture and food security Fisheries and Aquaculture	<ul style="list-style-type: none"> - Assessing the environmental status of marine waters, - Assessing fish stocks, - Providing economic analysis of the fisheries sector - Developing new technologies for sustainable fisheries
Environment and climate change Coastal and marine environment	<ul style="list-style-type: none"> - Environmental indicators of marine and coastal areas - Analysis of coastal and marine ecosystem status and trends, including climate change, on the scale of European and regional seas.

Table 2: Areas of research from JRC relevant within EAFM advisory process (after JRC, 2016c; 2016d)

Generally, the EU institutional design is perceived as fit for purpose in terms of providing EAFM advice (JRC 1, 2017) and the uptake of EAFM advice is not constrained by the place the JRC occupies within the advisory system (see Figure 2). Analysis indicate that it is the gap (bottlenecks) between the advice provided and the decision to be made the one hampering the process. Bottlenecks would be associated to the technical and political dimensions. At technical level, ecosystem models have limitations (Fulton, 2010; Tallis et al. 2010; Link et al. 2012). At political level, EAFM advice makes the trade-offs explicit and the decisions to be made would create winners and losers within the fisheries sector (e.g. more predator or more prey). Current decision-making is based on formally isolated decisions (e.g. more or less quota for a given species). Considering interactions and making choices in complex scenarios e.g. decisions about trade-offs made by scientific groups (Jennings and Rice, 2011) is at odds with how fisheries policy operates.

3.3 Scientific, Technical and Economic Committee for Fisheries (STECF)

Within the 2013 CFP, the STECF is listed as a scientific body to be consulted by the EC, “on matters pertaining to the conservation and management of living marine resources” (Reg. 1380/2013 art 26; C/2016/1084 §4). The STECF is the EC’s own advisory body, mainly to be consulted to ensure the assistance of scientific personnel in the disciplines of biology, economy, environment, social aspects and technology (Reg. 1380/2013 §48; C/2016/1084 §2). STECF members are nominated by DG MARE.

STECF responds to the EC’s terms of reference (ToR) (. The response is developed by STECF working groups in an annual standard procedure, following an agenda usually set by DG MARE. STECF also responds to requests presented by MS about derogations on a specific regulation or measure which is affecting their fisheries. The requests are evaluated by scientists (STECF members) during the plenary sessions (three per year). The nature and number of requests varies but the procedure is the same as with other work: the EC puts forward the ToR for the MS request and the members of plenary evaluate the science and technology behind the request (STECF 1, 2017; STECF 2, 2017).

STECF undertakes limited scientific work (e.g. economic analyses), but in practice mainly reviews the scientific advice received from external science bodies (Hegland and Raakjær 2020). Within this framework, where STECF is requested to provide responses to the EC’s pre-defined questions, it is relevant whether STECF has room to provide additional input besides the ToRs. As a response to this, the interviewed STECF member commented that STECF’s inputs in terms of EAFM have been evolving (STECF 2, 2017). Members of STECF perceive that a convergence has taken place: they try to introduce EA components when they see it convenient and relevant, while DG MARE staff increasingly introduces these types of components in its requests.

Both STECF and DG MARE have identified socio-cultural aspects as an EA component to be included. Formalized data, thresholds and reference points exist in terms of fish stocks and ecosystems, but not in terms of social impacts (STECF 2, 2017). “Socio-cultural” here refers to social aspects that are not specifically economic in nature (e.g., *social dynamics*, *social cohesion* are explicitly associated to social dimensions, while *livelihood* is associated to an economic dimension (ICES, 2018). It is argued that the inclusion of socio-cultural aspects has not been really formalized due to the lack of a formal legal backbone (STECF 1, 2017). Nevertheless, it cannot be said that the socio-cultural aspects are not present in the evaluations made by STECF. This is the case as STECF is often called to evaluate requests by MSs for derogations from specific regulations or directives on the basis that they have negative social impacts for their fisheries or communities (STECF 2, 2017).

Within the current scheme, it has been difficult to find the space to address and report social impacts (STECF 1, 2017; STECF 2, 2017). There has not been many cases where MS have presented evidence associated with social impact, and in the few available cases this was reported in terms of a narrative to characterize the social impact that the measure in question was causing (STECF 2, 2017). However, narratives do not tend to fit the accustomed format of quantitative information –often presented as a table and used in the decision-making process. In any case, there is a call for the development of systematic assessment tools of the social dimension (whether quantitative or qualitative) (Fulton, E. 2010; Prollezo and Curtin 2015; Curtin and Keatinge, 2018)

3.4 Advisory Councils (ACs)

ACs are stakeholder forums composed of representatives of fishermen occupying 60% of the seats, and “*other interest groups affected by the CFP*” (e.g. environmental organisations and consumer groups) occupying 40% of the seats (Reg. 1380/2013 art 45(1)). According to the 2013 CFP (Reg. 1380/2013), dialogue with stakeholders has proven essential for the achievement of the objectives of the CFP (§65). Their involvement “*at all stages –from conception to implementation of the measures*” is one of the principles of CFP good governance (art 3(f)). Within the CFP ACs shall be consulted by MS when drafting the joint recommendations (art 18(2)) and other measures (art 44(3)). Such consultations are without prejudice to consultations made to the STECF or to other scientific bodies (art 44(3)), and ACs’ advice “*shall be taken into account*” (art 44(3)) or detailed reason for not doing so should be given (art 44(4)). The ACs may as well –on its own initiative, submit information, recommendations, or suggestions on matters relating to the management and the socio-economic and conservation aspects of fisheries (art 44(2)(a)(b)).

ACs aim to bring stakeholders closer to the decision-making process and to bring more consideration of regional circumstances into decision-making (Eliassen et al., 2015; Hegland et al., 2015). ACs have become arenas of co-creation where multiple sources of knowledge are combined and tested on a continuous learning-by-doing dialogue; where experience-based information is provided on social, economic and cultural aspects; and where trade-offs and appropriateness of the weights to the social, economic and ecological outcomes of fisheries can be discussed. ACs are thus considered important mechanisms for the implementation of an EAFM in the EU (Ramírez-Monsalve, et al. 2016a).

The provision of EAFM advice by ACs has evolved. Sub-groups within the ACs have been created to explicitly address topics related to an EA. Examples include the Ecosystem Focus Group in PELAC (PELAC, 2015), the Working Group for Ecosystem-based Management in the BSAC (BSAC, 2016), and the Ecosystem Group in the NSAC (NSAC, 2017). Moreover, seminars with external participants had taken place to explore possibilities to learn from other cases of EAFM (PELAC, 2016; 2018). There has also been a change in perception from AC members, from either not being aware of the EAFM concept, or expressing scepticism

towards it (AC Secretariats, 2014a; 2014b) to consciously thinking about it. As a member of an AC expressed it, *“the penny has dropped”* concerning the recognition of the need of a holistic approach (AC Secretariats, 2017). Nevertheless, there is generally slow progress within ACs to integrate the EAFM concept in their advice⁴.

A number of elements of the CFP (e.g. multiannual, multi-species management plans; landing obligation; technical measures) are being interpreted as tools to operationalize EAFM (AC Secretariats, 2017), as well as the advice provided in ICES workshops related to four of the MSFD descriptors associated to fisheries (D1 biodiversity, D3 commercial species, D4 food webs and D6 sea-floor processes) (AC Secretariats, 2014a). Other initiatives beyond the CFP and the MSFD have been taken including mapping spawning grounds together with gravel extraction industry; assessing wind farm zones; studying effects of climate change on migration routes; and participating in projects for ghost net retrieval (AC Secretariats, 2014a, 2017).

Improved and sustained communication with the scientific community, partly through EU projects, and ACs' increased organizational capacity, makes them feel better suited for the task (AC Secretariats, 2014a). Yet, a feeling of insecurity could still be perceived and issues such as EAFM are considered an overwhelming topic, in addition to the day-to-day activities or *“yet another thing to find consensus about”* (AC Secretariats, 2014a; 2014b; 2017). In addition, ACs seem constrained in terms of the type of advice they can provide (CFP and MSFD “recipes”) and where the advice is provided (i.e. in relation to some of the MSRGs, an issue that –as elaborated later in the article, is still pending a further maturation process).

3.5 Member States Regional Groups (MSRG)

The 2013 CFP (Reg. 1380/2013) enables MS to cooperate at regional level in order to provide joint recommendations to the EC for achieving the objectives of the conservation measures, multiannual plans, discard plans (art 18(1)) or the designation of protected areas (§22). The *“availability of relevant competences and human resources to be involved in the scientific advisory process”* is, among other things, ensured by the involvement of relevant stakeholders (art 27(2)). However, the regulation leaves this responsibility of involving *“the relevant stakeholders”* to the MSs (art 27(2)).

As part of the regionalization process, MSRG have been granted considerable responsibility at the scale most relevant to EAFM, namely, the regional marine ecosystem. This may pose an institutional challenge to EAFM as MSRGs have no legal competence beyond the competence of the individual MS (Ramírez-Monsalve et al., 2016b). The regional cooperation does not include formal mechanisms for transparency and stakeholder involvement and challenges could also be seen associated to exclusion of stakeholders from this regionalized policy arena: as MSRGs have no legal basis, they are not bound by any legal requirement for transparency and stakeholder involvement (Ramírez-Monsalve et al., 2016b). MSRG seem to differ in their processes and performance and no generalizations can be made across all EU regional seas: some groups welcome the advice ACs provide, while others are less receptive (AC Secretariats, 2017). In the latter cases, the ACs' advice might be at risk of being sent into a vacuum, as observed for the JRC. This seems to depend on who is at the presidency of the MSRG and what is the tradition on stakeholder participation within that context. In addition, some decision based on the advice are made explicit while others are implicit or hidden.

An interviewed member of a MSRG mentioned that situations where stakeholders (including non-EU Coastal States in addition to ACs) find themselves left outside the regional processes may arise due to the rush that the MSRGs face when delivering timely joint recommendations to the EC (Ramírez-Monsalve et al., 2016b). It

⁴ Personal communication with AC chair. March 2019

is acknowledged that this rush prevents the identification of practical solutions by means of dialogue between the parties (MSRG Scheveningen 1, 2016).

3.6 Regional Fisheries Management Organisations (RFMO): GFCM and ICCAT

RFMOs are international organizations formed by countries with fishing interests in an area which aim to strengthen regional cooperation and guarantee conservation and sustainable exploitation of straddling stocks and other fish resources on the high seas (EC, 2017). Two RFMOs, the GFCM and the ICCAT, provide to the STECF scientific advice for stocks (stock assessments) under EU sovereignty (FAO, 2017a, 2017b; ICCAT, 2006, 2007, 2017).

The GFCM regularly assesses and reviews the state of living marine resources, and recommends measures to ensure their conservation. Efforts to include EA aspects within the scientific advice on fisheries provided by GFCM's SAC are reflected other GFCM's activities. For instance the GFCM SAC Subcommittee on Marine Environment and Ecosystems (SCMEE) has developed a plan to implement an EAFM within the GFCM geographical area (SCMEE, 2015). A series of working groups have been created to address the environmental aspects associated to fishing activities, and aim to find mechanisms to minimize their direct or indirect impact on the ecosystem (e.g. impacts on elasmobranch, monk seal, red coral and sea turtles; minimize impacts of longline fishing on marine birds; implementation of MSFD indicators; artisanal fisheries; marine protected areas and vulnerable marine ecosystems) (GFCM 1, 2017; GFCM 2, 2017). The focus areas of the SAC have primarily related to the development of better data collection along with improvement of single species assessments (FAO, 2015; FAO/GFCM, 2017). In recent years, efforts have focused on the development and implementation of multiannual management plans in the Mediterranean, especially in the Strait of Sicily, and the exploitation of small pelagic (sardine and anchovy) in the Adriatic (GFCM 2, 2017). Currently, the GFCM is in the external advisory committee of the EU-project CREAM, which seeks to identify gaps that need to be considered before an EA to management can be further implemented in the Mediterranean Sea (EU FP7 PROJECT 2011). According to one of the project's deliverables, difficulties in compliance and diverse fisheries interests among states are considered a bottleneck for implementation of the EAFM (CREAM Project, 2012, D4.3).

The ICCAT established a sub-committee on ecosystems in 2005 with the goal to build the scientific foundation for an EAFM in ICCAT (ICCAT, 2005). Since then, activities and assessments have mostly focused on the development of EAFM understanding and of EAFM tools (SCRS, 2013), followed by plans for implementing EAFM (SCRS, 2015, 2017). In addition, the status and trends of selected ecosystem indicators have been described (ICCAT, 2017), and a review of five tuna RFMOs in terms of their application of EAFM took place (SCRS, 2017). However, challenges are perceived that could hamper a more thorough implementation of EAFM in the ICCAT. These relate to understanding the EAFM concept and the requirements for its implementation. Further, the application of EAFM is in ICCAT's own words considered to be "patchy" and without a long-term vision (SCRS, 2017).

4. Discussion.

The policy framework may have formally stated an EA for European fisheries. The CFP and MSFD provided the legal setting that triggered requests for EAFM advice (pulling mechanisms). The evolution in the provision of advice can be perceived not only in relation to sustainability of the fishing resources, but also in relation to reduce environmental impacts of fishing, while taking economic and social concerns into account.

EA is as much a process as an endpoint (Garmendia et al, 2017). Practical implementation is showing –also in the EU, that the process is a transition from what currently exists (Link et al., 2019) and that good work in implementing the approach can be done even if the preconditions are far from perfect (Langlet and Rayfuse, 2019). Developing EAFM should be seen as “*adding tools to the toolbox, rather than replacing tools*” (Skern-Mauritzen et al., 2018: 2430). In the EU fisheries advisory system the players (Figure 3) provide information needed to start an EAFM. The challenge might be in putting existing knowledge to good use (Patrick and Link, 2015; Langlet and Rayfuse, 2019). Findings confirm that advisory bodies deliver advice on a range of elements with EAFM relevance: advice on the status of fishery resources is provided by JRC, ICES, and the Scientific Committees of GFCM and ICCAT; status of the ecosystems where such fishing activities are taking place is provided by JRC in cooperation with EEA and RSCs, and ICES; and information on impacts of human activities is provided by ICES and STECF. However, progress still needs to be done as it is explained next.

This provision of advice responds to the mandatory requests from policy makers, suggesting that the inclusion of EA within fisheries advice results from a *pulling mechanism*, where many of the advisory bodies respond to what their clients asks of them. As such, STECF responds based on what the ToRs require; ACs and MSRSG respond to what is requested on them within the boundaries of the CFP. Addressing advice requests, however, does not explain the whole picture. In some occasions the rush for answering legal requirements and keeping with the short deadlines might have restrained advisory bodies from identifying other opportunities. Likewise, some actors have been proactive and follow a strategic plan beyond the policy requests of their clients (e.g. ICES), whereas others seem to be responding more on an *ad-hoc* basis (e.g. STECF), or appear uncertain about what EAFM advice is (e.g. ACs, RFMOs). Focus remains mainly on natural resource exploitation, conservation and ecosystem objectives than on the social, and economic objectives which are also part of an EA, and which are described in the 2013 CFP. Despite progress in the inclusion of economic and social concerns, these dimensions are still considered the weakest aspects in the EAFM advisory process, e.g. ACs mostly provide advice on TAC setting and MAPs focussing on science and economics, and social aspects are rarely discussed⁵.

To what extent delivering an EAFM advice calls for further integration of the fisheries advisory system has been already explored (Ballesteros et al., 2018). On the one hand, streamlining the advisory process would avoid overlaps and reduce piecemeal advice on individual sustainability dimensions. On the other, the plurality of bodies in terms of their nature (e.g. scientific advisory bodies or advisory bodies), their position in the institutional system (e.g. external bodies as ICES or internal as the JRC), and even their role in the decision-making process (e.g. the MSRSG) might be better suited to play checks and balances while harnessing the complexity of the European fisheries

Beyond the improvements that could arise from its design, it is in this process of *adding tools to the toolbox* that we will be able to see if the EU advisory system is capable to provide relevant advice. Capacity to provide advice have been understood in terms of staff-related resources (staff assertiveness, access to information, maintaining the human capacity, institutional memory and social networks), and financial resources to

⁵ Personal communication with AC chair. June 2020

dedicate to the process on an ongoing basis (Rudd et al., 2018). It is only then that we could argue if indeed there is a lack of formalized process to provide EAFM advice.

Despite the *pulling mechanisms* enabled by the policy framework, the advisory bodies' capacity to inform actual policy decisions is still rather limited. Advice suppliers are providing EAFM advice input, but advice recipients do not have a clear path to use it. Overall, policy-makers are reluctant to receiving advice that cannot link directly to their current list of tactical and strategic management decisions. Unevenness of the capacity to operationalize an EA type of management among stakeholders and decision-makers have been reported (Trenkel, 2018; Mackinson and Middleton, 2018; Link et al., 2019) hence the argument of a lack of formalized process to integrate EAFM advice into EU fisheries policy.

Our analysis shows that the dynamics of the EU advisory system appear to constraint the provision of an EAFM advice in the EU. First, dealing explicitly with trade-offs –as required under an EAFM (Long et al., 2015; Skern-Marutzen et al., 2018; Link et al., 2019), the conventional fisheries decisions concerning healthy commercial fish stocks are expanded to include maintaining biodiversity, ensuring long-term abundance and reproduction of food webs, and ensure sea floor integrity from a science perspective, but this needs to be balanced with consideration of economic and social impacts. For a truly EAFM, as well as fully implemented CFP, social aspects/indicators should be strengthened in fisheries management processes. Several players within the advisory system may produce this kind of advice (e.g. JRC, STECF) but presently there is no EU policy decision to be supported by it. It needs to be explored in particular whether making the social and economic sustainability more explicit in the next CFP reform would formalize the request of such components. The 2002 CFP included a *social sustainability* component⁶, but this element is not included in the 2013 CFP. In addition, although there are a number of points and objectives related to socio-culturally aspects in the 2013 CFP (e.g., “*fair standard of living*” and “*preserve traditional fishing activities*”), these points appear to lack the strength of the overarching “*social sustainability*” component of the 2002 CFP (STECF 1, 2017). Second, regional management challenges the advisory system. On the one hand, the advice needs to broad the scope at a level with multiple actors without a competent decision body that could use it. At the other hand, the new players at regional level (MSRG) might be disrupting the interplay with other actors (e.g. ACs). Both of them, however, lack resources to deliver on time multiple advice requests on fisheries decisions, let alone ecosystem considerations (Mackinson and Middleton, 2018). Finally, the underlying tension between fisheries and marine environmental advice is being addressed (ICES, JRC) but further progress from the policy side (EC) is still required (see Ballesteros et al. 2018). Ideally, the EC would formulate concrete operational management objectives combining the streams of the fisheries and environmental policies. This is unlikely to happen in the short term. We suggest (in the meantime) a path to ensure advances towards informed EAFM policy decisions.

What next steps could be taken in the advisory system to foster the transition towards and EBFM in the EU? In terms of concrete actions for (stakeholder) advisory bodies, providing advice in implementation of EBFM is through regional processes. Investments and initiatives (*pushing strategies*) must be designed taking into account the specificities of the socio-ecological context (Rudd et al., 2018). Lessons can be learnt from other continents on how EAFM implementation processes have taken place, e.g USA (Levin et al., 2018; Jones and Seara, 2020), Canada (Stephenson et al., 2019b), and New Zealand (Mackinson and Middleton, 2018). Through gradual adjustment and iterative processes such knowledge and experience could be adjusted to the contextual conditions (Langlet and Rayfuse, 2019). *Windows of opportunity* (e.g. on the benefits of an EAFM) may offer possibilities for transitions toward an EBFM, and the importance of individuals as catalyst,

⁶ The CFP shall ensure exploitation of living aquatic resources that provides sustainable economic, environmental and social conditions. For this purpose, the Community shall –among other things, “*aim at a progressive implementation of an eco-system-based approach to fisheries management*” (Reg 2371/2002, art 2(1))

can-do committed personalities, has also been pointed out as a key aspect (Mackinson and Middleton, 2018; Rudd et al., 2018)

In terms of concrete actions for (scientific) advisory bodies providing advice, building the capacity to manage and reach an in-depth understanding of issues that cut across the natural and social sciences take sustained time, effort, and investment (Rudd et al., 2018; Link et al., 2019; Pope and Weber, 2019). Providing resources to create this capacity can be viewed as an investment to increase understanding of social, economic and political aspects which interrelate with ecosystemic components. It is an upfront investment which make more likely that the EBFM objectives will be met (Rudd et al., 2018). Current efforts by key players in the system (see for instance, ICES Strategic Plan for 2019) illustrate this. Different ways of producing and integrating knowledge has been presented among the key challenges to implement EBFM (Link et al., 2019). The EBFM process can be used as a tool for a better alignment between scientific effort and policy needs by better articulating EBFM challenges and/or identifying and creating new knowledge that addresses those challenges (Cormier et al., 2017; Rudd et al., 2018; Langlet and Rayfuse, 2019). Stakeholder engagement in advisory process helps ensure that outputs remain relevant to societal needs; considerations of risk and uncertainty, normative values, and trade-offs between management objectives is not something to be explored solely by researchers (Dickey-Collas and Ballesteros, 2019), although interaction with stakeholders also need to be considered more carefully. Governments can use stakeholder engagement implicitly as a tool to download management costs on stakeholder groups (Rudd et al., 2018). ACs report that the work load for their members has exponentially increased as more projects, institutions, and bodies call on their participation as formal stakeholders; this may result in dilution of attention and growing resentment toward events that use poor stakeholder engagement practices (Rudd et al., 2018). The present situation in Europe can be considered a period of progressive collaborative research initiatives seeking to fill evidence gaps and promote shared learning and problem solving; however, these successes represent an ad-hoc collection of good practice examples rather than demonstration of a systematic move towards institutionalization of co-design and co-delivery processes (Mackinson and Middleton, 2018).

In terms of concrete actions for recipients of advice, the goal of EBFM is to improve decision-making by providing a means for managers to explicitly consider all ecological, social, and economic components, across all fisheries prosecuted in the system (Levin et al., 2018; Dickey-Collas and Ballesteros, 2019). Although scientific bodies have done a great effort in advancing knowledge to deliver integrated advice, it is not so well understood how to make it work for the actual decisions that fisheries managers have to take. At the same time, decision-makers need to be open and responsive to the need for continued adjustments in the light of new knowledge (Langlet and Rayfuse, 2019). Further developments in how the advice is requested and what decision-makers may gain from redefining those requests would be a significant step forward. A significant step forward might also be *windows of opportunity* applicable for policy entrepreneurs (politicians or leaders of interest groups) to put enhanced EBFM implementation on the political agenda through coalition building or strategic framing of EBFM issues. Allowing for a flexible approach to delivering EBFM advice, both (stakeholder and scientific) advisory bodies and decision-makers may find ways to accommodate what ones are able to produce and what others are able to use for short and mid-term decisions in European fisheries.

5. Conclusion.

Implementing an EAFM is a CFP objective, as well as an MFSD objective, which requires advice on biotic, abiotic, social and economic components. On the one hand, scientific and governance advances increase the capacity of the advisory bodies to deliver advice to achieve that policy goal. On the other hand, conventional EU decision-making based on stock-related advice (how much to fish, when and where) has only started to gear towards ecosystem-related decisions (e.g. what parts of the ecosystem to protect or to be considered in management). Multi-annual plans can be considered as a first move towards EAFM but does not go beyond multi-species management and have their roots in the present management paradigm (Ramírez-Monsalve et al., 2016b; Hegland and Raakjær 2020).

We have explored to what extent the process of providing advice in support of an EA (EAFM advice), as well as integrating it into management has been formalized. We examined this in terms of two questions: (i) *to what extent can the EAFM advice be provided?* And (ii) *how prepared is the management system to integrate EAFM advice?* We first elaborated on what could be understood as EAFM advice (Figure 1), and mapped the EU fisheries advisory landscape (Figure 2). We then examined what advisory actors currently (2014-2018) provide in terms of EAFM advice (Figure 3). We also collected information on the challenges encountered associated to the uptake by recipients of the advice.

Substantive progress could be based in three components: first, implementation of EAFM requires transitional periods and innovation within the current setting rather than new decision-making frameworks aiming for accountability and better integration. Second, the advances towards EAFM need to be facilitated through the implementation of initiatives for the main players (pushing strategies), and by creating flexibility in the system and alignment of expectations. Third, as EAFM increases the complexity of management, transparency about the trade-off between different management choices need to be provided and resources need to be allocated to this purpose. We have suggested steps for (stakeholder and scientific) advisory bodies, and for the recipients of advice (decision-makers) to foster the transition towards an EAFM in the EU.

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6. References

AC Secretariats (2014a). Status of ACs on providing advice on EAFM. ACs secretariats of NSAC, NWWAC, PELAC, and MEDAC, Brussels, June 10, 2014 [focus group]

AC Secretariats (2014b). ACs constrains for providing EAFM advice in terms of resources, scope and processes. ACs secretariats of NSAC, NWWAC, PELAC, MEDAC, SWWAC, BSAC, July 01 – October 27 2014 [key informant interviews]

AC Secretariats (2017). Perceptions on development of AC's capacity to provide EAFM advice (AC's secretariats of PELAC, NSAC, MEDAC, BSAC), September 18 – 21, 2017 [key informant interviews]

Ballesteros, M. et al., (2018). Do not shoot the messenger: ICES advice for an ecosystem approach to fisheries management in the European Union. *ICES Journal of Marine Science*, <https://doi.org/10.1093/icesjms/fsx181>

BSAC (2016). Outcome of the BSAC Technical Working Group. 15th December 2016. <http://www.bsac.dk/getattachment/Meetings/BSAC-meetings/Working-group-on-technical-measures/BSACWGtodealwithtechnicalmeasures15122016Outcome.pdf.aspx?lang=en-GB>

CSG et al (2016). Council Steering Group on MSFD &EA, ACOM leadership, ICES secretariat (2016) ICES and Ecosystem Based Management (accessed September 2017): <https://www.cbd.int/doc/meetings/mar/soiom-2016-01/other/soiom-2016-01-ices-01-en.pdf>.

Coll, M., et al., (2015). Modelling dynamic ecosystems: venturing beyond boundaries with the Ecopath approach. *Reviews in Fish Biology and Fisheries*, 25(2), 413–424. <https://doi.org/10.1007/s11160-015-9386-x>

Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries C/2016/1084. OJ C 74, 26.2.2016, p. 4–10

Cormier, R., et al., (2017). Moving from ecosystem-based policy objectives to operational implementation of ecosystem-based management measures. *ICES Journal of Marine Science*, 74(1), 406–413. <https://doi.org/10.1093/icesjms/fsw181>

Curtin, R., & Keatinge, M. (2018). A methodology to measure the social impact of the EU quota setting procedure. *Marine Policy*, 95(May), 248–255. <https://doi.org/10.1016/j.marpol.2018.05.023>

Dickey-Collas, M., & Ballesteros, M. (2019). Swinging back ? Science ethos and stakeholders ' engagement in ICES advisory processes . (Fishing industry as authors of ICES expert group reports). <https://www.ices.dk/news-and-events/news-archive/news/Pages/Science-ethos-and-stakeholders-engagement-in-ICES-advisory-processes.aspx>

EU FP7 PROJECT (2011). Welcome to the CREAM project (accessed September 2017): <http://www.cream-fp7.eu/index.html>.

EC (2017). European Commission, Fisheries, Regional fisheries management organizations (RFMOs) (accessed September 2017): https://ec.europa.eu/fisheries/cfp/international/rfmo_en

Eliassen, S. Q. et al. (2015) Decentralising: The implementation of regionalisation and co-management under the post-2013 Common Fisheries Policy. *Marine Policy* 62: 224–232
<https://doi.org/10.1016/j.marpol.2015.09.022>

FAO (2015). General Fisheries Commission for the Mediterranean. Report of the seventeenth session of the Scientific Advisory Committee. FAO headquarters, Rome.

FAO (2017a). General Fisheries Commission for the Mediterranean (GFCM). About GFCM (accessed September 2017): <http://www.fao.org/gfcm/background/about/en/>

FAO (2017b). General Fisheries Commission for the Mediterranean (GFCM). Role of the GFCM (accessed September 2017): <http://www.fao.org/gfcm/background/role/en/>

FAO/GFCM (2017). Nineteenth session of the Scientific Advisory Committee (SAC). Ljubljana, Slovenia.

Fulton, E. (2010). Approaches to end-to-end ecosystem models. *Journal of Marine Systems* 81: 171-183
<https://doi.org/10.1016/j.jmarsys.2009.12.012>

Garcia, S. M., & Cochrane, K. L. (2005). Ecosystem approach to fisheries: A review of implementation guidelines. In *ICES Journal of Marine Science*. <https://doi.org/10.1016/j.icesjms.2004.12.003>

GFCM 1 (2017). Interview member GFCM; September, 2017 [key informant interview]

GFCM 2 (2017). Interview member GFCM; September, 2017 [key informant interview]

Hegland, T. J., et al., (2015) Implementing ecosystem-based marine management as a process of regionalisation: some lessons from the Baltic Sea. *Ocean Coast Manag.* 117: 14-22
<https://doi.org/10.1016/j.ocecoaman.2015.08.005>

Hegland, T., & J Raakjaer, (2020, March 31). The Common Fisheries Policy. *Oxford Research Encyclopedia of Politics*. <https://oxfordre.com/politics/view/10.1093/acrefore/9780190228637.001.0001/acrefore-9780190228637-e-1099>.

ICCAT (2005). International Commission for the Conservation of Atlantic Tunas (ICCAT) Standing Committee on Research and Statistics (SCRS), Terms of Reference for a Sub-committee on Ecosystems. *ICCAT*.

ICCAT (2006). Organigram. (accessed September 2017): <http://www.iccat.es/en/CommOrganigram.htm>.

ICCAT (2007). Introduction (accessed September 2017): <http://www.iccat.es/en/introduction.htm>.

ICCAT (2017). Report for biennial period, 2016-17, Part I (2016). Vol 2. *SCRS. ICCAT*

ICES (2014). ICES Strategic Plan 2014-2018. 21 pp. www access <https://www.ices.dk/news-and-events/news-archive/press-releases/Pages/Press-Release---ICES-is-leading-the-way-to-integrated-understanding-of-marine-ecosystems.aspx>

ICES (2016). Providing the knowledge for ecosystem based management (accessed September 2017): https://www.slideshare.net/ICES_ASC/knowledge-for-ecosystem-based-management. Published November 2016.

ICES (2017). Explaining ICES approach to ecosystem based management (accessed September 2017): <http://www.ices.dk/news-and-events/news-archive/news/Pages/Explaining-ICES-approach-to-ecosystem-based-management.aspx>

ICES (2018). Interim Report of the Working Group on SOCIAL indicators (WGSOCIAL). 25-29 June 2018. ICES Headquarters, Denmark. ICES CM 2018/IEASG: 13. 19 pp. <http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/IEASG/2018/WGSOCIAL/WGSOCIAL%202018.pdf>

Jones, K., & Seara, T. (2020). Integrating Stakeholders' Perceptions into Decision-Making for Ecosystem-Based Fisheries Management *Coastal Management, 0*(0), 1–14. <https://doi.org/10.1080/08920753.2020.1773211>

JRC (2016a). JRC in brief (accessed September 2017): <https://ec.europa.eu/jrc/en/about/jrc-in-brief>

JRC (2016b). Coastal and marine environment (accessed September 2017): <https://ec.europa.eu/jrc/en/research-topic/coastal-and-marine-environment>

JRC (2016c). Fisheries and aquaculture (accessed September 2017): <https://ec.europa.eu/jrc/en/research-topic/fisheries-and-aquaculture>.

JRC (2017). Data Collection Framework, fisheries data collection web site (accessed September 2017): <https://datacollection.jrc.ec.europa.eu/index.html>.

JRC 1 (2017). Interview member JRC; September 29, 2017 [key informant interview]

Levin, P. S. et al., (2018). Building effective fishery ecosystem plans, *92 Marine Policy* (October 2017), 48–57. <https://doi.org/10.1016/j.marpol.2018.01.019>

Link, J. S., et al. (2012) Dealing with uncertainty in ecosystem models: The paradox of use for living marine resource management. *Progress in Oceanography* 102: 102-114. <http://doi.org/10.1016/j.pocean.2012.03.008>

Link, J. S., et al., (2019). Clarifying mandates for marine ecosystem-based management. *ICES Journal of Marine Science*, 76(1), 41–44. <https://doi.org/10.1093/icesjms/fsy169>

Langlet and Rayfuse (2019). Challenges in implementing the Ecosystem Approach: Lessons Learned. In D. Langlet & R. Rayfuse (Eds.), *The Ecosystem Approach in Ocean Planning and Governance. perspectives from Europe and beyond. Series: Publications on ocean development; 87. Netherlands: Brill Nijhoff* <https://doi.org/10.1163/9789004389984>

Mackinson, S., & Middleton, D. A. J. (2018). Evolving the ecosystem approach in European fisheries : Transferable lessons from New Zealand's experience in strengthening stakeholder involvement. *Marine Policy*, 90(August 2015), 194–202. <https://doi.org/10.1016/j.marpol.2017.12.001>

MareFrame (2017). Co-creating Ecosystem-based Fisheries Management Solutions. European Union's Seventh Framework Programme. <http://mareframe.eu/>

MSRG Baltfish 1 (2016). Interview member Baltfish group; October 2015 [key informant interview]

MSRG Scheveningen 1 (2016). Interview member Scheveningen group; January 2016 [key informant interview]

MSRG Scheveningen 2 (2016). Interview member Scheveningen group; January 2016 [key informant interview]

NSAC (2017). Ecosystem Working Group, Draft minutes. 23rd February 2017. <http://nsrac.org/forthcoming-meetings/ecosystem-working-group-23rd-february-2017-edinburgh/>

Ohms, V. R., & Raakjær, J. (2019). The future of the Pelagic Advisory Council: Repositioning the organization in the face of BREXIT. *Marine Policy*, 106(May), <https://doi.org/10.1016/j.marpol.2019.103535>

Patrick, W. S., & Link, J. (2015). Myths that Continue to Impede Progress in Ecosystem-Based Fisheries Management. *Fisheries*, 40(4), 155–160. <https://doi.org/10.1080/03632415.2015.1024308>

Pope, J. G., et al., (2019). Steps to unlocking ecosystem based fisheries management : Towards displaying the N dimensional potato. *Fisheries Research*, 209(February 2018), 117–128. <https://doi.org/10.1016/j.fishres.2018.07.023>

Pope, J. G., & Weber, C. T. (2019). A parable of compliance issues and their link to EBFM outcomes. *Fisheries Research*, 211(November 2018), 51–58. <https://doi.org/10.1016/j.fishres.2018.10.012>

PELAC (2015). Pelagic Advisory Council, Newsletter 1/2015. January-March 2015. <https://www.pelagic-ac.org/media/pdf/Newsletter%201-2015.pdf>

PELAC (2016). Pelagic Advisory Council, Newsletter 3/2016. July-September 2016. <https://www.pelagic-ac.org/media/pdf/Newsletter%203-2016.pdf>

PELAC (2018). Pelagic Advisory Council, Newsletter 2/2018. April-June 2018. <https://www.pelagic-ac.org/media/pdf/Newsletter%202-2018.pdf>

Ramírez-Monsalve, P., et al., (2016a). Ecosystem Approach to Fisheries Management (EAFM) in the EU – Current science-policy-society interfaces and emerging requirements. *Marine Policy* 66: 83-92 <https://doi.org/10.1016/j.marpol.2015.12.030>

Ramírez-Monsalve, P., et al., (2016b). Institutional challenges for policy-making and fisheries advice to move to a full EAFM approach within the current governance structures for marine policies. *Marine Policy* 69: 1-12 <https://doi.org/10.1016/j.marpol.2016.03.016>

Rätz, H-J., et al. (2010). Complementary roles of European and national institutions under the Common Fisheries Policy and the Marine Strategy Framework Directive. *Marine Policy* 34: 1028-1035 <https://doi.org/10.1016/j.marpol.2010.03.001>

Regulation (EU) No. 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, OJ L 354, p 22-61.

RTD (2015). MareFrame Round table discussion. EAFM in EU's CFP. Members of DG MARE, ICES, STECF, and EFARO, Brussels, January 2015 (round table discussion)

Rudd M.A. et al. (2018) Ocean Ecosystem-Based Management Mandates and Implementation in the North Atlantic. *Front. Mar. Sci.* 5:485. <https://doi.org/10.3389/fmars.2018.00485>

SCMEE (2015). Subcommittee on Marine Environment and Ecosystems Transversal Workshop on Ecosystem Approach to Fisheries. Salammbô, Tunisia.

SCRS (2013). Report on the Standing Committee on Research and Statistics. *ICCAT/CICTA/CICAA*. Madrid.

SCRS (2015). Report of the Standing Committee on Research and Statistics. *SCRS*. Malta

SCRS (2017). Report of the 2016 Inter-sessional Meeting of the Sub-committee on Ecosystems. *Collect. Vol. Sci. Pap. ICCAT*, 73(9), 3042-3119.

Stange, K. et al. (2012) Managing organizational change in an international scientific network: A study of ICES reform processes. *Marine Policy*. 36: 681-688 <https://doi.org/10.1016/j.marpol.2011.10.013>

STECF (n.d.) About STECF. www access <https://stecf.jrc.ec.europa.eu/about-stecf>

STECF 1 (2017). Interview former member STECF; September 2017 [key informant interview]

STECF 2 (2017). Interview member STECF; September 2017 [key informant interview]

Stephenson, R. L., et al., (2019a). A practical framework for implementing and evaluating integrated management of marine activities. *Ocean and Coastal Management*, 177(March), 127–138. <https://doi.org/10.1016/j.ocecoaman.2019.04.008>

Stephenson, R. L. et al., (2019b). Integrating diverse objectives for sustainable fisheries in Canada. *Canadian Journal of Fisheries and Aquatic Sciences*, 76(3), 480–496. <https://doi.org/10.1139/cjfas-2017-0345>

Tallis, H. et al., (2010) The many faces of ecosystem-based management: Making the process work today in real places. *Marine Policy* 34: 340-348 <http://doi.org/10.1016/j.marpol.2009.08.003>

Trenkel, V. M. (2018). How to provide scientific advice for ecosystem- - based management now, (August 2017), 390–398. <https://doi.org/10.1111/faf.12263>

WEAF (2016). MareFrame Workshop on the Ecosystem Approach to Fisheries. Members from BSAC, NWWAC, MEDAC, NSAC, PELAC, DG MARE, ICES, STECF, Copenhagen, October 2016 [workshop]

Wenzel, B. (2017). Organizing coordination for an ecosystem approach to marine research and management advice: The case of ICES. *Marine Policy*, 82(December 2016), 138–146. <https://doi.org/10.1016/j.marpol.2017.05.009>

