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Asking for advice: A Review of the Special Request for ICES Advice of the years 2010 to 2020

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Master's thesis in International Fisheries Management…[FSK-3910] … [Autumn 2021]

Declaration

I, Adwoa Sarfowaa, hereby declare that the thesis titled "Asking for advice: A Review of the Special Request for ICES Advice of the years 2010 to 2020" is the result of my original research conducted under the supervision of Professor Petter Holm and Scientist Kåre Nolde Nielsen, and there is no copy of the thesis, in part or full, for another degree at this university or another institution.

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Dedication

This study is dedicated to my mother, Mad. Akosua Afriyie, Mr. Kwaku Addai Asamoah (my late father), and Her Hon. Lady Mrs. Sarah Adwoa Sarfo.

Additionally, to Mad. Sonia Nkum, and Mrs. Phillipa Lamptey for their assistance in advancing my academic career. And once again, to my siblings, nephews, and nieces for their tremendous support in bringing me this far.

Acknowledgment

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Terms/Acronyms with Explanation

ACOM
Advisory Committee

BRPs
Biological Reference Points

EA
Ecosystem Approach

EAFM
Ecosystem Approach to Fisheries Management

EBFM
Ecosystem-Based Fisheries Management

EBM
Ecosystem-Based Management

EBSA
Ecologically or Biologically Significant Marine Areas

EC
European Commission

EEZ
Exclusive Economic Zone

ESSR
Ecoregion specific special request

EU
European Union

EU/ECR European Union/European Commission

EU/IOR
European Union/Individual Organisation Requesters

EU/NEUMSR
European Union/Non-European Union Member State Requesters

F
Fishing mortality rates

FAO
Food and Agriculture Organization of the United Nation

GS
Geographic Scope

ICES
International Council for the Exploration of the Sea

IMSR
Individual Member-state Requesters

IOR
Individual Organization Requesters

JMSR
Joint Member-state Requesters

JOR
Joint Organization Requesters

MSFD
Marine Strategy Framework Directive

MSY
Maximum Sustainable Yield

NDR
Non Defined Requesters

NESSR
Non-ecoregion specific special

PA
Precautionary Approach

PRISMA
Preferred Reporting Items for Systematic Reviews and Meta-Analysis

RSRIA
Requesters of the SRIA

SLR
Systematic literature review

SRFA
Special Request for Advice

SRIA
Special Request for ICES Advice (from 2010 to 2020)

SSAFM
Single-Species Approach to Fisheries Management

VME
Vulnerable marine ecosystems

VMSs
Vulnerable marine stocks

Abstract

The International Council for the Exploration of the Sea (ICES) is the primary advisory body in the North-East Atlantic, coordinating about 700 marine institutions throughout Europe, five affiliates, and other international projects. ICES offers guidance on a wide range of topics, from the impact of pollutants on individual animals to the state of fish populations and the consequences of numerous human stressors and climate on an ecoregional scale. Each year, the ICES delivers different advice to member nations on fisheries resources and ecosystems, and among the various forms of advisory service requests, the Special request system stands out. The peculiarity of the special request for ICES advice (SRIA) is reflected in a more extensive interaction between the requesters and the ICES to develop a clear and transparent advisory product in response to the request. With the advocate of ecosystem management, it is expected that a transition towards this approach is likely to increase the demand for SRIA. Dolan et al. classified the different EMs into four separate levels: SSAFM (single-species approach to fisheries management), EAFM (ecosystem approach to fisheries management), EBFM (ecosystem-based fisheries management), and EBM (ecosystem-based management). The categorization of these levels, which are here referred to as Dolan's levels, are utilized as a tool to examine the SRIA to establish whether or not there is a trend in the EM levels. Through the research of SRIA, a novel approach for evaluating trends in single-species management to more advanced degrees of ecosystem integration may also be developed. In addition, the study set out to establish a preliminary method for studying the SRIA's conspicuous features, see how fisheries management has been categorized toward Dolan's levels in the SRIA, and investigate the various SRIA requesters and geographic affiliations. This research employs some elements of the Preferred Reporting Item for Systematic Reviews and Mata-Analyses (PRISMA) checklist to establish a framework for assessing the SRIA. The most recent data for this study were obtained from the ICES official homepage and the baseline period covered by the review was from 2010-2020. In the study, The SRIA was examined using Dolan's EM levels, the SRIA requesters were divided into eight major groups, and the SRIA's geographic scope was generally grouped into four important groups. This study discovered no significant trend in the SRIA. The SRIA requesters submitted two unique types of special requests: non-ecoregion-specific special requests (NESSR) and ecoregion-specific special requests (ESSR). Finally, in the geographical affiliation of the SRIA different forms of geographical or non-geographical variables may account for the variation in the number of SRIA. However, the research encountered some uncertainty about the classification into one of Dolan's EM levels, which

may have compromised the robustness of the categorization of SRIA. As a best practice, SRIA expert panel discussion is recommended to debate on individual SRIAs to eliminate these concerns about bias across the entire research.

1 Introduction

The International Council for the Exploration of the Sea (ICES) is a major advisory organization, founded in 1902 but defined its Convention in 1964 with 3 fundamental purposes: to promote and stimulate research and exploration of the sea; with core goals of developing programs essential for this purpose, and to organize any important future research (ICES 2013b). About 700 maritime institutions in Europe and five affiliates make up this intergovernmental organization's network of 5000 specialists (Ballesteros et al. 2018). Roughly, 1500 experts actively participate in their yearly events, which have a geographical span of 20 member nations (Lordan 2018). The ICES is organized around five major work areas: science (promotes marine science research and collaboration), advice (which provides objective, evidence-based scientific advice on environmental issues and fisheries management), data and information (which serves as the custodian and provider of fisheries and environmental data), training (which helps build capacity to support scientific advice), and communication (disseminating scientific knowledge, statistics and advice to general members) (Lordan 2018). In the Advisory Plan of ICES, the approach to ecosystem management is defined as the core premise that regulates how the scientific community delivers independent advice on anthropogenic activities in the seas and oceans (Advice 2020b). The ICES, through this system, seeks to improve and disseminate scientific understanding of marine ecosystems and the services they offer to realize conservation, management, and sustainability objectives (ICES 2020i). From the advisory framework, the ICES has an established science plan (known as the ICES Science Plan) which governs around the concept of ecosystem and sustainability science and they explore this knowledge to produce scientific advice that has a significant and positive influence on society (ICES 2020i).

With an open and transparent advisory system, the ICES scope of advice revolves around matters that include the impact of pollutants on individual animals, the health of fish populations, and the consequences of various human pressures and climate change at the ICES ecoregional levels (ICES 2020i). The advisory products from the ICES community are exploited and created from the most up-to-date scientific research and data available at the time of their formulation.

However, its enhancements are stimulated from feedbacks. The ICES improves its coordination and monitoring of marine ecosystems as a result of these contributions. In the organization, the sole body that is responsible for the approval of all the advisory products and processes the current advisory development and improvement is the ICES Advisory Committee (ACOM) (Advice 2020b). It is composed of delegates nominated by each ICES Member Country, and decisions are reached unanimously. Additionally, the scientific community provides evidence-based advice in response to maritime policies, legal instruments, multiple international agreements, and client legal needs (ICES 2013b). For example, advice on issues relative to living marine resources (LMR) exploitation relies on some treaties and conventions such as the United Nations Straddling Fish Stocks Agreement of 1995 ((UN 1995) (known as the UN Fish Stocks Agreement or UNFSA)), United Nations Convention on the Law of the Sea ((UN 1982) (also known as UNCLOS)), and the FAO Code of Conduct for Responsible Fisheries (FAO 1995), etc. Furthermore, several relevant policies and legal tools that conceptualize the ICES advice to manage the impacts on ecosystems by human activities follow: The Marine Strategy Framework Directive (EC 2008), the Common Fisheries Policy of the European Union (EU 2013), Norwegian Marine Resources Act (Lovdata 2008) and among others.

ICES (2018), classifies advisory products into two broad categories: Advice that is approved by the ICES Advisory Committee (ACOM) and Services supplied by the ACOM Leadership and/or the Secretariat under the supervision of the ACOM (Advice 2013). There are a variety of advisory products available that are connected to marine environments, ranging from fishing opportunities to the ecosystem and environmental problems. Whereas 'Aquaculture Overviews' are also being created, the 'Ecosystem and Fisheries Overviews' are produced and frequently updated by ICES based on requirements highlighted by the scientific community and those seeking guidance (ICES 2020i). A four-stage structure comprising request formulation, knowledge synthesis, peer review, and advice production is used to create ICES recommendations (ICES 2020i).

An ICES services are the way of giving scientific information or the process through which policymakers get scientific knowledge. They are categorized into technical services, clarification of advice, process services, and review services (ICES 2018). The ICES 'Request formulation' is grouped into 'Recurrent requests' and 'Special requests' (ICES 2020i). It also delivers a variety of products and services including, Ecosystem, Fisheries, and Aquaculture Overviews, and Viewpoints and Requests for services (ICES 2020i).

Recurrent requests result in the updating of existing ICES advice through the use of predefined methods/models and new data given by Member Countries via established data calls and flows (ICES 2020i). Numerous replies to recurring requests include detailed information on the effects and dangers associated with various management alternatives, even when the management aim is stated. Additionally, these demands often pertain to well-established scientific and management frameworks (ICES 2020i). Annually, the expert network gathers to synthesize information for recurrent requests and the ACOM adapts its yearly terms of reference (ToRs). Input from the expert groups is used to update the existing knowledge base and assemble new data, they are peer-reviewed independently by expert groups and the advice for recurrent requests is prepared by an ADG (ICES 2020i).

Special requests deal with the advice on specific issues to individual member countries per their request in a dialogue form. In contrast to recurrent requests, special requests often do not fall neatly into well-established science and management frameworks. They may include complex issues with ambiguous nature which could generate unforeseen challenges and uncertainties (ICES 2020i). In this type of Request formation, all applications need to be clear with easy understanding, their normative management objectives must be transparent and the ACOM with the assistance of the Secretariat appraise the special requests with agreed benchmarks (Advice 2020b). When making recommendations, ACOM takes the request's urgency into account, as well as the advice's possible influence on business choices. One-time workshops or a yearly network of expert groups synthesize information for specialized demands (ICES 2020i). ACOM changes their ToRs to fit their needs and as a result, benchmarking methodologies are used in various ways, such as impartial peer evaluation of workshop output. ADGs are used in the same way as for recurrent advice to provide advice for exceptional requests, with final approval by ACOM (ICES 2020i).

Ecosystem, Fisheries, and Aquaculture Overviews and Viewpoints are regional guidance products that summarize developments in any ecoregion of the ICES and they provide value to both routine and one-off requests, while also increasing the capacity to give holistic ecosystem advice (ICES 2020i). They address regional managers' concerns and include new information on ecosystem, fisheries, and aquaculture trends as it becomes available. Expert groups and/or workshops combine their expertise to create Ecosystem Overviews, which are then presented to the public (ICES 2020i).

In the Requests for services, ICES leverages its networks to identify and engage independent experts or experts' groups to fulfill service requirements. ICES Data Centre is responsible for or oversees data compilation and mapping services and as a service, an ICES-approved peer review is available (ICES 2020i). As services are not considered ICES guidance, they are not subjected to the official advisory procedure. The Secretariat, on the other hand, notifies ACOM of a service request and makes production recommendations (ICES 2020i).

The mandate of the ICES is to provide diversified expertise on marine policy and management concerns. ICES collaborates with its clients to determine the most effective method of offering comprehensive guidance. Advice is sent immediately via the ICES Internet site, and a yearly summary of guidance is included in this publication, which covers all facets of ICES advice (ICES 2020i). The requesters of ICES advice are known as MIRIA, and its members include regional fisheries and environmental commissions, as well as responsible authorities from ICES member nations. (ICES 2017). Public agencies with jurisdiction over maritime management may make requests for advice, and these agencies include the following:

- ❖ Governments of ICES Member Countries (of 20 member countries)
- ❖ European Commission (EC)
- ❖ Helsinki Commission (HELCOM)
- ❖ North Atlantic Salmon Commission (NASCO)
- ❖ OSPAR Commission (OSPAR)

The ICES community's synthesis of information for the benefit of its members is connected to geographical distributions or ecoregions. Ecoregions are used as geographical units by this scientific organization to give various recommendations on fisheries resources and ecosystem management (ICES 2020e). In the words of Bailey (1983), ecosystem regions or ecoregions are described as "large ecosystems of a regional extent that contain several smaller ecosystems or geographical zones that represent geographical groups or associations of similarly functioning ecosystems." Their establishments are through an iterative process of consultations between scientists and stakeholders, which is overseen by our Advisory Committee (ACOM) (Advice 2020a).

In the ICES, the system of fishing area and the ecoregional system are distinct; thus, the latter represents ICES' commitment to establishing evidence for an approach to ecosystem fisheries management (ICES 2020e). Ecoregion delineations are critical for the ICES because their

distinct characteristics aid in establishing boundaries for the study of social dynamics and ecosystems and guide an integrated management strategy on a local scale. The ICES ecoregions, as described as primary spatial units, are keys for creating knowledge, innovative methodologies, and monitoring programs (ICES 2020e).

The present ICES ecoregion originated in 1904 as the ICES fishing area, intending to collect statistics on fisheries catch. However, due to its inadequacy as a tool for showing ecosystem-based management, a new ecoregion was introduced in 2004. The call from the Environment Directorate-General of the European Commission (EU DG Environment) led to the establishment of the 2004 ecoregion and while assessing the definitions and probable merging of existing spatial systems, a variety of assessment criteria were used (Advice 2004). ICES used diverse regionalization systems (such as Dinter biogeographical regions, Longhurst provinces, large marine ecosystems (LMEs), ICES fishing areas, OSPAR regions, and EU Regional Advisory Council areas) to deduce the independence of the system to either biogeographic, oceanographic, ecological and human impact or management issues (Advice 2004). The ICES maps out ecoregions with the different biogeographic and oceanographic characteristics through the coordination of the economic, social, political, and management divisions (Advice 2020a).

Ecoregions are dynamic, as their boundaries are not permanent. They are progressively evaluated periodically in response to public debate and input from policymakers (ICES 2020e). Four principles were adopted to the 2004 ecoregional delineations to create the present ecoregion in 2015, which is split into twelve areas. The current ecoregions are modified from the 2004 ecoregion in that their boundaries have been redrawn to reflect new policy objectives and legislative reconciliation (e.g., the MSFD and the EU water and habitats directives) (ICES 2020e). See below for a list of the current ICES ecoregions including the Arctic Oceans, Azores, Barents Sea, Baltic Sea, Bay of Biscay and Iberian Coast, Celtic Sea, Faroes, Greater North Sea, Greenland Sea, Icelandic Waters, Norwegian Sea, and Oceanic Northeast Atlantic.

Figure 1.1 The map of the ICES Ecoregions is shown above. The Arctic Oceans, Azores, Barents Sea, Baltic Sea, Bay of Biscay and Iberian Coast, Celtic Sea, Faroes, Greater North Sea, Greenland Sea, Icelandic Waters, Norwegian Sea, and Oceanic Northeast Atlantic are represented with distinct hues. (Source, ICES (2020e)).

1.1 Problem Statement

Global advancements in sustainable fisheries management have been a long-standing policy objective of a number of marine-related organizations, including the ICES (International Council for the Exploration of the Sea), PICES (North Pacific Marine Science Organization), FAO (Food and Agriculture Organization), UNEP (United Nations Environment Programme), and NOAA (National Oceanic and Atmospheric Administration) (Link and Browman 2014). Many summits on the implementation of an enhanced holistic fisheries management framework have mandated the requirement to incorporate an ecosystem approach into fishery management plans, and this has been a regular topic of discussion.

In a broader context, the Convention on Biological Diversity (CBD) defines the Ecosystem Approach as "a strategy for the integrated management of land, water, and living resources that

promotes conservation and sustainable use in an equitable way" (Smith and Maltby 2003). However, a more detailed description for the European Marine Strategy is "a comprehensive integrated management of human activities based on the best available scientific knowledge about the ecosystem and its dynamics, to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity" (Rice et al. 2005). From the perspective of Rice et al. (2005), the Ecosystem Approach offers a strategic balance between anthropogenic activities as well as human demands and their potential effects on the marine environment, while also emphasizing the different effective management regimes.

The ICES, a scientifically-driven organization, is a significant international network dedicated to raising knowledge of the ecosystem approach in the management of fisheries across the European Union (EU) and beyond. A deeper recognition of the marine ecosystem within the framework of fisheries management by such an independent and advisory organization initiated a gradual development of "a functional strategic plan" which commenced in the year 1999 and this, was approved by representatives from 19 member countries (ICES 2002). Subsequently, the ICES 7 scientific committees have instituted detailed action plans to execute this new approach (Misund and Skjoldal 2005). With their capacity to respond to the unforeseen need of the ecosystem in the management of fisheries, the ICES provides an exceptional role of delivering responses to its clients on a Special Request for ICES Advice[1] (SRIA) (Advice 2020b).

Within the context of the scientific management of the ecosystem, the SRIA could be expected to have expressed a unique development from the scope of a single-species focus towards a more general and multi-sector standpoint. For example, a bibliometric study (in Dolan et al. (2016)) from the Web of Science Database determined high usage of the terminologies "EBM", "EBFM", and "EAFM" as key issue topics in peer-reviewed publications over the past 20-years. The latter could be used as evidence of the classification in ecosystem management from a fisheries perspective.

Accordingly, there is a trend towards a more inclusive ecosystem approach in fisheries management (Trochta et al. 2018), and that the SRIA, like any other scientific request system, is anticipated to reflect this trend. As maritime management moves towards an ecosystem-based

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[1] SRIA – Special Request for ICES Advice or the Special Request for ICES Advice issued from 2010 to 2020.

approach, the ICES anticipates receiving more special requests, according to its advice (ICES 2018). Dolan et al. (2016) present conceptual levels in the alterations of EM and split them into four unique levels (thus, SSAFM-single-species approach to fisheries management, EAFM-ecosystem approach to fisheries management, EBFM-ecosystem-based fisheries management, and EBM-ecosystem-based management). In this study, the four levels of EM developed by Dolan et al. (2016) are collectively referred to as the Dolan's levels, and the transition within the individual scope of the EM is characterized as Dolan's first, second level (s), up to the fourth level. Given that the approach to EM is a critical policy priority, but progress is difficult to assess due to terminological ambiguity and other factors, Dolan's levels are employed as an instrument to critically investigate and establish whether or not the development of the levels of EM is operationalized regarding the SRIA. Also, it may be possible to develop an alternate method for evaluating the transition in the notion of ecosystem management in fisheries, from the most fundamental level of single-species management to the more sophisticated levels of ecosystem integration by analyzing the context of SRIA. It is envisaged that such a knowledge-brokering evaluation of the SRIA would yield certain essential features that might be utilized to define the route of the levels of EM inside the special request system in a knowledge-based environment.

1.2 Research Goal

To explore whether and how the turn towards holistic approaches in resource governance (ecosystem management) is reflected in ICES client's demand for scientific advice.

1.2.1 Specific Objectives

The main objectives are as follows:

1. To establish an approach to study changes in Dolan's levels for the SRIA.

2. To analyze if there is a trend in Dolan's levels for the SRIA.

3. To analyze the distribution of clients that are requesting SRIA.

4. To analyze the geographic scope of SRIAs.

1.3 Research Questions

In pursuit of the goals above, the study aims to address the following questions:

1. Is there a trend of Dolan's level in the SRIA?
2. Who is/are the set of clients requesting SRIA?
3. What geographic breadth or affiliation is the SRIA directed towards?

2 Methods

The methodology section of this study provides a detailed protocol to address the stated objectives. The research source contains all of the materials that meet the requirements for inclusion in the study. To minimize bias and ultimately present credible observations from which conclusions can be drawn and decisions inferred, the report relied on a comprehensible method proposed by Liberati et al. (2009).

2.1 Protocol and Registration

In organizational practices and policy directions, several new developments and decision-making interventions could be structuralized or conducted based on the PRISMA Statement (thus, Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Pati and Lorusso 2018). This is generally viewed as a reliable step-by-step approach that provides straightforward methods of analysis in finding and synthesizing all relevant data (Pati and Lorusso 2018; Liberati et al. 2009).

According to PLoS (2011), high credibility is accorded to studies that stem from their main components that are integral in the process of conducting a systematic review. Following the best practices in the conduct of the systematic review, registration of protocols allows for more transparency in the review process because of the inclusion criteria, which are mostly specified in advance and documented in the protocol (Liberati et al. 2009). However, this is a study of a preliminary review of the SRIA and, therefore, does not have an already existing protocol with registration information as a prerequisite to the PRISMA checklist (yet the likelihood of bias in reporting the outcome is managed with the provision of eligibility criteria for the review process).

2.2 Study Design

This research applies some of the PRISMA checklist's features in order to create a foundational approach for analyzing the SRIA. This kind of research, if properly carried out, allows us to generate and register the first and primary protocol that pre-specifies the outcomes of the objectives and methods for reviewing the SRIA. Future reviewers of the ICES request system may automatically expand the protocol based on legitimate modifications such as the period framed for the study to include either newer or older publications and broaden eligibility criteria that have proven to be too limited. Such a worthwhile review would impact on two main reasons: This type of analysis compiles and integrates all applicable research and again evaluates the risk of bias in each study that meets the eligibility criteria.

2.3 Inclusion and Exclusion criteria

This is a preliminary review and thus does not have pre-established inclusion and exclusion criteria. The procedure began with a thorough examination of ICES publications and other periodicals. The following factors were considered in determining the study's eligibility:

❖ Type of study: Only the ICES range of request products that relate to the SRIA for the period spanning from 2010-2020 were considered eligible for inclusion in this review.

❖ Setting: eligible advice products must be designated by the ICES within the time frame of 2010-2020 and must be a SRIA from Member Countries and multinational and intergovernmental organizations that use the advice from their requests as to the scientific basis for human activities that affect, and are affected by, marine ecosystems (Froese et al. 2018).

❖ Language: the SRIA publications with full text available in English were included. Hence, at the time of the search, ICES did not have publications that were available in any language other than English.

❖ Publication Date: the baseline time eligible for the review was from 2010-2020. Any date for the data extraction published before 2010 and after 2020 was excluded from the review.

❖ The Measured Outcomes: the assessment criteria for the review of the SRIA were the characterized levels of Ecosystem Management (EM) (specifically, Dolan's levels), the requesters of the advice, and geographical scopes.

2.3.1 Levels of Ecosystem Management (EM)

Dating back to many centuries, the importance of the ecosystem has long existed in marine research and management (Baird 1873). According to Thomas (2000) and Christensen et al. (1996), although the present use of ecosystem methods to manage living marine resources is gaining significance, it is not in the same fashion as it is in certain other kinds of ecosystems. Numerous papers, such as Larkin (1996), Grumbine (1994), Atkins et al. (2011), and others have established the concept of ecosystem management (EM) in relation to the marine ecosystem. And, in other ways, created linguistic ambiguity about the meaning at various levels and the possible ways it can be applied (Link et al. 2002). However, the clarification of the overlapping lexicons of ecosystem management levels in marine resources could be seen in much scientific literature, which included Patrick and Link (2015b) and Link and Browman (2014).

Despite that, the knowledge derived from Dolan et al. (2016), a core source of information in this study delineated four levels of EM starting with a single-species approach to fisheries management through to the ecosystem-based management (the highest level in the paradigm) with its unique interpretation and diverse implementation techniques. The four EM levels will be discussed in detail in the following sections:

❖ Single-species approach fisheries management (SSAFM)

Jennings (2006) asserts that a stock-by-stock approach[2] has been used to govern the majority of the world's main fisheries and serves as the still-predominant fisheries management idea, upon which the ICES has historically based its recommendations on fisheries management (Vinther et al. 2004; Morishita 2008). The logical beginning point for uncovering the distinctions between the various EM levels is referred to as the single-species approach to fisheries management, and at this level, a multitude of characteristics of increasing complexity are excluded (Dolan et al. 2016). To account for single-species management, the distinct feature

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[2] Also known as single-species approach to fisheries management (SSAFM).

that characterizes the sector of focus, as well as its biological hierarchy, is the fishery stock or population, with the primary objective being to determine the status of stocks and establish the productivity of stocks (Link and Browman 2014).

SSAFM generates outputs from a stock assessment model that are used to guide management choices. The allowable biological catch (ABC) and biological reference points (BRP) are the two main assessment methods used to quantify fisheries stocks and produce scientific advice on single-species management approaches (Morishita 2008; Dolan et al. 2016). The ABC is defined as the maximum amount of fish stock that can be harvested without adversely affecting the recruitment of other components of the stock (Atlantic 2011). It is typically greater than the Total Allowable Catch (TAC), which is the maximum amount of fish that can be taken annually from a stock or stock complex and it takes into account factors such as bycatch (Atlantic 2011). According to Morishita (2008), estimates of species parameters, such as stock size, reproductive capacity, and distribution range of the fish species targeted for exploitation, are calculated from the ABC level and it is further ascertained that the species can be sustainably harvested without depletion if the yearly catch is less than the ABC.

Likewise, from a management perspective, BRP serves as a baseline for evaluating a management regime's success in a biological setting (Gabriel and Mace 1999). BRPs are generated by comparing the stock's current mortality rate and abundance to the fish's life history and management objectives, as shown by detailed analogies established during a stock assessment (Dolan et al. 2016). Fisheries managers may use BRPs to determine if a stock is overfished or on the verge of becoming overfished (Gabriel and Mace 1999).

The science in fisheries persists in uncertainty. Its application towards achieving successful management advice is critical and requires a proper methodology to handle concerns about ambiguity in its guidance (Hauge et al. 2007). In 1996, the ICES instituted a framework known as the precautionary approach (PA) for addressing these challenges (ICES 1996). The framework is used to give fisheries advice in two ways: through limit reference points (LRP) and precautionary reference points (PRP). According to Hauge et al. (2007), the LRP is used to classify the status of a stock, whereas the PRP is used to constrain recommendations for short-term exploitation boundaries or to represent the danger of crossing the LRPs. LRPs and PRPs are classified according to their spawning-stock biomass (SSB) and fishing mortality rates (F).

❖ Ecosystem Approach to Fisheries Management (EAFM)

The ecosystem approach to fisheries management (EAFM) has gained popularity in recent years, with the stated goal of "planning, developing, and managing fisheries in a way that addressed the multiple needs and desires of societies without jeopardizing future generations' ability to benefit from the full range of goods and services (including, of course, non-fisheries benefits) provided by marine ecosystems" (FAO 2003). With the inclusion of environmental and ecological variables affecting a stock's population dynamics, the scope of EAFM expands beyond the single-species viewpoint (Mace 2001; Link 2010). However, another research shows that the concept of the single-species approach is pivotal for implementing EAFM which requires to "balance diverse societal objectives" and scientific knowledge on the interactions of the fishery on other components of the ecosystem such as climatic conditions, habitat, and predation (Dolan et al. 2016).

Dolan et al. (2016) state that, this EM level's sectoral emphasis and biological hierarchies are fisheries and stock/population, with the analytical goal of assessing the stock status and productivity and scientific advice being generated from biological reference points (BRPs). BRPs are used to aid EAFM management decisions to capture a larger variety of variables affecting fish stocks more directly. Ecosystem data may be easily included in stock assessment models. "These ecosystem-linked assessments or extended stock assessment models incorporate ecological and environmental processes that are thought to influence population dynamics via predation, habitat-mediated or physiochemically mediated changes in carrying capacity, structural changes in the stock-recruitment function, or a combination of these processes" (Tyrrell et al. 2011; Dolan et al. 2016). Within the framework of this study, an EAFM is Dolan's second level and should be regionally specific, adaptable, take ecological knowledge and uncertainty into account, account for numerous external influences, and try to balance varied societal objectives, but the implementation must be gradual and collaborative (Sissenwine and Murawski 2004).

❖ Ecosystem-Based Fisheries Management (EBFM)

Due to the constraints associated with the application of SSAFM and EAFM levels in ecosystem management, ecosystem-based fisheries management (EBFM) has evolved. As seen by numerous recent publications (Trochta et al. 2018; Link and Browman 2014; Link 2010), there is increasing interest in EBFM. The EBFM is regarded as a comprehensive approach to fisheries management by the scientific community because of its expansions to the complex interactions between target and non-target species and the larger social-ecological system (Pitcher et al. 2013; Janssen et al. 2000; Brodziak and Link 2002).

In principle, EBFM (Dolan's third level) is distinct from the other levels of EM by focusing on the management of fisheries to promote sustainability in the fisheries sector and resilient and productive ecosystems (ICES 2020f). Patrick and Link (2015a) explained it further as "it focuses on multiple or all fisheries within an ecosystem and takes a coordinated and strategic approach to provide the greatest benefit to the nation." However, the ICES standard of EBFM, as summarised in its mission, "is to advance and share scientific understanding of marine ecosystems and the services they provide and to use this knowledge to generate state-of-the-art advice for meeting conservation, management, and sustainability goals" (ICES 2020f). That being so, EBFM is a holistic way of managing fisheries and marine resources by taking into account the entire ecosystem of the species being managed. "The goal of ecosystem-based management is to maintain ecosystems in a healthy, productive, and resilient condition so they can provide the services humans want and need" (NOAA). Accordingly, the ICES simply sees EBFM as addressing the fishery sector (ICES 2020f). To conclude, the EBFM context assembles and investigates factors about multiple species, trophodynamics, the environment, and the ecosystem (Patrick and Link 2015b).

A critical aspect to remember in the feature of scientific advice about EBFM is that there are other decision criteria in addition to those relating to biological yield. Systemic reference points (SRPs) incorporate BRPs but also take into account other ecosystem-level objectives such as conservation, resilience, and socioeconomic concerns (Dolan et al. 2016). Pranovi et al. (2012) describe SRPs as integrative, cumulative, and quantitative and represent an important advance in how systemic properties can be understood and detected to respond to a wide range of uses and pressures.

❖ Ecosystem-Based Management (EBM)

The broadest and the last level of EM is the Ecosystem-based management (EBM) and is defined by the Food and Agriculture Organization (FAO) as "an approach that takes major ecosystem components and services (both structural and functional) into account in managing fisheries." EBM encompasses the greatest range of the management continuum discussed here, including several sectors within an ecosystem. It values habitat, embraces a multispecies perspective, and is committed to understanding ecosystem processes. Its goal is "to rebuild and sustain populations, species, biological communities, and marine ecosystems at high levels of productivity and biological diversity so as not to jeopardize a wide range of goods and services from marine ecosystems while providing food, revenue, and recreation for humans" (Trochta et al. 2018).

Another definition by the Arctic Council EBM is "the comprehensive, integrated management of human activities based on best available scientific and traditional knowledge about the ecosystem and its dynamics, to identify and take action on influences that are critical to the health of ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity" (Council 2013). Straightforwardly, the ICES further simplified and distinguishes the definition of EBM as "the primary way of managing human activities affecting marine ecosystems" (ICES 2020f). Arkema et al. (2006) derived 3 broad general criteria for the aforementioned disciplines' and focusing on, "sustainability, ecological status, and inclusion of human dimensions" which were verified by other famous research, most notably one by McLeod and Leslie (2009).

In addition, the different characters which enable one to identify the facet of EBM level in EM are deduced from the focus of biological hierarchy that governs "the whole system and connected systems with a primary objective of addressing the cross-sector trade-offs which can identify the best mix of goods and services across systems" (Link and Browman 2014; Dolan et al. 2016). Both production-based biological reference points (BRPs), as well as a wider range of systemic reference points (SRPs), are used to implement the scientific advice for an EBM (Dolan et al. 2016).

Dolan et al. (2016) reduce this continuum by diagramming the progression from single-species management to ecosystem-based management (i.e., a more systemic and multi-sector viewpoint). Figure 2.1 summarizes the four EM subcategories that were discovered over the course of the study.
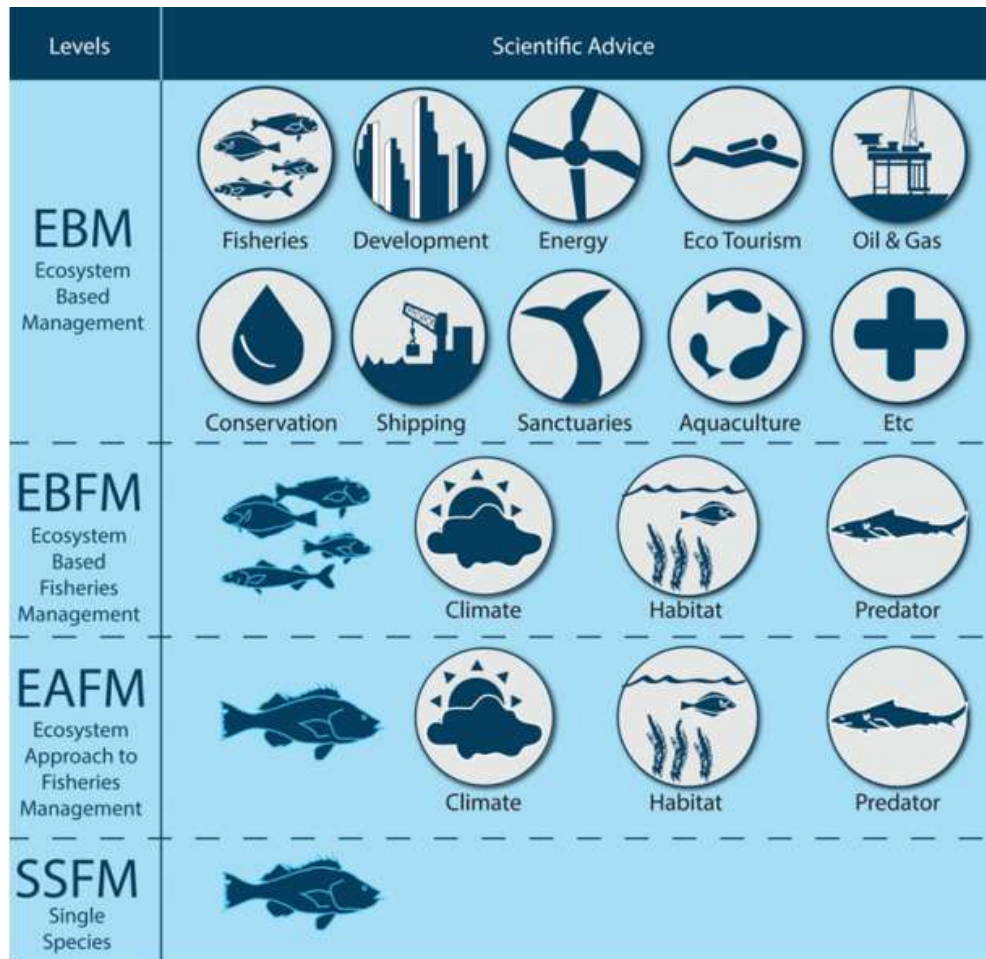
Figure 2. 1 Typology of Dolan's levels of EM, starting with single-species management and progressing upward to ecosystem-based management. Scientific advice and management are developed with each degree of advancement. The figure was adopted from Dolan et al. (2016).

This study, on the other hand, analyzes and underlines in greater detail the all-inclusive fundamental aspects for differentiation across Dolan's level characteristics in the SRIA. Consequently, more information was efficiently obtained and translated from other scientific publications, including Pitcher et al. (2009), Patrick and Link (2015b), Link and Browman (2014), and Cormier et al. (2017).

2.3.2 The Requesters of the Advice

The ICES plays a critical role in the advice system and provides independent advice for the implementation of EM in the European Union (EU). The ICES, as a scientific community and a global network organization, executes its mandate of sharing a scientific understanding of the marine ecosystem and management of human activities with twenty member countries, five affiliates, and multiple international initiatives (Ballesteros et al. 2018). For a range of clients, including national states as well as international bodies, ICES provides biological advice on North Atlantic fish resources and ecosystems. Several major clients, in addition to the EU, are following an approach in ecosystem management in various ways. According to the ICES Advisory Plan, any stakeholder (thus, the ICES member country or intergovernmental organization) is not restrained from sending a SRIA. To be able to group the ICES clients, (which could also be termed as the Requesters of Advice), a summary definition of all the beneficiaries of the ICES advisory system would be categorized according to eight client groups. Therefore, in this study, the inclusion criteria to address the outcome of the question, "Who are the Requesters of the SRIA?" would be based on the eight-client-groups proposed in an empirical study of the SRIA and they are:

- ❖ Request by the European Union (EU) / European Commission (EC)
- ❖ Individual Organisation Requesters (e.g., OSPAR, NEAFC)
- ❖ Joint Organisation Requesters
- ❖ Individual Member-State Requesters

- ❖ Joint Member-State Requesters

- ❖ EU and Non-EU Member-State Requesters

- ❖ Non-defined Requesters

- ❖ EU and Individual Organization Requesters

2.3.3 Geographical Scope

An ICES publication (Advice 2004) reported the establishment of the first ICES geographical boundary known as Ecoregions in 2004. There is no static ecoregional delineation, but sometimes it is reassessed in reference to societal debate and the input from policymakers. In 2015, the current ecoregions were established and they are different from those defined in 2004 (Advice 2020a). However, the inclusion criteria to analyze the outcome of the study would be based on 2004 due to the period which spans from 2010 to 2020. But the study would group the different geographical areas under four main delineations for simple categorization.

- ❖ Geographical scope 1-the ICES ecoregions **within the EU** (which include the Baltic Sea, Greater North Sea, Celtic Sea, Bay of Biscay and the Iberian Coast, Azores, Mediterranean Sea, and the Black Sea).
- ❖ Geographical scope 2-the ICES ecoregions **outside the EU** (Oceanic Northeast Atlantic Ocean, Faroes, Icelandic Waters, Greenland Sea, Norwegian Sea, Barents Sea, and the Arctic Ocean).
- ❖ Multi-ecoregional scope-which covers combined ecoregions from both geographical scope 1 and 2.
- ❖ Non-defined geographical scope – this describes all the non-ecoregions which were classified as "widely distributed and migratory stock," in addition to those designated as "general advice" in the SRIA.

2.4 Search strategy and information sources

The up-to-date data for this review was accessed from the ICES official homepage (https://www.ices.dk/Pages/default.aspx), where the SRIAs were selected and all the publications in the full text were downloaded. In finding the ICES special requests on their website, two different approaches were taken and, either way, the 'Latest Advice' was available for download. The first and most recommended search strategy to gather the data for the study was to:

Click on 'Library' on the ICES home page. Select 'Advice' and on the right-hand refining button, then type and search for 'Special Request', and then click on 'Advice' again beneath the publication type. Following the screening process, pertinent advice is compiled (Appendix

I.1). Alternatively, the following search resulted in the presentation of simply the 'Latest Advice':

On the ICES page, beneath the refining panel on the right, click 'Advice'; this will take you to the advisory page's hub. Click on 'Latest Advice' under the headline 'ICES advice' (Appendix I.2). The website displays the various advise release dates, along with the year, the publishing of 'Advice by ecoregions', 'Advice by species', and 'Special requests and additional advice by title.' Thus, in addition to the current presentation of advice, scroll down to see guidance from previous years. Finally, sort and choose reports on just Special Request Advice under the heading 'Special requests and other advice by the title.'

This research sourced only secondary data on a special request for advice from the International Council for the Exploration of the Sea (ICES) within the timeframe of 10 years. Also, the research used information from other sources, such as scientific journals, published and other unpublished materials. After the compilation of the Special Requests advice from the ICES website (http://www.ices.dk/) spanning a ten-year timeframe. And to determine whether research met the eligibility criteria, the entire text of the chosen studies was then reviewed and assessed for eligibility based on the following sections:

- ❖ Address of individual Special Request Advice (which identifies the ecoregion/s in question, date of publication, and a permanent web ID for the advice).
- ❖ Titles of the Special Request advice.
- ❖ Advice summary.
- ❖ The Request section.
- ❖ Elaboration on the advice and the basis of the advice.

2.5 Data Collection Process and Data item

On a Microsoft Excel spreadsheet, a standardized report extraction sheet was created. To start with, data based on the inclusive assessment criteria for this systematic literature review was retrieved for the advice release year 2020[3]of the SRIA. Some sections of this data sheet were then piloted and readjusted based on the guidance of the supervisor and co-supervisor before a progressive categorization was allowed for further studies into other publication years of the SRIA (Appendix III.2). The main data acquired from the selected questions for inclusion in this research included the following:

- ❖ Level of Ecosystem management.
- ❖ The Requesters of the Advice.
- ❖ Geographical Scope.

2.6 Risk of Bias in Individual Studies

In reporting a systematic review with or without meta-analysis, Pati and Lorusso (2018) and Liberati et al. (2009) recommended studies to provide descriptions of various risk-of-bias assessment methodologies utilized by the researchers and specify whether this was done at the study or outcome level. In this study, the approach used to harness an appropriate level of research quality was conducted by inserting a webpage reference link (known as Hyperlink[4]) to each data set in the Microsoft Excel Spreadsheet. This played a vital role in linking two reviewers (in the person of my supervisor and co-supervisor) to the specific SRIA under assessment for additional review to minimize possible bias across the study during data reporting. From this study, hyperlinks were the simplest and easiest quality appraisal alternative for conducting the knowledge synthesis process.

The risks of bias from the individual studies could not be quantified and this is because a qualitative standard approach was adopted to eliminate some possible forms of bias. Thus, this study did not accede to the use of component rating as an evaluation tool for quantitative research to mark the validity of every single report during a systematic literature review. Rather, two reviewers who were specifically my academic supervisors only reassessed and discussed

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[3] All the ICES Special Request Advice released in the year 2020 was the most recent or known to be the latest ICES official advice during the period of this study.

[4] According to (Britannica), "a **hyperlink** is an element that links between related pieces of information by electronic connections to allow a user easy access between them."

the categorization and underlying rationale for a small number of requests' datasets[5], and the recommended changes were made without altering the total of the eligible studies.

2.7 Synthesis of results

In reporting, a table was created that presented a summary of the characteristics of the included studies. The process of data extraction from the research selected for analysis provided the foundation for synthesis, which was conducted based on that data. The synthesis was structured around the data collected from the relevant studies based on the Levels EM requested by the Advice Requesters and the Specific Geographical Scope (Appendix III.1). The data synthesis was examined and evaluated to compile information and find answers surrounding the study designs and the indicators that measure the outcomes of the emerging characteristics of the SRIA to answer the research questions.

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[5] The SRIA has been evaluated and organized by the various inclusion criteria in the Microsoft Excel file.

3 Results

3.1 Study selection

Three thousand and twenty-seven (3027) publications were released during the first search of ICES requests within the period of 2010 to 2020 on the ICES Library. On the same page, the search was narrowed down with the term, "Special Request" and by the use of the refinement panel to ensure higher precision. And then, the search retrieved 464 Special Requests. Additionally, the analysis with potential eligible criteria elucidated a total of SRIA for inclusion in the review. In all, 251 SRIA were categorized for the three main assessment criteria, which were Dolan's levels of EM, the requesters of the advice, and the specific geographic affiliations. However, because the study was a piloted framework of the analysis of the SRIA according to Dolan's levels, the type of results reporting did not follow the ideal reporting structure with a flow diagram[6]. Although few sections of the checklist of items to include when reporting a systematic review were adopted in this preliminary study. This kind of research could still take on the approach of systematic literature review as suggested by Page et al. (2021) and Liberati et al. (2009).

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[6] Which is known as the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) study flow diagram.
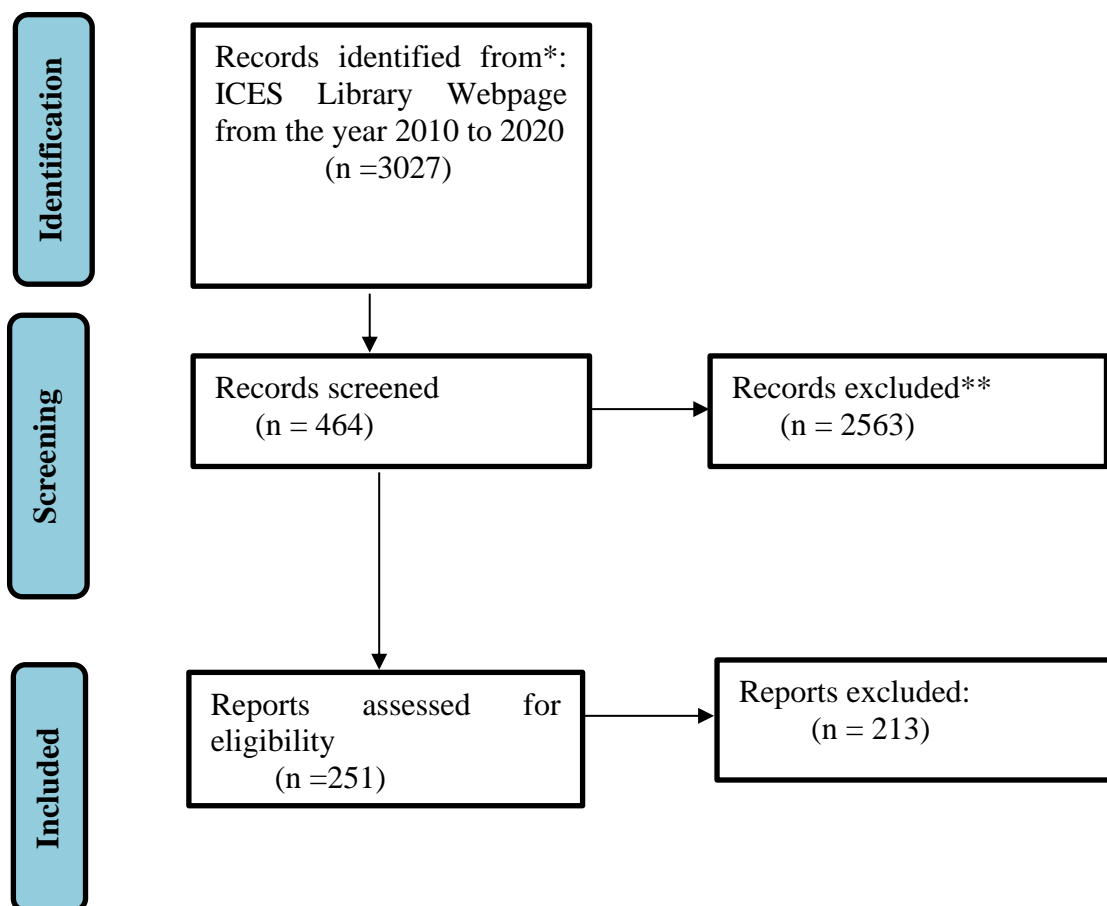
Figure 3.1 Preferred Reporting Items for Systematic review without Meta-Analysis (PRISMA) study flow diagram. Modified after Page et al. (2021).

Table 3 1 Quality assessment of potentially eligible studies

	Years										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
No. of advice displayed	37	17	37	49	34	41	56	50	56	52	35
No. of SRIA released	27	12	30	39	18	18	25	21	27	24	10
Other advice issued	10	5	7	10	16	23	31	29	29	28	25

Note. Other advice by title for the entire timeframe 2010 to 2020 included technical services, technical guidelines, special requests, the general context of ICES advice, and ICES advice basis.

3.2 Study Characteristics

A breakdown of the 251 series of SRIA included in this systematic review encompasses the different amounts of yearly publications (see Figure 3.1). All the pieces of requests in this review were published from 2010 to 2020 on the ICES official homepage. However, other series of advice which was inconsistent with the eligibility criteria but released from the period of 2010 to 2020 was titled as technical services, technical guidelines, special request, the general context of ICES advice and ICES advice basis, and these summed up to a total 213 (see Figure 3.1, Table 3.1).

3.3 Synthesis of Results

In this section, 'research question 1' employed a two-way analytic format, where the measurable outcomes to answer the question was represented in two main charts – namely, the stacked column chart and the pie chart. When analyzing changes over time, or comparing the differences in several categories, a stacked column chart is one of the basic Microsoft Excel

chart styles. Alternatively, data was presented in a pie chart with a different goal; thus, to express and compare the percentages of numerical values over time[7].

Regardless of the method, this review study used the Microsoft Excel software program to analyze the results and generate a visual representation of the data series. The stacked column chart displayed the total value of the various categories of interest over the time expressed in years (thus, providing an in-year data assessment), whereas the pie charts provided a quantification of the data's values by converting the same dataset into percentages. To distinguish the many essential variables, only readily recognizable tints were chosen.

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[7]In most cases, displaying data values on a pie chart may be deceptive, and to avoid this mistake, the pie chart is used to reduce values into data proportions or percentages.

3.4   Levels of Ecosystem Management (EM) in the SRIA

3.4.1   Year-over-year graphic depiction of the levels of Ecosystem Management (2010-2020)

The stacked column chart below (Fig. 3.2) shows the various stages of Ecosystem Management according to Dolan et al. (2016) classification. The graphical depiction presented in the information in question is an annual view, which spans the years 2010 to 2020.
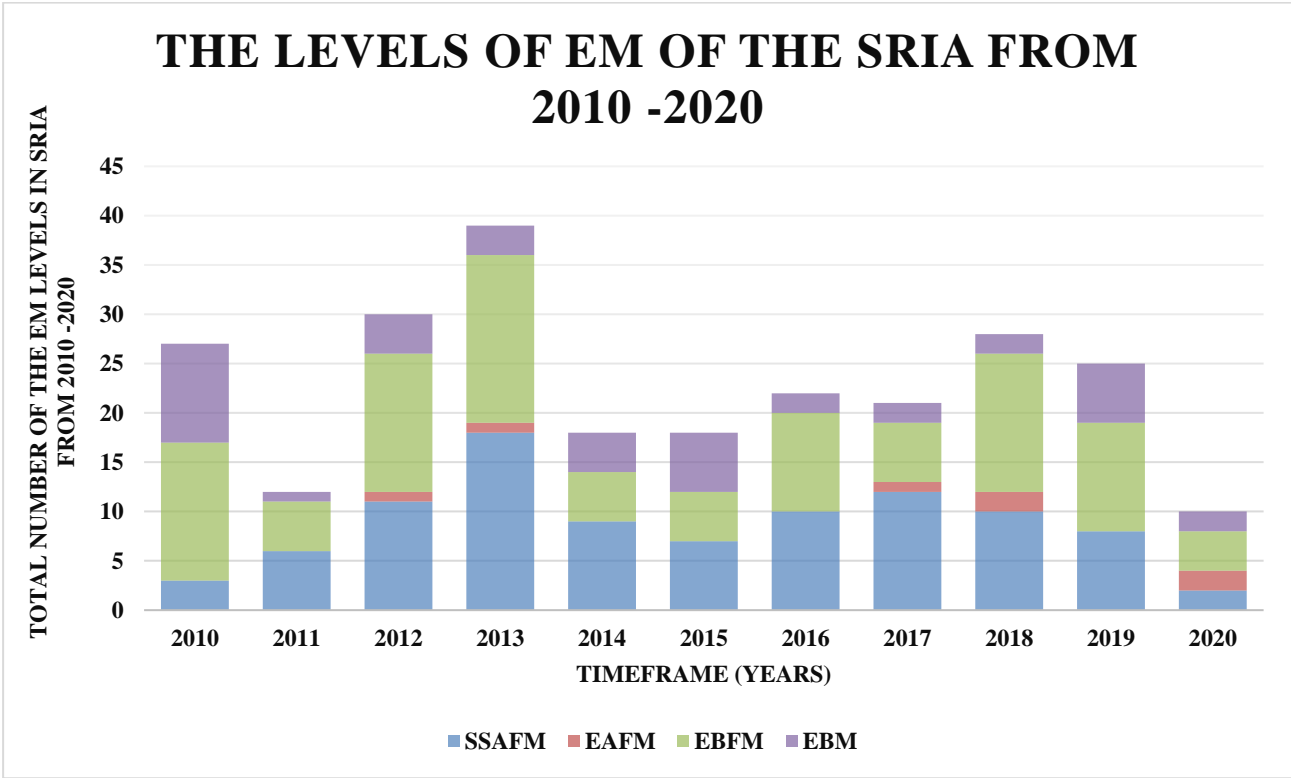
Figure 3.2 Graphical illustration of the levels of the EM in yearly viewpoint (from 2010-2020). On the vertical axis are 'the total number of the levels of EM in SRIA from 2010 to 2020' and the 'year-to-year timeframe (Years)' horizontal axis. From the stacked column chart, 4 – main colors were used to represent Dolan's levels, and these included: Blue represents SSAFM – Single-species approach to fisheries management, Orange represents EAFM – Ecosystem approach to fisheries Management, Green indicates EBFM – Ecosystem-based fisheries management and then, purple represents EBM – Ecosystem-based management.

A comprehensive assessment of the SRIA reviewed a common trend of 3 - distinct ecosystem management levels within the years, 2010, 2011, 2014, 2015, 2016, and 2019 and these levels were SSAFM, EBFM, and EBM (Figure 3.2).

Within the latter years, 2016 was seen as the highest number of SSAFM with a total of 10, followed by 2014 with 9 and then, 2019 with a total number of 8 special request articles. The lowest number of SRIA with the SSAFM feature was found in 2010, with a total of 3 (Appendix V.1). On the other hand, the analysis of the content of EBFM in SRIA (released in 2011, 2014, 2015, 2016, and 2019), showed 14 SRIA in 2010, followed by a total of 11 SRIA in 2019, and then, in 2016, with a total number of 10. The year 2010 published the highest SRIA with EBFM characteristics among the years with 3-distinct EM levels. However, the lowest number of SRIA with EBFM features was 5 and was seen in 2011, 2014, and 2015 each. Also, the characteristics of EBM in the SRIA concerning the 3-distinct EM levels revealed in the years 2010, 2015, 2014, 2016, and 2011 respectively (Figure 3.2, Appendix V. 1).

Alternatively, 4-distinct EM levels were seen in 2012, 2013, 2017, 2018, and 2020 (Figure 3.2) This EM paradigm progresses from SSAFM to EAFM, to EBFM, and finally EBM, each having its own set of essential features. In the perspective of SSAFM, the years 2012, 2013, 2017, 2018, and 2020 issued a total of 11, 18, 12, 10, and 2 special requests from the ICES, with the majority of them released in 2013, followed by 2017 and then 2012 respectively (Appendix V.1). From the EAFM point of view, the SRIA publications were a total of 1, 1, 1, 2, and 2 in the years 2012, 2013, 2017, 2018, and 2020 correspondingly (Figure 3.2). Moreover, in 2012, 2017, 2018, and 2020, the ICES released a total of 14, 17, 6, 14, and 4 SRIA with the unique characteristics of EBFM, whereas the EBM level was seen in a total of 4, 3, 2, 2 and 2 of the SRIA published in 2012, 2017, 2018 and 2020 (Appendix V.1).

3.4.2 Graphical representation of the levels of EM over a 10 – year timeframe

The graphical depiction below, which is presented as a pie chart, illustrates the unique levels of ecosystem management seen in the SRIA over a decade. The pie diagram was presented in a variety of colors, including blue, green, purple, and orange.

The Level of EM in the SRIA from 2010 -2020.
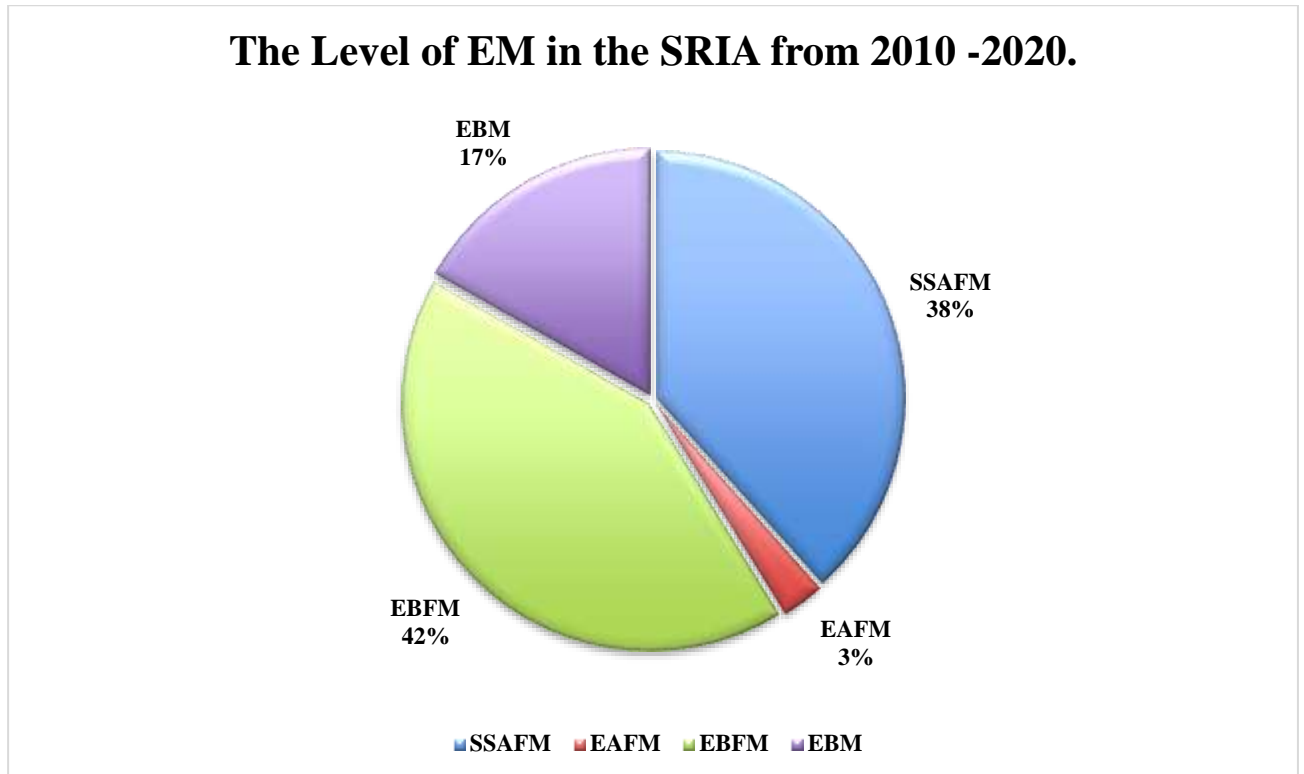
Figure 3.3 illustrates the EM levels throughout a decade. Four primary colors were selected from the pie chart to depict the different degrees of EM: Blue denotes SSAFM – single-species approach to fisheries management; orange suggests EAFM – ecosystem approach to fisheries management; green shows EBFM – ecosystem-based fisheries management; and purple indicates EBM – ecosystem-based management.

The results of the study in figure 3.3 revealed the different levels of the EM from 2010 to 2020. Over that period, the SRIA published on the ICES official homepage constituted 38 percent of SSAFM with a total of 96 ICES advice (Appendix V.2). The ICES released 42 percent of the SRIA with the unique feature of EBFM and the 17 percent of the SRIA issued comprised the EBM level with a total of 105 and 42 respectively (Figure 3.3). The lowest feature seen from the SRIA according to the level of EM was the EAFM and with a total of 7, corresponding to 3 percent of the total ICES special request released over the decade (Appendix V.2).

3.5 The Requesters of SRIA

3.6 SRIA Requesters dataset is shown in a pie chart from 2010 to 2020

Within this section is the representation of a pie chart formatted graph depicting the percentages of the SRIA requesters. This number represented the total (in percentages) of SRIA Requesters who submitted requests throughout the year.

The number of requesters of the SRIA from 2010 -2020
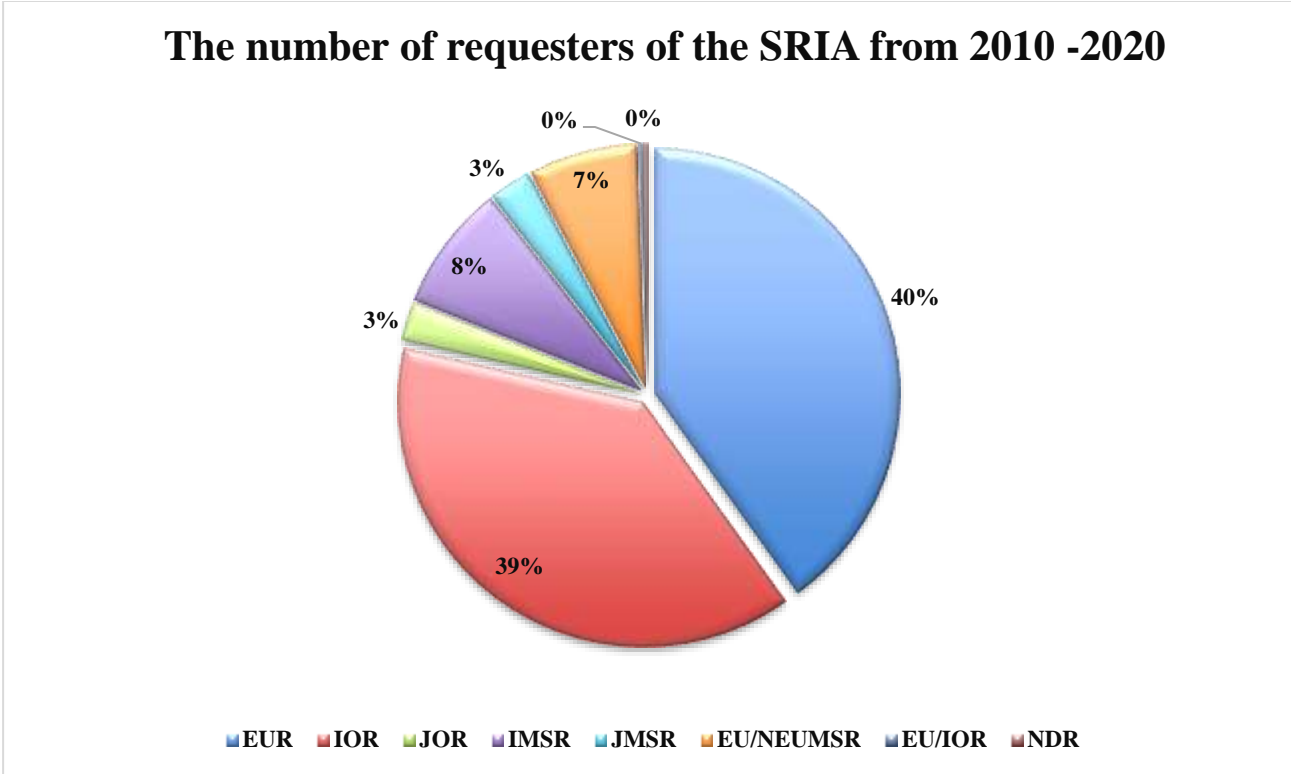
Figure 3. 4 A Pie Chart depiction but with percentage values. The chart's sections represented the various types of requesters for the SRIA, including NDR-Non-defined Requesters, EU/IOR-European Union, and Individual Organization Requesters, EU/NEUMSR-European Union and Non-European Member State Requesters, JMSR-Joint Member State Requesters, IMSR-Individual Member State Requesters, IOR-Individual Organization Requesters, and JOR-Joint Organisation Requesters.

According to the research conducted, a different perspective was given in answer to the SRIA Requesters, which revealed that 40 percent (Figure 3.4) of those organizations that requested SRIA were from the European Union/European Community (EU/ECR), accounting for a total of 100 individuals (Appendix VI.1) who requested SRIA over the ten years.

The study discovered that the EU/ECR form the largest group of requesters during the research period. The analysis further examined and identified the Individual Organisation Requesters (IOR) as the second-largest group of requesters, followed by the Individual Member State

Requesters (IMSR), European Union and Non-European Member State Requesters (EU/NEUMSR), Joint Member State Requesters (JMSR) and Joint Organisation Requesters (JOR) and who accounted for 31,12, 11, 4 and 2 percent of the SRIA Requesters respectively (Figure 3.4).

The overall total number of subsequent requesters amounted to only 148 ICES clients for the SRIA (Figure 3.4). Nonetheless, the Non-defined Requesters (NDR), as well as European Union and Individual Organization Requesters (EU/IOR), had a negligible part in the whole process, seeking a total of 2 SRIA which represented a total of 0 percent (Figure 3.4, Appendix VI.1).

3.7 Geographic distribution of the SRIA

3.7.1 Geographical distribution of ICES Special Request for Advice over a decade

This section contains a pie chart graph illustrating the percentages of the geographical locations of the receivers of the SRIA. In the figure, different colors were linked to the data being graphically shown in the chart's plot area to represent the ICES geographic areas that sent the Special requests throughout the 10-years timeframe (in percentage terms).

The Geographic distribution of the SRIA over a period of 10-years.
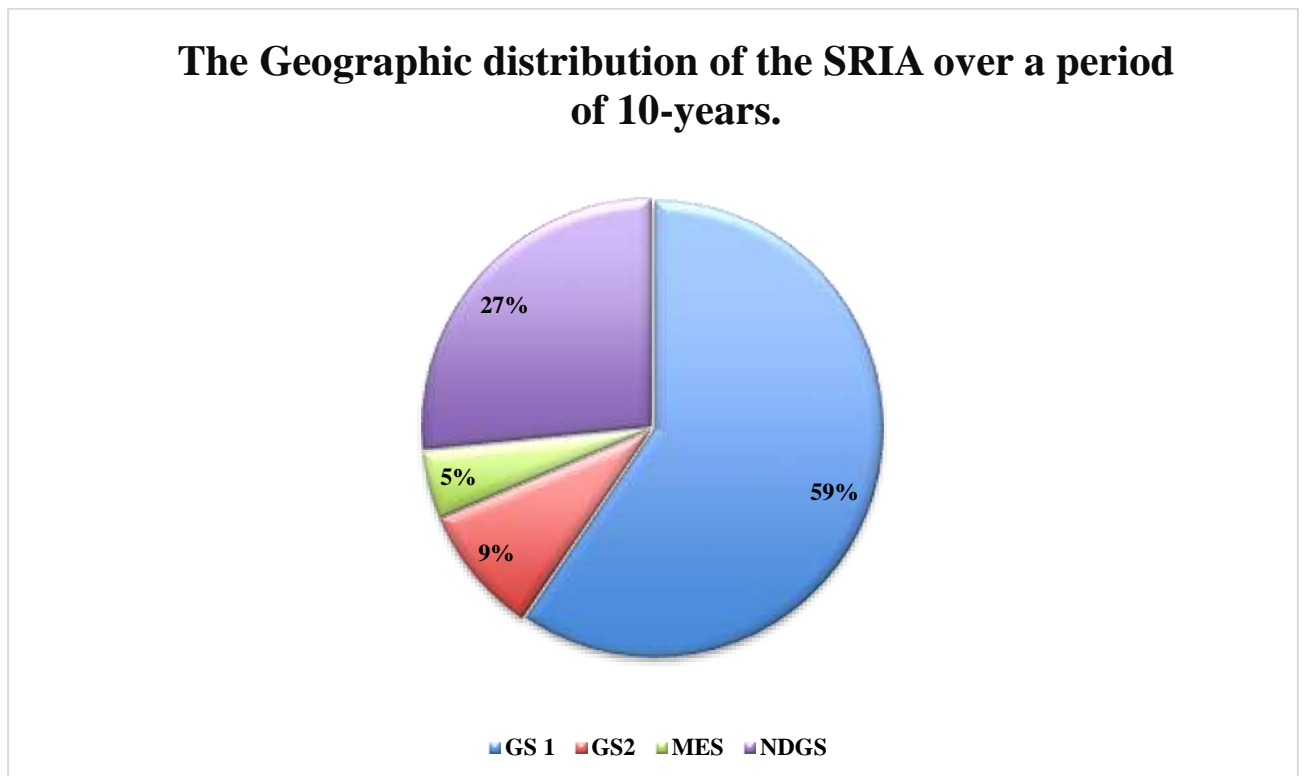
*Figure 3.5 A pie chart representation of the geographic areas within the ICES where a special request for an investigation into a particular study is addressed. Over 10 years, the graph accounted for the following geographical areas in terms of percentages: GS1-Geographical Scope 1(**within the EU -** which include the Baltic Sea, Greater North Sea, Celtic Sea, Bay of Biscay and the Iberian Coast, Azores, Mediterranean Sea, and the Black Sea) was represented by a blue color, GS2 - Geographical Scope 2 (**outside the EU -** Oceanic Northeast Atlantic Ocean, Faroes, Icelandic Waters, Greenland Sea, Norwegian Sea, Barents Sea, and the Arctic Ocean) was represented by an orange tint, MES-Multi-ecoregional scope (ecoregions from both geographical scope 1 and 2) was illustrated by green and NDGS-Non-defined Geographical Scope (Ecoregions classified as widely distributed and migratory stock and those designated as general advice in the Special Request Advice), also by a purple color.*

An analysis of figure 3.5 showed the various geographical areas in which special request research was conducted, and counsel was given for ten years, according to the findings of the analysis. The pie chart demonstrated that, for ten years, the GS1 received the greatest number of ICES Special Requests, with a percentage of 59 and a total amount of 150 requests received (Appendix VI.2). The geographical scopes designated as NDGS were followed by the second largest number of research sites for the ICES Special Request Services, which was located in the same geographic area. With a total of 67 articles published over a decade (Appendix VI.2), this segment represented 27% of the total (Figure 3.5).

Over the course of the aforementioned period concerning the geographical areas where ICES conducted Special Request analysis to provide advisory services revealed that the GS 2 was once again the third-highest area that received an ICES investigation for SRIA services, with a percentage of 9 being awarded to the GS 2. (a total of 23). After the investigation of an administrative issue to provide a SRIA, the MES served as the smallest possible location. Approximately 5 percent of the 12 counts came from this region (see Figure 3.5, Appendix VI.2).

4 Discussion

4.1 The applicability of the FEM approach in SRIA

This study utilized some of the elements of a systematic literature review to offer an overview of the implementation of fisheries ecosystem management (FEM) in the context of SRIA (see method section). The study aimed to ascertain the progress of the SRIA from SSAFM through to a more systemic and multi-sectoral perceptive (that is ecosystem-based management) and further determined the 'who' and 'where' of the various SRIA[8] (issued from 2010 to 2020) were requested and directed to.

In its yearly report (result section, figure 3.2), the SRIA discovered an inconsistent pattern in terms of displaying some features of slower keenness as it proceeded from single-species emphasis to different degrees in the Dolan classification system. Over ten years, the SRIA also accounted for a varying proportion (in percentages) of special requests[9] pertaining to the levels of EM (Figure 3.3). It is therefore possible to examine the causes for such outcomes from a variety of angles, and these viewpoints discuss topics about the SRIA from the perspective of or as seen through the eyes of ICES members/clients. Due to the fact that this research used only data from the official ICES website (dated from 2010 to 2020), it is assumed that all special requests were made public and that the ICES issued advice on every SRIA submitted to the community.

In a very comprehensive review of the rationales underlying the special requests, the SRIA included SSAFM requests on many specific groupings of stocks that are classified as deep-sea species, large marine mammals, shared species, exclusive, transboundary, and straddling stocks (see Appendix III.2). The ICES describes deep-sea species as stocks with "lower biological productivity" (ICES 2018) and its clients frequently seek specific information on the survey abundance index. For example, SRIA was used to target deep-sea species such as red seabream* (*Pagellus bogaraveo*) stock and *alfonsino* (*Beryx decadactylus*). There were also calls of SRIA in SSAFM for all relevant data on Large marine animals, such as coastal bottlenose dolphins (*Tursiops truncatus*), to be compiled. Several SRIA was directed at exclusive stocks such as horse mackerel, cod, haddock, Norway pout, saithe, and summer-spawning herring throughout

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[8] SRIA – Special Request for ICES Advice published from 2010 to 2020.
[9] Percentages of EM levels - 38% of SSAFM, 3% of EAFM, 42% of EBFM and 17% of EBM.

the ten years. Exclusive stocks are those that are confined to a state's exclusive economic zone (EEZ).

Other SRIAs on SSAFM targeted certain groupings referred to as shared stock or population, such as North Sea cod, haddock, saithe, whiting, and plaice, as well as Northeast Arctic cod, haddock, capelin, and herring. For example, IMSR, which shares the Barents Sea supplies of cod and haddock, sought a long-term management strategy (Appendix III.2). Some requesters also sought information about transboundary fish resources[10], according to the SRIA on SSAFM. Sole, hake, Baltic herring, sprat, and horse mackerel are a few examples of these fisheries' populations. The SRIA on SSAFM also targeted stocks classified as straddling fisheries populations, which include blue whiting, Atlanto-Scandian herring, mackerel, sardine, and *Sebastes mentella*.

While the ICES recurrent requests system updates most of the information on the aforementioned stock groups annually, there are key reasons that move the default single-species requests system from recurrent to a more critical level known as a Special Request, and these are discussed further below:

The SRIA system is used by ICES clients to request re-evaluation, establishment, updating, or assessment of long-term management plans/strategies (LTMS) and recovery plans for specific fish populations. Examples of SRIAs with such objectives include, "a special request concerning long-term management strategy for mackerel in the Northeast Atlantic," and other special requests with identities including "10_21, 13_27, 17_02, and 17_10," etc. (Appendix III.2).

Accordingly, the ICES with special requests of that sought can give critical information on TAC and HCR (harvest control rules). TACs are a major tool for allocating fishing rights and they were first created for a small number of fish populations (Lado 2016). A fundamental vehicle for distributing stock rights among the Member States is thus considered to be this system of national quota (Lado 2016). The ICES, in particular, provides guidance on yearly TACs for specific species on a recurring basis; nevertheless, a shift of the series of SRIAs on

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[10] Transboundary species that crossed the EEZ boundary of one coastline state into the EEZ(s) of one or more other coast states.

SSAFM has been seen as requesters want simulations over a long-term management framework in some extraordinary fashion.

Once again, a SRIA about TACs over long-term periods yields crucial information where management scenarios are evaluated in the ICES PA framework in an exceptional pathway. The precautionary approach delineates fishery stock in either LRP or PRP for both *SSB* (Spawning stock biomass) and *F* (Fishing mortality). The limit reference points (LRPs) reflect the stock status and precautionary reference points (PRPs) reflect risk levels (Hauge et al. 2007). Instances are drawn from SRIA which provided advice on the request to "tabulate the long-term yield, long-term SSB, inter-annual TAC variability, and other similar aims were found in SRIAs such as "10_13, 12_02,12_09, 14_02" and among others (Appendix III.2).

The HCR is another characteristic of SRIA in SSAFM. HCR is an operational component of a harvest strategy (also known as management procedure), which is the latest generation of science-based approaches to effective fisheries management (Kvamsdal et al. 2016). Harvest strategies are essentially pre-agreed guidelines that determine how much fishing can occur based on indicators of the targeted stock's status (Kvamsdal et al. 2016). The SRIA on SSAFM in relation to HCR also establishes long-term management measures to control fishing based on catch, effort (e.g., fishing days), or fishing mortality rate (F). Additionally, HCRs can also provide modifications to other controls, such as the length or scale of time-area closures or size limits. Some examples of such characteristics of the SRIA included special requests with identities such as, "14_01, 14_07, 17_19 and 18_18" etc. (Appendix III.2). In a nutshell, a SRIA on a single species would enable the scientific community to optimize the TAC and HCR settings for long-term sustainable fisheries management while also providing ICES with adequate data to continue giving scientific advice on the stock's status.

Additionally, the acquisition of stock assessment data could be a factor to SRIA in the management of single stocks. By utilizing this technique, ICES members may get fishery-independent estimations of the biomass or spawning biomass of certain populations, such as pelagic and demersal fishery resources. In the majority of situations, such forecasting is quite beneficial since it enables the tracking of a single stock's health as well as keeping tabs of the stock through successive years in terms of F_{MSY} range, natural and fishing mortality, recruitment of young fish, growth, and reproductive capacity. Examples of such special requests are the ones with identifiers including, "12_01, 13_07, 15_07, 16_21" and others (Appendix III.2).

In another perspective, a possible motivation for SRIA in single-species may be the requester's desire to treat a specific problem as a 'special request' rather than a 'regular or recurrent request' and to get in-depth and urgent information of the situation. Moreover, other significant aspects of the SRIA on SSAFM that contributed to the variable figures include special requests for in-year advice, assessment of inter-area or annual quota flexibility, updating management area for specific species, modification of single-species advice, and among others. Instances of such characteristics in the SRIA on SSAFM are, request "to ICES on in-year advice on haddock (*Melanogrammus aeglefinus*) in the Irish Sea," "a SRIA on in-year advice for anchovy (*Engraulis encrasicolus*) in the Atlantic Iberian waters", and request with identifiers including, "13_17, 15_07, 16_08, 16_10, 17_03 and 17_04" etc. (Appendix III.2).

Within the next level of EM, the SRIA in EAFM provided important evidence to support the ICES clients and scientists' assertion about the growing number of scientific studies that reflect a fisheries management strategy that is geared towards ecosystem management. The following could be cited as justifications for such a course of action:
It is possible to make precise forecasts of changes in fish stock and their effects on ecosystems using sources such as vulnerable marine ecosystems (VME), vulnerable marine species (VMS), environmental impacts on fish stock, climatic variation and its effects on fish stock, stock dynamics, and food-chain effects (Advice 2021a).

According to studies, EAFMs are initiated, especially on vulnerable marine ecosystems and species such as cold-water coral reefs, seamounts, and aggregations of deep-water sponges[11] (Advice 2021a). Other than international treaties, the SRIA might be used to urge extra management measures to safeguard them from massive bottom-fishing operations. For instance, when a SRIA is requested, the criteria for identifying VMEs can be updated, including the uniqueness or rarity of stocks, their functional importance, fragility, and life cycle characteristics as well as their structural complexity (ICES 2020g).

To the extent that the SRIA on EAFM addresses the sensitivity of VME to fishery operations, several ICES clients also request extensive evaluations and updates of the gear-fisheries impacts and the marine environment with respect to specific fish stock in their SRIAs. For example, "ICES was requested to provide some advice on fisheries-related anthropogenic impacts on eel in EU marine waters," and a SRIA to "analyze the ecosystem/environmental

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[11] Cold-water coral reefs, seamounts, and aggregations of deep-water sponges are classified as deep-sea bottom-dwelling invertebrates.

effects of the pulse trawl sole (*Solea solea*) fishery on North Sea ecosystems," etc. (Appendix III.2).

Similarly, the SRIA on EAFM products may be tailored to account for the environment's influence on fish stocks. An inadequate understanding of these challenges and their underlying causes, which are connected to the unpredictability of stock reproduction may contribute to the desire for SRIA in some instances. For example, a SRIA might provide a comprehensive knowledge of environmental elements such as the density and composition of marine plankton[12], predator abundance, and hydrographic conditions [13], to enhance the ecosystem's sustainability and health (ICES 2013a). Additionally, ICES clients with an interest in obtaining information on themes such as the link between recent declines in recruitment rates for North Sea species and their correlation to the erratic abundance and/or growth rates of certain southern species[14] may submit a SRIA (ICES 2013a).

Furthermore, a SRIA on EAFM will help to resolve several biological uncertainties related to climatic changes and their influence on fish stocks, physical damage to stock habitats, and food chain impacts. Numerous natural or physical environments for fisheries are progressively adapting to changes, and such an occurrence might trigger an ICES SRIA. Instances of such SRIAs on EAFM are, "a request to compile all available data to evaluate the variability of oceanographic conditions and their effect on the abundance and distribution of beaked redfish (*Sebastes mentella*) in the NEAFC Convention Area" and "a special request to ICES to collate data and information on European eel (*Anguilla anguilla*) migration as well as assess the seasonality of the migration patterns in EU waters" etc. (Appendix III.2).

Another rationale for SRIA on EAFM is to amass available data on heavily exploited habitats and fish stocks[15], where the gathered knowledge might alleviate the challenge of identifying the relative relevance of fisheries and the environment on observed changes in biology (ICES 2013a). For example, the ICES through the SRIA was requested "to review the draft Red List assessment of Baltic Sea cod (*Gadus morhua*)," as well as "analyze all relevant data on the growth of the cod stock(s) and its habitats" and among others (Appendix III.2).

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[12] Marine plankton provides food for fish larvae and juveniles.
[13] The abundance of predators, and hydrographic conditions are known to be critical for the growth and survival of fish eggs, fish larvae, and juvenile fish.
[14] Southern species include the red mullet and the sea bass.
[15] Examples of highly exploited stocks are Capelin (*Mallotus villosus*), Greenland halibut (*Reinhardtius hippoglossoides*), Northern shrimp (*Pandalus borealis*), and Polar cod (*Boreogadus saida*).

In addition, knowledge gained from simulations of interactions between capelin, herring, cod, harp seals, and minke whales could be requested through the SRIA to keep stakeholders up to date on the effects of food change. Also, the abundance of whale predation in the Barents Sea, which affects the number of recruits to the mature herring stock, could be requested through the SRIA (Bogstad et al. 1997). For instance, a SRIA could be requested to evaluate whether any significant immigration exists between the Baltic Sea stock(s) and the North Sea population (Appendix III.2).

Although an evaluation of the first two levels of EM (specifically, SSAFM and EAFM) in the context of SRIA may have operational limitations during the classification of the various special requests for advice, this issue may have an impact on the numbers accounted for on an annual and decade basis, as previously stated. One good example might be related to an assessment of fish stock based on PA reference points. A round-table debate among professionals in the field of fishery management, for example, might help to correct this and other mistakes.

To foster a more holistic and multi-sectoral view on the levels of EM (EBFM and EBM), the SRIA addresses a broader range of issues about either fishery sector management (i.e., EBFM) or management of human activities impacting ecosystems (i.e., EBM). Certain essential characteristics of the SRIA in connection to EBFM can be roughly classified under the headings; the types of fishery community and distributional pattern, vulnerable marine ecosystem/species, gear-fisheries/ecosystem impact, bycatch assessment, methodological standards for ecological classification, fishery conservational management, habitat management, and fisheries data management.

Numerous SRIAs on EBFM have been sought for various categories of fishery communities. Within these exceptional demands, SRIA is frequently requested for the following species: recreational fisheries, deep-water fisheries, bycatches and discard rates, joint/mixed fisheries, self-sustaining fishery population, burrowing megafauna, and higher groups of species. For instance, SRIA was requested on drivers for the collection of recreational fishery data and another on the evaluation of angler fishery; SRIA on deep-water fisheries included requests with identities, "11_07, 12_11, and 16_13" etc. (Appendix III.2). Also, special requests on bycatches, discard rates, and higher groups of species included requests with identities, "13_04, 19_06, and 19_09" etc. (Appendix III.2).

In addition, other fisheries-related SRIA include "request on developing marine mammal indicators for the grey seal and harbour seal as well as other requests with identity such as, "13_26, 14_08,15_11, 16_22, 19_17," and among others (Appendix III.2).

Furthermore, identification of marine ecosystem/species at risk and gear-fisheries/ecosystem effect is also a subject that triggered SRIA on EBFM, as evidenced by the findings. An example includes the "NEAFC special request on vulnerable deep-water habitats in the NEAFC Regulatory Area" (Appendix III.2). Also, some examples of SRIAs on gear-fisheries effects include, "a review of NEAFC bottom fisheries regulations", "request to update the ecosystem effects of pulse trawl", as well as "request on indicators of the pressure and impact of bottom-contacting fishing gear on the seabed," and among others (Appendix III.2).

Several SRIA inquiries on EBFM demonstrated the breadth of defined topic areas of ecological categorization and fisheries conservation management methodology. Fisheries and ecosystem assessments can benefit from using formalized ecological criteria such as the EBSA, MSFD criterion, and EcoQO to determine Good Environmental Status (GES). Among the SRIAs that fell under these categories were requests for information on "Barents Sea adapting for international criteria for Ecologically or Biologically Significant Marine Areas (EBSA)", "assessment of healthy fish stocks under the MSFD for Descriptor 3 commercial fish", "to review and make recommendations on a draft Ecological Quality Objective (EcoQO) on Seabird Population Trends" and others (ICES 2013b).

The other SRIA requests on EBFM which revealed conservation management methodologies include, "OSPAR request to the development of OSPAR biodiversity indicators for benthic habitats, special request on "review of the OSPAR Case Report for the addition of *Haploops* communities to the OSPAR List of Threatened and/or Declining Species and Habitats", "request on analysis of the IUCN process for the assessment of the conservation status of marine species" and "the review of criteria for CITES non-detriment finding for the European eel," etc. (Appendix III.2).

The information gathered from these issues may aid in determining the most effective method for limiting fishing of species such as eels (either juvenile glass eels or adults silver eels), re-establishing escapement levels of certain species in rivers by removing physical barriers to migration, or providing alternative measures of restocking to recover the wild population (Lado 2016). Also, understanding such concerns may help identify viable solutions for improving the

conservation status, increasing awareness of the rich marine biodiversity, and resolving difficulties related to undesired captures.

To accomplish conservation goals in EBFM, a number of ICES clients have submitted several SRIAs to collect information on habitat and fisheries data management. The EBFM strongly advocates for the development of marine protected areas and conservation regions as a means of advancing both fisheries management and conservation objectives. Examples of SRIA requests on EBFM that indicate the breadth of such topic areas are special request identifiers, "12_21, 12_29, 18_23," and others (Appendix III.2).

Moreover, the ICES clients are also interested in exploring more about developing a consistent data collecting strategy for fisheries resources and the ecosystem from ICES. On that note, requesters will submit requests to secure further details and examples of such instances are, "a request to assist in the identification of new data to support the implementation of the Common Fisheries Policy (CFP) and the Marine Strategy Framework Directive (MSFD)", "special request on suitable arrangements for data collection and storage resulting from the implementation of OSPAR Recommendations" and among others (Appendix III.2).

Furthermore, SRIA on EBM consisted of unique reviews which are broadly grouped under the development of new/scientific information, spatial/ecological mapping, substance monitoring programs, mitigation, and innovation strategies and measures as well as aquaculture and mariculture. In most cases, ICES clients require new and scientific information regarding the marine ecosystem and examples include the following SRIAs with IDs, "18_27, 19_23,19_24, and 20_09" etc. (Appendix III.2).

A number of requests for information have been made through the SRIA on EBM including spatial and ecological mappings. Exemplifying this idea of EBM in SRIA are the SRIAs identified in this study as, "14_15, 15_16, 15_18 and 16_25" etc. (Appendix III.2). However, several requests have been filed under the SRIA for monitoring programs that focus on dangerous chemicals/substances, sediments, and plastic particles. Examples are, "request on the development of guidance on integrated monitoring and assessment of chemicals and biological effects," as well as SRIAs with identities such as, "11_11, 12_26, 12_27, 13_36, and 14_17" etc. Also, "10_20, 10_24, 10_27, 12_28, and 15_12" are examples of special requests that are used to refer to scientific recommendations (Appendix III.2).

In addition, the SRIA on EBM constituted various requests for information on energy, mitigation measures, and innovation initiatives. In this research, "10_03,18_17, 19_06, 19_19, and 20_04" are instances of SRIAs related to this concept of EBM (Appendix III.2). According to SRIA on EBM, the essential features and trends of each ecoregion may be described based on factors such as the scale and location of the ecoregions, the primary local pressures, human activities within the ecoregions, and changes in the ecosystem components and external pressures (such as climate change) (Advice 2021a).

Generally, the SRIA on aquaculture or mariculture seeks regional and temporal information describing relevant policies and legal foundations, examining the interactions of environmental and socioeconomic factors with aquaculture activities and practices, and providing insight into the interactions of these factors as well as future projections, threats, and opportunities (Advice 2021a). Several examples include the following: "OSPAR request on interactions between wild and captive fish stocks", as well as "a specific request on the impacts of mariculture on wild fish populations" (Appendix III.2).

During this study, only publicly accessible data (from 2010 to 2020) from the ICES official website was analyzed. As a result, it is projected that other general factors will likewise constrain the number of SRIAs, and examples are as follows:

The ICES request, advisory system, and the process are open and transparent and the scientific community contributes to it by upholding rigorous independence, credibility, and peer review to produce good advice (Advice 2020b). From ICES (2020i), its breadth of scientific expertise enables it to advise on a range of subjects, from the impact of pollutants on individual animals to the condition of fish populations and the consequences of various human pressures and climate change at the size of ICES ecoregions. Further, into the request and advisory structure, the ICES guidance is based on the most up-to-date research and data available at the time it is issued whereby their advisory products often provide advice and ideas on how to expand the use, development, and improvement of research and data flow (Advice 2020b).

Consequently, the above characteristics of the scientific community may either have a detrimental effect or stimulate the operations within ICES in a positive manner in terms of delivering the response of the SRIA to its clients. A fluctuating trend in the number of the release of the SRIA could be attributed to the urgency of the special request, clarity of the special request, availability of the scientific articles to be peer-reviewed, late request

submission, critically incomplete data, and the interest level of ICES clients in relation to a particular problem. Also, another possible reason which may limit the availability of the SRIA may be related to the requirements of additional features which mirror broader international fisheries policy standards like the precautionary approach, MSY, and an ecosystem approach, while also meeting the specific needs of management bodies that ask SRIA on fisheries advice (Advice 2013).

According to Advice (2021b) "ICES special request for advice products are tailor-made depending on the topic and the needs of the requester." This lack of uniformity may have impacted how SRIA is provided, particularly when the components of these standards have not been previously defined for the species in question. In addition, the bureaucratic structure of the data gathering procedure may lead to fewer releases at a time, particularly when a broader ecosystem perspective is required. For instance, the lack of population estimates for over half of the more than 200 species for which ICES makes recommendations was one of the flaws in the 2012 report from ICES. This complicates the process of calculating the MSY methodology's catch choices (ICES 2012). As a result, the number of requests that are accessible for analysis may be influenced by this change. It was further highlighted by ICES (2020d) that fish stock assessments and request-drafting expert groups experienced global disruption in 2020 as a result of the unusual COVID 19. This circumstance caused delays throughout the spring months and, as a result, SRIA publications on fish populations in the North Atlantic, Baltic Sea, Northeast Atlantic, Arctic, and Northwest were postponed.

4.2 Who are the requesters of the SRIA?

As part of the approval process, the ICES provides advice on requests with the authorization of the Advisory Committee (ACOM), and it is the central body responsible for all advising products and the continuous growth and improvement of the advisory process (ICES 2013a). This committee is composed of members assigned by the individual member state and operates on a consensus-based decision-making basis (Advice 2020b). Only ICES Member countries and intergovernmental organizations are entitled to seek help from the ICES in the form of advice or other forms of assistance.

The SRIA research examined the various requesters and classified them into eight primary bodies [16]. The SRIA's requesters/requesters of the SRIA (RSRIA's) submit two distinct categories of special requests and these are non-ecoregion specific special request (NESSR) and ecoregion specific special request (ESSR). The NESSRs are not focused on a particular ecoregion, and the majority of requesters comprised the EU/ECR, IOR, JOR, and EU/IOR. They mostly seek specialized advice in several different disciplines and for a wide range of reasons.

For example, the EU/ECR[17] requested for an ICES response "concerning the monitoring of bycatch of cetaceans and other protected species" (see Appendix III.1, the Year 2013). Within this SRIA, the EU/ECR required detailed information on: "the current fishery monitoring schemes and acceptable methods for assessing the nature and extent of cetaceans and other protected species bycatch" and among others (ICES 2013a). As well as request on the monitoring of bycatch of seabirds, whereby the organization asks the ICES to "review and update current seabird bycatch data, explore the criteria and/or metrics that could be used to define a seabird bycatch problem, and establish a standard data reporting format for recording seabird bycatch and develop a database of seabird bycatch data in EU fisheries" (ICES 2013a). Hence, such SRIAs and among others apply exclusively to bycatch catches and protected species or marine species listed in the relevant annexes of the Habitats Directive (ICES 2013a). The EU/ECR would also seek for SRIA to get new information regarding the impact of fisheries

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[16]These included European Union/European Commission Requesters (EU/ECR), Individual Organization Requesters (IOR), Joint Organization Requesters (JOR), Individual Member-state Requesters (IMSR), Joint Member-state Requesters (JMSR), European Union/Non European Union Member State Requesters (EU/NEUMSR), Non Defined Requesters (NDR) and European Union/Individual Organisation Requesters (EU/IOR).

[17] EU/ECR - The largest group of requesters for SRIA (40%).

and data collection issues (Appendix III.2). Such requests would keep them up to date on habitat sensitive or VME locations, as well as help identify new data to support the implementation of the CFP and MSFD and review the existing environmental indicators to measure the impact of fisheries on the marine ecosystem.

The IOR, JOR, and the EU/IOR (which together constitute the next largest requesters) are also members of the NESSR and constitute the Regional Fisheries Management Organization whose operations are guided by policy and legal instruments in their respective regions. These clients primarily request that ICES collect data on the distribution of vulnerable habitats, MSFD guidelines, pressures and their impact on the seabed, fisheries management assessment, management measures for EBSAs, and the impact of bottom fishing closure on buffer zones, all within a specific regulatory area (Appendix III.2), etc. For instance, a SRIA from NEAFC asked the ICES "to continue to provide all available new information on the distribution of vulnerable habitats in the NEAFC Convention Area and fisheries activities in the vicinity of such habitats;" And another SRIA by OSPAR/NEAFC was requested "on existing and potential new management measures for ecologically and biologically significant areas (EBSAs)" as well as SRIA by OSPAR on the subject of "implementation of MSFD for marine mammals)" among others (see Appendix III.2).

As previously stated, the ESSR relates to the SRIA, which is directed to specific ecoregion/s or subject matters that are related to the different ecoregions under the administration of the ICES. According to the RSRIA, groupings designated as IMSR, JMSR, and EU/NEUMSR primarily constitute an ESSR. Their ultimate aim is to get responses on the effect of fisheries, in-year fishing advice and opportunities, PA reference points and MSY reference points, long to short management plans. For example, a SRIA from JMSR was directed to the ICES to "evaluate a proposed harvest control rule for deep pelagic redfish in the Irminger Sea and adjacent waters." Another SRIA from IMSR consisted of requests to "evaluate long-term management plan and harvest control rule for Icelandic haddock and saithe" etc. Other instances of SRIA from EU/NEUMSR are joint requests to the ICES for advice on the long-term management strategies on Northeast Atlantic Mackerel as well as a "long-term management strategy for *Pandalus* in Skagerrak and the Norwegian Deep" among others (Appendix III.2).

Most frequently, the desire of ICES clients to preserve marine ecosystems and endangered species is the most common reason for the organization's members to cooperate and seek SRIA. For example, it is possible for collaboration among RSRIA when they shared the border of

fishing areas. Additionally, areas, where collaborative RSRIA has a significant amount of fishing activity, may lead them to seek specific guidance. Similarly, joint coastal states with the cooperative responsibility of protecting the exclusive, transboundary, shared, and straddling stock would request for SRIA on those species and jurisdictions.

4.3 Which geographic scope or area/s is the SRIA addressed to?

Four broad categories were derived from the study's analysis of the various ICES ecoregions[18]. Having a different number of SRIAs directed to the different ecoregions may be due to geographical factors such as visible signals within ecoregions, pressures from human activity, fishing practices, climate change uncertainties, and the state of the ecosystem components, which are all factors that the study will be looking into.

A natural key signal in the environment is found in every ecoregion. These key signals are defined as being vital to the ecosystem's survival yet are subject to change through time. The pattern of these dynamic signals might serve as a warning that requires more investigation to promote the likelihood of long-term sustainability in the fisheries industry.

There could be a plethora of such distinguishable natural signals in the GS1 that show inconsistent trends that could have an impact on fisheries' resources. For example, in the Bay of Biscay and the Iberian Coast ecoregion, a subdivision of GS 1 has shown a northwards shift in the distribution of *Temora stylifera* and *Calanoides carinatus*[19], gradual decline in the conditions of diverse small pelagic fisheries such as the anchovy and sardine as well as a similar trend in certain demersal species, and population decline in some seabird species and reasons of extinction in both the Iberian guillemot (*Uria aalge ibericus*) and the black-legged kittiwake (*Rissa tridactyla*), etc. (ICES 2020c). Nevertheless, these episodic changes in the GS1 may prompt the region's ICES clients to send a SRIA for prospective management strategies to address these new conditions.

Also, variable cycles in the productivity of the Greater North Sea ecoregion's ecosystem components (e.g., phytoplankton, zooplankton, and demersal and pelagic fish), the impact of the North Sea's expansion of artificial hard substrate (platforms, wind turbines, and rocks) on biodiversity and productivity (ICES 2020h) as well as a shift in the plankton community's size composition toward smaller taxa, are among other factors that would prompt a SRIA (ICES 2020a).

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[18] Geographical scope 1 (GS 1) – 59%, Geographical scope 2 (GS 2) – 9%, Multi-ecoregional scope (MES) – 5%, and Non-defined geographical scope (NDGS)- 27%.
[19] *Temora stylifera* and *Calanoides carinatus* are known as warm-water copepod species.

The GS 2 classifies the ICES ecoregions that fall outside the purview of the GS 1 classification. There are also substantial environmental and ecological signals within the jurisdiction of the GS 2, which might affect the quantity of SRIAs directed to the various areas across the GS2. It is relied upon by many ICES member nations for various reasons, but the trends in its alteration may be detrimental to biotopes and biodiversity, prompting the need to address these concerns in the future. For instance, in the Icelandic Waters, a sub-ecoregion of the GS 2, has experienced a collapse in the stocks of northern shrimp *Pandalus borealis* with the effect of increased predation by gadoids, increasing temperature, and high fishing mortality, the unexpected decline of the Sandeel (Ammodytidae) population and failure in their recruitment, etc. (ICES 2019a) as well as the fluctuations in the biomass index of zooplankton within the entire Norwegian Sea (ICES 2019b) and among others are some examples of environmental trend issues that would give rise to SRIA on GS 2.

The MES classification, on the other hand, applied to any SRIA directed at areas both inside and outside of the EU. According to the findings of this study, the MES was utilized to categorize those ecoregions where a single SRIA was directed to several geographical scopes. Moreover, the interconnected character of this ecoregion provides a variety of critical environmental and biological indications.

According to the ICES Technical Guidelines study, the distribution of human activities[20] (ICES 2020c, a, 2019b, c) leads to a range of environmental pressures[21]and diverse impacts on the status of biological diversity (ICES 2020h, b). These factors may influence the SRIA direction in GS 1, GS 2, and MES ecoregions. For example, SRIAs could be sent to ICES to provide strategic ecoregional management which is capable of dealing with activities and pressures on the ecosystem.

Corresponding to ICES (2020b), ICES (2020h), and ICES (2019b), the aforesaid pressures and others would have varied impacts on the status of the habitat, food webs, and benthos, fish, seabirds, and marine mammals populations, plankton, and productivity, among other things, in all ecoregions. For example, pressure from selective extraction of species has a variety of

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[20] Examples are fishing, agriculture and forestry, coastal construction, discharges, aquaculture, maritime transport, offshore structures, tourism, and recreational activities, navigation dredging, telecommunications, aggregate extraction, oil and gas production, military operations, and renewable energy.

[21] Such as effect on nutrient and organic enrichment, selective extraction of species, abrasion smothering, substrate loss and degradation, the introduction of invasive species, the introduction of contaminating compounds, marine litter, and underwater noise.

effects on the ecosystem's components, including impact on commercial stocks and bycatch[22], and unsustainable fisheries (ICES 2019b, c). The possible consequences of inadequate management of human activities and their impacts on the status of biodiversity in the GS 1, GS2, and MES may lead to an increase in the number of requests for SRIA across the different scopes at the same time.

Multiple consequences on the marine ecosystem result from multinational fisheries employing a variety of diverse fishing methods and tactics. Aside from small-scale fisheries that operate using tiny boats, there are large fish industrial factory ships that operate in the same ecoregions. An example of Large-scale fisheries operation includes those in the Baltic Sea, which employ large offshore vessels (small-meshed pelagic trawls) to harvest species such as sprat and herring, as well as demersal trawls to harvest cod and plaice (ICES 2020b), etc. The progress of technology in the fishing sectors at the GS1, GS 2, and MES levels would prompt ICES clients to request an up-to-date management plan to mitigate the negative effects of fisheries on marine ecosystems, which would be provided through SRIA.

The physical impacts of climate change and their effects on the ecosystem are intricately intertwined, making it hard to isolate and measure the effects on biological resources (Klais et al. 2013). However, the predictability of climatic variation and seasonal fluctuations requires advice from expert groups or organizations to forecast warming throughout all ecoregions (ICES 2020h). In the case of human-induced climate change and ocean acidification, for example, the accumulation of information about these phenomena and their considerable impact on ecoregions and several studies in the Azores, a sub-ecoregion in the GS 1 that is known as a hotspot for cold-water corals, have proven the region's sensitivity to ocean acidification and these issues may drive the request of a SRIA (ICES 2020a). Also, in the Bay of Biscay and the Iberian Coast ecoregion, the alteration of the degree of synchrony (and stability) of the zooplankton population due to the strength of upwelling as well as river discharge off Galicia and its impact on upper trophic levels, and the response to climate change effects on upwelling patterns by species such as mackerel (*Scomber scombrus*) could indicate the need to request SRIA in the respective ecoregions (ICES 2020c).

The status of the environment, as well as the ecosystem in which it exists, is a contributing element to SRIA. It may be necessary to request SRIA in certain ecoregions based on factors

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[22] Commercial stocks and bycatch include *Dipturus spp.*, small-eyed ray (*Raja microocellata*), undulate ray (*Raja undulata*).

such as the primary productivity and phytoplankton biomass, the abundance of phytoplankton in an ecoregion, topographic diversity, and the wide range of substrates in an ecoregion, fish diversity, breeding habitats for seabird species, and other factors (ICES 2020h, 2019c). For example, in the area of fishery diversity, a SRIA could be made to investigate the causes of the recent sharp decline in the recruitment population of the European eel (*Anguilla anguilla*), and also, a SRIA to acquire a management plan for the limited distribution of certain cold-water species such as whiting (*Merlangius merlangus*) and pollack (*Pollachius pollachius*) in regions of the northernmost part of Portugal, etc. (ICES 2020b). Again, a SRIA could be requested by ICES clients on a number of relevant topics, including the current fluctuating trends in the abundance of *Illex coindetii* in both the Bay of Biscay and the Iberian Coast, and assess the state of benthic habitats in different ecoregions to make judgments about their state and temporal changes (ICES 2020b).

The varying SRIA levels assigned to the ecoregions for the aforementioned reasons do not necessarily mean that ICES clients in the various areas were not committed to protecting and conserving the ecoregions between the period 2010 and 2020. However, one factor that may have contributed to this is the extremely low degree of collaborative involvement among ICES consumers during that period. Nevertheless, another possibility is that the beneficiaries of these ecoregions (e.g., GS 2) are classed as "smaller coastal states," and their activities in the region could not possibly exceed those of GS 1 over ten years (Long 2017).

The final group among the several geographical scopes examined in this study is NDGS[23], which was previously identified as having the second-highest number of ESRIA (Figure 3.5). The following are some possible explanations to why ICES clients sought specific assistance in this area, and which are discussed further below:

Migratory species are classified as a complex collection of interrelated populations, each of which is associated with either breeding or nonbreeding populations (Taylor and Norris 2010). Numerous marine species, such as sea animals and fish, are not restricted to a particular habitat and are extensively dispersed throughout ecoregions in the marine ecosystem. Apart from this, other types of stocks, such as shared stocks, transboundary stocks, and straddling stocks, are also distributed across all aquatic zones and are administered cooperatively by coastal states. Members states cooperating in this resource exploitation would request SRIA on catch

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[23] They are described as "Widely distributed and migratory populations", together with the "general advice".

limitations (either precautionary limits or target reference points). For example, the collaborative effort in the Norwegian-Russian Fisheries Commission would necessitate the request of SRIA on the establishment of quarterly harvest limits for shared populations in the Barents Sea (e.g., capelin, haddock, and cod). Additionally, coastal states may agree to seek SRIA from the ICES on management plan (s) and total allowable catches (TACs) for straddling populations such as blue whiting and Norwegian spring-spawning (*Atlanto-Scandian*) herring on a frequent basis.

In terms of the number of SRIA addressed to the NDGS, however, the uncertainty involved with projecting how diverse populations would react to environmental change during the movement of target fisheries resources over the season may contribute to it. Examples include the lack of understanding of the relationship between the scale of the Atlantic inflow to the North Sea and phytoplankton color indices, as well as the impact on the scale of migration and capture rate in the Norwegian horse mackerel fishery (Reid et al. 2001b), the feeding conditions in the Norwegian Sea throughout autumn seasons and their influence on the availability of the zooplankton (*Calanus*) and reproductive success of this species (Slotte 2003), the importance of a community of commercial species such as whiting, blue whiting, *Trachurus spp*, cephalopods[24], rays, etc. to hake fishery and how this varies to different gears and sea areas, to name a few examples (Wiltshire and Manly 2004).

Taylor and Norris (2010) stated that the spatial structure of marine species may have a major impact on their relative populations, while seasonal variations can have a large effect on their degree of mixing within the ecosystem. For example, Reid et al. (2001a) demonstrated a lack of complete knowledge of the impact of temperature evolution on mackerel distribution before pre-spawning migration and migration timing in the northern North Sea throughout the winter and also, the link between recruitment success and stock size variations of Norwegian spring-spawning herring and the temperature in the Kola part of the Barents Sea, as well as the relationship between the strength of the influx of Atlantic water masses to the northeast Atlantic region (Toresen and Østvedt 2000). As a result of these interests, the ICES may receive many SRIAs for information on this and other topics related to the NDGS.

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[24] Cephalopods include octopus, *Loligidae, Ommastrephidae,* and cuttlefish.

5   Conclusions and recommendations

The special request is a key component of the ICES request formulation, and it is based on well-established scientific and managerial frameworks that provide advice to ICES members on specific problems at their request in the form of a dialogue. Fisheries management is increasingly becoming ecosystem inclusive, and as a result, the special request is also expected to reflect on the principles of ecosystem management (EM).

The study reveals different sets of ambition with regards to EM where the Special Request for ICES Advice from 2010 to 2020 was examined following Dolan's EM levels. In the course of the research, a preliminary instrument was developed using the approach of a systematic literature review. To ensure clear and proper results reporting structure, important information about the research was given in PRISMA[25] format but without meta-analysis. The study findings enable us to develop and register the first and primary protocol, which pre-specified the outcomes of the objectives and procedures for examining the SRIA.

The findings of the SRIA study in the context of Dolan's four levels of EM indicated the absence of a significant signal in the request system as it progressed from lowest to highest (that is, towards a more systemic and multi-sector viewpoint) of Dolan's levels. Some uncertainties exist over how to assign a specific SRIA to a Dolan level. Due to a lack of resources, this was not fully implemented in this thesis, and this may have contributed to a few misinterpretations of the SRIA in terms of the categorization scheme.

When evaluating the SRIA according to Dolan's EM levels, various questions came up that are frequently addressed by the ICES on a recurrent basis. Additionally, with the classification to the different levels, it was projected that the higher level of EM would have a greater number of SRIAs than the lower one. The SRIA investigation, on the other hand, produced a contradictory finding, and the odd reasons for such single-species requests were examined.

Nonetheless, it is recommended that the large parcels of requests for single species (particularly single-species TAC) need a more systematic analysis that can uncover the tendency toward higher levels in Dolan's system of EM levels. Additionally, an expert group debate on specific SRIAs would be an excellent technique for eliminating these bias issues across the research.

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[25] PRISMA-Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

On the other hand, this strategy would facilitate the deliberation of the explicit Dolan's level, allowing for the refinement of the categorization tool.

Furthermore, a review of the SRIA's requesters found that the SRIA's eight principal requesters filed two distinct types of special requests: non-ecoregion specific special requests (NESSR) and ecoregion specific special requests (ESSR). The NESSRs are not ecoregion-specific, with the bulk of requesters being from the EU/ECR, IOR, JOR, and EU/IOR. They seek specialist advice in a variety of different fields and for a variety of different reasons. The ESSR is connected to the SRIA, which is targeted at specific ecoregions or topic matters associated with the many ecoregions administered by the ICES. According to the RSRIA, the IMSR, JMSR, and EU/NEUMSR groups largely comprise an ESSR.

Moreover, the geographic affiliation of the SRIA was broadly classified into four key groups, which were GS1, GS2, MES, and NDGS. The varying number of SRIA may be attributed to either geographical or non-geographical factors. There may be a multitude of such distinct natural signals in the GS1 that exhibit inconsistent patterns and may affect fishery resources. Additionally, there are significant environmental and biological signals inside the GS 2's ecoregion, which may influence the number of SRIAs directed to the various places within the GS2. The MES was used to classify ecoregions in which a single SRIA was directed at several geographical scopes. NDGS is the final group evaluated in this study, having been identified as having the second-highest number of ESRIA cases.

In general, it is expected that future SRIA analyses in subsequent years would disclose the underlying tendency of the special requests to greater EM levels, which was surprisingly inconsistent with the findings in this study. Additionally, other SRIA requesters or groups of SRIA requesters would be identified, as well as new variables triggering SRIA to geographical affiliation would be uncovered.

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7   Appendices

This section summarizes the appendices (attached on the following pages) that were used during this systematic review to facilitate identification and reference.

Appendices

Review label	Description	Citation page
Appendix I.1	ICES Homepage full search	Page 61
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Appendix I 1 ICES publications showing different years

Appendix I 2 Alternate ICES Homepage search showing just Recent Advice.

Appendix II. 1 The explanation of acronyms

Requester of Advice				
EU/ECR-Request by the European Union/European Union				
IOR-Individual Organisation Requesters				
JOR-Joint Organisation Requesters				
IMSR-Individual Member-State Requesters				
JMSR-Joint Member-State Requesters				
EU/NEUMSR-EU and Non-EU Member-State Requesters				
EU/IOR-EU and Individual Organisation Requesters				
NDR-Non-defined Requesters				
Geographical Scope				
GS1- Geographical Scope 1				
GS2- Geographical Scope 2				
MES-Multi-ecoregional scope				
NDGS - Non-defined geographical scope				
Levels of Ecosystem Management				
SSAFM-Single-species approach to fisheries management				
EAFM- Ecosystem Approach to Fisheries Management				
EBFM- Ecosystem Based Fisheries Management				
EBM- Ecosystem Based Management				
NDL - Not-defined level of EM				

Appendix III. 1 Eligibility Assessment for synthesis of result (From 2020 – backdated to 2010)

* The first two numbers indicate the year   *Second digits -Identification
Year 2020

	Level of Ecosystem Management			
SSAFM ▾	EAFM ▾	EBFM ▾	EBM ▾	NDL ▾
20_07	20_01	20_02	20_04	
20_10	20_08	20_03	20_09	
		20_05		
		20_06		

	Requesters of Advice							
Year ▾	EUR ▾	IOR ▾	JOR ▾	IMSR ▾	JMSR ▾	EU/NEUMSR ▾	EU/IOR ▾	NDR ▾
	20_01	20_09	20_06	20_08	20_10	20_07		
	20_02							
2020	20_03							
	20_04							
	20_05							

	Geographical Scope		
GS 1 ▾	GS2 ▾	MES ▾	NDGS ▾
20_01		20_04	
20_02		20_06	
20_03		20_07	
20_05			
20_08			
20_09			
20_10			

Year 2019

Level of Ecosystem Management

SSAFM	EAFM	EBFM	EBM	NDL
19_08		19_01	19_10	
19_11		19_02	19_16	
19_13		19_03	19_19	
19_14		19_04	19_22	
19_15		19_05	19_23	
19_18		19_06	19_24	
19_20		19_07		
19_21		19_09		
		19_12		
		19_11		
		19_17		

Requesters of Advice

Year	EUR	IOR	JOR	IMSR	JMSR	EU/NEUMSR	EU/IOR	NDR
	19_03	19_15		19_01	19_20	19_11		
	19_04	19_19		19_02	19_21	19_12		
	19_05	19_24		19_13				
	19_06			19_14				
	19_07			19_16				
	19_08			19_17				
2019	19_09			19_18				
	19_10			19_22				
	19_23							

Geographical Scope

GS 1	GS2	MES	NDGS
19_01	19_13	19_15	
19_02	19_14	19_18	
19_03	19_16	19_23	
19_04	19_17	19_24	
19_05			
19_06			
19_07			
19_08			
19_09			
19_10			
19_11			
19_12			
19_19			
19_20			
19_21			
19_22			

Year 2018

	Level of Ecosystem Management			
SSAFM ▼	EAFM ▼	EBFM ▼	EBM ▼	NDL ▼
18_01	18_19	18_05	18_17	
18_02	18_16	18_07	18_27	
18_03		18_08		
18_04		18_09		
18_06		18_10		
18_15		18_11		
18_16		18_12		
18_18		18_13		
18_20		18_14		
18_22		18_21		
		18_23		
		18_24		
		18_25		
		18_26		

				Requesters of Advice				
Year ▼	EUR ▼	IOR ▼	JOR ▼	IMSR ▼	JMSR ▼	EU/NEUMSR ▼	EU/IOR ▼	NDR ▼
	18_02	18_20		18_19	18_01	18_18		18_08
	18_03	18_23		18_21	18_22			
	18_04	18_24		18_25				
	18_05	18_27						
	18_06							
	18_07							
	18_09							
	18_10							
2018	18_11							
	18_12							
	18_13							
	18_14							
	18_15							
	18_16							
	18_17							
	18_26							

	Geographical Scope		
GS 1 ▼	GS2 ▼	MES ▼	NDGS ▼
18_02	18_22	18_01	18_17
18_03		18_20	
18_04			
18_05			
18_06			
18_07			
18_08			
18_09			
18_10			
18_11			
18_12			
18_13			
18_14			
18_15			
18_16			
18_18			
18_19			
18_21			
18_23			
18_24			
18_25			
18_26			
18_27			

Year 2017

	Level of Ecosystem Management			
SSAFM ▾	EAFM ▾	EBFM ▾	EBM ▾	NDL ▾
17_02	17_08	17_01	17_14	
17_03		17_05	17_18	
17_04		17_06		
17_10		17_09		
17_11		17_07		
17_13		17_12		
17_15				
17_16				
17_17				
17_19				
17_20				
17_21				

				Requesters of Advice					
Year ▾	EUR ▾	IOR ▾	JOR ▾	IMSR ▾	JMSR ▾	EU/NEUMSR ▾	EU/IOR ▾	NDR ▾
	17_01	17_14		17_19		17_13		
	17_02	17_18		17_20		17_17		
	17_03			17_21				
	17_04							
	17_05							
	17_06							
	17_07							
2017	17_08							
	17_09							
	17_10							
	17_11							
	17_12							
	17_15							
	17_16							

	Geographical Scope		
GS 1 ▾	GS2 ▾	MES ▾	NDGS ▾
17_01	17_19	17_13	
17_02	17_20		
17_03	17_21		
17_04			
17_05			
17_06			
17_07			
17_08			
17_09			
17_10			
17_11			
17_12			
17_14			
17_15			
17_16			
17_17			
17_18			

Year 2016

	Level of Ecosystem Management			
SSAFM	**EAFM**	**EBFM**	**EBM**	**NDL**
16_02		16_01	16_15	
16_04		16_03	16_25	
16_07		16_05		
16_08		16_06		
16_10		16_09		
16_12		16_11		
16_16		16_13		
16_17		16_14		
16_18		16_19		
16_21		16_20		
		16_22		
		16_23		
		16_24		

	EU/ECR	Requesters of Advice						
Year	**Column1**	**IOR**	**JOR**	**IMSR**	**JMSR**	**EU/NEUMSR**	**EU/IOR**	**NDR**
	16_01	16_12		16_10	16_14			
	16_02	16_13		16_11				
	16_03	16_21		16_15				
	16_04	16_23		16_17				
	16_05	16_24		16_20				
	16_06	16_25		16_22				
2016	16_07							
	16_08							
	16_09							
	16_16							
	16_18							
	16_19							

	Geographical Scope		
GS 1	**GS2**	**MES**	**NDGS**
16_01	16_11		16_06
16_02	16_14		
16_03	16_15		
16_04			
16_05			
16_07			
16_08			
16_09			
16_10			
16_12			
16_13			
16_16			
16_17			
16_18			
16_19			
16_20			
16_21			
16_22			
16_23			
16_24			
16_25			

Year 2015

| | | Levels of Ecosystem Manageement | | |
SSAFM	EAFM	EBFM	EBM	NDL
15_02		15_01	15_06	
15_03		15_05	15_12	
15_04		15_11	15_13	
15_07		15_14	15_16	
15_08		15_15	15_17	
15_09			15_18	
15_10				

| | | | | Requesters of Advice | | | | |
Year	EU/ECR	IOR	JOR	IMSR	JMSR	EU/NEUMSR	EU/IOR	NDR
	15_01	15_12				15_04		
	15_02	15_13				15_07		
	15_03	15_14				15_09		
	15_05	15_15						
	15_06	15_16						
2015	15_08	15_17						
	15_11	15_18						
	15_10							

| | | Geographical Scope | |
GS 1	GS2	MES	NDGS
15_01		15_13	15_06
15_02		15_14	
15_03			
15_04			
15_05			
15_07			
15_08			
15_09			
15_10			
15_11			
15_12			
15_15			
15_16			
15_17			
15_18			

Year 2014

Levels of Ecosystem Management				
SSAFM ▼	**EAFM** ▼	**EBFM** ▼	**EBM** ▼	**NDL** ▼
14_01		14_03	14_12	
14_02		14_05	14_14	
14_04		14_08	14_15	
14_06		14_09	14_17	
14_07		14_16		
14_10				
14_11				
14_13				
14_18				

	Requesters of Advice							
Year ▼	**EU/ECR** ▼	**IOR** ▼	**JOR** ▼	**IMSR** ▼	**JMSR** ▼	**EU/NEUMSR** ▼	**EU/IOR** ▼	**NDR** ▼
	14_01	14_12	14_18		14_07	14_02	14_03	
	14_05	14_13			14_08	14_04		
	14_09	14_14			14_11	14_06		
	14_10	14_15						
2014		14_16						
		14_17						

Geographical Scope			
GS 1 ▼	**GS2** ▼	**MES** ▼	**NDGS** ▼
14_01	14_07		14_03
14_02	14_11		14_05
14_04	14_18		14_09
14_06			14_12
14_08			14_13
14_10			14_14
			14_15
			14_16
			14_17
			14_18

Year 2013

	Level of Ecosystem Management			
SSAFM ▼	**EAFM** ▼	**EBFM** ▼	**EBM** ▼	**NDL** ▼
13_01	13_14	13_04	13_21	
13_02		13_05	13_29	
13_03		13_09	13_36	
13_06		13_10		
13_07		13_19		
13_08		13_22		
13_13		13_23		
13_11		13_24		
13_12		13_26		
13_15		13_31		
13_16		13_32		
13_17		13_33		
13_18		13_34		
13_20		13_35		
13_25		13_37		
13_27		13_38		
13_28		13_39		
13_30				

			Requesters of Advice					
Year ▼	**EU/ECR** ▼	**IOR** ▼	**JOR** ▼	**IMSR** ▼	**JMSR** ▼	**EU/NEUMSR** ▼	**EU/IOR** ▼	**NDR** ▼
	13_01	13_14	13_37	13_12		13_11		
	13_02	13_16	13_38	13_18		13_13		
	13_03	13_21	13_39					
	13_04	13_22						
	13_05	13_23						
	13_06	13_24						
	13_07	13_25						
	13_08	13_26						
	13_09	13_27						
2013	13_10	13_28						
	13_15	13_29						
	13_17	13_30						
	13_19	13_31						
	13_20	13_32						
		13_33						
		13_34						
		13_35						
		13_36						

Geographical Scope			
GS 1 ▾	**GS2** ▾	**MES** ▾	**NDGS** ▾
13_02	13_12		13_01
13_03	13_18		13_04
13_07	13_26		13_05
13_11			13_06
13_13			13_08
13_14			13_09
13_15			13_10
13_16			13_19
13_17			13_21
13_20			13_23
13_22			13_24
			13_25
			13_27
			13_28
			13_29
			13_30
			13_31
			13_32
			13_33
			13_34
			13_35
			13_36
			13_37
			13_38
			13_39

Year 2012

Level of Ecosystem Management				
SSAFM ▾	**EAFM** ▾	**EBFM** ▾	**EBM** ▾	**NDL** ▾
12_01	12_16	12_05	12_25	
12_02		12_10	12_26	
12_03		12_11	12_27	
12_04		12_13	12_28	
12_06		12_14		
12_07		12_15		
12_08		12_17		
12_09		12_18		
12_12		12_19		
12_20		12_21		
12_22		12_23		
		12_24		
		12_29		
		12_30		

Year	EU/ECR	IOR	JOR	IMSR	JMSR	EU/NEUMSR	EU/IOR	NDR
	12_01	12_11		12_12	12_21	12_02		
	12_03	12_13		12_17		12_04		
	12_08	12_14		12_18		12_05		
	12_09	12_15		12_22		12_06		
	12_10	12_16		12_23		12_07		
		12_19		12_29				
2012		12_20						
		12_24						
		12_25						
		12_26						
		12_27						
		12_28						
		12_30						

Geographical Scope

GS 1	GS2	MES	NDGS
12_02	12_22		12_01
12_04			12_03
12_05			12_10
12_06			12_11
12_07			12_14
12_08			12_15
12_09			12_16
12_12			12_19
12_13			12_23
12_17			12_24
12_18			12_25
12_20			12_26
12_21			12_27
12_29			12_28
			12_30

Year 2011

	Level of Ecosystem Management			
SSAFM	EAFM	EBFM	EBM	NDL
11_02		11_01	11_11	
11_03		11_06		
11_04		11_07		
11_05		11_10		
11_08		11_12		
11_09				

			Requesters of Advice					
Year	EU/ECR	IOR	JOR	IMSR	JMSR	EU/NEUMSR	EU/IOR	NDR
	11_01	11_06		11_10		11_02		
		11_07				11_03		
		11_08				11_04		
2011		11_09				11_05		
		11_11						
		11_12						

	Geographical Scope		
GS 1	GS2	MES	NDGS
11_02	11_06		11_01
12_03	11_08		11_07
11_04	11_10		11_11
11_05			11_12
11_09			

Year 2010

	Level of Ecosystem Management			
SSAFM ▾	**EAFM** ▾	**EBFM** ▾	**EBM** ▾	**NDL** ▾
10_11		10_02	10_01	
10_13		10_04	10_03	
10_19		10_05	10_20	
		10_06	10_21	
		10_07	10_22	
		10_08	10_23	
		10_09	10_24	
		10_10	10_25	
		10_12	10_26	
		10_14	10_27	
		10_15		
		10_16		
		10_17		
		10_18		

			Requesters of Advice					
Year ▾	**EU/ECR** ▾	**IOR** ▾	**JOR** ▾	**IMSR** ▾	**JMSR** ▾	**EU/NEUMSR** ▾	**EU/IOR** ▾	**NDR** ▾
	10_01	10_16		10_18		10_13		
	10_02	10_17				10_14		
	10_03	10_19				10_15		
	10_04	10_20						
	10_05	10_21						
	10_06	10_22						
2010	10_07	10_23						
	10_08	10_24						
	10_09	10_25						
	10_10	10_26						
	10_11	10_27						
	10_12							

	Geographical Scope		
GS 1 ▾	**GS2** ▾	**MES** ▾	**NDGS** ▾
10_01	10_16		10_02
10_07	10_19		10_03
10_10			10_04
10_12			10_05
10_13			10_06
10_14			10_08
10_15			10_09
10_18			10_11
10_21			10_17
10_22			10_20
10_23			
10_24			
10_25			
10_26			
10_27			

Appendix III. 2 Justification for Categorization of Ecosystem Management Levels in the ICES Special Request for Advice from 2020 and backdated to 2010.

Year 2020

Year 2020	Specific Special Request Advice(Identity)	Year 2020	Rational for categorisation
		Level of Ecosystm Management	
1	20_01	EAFM	Request to compile data and information on European eel (*Anguilla anguilla*) migration to assess the seasonality of European eel migration patterns in EU waters.
2	20_02	EBFM	Request to provide an analytical evaluation of the recovery rate of individual wild salmon stocks under alternative fishing scenarios and to propose candidate definitions for "MSYsalmon"
3	20_03	EBFM	Request on emergency measures to prevent bycatch of common dolphin (*Delphinus delphis*) and Baltic Proper harbour porpoise (*Phocoena phocoena*) in the Northeast Atlantic
4	20_04	EBM	To provide information on what kind of innovative gears are being used, their objective, their technical specificities and the impact on both target species, non-target species and the environment in which they had been deployed
5	20_05	EBFM	Object of request was about the development of report list of commercially-exploited fish and shellfish
6	20_06	EBFM	Fisheries focused request on multi-species of elasmobranchs to generate maps and shapefiles of the distribution of the species
7	20_07	SSAFM	Request to provide long-term management strategies on Northeast Atlantic Mackerel and to identify appropriate precautionary combinations
8	20_08	EAFM	Request on the impacts of pulse trawling on the ecosystem and environment from the sole (*Solea solea*) fishery in the North Sea
9	20_09	EBM	Request was to focused on a group of species of elasmobranch indicating their conservation status, delivering information on various human activities and pressures which affect their status and measures control
10	20_10	SSAFM	Request to provide update on the catch opportunities for sardine (*Sardina pilchardus*) in divisions 8.c and 9.a

Year 2019	Specific Special Request Advice (Identity)	Year 2019 Level of Ecosystem Management	Rational for categorisation
1	19_01	EBFM	Request was to assess the population dynamics of sole (*Solea solea*), unwanted, precautionary approach framework
2	19_02	EBFM	An extension of 19_01 advice which the same concern
3	19_03	EBFM	Request was about Nephrops; which delivers information on single-species but with intereaction with other species, advice to minimise impacts on different sampling areas
4	19_04	EBFM	To deliver information on management measures to protect a single-stock, and their interaction with bycatches and other stocks in different fisheries
5	19_05	EBFM	Request on a revision of the contribution of TACs to fisheries management and stock conservation for greater silver smelt (*Argentina silus*) in ICES Subarea 7, and for boarfish (*Capros aper*) in ICES divisions 8.b and 8.c
6	19_06	EBFM	A request for catch advice on single species which accounted on relevant data of estimates on discards, wanted catch and seasons of the strata that have both landings
7	19_07	EBFM	To provide advice on fisheries impacts and the factors affecting the fisheries stocks in the ecosystem and the multiannual management plan to minimise the negative effects
8	19_08	SSAFM	To provide advice on the minimum level of catches (tonnage) required in a sentinel TAC, which would provide sufficient data for ICES in order to continue providing scientific advice on the state of this stock
9	19_09	EBFM	Request to provide advice on additional information on a single-species, which estimated unavoidable catches and the effect of selectivity strategies on the fisheries
10	19_10	EBM	A sea-floor assessment request to provide information on operational assessment process for analysing physical loss and disturbance pressures on the benthic habitat
11	19_11	SSAFM	To elaborate on the long-term management strategies on joint stocks between Norway and the European Union
12	19_12	EBFM	To provide an advice on multi-species long-term management framework which was considered precautionary
13	19_13	SSAFM	To evaluate single-species management plan and revised the biological reference points for the species
14	19_14	SSAFM	A request to account for current management plan for haddock in Icelandic waters and revised the biological reference points (stock assessment)
15	19_15	SSAFM	A requets to highlight on a harvest control component of a long-term management plan for haddock at Rockall and its precautionary framework
16	19_16	EBM	The object of request was to provide a data-driven advice mapping ecological and biological valued areas in a specific ecosystem representing ecological dimensions including foodweb, habitat, biodiversity and productivity
17	19_17	EBFM	A fisheries focused request toprovide an assessment of status and harvest potential of the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea, and of the hooded seal stock in the Greenland Sea
18	19_18	SSAFM	A request to provide an advice on a single mackerel species with with model-based approach of biological reference points which accounted for various stock assessment parameters
19	19_19	EBM	Request to advise on the current state and knowledge of studies into the deployment and environmental impacts of wet renewable technologies and marine energy storage systems
20	19_20	SSAFM	Object of request was to account for harvest control rules for the Iberian sardine stock in divisions 8.c and 9.a
21	19_21	SSAFM	A request to evaluate a harvest control management and recovery plans for the Iberian sardine stock
22	19_22	EBM	A request to deliver a reviewed advice on a single-species to determine if the trade of the stock will not be detrimental for the survival of the species
23	19_23	EBM	A request to provide information on the impact of fisheries on different species and sensitive habitats as well as awareness of threats of fishing activities on the ecosystem
24	19_24	EBM	Object of request to update the available information of vulnerable habitats and the different types of fisheries activities in the NEAFC Regulatory Area

Year 2018	Specific Special Request Advice (Identity)	Year 2018 Level of Ecosystem Management	Rational for categorisation
1	18_01	SSAFM	A re-evaluation of Norwegian spring-spawning herring (NSSH) reference points and development of a long term management plan for the stock
2	18_02	SSAFM	A request to account for the management areas for a sandeel stock, indicating the stock definition for the same species
3	18_03	SSAFM	Single-species studies on alternative ways for assessing the status of Norway lobster (*Nephrops*) which minimises impact on stock and provides appropriate adundance index
4	18_04	SSAFM	Studies on single-stock management plan, highlighting on the various simulations which can maximum sustainable yield
5	18_05	EBFM	Request to provide a long term plausible and updated FMSY ranges for the stocks of species inhabiting western EU waters
6	18_06	SSAFM	Request to assess the harvest control rule (HCR) of the proposed long-term management strategy for southern horse mackerel in ICES Division 9.a is considered precautionary.
7	18_07	EBFM	A request to review the list of different ecosystems with self-sustaining wild salmon population to ensure sustainable management
8	18_08	EBFM	Request to highlight on deep-sea bottom fisheries foot-prints and methods to identify vulnerable ecosystems which will be used to implement habitat protection regulation
9	18_09	EBFM	Request to assess the implication of removing Total Allowable Catch instrument of some selected deep-water stocks and the alternative conservation tool to replace the current management plan
10	18_10	EBFM	Request to provide appropriate method to integrate criteria for different species groups and various species aggregation alternatives
11	18_11	EBFM	A fisheries focused requests on different stocks which accounted for the implication of the absence of TACs and management measure to ensure sustainable fishing mortality
12	18_12	EBFM	A fisheries focused request on multiple species within diverse ecosystems which entailed the potential effect of removing TACs and the impact of other conservation tool to ensure maximum sustainable biological productivity of the species
13	18_13	EBFM	A comparative assessment of two different approaches used make a comprehensive inventory of global conservation status biological species in fisheries management
14	18_14	EBFM	A request to produce information on mixed fisheries, their technical and biological interactions within certain ecoregions
15	18_15	SSAFM	Request to estimate the stock parameters (thus; biomass and mortality) of a species in different waters which is needful for setting management plan for the European Eel Management Unit (EMU)
16	18_16	SSAFM	Request to establish the TAC regulation for a horse mackerel and the impact of increased interarea flexibility during landings
17	18_17	EBM	A request to develop a web-based quality assurance platform for analysing and transmitting age estimation across all international laboratories
18	18_18	SSAFM	Request to account for the long-term harvest control rules (HCRs) for Norway pout and identifying the precautionary state in the management strategy
19	18_19	EAFM	Request to update the estimates of landing of undulate ray and the impact of landing fluctuations on the survival of discards
20	18_20	SSAFM	A request to evaluate the long term management strategy for herring in the Northeast Atlantic, indicating the catch limits
21	18_21	EBFM	A request to evaluate the ecological and environmental impacts of two different types of trawls when exploiting catch limits of a target species and non-target ones or benthos
22	18_22	SSAFM	Request to propose the harvest control rule (HCR) options for redfish (*Sebastes mentella*) in ICES subareas 1 and 2 and its precautionary principles
23	18_23	EBFM	A request to review a draft document for establishing marine protected area and support for seabirds. Also evaluate the threats from human activities
24	18_24	EBFM	A request to examine a case report of integrating *Haploops* communities to the List of Threatened and/or Declining Species and Habitats
25	18_25	EBFM	A fisheries centred request was to evaluate the effectiveness of different conservation measures place for the Baltic Cod
26	18_26	EBFM	A request to develop new information on the impact of fisheries on to ecosytem's components, different species communities and the location of habitats sensitive to particular fishing activities
27	18_27	EBM	Request to generate new information on vulnerable habitats and the different types of fisheries activities in the NEAFC Regulatory Area

| Year 2017 | Specific Special Request Advice (Identity) | Year 2017 | Rational for categorisation |
		Level of Ecosystem Management	
1	17_01	EBFM	Request to assess the implication of no catch limits for combined dab and flounder TAC and alternative management measure beside the absence of catch limits for the stock
2	17_02	SSAFM	Request to propose a recovery plan for herring in divisions 6.a and 7.b–c which would monitor the catch limits of the same species
3	17_03	SSAFM	Request to assess the in -year advice for anchovy (*Engraulis encrasicolus*),its effect of increment of catch limits on a stock and its potential of being precautionary
4	17_04	SSAFM	A request to evaluate the effects of increased in interarea quota flexibility of pollack in subareas 7 and 8abde.
5	17_05	EBFM	Request to analyze the distributional shift effects of different fisheries species across TAC areas and the drivers of such distributional change as linked to environmental conditions
6	17_06	EBFM	Request to evaluate the impacts of lifting sprat box and its effect on bycatches,thus a comparing the implication of a single species catches when fishing within or out the box
7	17_07	EBFM	Request to account for the importance of setting potential indicators (MSFD criterion D3.3) to determine the age and size distribution of individuals within commercially exploited stocks
8	17_08	EAFM	A request to evaluate fisheries-related anthropogenic impact of eels and report the measures of reducing fishing mortality but not the effect of human activities
9	17_09	EBFM	Request to address a set of indicators for assessing pressure and impact on the seabed from mobile bottom-contacting fishin; thus, the evaluation of trade-off between the fisheries and their impacts on the seabed.
10	17_10	SSAFM	A request to evaluate the long-term FMSY range management plan and its precautionary range for whiting in North Sea and eastern English Channel
11	17_11	SSAFM	A long-term management plan indicating the harvest control rule (HCR) of Iberian sardine in a specific region
12	17_12	EBFM	A request to evaluate two species (*Beryx splendens* and *Beryx decadactylus*)and report it as a single group (*Beryx spp.*), indicating the bycatch effects
13	17_13	SSAFM	Request to evaluate the revised fishing mortality reference points for a long-term management strategy for mackerel in the Northeast Atlantic
14	17_14	EBM	Object of request on the use of area closure (for conservation purposes) to control the impact of human fishing activities on the ecosystem
15	17_15	SSAFM	Request on in-year advice of haddock (*Melanogrammus aeglefinus*) to assess the use of maximum sustainable yield approach as the basis for management
16	17_16	SSAFM	Request to examine the impact of precautionary approach on managing blackspot (= red) seabream (*Pagellus bogaraveo*) in Azores grounds
17	17_17	SSAFM	A request on a long term management strategy for *Pandalus* in Skagerrak and the Norwegian Deep, evaluating the TACs
18	17_18	EBM	A request to develop a list of projects, activities, and sources of information for hazardous substances of emerging concern in the OSPAR area
19	17_19	SSAFM	A request to indicate the harvest control rule for ling within a specific area
20	17_20	SSAFM	Request to evaluate the the harvest control rule for tusk within two different regions
21	17_21	SSAFM	Request to assess theharvest control rules for a management plan for Icelandic summer-spawning herring (Division 5.a)

Year 2016	Specific Special Request Advice (Identity)	Year 2016 Level of Ecosystem Management	Rational for categorisation
1	16_01	EBFM	Request to provide FMSY range management plan for different species and the precautionary points associated with them in ICES subareas 5 to 10
2	16_02	SSAFM	A request to provide full assessment of the potential measures to improve the effectiveness of imposing inter-area flexibility of TAC of Salmon in the Gulf of Finland
3	16_03	EBFM	Request to provide practical methodology for delivering an MSFD GES assessment , evaluating indicators of size distribution of stock, the selectivity pattern of the fishery, and the genetic effects of exploitation on the stock
4	16_04	SSAFM	Request to assess the scientific monitoring fishery programme for herring in some particular regions
5	16_05	EBFM	Request to propose two frameworks for aggregating indicators to species group level and for the assessment of good environmental status for MSFD Descriptor 1
6	16_06	EBFM	Request to evaluate the effectiveness of two main methods to determine seabed habitat sensitivity and comminities and concluded that a mechanistic, quantitative approach based on biological principles was best to assess the sensitivity of habitats to fishing pressure
7	16_07	SSAFM	Request to evaluate the consistency of the approach applied in the Trans-border management plan for European eel with the Regulation (EC 1100/2007) and further identified a number of data deficiencies that make it impossible to evaluate the ability to achieve the objective of the Regulation within proposed time period
8	16_08	SSAFM	A request on an in-year management advice which failed to provide a sustainable catch level for the stock in question accordance with ICES precautionary approach for category 3 stocks for short-lived species.
9	16_09	EBFM	Request to provide practical methodology for assessment of Good Environmental Status for Descriptor D3 and for regions/subreions. Further concluded that assessment must be based only on those stocks that have primary indicators until an approach for secondary indicators has been agreed
10	16_10	SSAFM	Request to investiage the approach for real-time monitoring for sandeel and confirmed it that the method was suitable for monitoring sandeel abundance and for setting catch limits for the species
11	16_11	EBFM	Request to estimate the current stock sizes, catch levels and defined the sustainable catches for harp and hooded seal stocks
12	16_12	SSAFM	Request to evaluate a long-term management strategy (LTMS) for blue whiting and described the precatory estimate of the species
13	16_13	EBFM	Request to provide list of bony fishes with stock information and reviewed the provisional categorization of deep-sea species adopted by the NEAFC Permanent Committee on Management and Science
14	16_14	EBFM	Request to evaluate the harvest control rules for Northeast Arctic cod, haddock and Barents Sea capelin and defined the precautionary estimates in accordance with the ICES standard
15	16_15	EBM	A request on the technical review which concluded that the MAREANO programme produces and delivers data products, maps, and dissemination materials that are in accordance with sound scientific standards and which meet the needs of the assumed objectives of the programme
16	16_16	SSAFM	Request to evaluate the data for monitoring recreational cod fisheries and made several important recommendation which filled data gaps on recreational fisheries of cod in the Baltic sea region
17	16_17	SSAFM	A request to evaluate the management strategy for *Pandalus* fishery and defined the catch limit to be precautionary based on the target fishing mortality
18	16_18	SSAFM	Fishery focused request which was to forecast the scenario of stochastic medium-term projection results for the western Baltic cod stock, based on different scenarios of reduction in fishing mortality in the commercial and recreational fisheries.
19	16_19	EBFM	A request to define a framework for stock status classification relative to MSY proxies for stocks in category 3, category 4 and selected stocks in ICES subareas 5 to 10 applying this framework.
20	16_20	EBFM	Request to provide an up-to-date information on the ecosystem effects of the pulse trawl, the lesions associated and mortality for targeted and non-targeted species that contact or are exposed to the gear

21	16_21		SSAFM	A request to collate all available relevant data on coastal bottlenose dolphins in different regions and assessed the trends in abundance by assessment unit
22	16_22		EBFM	Request to estimate bycatches for small cetaceans and other marine animals as well as impact of fisheries on other components of the ecosystem including seabirds and habitats, small cetaceans and other marine animals.
23	16_23		EBFM	A request to present an overview of data on distribution and abundance of cetacean species other than coastal bottlenose dolphins
24	16_24		EBFM	Request to evaluate the effectiveness of data analysis for determining trends in abundance of harbour seals, grey seals and an assessment of grey seal pup production in the Northeast Atlantic
25	16_25		EBM	To evaluate both the VMS and logbook data, estimate the total fisheries and landings of WMS and compared to the logbook data for fishing intensity and pressure mapping

Year 2015	Specific Special Request Advice (Identity)	Year 2015 Level of Ecosystem Management	Rational for categorisation
	15_01	EBFM	Request to present the main drivers for the collection of recreational fishery data; which were: providing advice on fishing opportunities, designing and evaluating management measures for recreational fisheries, developing fishery management plans and strategies, and supporting the development of marine spatial planning.
	15_02	SSAFM	Request to present an assessment of possible conditions that could be used in association with CITES non-detriment finding of European eel
	15_03	SSAFM	Request to define the management strategy for boarfish which follows the rationale for TAC setting procedures and the state of precaurionary estimates
	15_04	SSAFM	Request to provide a long-term management strategy for the stock of mackerel in the North East Atlantic, estimated MSY taking into account selectivity, recruitment, growth, and natural mortality ecosystem conditions
	15_05	EBFM	A request to prepare a long term management plan for selected North Sea and Baltic Sea stocks by estimating the precautionary range for Fishing mortality consistent in achieving Maximum Sustainable Yield (FMSY)
	15_06	EBM	To evaluate three Marine Strategy Framework Directive manuals of the descriptors D1 (biodiversity), D3 (fisheries), D4 (food webs), D6 (sea-floor integrity) and D11 (noise)
	15_07	SSAFM	A request to evaluate a multi-annual management strategy for mackerel in the Northeast Atlantic and considered the management plan to be precautionary
	15_08	SSAFM	Request to assess the reduction in catch per unit effort (CPUE) that results from the use of the SELTRA trawl for harvesting sole.
	15_09	SSAFM	Request to evaluate the Long-Term Management Strategy (LTMS) for herring in the North Sea and considered Division IIIa TAC-setting to be precautionary
2015	15_10	SSAFM	Request to update the catch options for herring in Divisions VIIa, taking into account the outcome of the benchmark assessment.
	15_11	EBFM	A request to generate new information regarding the impact of fisheries on other components of the ecosystem including small cetaceans and other marine mammals, seabirds and habitats
	15_12	EBM	Request to evaluate the effectiveness of existing monitoring programmes associated with benthic sampling stations, existing network of sampling stations and monitoring frequency across all OSPAR regions and on-going monitoring in relation to multimetric indicator (BH2) and/or typical species (BH1) on benthic habitats.
	15_13	EBM	Request to prepare a preliminary protocol for monitoring of plastics in fish stomachs in the OSPAR maritime area and further accounted for the impact of integration with fish disease and fish stock surveys and the possibility of using samples from commercial vessels
	15_14	EBFM	A request to evaluate the OSPAR JAMP ocean acidification or eutrophication guidelines on phytoplankton species composition
	15_15	EBFM	Request to develop selection criteria for generating a reduced list of habitats in support of the development of the Typical Species Composition indicator.
	15_16	EBM	A request to provide fishing abrasion pressure maps as well as fishing effort maps based on Vessel Monitoring System (VMS) but emphasized that the caveats must be taken into account when interpreting the maps and the data.
	15_17	EBM	Request to produce new information for the occurrence of vulnerable marine ecosystems in the NEAFC Regulatory Area and identified issues with the gear coding within the NEAFC VMS data
	15_18	EBM	Request to provide fishing abrasion pressure maps (and the underlying data) for OSPAR areas and explain the assumptions that have been made in developing these maps and provide a set of caveats that must be taken into account when interpreting the both maps and the underlying data.

Year 20[ ]	Specific Special Request Advice (Identity)	Year 2014 Level of Ecosystem Management	Rational for categorisation
	14_01	SSAFM	A clarification request for the evaluation of the harvest control rule for sole and based on the same simulations as the original advice (2013 advice) but with no additional biological assumptions to be investigated.
	14_02	SSAFM	A request for advice which pointed out that a 10% increase in the North Sea cod TAC can be considered precautionary if followed by implementation of the existing long term management plan and if catches are constrained so that discard rates do not increase and landings do not exceed the TAC.
	14_03	EBFM	A fisheries focused request for advice which evaluated the species composition of grenadier catches and also to estimate landings of roundnose grenadier in TAC areas.
	14_04	SSAFM	A request to evaluate the performance of the long-term management plan for North Sea haddock and emphasize on the the plan which provides sustainable fisheries with stable yields in conformity with the precautionary approach
	14_05	EBFM	A request to develop the useful future indicators for MSFD Descriptor 4 (foodwebs) and also for the large fish indicator.
	14_06	SSAFM	Request to analyse the risks associated with deviating form the TAC management plan for cod in the North Sea
2014	14_07	SSAFM	Request to evaluate the proposed harvest control rule for deep pelagic redfish in the Irminger Sea and adjacent waters and elaborated the options of precautionary approach
	14_08	EBFM	Request to elaborate on the management of the brown shrimp fishery in the North Sea by providing information on pros and cons of a management, role of brown shrimp in the ecosystem and the foodweb and the impact of crangon fishery on other species and fisheries
	14_09	EBFM	Request to provide common approach or logical framework for the assessement of of good environmental status (GES) for commercially exploited fish and shellfish stocks.
	14_10	SSAFM	Request was to elaborate on the basis of the harvest control rule G4 with a harvest rate of 0.45 and estimated the Total Allowable Catch for Bay of Biscay anchovy
	14_11	SSAFM	Request to assess the proposed long-term management plan and harvest control rule for golden redfish and considered it to be consistent with the ICES MSY approach and the ICES precautionary approach.
	14_12	EBM	A request to elaborate on finfish (wild and captive fish stocks) mariculture activities in the OSPAR area and further account for issues of introduction of antibiotics and other pharmaceutical, transfer of disease and parasite interactions, release of nutrients and organic matter, etc.
	14_13	SSAFM	Request to elaborate on the performance of the stochastic forecast model of blue whiting.
	14_14	EBM	A request to evaluate the Construction Environmental Management Plan (CEMP) whereby the advice concluded that no single method can be recommended to determine the geographic representativeness of existing sediment monitoring stations that would meet all monitoring purposes.
	14_15	EBM	Request to map the bottom fishing intensity and an advice which further explained that the spatial analysis of bottom fishing (towed gears) in the OSPAR area should use VMS and logbook data to map activity
	14_16	EBFM	Request for advice to provide assessment units for marine mammals by proposing their common MSFD indicators, methods for setting targets and baselines and their distributional range and patterns.
	14_17	EBM	Request to review and update some technical annexes to JAMP Guidelines for Monitoring of Contaminants in Biota and in Sediments to reflect scientific and technical state of the art.
	14_18	SSAFM	An analytical stock assessment advice which proposed a harvest control rule for Sebastes mentella in Subareas I and II.

Year 20▾	Specific Special Request Advice (Identity) ▾	Year 2013 Level of Ecosystem Management ▾	Rational for categorisation ▾
	13_01	SSAFM	Request to partially evaluate the proposed long-term management plan for boarfish and further explained that, in-year TAC revision is not possible because the assessment is the first that is of sufficient quality to be used for advice.
	13_02	SSAFM	Request to measure the factors influencing long-term changes in the distribution of megrim and estimate the Total Allowable Catch for the species.
	13_03	SSAFM	Request to evaluate the management strategy for the Norway pout stock based on the existing ICES escapement strategy and again established the minimum TAC and ceiling on the Total Allowable Catch (TAC).
	13_04	EBFM	A request to account for different methods for monitoring of bycatch of cetaceans and other protected species
	13_05	EBFM	Request to develop an inventory of the main bycatch issues for fisheries in each of Europe's Data Collection Framework (DCF) regions
	13_06	SSAFM	Request to technically evaluate the Eel Management Plan and report the progress achieved via the implementation of the measures.
	13_07	SSAFM	A request to evaluate the management plan for sardine in Divisions VIIIc and Ixa and to point-out the need for further exploration of sardine stock dynamics.
	13_08	SSAFM	A request to evaluate the Harvest Control Rule (HCR) in the management plan for western horse mackerel and measure its consistency with the precautionary approach (PA).
	13_09	EBFM	A request to develop new information on the location of habitats sensitive to particular fishing activities (i.e. vulnerable marine ecosystems, VMEs).
	13_10	EBFM	Advice request to review and develop existing indicators for Data Collection Framework (DCF) Annex XIII and further account the new indicators that are required to track and to guide the management of the effects of fisheries on the ecosystem.
	13_11	SSAFM	A request about a management plan which was to estimate the TAC option for cod in the North Sea and Skagerrak.
	13_12	SSAFM	A request to evaluate the long-term management plan and harvest control rule for Icelandic haddock and consider its precautionality in accordance with the ICES MSY approach.
	13_13	SSAFM	A request to evaluate the long-term management plan for whiting in the North Sea which aimed to achieve the objective of providing sustainable fisheries with high and stable yields in conformity with the precautionary approach.
2013	13_14	EAFM	Request to evaluate the draft Red List assessment of Baltic Sea cod by the Fish Experts Team of the HELCOM Red List project.
	13_15	SSAFM	A request to evaluate the interannual quota flexibility for plaice in the North Sea in terms of the stock biomass
	13_16	SSAFM	A request to evaluate the proposed harvest control rule (HCR), a component of the management plan for Rockall haddock fisheries.
	13_17	SSAFM	Request to evaluate the interannual quota flexibility for saithe in the North Sea by estimating the Harvest Control Rules in terms of the stock biomass.
	13_18	SSAFM	A request to evaluate the long-term management plan and harvest control rule for Icelandic saithe.
	13_19	EBFM	Request elaborate the bycatches from Fisheries within each of the four European DCF regions and others, pose a risk to seabird populations.
	13_20	SSAFM	A request to evaluate the harvest control rule for sole in the Bay of Biscay and its consideration to be precautionary based on a certain estimated TAC

	13_21	EBM	Request to generate new information on the location of vulnerable habitats in the NEAFC Regulatory Area and further suggest new closures to bottom fisheries.
	13_22	EBFM	A request propose the impact of the current area closure for juvenile haddock on the Rockall haddock stock and explain the additional technical and operational measures which could be examined to improve the fishing pattern of the entire fishery.
	13_23	EBFM	A request to document the list of VME indicator species, maps of VME elements and provide the occurrence of hydrothermal vents and measures applicable to protect hydrothermal vents.
	13_24	EBFM	A request to evaluate on the appropriateness of applying the threshold levels for VME indicator species for long line fishing
	13_25	SSAFM	Request to assess landings for mackerel records, considering different indices such as spawning-stock biomass and age-structured adult index
	13_26	EBFM	Request to estimate the abundance of both harp seal and hooded seal stocks, thus, population estimates, catch options and state of stocks
	13_27	SSAFM	A request to evaluate and propose harvest control rule options for the long-term management plan for blue whiting.
	13_28	SSAFM	Request to assess the modifications of the long term management arrangement for the Norwegian spring-spawning herring stock.
	13_29	EBM	A request to evaluate the appropriateness of applying buffer zones in the current bottom fishing closures.
	13_30	SSAFM	A request to evaluate the harvest control rule element of the long-term management plan for blue whiting and considered it to be precautionary.
	13_31	EBFM	A request to recommend the OSPAR bodies to use international standard methods to collate relevant data for the seven bird species.
	13_32	EBFM	A request to present information from a benchmarking exercise on the 35 common indicators whose technical specifications had been supplied and defined the nature of good environmental status of Descriptors 1,2,4 and 6.
	13_33	EBFM	Request to update the collated and analysed data for the ecological quality objective (EcoQO) indicator on breeding seabird population trends in OSPAR Regions II and III.
	13_34	EBFM	Request to recommend the development of an ecosystem monitoring programme which must be designed to observe status and provide understandable links ecosystem components and the physical environment.
	13_35	EBFM	A request to update the data for the ecological quality objective (EcoQO) indicator on breeding seabird population trends in OSPAR Regions III.
	13_36	EBM	Request to update the data on spatial design of a regional monitoring programme for contaminants in sediments and provide information on the preferred types of sediment, sampling depths, ship time considerations, and the selection of areas where monitoring will be most effective.
	13_37	EBFM	Request to update information and develop new maps of Ecologically and Biologically Significant Areas (EBSAs).
	13_38	EBFM	A request to provide the most up-to-date scientific data and information on ecological evidence supporting the ten proposed ecologically and biologically significant areas (EBSAs) in line with the CBD EBSA Scientific criteria.
	13_39	EBFM	Request to provide a summary of management measures, that has been implemented within ecologically and biologically significant areas (EBSAs) and make general suggestions that are likely to improve the protection of EBSAs.

Year 20	Specific Special Request Advice (Identity)	Year 2012		Rational for categorisation
		Level of Ecosystem Management		
	12_01	SSAFM		Request to review the new information from surveys concerning the abundance of the stock of Northern hake.
	12_02	SSAFM		Request to revise the long-term management plan for herring in the North Sea by re-evaluating the biological precautionary reference points and conclude the harvest control rules and their precautionary scenarios.
	12_03	SSAFM		A request to evaluate the harvest control rule for managing the stock of western horse mackerel and conclude its consistency with the precautionary approach in the long term.
	12_04	SSAFM		Request to assess the long-term management plan for plaice in Skagerrak, with the objective of providing sustainable fisheries with high and stable yield in conformity with the MSY approach.
	12_05	EBFM		A mixed-fisheries advice request to estimate the effect of a reduction of 20% in the cod Total Allowable Catch (TAC) on discard rates, at the expense of achieving the desired reduction in total catches.
	12_06	SSAFM		A request to assess the stock of saithe in the North Sea and evaluate the harvest control rule with different variations.
	12_07	SSAFM		Request to propose management strategies for Norway Pout which are in accordance with the precautionary approach to ensure sustainable yields.
	12_08	SSAFM		A request to evaluate the real-time monitoring approach for sandeel abundance and the approval of its suitability for monitoring sandeel abundance in Sandeel Area 1 based on the the amount of available fishery data.
	12_09	SSAFM		A request to update the information for the abundance of the stock of Northern hake, and estimate the fishing mortality consistent with achieving Maximum Sustainable Yield (FMSY)
	12_10	EBFM		A request to update the information of spatial distributions, summary of stock status and provide a list of methods to identify common skate (*Dipturus batis*) in terms of both *Dipturus cf. flossada* and *Dipturus cf. Intermedia* (thus, *Dipturus* complex).
	12_11	EBFM		Request to provide information on the stock status and catch history for the individual species of deep-sea shark species, with the aim of defining specific management measures.
	12_12	SSAFM		A request to evaluate the long-term management plan proposal for Celtic Sea herring and conclude on its accordance to the precautionary approach to fisheries management and achieving MSY.
	12_13	EBFM		A request to evaluate the scientific report for the identification of Ecologically or Biologically Significant Marine Areas (EBSAs) in the Northeast Atlantic and conclude it to lack a clear methodology with regards to how the criteria should be applied.
	12_14	EBFM		A request to evaluate the appropriateness of the use of the NAFO guide for identification of corals and sponges in the NEAFC area
	12_15	EBFM		A request to update the information on the distribution of vulnerable habitats in the NEAFC Convention Area and fisheries activities in and in the vicinity of such habitats.

12_16		EAFM	A request to evaluate all available data on the variability of oceanographic conditions and their effect on the abundance and distribution of beaked redfish (*Sebastes mentella*) in the NEAFC Area.
12_17		EBFM	A request to evaluate the proposed changes to the EU multi-annual plan for fisheries exploiting stocks of plaice and sole in the North Sea and estimated the consistency of the consistent with the precautionary approach and the principle of maximum sustainable yield (MSY).
12_18		EBFM	A request to evaluate the proposed fisheries measures for monitoring Cleaver Bank Special Area of Conservation.
12_19		EBFM	A request to assess the NEAFC bottom fisheries regulations and propose other different elements needed to improve impact assessments.
12_20		SSAFM	A request to evaluate the proposed harvest control rules (HCRs) of the management plan for Rockall haddock and propose the conditions of precautionary approach.
12_21		EBFM	A fisheries focused request to assess the proposed fisheries measures for the Dogger Bank Special Area of Conservation.
12_22		SSAFM	A request to assess the guidelines for the estimation of reference points for cod stocks in the Greenlandic waters.
12_23		EBFM	A request to update the information on the ecosystem effects of pulse trawl, and the amount of injury and mortality for targeted and non-targeted species that contact the gear but are not retained.
12_24		EBFM	A request to review the environmental assessment criteria (EAC) which is defined as is the contaminant concentration in the environment (water, sediment, and biota).
12_25		EBM	A request to develop a guideline document on monitoring of contaminants in seawater under the Joint Assessment and Monitoring Programme (JAMP).
12_26		EBM	Request to revise and update the documentation which cover the use of lysosomal stability as a monitoring technique across the OSPAR region.
12_27		EBM	A request to provide information on the spatial design of a regional monitoring programme for contaminants in sediments and conclude the challenging in the absence of details of the definitions of good environmental status (GES).
12_28		EBM	Request to evaluate and update the JAMP Eutrophication Monitoring Guidelines for Nutrients and Oxygen and integrated developments in the science and technology of nutrient and oxygen monitoring.
12_29		EBFM	Request to evaluate the proposed fisheries measures for the Frisian Front Special Area of Conservation for bird species conservation.
12_30		EBFM	A request to provide an updated assessment information for the EcoQO indicator on breeding seabird population trends in OSPAR regions II and III.

Year 20	Specific Special Request Advice (Identity)	Year 2011	
		Level of Ecosystem Management	Rational for categorisation
	11_01	EBFM	A stock assessment and ecosystem monitoring request to provide scientific surveys for deep water fisheries in different ICES Subareas and Divisions that incorporates the existing deep-water trawl survey
	11_02	SSAFM	Request to evaluate the long-term management plan for cod and with the objective of reductions in fishing mortality (F).
	11_03	SSAFM	Request to assess the long term management plan of the North Sea herring and further test the Harvest Control Rule (HCR) options and its compatible with the precautionary approach.
	11_04	SSAFM	Request to evaluate and propose a future long-term management plan of North Sea whiting in in Subarea IV and Division VIId.
	11_05	SSAFM	Request to evaluate the long management plan for North Sea herring and provide sustainable fisheries and stable yield in conformity with the precautionary approach.
	11_06	EBFM	Request to report the possibility of using survey methodology to monitor the geographic distribution of stocks in the ice-free parts of the Arctic Ocean.
	11_07	EBFM	A fisheries focused advice request to develop a table classifying elasmobranch species found within the NEAFC area and measures to prevent bycatch of basking shark in fisheries targeting other species.
	11_08	SSAFM	Request to assess and evaluate the stock structure of *S. mentella* in the Irminger Sea and adjacent waters.
	11_09	SSAFM	A request to evaluate the propose harvest control rules (HCRs) of a long-term management plan for Rockall haddock.
	11_10	EBFM	Request to assess the status and harvest potential of harp seal stocks and hooded seal stocks in the Greenland Sea and White Sea/Barents Sea.
	11_11	EBM	Request to develop JAMP guidance for integrated monitoring of chemicals and their biological effects through preparing technical annexes on survey design and to address specific questions.
	11_12	EBFM	Request to evaluate the effectiveness of two protocols, which were; whether ecological data from commercial Nephrops stock assessment and commercial video and photographic footage could be used for assessment of the status of sea-pen and burrowing megafauna communities.

Year 20▾	Specific Special Request Advice (Identity) ▾	Year 2010 Level of Ecosystem Management ▾	Rational for categorisation ▾
	10_01	EBM	Request to evaluate the conservation of three species of ray which are not specifically concerned by EU conservation measures by providing answers to the fisheries or fishing activities that have an impact on the conservation of the species, possible differences in conservation status of the species, and management recommendations in the form of measures that would provide effective protection and promote the recovery of these species.
	10_02	EBFM	Request to evaluate the Regulation 812/2004, Item 3 and improved the information of effective monitoring and mitigation measures to cetacean bycatch problems.
	10_03	EBM	Request to review the scope of Regulation 812/2004, Item 4 and account for mitigation measures used to reduce the incidental catches of cetaceans, including information on cost.
	10_04	EBFM	Request to assess the Regulation 812/2004, Item 5 and identify the most efficient mitigation measure for bycatch of each cetacean species and according to the fishing gear in use.
	10_05	EBFM	A request to evaluate the Regulation 812/2004, Item 1, and provide information on incidental catches of cetaceans and the status of small cetaceans and additional data on the bycatch of cetaceans in various EU fisheries, including species and taxa specific bycatch estimates.
	10_06	EBFM	Request to assess the Regulation 812/2004, Item 2 and provide information about the population status and map their annual distribution and density in European waters since 2004.
	10_07	EBFM	Request to evaluate information on *Dipturus batis* in Celtic Seas and Biscay-Iberia Ecoregions and provide scientific information regarding of the state of the species and analysis on the continuation of the measures provided for the species in the EU fishing opportunities, hence taking into account the various fisheries taking place in each area.
	10_08	EBFM	A request to provide new information on bycatches of marine mammals, trends in seabird populations and the locations of habitats sensitive to fishing pressure.
	10_09	EBFM	A request to evaluate the rules for setting Total Allowable Catches (TACs) with respect to the precautionary approach and compatibility with maximum sustainable yield (MSY) to stocks, excluding naturally short-lived species.
	10_10	EBFM	Request to assess the Harvest Control Rules (HCR) for the mixed fishery of southern hake, anglerfish and Nephrops and alternative for achieving Fishing mortality consistent with achieving Maximum Sustainable Yield (MSY).
	10_11	SSAFM	Request to evaluate the data on target fishing mortality rate of Northern hake and its appropriateness for exploiting the stock consistently with MSY.
	10_12	EBFM	A request to provide scientific information regarding of the state of in the Celtic Seas and in the Bay of Biscay/Iberian waters and evaluate the continuation of the measures provided for in the EU fishing opportunities, hence taking into account the various fisheries taking place in each area.
	10_13	SSAFM	Request to evaluate the long term management plan for North Sea haddock in Subarea IV (North Sea) and Division IIIa with the aim of ensuring sustainable fisheries with high and stable yields in conformity with the precautionary approach.
	10_14	EBFM	Request to assess the available data and models for a mixture of stocks, in particular Western Baltic spring spawners (WBSS) and North Sea autumn spawners (NSAS) and provide a long term management and alternative harvest control rule for the TAC setting for both species.
	10_15	EBFM	Request to evaluate the management of whiting in Subarea IV and Division VIId and highlight on management measures such as effort limitations, discard limits, closed areas, and increased selectivity.

10_16	EBFM		Request to evaluate the stock structure of pelagic redfish (*S. Mentella*) in the Irminger Sea and adjacent areas and account for two distinct biological stocks, and recommend two management units instead of the single unit.
10_17	EBFM		Request to provide new information on the distribution of vulnerable deep-water habitats within the NEAFC regulatory area and further confirm presence inside closed areas and extending closures to reverse impacts resulting from bottom fishing activities.
10_18	EBFM		Request to evaluate the information "Ex post and ex ante" for long term management plan for sole and plaice in the North Sea to ensure the consistency with the precautionary approach.
10_19	SSAFM		A request to evaluate the rebuilding plan for coastal cod and ensure the consistency with the precautionary approach.
10_20	EBM		Request to evaluate the atmospheric monitoring programmes for Perfluorooctanesulfonic acid (PFOS) and further account for other inputs/pollutants release from anthropogenic activities which are PFOS and affect the marine environment.
10_21	EBM		Request to provide a risk assessment report which explained the nature and impact of the interactions and pressures from finfish mariculture and wild fish populations.
10_22	EBM		Request to provide report on the intensity and duration of direct and indirect effects and interactions of marine wet renewable energy production with the marine environment and ecosystems of the OSPAR maritime area.
10_23	EBM		Request to review the appropriate scale for monitoring status and trends of human activities, ecosystem components, impacts and risk to the marine ecosystem and socio-economic aspects on the components of the ecosystem and confirm the matrix methodology used at the Utrecht workshop as useful in identifying relevant components and pressures and for summarising and communicating the conclusions of an Integrated Ecosystem Assessment (IEA) to stakeholders.
10_24	EBM		Request to update the information on the development of JAMP guidance for integrated monitoring of chemicals and their biological.
10_25	EBM		A request to evaluate the impacts of human activities on cold water corals and sponge aggregations and estimate the total amounts and percentage of these habitats affected by human activity.
10_26	EBM		Request to assess the monitoring programme for impacts of ocean acidification and further describe the availability of the programme to distinguish long term trends from shorter term natural variability.
10_27	EBM		Request to review the technical annexes to the JAMP Guidelines for monitoring Contaminants in Sediments and prepare tools for coordinated monitoring of dioxins, planar CBs (Polychlorinated biphenyls (CBs)) and Perfluorooctanesulfonic acid (PFOS).

*Appendix IV. 1 Levels of ecosystem management (EM) as applied in a fisheries context: SSAFM (single-species approach to fisheries management), EAFM (ecosystem approaches to fisheries management), EBFM (ecosystem-based fisheries management), and EBM (ecosystem-based management). The table was adapted and modified from (Patrick and Link 2015a; Dolan et al. 2016). * Examples from the United States fisheries management.*

Level of Ecosystem Management	Definition	Focus of Management	Management Frame work*	Primary analysis objectives	Scientific advice produced
SSAFM	The natural starting point for elucidating the differences between the levels of EM. Goes into producing stock assessment model output	Fisheries stock/population	Fisheries management plan	Determine the status of stocks, Ascertain stock productivity	Biological reference points (BRPs)
EAFM	Inclusion of ecosystem factors into a (typically single species) stock focus to enhance our understanding of fishery dynamics and to better inform stock-focused management decisions	Fisheries stock/population	Fisheries management plan	Determine the status of stocks, Ascertain stock productivity	Biological reference points (BRPs)
EBFM	Recognizes the combined physical, biological, economic, and social trade-offs for managing the fisheries sector as an integrated system, specifically addresses competing objectives and cumulative impacts to optimize the yields of all fisheries in an ecosystem	Fisheries system/community	Fisheries ecosystem plan	Address fisheries sector LMR trade-offs, Ascertain ecosystem productivity	Systemic reference points (SRPs), which include BRPs
EBM	A multi-sectored approach to management that accounts for the interdependent components of ecosystems, and the fundamental importance of ecosystem structure and functioning in providing humans with a broad range of ecosystem services	All sectors, including fisheries and connected systems	Regional Ocean Plan	Address cross-sector trade-offs, Identify best mix of goods and services across system	Systemic reference points (SRPs)

Appendix V. 1The summary statistics for Ecosystem Management levels is provided each year (2010-2020).

Year	Level of Ecosystem Management			
	SSAFM	EAFM	EBFM	EBM
2020	2	2	4	2
2019	8	0	11	6
2018	10	2	14	2
2017	12	1	6	2
2016	10	0	10	2
2015	7	0	5	6
2014	9	0	5	4
2013	18	1	17	3
2012	11	1	14	4
2011	6	0	5	1
2010	3	0	14	10

Appendix V. 2 The table contains a ten-year overview of the levels of EM of ICES Request services.

	SSAFM	EAFM	EBFM	EBM
Level of EM trend in the timeframe of 10-years	96	7	105	42

Appendix VI. 1Summary statistics for the Requesters of SRIA during a 10-year period is provided below.

Column1	EUR	IOR	JOR	IMSR	JMSR	EU/NEUM	EU/IOR	NDR
Number of requesters over 10-years period	144	138	9	30	10	26	1	1

Appendix VI. 2 The table presents a ten-year overview of the geographic distribution of the ICES Request services offered by the ICES.

Column1	GS 1	GS2	MES	NDGS
Geographical trend within a timeframe of 10-years	150	23	12	67