fish610.3 Societal Considerations of EAFM

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`http://minouw-project.eu/`

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1 Fleet Considerations

1.1 Learning Objectives

1.1.1 Details

Learning Objectives 1

- Explain what fishing mortality, economic performance, and sustainability are in relation to fleets and how they are calculated
- Explain why and how fleet fishing mortality, economic performance, and sustainability would be incorporated into an EAFM framework

1.2 Fleets

- What is a fleet
- Why consider fleets in an EAFM

1.2.1 Details

What is a Fleet

When incorporating fishing effort into an EAFM framework the amount of fishing mortality resulting from commercial fishing is often considered on the fleet level.

Definition 1: Fleet

The total number of vessels fishing in a particular area for a specific resource [FAO, 1997].

Often times, however, a fleet is too course of a resolution. Therefore, fishing fleets are often subdivided into fleet segments.

Definition 2: Fleet Segment

Vessels of the same size which use the same fishing technique [EUc].

Why Include Fleets

Fishing fleet impact is an important consideration within an EAFM framework because of its complex ecosystem interactions. From a societal perspective, fleets are a key component in the economic benefit of fishing on a community. Specifically, including fleets gives us an employment reference as well as an indicator for community level economic stimuli. However, fleet considerations also play an important role in marine ecosystem interactions. For example, fleet behavior can link species that usually don't interact such as yellowtail flounder and scallops (yellowtail flounder are often bycatch) [Gaichas et al., 2016]. Also, fishing mortality is commonly the largest source of mortality among commercial species.

1.3 Contribution to Fishing Mortality

- What is fishing mortality
- How fishing mortality is calculated
- Why a fleet's contribution to fishing mortality would be included within an EAFM framework

1.3.1 Details

Definition 3: Fishing Mortality

The proportion of fish harvested relative to the number of fish available at a specific location and time [FAO, 1997].

Calculating Fishing Mortality

Fishing mortality (F) can be calculated using fleet landing data via catch (C) or fishing effort (f), e.g. the total number of boats multiplied by the duration of fishing. Thus, the basic fishing mortality equations are:

$$C = BxF$$

$$F = qf$$

Where B is population abundance and q is the catchability coefficient.

Why Include Fleet Level Fishing Mortality

Fleet level fishing mortality can provide insight into the contribution of a particular fleet on total fishing mortality as well as the relative dependence of the fleet on a particular species. Thus, an idea of the relative impact of a fleet on a fishery as well as the relative economic impact of a species on a fleet can be calculated. While looking at the sum of the partial F's one can ascertain an index of the pressure applied by a fleet to a particular ecosystem [Doring et al., 2010].

1.4 Economic Performance

- How a fleet's economic performance is calculated
- Indicators of economic performance
- Why a fleet's economic performance would be included within an EAFM framework

1.4.1 Details

Calculating Economic Performance

Economic performance within European fisheries is often assessed based on cost and earnings surveys which follow the standard accounting framework. From these surveys operating performance is obtained in terms of income or economic efficiency. Thus, these surveys provide an idea of the financial and economic surplus generated. However, they do not provide any insight into the profitability of the fishery. In order to obtain an idea of a fleets profit-earning potential bio-economic modeling is required [Whitmarsh et al., 2000].

Definition 4: Bio-economic models

Bio-economic models are mathematical representations of the biological and economic systems and their interconnectedness.

Within bio-economic models for fishing fleets the biological system refers to the fish population while the economic component is the fishermen [Prellezo et al., 2012].

1.5 Economic Performance Indicators

Within bio-economic models Prellezo et al. [2012] found that fleet and effort dynamics, price dynamics, and cost dynamics were the most commonly used indicators of economic performance. While landings data was used interchangeably as a biological and/or economic indicator. The values used for these indicators can be derived from short-term or long-term indicators. Some short-term indicators include market price, income, and various profit indicators while long-term indicators include net present value and return on investment [Prellezo et al., 2012].

Many bio-economic models also include a social economic indicators such as employment and crew share. However, their inclusion is usually limited due to incomplete or non-existent data.

1.6 Why Include

Including bio-economic models into an EAFM framework can help to provide an indication of the relationship and feedback between human activity and natural resources since both systems (ecosystem and economy) are intimately related.

1.7 Fleet Sustainability

- How fleet sustainability is evaluated
- Why fleet sustainability is included within an EAFM framework

1.7.1 Details

There are two major ways to evaluate fleet segment sustainability. The first is to calculate a weighted average of fishing mortality for all fished stocks assessed by ICES. The second is to calculate a weighted average of the biomass

harvested for all fished stocks assessed by ICES. In both cases fishing mortality and harvested biomass, can be calculated from the landings data and compared to reference points to determine economic dependence and stock sustainability. Thus, the calculated sustainability index provides an indication of the mean status for the stocks being exploited [Doring et al., 2010].

1.8 Incorporating Fleet Considerations into an EAFM Framework

- Type of data needed/used to incorporate fleet considerations into an EAFM framework
- How the data is used within an EAFM framework
- How the data is evaluated in relation to multiple objectives

1.8.1 Details

Data Requirements

When incorporating fleet information into an EAFM framework several things need to be considered: the fleet's economic impact and the ecosystem impact of the fleet. In order to accomplish this several pieces of information are needed including landings data and stock reference points.

As previously discussed, the landings data can be used to evaluate the financial gains of the fleet segment as well as the economic dependence of the fleet on a particular fishery. While the fleet segment fishing mortality's impact on stock size can be compared to reference points to ensure stock sustainability and in turn fleet sustainability.

Incorporating Fleet Considerations

When incorporating fleet considerations into an EAFM framework it is important to take as large a time frame as possible into consideration as the objective is to provide a comprehensive picture of the entire fishery [Doring et al., 2010]. Thus, it is recommended by Doring et al. [2010] that total catches, catch by species, and fishing effort trends be incorporated. Doring et al. [2010] also recommends that a fleet-based synthesis be included that describes the fleets economic performance, their contribution to fishing mortality, their

economic dependence on stocks, and their ecosystem impact in relation to bycatch.

Multiple Objectives

When evaluating management discussions, such as quota changes, it is important to co-evaluate the biological and economic impact. Thus, it is recommended that bio-economic models which include fleet considerations be run to evaluate the potential consequences of management decisions on fleets. More specifically, Doring et al. [2010] recommends running trophodynamic models, such as EwE, as well as multi-species multi-fleets bio-economic models.

2 Regulatory Considerations

2.1 Learning Objectives

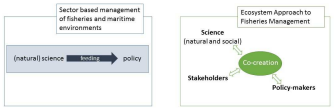
2.1.1 Details

Learning Objectives 2

- Identify common regulatory issues and explain how they are addressed within an EAFM framework
- Explain the role of policy-makers, scientists, and stakeholders within an EAFM framework
- Explain how uncertainty is managed within an EAFM framework

2.2 Policy Making

- Historical policy-making model
- New policy-making model



Decision making framework in the new and traditional system. Image is adapted from Ramírez-Monsalve et al. [2016].

2.2.1 Details

The process of creating new fishing regulations or maintaining current regulations is multidisciplinary in nature. For example, each regulation will impact the fishery as well as the ecosystem and society. As a result, the creation and maintenance of regulations is often as much, if not more, a political issue as it is an environmental or societal issue. In order to address this complexity EAFM proposes a new set of guidelines to increase transparency and decrease uncertainty. However, through this process the individuals included as well as their roles need to be shifted from historical models. In this section we will explore traditional models and explain how they are being modified to reduce the impact of issues such as:

- how the regulation of one species may cause the catch of another species to be unintentionally low; OR
- the reliance on scientists to provide predictive advice even when data is limited; OR
- the division between science and policy-makers; OR
- how uncertainty and confounding factors are dealt with

Thus, when looking at how policies are made it is important to understand the role of scientists, policy-makers, as well as civil society in the process.

Historical Approach

Traditionally a sector based approach was used. Within a sector based approach scientists provide "facts" while decision making is left completely up to policy-makers. Thus, in this format civil society is completely excluded from the process. As a result, lobbying is used by fishermen and social organizations as a way to provide input.

Pros	Cons
Simplistic	Excludes input from stakeholders
Time efficient	Places a lot of power in policy-makers hands
	Increases model uncertainty due to reduced data input
	Reduces buy-in due to lack of participation

New Approach

Under EAFM a new approach to policy-making which focuses on co-creation is used.

Definition 5: Co-creation

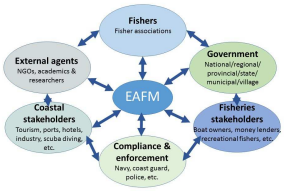
"theory of interactions that combines analytical and participatory tools to generate knowledge that has scientific acceptability, policy relevance, and social robustness" [Ramírez-Monsalve et al., 2016].

In other words, co-creation uses stakeholder involvement to aid in information gathering and distribution to ensure that policies are as effective as possible. Thus, in co-creation scientists provide data and models while working with stakeholders to gain practical information which is compiled and provided to policy makers to create informed policy decisions.

Pros	Cons
Transparent and inclusive Increased buy-in from those having to follow the regulations Decreases model uncertainty from increased data Solutions tend to incorporate biological, economic, and social considerations	Competing goals can be difficult to balance Time and effort intensive

2.3 Stakeholder Involvement

- Definition of stakeholders
- Examples of stakeholders
- Role of stakeholders



Potential stakeholders and their interaction within EAFM. Image was adapted from Staples et al. [2014].

2.3.1 Details

Definition and Example of Stakeholders

Definition 6: Stakeholder

An individual, group, or organization with a vested interest in management decisions and are directly impacted by them (either positively or negatively).

Within an EAFM framework stakeholders can include fishermen, fishing communities, animal protection groups, among others. Thus, a diversity of interests and backgrounds are represented by the stakeholder groups. This diversity is critically important to accomplishing a true ecosystem approach.

Role of Stakeholders

Stakeholders play a critical role in all aspects of fisheries management within an EAFM framework. Infact, the inclusion of stakeholders is a defining characteristics of any EAFM plan. As a result, it is critically important that stakeholders be included in as many aspects of EAFM planning, execution, and evaluation as possible.

During the planning process a stakeholder workshop should be conducted in which all relevant stakeholders are present. The stakeholders present should represent different sectors of the community and management agencies, for more information on determining who should be involved in stakeholder workshops see Staples et al. [2014]. The purpose of the stakeholder workshop is to:

- initiate and stimulate an EAFM dialog
- organize involvement
- help stakeholders understand EAFM
- identify problems, concerns, and opportunities
- provide input
- identify other necessary stakeholders
- initiate education campaigns

Subsequent stakeholder workshops are used to:

- select the FMU
- identify broad management goals
- obtain necessary background information
- obtain information to reduce uncertainty in the management models

Once management decisions have been put into action continuous re-evaluation of the management actions success is needed. During the management evaluation process, stakeholders are used to gain "field" data and

provide insight into the practical impacts, i.e. are fishermen seeing/catching fewer fish, are fish prices rising, have ecological processes been altered, etc.

Thus, stakeholders play two major roles, 1) help fill knowledge gaps to reduce model uncertainty (i.e. resolve stock size discrepancies, explain unaccounted mortality, etc.) and 2) increase the legitimacy of the legislative process (i.e. increase transparency, make joint policy recommendations, etc.).

2.4 Common Fisheries Policy

- Definition and role of common fisheries policy (CFP)
- 2013 CFP
- Role of CFP in EAFM

2.4.1 Details

Definition and Role of CFP

Definition 7: Common Fisheries Policy (CFP)

A set of regulations for European fishing fleets designed to ensure the sustainability of both the fish stocks and the fishing industry.

The common fisheries policy (CFP) is put out by the EU to ensure equality, for both the fisherman and the consumer, and sustainability, for the stock and the fishermen. Thus, the CFP works at a national and regional level to help manage this common/shared resource through a set of policies. In order to accomplish these goals the CFP has 4 main policy areas:

- fisheries management
- international policy
- market and policy
- policy funding

The CFP also contains rules on aquaculture and stakeholder involvement [cfp].

2013 CFP and its Role

Within the 2013 CFP the European commission identified a key underlying goal of minimizing all negative impacts of fishing activities on the marine ecosystem. This underlying goal is to be the backbone for all fishing regulations. Thus, some of the key components of the 2013 CFP are:

- identifying different regulations for industrial and small scale fisheries to account for social concerns
- incorporate multi-annual planing to address the preservation of marine resources
- promote the use of MSY (maximum sustained yield) as a reference point
- prohibit discards on stocks regulated by TACs and quotas

Within an EAFM framework the CFP is the primary instrument to ensure sustainable fisheries management and ecosystem preservation. More specifically, the 2013 CFP directly states that EAFM is to be applied to fisheries management [Ramírez-Monsalve et al., 2016].

2.5 EU Regulatory Issues

- Role of humans within an EA
- Policy enforcement given the fragmented governance system of the EU

2.5.1 Details

There are two major policy issues currently reducing the effectiveness of EAFM within the EU:

- Role of humans within an ecosystem approach
- Regulation enforcement given the fragmented governance system of Europe

Role of Humans

Humans are typically viewed in one of two ways within EA, 1) as part of the ecosystem or 2) separate from the ecosystem. This difference manifests itself in what is "allowable" human activities within EAFM. For example, currently the EU's 2013 CFP presents two different visions for human activity: human use of the fishery should only be allowed as long as the environmental impact is limited, and human activities are fine as long as they contribute to ecosystem health [Ramírez-Monsalve et al., 2016]. This discrepancy makes it difficult to analyze trade-offs and as a result often times social concerns take a backseat to ecological interests. As a result, it is often difficult to coordinate regulatory measures leaving regulation largely to the member states.

Policy Enforcement

Within the EU policy enforcement is often an issue due to the disjunct governmental system. Specifically, Ramírez-Monsalve et al. [2016] states that the EU's present governance system is characterized by ineffective coordination among relevant Directorate Generals, regional sea conventions (RSC), and member states (MS). As well as limited coordination among existing sectorial governance arrangements as each have their own legal/political instruments, institutional settings, and guiding principles for working with and incorporating stakeholders.

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