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**RESEARCH FOR PECH COMMITTEE -
FEASIBILITY OF MEASURING
SOCIO-ECONOMIC AND
ENVIRONMENTAL IMPACTS OF
RECREATIONAL AND SEMI-SUBSISTENCE
FISHERIES IN THE EU**

STUDY



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POLICY DEPARTMENT B: STRUCTURAL AND COHESION POLICIES

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Abstract

No unanimous definition for Marine Recreational Fishing yet exists among European Member States. The following report recommends a common definition and a methodological approach to assess marine recreational fishing socio-economic and environmental impacts. These recommendations are based on the analyses of five representative examples in Europe on these issues. The methodology recommended by the authors is an economic impact assessment based on fishermen's expenditures and catches, data collection by an on-line survey, adjusted and managed with a model based on input-output tables.

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LIST OF ABBREVIATIONS

- WGRFS** Working Group on Recreational Fisheries Surveys (ICES)
- MRF** Marine Recreational Fishery
- ICES** International Council For the Exploration of the Sea
- CFP** Common Fisheries Policy
- EAA** European Anglers Alliance Full Time
- FTEs** Equivalent jobs Gross Value Added
- GVA MEAS** Mapping and Assessment of Ecosystems and their Services

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EXECUTIVE SUMMARY

The following study aims to recommend a methodological framework for the performance of studies assessing the impacts of marine recreational and subsistence fisheries on national economies and on the environment. The purpose of a methodological framework is to supply the European Parliament with common definitions, concepts, perimeters and impact assessment methodologies so that a more homogenous vision on marine recreational fishing activities on a European scale can be obtained.

To fulfill these objectives, the authors carried out a benchmark analysis by comparing five assessment studies in Europe. The studies were selected as being representative of the diverse European contexts on MRF: in terms on natural environments (different seas and oceans), legal context (national laws on MRF) and MRF practices.

The benchmark analyses and comparisons of all studies were carried out on the basis of their perimeters (geographic, definition of MRF, inputs and outputs), their data sources and assessment methodologies. For each dimension of the benchmark, operational recommendations were made according to a performance analysis of studies and their potential scaling-up of methodologies at a European level with respect to operational and quality objectives.

KEY FINDINGS

- Divergent legal definitions of MRF in European Member States require unambiguous criteria to develop a common definition such as restrictions on fishing gears and on the use of the catch.
- Two levels of data collection are needed to get reliable results: (1) a general survey addressing the global population, aiming to describe the total population of fishermen and general practices and (2) a detailed survey addressing fishermen population and collecting precise data on fishing efforts, expenses, behaviours and catches.
- Data collection can be carried out nationally using online surveys.
- Environmental impact can be estimated through total MRF catches per species, needing adjustment methodology of data collected with the survey.
- Economic impact has to be estimated through direct, indirect and induced effects on the economy (total added value, and not only fishermen's expenditure). Social impact can be estimated through FTEs generated by fishermen's expenditure. These impact assessments would use an input-output economic model, homogenous between Member States.

(NB: these key findings are complementary and in line with recommendation formulated by the ICES WGRFS, see below text box).

GENERAL CONTEXT AND OBJECTIVES

Marine recreational fishing (MRF) can be an important source of income for national economies. Total expenditure is believed to exceed €25 billion a year in Europe (according to Dillon B.), and the number of sea anglers is estimated to be 8-10 million in Europe, according to the EAA¹. These figures are currently the only available at a European scale, but the methodology used has not been described in details nor developed with the cooperation of competent member state cooperation. However, this first estimation shows the need for MRF actors and public authorities to provide an objective view on MRF activities and its impacts. This is one of the purposes of the Working Group on Recreational Fisheries (WGRF) established in 2009 within the ICES.

The ICES² set up a working group in 2009: the WGRFS (Working Group on Recreational Fisheries) helping ICES European countries to develop sampling programmes on marine recreational fisheries and supplying data and an estimate of its impacts and stocks. WGRFS discusses and develops national surveys to obtain reliable comparable data on marine recreational fishing both biological (harvests, releases, size/age structure of catches) and on the socio-economic dimension of marine recreational fishery.

ICES WGRFS Report 2015 main recommendations for future surveys under EU-MAP

- Need to include MRF data in stock assessments, evaluated case-by-case, compared to commercial fishing, and regularly renewed (MRF fluctuating significantly between years)
- Need for a regional agreement for surveys conducted (international): mirror of the regional coordination of commercial fishery sampling
- Annual frequency of data collection needed over a number of years (need to develop time-series)
- Collection of biological data on catches (size, age...) required both for caught and released components
- Economic and social valuation of MRF with a 5 years frequency.

Source: ECES WGRFS Report, 2015

Recreational fishing and subsistence fisheries in the EU are national competences unlike commercial fishing activities, which are a European Union competence. However, according to the answer of the Commission, Article 1(1)(a) of the Basic Regulation (EU) No 1380/2013 on the Common Fisheries Policy (1) (CFP) mentions objectives in terms of conservation of marine biological resources and management of fisheries exploiting these resources.

Therefore, European conservation and management measures could also affect recreational fisheries, in this case national and European management of MRF should be evaluated impartially, with a common protocol assessing impacts of recreational fisheries on fish resources, in the terms of CFP objectives³.

¹ www.eaa-europe.org/files/intergroup-leaflet_6323.pdf

² International Council for the Exploration of the Sea: global organization developing science and advice to support a sustainable use of the oceans.

³ <http://www.europarl.europa.eu/sides/getAllAnswers.do?reference=E-2015-014510&language=EN>

In this context, the ability to describe objectively recreational and subsistence marine fisheries and assess their impact on the environment, and more specifically fishing stocks, at a national level, is essential.

Ahead of considering policy issues regarding non-commercial fisheries, a thorough analysis of scientifically valid data is due. The asymmetric legal context of these two separated forms of fishery can be a source of conflict between recreational and subsistence fishermen and commercial fishermen, accentuated by two sources of competition:

- A competition on fishing resources, the impact of MRF on stock not being assessed and the commercial fishing being controlled and managed through its impacts and state of fish stocks. This competition can take the form of a spatial competition on allocation or access to fishing areas and fish stocks.
- A competition on the market. However, MRF and subsistence fishing are commonly defined as practices prohibiting the sale of catches; informal economy can take place, lowering the price of fish, directly affecting commercial fisher businesses.

These potential conflicts and the lack of management in MRF are particularly strong due to lacking information and evaluation on MRF, but also because of the absence of a common definition at the European level. Moreover, recreational marine fishing practices are extremely difficult to assess since recreational fishermen represent a very mobile and highly heterogeneous population.

The plethora of different national definitions and of environmental impact and socio-economic role assessment methodologies make the aggregation of these on Union level extremely difficult.

1. EUROPEAN LEGAL CONTEXT ON MARINE RECREATIONAL FISHING AND DEFINITIONS

1.1. Definition of marine recreational fishing

Fishing can be defined as the activity devoted to the catching of aquatic animals, requiring specific tools, technics or processes. The different aspects of this activity, their analysis and declination enables the construction of a clear and common definition of what can be understood by "marine recreational fishing". An appropriate and common definition on marine recreational and subsistence fishing is needed in the perspective of a European wide evaluation and management of this activity. An appropriate definition should rely on the key elements enabling a clear distinction between different types of fishery, and the different modalities of recreational fishing. The different aspects composing recreational fishing are: the purpose of the catch, the fishing process, fishing motivations, species caught. Among these different dimensions, which are the most discriminating and should constitute the key elements of the definition?

1.1.1. Purpose of the catch

Most definitions of "recreational fishing" refer to what it does not constitute. According to different sources, recreational fishing is mainly defined as "**all fishing activities not conducted for commercial fishing purposes**". However, this definition covers a variety of realities.

Subsistence uses of the catch can be frequently encountered considering non-commercial fishing activities. Subsistence fishing, however, does not respond to recreational criteria since it does not respond to leisure motivation. Heritage or cultural motivation can be linked to this type of fishing.

Any catch from subsistence fishing is supposed to be entirely consumed within the home perimeter. However, subsistence fishing may also cover cases for which part or the whole of the catch is sold. In these cases, monetary returns should constitute an insignificant part of the person's income.

1.1.2. Fishing process and fishing gears

In some cases, recreational fishing may be defined from the fishing technics and processes, identifying the gears and methods with which recreational fishing can be performed.

There is an important variety of gear types that can be used within recreational activity:

- Active gears: angling technique using rod and line, hand-held lines, free diving to catch fish, various sport with harpoon, catching fish by hand.
- Passive gears: nets, traps, pots and set-lines
- Use or non-use of bait, types of bait.
- On-shore or off-shore fishing. Off-shore fishing requiring a boat that can be privately owned or charter boats.

The diversity of technics and gears, their potential combinations and variations among different Member States, makes it difficult to clearly define recreational fishing out of the method used. Moreover, some of these methods might also have something in common with commercial fishing.

1.1.3. Incentives for the activity

The enthusiasm for recreational fishing is linked to the leisure and sport characteristics of the activity: mostly facing the challenge for recreation and enjoyment purposes. Such incentives are contradictory to the purpose of food production (differentiating recreational from subsistence fishing), but however not exclusive within the practice: home-consumption of fish could be interpreted as being part of the motivation.

Sport and recreational fishing can also be confusing since the definition of sport fishing is not homogenous among all countries:

- Nordic countries: a sports fisherman is a fisherman using a rod and line;
- USA-based definition: sports fishing is primarily motivated by the challenge of finding and catching a fish.
- Sport fishing can also be reduced to fishing competitions (characterized by the weighing/measuring of the catch. Often, the "catch and release" practice (catch released alive) is a requirement for competitions.

1.1.4. Species caught

A recreational fishing catch aims at a wide range of species of aquatic animals: mainly fish and shellfish. This dimension of the activity is not specific to recreational fishing compared to commercial fishing: there are no species specifically caught by recreational fishermen.

1.1.5. Subsistence fishery

A trivial distinction is made between recreational fishing, characterized by motivation factors based on leisure sport and with no intention of making a profit; and commercial fishing carried out for profit. However, subsistence fishing seems to transcend this division and constitutes a hybrid form of fishery. Indeed, subsistence fishing can be carried out as a leisure and a recreational activity but contributes to sustaining a basic level of livelihood for the household of the fisherman or is consumed by individuals within a close network (family or friend). In that sense, catches of subsistence fishery are part of an informal economy, which differs from commercial fishery since it is not traded on a formal domestic or export market. In that context, subsistence fishery and its impacts on fishing stocks cannot be taken into account in the CFP.

The definition of subsistence fishery is not attributed according to the gesture or the purpose of the gesture, but according to the socio-economic situation of the author of the gesture. The subsistence fishery definition is relative and has to be evaluated according to each individual case, leading to a collection of specific data on fishermen's socio-economic situations.

1.1.6. Recommended definition

This analysis of the different definitions leads one to explore recreational fishing according to a greater acceptance covering both leisure and subsistence fishing. Since both catch destination and fishing professions can define fishing activities (in national legislation), these criteria give a common objective framework between European Member States and constitute the best key elements to be taken into account for an appropriate and common definition:

- Use of the catch;
- Type of gear and methods (simplified and common typology) needed.

In that sense, our study complies with the conclusions of the ICES WGRFS, defining recreational fishing as follows:

"Recreational fishing is the capture or attempted capture of living aquatic resources mainly for leisure and/or personal consumption. This covers active fishing methods including line, harpoon, and hand-gathering and passive fishing methods including nets, traps, pots, and set-lines". (ref. ICES WGRF, 2015).

This definition constitutes a consensus within IDEC WGRD which is composed of different national scientific institutions. A distinction can be introduced to this definition of recreational fishery using only the technical and use of catch criteria, in order to include and specify subsistence fishing situations. Recreational and subsistence fishing can be distinguished from the socio-economic situation of the fisherman (but not from the fishing practice itself). However, as part of an informal economy, subsistence fishing cannot be included in commercial fishing. Subsistence fishing enters the scope of this study. Being able to distinguish recreational from subsistence fishing implies the definition of discriminating criteria. It is recommended that taking monetary or economic criteria; for example, the **absolute value of the catch** or the value of the catch **relative to one's income** (% of one's income) can define whether one's activity falls under recreational or subsistence fishing. The definition of threshold entails a necessary socio-economic evaluation of recreational and subsistence fishing practices in the different Member States, its economic impact and potential interactions with environmental impact (mostly on fish stocks).

1.2. European legal system benchmark

On the model of commercial fisheries, which are managed at the European level through the Common Fishery Policy, recreational fisheries ; which were the sole prerogative of national and regional legislations, are becoming a European competence via fisheries controls and the impacts of recreational sector on fish stocks⁴.

National legislations can be very different, reflecting traditional rights and concerning their definitions of marine recreational fishing and management means.

The access regime to fisheries responds to national tradition and legislation. Two main forms are observed:

- In most cases, the State has the ownership of coastal waters and fisheries
- Fisheries can be privately owned (as coastal waters can be private, fishing right being part of property rights). This is the most common case for Nordic countries (Finland, Lithuania, Sweden, Denmark)

The legal context can discriminate the way recreational fishing might be managed and the capacity to regulate this activity (especially in the context of privately held fisheries).

⁴ EN E-014510/2015 Answer given by Mr Vella on behalf of the Commission (5.2.2016)
Article 1(1)(a) of the Basic Regulation (EU) No 1380/2013 on the Common Fisheries Policy (CFP) does not specifically make mention of recreational fishing, but rather of the conservation of marine biological resources and the management of fisheries and fleets exploiting such resources. This allows, in principle, for conservation and management measures to be adopted under the CFP, which may also affect recreational fisheries. Recital 3 of the Basic Regulation does indicate that recreational fisheries can have a significant impact on fish resources, and that Member States should, therefore, ensure that they are conducted in a manner that is compatible with the objectives of the CFP. This is also consistent with the contents of Recital 27 and with the provisions of Article 55 of Regulation (EC) No 1224/2009 establishing a Community control system .
The wording of Article 17 of the Basic Regulation does not exclude the extension of its scope to include recreational fishing. It is first and foremost up to the Member States to decide how fishing opportunities are allocated nationally (Article 16 paragraphs 6 and 7). Article 17 then obliges Member States to use transparent and objective criteria for such allocation among their different fleets."

1.2.1. Recreational fishing legal definitions

Most European Member States' legal definitions on marine recreational fishing are implicit. MRF is described in law through restrictions on fishing gear and/or on the catch, the use of the catch (home-consumption and prohibition from selling any catch). Some countries however provide an explicit definition of recreational fishing (6 out of 20, see Table 1).

The main procedures encountered in European legal terms are implicit definitions of MRF distinguishing it from commercial fishing and are based on:

- Gears used (5 Member States)
- Prohibition to sell catch (5 Member States)
- Both gears and prohibition to sell catch (3 Member States)

1.2.2. Recreational fishing management procedures

The main differences between the legislation in different Member States on recreational fishing are based on the traditional relation to fishing rights: considered as a public right in some countries (UK and Netherlands) or an activity that has to be regulated alongside commercial fishing (Sweden, Germany, Spain, Slovenia). However, national recreational fishing management regulations can be compared, based on unambiguous criteria:

- Gears restrictions;
- Catch restrictions / time or spatial limits on fishing activity;
- Fishing license.

A point in common with all Member States is the systematic restriction on gears. Another observation is the apparent exclusion of fisheries management between the fishing license system and the fishing limits system (spatial catch) leading to two main types of management (see Table 1):

- Fishing license without fishing limits (7 Member States);
- Fishing limits without fishing license (7 Member States);
- Fishing license and limits being combined (5 Member States).

1.2.3. Synthesis and recommendations

Table 1 synthesises the different elements concerning the European legal benchmark on MRF. This analysis reveals no clear link between the legal definition of MRF and its legal management. The absence of logic between these two aspects of MRF legal problematic increases the variety of cases and the diversity of legal system pertaining to MRF.

The following study aims at benchmarking MRF socio-economic and environmental assessment methodologies deployed on specific countries. Five studies were selected according to both availability and representation Member States covered by sampled studies are: Denmark, UK (Scotland and Wales), France and Portugal, representing a wide diversity of European legal context of MRF.

The three main legal definitions are covered by sampled studies:

- gear definition: Denmark
- sell catch prohibition definition: France and UK
- combining of both gear and sell catch prohibition: Portugal

The three main MRF management systems are also covered by the sampled studies:

- fishing license without fishing limits: Denmark
- fishing limits without fishing license: UK and France
- fishing license and limits being combines: Portugal

Table 1: Legal distinctions that apply to European Member States in relation to marine recreational fishing

Member state	Legal distinction between commercial and recreational fishing	Recreational fishing license	Recreational fishing catch/bag limits	Study benchmark selection
Finland	Sale of catch/gear (angling)	Yes	NA	
Estonia	No	Yes	No	
Latvia	Gear	Yes	Yes	
Lithuania	Gear	Yes	No	
Poland	Yes (?)	Yes	No	
Sweden	Yes (?)	Yes	?	
Denmark	Gear	Yes	No	Yes
Germany	Sale of catch	Yes	No	
Netherlands	Gear	No	No	
Belgium	Gear	No	NA	
UK	Sale of catch	No	Yes	Yes (2 studies)
Rep. Ireland	No	No	Yes	
France	Sale of catch	No	Yes	Yes
Spain	Sale of catch	Yes	Yes	
Portugal	Sale of catch/gear	Yes	Yes	Yes
Italy	No	No	Yes	
Malta	Sale of catch	No	NA	
Slovenia	Sale of catch/gear	Yes	Yes	
Greece	No	No	Yes	
Cyprus	Gear	Yes	Yes	

Source: Pawson et al. (2008)

2. GENERAL DESCRIPTION OF SELECTED STUDIES AND BENCHMARK APPROACH

Table 2: Studies sample presentation⁵

Nr.	Title	Country	Date	Institution	Authors
1	The Nationwide Assessment of Marine Recreational Fishing: A French Example.	France	2013	IFREMER	Herfaut Johanna Harold Levrel Olivier Thébaud Gérard Véron
2	Socio-economic and Spatial Review of Recreational Sea Angling in Wales	UK - Wales	2015	Bangor University (commissioned by the Welsh gov.)	Monkman G. G. Cambiè K. Hyder M. Armstrong A. Roberts M.J Kaiser
3	Economic Impact of Recreational Sea Angling in Scotland Technical Report	UK - Scotland	2009	Glasgow University & Scottish gov.	Radford A. G. Riddington Hervey Gibson
4	Impact of Recreational Fishery on the Formal Danish Economy	Denmark	2003	University of Southern Denmark	Roth Eva Susanne Jensen
5	Recreational Shore-Fishing in Southern Portugal : Biological and Socio-Economic Aspects and Perspectives for Management	Portugal	2012	University of Algarve	Veiga, Pedro Filipe Duarte Alves (Thesis)

2.1. Studies sample selection

Five different studies were selected in order to perform a benchmark study of the methodologies deployed nationally to assess socio-economical and environmental impacts of marine recreational fishing. Results reliability of the benchmark approach depends on the sample representativeness in both legal and environmental contexts.

As mentioned in 1.2.3, Table 1 shows main European legal contexts for MRF which are represented within the studies sample.

Environmental context criteria is evaluated with the different seas and oceans being covered by the geographical perimeters of the sample. All the different European seas and oceans: Baltic sea, North Sea, Northern Atlantic, Mediterranean Sea are covered by the selected studies.

⁵ Bibliographic details for each study are presented in the « References » section of this study.

Table 3: Sampled studies European seas coverage

Sea/Ocean	Study 1	Study 2	Study 3	Study 4	Study 5
Baltic				X	
North sea			X	X	
Northern Atlantic	X	X			X
Mediterranean sea	X				

2.2. Benchmark analysis

The objective of the analysis is to define the best-suited methodology, which could be used at a European level, in order to assess socio-economic and environmental impacts of marine recreational fishing. Studies sampled will be analysed and compared. The elements analysed are referring to the methodologies deployed by each study. Their analysis will lead to a comparative evaluation of their limits and advantages. The following paragraphs describe the elements of the benchmark analysis.

2.2.1. Perimeters

The study perimeter defines the different variables and their metrics composing the dimensions of the assessment analysis:

- **Geography:** territory on which the assessment is conducted (can be local, national, multinational ...);
- **Marine recreational fishing definition:** as state in 1.1, there is a diversity in MRF definitions. The assessment method is highly dependent on activities assessed;
- **Inputs:** the different variables enabling the impact assessment (fishing efforts, fishing expenditures, fishermen's demography, sociology, behaviour ...) and their metrics;
- **Impact assessed:** economic, social, environmental (and their metrics).

2.2.2. Data source

Part of the method description focuses on the way data were collected and their reliability. The term "data" refers here to the inputs of the perimeter, and the way these inputs were obtained. Different data sources can be used. The most common are:

- **Official statistics**
- **Survey data** (online, face to face interview ...)

In case of surveyed data, the sample selection methods have to also be evaluated.

2.2.3. Assessment methodology

The assessment methodology describes the way the impact (output) can be estimated from the inputs (data collected). The methodology depends on both data availability and the nature of the impact to be assessed.

Nature of impact:

- **Economic:** estimate the multiple effects of one activity on the business of a determined area in terms of part of the gross regional product.
- **Social:** estimate the total employment depending on the studied activity.
- **Environmental:** a diversity of environmental impacts can be assessed according to which dimension of the environment could be affected by the studied activity:

CO2 emissions, resources depletion (fish stocks), pollution (toxicity), biodiversity erosion...

Economic Impact dimensions:

- Direct: the results of the money initially spent in one region by the business studied
- Indirect: the results of the business-to-business transactions indirectly caused by the direct effects
- Induced: the results of increased personal income caused by the direct and indirect effects (the increase in household to business activity).

3. GEOGRAPHICAL AND MARINE RECREATIONAL FISHING PERIMETERS

3.1. Geography

Two main geographic perimeters are being adopted to assess MRF impacts: nationwide and local (regional) assessments (see Table 4).

Nationwide assessments were conducted in France and Denmark. More precisely, the Danish study was part of a joint approach shared with other Nordic countries. Moreover, the scale of both countries are not comparable. Danish MRF takes place on a rather small and homogenous scale and in that sense, it is quite comparable to other regional studies (Scotland, Wales); whereas French MRF occurs on very different ecosystems (Channel, Atlantic, Mediterranean Sea).

The strong link between fishing practices, species fished, and territorial impacts on the economy explains why most studies have a regional scope. It also explains the interests of local authorities to assess this activity, and the means they can engaged for these assessments.

The diversity of contexts explored within Study 1 (French study) is however quite representative of the different fishing contexts which can be met within the whole of Europe. Thus, the overall methodology developed in Study 1, and its potential transpositions to the European level will be focused on. From an operational and qualitative analysis point of view, it is also interesting to focus on how data can be collected by local actors and authorities.

Table 4: Sampled studies geographic perimeters

Sea / Ocean	Study 1	Study 2	Study 3	Study 4	Study 5
National	X			X	
Regional		X	X		X
Infra-regional		X			

3.2. Marine recreational fishing definition

The scope of fishing activities assessed and composing the MRF definition of the different studies are mostly based on fishing gears and methods (see Table 5). The risk – in adopting this entry point to define the MRF activity – is the diversity of fishing gears and technics available in one country, and even more at the European scale, referring to traditional and modern fishing, specific technics to species and/or ecosystems. Fishing techniques and their equipment are critical for impact assessments as they size both expenditure (taken into account for economic impact assessment) and fishing efforts efficiency (taken into account for environmental impact). The purposes of the catch are mentioned less: home-consumption, leisure, fun or sport.

Fishing gears and methods seem to be the best entry point and the most accurate on to define and evaluate MRF activities. However, in the perspective of a European level assessment, the diversity of gears and techniques has to be reduced to a common typology based on main discriminating criteria:

- On shore fishing with active gears (rod and line, ...)
- On shore fishing with passive gears (nets, traps...)
- Off shore fishing with active gears
- Off shore fishing with passive gears
- Diving fishing with harpoon gun
- Shellfish gathering

Table 5: Sampled studies MRF definition

Sea / Ocean	Study 1	Study 2	Study 3	Study 4	Study 5
Purpose of catch		X			X
Fishing process /gears	X	X	X	X	X

3.3. Impacts assessed and metrics

Economic impact is the main result of most studies. It is not restricted to expenditure, but direct, indirect and induced economical values trickling from this expenditure are also assessed. The results of this economic impact can be measured with different economic metrics most commonly the GVA, but also the values of import and export entailed, the impact on indirect taxes (in Study 4). A distinction is often made between the expenses of domestic fishermen and those of tourist fishermen. A social impact assessment reveals the employment dependence on MRF activities on one territory, resulting from the different level on value generation (direct, indirect and induced), is measured in FTEs.

Environmental impact assessment is limited to the estimated total catch on the studied territory, per species in tons per year. This total catch might be compared to the commercial equivalent (per species per year), leading to an evaluation of MRF pressure on stocks and its potential competition with commercial fisheries. Spatial assessment can be conducted leading to an infra-regional assessment of MRF catches, or MRF hotspots.

Concerning the perspective of a European assessment of MRF, minimum impact assessments are:

- Economic: total fishermen expenditure
- Environmental: total estimated catches per species (and comparison to commercial fisheries catch).

The capacity to get more sophisticated results on the economic impact (indirect and induced impacts) and on employment, relies on economic modelling which has to be calibrated on a specific territory. The different case studies mobilized local or national economic impact assessment models.

Example of the DREAM® model for Scotland: DREAM stands for Detailed Regional Economic Accounting Model

- Accounting models can assess direct, indirect and induced economic impacts of one activity. They rely on multiplier coefficients measuring the multiplying economic impact of expenditures in different economic sectors in one geographic area.
- The Detailed Regional dimension of the DREAM model relies on a 85 by 85 matrix of geographical origins and destinations a expenditures (32 Scottish local government areas, 12 regions in UK ...)

The structure of MRF economic impact implies that a global European model could be specifically developed, or which could result from the standardization and convergence of local and national models.

Table 6: Sampled studies impact assessed

Impact and metrics	Study 1	Study 2	Study 3	Study 4	Study 5
Socio-economic impact	Expenditure	Direct, indirect, induced	Direct, indirect, induced	Direct, indirect, import, taxes	-
Metrics	Value (in M€)	GVA, Employment (FTEs)	GVA, Employment (FTEs)	Income, Import dependency, Taxes Employment (FTEs)	-
Environmental impact	Total catch	Total catch	Species caught	0	Commercial and recreational catch comparison
Metrics	In T	In T	In T		In T and in % commercial fishing

3.4. Inputs variables

The inputs and collected variables can vary according to the assessment methodology adopted, and also the data collection procedures. However, some key variables can be identified as mandatory according to the comparison of the different studies. These different key variable categories are described in the following section.

3.4.1. Fishing expenditures

An inventory of all expenditures linked to MRF activities has to be made at the fishermen's scale/level. This inventory must cover:

- Operational expenses: transportations, licenses and fees, lodging, food, drinks, journals, charter boat fees ...
- Equipment expenses: fishing gears, bait, clothing ...
- Maintenance expenses: expenses due to fishing boat maintenance were taken into account only in the French study (Welsh and Danish studies did not take this into account).

A distinction between domestic fishermen and tourist fishermen has to be introduced, since MRF can contribute to tourist attraction in some regions at a European scale. The coverage of all European Member States in data collection constitutes a strength in the capacity to capture information on international recreational fishing (European residents?? fishing in different Member States).

The potential arbitration of fishermen between expenses is also an interesting piece of information to be collected. This consists in assessing the part of expenditures that could be made in case of fishing prohibitions: in both values and services/goods purchased.

Arbitration evaluation is another way to assess the potential impact of MRF on local economies and consists of evaluating potential losses entailed by fishing (Money that is not spent on fishing gears and services but on other leisure activities, may have a higher or lower direct and indirect economic and social impact).

3.4.2. Baseline fishermen characteristics

With the intention of obtaining an accurate figure of the population of fishermen, and be able to extrapolate individual impacts to a national scale, baseline characteristics of fishermen are mandatory and must cover at least the following variables:

- Mandatory:
 - Age
 - Sex
 - Place of residence
 - Income

- Secondary :
 - Marital status
 - Nationality
 - Education
 - Membership of fishing clubs
 - Fishing experience

3.4.3. Fishing behaviour

Fishing behaviour has to be illustrated by both effort and the results of those efforts. Different scales of evaluation could be adopted: fishing year/season or fishing trip/day.

Accuracy of the data is dependent on the time scale evaluated, from low accuracy (fishing year) to high accuracy (fishing trip during the day).

The best solution to gather reliable information on the behaviour of fishermen is to combine data from both annual and daily results:

- General information (on the year, season basis): number of fishing trips per season, fishing place, fishing methods/gears, expenditures, targeted species.
- More specific information on fishing activity (on trip /day basis): number and nature of fishing gears, bait, species caught, catches quantity.

4. DATA COLLECTION

Data are essential to objectively describe one activity and assess its impact on different dimensions (social, economic or environmental). Data collection over time and space, according to a common framework is also essential to monitor this activity over time and according to common objectives. MRF is thought to have a high impact on marine fish stocks. ⁶ Current lacks of data and assessments, or incomplete national recreational fisheries survey, make it difficult to determine all the total human impacts on fish stocks. And our ability to achieve maximum sustainable yield (MSY or maximum catch enabling the population size to maintain at the point of maximum growth rate).

Regulation (EC) No 1543/2000 establishes a Community framework for the collection and management of data needed to evaluate the situation of the fishery resources and the fisheries sector. To this end, it stipulates that Member States set up national programs for the collection and management of fisheries data in accordance with Community programs.

Regulation (EC) No 1639/2001 establishes the minimum and extend programs for the collection of data for scientific evaluations on fish stock evolutions. Data collection operations are entrusted to national authorities according to a common framework

Recreational fishery is included in this regulation, catches from recreational and game fisheries being part of the module of evaluation of the catches and landings.

The precision level of data collected had to be established with a pilot surveys which conclusion were to be forwarded to the Commission by the 31 October 2003.

Currently, authorities are lacking information and insight on recreational and subsistence fishery behaviours and their potential impact. On the model of the JRC data collection, could a framework data collection be designed in order to enlighten monitoring and decision making on recreational and subsistence fishermen behaviors and the impact or their activities? This means collecting data on socio-economics, demographics, and on the description of fishing activities

In order to answer this question (the authors) decided to analyse different experiments performed in Member States and describe data collected and the method chosen to collect these data. The following parts of the report expose the analyses of these experiments and draw recommendations to specify the form a European data collection framework for MRF could take.

In every study sampled, no public data were available on fishing expenditure, the characteristics fishermen nor fishing behaviours. All data used in assessing MRF impacts on the economy and on the environment were specifically surveyed through different methods and media.

A common data collection pattern arises from the comparison of the different studies. This data collection pattern is based on two different surveys, aiming complementary goals:

- a general survey
- a detailed survey

This common data collection pattern outlines a potential European data collection framework for MRF.

⁶ Research for PECH Committee - The discard ban and its impact on the maximum sustainable yield objective on fisheries, 16-05-2016, Thünen Institute of Baltic Sea Fisheries: Sarah B. M. KRAAK, Christian VON DORRIEN, Uwe KRUMME, Lena VON NORDHEIM, Rainer OEBERST, Harry V. STREHLOW, Christopher ZIMMERMANN

4.1. General survey

4.1.1. Objectives

The general survey is submitted to a representative (or randomly selected) sample. The main objectives of this survey are the production of a first estimate of MRF fishermen' population and baseline characteristics (see 3.4.2) necessary to describe the MRF population and gather unbiased estimates on marine recreational fishermen.

The general survey constituted the first step to collect data. The characterization of the MRF population produces a sampling plan for the "detailed survey" which will provide more accurate data on fishing expenditure and behaviours (see 3.4.1 and 3.4.3).

This first step is also to seize the opportunity to gather rough estimates on expenditure and behaviours: size of catch; number of fishing trips, expenditure ...

A large level of uncertainty can be observed in the results of a general survey for the collection of this kind of data. A rigorous analysis has to rely on another source of information, justifying the performance of a second type of survey (detailed survey), enabling for a cross-checking of information sources.

4.1.2. General survey performance procedures

Different procedures can be adopted to perform the general survey;

- Random-digit-dialing (RDD) telephone survey: executed by a service provider toward an adapted household sample
- Mail survey: dedicated form
- Omnibus survey: regular survey sent to a fixed sample, containing MRF questions (among others).

These different procedures can be compared according to their cost, flexibility (sample adaptation) and time of performance:

The sample can be adapted in order to gather more robust information: for example by over-sampling coastal zones.

4.1.3. Recommendations

Table 7: General survey performance procedure analysis

Procedure	Study + country	Population surveyed	Cost	Time	Sample adaptation
RDD	S1 – France	15 000 p.	-	+	++
Mail	S4 – Denmark	546 p.	-	--	-
Omnibus	S3 – UK-Scotland	17 037 p.	+	+	-

For each procedure and the analysis criteria, advantages are represented with +, disadvantages are represented with -

The best adapted procedure to perform the general survey, in terms of cost, time and sample (adaptation on population surveyed) is probably the use of omnibus surveys already carried out by authorities (see Table 7). In case no omnibus survey was available, or too difficult to adapt, a specific omnibus survey should be designed, common to all European Member States.

4.2. Detailed survey

4.2.1. Objectives

The detailed survey aims at capturing the diversity of fishing practices, and obtaining more precise numbers for expenditure and fishing behaviours compared to the general survey (see 3.4.1 and 3.4.3).

With the aim of acquiring more accurate data, this survey is addressed to a selected sample of marine recreational fishermen. The way to select this restricted sample depends on the existence of MRF organization and the capacity to address them the survey. This enables one to encapsulate the diversity of fishing practices; and to obtain more precise numbers on the size of the catch and of the expenditure undertaken.

More qualitative questions can be addressed such as their perception of MRF trends, relations with other agents (commercial fishermen), and their motivations...

4.2.2. Detailed survey performance procedures

Two main methods were followed to perform a detailed survey:

- *on-site*
- *on-line*

4.2.2.1. On-site survey

On-site surveys are carried out at fishing access sites. The choice of a selected fishing site must follow a sampling plan developed on the basis of:

- Representation of sites according to information collected in the general survey (150 sites identified in Study 5);
- Information collected by the national maritime administration, fishing clubs, scientific organization.
- Random selection of surveyed sites (among the sample selected) throughout the survey period.

So that an estimate of the fishermen represented and who were surveyed on-site, on one given day, an estimate of the total population of fishermen on the site the same day has to be carried out. Study 5 used two aerial surveys per month (by aircraft) in order to count the number of fishermen in the whole sampling area.

The *on-site survey* method is submitted to a selection bias: more fishermen who go fishing regularly, are more likely to be interviewed.

4.2.2.2. On-line survey

Another procedureway to collect more accurate information on fishing behaviours, expenditure, and catches is to perform an on-line survey (or mail survey). This survey is addressed specifically to fishermen. This survey has to be endorsed by Member State MRF associations and organizations, which have to be associated to the initiative, and who could participate by distributing the survey through their networks or to their members. Specialized newspapers, and magazines can also be used to advertise/disseminate the survey, especially if no national organization or association exists.

The on-line method has interesting advantages such as its cost, time and the high number of interviews that can be collected. However compared to on-site surveys, the information collected is subjugated to fishermen's declarations, which may not always be accurate. Moreover, there is a selection bias: some fishermen, due their age, may be more willing to respond to an on-line survey than others.

4.2.3. Recommendations

Table 8: Detailed survey performance procedure analysis

Procedure	Study + country	Survey length	Population surveyed	Cost	Time	Data quality
On-site	S1 – France	1 year	1 775 p.	--	--	++
On-site	S5 – Portugal	1 year	1 321p.	--	--	++
On-line	S3 – Scotland UK	1 year	-	+	+	+
On-line	S2 – Wales UK	1 year	-	+	+	+

By comparing survey procedures (see Table 8) on several operational criteria (cost, time needed and quality of data collected), and taking into account the geographical scale over which such a survey would be carried out (European Union), we recommend the on-line survey which constitutes the best adapted procedure, combining a good level of data quality collection with a good operating level for diffusion.

Moreover, in order to get good references and comparable statistics between Member States, the metrics and variables gathered with the on-line survey have to be homogenous (between Member States). The other determinant of the on-line survey is that it has to be homogenous (panel selection, season of achievement). Therefore, the study might need cooperative work between representatives of each Member State with the purpose of ensuring the harmony and adaptation of this international survey.

5. IMPACT ASSESSMENT PRINCIPLES

5.1. Expenditures and catches adjustment

With the intention of obtaining an estimate from each Member State of the total of catches and/or expenditures, data collected individually with different surveys have to be adjusted to the global population of the Member State in question.

This adjustment is possible if enough information is gathered on the population of fishermen and can be extrapolated to all the Member States.

The first adjustment to be done concerns the total population of fishermen leading to an estimated number of this population.

Then, among the population of fishermen, the sub-population (classification can be described according to fishing practices (fishing effort in number of trips and fishing of MRF performed).

The proportion of each sub-population within a representative sample of a national population can then be extrapolated to the Member State population for an estimate of the total expenditures and catches. This is an important step for the overall estimate, as the results of the different surveys maybe highly skewed towards the most regular and most active fishermen. Splitting the surveyed population according to key characteristics is a way of overcoming inherent survey bias.

Table 9: Detailed survey performance procedure analysis

Study + country	Fishermen total population	% in total population	MRF total expenditures	MRF total catches
S1 – France	2.45 M p.	5.1%	1,256 M€ - 2006	24,500 t
S3 – Scotland UK	0.125 M p.	1.7% (adults)	159 M€ (140 M£ -2009)	-
S2 – Wales UK	0.076 M p.	2%	99 M€(77.09 M£ - 2015)	-

These results are difficult to compare since the perimeters assessed are different: S1 evaluates fishermen's total expenditure while S2 and S3 assess direct, indirect and induced effects of fishermen' expenditure. In the following part, the differences in perimeters are explained.

5.2. Economic direct, indirect and induced economic impact

The different socio-economic impact:

- direct, indirect and induced values created from fishermen's expenditure(economic impact);
- direct, indirect and induced numbers of employment depending on fishermen's expenditure (social impact);

These variables are evaluated with a view to seeing how they impact on socio-economical modelling. These models are based on input-output table principles and are affecting expenditure to one Euro, the value created directly, indirectly and induced, such as the number of employment places generated.

Input-output table models are well adapted to activities such as fishery because the products needed for this activity are not produced within a single production line (which is the case of an industry) but within multiple transactions and actors.

Therefore, a demand-side approach has to be adopted: taking an inventory of fishermen's expenditure. This expenditure is then converted to expenditure categories corresponding to consumption categories of the input-output table (see Table 10)

Table 10: Expenditure categories of recreational fishing and the respective commodity groups in the Danish input-output tables (ref. Roth Eva)

Fishermen expenditure categories	Commodity group in input-output table
- Automobile transportation to fishing site	- Fuels and lubricants - Other services in respect of personal transport equipment
- Boating (fuel, other operating expenses, rental costs etc.)	- Fuels and lubricants - Other services in respect of personal transport equipment
- Other transportation to fishing site (ferrv. air plane. train etc.)	- Transport services
- Licenses and annual membership fees	- Recreational and cultural services
- Fishing journals, books, videos, CD-ROMS etc.	- Recording media for pictures and sound - Book, newspapers and periodicals
- Extra food and drinks expenses (above what one would have spent anyway)	- Meat - Ice cream, chocolate & confectionery - Mineral waters, soft drinks & juice, beer
- Other expenses	- Other recreational items and equipment

Input-output tables are an account for the economic production system in a well-defined geographical area. Regional model can be developed such as the Scotland study using the DREAM® model: Detailed Regional Economic Accounting (developed par CogentSI).

This approach is well adapted to national scale, since input-output tables are existing in all EU Member States and can be exploited to assess economic impacts of fishery expenditures.

Example of results

Denmark, employment impact of MRF:

- **Direct employment of 500p**
- **Indirect employment of 258p**
- **Relative to the 2,65Mp employed in Denmark**

In Wales:

- **Total net direct spending in sea angling activity: £77,09 million, supporting an average of £115,97 million : each £1 million of net sea angler spending in Wales supports another £0.5 million of spending in the Welsh economy.**
- **Total employment directly created from sea angling spending: 1,706 FTEs (0.13% of the total FTEs in Wales in 2007) 500 FTEs are probably supported indirectly.**

Other dimensions of national economy can be explored, such as tax incomes, import dependency of MRF in one country. Such information could also be valuable in an economic impact assessment.

Example of results

In Denmark:

14% of equipment consumption made by recreational fishermen is met by imports (less than private consumption average = 20.8%)

Share of demand expenditures destined to indirect taxes is higher for recreational fishery than private consumption in general or other forms of final demand (investments, exports, public consumption) because there are no VAT exemption nor subsidy on MRF.

5.3. Substitution analysis

An interesting notion in economic impact is introduced in a study on Scotland (S3): through the substitution analysis. In the detailed survey addressed to fishermen, trade off questions were asked on activities and expenditure that would replace fishing, in case it was prohibited. Relying on the shift in expenditure, the input-output approach reveals the net loss in regional expenditure, income and employment would face.

Contrary to impact analysis, which evaluate the creation of value and employment enabled by MRF, the substitution analysis reveals incomes and employment that are dependent on MRF. The substitution analysis introduces the notion of "economic activity supported".

Example of results

Table 11: Economic contribution of MRF in Scotland

Currently supported		Would be lost	
Jobs	Income (£'000s)	Jobs	Income (£'000s)
3,148 FTEs	£69,670	1,675 FTEs	£37,042

5.4. Contingent valuation

Contingent valuation, or stated preference model, is a method mostly used to measure the value of non-market resources such as ecosystemic services, the impact of pollution, environmental preservation. This survey-based method evaluates the benefits people receive from the non-market or immaterial resource. The "stated preferences" are evaluated by asking how much money people:

- would be willing to pay to maintain the resource's benefits
- or how much they should be compensated for the loss of the resource's benefits.

Most of the benefits people get from a leisure or recreational activity is not material (the catches in the case of MRF). There are important benefits taken into account and motivating fishermen such as: cultural benefit, relaxation, physical activity ... A way of evaluating these benefits is the contingent valuation.

This is not a proper economic impact, since these benefits are not submitted to market or monetary transactions.

Example of a question from the (Denmark study)

Contingent valuation question: « What is the most you would almost certainly pay over and above of what you now spend before you would stop going to the fishing sites you now use? »

5.5. Recommendations

In order to fulfill both objectives of assessing economic and environmental impacts of MRF, methodologies exposed in parts 5.1 and 5.2 are sufficient.

Environmental impact assessment has to be based on catches volume evaluations per species per region. It can be assessed from the adjustment of data collected individually with on-line surveys. This procedure reaches both requirements of data quality and operational collection.

According to the ICES WGRFS such assessment has to be conducted on a yearly basis (on the first years) in order to constitute robust time series.

Economic and social impact assessment has to cover at least direct and indirect impacts. It can be assessed from the adjustment of data collected individually with on-line surveys and the modelling of national economics thanks to input-output table models.

The adoption of demand-side approach needs to collect robust data on recreational and subsistence fishermen, in order to be able to model their behaviors (in particular an inventory of their expenditure and the understanding of the drivers of expenditure) and the socio-economic impacts of their activities.

The on-line survey procedure reaches both requirements of data quality and operational collection. In case no omnibus survey was available, or too difficult to adapt, a specific omnibus survey should be designed, common to all European Member States.

The configuration of the MRF economic impact implies a global European model which could be specifically developed, or which could result from the standardization and convergence of identified local and national models.

According to the ICES WGRFS such assessment has to be conducted on a five year basis. The relatively low frequency in data collection concerning socio-economic impact assessment is explained by the capacity to approximate recreational and subsistence fishermen behavior year to year evolution based on driver trends (income evolution, free time, geography and age of fishermen...).

On the other hand, structural behaviors may change on a longer time span; 5 years constitutes a good consensus to evaluate potential structural changes in fishermen behaviors.

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ANNEXE

LE BIPE

Created in 1958 on behalf of public authorities and major companies' executives, Le BIPE is now one of the leading European providers of forward-looking economic analyses and strategy consulting, for private companies' executives and public authorities. Its 60 highly qualified professionals are based in Paris. Le BIPE's value-added stands on its ability to quantify, to forecast, to foresee the evolution of economic sectors, forces and environment in an independent way, through quantitative knowledge (such as economic forecast, socio demography...) and various qualitative skills (such as prospective studies, market segmentation, strategic analysis).

These competences are offered to public policies (evaluation, regulation, programming) and to private companies (monitoring and forecasting markets, business plan strengthening) either through tailored strategic studies or thanks to Observatories and industry studies (involving the main actors, public or private in this industry) in a pooled approach. This framework, mixing economic environment, a multi-sectorial vision, and a focus at the company level, allows to take into account, in a coherent way, all the dimensions to be anticipated by both the public and by private decision-makers.

In 2014, BIPE assessed the socio-economic impact of freshwater recreational fishing on a national scale, commissioned by the French Federation of Freshwater Recreational Fishing. In 2015, BIPE's methodologies were applied to the study 'Socio-economic impact of hunting in France. Moreover, BIPE is currently accompanying recreational and territorial activities (hunting, infrastructure managers ...) into their ecosystemic services assessment, creating a reference methodological framework which complies with the European analytical framework developed in MAES.

Following these successful studies, BIPE was commissioned by the European Parliament to perform the feasibility study of a European methodological framework to assess environmental and socio-economic impacts of MRF.

Link to le BIPE's study:

http://www.federationpeche.fr/m6_comm_presse/docs/Enquete_socio_eco_FNPF.pdf

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