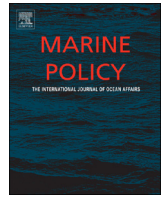




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How can discards in European fisheries be mitigated? Strengths, weaknesses, opportunities and threats of potential mitigation methods



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ABSTRACT

A number of solutions, with varying efficiency, have been proposed to mitigate discards. In this paper twelve mitigation measures were reviewed by their strengths and weaknesses, along with opportunities and threats, they might entail. How mitigation methods could either support or counteract others was also reviewed. The analyses of the mitigation measures are based on expert knowledge and experience and supported with existing literature. Discarding is highly variable and is influenced by numerous biological, technical and operational factors as well as social and economic drivers. These influences need to be carefully considered when designing management approaches. Finally, all reforms must be carefully considered within the context of a broader management system. The full management system needs to be thought of coherently to create an incentive framework that motivates fishers to avoid unwanted catches. It is only in this setting that discard mitigation methods may be potentially effective.

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1. Introduction

Over recent years the global fishing industry has been under increasing pressure to reduce bycatch and discards [1]. Discarding, where a portion of catch taken by a fishing vessel, is returned to the sea dead or alive [2], has drawn increasing criticism from the public and non-governmental organisations, such as the Fish Fight campaign in the UK and other European countries [3]. Discards are seen by many as a waste of human food and economic resources, and a source of unaccounted mortality as long as this catch is unreported and mortality rates of releases uncertain, increasing the uncertainty of stock assessments. It has been argued that discarding is not just an artefact of non-selective fishing practices,

but also a consequence of clumsy management regulations [4]. For example, until 2014 the European Union (EU) fisheries regulations prohibited the retention of catch that exceeded landing quotas or contravened Minimum Landing Sizes (MLS), and prescribed catch compositions [5]. Catches will also be discarded if they are of poor quality, small size, or of a non-commercial species or a low market value [6]. Discarding small-sized individuals of target commercial species to save quota for larger, higher priced individuals is referred to as high grading. In EU fisheries, high levels of discards have been considered an issue for decades [7]. The elimination of discarding and unwanted catches has been identified as a main objective under the 2012 reform of the Common Fisheries Policy [8–10] and a discard ban will be introduced gradually between 2015 and 2019 for all regulated species in European waters.

Discarding levels in EU fisheries vary between locations, gears, species and fishing grounds [11]. For example, the discarded proportions in trammel net fisheries vary between 20% in the Northeast

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Atlantic to 40% in the North Sea [12,13]. Similarly, proportions discarded by trawl fisheries will vary with fishing ground, and also between trawl types [11,14]. Northeast Atlantic pair trawlers discard from 40% to 60% of their catch, while single bottom trawlers discard between 20% and 40% of their catch throughout the Northeast Atlantic [12]. In the Mediterranean, discard ratios from bottom trawlers show high differences among areas and operations, varying from 20% to 65% [15]. A study combining data collected via the data collection framework indicates that there is a high difference in discard levels between the Mediterranean Sea and other regions in the EU and overall the variation in discard ratios for a number of commonly-discarded species is often greater between regions than between fisheries [11].

The substantial amount of catch that is discarded in some EU fisheries warrants the development and implementation of discard mitigation methods. Herein, actions carried out by a management authority (e.g. the EU Commission, a member state or a fisheries organisation) with the aim of reducing or eliminating discards within a fishery, will be referred to as mitigation methods. Surely, already proven approaches hold some potential for further discard reductions [16]. These include, but are not limited to, technical measures; minimum mesh sizes, effort regulations, and catch quotas [17]. Reviewing these and other examples, also of non-European fisheries, supported by relevant literature a detailed evaluation of potential mitigation methods are provided and possible options are identified for European Union Member States to meet the objectives of the reformed Common Fisheries Policy (CFP). Using a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, what factors may influence the success or failure of a measure are examined, and how different methods may interact to increase the likelihood of success. For example, the involvement of fishers in the development and adoption of more selective fishing gear [18] or the emergence of new markets for traditionally-discarded species or sizes [19,20].

SWOT analysis is a tool mainly used in business management to identify Strengths, Weaknesses, Opportunities and Threats of a business. In SWOT analysis the analyst lists factors regarding the business into four categories; internal positive and negative factors (strengths and weaknesses) and external positive and negative factors (opportunities and threats). These lists can be used to build a business strategy and identify ways of using strengths and opportunities to outweigh or circumvent weaknesses and threats. The number of areas using SWOT is constantly increasing [21];

including applied fisheries science [22]. Here SWOT analysis is applied to each of the identified discard mitigation approach to achieve a comparative description of the strengths and weaknesses of each approach.

However, because reasons for discarding are diverse and intricate [23], mitigation methods cannot be implemented in isolation; they should be combined with other methods to achieve a comprehensive approach suited to the conditions in the fishery of interest. Therefore, the analysis examines how different discard mitigation methods can be combined into a consistent strategy in light of their respective strengths and weaknesses. A comprehensive and generic approach to designing a discard mitigation strategy is proposed.

2. Material and methods

2.1. Mitigation methods

During an expert workshop held in Reykjavik, Iceland in May, 29–31, 2012, twelve mitigation methods were identified and classified into five categories. The suggested mitigation methods along with their description and classification are listed in Table 1:

- Total allowable catch (TAC) and quotas: controls how much is allowed to be caught (catch quotas), or landed (landings quotas).
- Fishing effort and capacity: limits the amount of fishing activity, such as the size of the fleet, amount of time spent fishing or amount of gear deployed.
- Technical: a range of regulations that define how, where and when fishing occurs, as opposed to (a) and (b) which affect the quantities of fish and fishing.
- Social: methods and initiatives that affect the relationships between and perceptions of stakeholders, in particular fishers.
- Market: actions and initiatives that modify the way fish are sold along the supply chain, from the vessel to the end user.

2.2. SWOT analysis

The SWOT analysis was also carried out during this workshop. Thirteen experts participated with expertise in European fisheries science, and together covered a comprehensive view of discards, both across EU regions (from the Mediterranean to the North

Table 1
A list of the mitigation methods with description and a classification.

No.	Mitigation measure	Description	Category
1	Multi-species catch quota	Limiting the catch of a mixed species group, as opposed to single species quotas.	TAC and quotas
2	Catch quotas, not landing quotas	Limiting catches instead of landings.	TAC and quotas
3	Fishing effort and capacity	Introducing or modifying limits to fishing effort and/or fleet capacity.	Fishing effort and capacity
4	Temporary/spatial restrictions	Restricting particular/all fishing activities in a certain area and/or for a defined time.	Technical
5	Selective practices	Prescribing types of gear and devices, or other practices better suited to avoid unwanted catch whilst maintaining commercial catch rates. Selectivity can be based on fish size, shape, species and/or behaviour.	Technical
6	Change of Minimum landing size (MLS)	Introducing or modifying MLS, the minimum size at which a fish can be landed.	Technical
7	Catch composition	Changing the proportion of non-target marketable catches allowed to be retained.	Technical
8	Discard ban	Requiring to land all catches of defined categories.	Technical
9	Transferability of quotas	Introducing or modifying the rules of lease, acquisition or swap of quota for specific species.	Technical
10	Co-management	Directly involving stakeholders in research, development and implementation of discard mitigation methods. May occur at different levels, i.e. stakeholders as consultants, partners, delegation or leaders.	Social
11	Society awareness of discard issues	Changing the awareness of stakeholders regarding discarding and discard related issues – may include e.g. education.	Social
12	Improving existing and/or finding new markets	Improving existing markets and finding new markets for species which are not currently utilised; this may include products for human consumption, fish meal, pharmaceuticals and other industries.	Market

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