

Cost-Effectiveness of Bycatch and Environmental Damage Reduction Methods

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Demersal Trawl Fisheries

- Most valuable and important fishery in Europe.
- >20,000 vessels annually land 2.2 million tonnes of fish and shellfish worth €4 billion. Direct employment generates almost 60,000 jobs. However, concerns over the associated;
- Externalities → Discards
→ Environmental Damage



Economic Perspective

- Externalities » inefficiency.
- Represents a market failure.
- Potential solutions tend to have certain economic impacts.

Research

- The varying economic implications of using technical measures to reduce bycatch/environmental damage in demersal fisheries will be assessed.
- Retrospective and prospective studies will be undertaken.

Overview

Discards and damage to the Environment

Discards

- Several reasons; (1) lack of market, (2) high-grading, (3) minimum landing size, (4) quota restrictions. Is estimated 800-950,000 tonnes fish and shellfish annually discarded into North Sea (approx. 1/3 weight of total landings). Associated mortality estimated at over 80% for discarded North Sea finfish.

Environmental Damage

- Demersal trawl gear can significantly degrade the benthic habitat and biota it supports. Destruction and disturbance can lead to ecosystems dominated by (often low value) disturbance-tolerant opportunistic species.

Possible Solutions

- These include; (1) Use low value fish more productively, (2) adjusting legislation (e.g. bycatch quotas), (3) better management of effort, (4) area closures, (5) ban discarding. This study will focus on the use of more selective/less destructive gear (technical measures) where the aim is to reduce the amount of non-target species brought aboard and/or damage to the environment.

Economic Perspective

- It is **economically inefficient**, there is a loss of potential future value when juveniles of target and non-target commercially important species are killed¹. This value may be lost by the fishery in question or, another, associated fishery. Additionally over quota species, loss of habitat and potential prod. are a cost to society.
- It is a **market failure**, as these externalities do not affect the cost of production there is no economic incentive to reduce bycatch or environmental damage and are subsequently not self correcting.
- Technical measures used to mitigate these externalities can result in reduced efficiency lowering fisher productivity (by effectively internalising the externalities), hence voluntary adoption tends to be very low.
- A relatively limited number of studies have formally assessed the economic impact of technical measures with most only accounting for the additional cost of reduced catch rate, fewer still consider any potential benefits to others. None, to the best of our knowledge, consider the economic value of reduced habitat damage in fisheries.

¹e.g. annual value of finfish lost through discarding in the European brown shrimp fishery is estimated at €24.9 million.

Research

Retrospective case-study

- In an attempt to reduce bycatch of juvenile fish species the mandatory use of veil nets was imposed on English and Welsh brown shrimp beam trawlers (shrimp fishing nets order 2002 No. 2870), effective from Jan 1st 2003.
- Pre and post measure cost and earnings data (1999/00 to 2005/06 inclusive), relating to the English fishery, will be combined with stock, landings and value data. Models will be developed to;
 - Assess changes in profitability of the Crangon fleet, separating out unit costs of inputs, prices, stock level and other exogenous changes.
 - Calculate potential gains to beam fleets from finfish growth, accounting for biological factors.
- Test hypothesis: 'There will be a net gain to North Sea fisheries as a whole' (assuming effort remains constant).



a. Undersize shrimp
b & c. Marketable shrimp with fish bycatch
d. Landings



Prospective study

This work relates to the EU project; Development of Fishing Gears with Reduced Effects on the Environment (DEGREE).

Feasibility of modified Gears

- Data from sea trials, gear specification and cost and earnings from similar vessels in same fisheries will be used to assess the profitability of a fisher adopting the proposed gears.

Cost-effectiveness

- Compares costs of achieving different outcomes, assumes non-market benefits of reduced environmental damage outweigh costs.
- Derive weighted cost-effectiveness scores for each gear accounting for the reductions in environmental impact each may achieve.
- Maximum abatement cost e.g. cost of no fishing.

Environmental Efficiency

- The use of Data Envelopment Analysis (DEA) will allow multiple outcomes to be considered making across gear comparisons possible. It defines weights internally and will provide a single measure of eco-efficiency ranking the proposed gears.
- Despite having been applied in other areas of environmental economics it will be the first application of this methodology in this context.

Progress to date

Crangon fishery (Retrospective study)

- The English *Crangon* fleet has been identified and defined²;
 - Currently an estimated 47 full time and 2 part time vessels cite shrimping as their main activity, combined these employ approximately 102 (full time equivalent) fishermen.
 - 70% fleet over 10m (largest 17.8m).
- A cost and earnings survey has been developed and willing participants are currently being sought.
- Landings and value data for the period under consideration has been requested from DEFRA³. Data coverage is anticipated to be good due to the high proportion of >10m vessels.

Prospective Study

- Data requirements for the profitability study have been finalised and forms for the collection of this data have been disseminated to the relevant project partners.

²fleet data obtained from the Eastern Sea Fisheries Joint Committee (ESFJC).

³Department for the Environment, Food and Rural Affairs.

Intended Outcomes and Outputs

- Review of the use of cost effectiveness analysis and environmental efficiency measures in environmental management.

Retrospective Study (*Crangon*)

- Identify and quantify any change in the *Crangon* fisheries economic performance resulting specifically from the technical measure.
- Estimation of any potential gains to associated fisheries resulting from the technical measure.

Prospective Study (DEGREE)

- Determine financial profitability of an individual adopting gears developed in the project.
- Identify the most cost-effective/efficient way of obtaining a reduction in environmental damage.

Dissemination of findings

- Paper considering the effect of mandatory measures on the UK *Crangon* fisheries.
- Two further papers, one looking at measuring the cost-effectiveness and eco-efficiency of proposed gears, respectively.
- Interim reports and final project publications relating to the DEGREE and *Crangon* projects will be made available to the relevant sectors of the fishing industry.

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