A close-up photograph of a fishing net with several bright orange floats. The net is made of a fine, light blue mesh and is set against a dark, deep blue background. The floats are arranged in a line, and the net appears to be floating on water, with some white foam visible. The overall scene is serene and focused on the details of the fishing gear.

Implementation of more selective and sustainable fisheries (IMPSEL)

Is it possible to introduce more selective and sustainable fisheries in Danish fisheries? To answer this question, a number of experts from various professions have teamed up in a large cross-disciplinary research project called IMPSEL financed by The Danish Ministry of Food, Agriculture and Fisheries.

This folder briefly describes the project and presents the conclusions of the study.

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Photos: Line Reeh, DIFRES

Why IMPSEL?

One of the goals of fisheries management is to ensure the sustainability of fish stocks by promoting more sustainable and selective ways of fishing and gear which are better at separating unintended catches.

In 2005, a multi-disciplinary project group (IMPSEL) consisting of biologists, economists, social scientists, fishermen and green interest organisations was set up in order to illustrate the consequences of such management measures and give recommendations. The project group chose to focus on two Danish fisheries which have cod as a part of their catch composition: mixed consumption trawl fishery in the North Sea as well as the mixed consume trawl fishery for Nephrops in the Kattegat/Skagerrak. On the basis of international and Danish experiences it was possible to identify some potential management measures to regulate the fisheries with purpose of increasing selectivity and sustainability.

This folder gives a brief description of the IMPSEL Project (IMpLementation of SElective and sustainable fisheries) and presents the main points from the study.

One of the conclusions from the project is that an increase of mesh size (from 90 mm to 100 mm or to 120 mm) in the Nephrops fishery looks promising, both from a biological and a socio-

economic perspective. Increased mesh-size will reduce discards and give a limited financial loss which, however, within a three-year period will be offset by increased fish stocks and, thus, increased catches and income. However, these results should be backed up with new fishing trials before introduction of new mesh-sizes can be recommended.

Another conclusion is that it is easier to gain support from fishermen to use more selective gear, if there are positive incentives associated with using this gear, for example in the form of extra fishing days when using larger mesh-sizes. However, there is an upper limit for how selective the gear/methods can be, if fishermen are still to accept this. The introduction of a sorting grid in the Kattegat/ Skagerak Nephrops fishery is one example of fishermen not selecting this gear, even though they are allowed unlimited fishing days when using the gear. Consequently, a decisive criterion for the success of regulation of fisheries is that fishermen are able to sustain a healthy financial performance.

Furthermore, IMPSEL is one of the first studies of the Danish "FKA system" (vessel quota shares which are individual by vessel and transferable) and its consequences. The project suggests the relevant problems to be further clarified in order to finally assess how the FKA system will influence selection and more sustainability in fisheries.

Implementation of selective and sustainable fisheries – is it possible?

What are sustainable or selective fisheries?

Denmark has many different types of fishery both in relation to fish stocks being exploited and fishing methods and gear. Large and small trawlers, gillnet vessels, exclusive sandeel fisheries and mixed cod fisheries, Nephrops (or Norway lobster) fisheries and flatfish fisheries are characteristic for Danish fisheries.

Fishing methods and fishing sites change throughout the year, adjusted to fish migration and their habitat in the sea as well as market conditions, the price of fish and changing commercial opportunities.

Regulations are adjusted to the complexity of the fisheries and must consider both profitable earnings for fishermen and a sustainable exploitation of the fish resources as well as protection of marine nature.

In spite of the many interests, there is, however general agreement that one important objective of fisheries management is to ensure the sustainability of fish stocks through more selective and sustainable fisheries. In doing so, the diversity of fish stocks and fisheries are secured to the benefit of society as a whole.

There is also agreement that extensive discards of fish are not compatible with selective or sustainable fisheries. Therefore, many regulatory initiatives concern how to minimise discards of fish either by separating the by-catches in the water or limiting fisheries to certain periods or areas.

It is not easy to point at specific regulatory initiatives or gear which can lead to more selective and

sustainable fisheries. Fishing gear which results in a good selection and is sustainable in one type of fishery may have a totally different impact in other types of fishery or in other seasons. What is sustainable for one species in a mixed fishery is not necessary sustainable for another species in the fishery. Furthermore, the gear being used to implement higher selection and sustainable fishery may result in so significant financial losses, or be so difficult to use, that it will never work in practice. One example of this is the introduction of sorting grids in the Danish trawl fishery for Nephrops in Skagerrak-Kattegat. Hardly any Danish fishermen have chosen to use the sorting grid, despite being allowed unlimited fishing days for using this gear. The reason for this is that the selection is so efficient that the financial losses become unacceptable high for the fisherman.

Cross-disciplinary approach: a necessary challenge

An important first step when discussing the implementation of "more selective and sustainable fisheries" is therefore to develop a clear and functional definition of the concepts, so the various management measures can be assessed.

In order to discuss all aspects of this approach, the project group behind IMPSEL included biologists, economists, social scientists, fishermen and interest organisations; all with different approaches and expectations to what more selective and sustainable fisheries mean.



International experience – has it been possible outside Denmark?

Closed areas, larger mesh sizes, selective panels, fish pots or nets?

As part of the project, the project group first mapped and analysed international experience with the introduction of more selective and sustainable fisheries. The purpose was to gather inspiration and more knowledge about the challenges associated with the use of similar management measures to increase sustainability and selectivity in Danish fisheries.

Evaluation of international experience showed a number of initiatives which had been introduced in commercial fisheries: closed areas, selective panels in nets and trawls, increased mesh sizes, minimum size limit of the fish landed (minimum landing size), as well as requirements for the use of passive fishing gear such as nets and fish pots. Furthermore, in some fisheries discards of fish have been prohibited and fishery has been controlled through regulation (e.g. number of fishing days or the size of vessels).

The analysis of international experience and studies showed that:

- Only few studies have examined the combined biological, financial and practical conditions as well as enforceability and fishermen's acceptance of the regulation in relation to one specific fishery regulation (or a combination of specific regulations).
- No studies have been completed yet which unambiguously show whether management measures, such as closed areas, in the long run will lead to increased catches of fish outside

the closed area, or whether reallocation of the fisheries outside the area has the same effect on the stock as fisheries inside the area.

- The more species and fishing methods included in fisheries and the more regulations linked to fisheries, the more difficult it will be to identify the actual effects of new (or changed) regulation efforts.
- An important criterion for success is that fishermen continue to be profitable, and that the rules are not too difficult and complicated to comply with and supervise.

What are

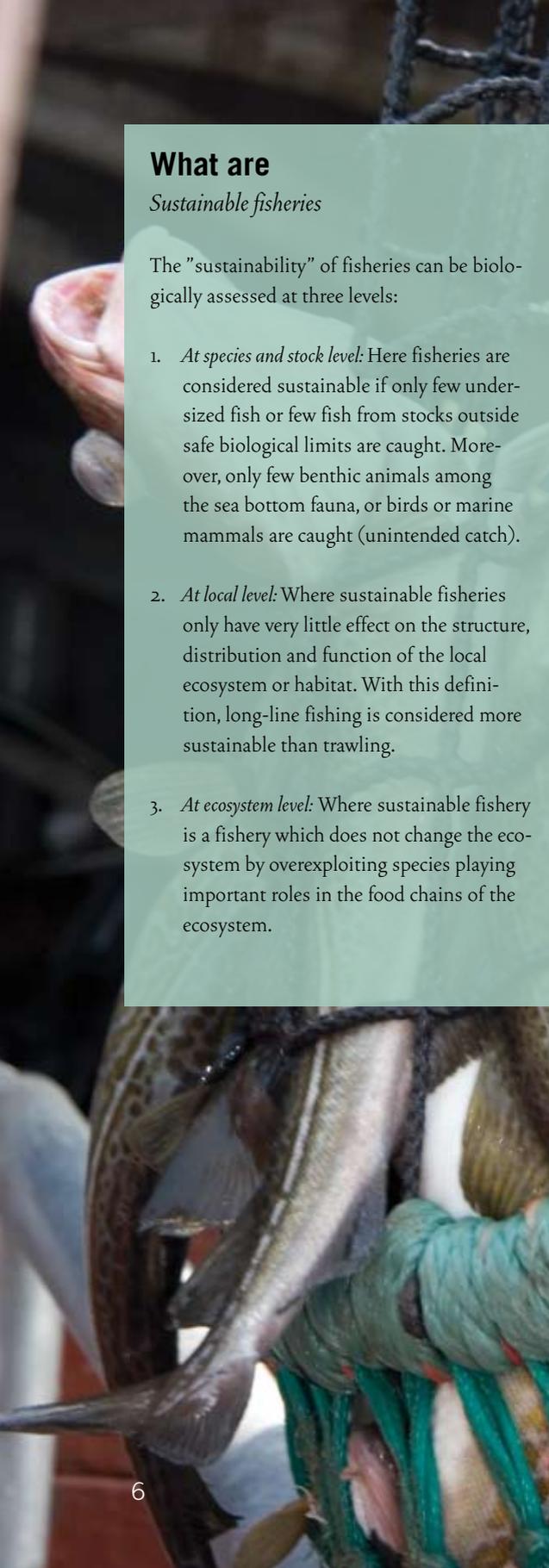
selective fisheries/gear?

The selection indicates the share of fish retained in the gear (when fishing). The selection can be roughly divided into three types: 1) Selection of fish that come into contact with the fishing gear, 2) Selection of fish scared by the gear, and 3) Selection as a result of the fishermen's choice of fishing ground and fishing period. Selective gear or a selective way of fishing may be described as a practise retaining the intended catch and separating or avoiding the unintended catch.

Knowledge about the various selection processes used to design the fishing gear providing the optimal and most sustainable exploitation of the resources is necessary in relation to the objective of the management.

Photos: Jens Astrup and Line Reeh, DIFRES





What are

Sustainable fisheries

The "sustainability" of fisheries can be biologically assessed at three levels:

1. *At species and stock level:* Here fisheries are considered sustainable if only few under-sized fish or few fish from stocks outside safe biological limits are caught. Moreover, only few benthic animals among the sea bottom fauna, or birds or marine mammals are caught (unintended catch).
2. *At local level:* Where sustainable fisheries only have very little effect on the structure, distribution and function of the local ecosystem or habitat. With this definition, long-line fishing is considered more sustainable than trawling.
3. *At ecosystem level:* Where sustainable fishery is a fishery which does not change the ecosystem by overexploiting species playing important roles in the food chains of the ecosystem.

Danish experience

Mixed fisheries with trawling in the North Sea and the mixed Nephrops fisheries in the Kattegat and the Skagerrak.

An important objective of the IMPSEL project was to examine through the multi-disciplinary approach, whether it was possible to give specific proposals on where and how to introduce more selective and sustainable fisheries in Denmark.

To answer this question, the group chose to focus on two specific fisheries:

1. Mixed trawl fishery for benthic (demersal) fish for consumption in the North Sea.
2. Mixed Nephrops trawl fishery in the Kattegat and the Skagerrak.

The two fisheries are financially important for the sector and both fisheries are characterised by being mixed fisheries with several catch species, including cod. Mixed fishery with mixed catches implies that traditionally significant discard of unintended catches also takes place.

The two fisheries selected were therefore obvious case studies for testing whether it is possible to introduce more selective and sustainable fisheries which can contribute to the recovery of cod stocks while ensuring financially sustainable fisheries for other species.

What are

discards?

Below sea level various species and sizes of fish and marine mammals swim around one another. Therefore, a typical catch will often contain both intended species/sizes as well as unintended by-catches of fish, bivalves (shellfish), etc. Often by-catches consist of species and size groups which cannot or may not be landed; either because they are endangered species, species from an expired quota, fish or shellfish below the minimum landing size or species which do not have commercial value (or relatively low value).

This part of the catch is thrown into the water again – and is called discard. Large amounts of discards are not considered to be sustainable exploitation of marine resources.

More selective and sustainable fisheries - what will it mean for the fish stocks, fishermen, society and fisheries management?

In the two fisheries selected, it was decided to analyse how a number of management measures influence the biological, financial, and practical conditions as well as management-related conditions. The management measures set up were composed on the basis of an assessment of the relevance of these measures for Danish fisheries as well as the availability of data for conducting an assessment.

For the mixed *Nephrops fishery in the Kattegat/Skagerrak* it was decided to analyse the effect of

various technical changes and solutions related to fishing gear. One of the main problems in this fishery is the considerable discard of under-sized fish and *Nephrops*. The assumption was that a change in the selectivity of the gear would minimise the discard as the small individuals would be sorted away in the trawl.

For the mixed *trawl fishery in the North Sea* it was decided to analyse the effect of a change in the quota system, the Danish “FKA system” (vessel quota shares) introduced in 2007. The assumption was that the highest discards are due to the previous regulation with rations (fractions of total quotas), where the problem often was that the catch composition not necessarily matched the rations of the different species, which could lead to a good deal of discards.



Photo: Lime Reeh, DIFRES

What are

FKAs – quota shares for vessels?

FKA is a new method of regulating Danish fisheries. FKA was introduced in 2007 and entails that the fish quotas are distributed to each individual vessel (or fisherman) as his property. The concept is shares of quotas for vessels (FKA), as each vessel is allocated a share of the total quota corresponding to the historical catch of the vessel. These shares of quotas for vessels may be traded between the fishermen; this being an innovation in the Danish human consumption fisheries.

Is it possible to implement more selective and sustainable fisheries?

Analyses and conclusions in relation to the chosen scenarios for more selective and sustainable fisheries in the Kattegat/Skagerrak and the North Sea

Mixed Nephrops fisheries in the Kattegat/Skagerrak

On the basis on the analysis of three gear technical solutions, the project group concluded that introduction of 100 mm or 120 mm mesh-sizes in the trawl gear used in the mixed, demersal trawl fishery in the Kattegat/Skagerrak is promising from a biological and socio-economic perspective. The enlarged mesh-sizes result in reduced discards and a limited financial loss which, however, within a three-year period will be offset by increased stocks and resulting increased catches and income.

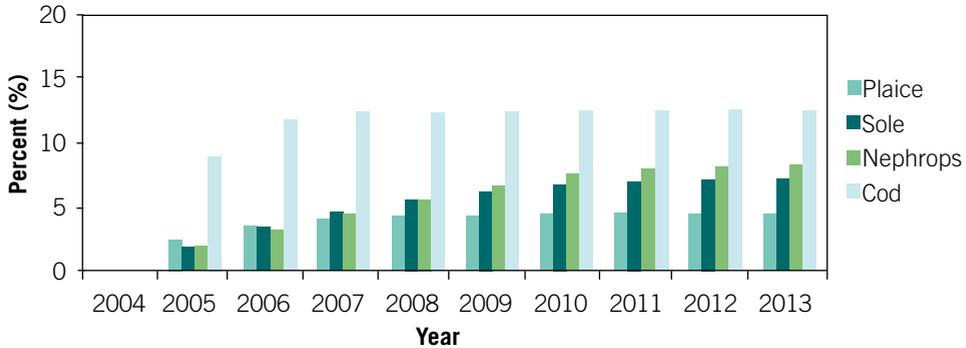
The evaluation of 100 mm (and 120 mm) mesh sizes are based on theoretically determined gear selection parameters. Consequently, the project group recommends supplementing with practical studies of the selection of gear in fishing trials in the relevant fisheries, if the introduction of the new mesh sizes is considered desirable in Danish fisheries.

The evaluation of 90 mm mesh sizes with a 120 mm panel (in the cod-end) shows that the existing introduction of this gear in Danish fisheries has been positive due to incentives in the form of donation of extra fishing days for those using this gear. Higher incentives in the form of increased effort seem to facilitate the introduction of more selective gears and sustainable fisheries as long as the fisheries can remain profitable.

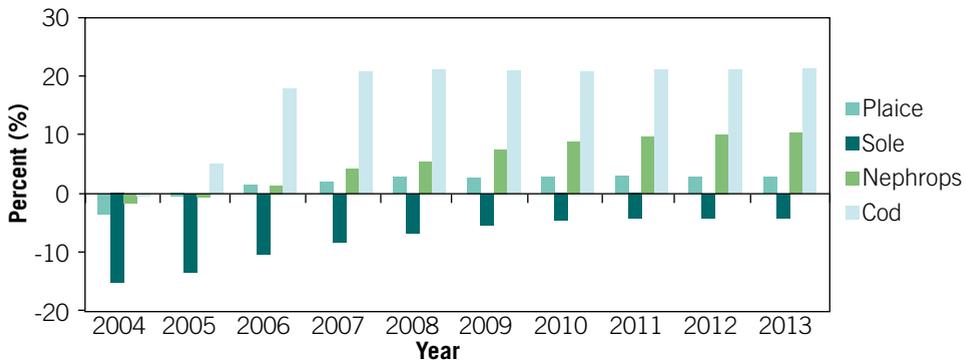


Effects of changed mesh-sizes in trawl gear used for Nephrops fisheries in the Kattegat/Skagerrak

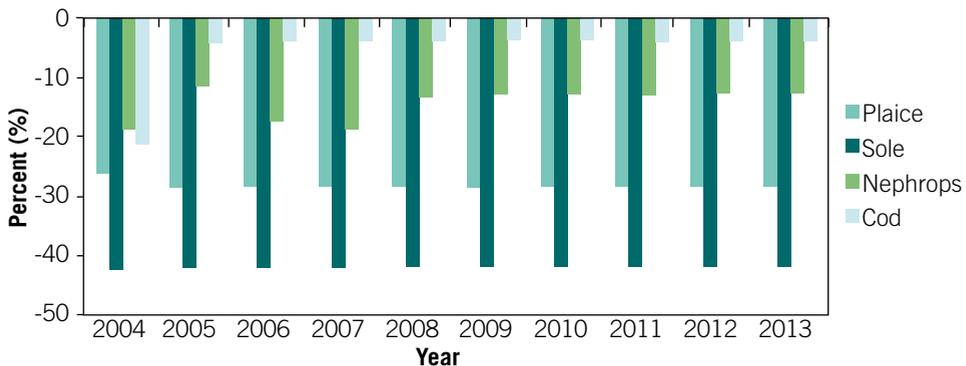
Change in biomass by using 100 mm instead of 90 mm



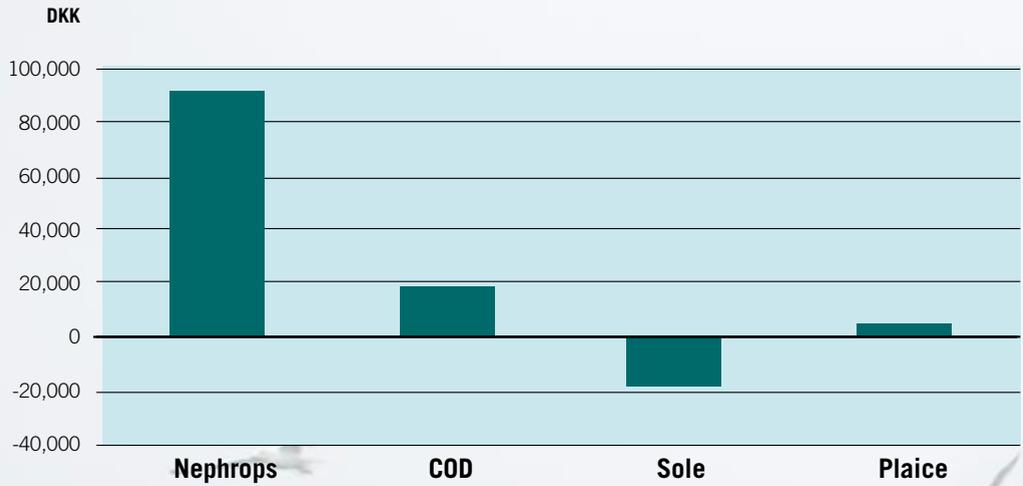
Change in landings by using 100 mm instead of 90 mm



Change in discards by using 100 mm instead of 90 mm



Present value of profit/loss over a 10 year period (DKK '000) at 100 mm vs 90 mm



Changed net profit (DKK '000) at 100 mm i vs 90 mm



Mixed fisheries with trawling in the North Sea

IMPSEL is the first thorough study of the Danish FKA system with respect to discards of fish (above the minimum landing size limit). The analysis indicates that fisheries management in connection with FKA gives incentives to reduce discards compared with the traditional regulation with rations.

However, the effect depends, in particular, on the vessel share prices traded and the fish landed, but also on the degree to which there are differences in the fishery patterns and efficiency for the vessels exchanging quotas. Therefore, it seems necessary to obtain more information on the dynamics of quota prices and changes in the fishing fleets' fishery efficiency.

The FKA system was introduced in 2007, and the sector has already developed institutions facilitating the exchange of quotas. Therefore, it is expected that the possibilities for reducing discards through quota trading are unfolding, however, it will still be necessary to regularly monitor the FKA system in regard to promoting the incentives leading to less discards.

Read more:

The premise, analyses and results of the project are described in three reports. All reports are available (in Danish) at www.dfu.dtu.dk under "Publikationer" (Publications).

Photo: Line Reeh, DIFRES

IMPSEL:

Participants in the project are:
Svend Erik Andersen and Carsten Krog
from the Danish Fishermen's
Association

J. Rasmus Nielsen, Ole A. Jørgensen
and Holger Hovgård from the Danish
Institute for Fisheries Research at the
Technical University of Denmark
Hans Frost, Ayoe Hoff and
Jan-Tjeerd Boom from the Danish
Research Institute of Food Economics
(FØI) at the University of Copenhagen
Søren Eliassen and

Sten Sverdrup-Jensen, Innovative
Fisheries Management, AAU
Lone Grønbæk Kronbak and
Niels Vestergaard from the University
of Southern Denmark
Christoph Mathiesen and
Espen Nordberg from the WWF
(project managers)

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Further information:

Project manager Christoph Mathiesen,
WWF. Telephone +45 3536 3635 and
email c.mathiesen@wwf.dk

