

Stakeholder Preferences for Management of the Danish Protein Fisheries in the North Sea

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Abstract.

Management of the Danish protein fisheries in the North Sea has during recent years become increasingly politicised, as various stakeholder groups are seeking influence on the decision-making process. In relation to management of the sand eel and Norway pout fisheries, two different issues are debated. In the sand eel fishery, which is the most important fishery (value and volume), particularly British environmental organizations are accusing Danish fishers of removing the food base for important sea bird populations and commercial fish stocks, and thus the conflict of interest is primarily between fishers and environmental groups. The Norway pout fishery is a classic example of a within fisheries conflict (national or international). There is a clash of interest between fishers targeting Norway pout and fishers targeting species for human consumption, because there is a large by-catch of primarily (haddock and whiting) in this fishery. In this paper the Analytical Hierarchy Process (AHP) is applied to evaluate stakeholder preference towards the management of the two protein fisheries (sand eel and Norway pout). The research is based on interviews and a questionnaire survey with 12 different stakeholders in Denmark and the UK. The stakeholders represent industry organizations, management authorities, government fisheries research institutions and environmental organizations. Comparisons are made between different stakeholder preferences and the conflicts of interest are analysed. The results from the AHP analysis have been supplemented with qualitative information in order to present a more in-depth picture of the arguments presented by the various stakeholders, which are tunnelled into the decision-making process regarding the management of the sand eel and Norway pout fisheries in the North Sea.

Keywords: Fisheries Management, Stakeholder preferences, Protein fishery, Decision-making, Closed areas, No-take zones.

1. INTRODUCTION

The Danish protein fishery is mainly targeting two species¹: sand eel and Norway pout composing 70% of the total Danish catches in the North Sea (Fisheries Directorate, 2000). The fishery employ approximately 150 vessels > 24 m giving jobs to 500 fishers and 500 workers (Guldberg and Top, 2000) in four fish meal plants located in Esbjerg, Thyborøn, Hanstholm and Skagen. The latter 3 fishing communities are highly dependent on the protein fishery for employment and economic development².

Management of the Danish protein fishery is based on Total Allowable Catches (TAC's), where Denmark is the only EU member state having a considerable protein fishery, and the Danish share of the EU TAC is for sand eel in the North Sea 94.3%³ and Norway pout 99.9%⁴. In practice TAC have not restricted Danish fishers, because their catches seldom exceed the TAC's (pers. comm. Palisgaard, 2000), whereas closed areas as a management instrument have been a major constraint for the Danish protein fishers. The Norway pout box was introduced in 1986 covering 95,000 km² and the sand eel box was introduced in 2000 covering 18,000 km² (see figure 1).

These two boxes exclude Danish protein fishers from a considerable proportion of the North Sea.

The aim of the Norway pout box is to reduce levels of fishing mortality on juvenile haddock and whiting, and

¹ Other protein species are sprat, blue whiting and horse mackerel.

² Esbjerg has a more complex business structure.

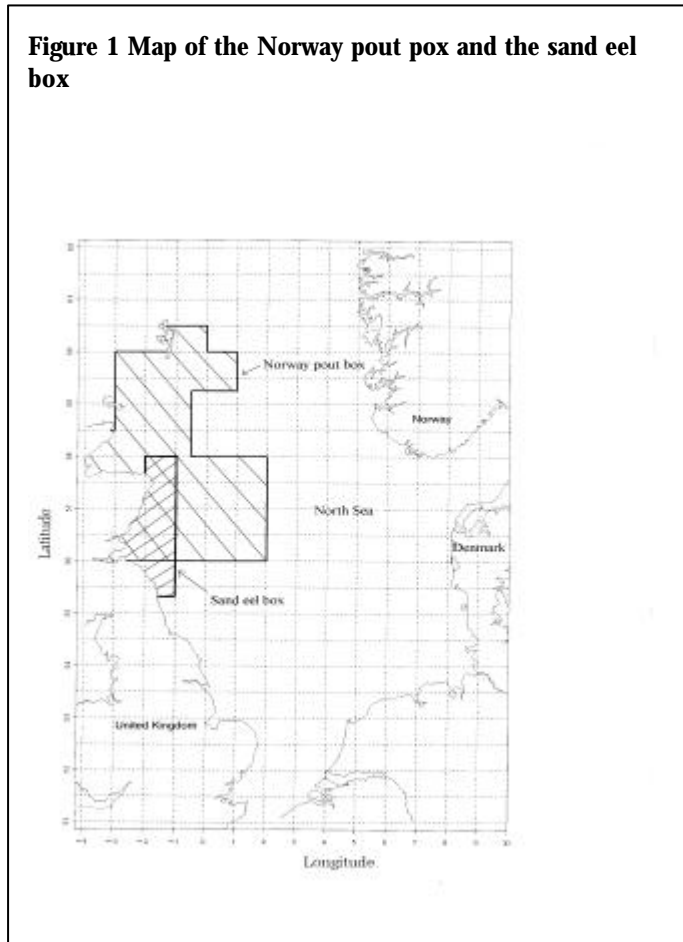
³ The sand eel TAC in the North Sea is shared between EU and Norway and has during the last 5 years been around 1 million tons of which 95-97% has been allocated to EU (ICES, 2001b).

⁴ The Norway pout TAC in the North Sea is shared between EU and Norway and has during the last 5 years been around 200,000 tons of which 80-90% has be allocated to EU (ICES, 2001a).

hence increase the potential availabilities of these species for the human consumption fisheries.

The aim of the sand eel box is to reduce levels of fishing mortality on sand eel in order to increase the availability of sand eel as food base for bird populations on the East coast of UK.

Figure 1 Map of the Norway pout pox and the sand eel box



By-catch regulations and mesh size restrictions are also used to manage the protein fishery. The sand eel fishery is generally undertaken with very limited by-catches. In the Norway pout fishery in shallow waters by-catches of haddock and whiting are frequent, whereas in deeper waters blue whiting quite often becomes part of the catch. In this case the problem is that blue whiting is considered a by-catch species, although it is also used for processing protein. By-catches of haddock and whiting are not a problem in the deeper waters. But according to ICES (2001a): *“In managing this fishery, by-catches of other species, particularly haddock and whiting should be taken into account. Existing measures to protect other species should be maintained”*.

The Common Fisheries Policy (CFP) in EU is highly politicised, where member states are arguing over fishing rights, quotas and fishing capacity. The primary interests for member states have been to protect their national fishing industry along with other national interests. When the CFP was implemented in 1983 it was primarily a concern of fishers, fish processors and national fisheries authorities. Overfishing and subsequently declining fish stocks and the impact from fishing on sea birds, marine mammals and the benthos have during the past decade made other

stakeholders and in particular environment and consumer groups interested in fisheries management in EU and elsewhere around the world. Fisheries management in EU is a highly technocratic exercise and is dominated by scientific advice. In reality this has decoupled most “non-scientists” including fishers who often have considerable knowledge of the marine ecosystem from the decision-making process. Fishers are formally involved in the decision-making process in EU, whereas other stakeholders have more limited access. However, by participating in the fisheries debate all stakeholders try to influence the decision-making process. In particular environment groups have been quite successful in voicing the public interest concerning fisheries issues and consequently influencing politicians and officials. Thus, the decision-making process has been further complicated, and the politicians need to balance the various and often confronting stakeholder interests.

In relation to management of the Danish protein fisheries different stakeholder groups pursue different objectives. The Danish fishing and fish processing industry and local fishing communities have an economic stake in the fisheries and are thus focused on economic issues. In contrast bird conservationists like the Royal Society of Protection of the Birds (RSPB) and environmental organizations like WWF and Greenpeace are representing the society at large and are concerned about environmental issues. In addition, and most likely because Denmark is the only EU member state with a substantial protein fishery, the protein fishery has been used as target by other member states in order to move focus away from problems in their fisheries⁵. The

⁵ A recent example is that the Spanish minister of fisheries in the debate on the reform of the CFP proposed by the European Commission is accusing the Danish protein fisheries of being unsustainable, all knowing that the hidden agenda is to get focus away from a huge reduction of the capacity of the Spanish fleet and for Spain to get access to the North Sea. The Spanish have for many years had the image in the Northern European countries of being the bad boys and would like to transfer this to the Danes. We can give many more examples on how British and Dutch arguments are examples hereof, but will refrain from doing so, as we might be considered biased due to our nationality. We also acknowledge that Danes in debates on other fisheries are using similar

viewpoints carried forward by national governments in relation to the management of the protein fishery are often used to pursue broader interests within the CFP and advocate for national interests more than they objectively address management issues. UK stakeholders argue that declining whiting, haddock and cod catches are caused by by-catches of these species in the Norway pout fishery. However, UK fishers have a considerable discard⁶ of whiting and haddock (ICES, 2001); (Krog, 1993). In contrast, the Danish stakeholders argue that the EU Commission should be more active in the reduction of discards in EU fisheries in general (MFAF, 2001). Each member state will try to direct the political focus towards issues having less impact on their own national fisheries.

1.1 The Sand eel Fishery

The total annual Danish catches of sand eel in the North Sea range from 500,000-900,000 tons. Still the fishery is within safe biological limits (ICES, 2001b1b). ICES recommends that the fishing mortality of sand eel should not be allowed to increase as the biological consequences of removing a larger fraction of the food-biomass is unknown (ICES, 2001b). The sand eel fishery has one of the lowest by-catch levels in EU fisheries. Nevertheless, the Royal Society for Protection of the Birds (RSPB), World Wide Fund for Nature (WWF), Greenpeace and UK fishers question the sustainability of the sand eel fishery and strongly promote a geographic and nominal reduction of this fishery in order to protect seabird populations, marine mammals and commercial fish stocks. Political campaigns and professional lobbying by these organizations have had a major influence on the decision resulting in a ban on sand eel fishing at “Wee Bankie” and hereby introducing a sand eel box closing the area for three years (2000-2002). As an act to keep the area “politically open” the Danes (fishing and processing industries together with government) argue that experimental fishing must be carried out in order to determine the effects of the ban. The experiments should be monitored in collaboration between British and Danish research institutes. Environmental groups are advocating for a permanent sand eel box, whereas the Danes consider the present box as a temporary closure of sand eel fishing in the area.

1.2 The Norway pout Fishery

The Norway pout fishery is accused for large by-catches of whiting and haddock. In the Norway pout box it is not allowed to use small mesh sizes which makes fishing for Norway pout impossible. Danish fishers consider the box as part of a political dispute on territorial fishing rights among member states and not as an instrument to protect juvenile fish. British fishers have surprisingly an opposite viewpoint. In spite of the implementation of the Norway pout box, by-catches are still at a high level in this fishery, and this continues to raise conflicts among particular British and Danish interests, because haddock and whiting are important species for British fishers. The conflict is not only on an international level, but also to some degree within Danish circles, as Danish fishers targeting species for human consumption have different interests than Danish protein fishers.

2. METHODOLOGY AND DATA

The Analytical Hierarchy Process (AHP), developed by Saaty (1990)⁷ has been applied. We have conducted interviews and undertaken a questionnaire survey among the most active stakeholders⁸ in both Denmark and the

strategies.

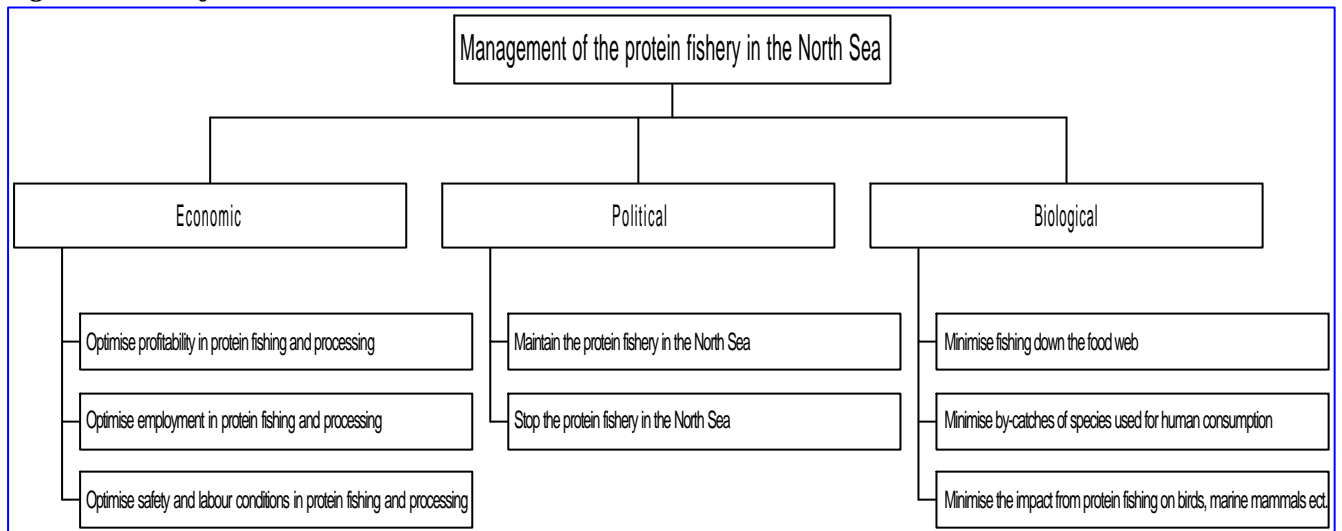
⁶ Around 24,000 tons of whiting are discarded annually, and mainly in human consumption fisheries, making the whiting by-catch of 5,000 tons in the protein fishery less significant (ICES 2001). However, the figures do not reflect the full biological impact of the by-catch as the by-catch of whiting in the protein fishery often consists of undersized fish and thus include many more individuals compared to the numbers which are discarded in the human-consumption fishery.

⁷ The Analytical Hierarchy Process (AHP) has been tried out in various contexts and disciplines to evaluate decision problems, which involve ranking of alternatives and objectives. The technique has been evaluated for its advantages and disadvantages in several contexts (e.g. Zahedi, 1986; Carlsson and Walden, 1995). However, the experience with AHP on fisheries management decisions is limited to a few recent studies (e.g. Leung *et al.*, 1998; Soma, 2001, Mardle *et al.*, 2001).

⁸ The twelve most active stakeholders dealing with economic, political, social and environmental aspects of the protein fishery have been selected for this study. Three Danish industry organizations: The Danish Fishermen's Association (DFA); The Association of Fish Meal and Fish Oil Manufacturers in Denmark (AFMD) and the General Workers Union in Denmark (GWUD). Two British fishers' associations: The National Federation of

UK⁹. The core of the AHP process is to define a hierarchy of objectives (objective tree) on the basis of the immediate preferences expressed by the respective stakeholders. All stakeholders have been closely involved in developing the “objective tree” which groups the objectives in three categories: economic, political and biological. The aim of the preferences elicitation process was to obtain the view of the stakeholder groups. Thus we have interviewed the persons representing the organizations in relation to policy issues. For most environment-oriented stakeholders only one or two persons are dealing with fisheries issues. Regarding Danish industry organizations (DFA and AFMD) interviews have been conducted with representatives at the national level and with chairmen in local fishing communities where protein fishing in the North Sea is economical important.

Figure 2 The objective tree



2.1 Pair wise comparisons and weightings

1st level of the objective tree is the management of the protein fishery in the North Sea. The 2nd level consists of three objectives: economic, political and biological. The 3rd level is sub-objectives of 2nd level objectives. The AHP process is a pair wise comparison of the objectives at the 3rd level. The number of sub-objectives in the comparison study is limited to 8 in order to restrict the overall number of pair wise comparisons to be made¹⁰. In the pair wise comparison the respondents are asked to evaluate the importance of one objective against another on a scale from 1-9 (e.g. profitability vs. minimising by-catches). The value "1" represents *indifferent importance*, and the higher the figure the more important, i.e. 3=moderately important, 5=particularly important, 7=very important, 9=extremely important. The values of 2, 4, 6, 8 are intermediate values. while e.g. the value "9" represent *extreme importance* of one objective against the other.

Fishermen's Organizations (NFFO) and the Scottish Fishermen's Federation (SFF). Four environmental organizations: The Royal Society for Protection of the Birds (RSPB); the World Wildlife Fund for Nature (WWF); Greenpeace and the Danish Society for the Conservation of Nature (DSCN). Three government bodies: The Ministry of Food, Agriculture and Fishery in Denmark (MFAF); the Danish Institute for Fisheries Research (DIFRES) and the Ministry of Agriculture, Fisheries and Food in the UK (MAFF). MAFF is representing the views of both government and research in the UK as the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) is not allowed to participate in a policy orientated survey.

⁹ A number of telephone interviews have been conducted with the SFF, but they never responded to the survey questionnaire.

¹⁰ Eight objectives in the 3rd level require 28 pair wise comparisons (28 questions). On average a respondent need almost a minute to answer a question, and 20-25 minutes is the maximum time one can expect a respondent to stay concentrated, which limited the number of objectives to eight.

Table 1 An example of a comparison of two objectives

Optimise profitability in protein fishing and processing	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Minimise by-catches of species used for human consumption
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3. STAKEHOLDER PREFERENCES

Table 2 Stakeholder preferences^{11, 12 and 13}

	DFA	AFMD	GWUD	RSPB	WWF	Green-Peace	DSCN	MFAF	DIFRES	MAFF	NFFO	Aggregate
Economic												
Optimise profit	0.268	0.294	0.092	0.026	0.031	0.025	0.023	0.070	0.050	0.020	0.021	0.076
Maximise employment	0.116	0.115	0.138	0.030	0.031	0.026	0.042	0.076	0.048	0.020	0.027	0.072
Optimise safety	0.189	0.165	0.317	0.079	0.031	0.026	0.076	0.058	0.052	0.043	0.027	0.084
Political												
Maintain the protein fishery	0.229	0.213	0.115	0.029	0.031	0.026	0.023	0.145	0.092	0.021	0.027	0.101
Stop the protein fishery	0.017	0.022	0.045	0.132	0.031	0.128	0.152	0.031	0.031	0.266	0.144	0.056
Biological												
Minimise fishing down the food web	0.032	0.033	0.120	0.158	0.281	0.301	0.251	0.095	0.162	0.168	0.192	0.142
Minimise by-catches	0.111	0.122	0.133	0.157	0.281	0.177	0.185	0.409	0.396	0.200	0.506	0.315
Minimise impact on birds, marine mammals etc.	0.038	0.036	0.040	0.389	0.281	0.290	0.247	0.115	0.169	0.262	0.057	0.154

The **1st level objective**: Management of the protein fishery in the North Sea, is the pivotal point of the survey and the pair wise comparisons.

The **2nd and 3rd level objectives** are generally in accordance with expectations. Environmental groups, government bodies and British fishers express strong preferences for biological objectives, whereas the Danish industry representatives express strong preferences for economic objectives. The aggregated preference structure is clearly for biological objectives and in particular for minimising by-catches (0.315), even the Danish industry representatives express relatively high preference for this sub-objective. Regarding the political objectives the preferences are somewhat mixed. All Danish stakeholders and WWF have low preferences for closing the protein fishery. In fact and not surprisingly to “maintain the protein fishery at its present level” is the second highest preference of DFA, AFMD and MFAF. In contrast MAFF has this as its top preference to stop the protein fishery (0.266). NFFO and the environment-oriented stakeholders except WWF also express a relatively high preference for closing the protein fishery. Nevertheless, this sub-objective has the lowest preference in the aggregated structure (0.056).

All the environmental groups express highest or second highest preference for minimising fishing down the food-web or minimising the impact of the protein fishery on birds, marine mammals etc. This is a very strong indication, that biodiversity issues are considered very important for these stakeholders.

Minimising by-catches in the protein fishery has top preference for MFAF, DIFRES and NFFO. As by-catches are low in the sand eel fishery these stakeholders indirectly turn their attention to the Norway pout fishery. However, by giving high preference to minimising fishing down the food web both NFFO and DIFRES express concern about the sand eel fishery as well.

¹¹ The stakeholders have been clustered based on profession and nationality. If more than one respondent has been interviewed within the same organization, the weighting presented here is an aggregation of the individual responses.

¹² The results have been subject to consistency analysis. They pass the Kendall’s consistency test (Kendall 1962), but minor inconsistencies appear using the Expert Choice test (Saaty, 1990), but all the tests are very close to the acceptable 0.1 level.

¹³ For easy comparison among stakeholders the top preferences are in bold and the second top are in bold italic.

DFA and AFMD are most concerned about profitability and maintaining the protein fishery at its present level. The two objectives are related, and both associations represent people having invested in the protein fishery or processing. It should, however, be noted, that the largest proportion of the members of DFA is not involved in the protein fishery.

It is necessary to be careful when interpreting the results of the aggregate preference figures. The figures are somewhat biased for several reasons. The aggregates present the sum of the number of involved stakeholders, and already from the outset 6 of the 11 stakeholders have negative attitudes towards the protein fishery. In addition all stakeholders are considered equally important. In order to provide a precise aggregation of preference among the stakeholders a power analysis need to be undertaken¹⁴. In this paper we are interested in exploring the future direction for management of the protein fisheries based on stakeholder preferences. In this respect it is indeed interesting to investigate if different clusters of stakeholder preferences can be identified.

3.1 Cluster analysis

In table 3 stakeholders have been clustered using an algorithm that groups together those stakeholders who have placed comparable importance on the surveyed objectives of management.¹⁵ The result of the 1st run of the cluster analysis clustered stakeholders with strong professional relations, except for MAFF, which was grouped together with environment-oriented stakeholders. It was also found that the opinion GWUD differed significantly from that the two other Danish industry organizations and become a separate cluster. The opinion of NFFO also differed from all others and become a separate cluster.

Table 3 Result of the 2nd run cluster analysis¹⁶

<p>Cluster 1 MAFF; RSPB; Greenpeace; DSCN; Cluster 1 coherence is 0.9808458</p> <p>Cluster 2 DIFRES; WWF; MFAF Cluster 2 coherence is 0.9573262</p> <p>Cluster 3 AFMD; DFA Cluster 3 coherence is 0.9988378</p> <p>Cluster 4 NFFO</p> <p>Cluster 5 GWUD</p>
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The results presented in table 3 shows that there are significant overlaps in opinion between the stakeholders surveyed. The result of the 2nd run of the cluster analysis grouped WWF together with the Danish government bodies MFAF and DIFRES, an interesting alliance.

The cluster analysis supports the fact that 3 major perspectives in the management of the protein fishery in the North Sea are put forward:

- 1) An environment-oriented perspective presented by cluster 1,
- 2) A balanced eco-fishery perspective presented by cluster 2 and

¹⁴ This has not been the scope of this study. Undertaking a power analysis might be extremely difficult and demanding, and the results would probably still be rather uncertain.

¹⁵ The algorithm used (see Zahir, 1999) derives from vector analysis, where the priority vectors (i.e. set of importance weights for objectives) obtained from stakeholders are compared to each other. The result of the dot product between two orthogonal vectors (i.e. vectors at "right angles") is zero, and between two vectors the same is one. Therefore, vectors can be aggregated based on the angle between them to form clusters. In this paper, tolerances of the angle (i.e. coherence value) of 0.95 and 0.96 were used in the two runs reported respectively.

¹⁶ Similar results have been found undertaking cluster analysis using the SPSS software, based on k-means cluster analysis.

3) An economic-oriented perspective presented by cluster 3

4. CHALLENGES AHEAD FOR MANAGEMENT OF THE PROTEIN FISHERY IN THE NORTH SEA

Based on the results of our study, we expect, that the Danish protein fishery in the North Sea will continue to be challenged by the non industrial catch sector (UK) and environment-driven stakeholders, who advocate for more restrictive regulations. The reform of the CFP (European Commission, 2002) also indicates a shift in management strategy from a fisheries approach towards an ecosystem-based approach. If the EU Council of Ministers approves this change in management it will support environment-oriented interests at the expense of economic-oriented interests and thus support development of a protein fishery with further restriction in the years to come.

Given an increased focus on ecosystem-based management one can expect, that the sand eel fishery, already within safe biological limits (ICES, 2001), will be further restricted as issues like fishing down the food web, impact on birds and marine mammals and benthos caused by the fishery will have increased attention. The Norway pout fishery will in addition to the above mentioned issues also have to pay attention to by-catch - beyond the existing measures (area closure and mesh-size regulations) which already reduces by-catches.

The stakeholder preference eliciting process (AHP) in this study clearly indicates, that biological issues are given high priority and management solutions considered appropriate by driven stakeholders need to be found. Hand in hand with the move towards ecosystem-based management, no take zones (boxes) are gaining support in the EU as a management measure. Since the CFP was introduced boxes have been used as a tool to control the protein fishery in the North Sea. Despite, that Danish fishers are reluctant to boxes, this management instrument appear as the most appropriate tool for balancing the interest of economic and environmental-oriented stakeholders and still maintain a Danish protein fishery. The environmental and non-industrial stakeholders generally accept, the existence of a protein fishery, as long as the biological impact is minimized. The challenge is then to find a compromise that will minimise the impact on the eco-system, and still make the fishery economic viable for the participating vessels and the processing plants ashore.

Based on our qualitative interviews it is clear that the economic-oriented and environmental-oriented stakeholders have conflicting viewpoints. Nevertheless most stakeholders express interests in finding pragmatic solutions. In regard to this, it's interesting that the cluster analysis of the survey results places an environmental organisation (WWF) with Danish government bodies. Such eco-fishery-oriented stakeholders can if they manage to form an alliance become important facilitators in establishing a dialogue among the more opponent stakeholders, but also as a single group become very influential in the decision-making process. A main purpose of a dialogue should be to agree on a common set of objectives for management of the protein fishery, and to develop a common scientific knowledge base for stock assessment and impact analysis. In supplement to the scientific knowledge some of the stakeholders have extensive local knowledge (biological, economical, cultural), which might be of relevance for the management of the protein fishery. Scientific knowledge and the political use of scientific data has become increasingly influential in the environmental debate in general and on fisheries management in particular. Increasing demands for scientific data and growing expenses on research puts weight on the argument that fisheries management and the stakeholders would gain from cooperating instead of seeking unique and costly research data. Recent initiatives to talk and cooperate between the catch sector and environmental groups in Denmark and the UK is perhaps the seed to a future development.

In terms of practical regulation, we foresee that boxes will remain as the key management tool. Several advantages are attached with this measure. Fishers have to some extent adapted to the existing boxes, boxes are easy to monitor and finally it meets the objective of the future CFP, to limit fishing effort. In case of the sand eel fishery the impact of the present box is to be evaluated in 2002/2003, and hopefully as part of this process a dialogue can be established among management bodies and stakeholders. Although most protein fishers would like the protein fisheries less regulated, Danish protein fishers have voluntarily suggested to implement temporary boxes or seasonal closings (2-4 weeks) as to protect juveniles in the Sand eel fishery.

However not suggested by the fishers, a similar strategy can be applied in the Norway pout fishery, The by-catch problem primarily occurs when fishing is undertaken in shallow waters, thus a temporary closures linked with water depths criteria could be considered as a measure to reduce by-catches of whiting or haddock without closing of larger areas as the Norway Pout Box. However, the practical set-up needs to be discussed in a co-management process with the stakeholders groups. The fore mentioned initiative on protecting juveniles stranded as a result of internal disagreements and the fact that the organisations involved did not manage to cooperate with management authorities on designing regulations and monitoring hereof.

From the study it is evident that the group of stakeholders on the one hand include interest groups (the Danish catch sector and processing industry) with high risk taking and large investments in fisheries, and on the other hand organisations who (e.g. environmental groups) may argue for a substantial reduction in the protein fisheries without facing any economic and political consequences. This presents a major constraint for setting up co-management arrangements including larger complex stakeholder groups (Raakjaer Nielsen, *et al.*, 2002). If stakeholders have no management responsibilities, strong incentives for opportunistic behaviour ("free riding") exists, in particular among radical environment-oriented stakeholders. However, most environmental groups of the study do show a pragmatic approach to fisheries management, but as any political player, they also see this survey (AHP) as a tube for expression of principal and strategic statements to the EU (DG-Fish).

Despite the bias' of the AHP approach, the method appears suitable for eliciting preferences among stakeholders sharing management responsibilities - like a management council. This was also the approach used by Leung *et al.* (1998) in a pioneering AHP-study on fisheries management (Hawaii). Nevertheless, we find the AHP to be a helpful tool in uncovering the essence of the existing conflicts in the protein fisheries, including similarities and differences in stakeholder view points. In a situation, where stakeholders do not have management responsibilities and where the issues are rather conflict-oriented it is our opinion, that the AHP need to be balanced with in-depth qualitative interviews. However, the combination of quantitative and qualitative methods has proven to be an efficient way to elicit stakeholder preferences for management objectives among complex stakeholder groups.

A future dialogue between stakeholders is both possible and necessary in order to reverse the historical disputes into a common agreement on management measures for the benefit of a broad set of interest groups (fishers, consumers, fish buyers, ornithologists, tourism, processing industries etc.). With the current political support for a more holistic approach, the dialogue between stakeholders should include discussions on how to apply the "new" concept of ecosystem-based management in general and for the protein fishery in particular - a debate which is perhaps just beginning in an EU context. Although often used in research and management contexts, the concept is still unclear and no specific implementation strategy exists (Degnbol, 2002) - which further complicates the decision-making process.

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