

Fisheries Co-Management: An alternative strategy in fisheries - cases from Denmark -

**An issue paper for the OECD study on the efficient
management of living marine resources**

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Abstract:

Sustainable and efficient use of fisheries resources is closely linked to the legitimacy of fisheries management schemes. Legitimacy depends on the content of the rules and the participation of user-groups in the decision-making process. The paper analyse the organisation of the fisheries management system, in particular the influence of user-participation in decision-making. Theories of common property resources and institutions are adapted to fisheries and a framework for the analysis of co-management institutions is developed. Two Danish case studies of user-participation are examined to analyse how co-management arrangements are functioning and how they impact on efficiency, equity and sustainability of fisheries resources exploitation.

Acknowledgements:

This paper is a result of research sponsored by The EU-Commission, DG XIV, project No. 94/32. However, it does not necessarily reflect the views of the Commission and in no way anticipates any future opinion of the Commission in this area, neither do the views presented in the paper necessarily reflect the opinion of the Danish government nor can the ideas presented be anticipated to be future Danish policy.

We gratefully acknowledge useful and constructive comments on earlier drafts made by Sevaly Sen, Sten Sverdrup-Jensen and Peter Friis.

Responsibility for accuracy of facts, interpretations and analysis lie with the authors.

1.0 Introduction

In many places throughout the world the fishing industry is in an economically perilous state. Management regimes have difficulties in protecting the resources from over-exploitation. International experience testifies that without support from the fishermen the chances for fisheries regulations to succeed are very poor because fishermen almost always find ways of by-passing regulations (Copes 1986).

It is a general characteristic for many countries that the national governments or supra-national institutions (the fisheries administration) have increased their role in fisheries management whilst local level control, through traditional management and custom, has correspondingly diminished. By appropriating this control over fisheries management, the fisheries administration has on one hand often underestimated the capacities of the local management systems, developed through often long and difficult experience and on the other hand in many instances overestimated its ability to manage these same resources.

Without denying that the traditional systems of fisheries management can often be inequitable and ineffective, state interventions which have chosen to ignore them have seldom fared better. National governments have, for the most part, failed to develop an adequate substitute for, or complement to, these traditional resource management systems. The promotion of nationalization or privatization as routine policy solutions has not solved the problem of resource degradation and over-exploitation. It has, in many instances, deprived large portions of the population of their livelihood (Bromley and Cernea 1989).

The current crisis in fisheries management can thus be argued to be caused to some degree by a lack of legitimacy of several management regimes. Townsend (1995) argues that government-centred regulation which has been applied in the past (quota management, input restriction, limited entry and individual fishing quotas) creates incentives to race for fish, break the rules and to mis-report catches. In addition it has also been expensive to administer and enforce these rules. Jentoft (1989) argues, that fishers' compliance of fisheries regulations depends upon four general characteristics: 1) content of the regulations, 2) distributional effects, 3) making regulations and 4) implementation of regulation.

Legitimacy of management regimes and compliance of rules can be improved by transferring greater responsibility to user-groups or by consulting them in management matters. In this relation representation and participation of user-groups in the decision-making process is important. In fact there is a growing awareness among fisheries administrators world-wide, that efficient fisheries management regimes depend not only on the content of the schemes, but also on the support and adherence from the users.

The advantages of user-based resource management or co-management systems have been well documented in various parts of the world (Berkes 1989, Korten 1986, McCay and Acheson 1987, Bromley 1992). The better known of these initiatives have been in irrigation and social forestry, but similar approaches are being applied in health, and upland agriculture, especially in developing countries. Co-management arrangements in fisheries are, for the most part, still being developed, although examples do exist in the United States (Acheson 1975 and McCay 1988), Canada (Pinkerton 1993), Norway (Jentoft and Kristoffersen 1989 and Hoel. et. al. 1992), UK (Goodlad 1992), Denmark (Raakjær Nielsen 1994), Faroe Islands (Mørkøre 1991),

Japan (Kalland 1994), the South Pacific (Ruddle 1989), and the Philippines (White 1989 and Pomeroy and Pido 1995).

However, co-management is not suitable for every situation. In many cases user-groups may not be willing nor capable of taking on fisheries management responsibilities. Furthermore, not all elements of fisheries management can, or should, be allocated to user-groups, due to the fact that the incentive(s) - economic, social and/or political - to undertake major fisheries management responsibilities may not be present for many user-groups. Thus, in these cases, the risk of changing fisheries management strategies may be too high.

In order to determine what kind of authority and how much authority should be allocated to user-groups, an analysis of the different functions of fisheries management is required, stating which functions can be best handled at local or central level.

The hypothesis on the efficiency and relevance of co-management arrangements in fisheries management are tested in a Danish context. The first part of the article defines the concept of fisheries co-management and develops a theoretical framework for addressing fisheries co-management issues. The second part of the article examines two Danish case studies: the days at sea regulation in the demersal fishery in Kattegat and the role of the matjes committee to regulate the herring matjes fishery in Skagerrak and the North Sea. Although the latter part of the article is more empirical, the aim is to extract more general features, which can contribute to the discussion of the potential of co-management arrangements in industrialized fisheries.

2.0 Definition of co-management

Co-management is a dynamic partnership using the capacities and interests of user-groups complemented by the ability of the fisheries administration to provide enabling legislation and administrative assistance. It is where the fisheries administration and user-groups share responsibilities and competence for fisheries management. Co-management involves delegation of management responsibilities, so that user groups take responsibility for management tasks. Co-management covers various partnership arrangements and degrees of power-sharing and integration of user-groups.

Co-management provides some sense of ownership to the fish resources, which makes user-groups far more responsible for obtaining long-term sustainability of the fish resources. It might also be more cost-efficient in terms of administration and enforcement than centralized systems, but administration costs may increase in a co-management system, as the process may be rather time consuming, involving several interest groups.

The devolution of authority to manage the fisheries, away from the fisheries administration to user-groups, may be one of the most difficult tasks of co-management. On the one hand, the fisheries administration may be reluctant to relinquish their authority, or portions of it, and are often opposed to decentralization. On the other hand, user-groups may neither have the aspiration nor the capabilities to undertake enhanced fisheries management responsibilities. Therefore, often what is needed is support to organize and train people to mobilize available resources to meet their needs.

Government agencies have recognized that the present problems of fisheries management are often of economic, social, and/or political origins. The EU Commission states in its Report 1991 on page V, that:

"distribution of responsibility at all levels, in accordance with the subsidiarity principle, conferring responsibility on the parties concerned, in particular the fishermen's organizations which could be given the task of implementing the management measures at the appropriate level"

Thus, the Commission recognizes the importance of involving user-groups in the decision-making and implementation process. Co-management is seen as the answer to improve the present management regimes.

Advantages of approaching fisheries management as a bottom-up process versus the traditional centralized top-down system may be a high degree of acceptability and compliance with regulation measures, due to the participation of user-groups in the decision-making and implementation process (Pomeroy and Williams 1994). Furthermore, one may expect improved data reliability, which may lead to increased efficiency, equity and sustainability in fisheries management and a reduction of administration and enforcement costs. Once user groups are involved in the decision making and implementation of fisheries management, a spectrum of co-management arrangements can be identified. Figure 1 illustrates the various types of institutional set-up for different co-management arrangements.

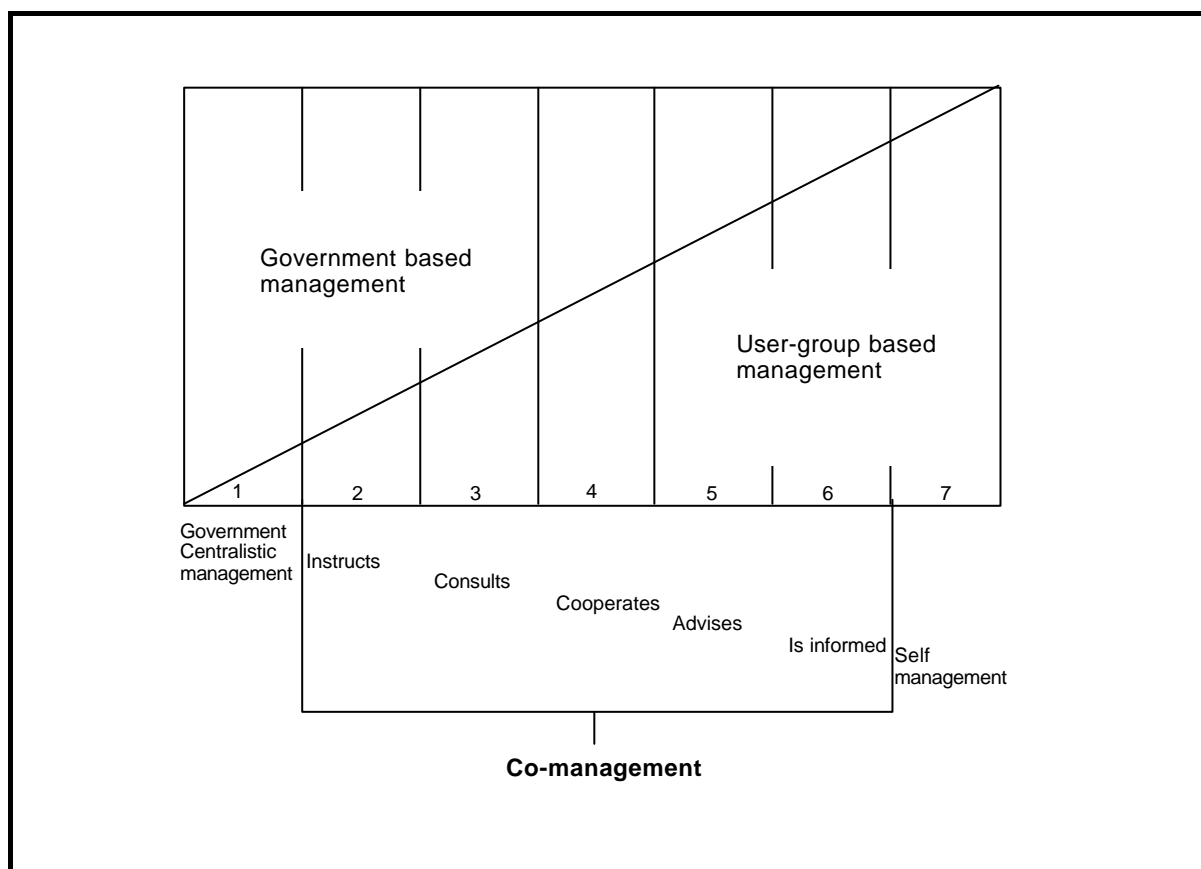


Figure 1 Typology of co-management arrangements
(Inspired by McCay 1993 and Berkes 1994)

Co-management should not be seen as just one strategy to solve all problems of fisheries management, but as a set of alternative management strategies, which are appropriate under certain situations and conditions.

2.1 Issues which influence co-management arrangements

Co-management can be seen as everything between government control on one side and pure self-regulation on the other side. Introduction of co-management may in some cases just be formal recognition of systems already in place, whereas in other situations it might require institutional change. One may not forget that establishment and successful operation of co-management in fishing might be both complex and costly not only in economic terms, but also in the political and social sense.

Co-management arrangements must be based on a consistent set of overall fisheries policy objectives and supportive conditions achieved in agreement between the fisheries administration and user-groups.

Co-management is a set of institutional and organizational arrangements (rights and rules), which determine how the fisheries administration and user-groups cooperate. There are four issues which influence co-management institutional arrangements:

Existing property rights regime in place: state, private, communal or open access (Feeny et. al 1990). Who has access to the resource, who defines rights for exploitation of the fish resources and are these rights transferable?

Scale and level of user-group involvement. At which level, central, regional or local, are user groups participating in the decision-making process and what is the scale of involvement in terms of tasks that are delegated or co-managed?

Representation of user groups in the decision-making process. Who should participate in co-management arrangements - which user-groups are legitimate participants in the decision-making process and who claim rights to participate (e.g. fishermen, fish processors, consumers, local/regional interest groups or environmentalists)?

What are the most appropriate *management institutions*: state agencies, regional or local bodies, executive regulation councils or private sectoral organisations e.g. fishermen's organisations? The specific design reflects the property rights regime in place and the scale, level and representation of user groups in the decision-making process.

A co-management arrangement is not a static legal structure of rights and rules, but a dynamic process of creating new institutional structures. A co-management institution can therefore be designed as an entirely new institution or can be based on already established institutional structures. The latter might often be the case in fisheries, where co-management institutions usually evolve as incremental user-group involvement in certain management tasks.

3.0 Theoretical background for addressing fisheries co-management arrangements

The rationale of the co-management approach in fisheries originates from the concept of common property and resource management regimes theory. Therefore, a brief background to these theories is given in this section.

In 1911 the Danish economist Warming (see Andersen 1982) demonstrated that by regulating fishing effort the economic yield to be obtained from fishing can be maximized. Gordon (1954) and Hardin (1968) argued, that fishermen or resource users of a common property resource only make decisions, which in a short-term perspective will increase their profit, but they have no incentive to take a long term view in order to preserve the resources from over-exploitation. Hardin (1968, p 1244) concluded, that: "*Freedom in the commons brings ruin to all*" and creates the tragedy.

Hardin identified two options; either privatization or government control of the commons in order to avoid the tragedy. Thus, both Gordon and Hardin assumed, that common property institutional arrangements are the same as open access. It has for a long time been a widespread perception that common property and open access are synonymous. Today this perception of common property is recognised as having no basis in reality (Hanna 1990), but unfortunately this misconception has dominated the fisheries management debate for more than 4 decades. Open access leads to tragedy and therefore some property systems need to be created in order to establish some sets of rights and rules. This paper investigates rights and rules systems for user group involvement in fisheries management.

3.1 Institutional analysis framework

Institutional analysis examines how institutional arrangements, the set of rights and rules by which users organize activities, affect user behavior and incentives to coordinate, cooperate and contribute in formulation, implementation and enforcement of fisheries management.

Oakerson (1992) has developed a framework for analysing institutional arrangements of common property resources including fisheries. This has been adapted to describe and characterize the organizational and institutional aspects of fisheries co-management arrangements (see Figure 2). The framework shows that physical and technical attributes of the fishery together with decision-making arrangements lead to a set of incentives for users to coordinate, cooperate and contribute, which in turn leads to patterns of interaction amongst resource users resulting in an outcome such as more (or less) efficient use of resources. The process is not static, and thus outcomes, incentives and patterns of interaction can effect both the attributes and the decision-making arrangements. In other words, the "system" is continually adjusting and reacting to changes. Looking at it from another perspective, the "system" may be altered to achieve a particular outcome.

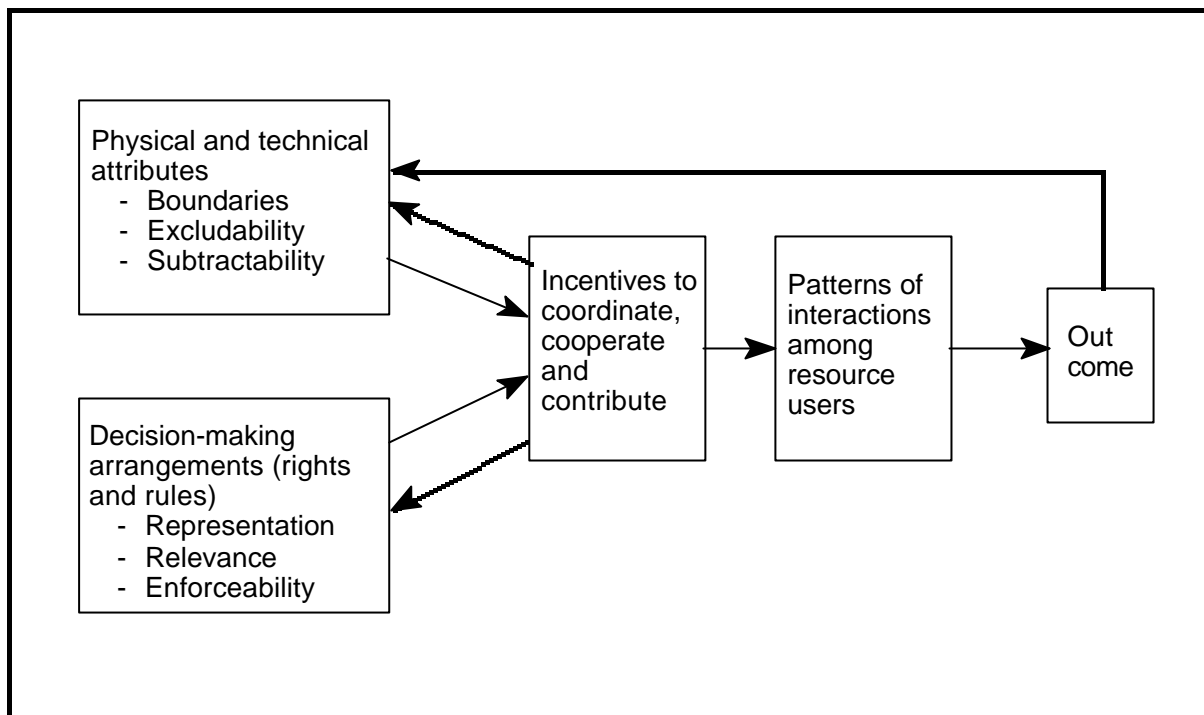


Figure 2 Framework for analyzing fisheries co-management arrangements
(Adopted from Oakerson 1992)

By adopting Oakerson's framework, the case studies on Danish fisheries co-management arrangements are based on a consistent framework. In addition, the framework in itself is not static, because as more researchers use the framework, it is likely to be modified. Jentoft and McCay (1995) emphasized the need for further comparative case studies in fisheries co-management. We also hope to provide some information in this process¹.

3.1.1 Physical and technical attributes

Physical and technical attributes include the property system in place, paying particular attention to the issues of excludability, subtractability and boundaries (Oakerson 1992). Excludability means the conditions which affect the control of access for potential fishers: natural, technological, economic or social. Subtractability means the conditions under which the activity of each fisherman subtracts from or reduces the catch per unit effort (CPUE) of other fishers. Boundaries, or indivisibility, relates to the conditions under which regulation would have to be effective. Boundaries can be physical such as an area of seabed; or technological such as a gear type; or socio-economic, such as a community. As Oakerson (1992) states, there might be "underlying economic or cultural reasons for the treatment of a divisible resource as a commons".

¹ Presently the authors are involved in 2 research projects on Fisheries co-management: 1) The worldwide collaborative research project on Fisheries Co-management in 9 countries in Africa and South East Asia, financed by Danida and 2) An EU research project: "Devolved and regional fisheries management", with participants from Denmark, France, Holland, Norway, Spain and UK.

Thus, related to these issues of excludability, subtractability and boundaries, four sets of attributes are important because they contribute to the creation of incentives or disincentives for cooperation among fishermen:

(1) *Resource characteristics* include whether the fish resource is multi/single species, the level of exploitation, whether the stocks are highly migratory or sedentary, whether the stocks fluctuate over time or are stable and what boundaries there exist in the fisheries. The resource characteristics can create incentives or barriers for cooperation among fishermen in setting up access and exploitation rules. Nevertheless, it is difficult to correlate distinct resource characteristics and incentives for cooperation across different contexts. For example, a sedentary inshore fish stock in one case might give incentives for cooperation in setting up regulation methods among local fishermen legally ensured by the state (McCay 1988). However, in other cases, a migratory fish stock may give the same incentives in order to coordinate resource exploitation during the period when the fish is present, the situation in one of the case studies in this paper.

(2) *Technology characteristics* include whether the applied fishing gears are single/multiple, the level and mix of technology including fishing patterns and whether there is a rapid technological development of the applied fishing gear and equipment. *Ceteris paribus*, the single gear situation provides more incentives for cooperation among fishermen than in a situation with multiple gears. This is especially true, if one gear group experiences a high pace of innovations and thereby increases efficiency very fast, creating problems of externalities for other gear groups. However, in other cases cooperation in setting up rules might be possible within user-groups of multiple gears if the aggregated benefits of cooperation exceed the costs of non-cooperation.

(3) *Market characteristics* include market structure, market orientation and the value of the products. Basically, industrialized fisheries have a high degree of market orientation and is in a situation of enhanced competition (Friis 1994), although there are variations in the structure among different market segments and the value of the products. However, markets may create incentives or disincentives for cooperation among user-groups. In a situation with market control and low competition there might be incentives in terms of economic benefits for cooperation among fishermen (and other user-groups) in order to set-up rules for access and resource exploitation.

(4) *Socio-economic characteristics* include the level of information and knowledge on the fishery and fisheries management by user-groups, motivation of user-groups for undertaking management responsibilities, their aspiration for adjusting their organisational structure to changes in the political, administrative environment, regional and organisational structures of the industry, dependence on fishing for livelihood and the availability of alternative employment outside fishing.

3.1.2 Decision-making arrangements

Decision-making arrangements refer to rights and rules, in particular who allocates/makes them (representation), what they contain (relevance) and whether they can be enforced (enforceability).

Rights and rules are hierarchical in nature. For example, there are rights to manage the fishery and rules which decide who has the right to do so. The rules which decide the right are attached to another set of rights.

Rights and rules which cause fishermen to take action can be divided into:

(1) *Constitutional rules*, which determine who has the rights to make collective choice rules and the legal framework for the institutional set-up for co-management institutions.

(2) *Collective choice rules*. According to Schlager and Ostrom (1993), different collective choice rights are accorded to different people based on their relationship to the resource. They have defined 3 types of collective-choice rights:

- | | | |
|---|---|--|
| Owners (State) | - | rights to set operational rules for exclusion, resource estimation, management and transfer/sale of these collective-choice rights. |
| Proprietors (Ministry/
management committee) | - | rights to set operational rules for exclusion, resource estimation and management, but cannot transfer these collective-choice rights. |
| Claimants (Operators) | - | rights to set operational rules for management. No rights to set rules for exclusion and cannot transfer these collective-choice rights. |

As rules define how rights can be exercised, the proprietor of a resource can, for example, transfer the rights to set some operational rules for resource management to claimants, although the latter group then cannot transfer these rights to someone else. Fishermen with no rights to make operational rules can be defined as authorised users.

(3) *Operational rules* include rules on structural planning, regulation methods and quota allocation and monitoring, control and enforcement. The legitimacy and enforcement of these rules will depend on the levels of representation and participation of fishermen in the process of rule-making.

3.1.3 Incentives

Between the content of the regulations and the observed behaviors in the decision-making process lie the unobserved mental calculations of individuals who make choices (Oakerson 1992). This is based on their incentives to coordinate, cooperate and contribute.

Social and cultural norms within the user-groups influence their choice of following or bypassing regulations enforced by the co-management institution. Game theory can explain why users may or may not coordinate, cooperate and contribute, based on the assumption, that each user has a clear preference order of options (Wade 1988). Figure 3 based on Wade (1988) illustrates the choice of an individual in relation to the behaviour of others.

The incentives of user-groups and government to co-manage the fishery is a combination created by the physical and technical attributes as well as the factors affecting and contributing to decision-making.

Individual behavior	Non Cooperative	Some users* affected, but do not participate (or have representation) in the decision-making process	Users* do not participate (or have representation) in the decision-making process
	Cooperative	All users* participate (through representative bodies) in the decision-making process (Ideal co-management)	Only some users* affected participate (or have representation) in the decision-making process
		Cooperative	Non Cooperative
		Group behaviour	

Figure 3 Choice of an individual in relation to the behavior of others

(note * and other interested parties)

In co-management arrangements, all four conditions are met and one should expect to find the behaviour of user-groups to be in the lower left corner of the matrix. However, this might not be the situation in all cases. Thus, the institutional analysis should investigate whether user-groups comply with management regulations, if one monitors another's behaviour and holds each other accountable, and if social sanctions are applied in a way which encourages compliance.

3.1.4 Patterns of interaction

Patterns of interaction result directly from the mutual choice of strategies by users under a given set of physical and technical attributes and the decision-making arrangements by which the co-management institution is affected.

3.1.5 Outcomes

Outcomes concern whether the co-management institution been able to implement and enforce regulations, which ensure sustainability of resources, efficiency in resource utilization and equity in distribution of benefits?

Outcomes also look at how the decision-making arrangements can be characterized and whether there have been changes in the physical and technical attributes (boundaries or exclusions rules).

4.0 Requirements and constraints for Danish fisheries co-management

The Scandinavian countries have developed a historical tradition of participation of interest groups at a high level, as well as more detailed, policy discussions concerning the determination of development objectives for specific sectors of the economy. The present Scandinavian model of the "negotiation economy" (Pedersen 1989) can be traced back to the co-operative movement in the beginning of the last century and to the constitution of labour market institutions in the beginning of this century. Today, the political system is characterized by integration of interest groups in the institutions of policy making. In contrast, within the European Union (EU) and many member states, interest groups are effectively sidelined during formal policy making, as they only have lobbying roles.

The political system of fisheries management ought to be approached within this political culture. Although the resource system is quite centralized and is state property according to Danish law, cooperative institutions are established in Danish fisheries management at a consultative level.

This chapter briefly characterizes the physical and technical attributes of the Danish fishing industry and examines the decision-making arrangements of the fisheries management system. The aim is to analyse the interaction among the resource related attributes and the fisheries management system in order to identify incentives for collective action among fishermen. As such, the present chapter also forms a contextual framework for the case studies of co-management arrangements presented in the following chapter.

4.1 Physical and technical attributes of the Danish fishing industry

The Danish fishing industry comprises a minor share of the Danish GNP (1-2%). However contribution to export earnings by fish and fish products is more important and constituted 5-6% of the total Danish export value in 1993. The total sector employment is approximately 15,000 of which 5,000 are fishermen, although these numbers are slightly decreasing².

² All figures from the Danish Ministry of Agriculture and Fisheries (MAF).

4.1.1 Resource and catch

The Danish fishery includes fisheries for both consumption and reduction purposes. In quantity, species for reduction purposes comprises approximately 75% of the total Danish catches. In terms of value, however, fishing for consumption purposes comprises 73% of the total catch value in 1993. Cod, plaice, shrimp, nephrops and sole are - in terms of value - the most important species in the demersal fishery, while herring and mackerel are the most important pelagic species.

The Danish fishery is a multispecies fishery, where almost all species are heavily exploited. The fish stocks are both stable/fluctuating and migratory/sedentary. There is a seasonal variation in the availability of many species. Fluctuating and migrating species - for example cod and herring - make stock assessment in some areas a difficult matter.

Danish quotas have fluctuated since their introduction in the late 1970s. Although a decreasing pattern seems to emerge for species important for Danish fishery. Cod catches (the most economic important species) have fallen to less than one third of their volume, from 186,100 tonnes in 1983 to 53,673 tonnes in 1994, as a result of lower quotas. Fishermen have tried to substitute with other species - increasing fishing effort in sole, nephrops and shrimp fisheries. The value of the total Danish catches has decreased by 24% in the period from 1983-1993.

4.1.2 Fleet and technology

The Danish fishing fleet is composed of approximately 3,000 vessels³ ranging from less than 5 GRT to more than 3,000 GRT. 50% of the vessels use static gear (gill net and line), 30-35% are trawlers, most below 24 meters. The remaining 15-20% use the Danish seine and 11 vessels purse seine for pelagics. The fleet can thus be characterized as differentiated in size and length, using multiple gear types at very diversified technological levels (Raakjær Nielsen 1992a and MAF 1994).

During the last 5 years, almost 1,000 fishing vessels have been removed from the fleet due to low profitability in the fleet and to fulfill the Multi Annual Guidance Programme (MAGP). Although fishing capacity is decommissioned, estimates of increasing efficiency caused by new and improved catch technologies indicate, that the fishing capacity of the existing vessels is the same as in 1983 despite the large number of vessels decommissioned,⁴ if a 2% yearly increase in fleet productivity is assumed. Thus, the capacity of the fleet is too big in relation to the fishing possibilities.

Technological improvements lead to permanent problems with overcapacity, and require a continuous withdrawal of capacity. Although reduced costs and higher fish prices might improve profitability and justify some degree of overcapacity, it is important to remove incentives for innovation within the regulation system. The existing quota system has - within

³ Figures for vessels below 5 Grt. are not available and are not included in the table, but are estimated to approximately 700.

⁴ Calculation made by the working group on changed regulations under the Industrial Development Council of North Jutland. 1983 was proposed by fishermen representatives.

a situation of decreasing resource availability - created incentives for individual improvements of catch technologies by creating a "vessel race" among the participating vessels.

4.1.3 Market structures

The development of international markets for fish and fish products has influenced the Danish fishing industry. The Danish fisheries sector has traditionally been very dependent on export markets, mostly in Europe (MAF 1994). There are two factors in particular which influence the Danish fisheries sector:

- (1) A change in the external competitive environment, as e.g. a result of the GATT-agreement, and the fact, that food products from agriculture e.g. chicken and turkey have reduced prices and hereby these products' competitiveness towards fish products, (Friis 1994), has made markets more open and globalized, causing intensified competition for frozen fish and fillets on the world market. In addition, lower rates of air freight have also contributed to increase competition on the European fresh fish market.
- (2) Consumer's demand for standardized "white" fish has caused cod to a large extent to be substituted by similar white fish, in particular Alaskan pollack and hake. Retail chains and processing industries now source white fish from many different places, which has lead to reduced cod prices (Friis 1994).

4.1.4 Socio-economic conditions

The social structure of the industry ranging from a survival livelihood in small-scale fisheries to company-owned, large-scale vessels influence the characteristics of the Danish fishing fleet.

This diversified structure influences incentives for collective action on fisheries management (Vedsmann et al. 1995) in three ways. Firstly various fleet segments identify different problems and production strategies; secondly local fishermen's organizations to generate collective action to participate in fisheries management; and thirdly there is a lack of alternative job opportunities in fishing ports, which leads to low occupational mobility of fishermen and resistance towards fleet adjustment (Raakjær Nielsen 1992b).

Two kinds of fishery dependent communities can be identified, which differ in scale and structure. Small communities in isolated areas with small-scale vessels and high dependency on coastal fisheries, and regional production systems which have a more diversified fleet structure and a number of processing industries and ancillary services. The latter type has a better potential for collective action as they are more powerful in political and economic terms.

4.2 Decision-making arrangements

The property rights regime in place determines the involvement of fishermen in the decision-making process, which influences the incentives for collective action and rule compliance. To associate decision-making arrangements in the Danish fisheries with Ostrom's "bundle of rights" it is necessary to identify the *levels* at which decisions on fisheries management tasks are made and the *actors* who participate in the decision-making process.

4.2.1 External arrangements

As stated in Article 3 and 38 within the Treaty (Holden 1994), the Danish fishery is formally and legally under the jurisdiction of the Common Fisheries Policy (CFP). In very brief terms, the CFP determines:

- the size of the TACs and their allocation among member states,
- the fleet capacity within each member state (MAGP),
- the minimum withdrawal price scheme.

The quotas are determined externally, although the national state participates in the decision-making at EU level. Danish FOs have no formal influence at this level, but POs hold some authority for the minimum withdrawal price scheme.

4.2.2 Rights of collective choice in Danish fishery

The Ministry of Agriculture and Fisheries (MAF) has the right to:

- define access and exclusion to fisheries through the distribution of licenses;
- set-up operational rules and management tasks (in accordance with EU rules);
- transfer/sale rights (e.g. quota substitution with other countries).

The Danish state is thus the "owner" of the resource as defined by Schlager and Ostrom (1993). Denmark has, through its membership of the EU, transferred power to the EU in accordance with the CFP. Denmark has the authority to make operational rules within the frame of the CFP, but as illustrated in one of the case studies, implementation of rules where the regulation is not based on quotas requires permission from EU. In this sense it may be more correct to define Denmark as a "restricted owner", but with further rights than both "proprietors" (no rights to transfer) and "claimants" (no rights of transfer and exclusion) as long as authority to EU has been transferred to the EU.

Danish fishermen can be characterized as "authorized users" with operational rights, but hold no formal rights of collective choice. However, within these general observations, examples of fishermen who have obtained rights of collective choice though their organizations are identified in the case-studies.

Representatives within the institutional set-up of the fisheries management system hold a right to be consulted in the decision-making process of making operational rules for management and

have, as such, some sort of collective choice rights, even though it cannot be characterized as claimants rights.

4.2.3 Institutions of collective choice and representation of fishermen's organizations

The institutional set-up within Danish fisheries policy consists of a political component: Parliament and the Committee for Agriculture and Fisheries (Parliamentary committee), and an administrative component, MAF.

Decision-making in Danish fisheries management is centralized. However, cooperative institutions comprising sectoral organizations and interest groups representation⁵ influence quota allocation and, to a less degree, structural measures.

The Regulation Advisory Board, is the most important institution representing both administrative and sector organizations (fishermen's associations, producer organisations, processors and the labour union) in fisheries management decision-making. The competence of the Regulation Advisory Board is to advise the Minister on Danish regulation within the constraints of the CFP, especially on quota allocation.

However, the Regulation Advisory Board also contains subcommittees and ad hoc working groups, dealing with particular fisheries, structural measures and experiments on alternative regulation methods. The capacity subcommittee advises on licenses and permits. There have been several working groups which refers to the Regulation Advisory Board, one of these on the days at sea regulation in Kattegat (see case studies).

4.3 Outcomes and patterns of interaction

Whatever the incentives for collective action are within the physical/technical/social attributes and decision-making arrangements, rule compliance and cooperation among resource users depends on the individual strategy and action of the single resource user (Oakerson 1992 and Wade 1988). Experiences and expectations of other resource users actions influence - besides the contextual incentives - the single resource user's future strategy. The efficiency of monitoring and enforcement of rules and implementation of sanctions towards rule-breakers are important factors influencing the single user's expectations of other resource users strategies. If free-riders can persist in obtaining higher benefits than rule-compliers because enforcement and sanctions are vague, then incentives to cooperate will decline over time. According to EU (1991) enforcement in Denmark, as in many other EU member states, have for some years had a low priority.

The following characteristics of the physical and technical attributes of Danish fishing industry do not encourage the single fisherman to select a cooperative strategy in rule compliance:

⁵ According to the Danish legislation, collaboration between MAF and different user-groups is formalized through user-group participation in various advisory boards. Especially two boards are important: the EU Advisory Board and the Regulation Advisory Board. As space is limited, we focus on the Regulation Advisory Board only in this article.

- C quotas are limited, there are unclear boundaries and a large number of seasonal fisheries;
- C technology is highly diversified and overcapacity exists;
- C markets are becoming open, global and highly competitive;
- C socio-economic conditions are regionally and sectorally diversified leading to a number of different production strategies for resource users.

There are also a number of barriers for collective action found within the decision-making arrangements:

- C shared owner rights for the state of Denmark under the CFP restricts the development of national operational rules;
- C fishermen's organizations/associations rights of collective choice to set-up operational rules for resource users are limited to joint consultation with other user groups;
- C fishermen's participation is further reduced by the organizational hierarchy of their associations;
- C inappropriate enforcement will always encourage fishermen to break the rules.

User-participation in Danish fisheries management is present, but takes place at a very central level, is hierarchial, and consultative (Vedsmund and Raakjær Nielsen 1995). Fishermen find operational rules hard to obey as they do not feel responsible for the creation of the principle of the CFP in 1983, so that the incentive structure for collective action becomes dominated by individual strategies of resource exploitation. The fisherman is to a large degree motivated to extract the highest possible outcome which implies a competitive race for quotas, technology improvements and, if necessary, rule-breaking.

The outcome is illegal fishing and therefore some degree of overfishing, problems of bycatch and discard and low profitability of fishermen, which leads to further resource devastation and creates problems of externalities among different fleet segments subtracting resources from each other. This leads to increased control and enforcement costs and in general a fairly bad reputation of the fishing industry.

It seems like the operational rules have the kind of legitimacy problems identified by Jentoft (1989), for practical reasons as rules are difficult to obey and the fact, that fishermen have lost influence in the decision-making process. However, there are examples of cooperative management processes involving groups of Danish fishermen as active participants in setting-up operational rules, two of which are described in the following section.

5.0 Two Danish case studies

5.1 The days at sea regulation in Kattegat⁶

The days at sea regulation in Kattegat is an experiment with the aim to solve some of the problems created by the quota system; discard and mis- or non-reported landings within the sole/nephrops fishery in this area. By using effort regulation by days at sea, fishermen were allowed to land all catch of sole and nephrops whereby discard and mis-reported landings of these species are diminished. The experiment was implemented at the end of 1993 as the result of negotiations between the MAF and the industry and is currently in operation.

In Spring 1993, conflicts arose in the Danish fishery as fishermen demonstrated against the crisis in the fishing industry. They blocked harbours and distributed fish for free. Furthermore, it was emphasized that the regulation system was unacceptable as it aggravated the economic crisis of the industry by mis-matching fishing patterns and being inflexible to resource fluctuations. Fishermen's organizations advocated a management system based on effort control which could improve planning opportunities and generate enough income to sustain a profitable fishery.

Consequently, a working group was established, comprised of representatives from fishermen's organisations, the labour union and MAF, to propose alternative management systems in Danish fisheries (MAF 1993). One of the proposals was a management system based on effort regulation by days at sea as emphasized by the fishermen's organisations. In the subsequent negotiations, it was decided to test an effort regulation by days at sea as an alternative management scheme in specific fisheries.

A second working group was then established in order to formulate and initiate the days at sea regulation arrangement within the sole and nephrops fishery in Kattegat. The objectives were (MAF 1995) to:

- obtain more flexibility to take into account fishing patterns;
- get improved data on alternative regulation methods and;
- improve catch statistics and the knowledge on the fish stocks in the area.

5.1.1 Physical and technical attributes

Kattegat was chosen since biological data were rather poor for these fishing waters. Furthermore, problems of bycatch, discard and mis-reported landings were significant in the sole/nephrops fishery due to a large increase in the sole stock as indicated by a historical high CPUE (MAF 1995). Therefore, the experiment on alternative regulation by days at sea was primarily related to the sole/nephrops fishery. At the outset, cod, herring and species for reduction purposes were excluded in the experiment, although cod is in a process of being integrated into the days at sea arrangement (August 1995). The experiment was approved by the EU-Commission and an additional quota was provided to ensure that the effort regulation could be tested and not infringe on existing quotas.

⁶ Kattegat and suparea 22 in the Western Baltic Sea. In the text referred to as Kattegat.

The total number of days to be allocated were estimated on the basis of historical effort (1990-1992)⁷. However, uncertainties in the assessment of fishing effort were significant e.g. defining which vessels actually did participate in the sole/nephrops fishery in that period. Furthermore, as the number of participants were unknown in advance, it was difficult to allocate the number of days among participants and to decide the length of each period. While fishermen wanted to have the period as long as possible in order to improve planning possibilities, MAF feared an enhanced pressure on certain species, particularly the cod (as it is a significant bycatch in the sole/nephrops fishery). However, these disagreements were solved by close collaboration among fishermen and MAF in the working group.

When the experiment was initiated in December 1993, the first period was fixed at four weeks. Vessels participating were given 15 days at sea, independent of vessel size. Participating vessels also enjoyed access to waters outside the Kattegat area, however, within the normal regulations of that respective area e.g. the ration fishery and technical measures as well as within the constraints of days at sea regulation.

The table below shows the periods given in 1994, the length of the period (total no. of days), the maximum number of days at sea allowed within each period, the number of vessels participating in the experiment (and their share of the total) and the total number of vessels in the sole /nephrops fishery in the area.

Table 1 Allowed days and participating vessels in the days at sea regulation.

Period 1994	Length of the period (no. of days)	Max. no. of days at sea allowed	No. of vessels participating	Total no. of vessels registered in the sole-/nephrops fishery
1.1 - 30.1	30	15	131 (72%)	182
31.1 - 27.2	28	15	103 (71%)	145
28.2 - 27.3	28	15	97 (73%)	133
27.3 - 24.4	29	15	107 (80%)	134
25.4 - 3.7	70	48	168 (64%)	264
4.7 - 28.8	55	48	145 (67%)	217
29.8 - 23.10	56	38	187 (74%)	254
24.10 - 1.1 95	70	35	224	-

Source: The Danish Ministry of Agriculture and Fisheries

The information given in the table reflects the aim to match the regulation of days at sea to the fishing patterns for sole and nephrops which have shown a relative historical stability. From May to October (especially August-October) the sole/nephrops catch is traditionally at its highest level. This seasonal variation in the fishing pattern is reflected in the length of the fishing periods, which are longest in May-October (55-70 days) and in the maximum number of days at sea which reach the highest number in this period (38-48 days). Thereby, the

⁷ Corresponding to the total number of fishing days for participating vessels reduced by 10%.

regulation by days at sea attempts to adjust the rules to the actual fishing pattern by improving the opportunities for the fishermen to plan their fishing activities when the catches traditionally are at the highest level.

However, not only the objective of adjusting rules to fishing patterns influences the length of the periods. Concern of the bycatch of cod in the sole/nephrops fishery and a general uncertainty of the experiment meant that short periods were implemented in the beginning. As trust and experience developed, periods became longer and are now 70 days in the beginning of 1995. This improves the ability of fishermen to plan the fishery.

Furthermore, the table shows that between 64% and 80% of all vessels within the sole/nephrops fishery in Kattegat are participating in the days at sea regulation (1994). These are primarily smaller trawlers (sole and nephrops) and gill-net vessels (sole), and come from nearly all the ports around Kattegat (and subarea 22). The vessels had the possibility of having 229 days at sea in 1994 which can be considered almost as free fishing (4.4 days at sea/week).

5.1.2 Decision-making arrangements

Representatives from MAF, Danish Fishermen's Association (DFA) and Danish Institute for Fisheries Research⁸ (DIFR) constitute the working group on the days at sea regulation⁹. DFA have two representatives in the working group which is also comprised of; the chairman of DFA and a central board member who also is a local chairman in one of the main ports in the Kattegat region. In addition, the chairman of DFA is from the region as well. Therefore, DFA representation in the working group has detailed knowledge of the regional fishing patterns.

The working group formally reports to the Regulation Advisory Board. However, it functions fairly independently of the Regulation Advisory Board as all proposals and advice have so far been accepted by the Regulation Advisory Board. The working group meet approximately once a month to review the experiment and advise on the number of days to be allocated in the next period (MAF 1995).

In more informal terms, the participants express their satisfaction with the cooperative process in the working group. In particular, participants emphasize the composition of interests as suitable. The narrow composition and the small size of the working group have so far given space for fruitful and open-minded cooperation where the influence of the participants organizational background and culture have been minor.

The broad range of possibilities and models which were discussed in the formulation of the set-up of the experiment were found to be very useful in order to find suitable solutions. This was only possible due to the fact that the representatives from MAF were from the rather low end of the hierarchy as the participants emphasized that the absence of civil servants at higher

⁸ Generally Workers Union in Denmark is formally represented, but has not directly participated. It has been informed on decisions taken.

⁹ 4 out of 5 members of the working group have been interviewed, and available documents have been reviewed.

political levels gave space for more open-ended discussions which were important in building up trust and knowledge in the working group.

In addition, the clear management problems and common identification of main objectives have helped to overcome social and organizational barriers¹⁰ which normally exist in, for example, the Regulation Advisory Board. It has supported the development of a learning process; from the very beginning participants emphasized that they previously did not have detailed knowledge on effort regulation. However, since an obvious management problem required solutions, it was necessary for all participants to contribute with their individual knowledge and to cooperate in order to develop a clear management scheme. The exchange of knowledge and information seems, in this case, to be a precondition for implementing an acceptable days at sea regulation.

Thus, the formulation and initiation of the management scheme in the working group can be characterized as a process of "muddling through", where cooperation was a precondition for success.

5.1.3 Outcomes and patterns of interaction

It is difficult to assess the outcome of the days at sea regulation in Kattegat based on a one year experiment. However, the working group has succeeded in achieving a management system which takes the fishing patterns into account and which is more flexible and probably no less sustainable than the previous quota system. A precondition for assessing sustainability is to collect more reliable data for stock assessment. This should be improved by the current experiment.

In general, the fishermen found the system better than the previous quota system. Some fishermen¹¹ argue that there are economic gains to be achieved by legalizing landings of larger catches and that costs can be reduced by improved opportunities in planning the fishery. In addition, the decriminalization of sole/nephrops fishing in Kattegat seems to be an important outcome of the experiment¹². Furthermore, DFA has sought to inform members and local fishermen's organisations to support the experiment by rule compliance and thereby to delegate management responsibility to participants.

However, part of the reason for the short term success of the management system seems to depend on the large number of days at sea allocated during the first year of the project. It has almost introduced free fishing in Kattegat by enabling vessels to fish for 4.4 days per week.

¹⁰ Bonnie McCay (1988) has identified similar processes - that common problem identification, "to get something done" can help overcome barriers of communication based on different social, cultural and organizational backgrounds.

¹¹ Surveys in this field are not done, however, fishermen from the region have been interviewed. In addition, MAF (1995) refers fishermen who claim that they can earn approximately 20% more with the effort regulation system.

¹² Although, there are still problems of bycatch/discard of cod which can lead to illegal landings.

Even though the quotas were not fully utilized at the end of 1994, the days were reduced in this period, because the fishermen had used nearly all days at sea. However, fishermen found it somewhat difficult to understand that they were not allowed to fish the rest of the yearly quota. As the fishery in the experiment is effort regulated it implies that no quotas, in theory, are required. Confusion occurs when the effort experiment is implemented within a quota regulated fishery and therefore it is not allowed to exceed the yearly quota (including the additional quota given by the EU), although this is only a technical problem within the experiment. In this case, there seems to be a lack of clear information given to the fishermen participating in the experiment on the objectives of the experiment by the working group, and in particular within DFA.

The exclusion of cod in the days at sea arrangement puts a limit to the value of the experiment, because cod is the only species in which a large reduction in fishing effort is required. In terms of value, cod is equally important to sole and nephrops in Kattegat and is taken as bycatch in these fisheries. Currently (August 1995), cod is going to be included which probably will enhance the fishing pressure and thus require a reduction of days allocated. As a result fishermen will face a situation with a reduced number of days and the experiment will be put under a serious test.

However, there is no doubt that the experiment is a “cooperative success” among the participants. Besides the success of the cooperative process itself, as highlighted in the decision-making arrangement, some factors influencing the cooperative outcome can be identified.

It is noteworthy, that all representatives had an individual interest in the experiment:

- C DFA wanted to improve the operational rules and follow up the demands for effort regulated management;
- C DIFR wanted to improve their catch statistics in order to improve stock assessments in Kattegat;
- C MAF wanted to pursue a more appropriate regulation in order to overcome the fisheries conflict which occurred in Spring 1993.

That the initiative to experiment on days-at-sea regulation originally came from fishermen's organizations has obviously encouraged further cooperation, especially in order to reach an agreement. Representatives from DFA have been open and active so that it was difficult for DFA not to cooperate, when the initiative came from DFA itself.

The present case-study illustrates, that a co-management arrangement is able to set-up operational rules. However, institutions with a broad membership seem appropriate in the implementation process, in order to hear other stakeholders. Co-management at a central level, through increased delegation within cooperative institutions seems possible within working groups of smaller committees in order to elaborate operative rules for specific fisheries and fishing areas.

5.2 Regional Co-Management of the Danish Matjes herring fishery

The Matjes herring is a particular quality of the North Sea/Skagerrak herring, which is mainly sold as a snack in the streets of Amsterdam and in other parts of the Netherlands during the summer.

The fishery for Matjes herrings has been coordinated and managed by regional Danish fishermen's organisations since the late 1970's. In 1992 the regional management was institutionalized on a voluntary basis by the creation of the Matjes Committee (MC)¹³.

5.2.1 Physical and technical attributes

The matjes season starts in May and ends in July, as the herring has the right quality in this period. The fishing takes place in the North Sea, Skagerrak and along the Norwegian coast. During that period the herring migrates and therefore it can be difficult to catch herring of the right quality in large quantities.

There are yearly fluctuations in catches; catches in recent years have been lower than those to the 1970's. Nevertheless, the herring quota has increased.

Traditionally the matjes fishery has been undertaken by trawlers and purse seiners. In recent years the matjes fishery has only been undertaken by purse seiners because the trawlers have been unable to land the required quality at a profitable level. This has led to a homogeneous mono-gear user-situation.

The purse seiners are large vessels, most are more than 40 meters in length, and have an average crew of 8-12 fishermen. The purse seine fishery can be characterized as an innovative and very capital intensive.

The matjes fishery is a Scandinavian fishery, where vessels from Sweden, Norway and Denmark participate. Approximately 25 vessels participate at a time, 6 Swedish, 11 Danish and 6-10 Norwegian vessels. The owner structure of the purse seiners differs from the rest of the Danish fleet. Danish purse seine vessels are, with some exception, owned by fishing companies or the processing industry. More than 100 Norwegian vessels are potential participants, but due to the fact that the Norwegian vessels are collectively allocated a total catch quota, the number of vessels participating is lower in order to make the fishing profitable.

In order to ensure full transparency on quantity and quality on the first hand sale of matjes herring, these are sold at the public fish auctions in Hirtshals or Skagen in Northern Jutland, Denmark. In 1994, 19,200 tonnes matjes herring were sold at the fish auctions in Hirtshals and Skagen, obtaining an average price of 3.20 DKK per kilo, making the total first hand turnover of matjes herring 61.45 mill. DKK.

Thus, during the same period the average price of non-matjes herring was 1.89 DKK per kilo the matjes fishery created an extra 25.2 mill. DKK or approximately 70% more out of the same amount of herring. Thus, the matjes market can be characterized as a high-value herring market.

¹³ The two persons undertaking the daily management on behalf of the MC have been interviewed and we had access to all transcript of minutes of meeting for the entire 1994 matjes season.

There are strong links between vessel owners, processors and the Dutch buyers in order to ensure the high-quality (and high-value) product. Dutch buyers purchase the herrings at the fish auctions and then more than half of this quantity is processed in Northern Jutland. The processors remove the gills from the herring, salt and grade them as contract work for the Dutch buyers. 400-500 persons are employed in this operation throughout the matjes season.

The main market is the Netherlands, but also a minor portion is sold in Belgium. The market is dominated by 8-10 Dutch buyers having a market share of approximately 80-90%.

Previously, the first hand sale of matjes herring in Northern Jutland has not been exposed to any major competition from other countries. However a newly established first hand sale centre based at Egersund, Norway is aiming towards moving the first hand sale of matjes herring from Northern Jutland to Egersund. Until now only this has had limited success, as the market share of the Egersund market in 1994 was approximately 20%. However, as long as the Egersund market exists, there will be a potential challenge to the first hand sale in Northern Jutland.

The Swedes and the Danes fear, that the matjes markets will lose its exclusiveness if a new market is established. They think supply will exceed demand, and then it will be likely that the matjes market will be unable to maintain its status as a high value market.

The processors from Northern Jutland and the Dutch buyers have a long business record (often more than 20 years of collaboration), which to some extent creates a matjes brotherhood. This includes the purse seiners which also have a long history in the matjes fishery.

The matjes fishery is outstanding because Norwegian and Swedish fishermen's organisations voluntarily accept rules made by a local Danish management committee.

5.2.2 Decision-making arrangements

The MC based in Northern Jutland, composed of regional representatives from DFA and the Association of Danish Fish processing Industries and Exporters, has voluntarily undertaken management responsibility for the Matjes fishery within the framework of EU and Danish regulations. Danish regulations have been adjusted to meet the requirement of the MC. Thus, the MC has been approved by MAF.

On behalf of the MC practical management is undertaken by the Purse Seiners Producer Organisation (PSPO) in close collaboration with one representative from the regional processing industry. This includes monitoring of the matjes fishery, gathering catch data, determination of weekly catch rations and distribution of information to fishermen's organisations in Norway, Sweden and Denmark, Danish processors and Dutch buyers.

Meetings are held throughout the year in order to coordinate activities and ensure cohesion among the participants. While landings, processing and management are based in Denmark, meetings take place in all countries. It is a tradition that the MC first meet with the Swedish and Norwegian fishermen's organisation to prepare and plan the forthcoming matjes season from the supply side. This meeting is normally held in Sweden in early spring. Shortly after the MC

meet with the Dutch buyers in the Netherlands to obtain information on expected demand and Dutch quality requirements for the coming season.

The meetings in Sweden and the Netherlands are aimed at reaching an agreement on operational rules for the coming matjes season. There is a bundle of rules, accepted by all parties, which are contained in "The Ten Commandments" of the matjes fishery.

The Ten Commandments of the Matjes Fishery:¹⁴

1. Herring for Matjes shall be landed in fish boxes.
2. Herring for Matjes shall be sold at the public fish auction.
3. The Matjes Committee decides maximum weekly rations for all vessels landing herring for Matjes.
4. Herring for the Danish processing industries (non-Matjes) must be sold at the teleauction or directly to the processors; in all cases the buyer takes over the herring in the bulk tanks of the vessel.
5. Herring for non-Matjes can be landed in addition to the maximum weekly ration for Matjes.
6. Herring, landed for non-Matjes must not be used for Matjes.
7. Vessels, which want to land Matjes herring on a given day are required to sign up for landings at the public fish auction before 06:00 at that day.
8. Vessels, signed up for landing at the public fish auction shall land the quantity signed up for and are only allowed to land this quantity.
9. The quantity signed up for, shall be landed at one time.
10. Two weeks before the Matjes season starts it is not allowed to sell herring in fish boxes at public fish auctions in Northern Jutland.

These rules are formulated and continuously revised by representatives of the MC in collaboration with representatives from all involved parties in order to obtain the highest possible quality and thereby maintain the matjes market as a high-value market. Whereas fishermen's incentive are to maintain high prices on herring sold as matjes, the incentives of the processors are to keep as much as possible of the processing in Northern Jutland. The incentives for Dutch buyers are to get matjes herring with the highest possible quality.

Representatives from the MC emphasize the importance of the circulating meetings, as it minimizes the Danish dominance and gives the Norwegian and Swedish fishermen's organisations (FO's) and the Dutch buyers influence on operational rules for the matjes fishery.

As part of the process, the weekly "coffee-meetings" as they are called emphasizing their highly informal structure are extremely important. At these meetings - taking place in Hirtshals or Skagen usually on Thursdays - representatives from the vessel owners, the processors and the Dutch buyers meet to discuss the quantity and the quality of the landed herring in the past week.

¹⁴ Source: The Matjes Committee.

At the coffee meetings, the Norwegians are represented by a Dane, the Swedish participation is more sporadic, 4-5 Dutch buyers usually attend as well as 4-5 Danes representing fishermen and processors. The coffee meetings are a focal point for exchange of information between the fishermen's representatives and the Dutch buyers. The fishermen are able to inform where the herrings have been caught and in which sizes and quantity and how the fishing activities are going. The buyers are able to inform on the quality of the landed matjes, e.g. size, stomach and fat content, appearance and taste (which is hard to measure) as well as the market prospects for the coming weeks. This gives the fishermen and the buyers the opportunity to coordinate the fishing activities in the coming week in accordance with the actual fishing situation and the quality requirements of the buyers.

When the matjes season is over, an evaluation meeting is held in Norway in late autumn, attended by representatives from the Norwegian and Swedish FO's and the MC with the aim to evaluate the past season and prepare the next one. In particular the operational rules are discussed and alternatives are considered. Minutes of the meetings are distributed to all involved parties.

The PSPO undertakes the daily management including supplying information to the Swedish and Norwegian FOs on the size of the weekly catch rations the operational rules. Enforcement of these rules lie within the FO's of the participating fishermen. The PSPO can therefore only enforce rules on its own members, inform Norwegian and Swedish FOs, if their members break the rules and encourage them to enforce the rules on their members. Continuous exceeding of the weekly rations leads to economic sanctions, where the vessel must pay back the estimated value of the extra catch minus costs.

However, the MC is a 100% voluntary agreement, thus the committee only hold power which the organisations involved in the matjes fishing/processing are willing to delegate. Therefore, enforcement of rules is a part of the agreement between the international partners and is built on trust and confidence among the participants in the whole Matjes fishery and not only within the MC.

The third rule in the "Ten Commandments" concerning maximum weekly catch rations cannot be questioned, because this rule is the core method to sustain prices at a high level by regulating supply in accordance to demand. The weekly catch rations are decided by the MC after recommendations made at the coffee-meetings.

While Danish and Swedish participants have vessel quotas, the Norwegian FO has a collective quota, which it can distribute among its members. Disputes arise when the weekly ration is reduced. However, the MC has been able to solve disputes and reach agreements on operational rules and enforcement hereof.

Representatives of the MC argue, that the institutional management set-up is the main reason for the success in solving disputes. Openness, exchange of information and equal participation from all organisations have created trust and confidence among participants in order to maintain the economic surplus in the matjes fishery, which they emphasis is only possible through close cooperation.

Representatives of the MC argue, that if the "Ten Commandments" fall apart the market will be over supplied, untransparent and the quality of the landed herring will be reduced. This will

lead to significant economic losses for the fishermen and a low quality matjes product sold on the Dutch market.

5.2.3 Outcomes and patterns of interaction

The fact that there are many unquantifiable factors which determine the quality of matjes herring may be one reason for the need for very close user-producer relations among fishermen, processors, and the Dutch buyers in the matjes fishery.

Exclusion of trawlers seems important in the management of access rights to the high-value Matjes fishery, as the fishery is undertaken by only a small number of technological homogenous vessels.

The regional management of the Matjes herring fishery seems successful in creating incentives for collective action. The process of cooperation among different nationalities and *ceteris paribus* dividing economic interests in a set of clearly defined operational rules with possibilities of refinement seems important.

Some of the reasons for the successful performance of the MC are:

- C Clearly defined boundaries concerning the institutional set-up, where the MC has been delegated regional self-management authority for the matjes fishery.
- C Limited number of mono gear vessels participating in the fishery.
- C Single species fishery concentrated in a short period, where the herring is sold on a single market by a relatively low number of buyers.
- C A very high degree of user participation in the decision-making process. A transparent decision-making process and open distribution of information to all participants involved.
- C Creation of a set of collective choice rights concerning the Matjes fishery, although operational rules need to be within the framework of national and international regulations.
- C Large economic benefit for the fishermen by collaboration.

The future success of the co-management of the matjes fishery depends heavily on cooperation from all involved parties and the ability of the MC to balance the different interests equally. In this respect, some concern could be raised as to whether this is likely to happen. The present success of the MC is closely linked to the persons who represent the MC and their professional capabilities, personal enthusiasm and the relationships within the group. Thus, the personal composition of MC is a key factor in order to ensure compliance and enforcement of the "Ten Commandments" and therefore of the persistence of the MC.

The balance of the matjes fishery regulation is fragile. Presently the number of participants are limited due to fact that trawlers for the timebeing do not participate in the matjes fishery and

the limitation of Danish purse seines licences. If the trawlers become active again in the matjes fishery or some trawlers get licenses to purse seine, the number of participants will more than double and reduce the weekly catch rations to a size, where it may not be profitable for the vessels to be involved in the matjes fishery, if catch rations are distributed equally. Furthermore, some trawler representatives find that the MC has become an exclusive club for purse seiners and processors. They feel that they are not taken seriously, because they currently do not participate in the matjes fishery. This is an example of a classic gear conflict between purse seiners and trawlers. However, the frustration of the trawler fishermen cannot be neglected because the trawlers can interfere and disturb the matjes market. Nevertheless, it is important to keep the trawlers involved in the MC in order to reduce conflicts.

The limited access to the matjes market for Norwegian vessels could be problematic in the future, due to the fact that Norwegian herring quotas in the coming years will increase dramatically. The Norwegians will be in a powerful position in the negotiation of operational rules for the matjes fishery. The Norwegian vessels will not be so dependent on the high price matjes market as their Swedish and Danish colleagues, because they can compensate lower matjes prices with larger landings. One fear is that the Norwegians will use this power to increase their share of the matjes market at the expense of Swedish and Danish purse seiners. An indication of this intention is the creation of the Egersund matjes market.

The close user-producer relation, especially on quality aspects, might lead to discards as a way to maintain high grade quality in the future, in particular if vessels have low catch rations and can easily catch another school of herring. If this becomes a habit it has a negative impact on the preservation of the herring stocks in Skagerak and the North Sea and might create a political pressure on the matjes fishery from other stakeholders e.g. environmental groups.

6.0 Evaluation and discussion

Theoretical aspects of user-participation in fisheries management were elaborated in order to develop an operational framework for addressing co-management issues in industrialized fisheries. The aim was to identify specific institutional set-ups of user-participation in Danish fisheries management to illustrate the important aspects of legitimacy of management and to broaden analysis of fisheries management to include aspects of rule-making, participation and institutions.

6.1 Case studies of Danish fisheries co-management arrangements

The co-management concept covers a broad variety of collaborative arrangements. The Danish case studies show, that different co-management arrangements are in place ranging from cooperative consultative, *the Regulation Advisory Board* to cooperative and advisory, *the Working group for days at sea regulation* to delegated local management, *the Matjes Committee* (see figure 4). Thus, co-management is not a clearly defined and unambiguous concept, but a process of integrating user-groups as participants in fisheries management decision-making.

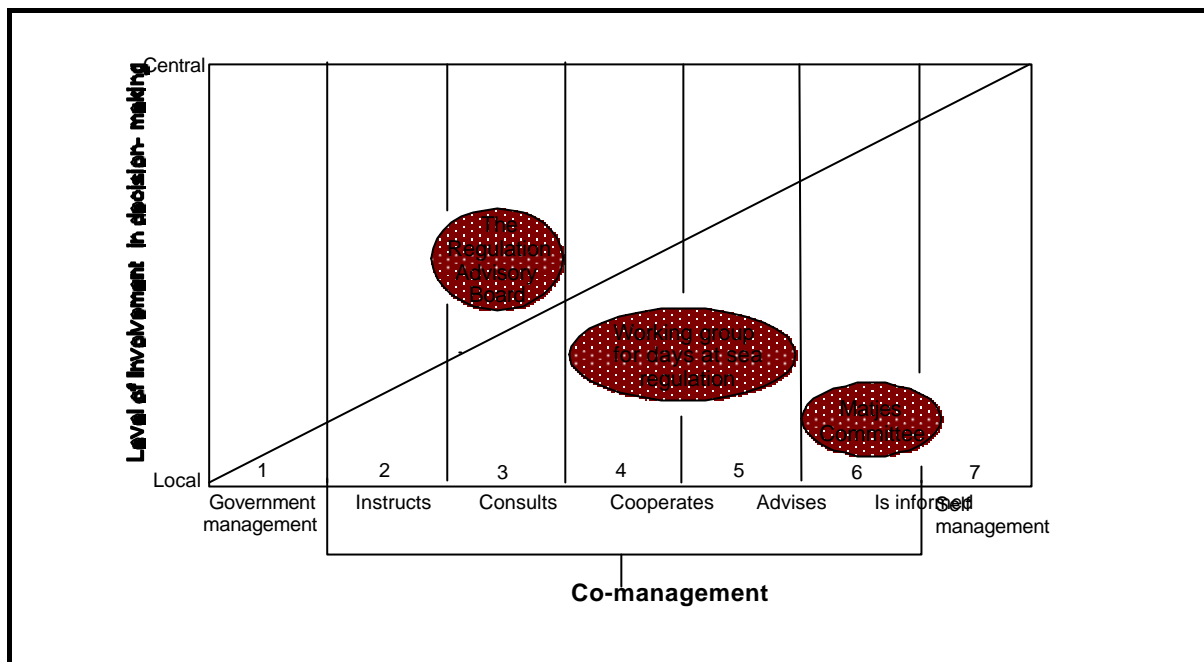


Figure 4 Case studies placed in co-management typology.

(1) In the Regulation Advisory Board, co-management takes place as consultation at a central level. A broad range of user-groups are represented and have the right to advise the MAF, particularly on quota allocation and partly on structural measures and regulation methods.

(2) In the working group for days at sea regulation in Kattegat, co-management is present as a cooperative process between MAF and user-groups. At the central level, DFA participates in formulation and initiation of alternative regulation methods.

(3) In the Matjes Committee, management authority is delegated to a number of user-groups at the regional level and is therefore close to self-management where the MAF is only informed. The MC distributes weekly catch rations as its main management task.

The three examples illustrate differences in the tasks that are co-managed or delegated, the level at which decisions are made and the representation of user-groups in the decision-making process. It is therefore difficult to operate with one single co-management concept. One needs to investigate various types of co-management, although user-group involvement is the common feature. However, they can serve different functions in the fisheries management system and they can be more or less efficient, equitable and sustainable.

Efficiency is expected to increase in co-management arrangements, because transaction costs can be reduced by the exchange of information between different links in the production chain, documented in the two case studies. In the effort regulation, enhanced planning opportunities for fishermen have reduced their costs and give possibilities for improving prices by better market adjustment. In the case of matjes regulation, cooperation gave opportunities to sustain a high-value market and the vessels gain an economic surplus by voluntary output control (limitation on catch rations).

Efficiency can also be measured in terms of the overall transaction costs of the management system, although such calculations are very difficult to carry out in practice. The case studies illustrate that the co-management process is time consuming and costly to carry out. The matjes regulation is very sensitive cooperative process which requires significant information exchange to sustain the management system. In the case of effort regulation, management costs have probably reached its maximum during the formulation and initiation of the management scheme at the very beginning of the experiment. Subsequently, management costs are expected to be reduced, further strengthened by the improvement of trust and confidence among participants which reduces the need for close collaboration. Increased management costs are expected to be counterbalanced by reduced costs to monitoring, control and enforcement as rules are adjusted to fishing patterns and DFA supports the management scheme.

In terms of *equity/distributional effects* among fishermen and/or groups of fishermen there are contradictory patterns emerging in co-management. At the outset, there is a dilemma between establishing boundaries to resources by limiting access and sustaining equal access to resources. However, the matjes regulation is voluntary, whereby the existence and success of the regulation indicates that participants accept the distributional effects of the process and the outcome. Similar observations can be made on the effort regulation where fishermen can choose between the days at sea regulation or the quota regulation. There has been a remarkable approval to the days at sea arrangement from the very beginning which strongly indicates that fishermen accept the distributional effects. Thereby, it looks like the working group is able to balance limitation on access versus equal access.

In terms of *sustainability*, it is very difficult to assess the outcome of the case studies. The matjes regulation is based upon a fishery which only lasts 10 weeks and the matjes fishery only subtracts a minor share of the herring stock. In Kattegat - with the effort regulation - stock assessment is very uncertain and the experiment is partly initiated in order to gain knowledge and statistics of the Kattegat fishery to improve stock assessment. Thus, it is currently impossible to assess the outcome of effort regulation in terms of sustainability, although data gathering is improved by the experiment.

6.2 Lessons learned

Co-management is not a panacea for fisheries management, as the process of involving user-groups in the decision-making can develop different regulation methods. A precondition for successful co-management is, that user-groups on one hand have the aspiration and capabilities to co-manage and take over competence and responsibility and on the other hand that an appropriate institutional arrangement is established. Based on the Danish cases some general lessons for successful co-management can be deduced:

- C The more specific management competence user-groups are given, the more important is homogeneity of user-groups involved in terms of gear type and vessel size.
- C Giving users competence in rule making may lead to simple and clear rules, e.g. the "Ten Commandments".
- C Giving fishermen's organisations competence in rule making can increase responsible performance of the involved organisations, as they encourage their members to comply with the rules.

- C Multi user-group participation in co-management arrangements increases legitimacy of decision-making.
- C The co-management process heavily depends on the commitment from few key-persons and is bottom-up driven.
- C It is of major importance, that user-groups can see the economic benefit of cooperation, also in a short term perspective.

Therefore, it is not a question if co-management should be implemented, in order to solve the resource crisis or ensure adjustment to changed market conditions, but how.

A number of co-management case studies worldwide indicate, that efficient, equitable and sustainable resource management requires *institutional resiliency* of the co-management institution (Hanna 1995). In order to integrate information and knowledge from resource fluctuations, fishing patterns and market trends in decision-making, institutions need to be flexible and able to adapt to external conditions. The Danish case studies confirm these observations. Close user-producer linkages, and the weekly meetings in the matjes fishery strongly indicate resiliency towards adapting fishing effort to market demand. In the case of effort regulation, the set-up of an alternative management scheme documents flexibility to combine knowledge of resource fluctuations and fishing patterns in rule-making. Both cases demonstrate the need for user-participation to obtain information on external changes needed to ensure institutional resiliency.

We will argue, that some form of co-management is always appropriate - to improve the knowledge and information for management decisions. However, this does not imply that delegated local management is more appropriate than informative or consultative management arrangement. The proper design principles depend upon the context and conditions under which the co-management arrangement has to work.

These will often evolve gradually (Jentoft and McCay 1995) through a process of muddling through, often in the light of crisis management: such as the days at sea regulation. North (1990) observes, that institutional change often occurs as marginal adjustment of old structures rather than radical innovations or total reorganization. The evolution of co-management arrangements in Denmark have moved from consultative arenas towards the creation of joint or self management arrangements for particular fisheries, empowering user-groups with enhanced management authority for a limited numbers of tasks.

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